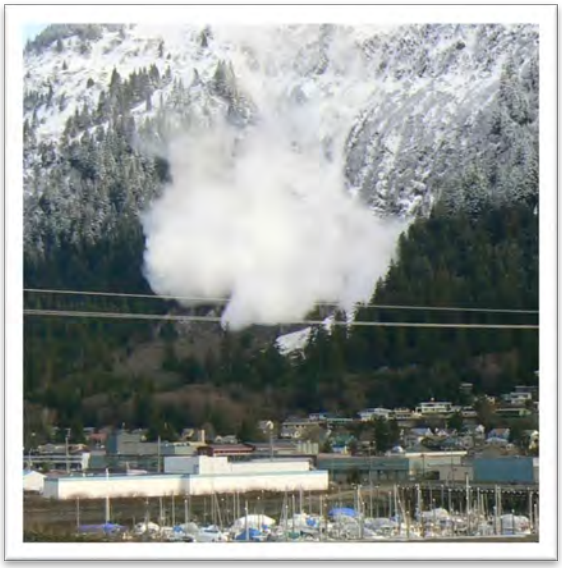
City and Borough of Juneau and the Central Council of Tlingit and Haida Indian Tribes of Alaska (Tlingit & Haida)

2025 Multi-Jurisdictional Hazard Mitigation Plan Update



CBJ Adoption Date: **TBD**
Tlingit & Haida Adoption Date: **TBD**

Dates Active: **TBD**

CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY

FAIRWEATHER SCIENCE

Tlingit & Haida

TABLE OF CONTENTS

EXECUTIVE SUMMARY XIV

Vulnerability Snapshot xv
Community Profile xx
Critical Facilities – City and Borough of Juneau xxxii
Critical Facilities – Tlingit & Haida xxxvi
Mitigation Action Plan (MAP) Snapshot xxxviii

FEMA APPROVAL LETTER LXXII

1. PLAN INTRODUCTION AND BACKGROUND 1-1

1.1 Purpose 1-1
1.2 Hazard Mitigation Plan Layout Description 1-1

2. PLANNING PROCESS 2-1

2.1 Overview of the Planning Process 2-1
2.2 Hazard Mitigation Planning Team 2-3
2.3 Opportunities for Collaborators and Other Interested Parties to Participate 2-4
2.4 Public Involvement and Tribal Definition of Membership 2-6
2.5 Review and Incorporation of Existing Plans, Studies, and Reports 2-7
2.6 Other Ongoing Tribal Efforts 2-9

3. RISK ASSESSMENT 3-1

3.1 Overview 3-1
3.2 Hazard Identification and Screening 3-2
3.2.1 Hazards Not Profiled in This HMP Update 3-4
3.3 Hazard Profiles 3-6
3.3.1 Earthquake 3-8
3.3.2 Severe Weather 3-16
3.3.3 Wildland Fire and Urban (Community/Downtown) Fire 3-51
3.3.4 Landslide 3-62
3.3.5 Tsunami 3-85
3.3.6 Flood 3-98
3.3.7 Shoreline/Bank Destabilization 3-131
3.3.8 Changes in the Cryosphere 3-145
3.3.9 Volcano 3-162
3.3.10 Dam Failure (High Hazard and Significant Hazard Dams) 3-171
3.3.11 Cybersecurity 3-189
3.3.12 Hazardous Materials Release 3-194
3.4 Summary of Vulnerability 3-208
3.4.1 Vulnerability Overview 3-208

3.4.2 Cultural and Sacred Site Sensitivity 3-209
3.4.3 Population and Building Stock 3-209
3.4.4 Vulnerability Assessment Methodology 3-210
3.4.5 Data Limitations 3-212
3.4.6 Critical Facilities Inventory 3-212
3.4.7 Vulnerability Exposure Analysis 3-225
3.4.8 Land Use in Juneau and Traditional Lands of Tlingit & Haida 3-230
3.4.9 Future Development 3-240
3.4.10 Subsistence and Food Sovereignty in Alaska 3-241

4. MITIGATION STRATEGY 4-1

4.1 Existing Authorities, Policies, Programs, and Resources 4-2
4.1.1 Ability to Expand and Improve Resources 4-7
4.2 NFIP Participation and Repetitive Loss 4-7
4.3 Alaska Dam Safety Program 4-10
4.4 Mitigation Goals 4-11
4.5 Mitigation Actions 4-12
4.6 Evaluating and Prioritizing Mitigation Actions 4-17
4.7 Mitigation Action Plan (MAP) 4-18
4.8 Monitoring and Reviewing Mitigation Actions 4-38

5. PLAN MAINTENANCE 5-1

5.1 Planning Team MJHMP Maintenance Commitment 5-1
5.2 Continued Public Involvement 5-1
5.3 Implementing, Monitoring, Evaluating, and Updating the MJHMP 5-2
5.4 Plan Integration 5-5

6. PLAN UPDATE 6-1

6.1 2024 MJHMP Update Summary 6-1
6.2 Changes in Development in Hazard-Prone Areas 6-2
6.3 Changes in Priorities and Mitigation Efforts 6-3

7. PLAN ADOPTION 7-1

7.1 Tribal Assurances 7-1
7.2 Formal Adoption 7-1

8. REFERENCES 8-1

9. APPENDICES 9-17

Appendix A – Adoption Resolutions 9-17
Appendix B – FEMA Plan Review Tools 9-19
Appendix C – Public Outreach Activities 9-21

Appendix D –Funding Resources for Mitigation Projects 9-25
Appendix E – FEMA FIRMs and Special Flood Hazard Exposure Assessment 9-73
Appendix F – Hazard History Detail 9-76

LIST OF FIGURES

Figure ExSummary-1 City and Borough of Juneau Boundary Map xxi
Figure ExSummary-2 Juneau Population Timeline xxii
Figure ExSummary-3 Historical Population of Juneau relative to Southeast Alaska xxii
Figure ExSummary-4 Juneau Demographics xxiii
Figure ExSummary-5 Juneau Age Demographics xxiii
Figure ExSummary-6 City and Borough of Juneau 2010 US Population by Geographic Area xxv
Figure ExSummary-7 Tlingit People Social Hierarchy xxvii
Figure ExSummary-8 Traditional Southeast Alaska Foods xxviii
Figure ExSummary-9 Juneau Fishers who Fished Trendline xxx
Figure ExSummary-10 Cruise Passengers Visiting Juneau, 2012-2024 xxxi
Figure 11- Statewide Permafrost Hazard Areas and Risk 3-5
Figure 12- Types of Seismic Waves 3-8
Figure 13- Alaska's Faults and Folds 3-11
Figure 14- Faults and Folds Surrounding Juneau and Traditional Lands of Tlingit & Haida 3-12
Figure 15- Statewide PGA and Perceived Shaking from Earthquakes 3-13
Figure 16- Illustration of a Taku Wind Event in Juneau and Traditional Lands of Tlingit & Haida 3-19
Figure 17- The Science Behind Atmospheric Rivers 3-22
Figure 18- Alaska Average Annual Temperature 1991-2020 3-23
Figure 19- Alaska Average Annual Precipitation 1991-2020 3-23
Figure 20- A Visible Gustnado Crossing Egan Drive During the 6/16/2025 Squall Line Event 3-25
Figure 21- Annual Wind Speed/Direction Distribution in Juneau and Traditional Lands of Tlingit & Haida, 1980-Present 3-26
Figure 22- Flooding near Jordan Creek following an Atmospheric River Event (December 2020) 3-29
Figure 23- Heavy Snow Sinking Boat (2024) 3-31
Figure 24- Heavy Snow Collapses Shelter on a Boat 3-31
Figure 25- Low Visibility in Juneau and Traditional Lands of Tlingit & Haida due to Blizzard Conditions (2024) 3-32
Figure 26- Wildfires Surrounding SE Alaska During the Drought of Summers 2016-2019 3-33
Figure 27- Bug Outbreaks in SE Alaska During the 2016-2019 Drought 3-34
Figure 28- Heat Stroke vs Heat Exhaustion 3-35
Figure 29- Historical and Projected Precipitation Amounts for Juneau and Traditional Lands of Tlingit & Haida (Historical – 2099) 3-38
Figure 30- Percent Change in Annual Average Precipitation Statewide (1974-2024) 3-38
Figure 31- Juneau and Traditional Lands of Tlingit & Haida Annual Precipitation 3-39
Figure 32- Estimated National Annual Increase in Damages from Atmospheric Rivers (1960-2100) 3-40
Figure 33- Historical and Future Modeled Wind Frequency in Juneau and Traditional Lands of Tlingit & Haida, 1980-2099 3-42
Figure 34- Predicted Average Annual Temperature Southeast Alaska, 2031-2060 3-46
Figure 35- Historical and Projected Temperatures for Juneau and Traditional Lands of Tlingit & Haida (Historical – 2099) 3-47

Figure 36- Historical and Projected Length of Growing Season in Juneau and Traditional Lands of Tlingit & Haida 3-49
Figure 37- Future Drought Risk in SE Alaska due to Future Climate Conditions 3-49
Figure 38- Juneau and Traditional Lands of Tlingit & Haida Wildfire Exposure (2024) 3-54
Figure 39- Vegetation/Landcover Class and Ecoregions of Alaska 3-55
Figure 40- Urban Fire High Hazard Area of Downtown Juneau with Nearby Facilities (From the 2004 CBJ HMP) 3-57
Figure 41- Projected Changes in Vegetation in Juneau and Traditional Lands of Tlingit & Haida 3-60
Figure 42- Historical and Projected Flammability Conditions in Juneau and Traditional Lands of Tlingit & Haida 3-61
Figure 43- Historic Landslide Hazard Areas in Downtown Juneau 3-68
Figure 44- 2024 DGGS Blackerby Parcel Study Area Map 3-69
Figure 45- Shallow Landslide Susceptibility Map of the Blackerby Land Parcel (2024) 3-70
Figure 46- Channelized Debris Flow Susceptibility Map of the Blackerby Land Parcel (2024) 3-71
Figure 47- Locations of Potential Underwater Slides in Juneau and Traditional Lands of Tlingit & Haida 3-72
Figure 48- Fritz Cove Potential Submarine Slide Area 3-73
Figure 49- Eagle River Potential Submarine Slide Area 3-73
Figure 50- Berners Bay Potential Submarine Slide Area 3-74
Figure 51- Sheep Creek Potential Submarine Slide Area 3-74
Figure 52- South Franklin Street Potential Submarine Slide Area 3-75
Figure 53- Taku Inlet Potential Submarine Slide Area 3-75
Figure 54- 2020 Debris Flow Running onto Glacier Highway 3-77
Figure 55- 2020 Landslide Induced Debris Flow and Flooding 3-77
Figure 56- Downtown Juneau Damage After the 1936 Landslide 3-79
Figure 57- Macauley Salmon Hatchery Water Supply Damage Following a Landslide (2020) 3-80
Figure 58- Gastineau Avenue Landslide (2022) 3-81
Figure 59- Gastineau Avenue Blockage Following a Landslide (9/26/2022) 3-81
Figure 60- Cross Section of a Tsunami Propagation 3-87
Figure 61- Illustration of Common Tsunami Terms 3-88
Figure 62- Statewide Tsunami Hazard Areas 3-88
Figure 63- Alaska Tsunami Risk Map 3-89
Figure 64- Overview of Maximum Estimated Tsunami Inundation and Flow Depth in Juneau and Traditional Lands of Tlingit & Haida 3-90
Figure 65- Maximum Estimated Tsunami Inundation- Echo Cove, Bridget Cove, Eagle Creek Delta 3-91
Figure 66- Maximum Estimated Tsunami Inundation- Lena Cove, Tee Harbor, Pearl Harbor 3-92
Figure 67- Maximum Estimated Tsunami Inundation- Juneau Airport Area 3-93
Figure 68- Maximum Estimated Tsunami Inundation- Gastineau Channel 3-94
Figure 69- Statewide Coastal Flooding Hazard Areas 3-101
Figure 70- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 1 of 4) 3-102
Figure 71- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 2 of 4) 3-103
Figure 72- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 3 of 4) 3-104

Figure 73- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 4 of 4) 3-105
Figure 74- Mendenhall Lake at Bankfull, at USGS Mendenhall River Gauge Reading of 9.0 feet 3-107
Figure 75- Flooding of the Mendenhall Campground from the 2011 GLOF at USGS gauge reading of 10.92 feet 3-108
Figure 76- Gauge photo from Montana Creek at Mendenhall Loop Road at 15 feet 3-109
Figure 77- Minor Flooding of the front parking lot of Jordan Square at River Stage 10 feet 3-110
Figure 78- Michael Baker International 16' w/HESCO (Map 1 of 5) 3-112
Figure 79- Michael Baker International 16' w/HESCO (Map 2 of 5) 3-113
Figure 80- Michael Baker International 16' w/HESCO (Map 3 of 5) 3-114
Figure 81- Michael Baker International 16' w/HESCO (Map 4 of 5) 3-115
Figure 82- Michael Baker International 16' w/HESCO (Map 5 of 5) 3-116
Figure 83- Mendenhall River Shoreline/Bank Destabilization (August 2023) 3-120
Figure 84- Structure Swept Away by the Mendenhall River (August 2023) 3-121
Figure 85- Mendenhall River Shoreline/Bank Destabilization on Riverside Dr (August 2023) 3-121
Figure 86- Hydrostatic Force on a Structure 3-124
Figure 87- Hydrodynamic Force on a Structure 3-125
Figure 88- Days per year of precipitation greater than 0.5 inches 3-129
Figure 89- Distinguishing Between Shoreline/Bank Destabilization and Scour 3-132
Figure 90- Historical Locations of GLOF- Caused Shoreline/Bank Destabilization 3-134
Figure 91- Historical Locations of Coastal Shoreline/Bank Destabilization in Juneau and Traditional Lands of Tlingit & Haida 3-135
Figure 92- Linear Extent of Erosion in Juneau and Traditional Lands of Tlingit & Haida (Mendenhall Valley) (2007) 3-136
Figure 93- Meander Way (Riverside Neighborhood) Shoreline/Bank Destabilization (2018) 3-137
Figure 94- Mendenhall Riverbank Shoreline/Bank Destabilization (2024) 3-138
Figure 95- Brotherhood Bridge Trail Shoreline/Bank Destabilization (2007) 3-138
Figure 96- Flood Waters and Riverine Scour on Brotherhood Bridge Pilings (2018) 3-139
Figure 97- Mendenhall River Shoreline/Bank Destabilization (August 2023) 3-141
Figure 98- Riverside Home Shoreline/Bank Destabilization (August 2024) 3-141
Figure 99- Brotherhood Bridge Trail Shoreline/Bank Destabilization Damage (August 2024) 3-142
Figure 100- Riverside Neighborhood Residences Being Undercut and Destroyed by Rapid Riverine Shoreline/Bank Destabilization (August 2023) 3-142
Figure 101- Components of the Cryosphere 3-145
Figure 102- Type of Glaciers in the Juneau Icefield (2019) 3-146
Figure 103- Illustration of Glacial Rebound 3-147
Figure 104- Map of the Juneau Icefield with Named Glaciers 3-148
Figure 105- Mendenhall Glacier 3-149
Figure 106- Statewide Glacial Hazard Areas 3-150
Figure 107- Juneau and Traditional Lands of Tlingit & Haida Relative Sea Level Trend (1936-2024) 3-151
Figure 108- Juneau and Traditional Lands of Tlingit & Haida Sea Level Rise Scenarios (Through 2100) 3-154

Figure 109- Avalanche Hazard Areas in Juneau and Traditional Lands of Tlingit & Haida 3-157
Figure 110- Avalanche Hazard Areas in Downtown Juneau 3-159
Figure 111- Types of Volcanoes 3-163
Figure 112- Northern Cordilleran Volcanic Province East of Juneau 3-166
Figure 113- Alaska Volcano Status (4/25/2025) 3-167
Figure 114- Volcanic Ash Hazard Areas in Alaska 3-168
Figure 115- Causes of Dam Failure 3-172
Figure 116- Visible Signs of Potential Failure Mechanisms of Concrete Dams 3-172
Figure 117- Location and Hazard Class of Dams in Juneau and Traditional Lands of Tlingit & Haida 3-174
Figure 118- Salmon Creek Dam 3-177
Figure 119- Salmon Creek Dam Inundation and Evacuation Area 3-184
Figure 120- Douglas Island Dam Estimated Hazard Area 3-185
Figure 121- History and Concentration of Hazardous Materials Incidents in Juneau and Traditional Lands of Tlingit & Haida 3-200
Figure 122- Contaminated Sites and Solid Waste Sites in Juneau and Traditional Lands of Tlingit & Haida 3-201
Figure 123- Map of City and Borough of Juneau's Critical Facilities- Tee Harbor Area 3-218
Figure 124- Juneau's Critical Facilities- Airport and Mendenhall Valley Area 3-219
Figure 125- Map of City and Borough of Juneau's Critical Facilities- Downtown Juneau and Douglas Area 3-220
Figure 126- Map of Tlingit & Haida's Critical Facilities- Tee Harbor, Airport, and Mendenhall Valley Area 3-221
Figure 127- Map of Tlingit & Haida's Critical Facilities- Lemon Creek Area 3-222
Figure 128- Map of Tlingit & Haida's Critical Facilities- Downtown Juneau and Thane Area 3-223
Figure 129- Map of Tlingit & Haida's Critical Facilities- Detail of Downtown Juneau 3-224
Figure 130- CBJ Owned Lands Atlas 3-236
Figure 131- CBJ Dwellings and Occupancy Rates (2010-2025) 3-239
Figure 132- Tlingit & Haida Food Security Program Gathering Traditional Foods for Distribution to Tribal Citizens 3-243
Figure 133 HMP Update Schedule 5-4

LIST OF TABLES

Table ExSummary-1 Executive Summary Snapshot xv
Table ExSummary-2 Juneau Population by Neighborhood xxiv
Table ExSummary-3 Average Weather Data for Juneau (2000-2024) xxix
Table ExSummary-4 General Economic Conditions in Juneau (2014-2024) xxxi
Table 5- Summary of Planning Team Meetings and Other Key Dates 2-2
Table 6- Hazard Mitigation Planning Team 2-3
Table 7- List of Project Collaborators 2-4
Table 8- Documents Reviewed 2-7
Table 9- Identification and Screening of Hazards 3-2
Table 10- Hazard Extent (Magnitude/Severity) Criteria 3-6
Table 11- Hazard Probability of Future Events Criteria 3-7
Table 12- Magnitude/Intensity/Ground-Shaking Comparisons 3-9
Table 13- Beaufort Scale of Wind Strength 3-16
Table 14- Saffir-Simpson Hurricane Wind Scale 3-17
Table 15- Classifications of Drought Conditions 3-21
Table 16- Types of Building Construction 3-52
Table 17- Extent of Potential Juneau and Traditional Lands of Tlingit & Haida Submarine Landslides 3-78
Table 18- Impacts from Potential Landslide-Generated Tsunamis in Juneau and Traditional Lands of Tlingit & Haida 3-96
Table 19- Locations of Principal Flood Problems 3-106
Table 20- Mendenhall River Flood Stages and Descriptions 3-106
Table 21- Montana Creek Flood Stages and Descriptions 3-108
Table 22- Jordan Creek Flood Stages and Descriptions 3-109
Table 23- Extent of Historic Flood Events in Juneau and Traditional Lands of Tlingit & Haida 3-118
Table 24- Impact on Public Infrastructure due to Historic Flood Events in Juneau and Traditional Lands of Tlingit & Haida 3-122
Table 25- Impact on Private Property due to Historic Flood Events in Juneau and Traditional Lands of Tlingit & Haida 3-125
Table 26- Flood Recurrence Probability Terminology 3-126
Table 27- Impacts from Historical Shoreline/Bank Destabilization Events in Juneau and Traditional Lands of Tlingit & Haida 3-139
Table 28- Avalanche Impact Pressures with Associated Damages 3-160
Table 29- Volcano Alert Levels 3-164
Table 30- Dam Locations in the Planning Area 3-173
Table 31- Cybersecurity Threats and Potential Outcomes 3-191
Table 32- History and Extent of Hazardous Materials Incidents in Juneau and Traditional Lands of Tlingit & Haida 3-202
Table 33- Vulnerability Overview 3-208
Table 34- Estimated Population and Residential Building Inventory 3-210
Table 35- City & Borough of Juneau's Critical Facilities and Infrastructure in Juneau 3-213

Table 36- Tlingit & Haida's Critical Facilities and Infrastructure in Juneau 3-216
Table 37- Vulnerability Exposure Analysis- City and Borough of Juneau..... 3-225
Table 38- Vulnerability Exposure Analysis- Tlingit & Haida (Juneau assets) 3-227
Table 39- Vulnerability Exposure Analysis- Residences and People at Risk..... 3-229
Table 40- City and Borough of Juneau Land Use Designations 3-230
Table 41 City and Borough of Juneau's Capability Assessment..... 4-2
Table 42 Tlingit & Haida's Capability Assessment 4-5
Table 43 Mitigation Goals 4-11
Table 44 Status of Mitigation Actions from 2012 HMP..... 4-12
Table 45 Mitigation Actions Not Selected..... 4-14
Table 46 Evaluation Criteria for Mitigation Actions 4-17
Table 47 City and Borough of Juneau and Tlingit & Haida's 2025 Mitigation Action Plan..... 4-19
Table 48 Annual Review Checklist 5-5
Table 49 2025 Plan Update Summary 6-1

Acronyms/Abbreviations

°F	Degrees Fahrenheit
ACCAP	Alaska Center for Climate Assessment & Policy
ACASC	Alaska Climate Adaptation Science Center
ADFG	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
ADOT&PF	Alaska Department of Transportation and Public Facilitiesf
AEC	Alaska Earthquake Center
AEL&P	Alaska Electric Light & Power
AFPC	Alaska Food Policy Council
AICC	Alaska Interagency Coordination Center
AMNH	American Museum of Natural History
ANTHC	Alaska Native Tribal Health Consortium
APT	Advanced Persistent Threat
ARFF	Aircraft Rescue and Fire Fighting
AV	Avalanche
AVO	Alaska Volcano Observatory
BB	Berners Bay
BE	Bonus-Eligible Area
BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure and Communities
C	Commercial
CA	Conservation Area
CBJ	City and Borough of Juneau
CCHP	Climate and Cryosphere Hazards Program
CCTH	Central Council of the Tlingit and Haida Indian Tribes of Alaska
CFR	Code Of Federal Regulations
CF	Critical Facility
CMIP	Coupled Model Intercomparison Project
CRS	Community Rating System
CS	Cryosphere
CYBER	Cybersecurity
DCCED	Department of Commerce, Community, and Economic Development
DCI	Disaster Cost Index
DCRA	Division of Community and Regional Affairs
DEC	Department of Environmental Conservation
DF	Dam Failure
DGGS	Division of Geological and Geophysical Survey
DHS&EM	Division of Homeland Security and Emergency Management
DHSS	Department of Health and Social Services
DIPAC	Douglas Island Pink and Chum
DMA 2000	Disaster Mitigation Act Of 2000
DMLW	Division of Mining, Land, and Water
DNR	Department of Natural Resources
DOF	Division of Forestry
EPA	Environmental Protection Agency
EQ	Earthquake
ER	Eagle River
FOS	Factor of Safety
FC	Fritz Cove

FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FL	Flood
FIRM	Flood Insurance Rate Map
FP	Federal Park
ft	Feet
GIS	Geographic Information System
GL	Glacier
GLOF	Glacial Lake Outburst Flood
HA	Hazard Area
HAZMAT	Hazardous Materials Incident
HDR	High Density Residential
HI	Heavy Industrial
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMT	Hazardous Materials Table
HHPD	High Hazard Potential Dams
HUD	Housing and Urban Development
IARC	International Arctic Research Center
IAWG	Inter-Agency Working Group
IPCC	Intergovernmental Panel on Climate Change
IPU	Institutional and Public Use
IT	Information Technology
IVT	Integrated Water Vapor Transport
JACC	Juneau Arts and Culture Center
JEDC	Juneau Economic Development Council
JIA	Juneau International Airport
LANDFIRE	Landscape Fire and Resource Management Planning Tools Project
LiDAR	Light Detection and Ranging
LI	Light Industrial
LOMC	Letter of Map Change
LS	Landslide
M	Magnitude
MAP	Mitigation Action Plan
MC	Marine Commercial
MDR	Medium Density Residential
MDR/SF	Medium Density Residential – Single Family Detached
MGVC	Mendenhall Glacier Visitor Center
MH	Multi-Hazard
MJHMP	Multi-Jurisdictional Hazard Mitigation Plan
MMI	Modified Mercalli Intensity
M/MU	Marine Mixed Use
mph	Miles Per Hour
MS	Microsoft
MSL	Mean Sea Level
NCAR CCSM4	National Center for Atmospheric Research Community Climate System Model 4.0
NFIP	National Flood Insurance Program
NID	National Inventory of Dams
NOAA	National Oceanic and Atmospheric Administration
NP	Natural Area Park

NPS	National Park Service
NWS	National Weather Service
PARN	Pacific Arctic Railway Company
PGA	Peak Ground Acceleration
PM	Project Manager
RCP(s)	Representative Concentration Pathway(s)
RD	Resource Development
RDR	Rural Dispersed Residential
REC	Recreational Resource
RS	Recreational Service Park
RLDR	Rural/Low Density Residential
SE	Southeast Alaska
SC	Sheep Creek
SCV	Scenic Corridor/Viewshed
SFHA	Special Flood Hazard Area
SFS	South Franklin Street
SHMP	2023 Alaska State Hazard Mitigation Plan
SNAP	Scenarios Network for Alaska + Arctic Planning
SP	State Park
SQL	Structured Query Language
SW	Severe Weather
THTBC	Tlingit Haida Tribal Business Corporation
THIRA	Threat and Hazard Identification and Risk Assessment
TDC	Total Development Cost
T&H	Tlingit & Haida
THRHA	Tlingit-Haida Regional Housing Authority
TI	Taku Inlet
Tribe	Central Council of the Tlingit and Haida Indian Tribes of Alaska
TS	Tsunami
TTC	Traditional Town Center
UAF	University of Alaska Fairbanks
ULDR	Urban/Low Density Residential
US, U.S., or USA	United States
USACE	United States Army Corps of Engineers
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USDM	U.S. Drought Monitor
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGCRP	United States Global Change Research Program
USGS	United States Geological Survey
VO	Volcano
WCI	Waterfront Commercial/Industrial
WF/UF	Wildland Fire/Urban Fire
WS	Watershed

Tlingit Translations

Auke Bay	Áak'w
Avalanche	Dleit ñaadí
Berners Bay	Daxanáak
Blueberry	Kanat'á
Cedar bark (for weaving)	Teey woodí
Douglas Island	Deishú Áak’w
Earthquake	Yoo aan ka.á
East Wind	Dákde át
Eagle	Ch’áak’
Fish (Salmon)	Yáat
Flood	Aan galañú
Glacier	Sít'
Haines	Deishú
Heavy Snow	Dleit çéedi
Hunting	Haines-al’ooni
Inland, into the forest, up towards the mountains	Daak
Juneau	Dzantik’i Héeni
Ketchikan	Kichxáan
Lemon Creek	Eix'gulhéen
Lynn Canal	Ch'áak' Kwáan
Mountain	Shaa
Mountain Goat	Jánwu
Mendenhall Glacier	Sít' Aant'aakú
North Wind	Xóon
Petersburg	Séet Ká
Potlach	Ku.éex’
Raven	Yéil
Roe	Kaháakw
Salmon Creek	ýáat héen
Seaweed	Daaw
Sitka	Sheet'ká
Southeast Alaska	Aani
Taku River	T'aakú Héeni
Wrangell	Shtax’héen
Yakutat	Yaakwdáat

EXECUTIVE SUMMARY

This Executive Summary meets the State of Alaska, Division of Homeland Security and Emergency Management's Element H: Additional State Requirements in the Local Mitigation Plan Review Tool.

The purpose of hazard mitigation planning is to reduce or eliminate long-term risk to people and property from natural hazards. The City and Borough of Juneau (CBJ) updated their 2012 Hazard Mitigation Plan (HMP) to include the Tlingit & Haida (T&H or Tribe) as a participating jurisdiction and to make the residents of the Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida area less vulnerable to future hazard events. This plan was prepared following the requirements of the Disaster Mitigation Act of 2000 so that the CBJ and the Tribe would be eligible for the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grant programs and other federal programs.

The CBJ and T&H followed a planning process prescribed by FEMA, which began with the formation of a Hazard Mitigation Planning Team comprised of key CBJ and T&H representatives across various departments. The Planning Team reviewed the 2012 CBJ HMP to identify areas of the Plan that needed to be updated; conducted a risk assessment review that identified and profiled hazards that pose a risk to Juneau; assessed their vulnerability to those hazards; and examined the capabilities currently in place to mitigate them.

The people, property, and lands that the community members depend on are vulnerable to several hazards that are identified, profiled, and analyzed within this Plan. Earthquake (Yoo aan ka.á), Severe Weather (including Drought), Wildland and Downtown Fire, Ground Failure (Landslide), Tsunami and Seiches, Flood (Aan galañú) , Shoreline/Bank Destabilization (Erosion), Changes in Cryosphere (Glacier (Sít') and Avalanche (Dleit ñaadí)), Volcano, High Hazard Potential Dams (HHPD), Hazardous Materials, and Cyber Threat are among the hazards that could have a significant impact on the people, property, and lands in Juneau.

The hazards of greatest concern to the Planning Team and Public are Flood (Aan galañú), Avalanche (Dleit ñaadí), and Landslide.

Based upon the risk assessment review and goal setting process, the Planning Team updated the goals from the 2012 HMP with the following overarching goals for this Plan, which align with the 2013 CBJ Comprehensive Plan (note the CBJ Comprehensive Plan is currently being updated):

1. Implement actions which protect the lives and property of the City and Borough of Juneau and Tlingit & Haida residents.
2. Implement actions which protect the City and Borough of Juneau and Tlingit & Haida critical facilities and infrastructure.
3. Implement actions which protect the City and Borough of Juneau and Tlingit & Haida cultural, historical, natural, economic, and agricultural resources.

The 2025 MJHMP Update establishes a series of specific mitigation strategies that were developed collaboratively with the intent to meet the identified mitigation goals, by the Planning Team. These strategies provide a basis for continued planning to develop specific action plans. These will be implemented over time and can provide a means to measure progress towards hazard reduction. The Plan also describes future update and maintenance procedures.

VULNERABILITY SNAPSHOT

Participating Jurisdiction(s): City and Borough of Juneau and Tlingit & Haida

Year MJHMP Completed: 2025

Table ExSummary-1 Executive Summary Snapshot

	Estimated Losses					Extent	Probability	Hazard Explanation
	# of CF	$ of CF	# of residences	$ of residences	# of people			
Earthquake	CBJ- 75 T&H- 32	CBJ- $ 1.14B T&H- 88M	12,757	$7.7B	31,382	Limited	Highly Likely	Earthquakes are of concern in the Planning Area because of the community's proximity to large fault systems, specifically the Queen Charlotte-Fairweather fault. Since the 2012 HMP was adopted, there have been 4 earthquakes, M5.0 or greater, that occurred within 100 miles of the Planning Area.
Severe weather	CBJ- 75 T&H- 32	CBJ- $ 1.14B T&H- 88M	12,757	$7.7B	31,382	Critical/Limited	Highly Likely/Possible	Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida experiences severe weather events: heavy rain, atmospheric river, high wind, thunderstorm (lightning, hail), dense fog, heavy snow (Dleit çéedi), extreme cold, freezing rain/ice storms, drought, and extreme atmospheric heat. Since the 2012 HMP, there have been 122 severe weather events in the Planning Area (68 High Wind, 27 Winter Storm, 23 Heavy Snow (Dleit çéedi), 2 Frost/Freeze, and 2 Blizzard). After a heavy snow event in January 2024 multiple boats sank at the city boat harbor due to the heavy snowfall followed by heavy rain.

	Estimated Losses					Extent	Probability	Hazard Explanation
	# of CF	$ of CF	# of residences	$ of residences	# of people			
Wildland and Urban Fire	CBJ- 75 T&H- 32	CBJ- $1.14B T&H- $88M	12,757	$7.7B	31,382	Critical/ Limited	Possible	The Planning Area is in the EC7 Level II Ecoregion which is classified as Coastal Rainforests. This area is normally quite wet, but fires can occur in the Panhandle under dry conditions, which may become more frequent due to climate change (BLM 2020). According to the Alaska Interagency Coordination Center (AICC), 276 fires have occurred within the Planning Area in an 85-year period (1939-2024). The largest fire burned 56 acres near Berners Bay (Daxanáak)in 2018. This fire was caused by a campfire. Since the 2012 HMP, there have been 7 wildland fire events in the Planning Area. The Alaska State Fire Marshal's office records fatalities due to community fires, and there have been 2 fatalities in the Planning Area from structure fires between 2020-2024.
Ground Failure (Landslide)	CBJ- 16 T&H- 13	CBJ- $319M T&H-$46M	1,126	$698M	2,770	Critical/ Limited	Highly Likely/ Possible	In September 2022, a landslide above Gastineau Avenue damaged homes and damaged power lines. In August 2023, a landslide was reported in the Starr Hill neighborhood. In July 2024, a Downtown Juneau apartment building was evacuated following a landslide that was triggered by heavy rain. Trees, large debris, and mud washed onto the road. Since the 2012 HMP, there have been 9 documented landslides in the Planning Area.
Tsunami and Seiche	CBJ- 5 T&H-1	CBJ- $280M T&H-$1M	1,049	$627M	2,581	Limited	Possible	The Planning Area has not been impacted by a damaging tsunami in recent history; however, historical tsunamis have resulted submarine landslides that caused underwater cable damage effecting the community in 1958. In 2017, Alaska Division of Geological & Geophysical Surveys (DGGS) completed tsunami inundation modeling/mapping for Juneau. Since the 2012 HMP, an 8.2 earthquake in the Gulf of Alaska resulted in 0.05 meters of runup the Planning Area. This event did not impact the community.

	Estimated Losses					Extent	Probability	Hazard Explanation
	# of CF	$ of CF	# of residences	$ of residences	# of people			
Flood	CBJ-12 T&H-6	CBJ- $231M T&H-$13M	2,410	$1.4B	5,929	Critical	Highly Likely	Riverine flooding and glacial outburst flooding are hazards in the Planning Area. Since the 2012 HMP, Suicide Basin has released some volume of its water almost every year, and in some cases multiple times in one year. This has led to severe Glacial Lake Outburst Floods (GLOFs), impacting the Mendenhall Valley. Since the 2012 HMP, there have been 21 flooding events in the Planning Area.
Volcano	CBJ- 75 T&H- 32	CBJ- $ 1.14B T&H- $88M	12,757	$7.7B	31,382	Negligible	Possible	While the Planning Area is at low risk for experiencing the primary effects of a volcanic eruption, the large numbers of volcanoes in Alaska place Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida at risk for experiencing secondary effects of eruptions, such as ash fall. Several relatively recent volcanic eruptions have resulted in ash fall throughout the state, disrupting air traffic and, in extreme cases, making living conditions horrific and causing significant environmental damage even in areas hundreds of miles from the eruption.

	Estimated Losses					Extent	Probability	Hazard Explanation
	# of CF	$ of CF	# of residences	$ of residences	# of people			
Changes in Cryosphere (Glaciers & Snow Avalanche)	G CBJ-11 T&H-1 A CBJ-1	G CBJ-$54M T&H-$1M A CBJ-$16M	G 4,576 A 189	G $2.8B A $122M	G 11,257 A 465	Critical	Highly Likely	Glaciers and snow avalanche (Dleit ñaadí) hazards occur in the Planning Area, both inside and outside of the populated areas of Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida. The ice-dammed lake in Suicide Basin has flooded annually since 2011; some years have multiple smaller floods and some years have only one large flood. In 2014, an outburst flood from Suicide Basin caused the water level of Mendenhall Lake to gain 12 feet over the baseline and resulted in significant damage to riverside properties. In July of 2018, more than one billion cubic feet of water was unleashed into the Mendenhall River from Suicide Basin. In 2023, a glacial dam outburst from the Mendenhall Glacier's Suicide Basin caused record flooding and riverbank destruction along the lake and river. In 2024, a glacial dam outburst from Mendenhall Glacier's Suicide Basin caused historic flooding, inundating more than 100 homes, businesses, and public infrastructure in the valley along Mendenhall Lake and Mendenhall River. The Planning Area has experienced avalanche (Dleit ñaadí) hazards and actively monitors at least six avalanche path systems (Behrends, Gold Creek-Mt Juneau, Gold Creek – Snowslide Gulch, Greenhouse, Thane Road, White, and unmapped areas above Gastineau Avenue and South Franklin Street). In January 2024 two avalanches occurred after a significant snowfall event, but there were no reported damages.
Dam Failure (HHPD)	CBJ-34 T&H-2	CBJ-$34M T&H-$4.8M	98	$59M	241	Negligible	Unlikely	There are thirteen dams in the Planning Area- two are classified as High Hazard (Salmon Creek Dam and Douglas Island Dam), four are classified as Significant Hazard, and seven are classified as Low Hazard. There has not been a dam failure of a High Hazard Potential Dam, but a failure would have an impact on the Planning Area.

	Estimated Losses					Extent	Probability	Hazard Explanation
	# of CF	$ of CF	# of residences	$ of residences	# of people			
Shoreline/Bank Destabilization (Erosion)	CBJ-26	CBJ-$211M	1,844	1.1B	4,536	Critical	Highly Likely /Likely	The Planning Area is at risk of coastal and shoreline/bank destabilization. Historically, coastal shoreline/bank destabilization impacted Thane Road, Egan Drive, and the Gold Creek Delta. Riverine shoreline/bank destabilization is a much more frequent hazard, predominantly a secondary hazard caused by GLOFs in the Mendenhall River Valley. During the 2023 GLOF event, some areas of the Mendenhall Riverbank eroded as much as 20 to 150 feet. Since the 2012 HMP, there have been 4 shoreline/bank destabilization events in the Planning Area.
Cybersecurity	CBJ- 75 T&H- 32	CBJ- $ 1.14B T&H- $88M	12,757	$7.7B	31,382	Negligible	Highly Likely	There have been at least 2 historical cyberattack impacts in the Planning Area. However, all residents, businesses, and government offices in the Planning Area are at risk of a cybersecurity attack.
Hazardous Materials	CBJ- 75 T&H- 32	CBJ- $ 1.14B T&H- $88M	12,757	$7.7B	31,382	Limited/ Negligible	Highly Likely	Between January 1st, 2012, and April 1st, 2025, the Planning Area experienced 3,113 recorded releases or spills. Based on historical data, the Planning Area experiences upwards of 10 hazardous materials releases per month (ADEC 2025). Mining operations make up about half of all releases in the Planning Area. About one third of the releases came from transportation by air, land, and sea. Residential releases make up less than 10% of all releases, and commercial activities make up about 5%. Utility provision makes up less than 1%

CF: Critical Facility

COMMUNITY PROFILE

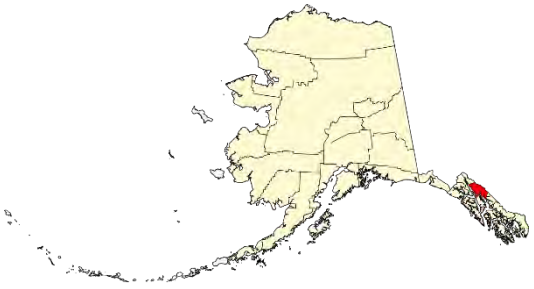
This section describes Juneau's (Dzantik'i Héeni) location, geography, history, demographics, and economy.

Tlingit & Haida Traditional ancestral lands include over 43,000 square miles throughout the Alaska Panhandle. This MJHMP Update includes Tlingit & Haida people, critical facilities and infrastructure, and cultural and subsistence resources and assets within the boundaries of the City and Borough of Juneau.

Note: Throughout this HMP, the abbreviation CBJ is used as a geographic term to describe the entire geography of the City and Borough of Juneau as well as a term for the governmental body/jurisdiction of the City and Borough of Juneau.

Location

Juneau, Alaska's isolated, coastal capital city, encompasses 3,250 square miles and is bordered to the east by British Columbia, Canada; to the north and northwest by Haines (Deishú) Borough; and to the south and southwest by the Tongass National Forest.



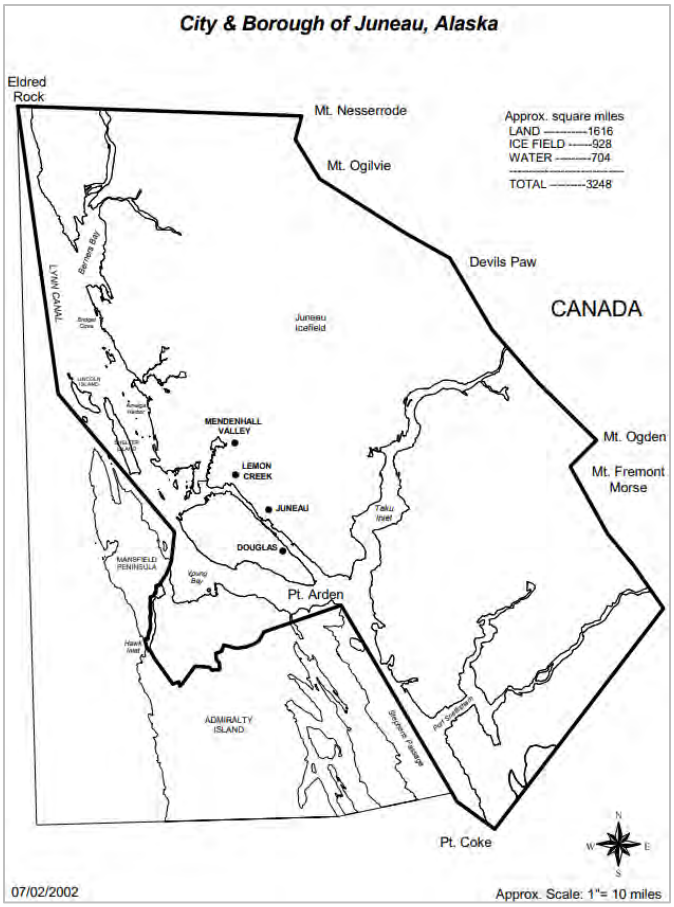
Geography

The area is characterized by mountains (Shaa) rising abruptly to over 4,000 feet and by the temperate rain forest that comprises the Tongass National Forest. Farther inland (Daak̲), the mountains reach 8,000 feet and higher. The topography has been shaped by glacial action, exaggerating the steep mountain slopes and leaving U-shaped valleys through which the larger rivers flow. The most prominent of these valleys in CBJ is the Mendenhall Valley. Fjords cut the coast and generally terminate in river valleys which extend through the mountain ranges and provide access to the interior. There are many smaller streams in the area that are swift and carry a great deal of silt and debris. Many derive a large percentage of their water from melting glaciers (Sít') and consequently appear milky in color due to suspended solids.

Juneau, situated on the Gastineau Channel, is the largest population center in southeastern Alaska. It is located on the sheltered Inside Passage of southeast Alaska (Aani), 900 miles northwest of Seattle, Washington, and 75 miles from the open water of the Pacific Ocean. Anchorage, the largest city in Alaska, is 600 air miles northwest of Juneau.

Although the Borough encompasses a large area, only a small percentage is suitable for development as the area is composed of remote areas with steep slopes and glaciers (Sít'). The most rapidly developing area in recent years and the most densely populated residential area in the Borough is the Mendenhall Valley, reaching from Juneau International Airport (JIA) north to Mendenhall Lake and Mendenhall Glacier (Sít' Aant'aakú). The valley is bordered by steep mountains with the Mendenhall River traversing the valley center. The river flows from Mendenhall Lake to the Gastineau Channel with only a 60-foot drop in elevation. Flowing into the Mendenhall River from the west side is Montana Creek which originates from Windfall Lake approximately 10 miles away.

Duck and Jordan Creeks parallel the Mendenhall River to the east and flow into the Gastineau Channel at JIA.



Source: CBJ, 2025 (ArcView Print Job)

Figure ExSummary-1 City and Borough of Juneau Boundary Map

Due to topography and the pattern of available land, development in the CBJ has continued in a linear fashion that follows the shoreline. Additional development is expected along the Glacier Highway and on Douglas Island (Deishú Áak'w) in the future.

Juneau is accessible only by air and sea. Scheduled jet flights and air taxis are available daily at the municipally owned JIA. The airport includes a paved 8,456-foot runway and a seaplane landing area. Marine facilities include a seaplane landing area at Juneau Harbor, two deep draft docks, five small boat harbors and a state ferry terminal. The Alaska Marine Highway System and cargo barges provide year-round services.

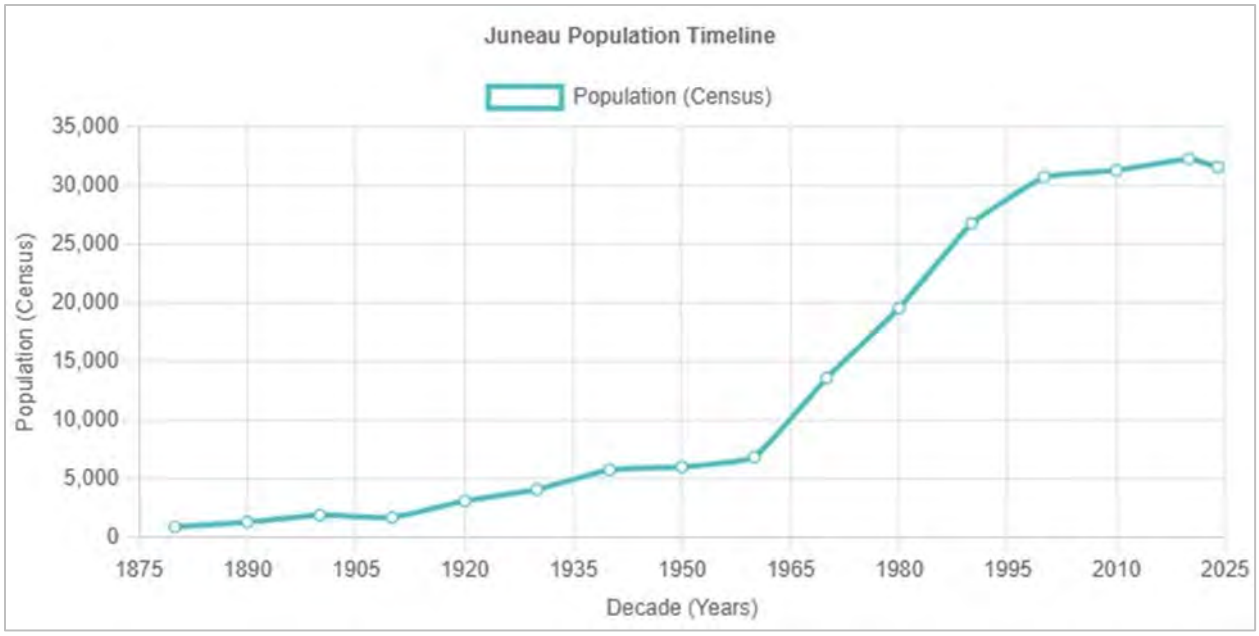
History, Culture, and Government The coastline and valleys of present-day Juneau (Dzantik'i Héeni) were originally part of the territory of the Tlingit Indian Nation. The Tlingit's possessed one of the most highly developed aboriginal cultures in North America, with a prosperous economy based on the abundant forest, fishing, and mineral resources of the southeast Alaska region.

Although the Hudson Bay Company operated a fur trading post south of Juneau in Taku Inlet from 1841 to 1843, the area was not permanently settled by whites until 1880. Juneau was settled by gold miners at this time and quickly became the mining center of southeast Alaska. In later years, it had the Alaska-Juneau Mill, at one time the largest low-grade, hard rock gold mine in the world. Douglas Island (Deishú Áak'w) was the location of the famous Treadwell Mine, almost as large as the Alaska-Juneau Mine. In 1900, Juneau replaced Sitka (Sheet'ká) as the capital of the Territory of Alaska. With Alaska's induction into statehood on January 3, 1958, Juneau became the state capital after being the territory capitol since 1906.

Demographics

Juneau first appeared on the 1890 U.S. Census as it grew from a mining camp into a more established settlement. The population was 1,253. Juneau's population peaked in 2015, slowly decreasing until experiencing an increase in 2020.

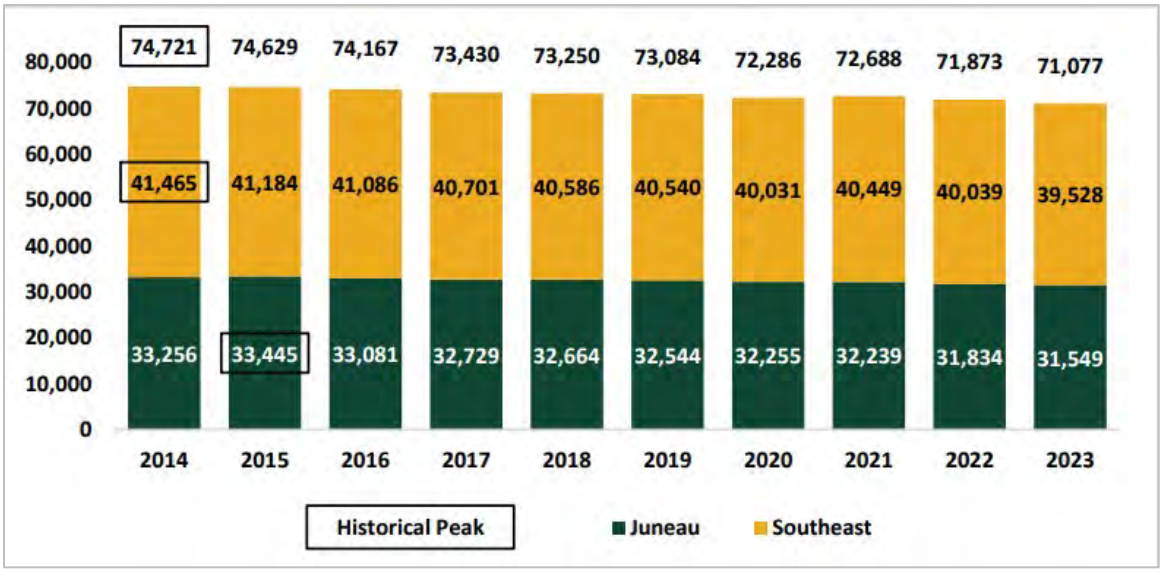
Since 1890, the CBJ population has grown from 1,253 to 31,572 residents in 2024 (US Census Estimate). That change blends periods of growth and periods of decline, which are linked to the number of residents being born and dying, to economic conditions, and to personal choices about community, culture, and family (JEDC 2024).



Source: JEDC 2025

Figure ExSummary-2 Juneau Population Timeline

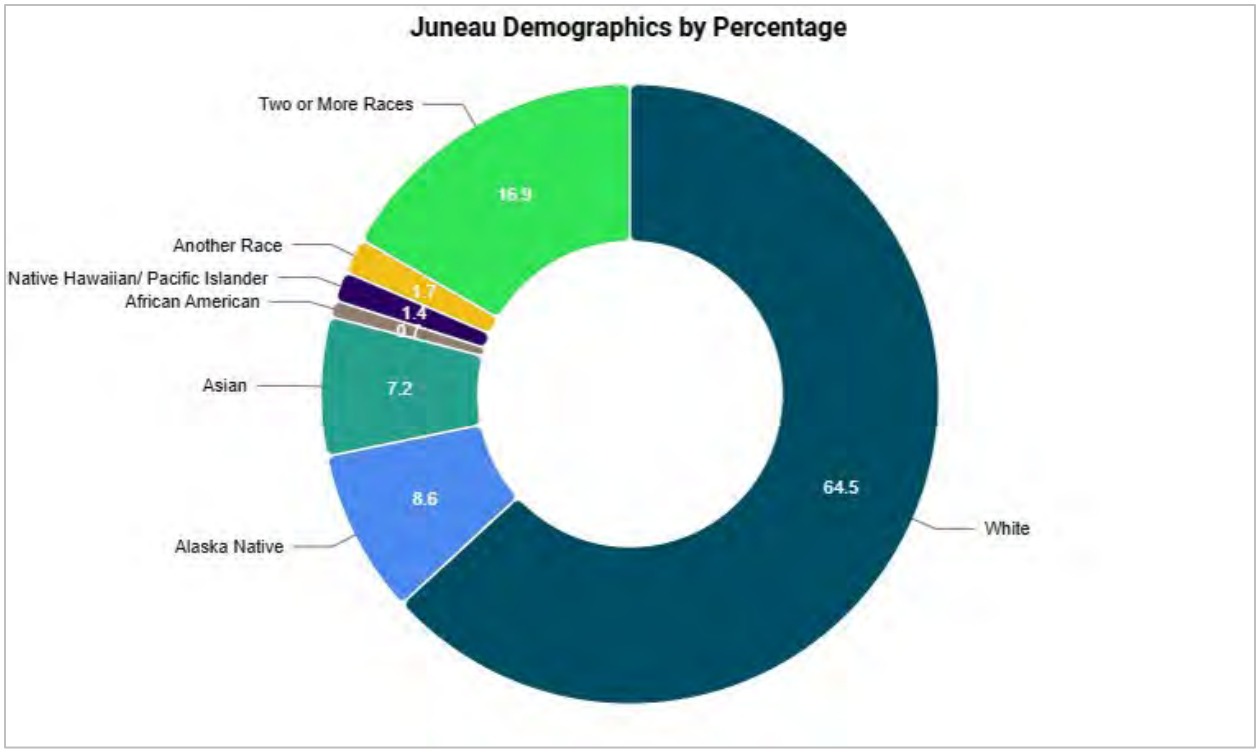
The population for 2024 estimated 31,572 residents in Juneau, of which the median age was 39 years.



Source: JEDC 2024

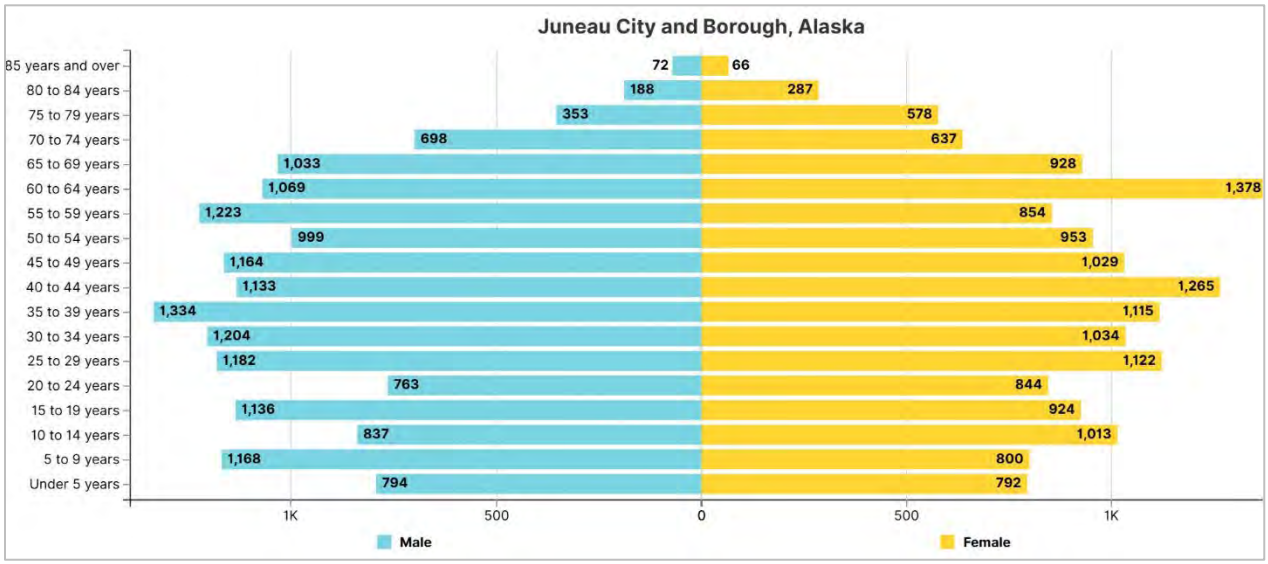
Figure ExSummary-3 Historical Population of Juneau relative to Southeast Alaska

The population of Juneau (Dzantik'i Héeni) is diverse. See the above figure for a breakdown of Juneau's population. The composition of the population is 48.9% female and 51.1% male. There are an estimated 13,138 households in the community with the average household size of 2.38 (USCB 2025).



Source: USCB 2025

Figure ExSummary-4 Juneau Demographics



Source: USCB 2025

Figure ExSummary-5 Juneau Age Demographics

About every five years, ADOLWD releases a 30-year population projection for the state. The state is projecting a population decline for Southeast Alaska and Juneau (USCB 2025). Southeast Alaska has experienced steady population losses over recent years and there is uncertainty about future population trends. Compared to the rest of the state, the region has a low birth rate and a high median age, so for the region to grow, more people must move to the region than move out of the region (an increase in net in-

migration). For Southeast Alaska, the 2021 population was 72,494 and the ADOLWD predicts a decline for the region between now and 2050 of 17%, resulting in a regional population in 2050 of 59,940 (down about 12,278 people). For Juneau, the state's 2022 population estimate was 32,202 with a forecasted decline of 17% by 2050, resulting in a population of 26,728 (down 5,434 people). The accuracy of these projections will depend on economic and other trends in Juneau, the region, and the country, all which impact how many people choose to move to, from, and stay in Juneau (ADOLWD 2024).

Juneau residents predominantly live in the following areas:

Table ExSummary-2 Juneau Estimated Population by Neighborhood

Area/Neighborhood	Population
Mendenhall Valley	12,642
Lemon Creek & Salmon Creek	4,728
West Mendenhall Valley & Auke Bay	3,581
Downtown Juneau	3,284
Douglas	2,111
North Douglas	1,685
West Juneau	1,666
Ferry Terminal to Echo Cove	1,331
Other Areas	521

Source: USCB 2025

Source: CBJ 2025

Figure ExSummary-6 City and Borough of Juneau 2010 US Population by Geographic Area

Economy

The State of Alaska, CBJ, and federal agencies provide nearly 50% of the employment in the community. Juneau is home to State Legislators and their staff during the legislative session between January and May.

Tourism is a significant contributor to Juneau's economy, and the largest industry in the private sector. During the summer months, tourism provides a $236 million income and over 2,600 jobs, generating almost $12 million in CBJ sales tax (JEDC 2024). Over 1.6 million visitors were estimated to have arrived by cruise ship between May and October of 2024, and another 100,000 independent travelers visit Juneau each year. This sector has experienced more growth in the past decade than any other economic sector in CBJ.

Support services for logging and fish processing contribute to the Juneau economy. Douglas Island Pink and Chum (DIPAC), a private non-profit organization, operates a fish hatchery which increases the local salmon population. The Kennecott Greens Creek Mine produces gold, silver, lead and zinc, and is the largest silver mine in North America. The Kensington Gold Mine is also located to the North.

Juneau History, Culture, and Government

Juneau (Dzantik'i Héeni) has a diverse cultural history. The original settlers are believed to be the Tlingit people. Juneau's original name in Lingít is *Dzántik'i Héeni*, meaning "Base of the Flounder's River." In the 18th and 19th centuries, English and Russian explorers came to the region. Fur traders were attracted by the region's sea otters. The Russian American Company built a fort in Sitka (Sheet'ká) in 1804 to harvest sea otter pelts in the surrounding waters, including Gastineau Channel.

By 1880, the beaches in the area were being mined for gold after Auk Tlingit Chief Cowee led prospectors to the area he found rich gold deposits. George Pilz, a Sitka engineer, grubstaked prospectors Richard Harris and Joseph Juneau in August 1880. They found plenty of color in Gold Creek but did not follow the gold to its source. At Cowee's urging, Pilz sent the pair back again. Harris and Juneau climbed Snow Slide Gulch at the head of Gold Creek and looked down into the mother lode of Quartz Gulch and Silver Bow Basin.

On October 18, they staked a 160-acre town site on the beach where, the following month, they were joined by the first boatloads of prospectors bound for the new strike on Gastineau Channel. The discovery was the first that resulted in the founding of an Alaskan town.

Juneau grew from a boomtown to a center for large-scale hard-rock mining when the loose gold in the stream beds ran out. On the mainland side of the Channel, two great mills were created: the Alaska-Juneau at the south end of Juneau and the Alaska-Gastineau at Thane, farther south. On Douglas Island (Deishú Áak'w), operations of the Treadwell Gold Mining Company began.

Treadwell production peaked in 1915. Two years later, a cave-in flooded three of the four mines, effectively ending the Treadwell era. In Juneau, the Alaska-Gastineau shut down due to high costs in 1921. Alaska-Juneau was halted by the war in 1944.

Mining and fishing play a role in Juneau's economy to this day, but the two dominant sectors are tourism and the government.

In the fall of 1993, the Juneau Tlingit Tribe was officially recognized by the U.S. government as a tribal government.

Juneau maintains a traditional Tlingit culture with influences from Eyak, Athabascan, as well as Russian, English, and American traders, and miners. Fishing and subsistence activities are prevalent in Juneau (CBJ 1995).

The City of Juneau was incorporated in 1900 and became the territory capitol in 1906 when the government was transferred from Sitka (Sheet'ká). When Alaska became a state, Juneau continued as the capital city. In the transition from territory to statehood and in accordance with provisions of the 1959 Session Laws of the State of Alaska the City of Juneau was established as a home-rule city in October 1960. A Manager-Council form of government was established. The Council had seven members with the mayor as the presiding officer. The boundaries of the new City of Juneau remained as previously drawn.

The City and Borough of Juneau was incorporated as a unified City and Borough on July 1, 1970. The CBJ has nine members with the mayor as the presiding officer. The newly created boundaries of CBJ consolidated the City of Douglas, the City of Juneau, and the Greater Juneau Borough.

CBJ is a home-rule municipality, exercising the powers granted to it by the Constitution of the State of Alaska. CBJ's mission is to

> *"Provide for local government responsive to the will of the people and to the continuing needs of the community" (CBJ 1995)*

History of the Tlingit & Haida People

The Haida Nation and the Tlingit Nation have existed as two separate and distinct people since time immemorial.

Aani (Southeast Alaska) is their ancestral home. These Tribal Nations take great pride in their ability to cultivate and harvest the resources of the land and sea in a responsible manner, always recognizing the value of and showing reverence and respect for all life of the land and sea. Through good stewardship, hard work, wise laws, and respect they strove to maintain balance in their community.

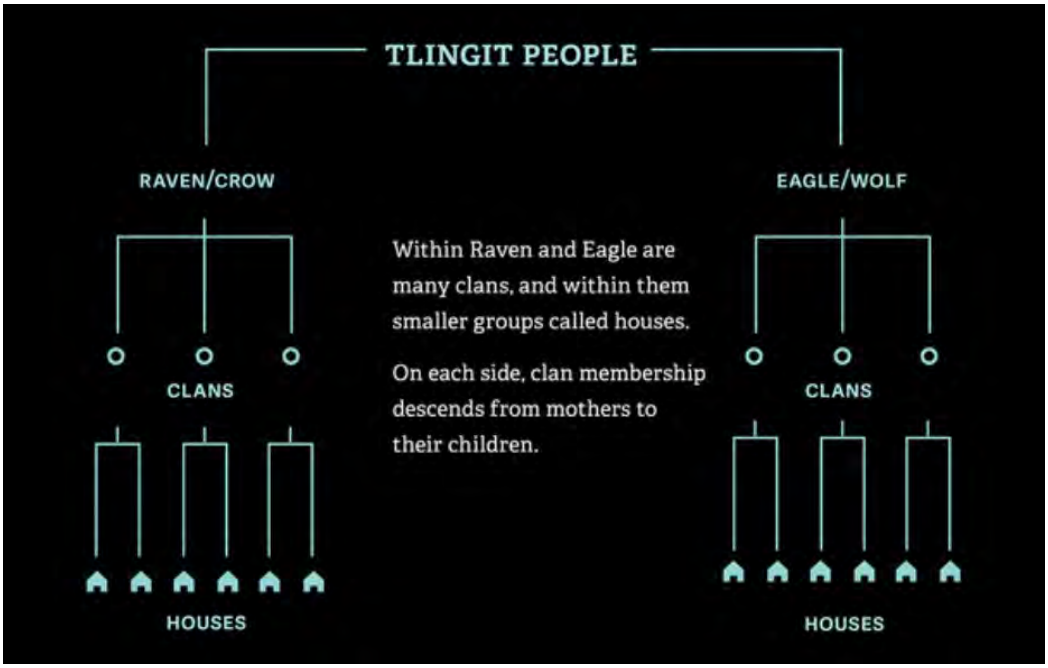
Over time, these Nations made a transition to a written, formal process to engage in foreign government relationships. The Tlingit Nation and the Haida Nation united with foresight, courage, and determination to fight for their rights and preserve their relationship with the land, water, and resources (THTBC 2025)

Tlingit people are divided into two matrilineal groups, or moieties. About half are Raven/Crow, and the rest are Eagle/Wolf. Traditionally, an Eagle (Ch'áak') must marry a Raven (Yéil) , but this rule has softened in modern times.

Members of each clan inherit the right to display certain crests: symbolic images of animals, plants, celestial bodies, supernatural beings, or natural landmarks.

Weaving and dancing are important aspects of Tlingit and Haida heritage. A story from the Chilkat Valley states that weaving started near the beginning of time, when Raven (Yéil) traveled the world gathered knowledge. In a cave by the ocean, he encountered the powerful sea spirit Gunakadeit, who sat with a fabulous robe draped over his shoulders. Gunakadeit served Raven a feast on long wooden dishes, taught him many dances, then gave him the robe as a parting gift. Raven brought the robe back and gave it to people, who took it apart to learn how to make robes of their own (AMNH 2025).

Traditional materials used by female clan members in weaving are natural materials including mountain goat (Jánwu) hair, softened cedar bark (Teey woodí), natural dyes, and they used cedar planks painted by men to create designs, called pattern boards.

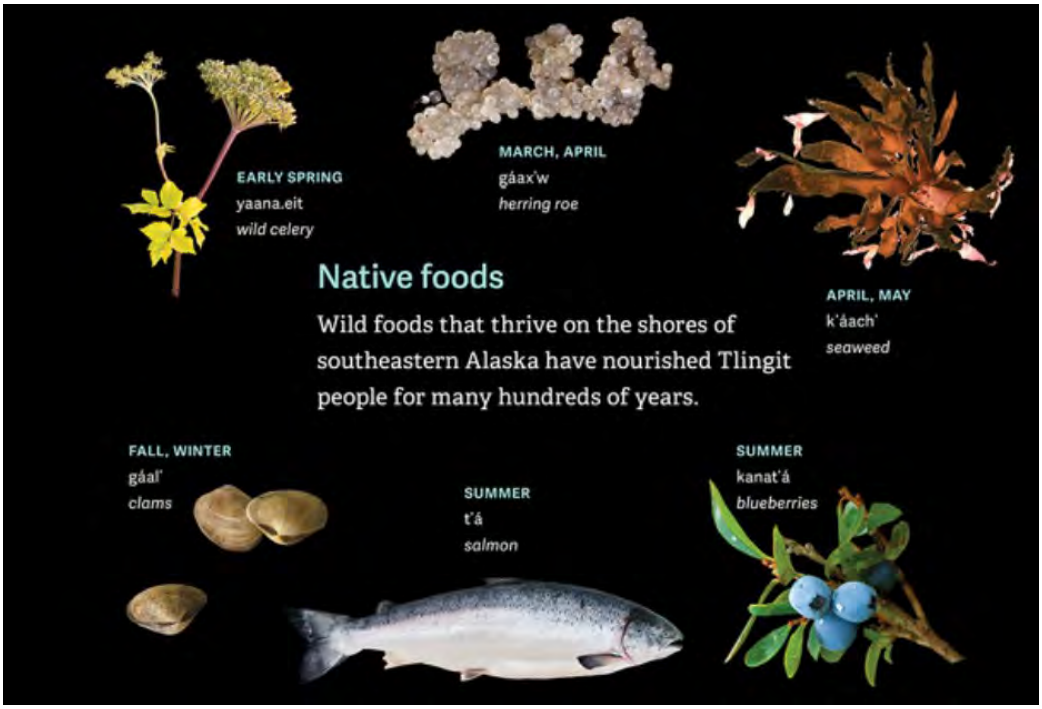


Source: AMNH 2025

Figure ExSummary-7 Tlingit People Social Hierarchy

Wild foods that thrive on the shores of Southeastern Alaska (Aani) have nourished Tlingit and Haida people for thousands of years. When a clan hosts a celebration or ceremonial gathering, members prepare a lavish meal gathered from sea and land. Fish (Yáat), fish eggs (Kaháakw), seaweed (Daaw), game, and berries (Kanat'á) were traditionally served in elaborate carved wooden dishes. The rhythm of life ebbed and flowed with the migration of salmon. In the past, communities traveled together to summer fishing sites by canoe. Women fileted and dried or smoked the catch, then tied it in bales, and families paddled home in fall with boats heavily loaded. Today, many Tlingit and Haida people continue to fish to feed their families.

Food, dancing, weaving, stewardship of the land, and respect for elders are all important parts of the Tlingit and Haida culture. All these aspects are blended during a potlach (K̲u.éex'); a time for public speaking, dancing, singing, feasting, and distributing gifts and stories. A clan may host a K̲u.éex' to recognize a child's coming of age, a marriage, and house renovation, or a family loss. Through words and actions during the gathering, hosts and guests reinforce the philosophy of balance and respect for one another. Potlachs (K̲u.éex') have been an integral part of Tlingit and Haida society since time immemorial (AMNH 2025).



Source: AMNH 2025

Figure ExSummary-8 Traditional Southeast Alaska Foods

Climate

Juneau falls within the southeast maritime climate zone, characterized by cool summers, mild winters, and heavy rain throughout the year. The combination of heavy precipitation and low temperatures at high altitudes in the coastal mountains of southern Alaska accounts for the numerous mountain glaciers.

Table ExSummary-3 shows average weather data for Juneau.

Table ExSummary-3 Average Weather Data for Juneau (2000-2024)

Month	Max Temp (°F)	Min Temp (°F)	Avg Temp (°F)	Rainfall (in)	Snow (in)
Annual	44.8	37.3	42.1	68.3	84.5
Winter	37.0	23.2	30.1	16.9	55.8
Spring	46.3	36.1	40.8	10.9	14.3
Summer	59.5	52.4	56.2	16.1	0.0
Autumn	46.0	35.6	42.2	24.4	14.4

Data collected at the Juneau International Airport.

Source: NOAA 2025

The influence of future climate conditions on weather patterns and natural hazards is discussed within each hazard profile as well as an overview of changes predicted in Southeast Alaska in Section

Transportation

Like most of Southeast Alaska, Juneau is relatively isolated with no road or rail access. The airport has daily commercial jet service that directly connects with Anchorage, and Seattle. There are also air taxis and float plane services to Juneau from surrounding communities. Scheduled jet flights and air taxis are available daily at the municipally owned Juneau International Airport. The airport includes a paved 8,456-foot runway and a seaplane landing area. Marine facilities include a seaplane landing area at Juneau Harbor, two deep draft docks, five small boat harbors and a State ferry terminal. The Alaska Marine Highway System and cargo barges provide year-round services. The airport is located 8 miles Northwest of downtown Juneau. Due to the proximity to water, abundant lakes, and steep topography, primitive runways are few and far between. Planes equipped with floats are much more commonplace to allow for air taxi services taking off and landing on water.

Barges deliver goods monthly during the winter and more frequently in summer. The State Ferry serves Juneau from the Auke Bay (Áak'w) harbor. Juneau heavily relies on the Alaska Marine Highway/Ferry System for transportation, services, supplies, and tourism. The ferry is the cheapest transportation option for the movement of goods into and out of Juneau. The ferry takes approximately three days to reach Bellingham, WA, 18 hours to Ketchikan (Kichx̱áan), AK, and 6 hours to Skagway or Haines (Deishú), AK.

Economy

The following is a brief history of the different industries that shaped Juneau's economy:

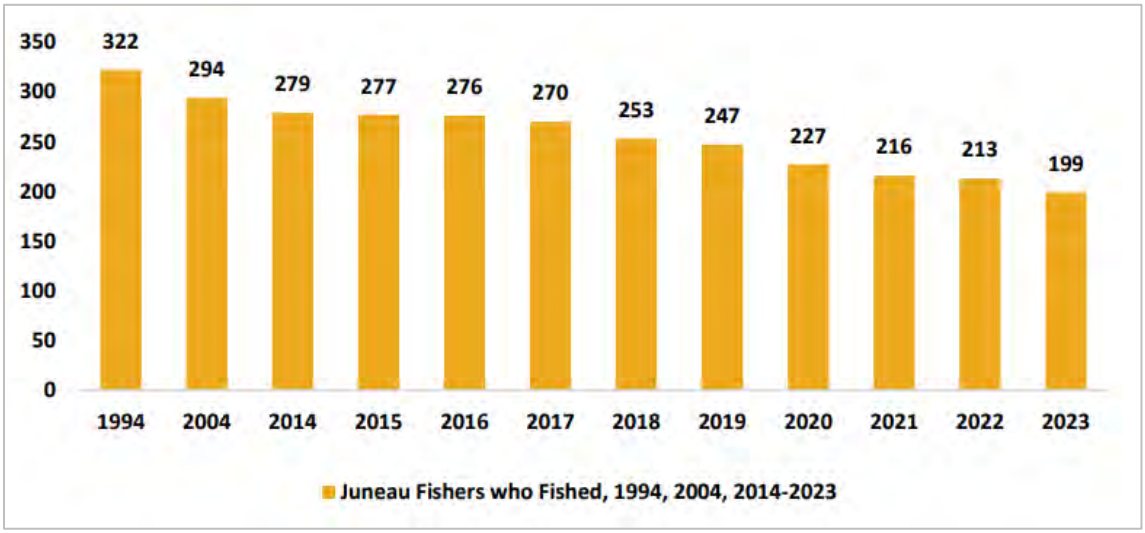
Furs: In the 1790s, the Russians came to Southeast Alaska (Aani) in pursuit of sea otter pelts. Trade with Tlingits and Haidas traditionally hunted and trapped beaver, otter, and seals. As European trapping presence grew, trade between Native Alaskans and Europeans also grew. For a brief period pre-WW II, Southeast Alaska hosted a fur farming industry that was an extreme example of boom-and-bust markets. These farms primarily farmed foxes, using many of the islands as natural fencing to raise stocks.

Mining: Mining has been a central part of Juneau's history and economic development since its founding. While it is now known as Alaska's capital and government center, it was born as a gold mining town. In 1880, Tlingit leader Chief Cowee guided prospectors Joe Juneau and Richard Harris to a gold discovery in present day Gold Creek. This led to a gold rush in the region, turning Juneau (then called Harrisburg) into a mining camp for placer mining operations. Soon after, large scale hard rock mining became much more prevalent. The Treadwell mine on Douglas Island was founded in 1881 and employed over 2,000 workers at its peak. Its run of industry dominance ended in 1917 after a partial collapse of several of its mine shafts. Right across Gastineau Channel, in 1917, the Alaska-Juneau (AJ) Mine was opened. The operation ended in 1944 due to rising labor costs and World War II priorities. WWII brought a sharp decline to mining in Juneau. In the early 2000s, Coeur Alaska developed the Kensington Mine, located 45 miles Northwest of

Juneau. Kensington Mine is an underground gold mine producing several hundred thousand ounces of gold annually. The mine is a significant employer in the region. Southeast Alaska has known deposits of silver, zinc, lead, and copper in addition to gold. Exploration continues to this day, but large-scale development is limited by environmental, legal, and political concerns.

Timber: Even during the peak of the Southeast Alaska logging boom, Juneau's impact in the industry was a largely supportive and localized role. Acting as the government and administrative hub in the region, Juneau housed U.S. Forest Service offices were much of the political and legal debate over timber sales, forest planning, and Indigenous land rights occurred. There were several sawmills close to Juneau, most notably in Thane and Taku River (T'aakú Héeni), but they were small in scale.

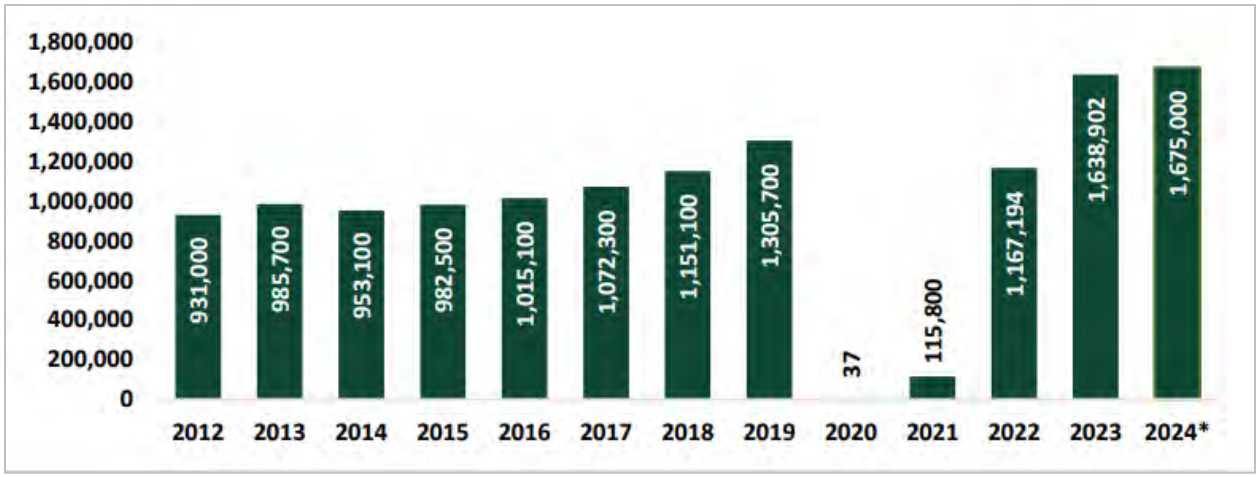
Seafood: Seafood has been an integral part of Juneau since before European contact. The Tlingit and Haida have been traditionally using the natural resources of the area since time immemorial. Salmon, clams, and herring roe (Kaháakw) remain largely important to the modern-day Tlingit and Haida culture. The seafood industry is one of the cornerstones of Juneau's economy. Commercial fishing and processing are large economic drivers and employers in the region. Hundreds of commercial fishing permit holders reside in Juneau and start and end their seasons in Juneau's harbors. Key species include chinook, sockeye, and coho salmon, black cod, Dungeness crab, and shrimp. Commercial fishing vessels are typically trollers, longliners, and seiners/gillnetters. There are two seafood processing facilities in Juneau- Taku Fisheries, opened in 1984, and purchases and processes over 7 million pounds of seafood annually. Alaska Glacier Seafoods was established in 1996, and purchases and processes over 10 million pounds of seafood annually. Alaska Glacier Seafoods employs over 150 people during peak season, while Taku fisheries employ nearly 200 people during peak season. However, there has been a declining trend of commercial fishing participation based out of Juneau. "Fishers who Fished" is defined as a count of permit holders who made at least one landing during the year.



Source: JEDC 2024

Figure ExSummary-9 Juneau Fishers who Fished Trendline

Tourism: The community's tourism economy is largely centered around cruise trip traffic. In peak years, over 1.6 million visitors arrived in Juneau on cruise ships. Other tourists visit Juneau independently, primarily drawn to the area to participate in activities such as guided sport fishing, whale watching, glacier hiking, and bear viewing. Many of the local companies specializing in ecotourism and adventure tourism also cater to cruise ship visitors. Tourism is the economic sector of Juneau displaying the largest growth. The tourism sector experienced a substantial decrease during the COVID-19 pandemic but has since rebounded in terms of visitation numbers.



Source: JEDC 2024 (2024 data is a projection based on available counts when report was produced)

Figure ExSummary-10 Cruise Passengers Visiting Juneau, 2012-2024

Government: Government is the largest and most stable economic sector in Juneau. As the capital of Alaska, Juneau hosts key state government functions, federal agencies, and local administration. Depending on the season, approximately 33-50% of Juneau's workforce is employed in government. This provides economic stability by providing year-round jobs with relatively high wages and benefits. The largest employer in Juneau is the State of Alaska, including the Governor's office, Alaska State Legislature, state departments (Education, Fish & Game, etc.), and the judicial branch. Over 4,000 Juneau residents are employed by the State of Alaska. The federal government also has a large presence in Juneau, including NOAA offices, USFS offices, BLM offices, Customs and Border Protection, and the U.S. Coast Guard.

Juneau's economy is experiencing historic strength in the early 2020s. However, economic development in Juneau is also limited by a lack of housing availability plus prohibitive pricing, directly contributing to worker shortages (JEDC 2024).

Table ExSummary-4 General Economic Conditions in Juneau (2014-2024)

	2014	2017	2021	2024	Change 2014-2024
Total Labor Force (excluding self employed)	17,980	17,709	16,463	17,722	-2%
Total Job Earnings (in millions)	$1,151.5	$1,124.1	$1,109.2	$1,180.6	+3%
Average Annual Wage	$66,567	$65,983	$68,905	$69,312	+7%
Annual Unemployment Rate (seasonally unadjusted)	5.0%	4.3%	4.8%	3.6%	-28%

Source: JEDC 2024

CRITICAL FACILITIES – CITY AND BOROUGH OF JUNEAU

Facility Type	# of Occupants	Facility	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner	Land Owner
Government	200	City Hall (Municipal Building)	155 S. Seward Street	58.299767	-134.406804	$ 31,289,916	C1	CBJ	CBJ
	30	Public Works Consolidated Shop	7100 Glacier Highway	58.358862	-134.533782	$ 33,634,781	S1	CBJ	CBJ
	30	Water Department Shop	2520 BARRETT AVENUE	58.368635	-134.608144	$ 7,988,741	W2	CBJ	CBJ
	30	Centennial Hall	144 Willoughby Avenue	58.299794	-134.410822	$ 40,205,594	S4	CBJ	CBJ
	30	Mt Jumbo Facility	409 D Street, Douglas	58.27594	-134.39578	$ 17,373,619	C1	CBJ	CBJ
Emergency Response	23	Glacier Fire Station (Airport Fire station)	1700 Crest St	58.35847	-134.573949	$ 24,656,162	W2	CBJ	CBJ
	23	Juneau Fire Station	820 Glacier Ave	58.300993	-134.420829	$ 29,156,407	W2	CBJ	CBJ
	23	Douglas Fire Station & Library	1016 3rd St	58.276719	-134.395049	$ 20,228,485	S4	CBJ	CBJ
	23	Auke Bay Fire Station	11900 Glacier Hwy	58.387594	-134.649485	$ 6,736,034	C1	CBJ	CBJ
	23	Lynn Canal Fire Station	17900 Glacier Hwy	58.409648	-134.757102	$ 5,103,829	W2	CBJ	CBJ
	96	Juneau Police Department	6255 Alaway Ave	58.357036	-134.507313	$ 31,627,937	RM1	CBJ	CBJ
Medical	1304	Bartlett Regional Hospital	3260 Hospital Drive	58.32942	-134.466029	$ 103,357,204	S4	CBJ	CBJ
Transportation	100	Juneau International Airport	1873 Shell Simmons Dr	58.359816	-134.583449	$ 87,833,800	RM1	CBJ	CBJ
	25	Statter Harbor(Office Building)	11497 Auke Bay Harbor Road	58.383553	-134.644638	$ 3,400,794	S1	CBJ	CBJ
	25	Amalga Harbor Boar Launch & Facility	25498 Amalga Harbor Road	58.491339	-134.788446	$ 20,000,000	C2	CBJ	CBJ
	25	Auke Bay Loading Facility	13555 GLACIER HIGHWAY	58.382356	-134.691197	$ 9,750,300	C1	CBJ	CBJ
	25	Intermediate Vessel Float	13575 GLACIER HIGHWAY	58.294743	-134.399476	$ 1,114,050	N/A	CBJ	CBJ
	25	Downtown Cruise Ship Berths	704 S Franklin St	58.296754	-134.401739	$ 47,242,650	N/A	CBJ	CBJ
Utility	25	Juneau-Douglas Wastewater Treatment Plant	1540 Thane Road	58.286901	-134.382728	$ 15,678,043	S4	CBJ	CBJ
	25	Mendenhall Wastewater Treatment Plant	2009 Radcliffe Road	58.360256	-134.596796	$ 74,416,839	RM1	CBJ	CBJ
	25	Auke Bay Wastewater Treatment Plant	11909 Glacier Hwy	58.387439	-134.647457	$ 2,617,885	S1	CBJ	CBJ

Facility Type	# of Occupants	Facility	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner	Land Owner
	Bulk Fuel	Statter Harbor Food and Fuel LLC	11687 Glacier HWY	58.38620	-134.64495	$ 1,324,270	n/a	Statter Harbor Food and Fuel LLC	Statter Harbor Food and Fuel LLC
	Bulk Fuel	Bulk Plant Facilities - Structure Petro 49	0 Jacobsen Dr.	58.28948	-134.39329	$ 3,658,437	n/a	Petro 49 Inc	Petro 49 Inc
	Bulk Fuel	Aurora Fuel Dock	1401 Harbor Way	58.30359	-134.42860	-	n/a	CBJ Lands & Resources	CBJ Lands & Resources
	Bulk Fuel	Airport Helipad Lease	0 Yankukin Dr.	58.35548	-134.56028	$ 88,765	n/a	CBJ Airport	CBJ Airport
	Bulk Fuel	Aero Services Juneau	Parcel 3-B16-0-100-008-0 Lot 8 Block J	58.36000	-134.59000	-	n/a	Aero Services Juneau	CBJ
	Bulk Fuel	Alaska Airlines - Juneau	1873 Shell Simmons Drive	58.35928	-134.58323	-	n/a	Alaska Airlines	State of Alaska
	Bulk Fuel	Alaska Army National Guard - Juneau Readiness Center	12300 Mendenhall Loop Road	58.38944	-134.64781	-	n/a	Alaska Army National Guard	State of Alaska - Dept of Education
	Bulk Fuel	Alaska Army National Guard - Juneau AAOF	8425 Livingston Way	58.35740	-134.56874	-	n/a	Alaska Army National Guard	CBJ - Airport
	Bulk Fuel	Alaska Electric Light & Power - Auke Bay Generation Station	12480 Mendenhall Loop Rd	58.38706	-134.64447	-	n/a	AELP	AELP
	Bulk Fuel	Alaska Electric Light & Power - Gold Creek		58.30000	-134.42000	$ 896,000	n/a	AELP	AELP
	Bulk Fuel	Alaska Electric Light & Power - Juneau - Industrial Power Plant	2500 Barrett Avenue	58.36737	-134.60832	$ 1,805,400	n/a	AELP	AELP
	Bulk Fuel	Alaska Electric Light & Power - Lake Dorothy		58.23008	-134.05225	-	n/a	AELP	AELP
	Bulk Fuel	Alaska Electric Light & Power - Lemon Creek	5601 Tonsgard Court	58.35369	-134.49617	$ 13,457,100	n/a	AELP	AELP
	Bulk Fuel	Alaska Electric Light & Power - Snettisham		58.20747	-134.14919	-	n/a	Alaska Energy Authority	Alaska Energy Authority
	Bulk Fuel	Alaska Power & Telephone - Auke Mountain Microwave Tower		58.39000	-134.72000	-	n/a	Alaska Power & Telephone	US Forest Service
	Bulk Fuel	AT&T - Juneau - Lena Point	17103 Lena Loop Road	58.39057	-134.76867	$ 5,193,400	n/a	AT&T	AT&T

Facility Type	# of Occupants	Facility	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner	Land Owner
	Bulk Fuel	USCG Station Juneau	345 Egan Drive	58.29853	-134.41254	-	n/a	USCG	USCG
	Bulk Fuel	Coastal Fuel, Inc	Juneau International Airport	58.35816	-134.58116	-	n/a	CBJ Airport	CBJ Airport
	Bulk Fuel	Colaska - Secon/AggPro Juneau	5771 Concrete Way	58.35393	-134.50203	$ 1,207,700	n/a	Coalaska	Coalaska
	Bulk Fuel	Delta Western - Juneau Airport	1873 Shell Simmons Drive	58.36000	-134.59000	-	n/a	Delta Western	CBJ Airport
	Bulk Fuel	FAA - Coghlan Island - CBL NDB PX		58.35927	-134.69930	-	n/a	FAA	FAA
	Bulk Fuel	FAA - Juneau - JDL LDA SX		58.36000	-134.64000	-	n/a	FAA	FAA
	Bulk Fuel	FAA - Juneau - JNU LDIN 1		58.35204	-134.57328	-	n/a	FAA	FAA
	Bulk Fuel	FAA - Juneau - JNU LDIN 2 SX		58.35231	-134.57039	-	n/a	FAA	FAA
	Bulk Fuel	FAA - Juneau - JNU LDIN 3		58.36000	-134.64000	-	n/a	FAA	FAA
	Bulk Fuel	GCI Communication Corp. - JUN - DC & ES	1580 Thane Road	58.28665	-134.38285	$ 242,600	n/a	GCI	CBJ Lands & Resources
	Bulk Fuel	Juneau DOT&PF 7-Mile Office Complex	6860 Glacier Highway	58.36000	-134.53000	-	n/a	ADOT&PF	ADOT&PF
	Bulk Fuel	NorthStar Helicopters North Douglas Helibase	6910 North Douglas Highway	58.33206	-134.49825	$ 2,336,900	n/a	Northstar Helicopters North Douglas Helibase	Northstar Helicopters
	Bulk Fuel	Petro 49 - Juneau - Auke Bay Marina	11739 Glacier Highway	58.38644	-134.64531	-	n/a	Petro 49 - Juneau - Auke Bay Marina	Petro 49
	Bulk Fuel	Petro 49 - Juneau - Petro Marine Goldbelt Marina	76 Egan Drive	58.29926	-134.40959	$ 1,177,716	n/a	Petro 49 - Juneau - Petro Marine Goldbelt Marina	Goldbelt
	Bulk Fuel	Riverbend Elementary School	2901 Riverside Drive	58.37536	-134.59190	-	n/a	CBJ Juneau Schools	CBJ Juneau Schools
	Bulk Fuel	ADOC - Lemon Creek Correctional Center	2000 Lemon Creek Road	58.36266	-134.48345	-	n/a	ADOC	ADOC
	Bulk Fuel	University of Alaska - Southeast	12300 Mendenhall Loop Road	58.39122	-134.64665	-	n/a	University of Alaska - Southeast	University of Alaska - Southeast
Edu	339	Auke Bay Elementary School	11869 Glacier Hwy	58.387598	-134.648095	$ 14,977,982	W2	CBJ	CBJ

Facility Type	# of Occupants	Facility	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner	Land Owner
	338	Harborview Elementary School	1255 Glacier Ave	58.30354	-134.424796	$ 24,022,388	C2	CBJ	CBJ
	284	Kaxdigoowu Héen Elementary School	2901 Riverside Dr	58.366039	-134.604889	$ 19,023,878	W2	CBJ	CBJ
	316	Mendenhall River Community School	9001 Mendenhall Loop Rd	58.400178	-134.578973	$ 19,945,024	W2	CBJ	CBJ
	283	Sayéik: Gastineau Community School	1507 3rd St	58.279083	-134.399633	$ 17,029,466	RM1	CBJ	CBJ
	322	Sít' Eetí Shaanáx – Glacier Valley Elementary School	3400 Tongass Blvd # 111	58.382608	-134.57255	$ 15,496,144	W2	CBJ	CBJ
	466	Dzantik'i Heeni Middle School	1600 Renninger St	58.361662	-134.512888	$ 30,768,098	W2	CBJ	CBJ
	395	Floyd Dryden Middle School	10014 Crazy Horse Dr	58.366039	-134.604889	$ 119,392,931	W2	CBJ	CBJ
	592	Juneau-Douglas High School: Yadaa.at Kalé	1639 Glacier Ave	58.305138	-134.427854	$ 100,637,593	C2	CBJ	CBJ
	618	Thunder Mountain Middle School	3101 Diamond Pk Lp	58.379948	-134.587984	$ 69,950,604	S1	CBJ	CBJ
Community	30	Downtown Juneau Public Library	292 Marine Way	58.298562	-134.403701	$ 24,980,329	C1	CBJ	CBJ
	30	Mendenhall Valley Public Library	3025 Dimond Park Loop	58.377798	-134.589235	$ 32,585,779	W2	CBJ	CBJ
	50	Adair-Kennedy Memorial Park	3820 Mendenhall Loop Rd	58.389114	-134.570266	$ 473,488	W2	CBJ	CBJ
	50	Savikko Park	101 Savikko Road	58.272977	-134.385753	$ 1,211,204	W2	CBJ	CBJ
	50	Twin Lakes Park	3499 Glacier Hwy	58.332838	-134.472927	$ 2,894,960	W2	CBJ	CBJ
	50	Cope Park	1001 Calhoun Ave	58.304922	-134.412522	$ 400,331	W2	CBJ	CBJ
	50	Riverside Rotary Park	3300 Riverside Dr	58.381	-134.5856	$ 500,000	W2	CBJ	CBJ
	50	Melvin Park	4098 Riverside Dr	58.382302	-134.582287	$ 378,793	W2	CBJ	CBJ
	-	Evergreen Cemetery	601 Seater St	58.304533	-134.42506	-	N/A	CBJ	CBJ
	-	Alaska Memorial Park	3839 Riverside Dr	58.389655	-134.58654	$2,428,915	W2	Dyemond LLC	Private
	-	Taku Indian of the Raven Tribe Cemetery	0 3rd St	58.280228	-134.40171	-	N/A	Ross Estate Cemetery	Private
Total:	6,448					$ 1,141,899,265			

CRITICAL FACILITIES – TLINGIT & HAIDA

Facility Type	# of Occupants	Facility Name	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner (T&H)	Land Owner (T&H)
Government	0	Blue Storage Bldg	383 Village St	58.2998	-134.4068	$205,900	S2	T&H	T&H
	6	AK Seafood Building	5731 Concrete Way	58.358	-134.521	$1,175,200	S2	T&H	T&H
	0	Driftwood Warehouse Building	429 W Willoughby Ave	58.30058	-134.5158	$348,955	W2	T&H	T&H
	210	Andrew Hope Bldg & Condo	320 W Willoughby Ave	58.3019	-134.4197	$9,135,899	S1	T&H	T&H
	20	Edward Thomas Bldg (Airport Annex)- Historical Archives	9097 Glacier Hwy	58.355	-134.576	$3,145,557	W2	T&H	T&H
	100	T&H Community & Behavioral Services Healing Center	400 W Willoughby Ave	58.3019	-134.4197	$6,720,000	S1	T&H	T&H
	150	T&H Building	410 W Willoughby Ave	58.3019	-134.4197	$10,080,000	S1	T&H	T&H
	80	Driftwood Lodge Building	435 W Willoughby Ave	58.3019	-134.4197	$8,156,588	W2	T&H	T&H
	10	Smokehouse Catering Building & Procurement Warehouse	1721 Anka St (1722 & 1723)	58.362	-134.498	$6,234,500	S2	T&H	T&H
	12	219 S Franklin	219 S Franklin St	58.2998	-134.4068	$2,035,546	W2	T&H	T&H
	0	Franklet Bldg	379 Village St	58.301321	-134.4167	$417,553	N/A Empty Lot	T&H	T&H
	8	Bonnell Bldg	5750 Concrete Way	58.358	-134.521	$2,328,420	S2	T&H	T&H
	5	Sacred Shine - Bldg	1721 Anka St	58.362	-134.498	$2,845,435	S2	T&H	T&H
	5	1725 Anka St (SR)	1725 Anka St	58.362	-134.498	$2,845,435	S2	T&H	T&H
	0	Thane Building	4400 Thane Road	58.267	-134.357	$1,000,000	N/A Empty Lot	T&H	T&H
	0	Tee Harbor	17900 Glacier Hwy	58.410678	-134.7551	$4,443,400	N/A Raw Land	T&H	T&H

Facility Type	# of Occupants	Facility Name	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner (T&H)	Land Owner (T&H)
	0	Warehouse	535 Willoughby Ave	58.3019	-134.4197	$944,313	N/A Empty Lot	T&H	T&H
	6	TANF/Child Care - 1st Bank	3075 Vintage Blvd	58.3545	-134.482	$2,002,833	W2	T&H	T&H
Utility	20	SGC Channel Dr Bldg	2631 Channel Dr	58.289	-134.41	$4,074,500	S1	T&H	T&H
Education	20	Demmert Bldg- HeadStart	9095 Glacier Hwy	58.3545	-134.5755	$1,957,659	W2	T&H	T&H
	40	Generations Southeast (VTRC)	3239 Hospital Dr	58.2786	-134.4107	$4,068,239	S2	T&H	T&H
	0	Early Education Campus Project - Juneau	8181 Glacier Hwy	58.36153	-134.5506	$4,500,000	N/A Raw Land	T&H	T&H
	40	JCC LEARN Building	8001 Glacier Hwy	58.355	-134.576	$808,953	W2	T&H	T&H
Community	100	JTHCC Building	3235 Hospital Dr	58.2789	-134.411	$665,116	W2	T&H	T&H
	30	Driftwood Event Space	429 W Willoughby Ave	58.30058	-134.5158	$2,703,074	W2	T&H	T&H
	8	Alter Bldg (2nd Chance Program)	324 Village St	58.30191	-134.415	$395,900	W2	T&H	T&H
	0	Honsinger Neighborhood Center	7880 Honsinger Dr	58.354	-134.521	$1,012,165	N/A Empty Lot	T&H	T&H
	15	Haven House 1	3200 Malissa Drive	58.3775	-134.5697	$576,000	W1	T&H	T&H
	15	Haven House 2	3202 Malissa Dr	58.2786	-134.4107	$1,002,900	W2	T&H	T&H
	7	Gaaja Hit	250 Village St	58.2998	-134.4068	$500,000	W2	T&H	T&H
	15	Reentry and Recovery	1921 Allen Ct	58.362	-134.498	$625,000	W2	T&H	T&H
	15	Alaway Ave	6205 Alaway Ave	58.355	-134.576	$953,022	W2	T&H	T&H
Total	**937**					**$87,908,062**			

MITIGATION ACTION PLAN (MAP) SNAPSHOT

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
1	Continue to educate residents about Avalanche Hazard risks and area and establish regular avalanche evaluating and forecasting during winter months	M	n/a	Emergency Programs	-	Short Term (<1 year)	EPA Environmental Justice Small Grants (EJSG) Program, internal budget, FEMA HMGP, HUD CDBG, FEMA EMPG	This project would enhance public safety by reducing the risk of avalanche injury or deaths, inform decision-making for residents and visitors, supports better emergency response and planning, and protects critical infrastructure and property.	Medium (30k-99k)	This project is technically feasible, the education of residents can be achieved with existing CBJ staff. Avalanche forecasting is a well established practice in snowy, mountainous areas. CBJ could consider partnering with NOAA,NWS, local ski resorts, and AAIC.	Land Management Plan, Trails Plan
2	Facilitate federal buyout programs for homes in high hazard areas	M/H	M/H	Emergency Programs	Public Safety	Long Term (>3 years)	Internal, CWDGP, FEMA HMGP, HUD	Reduces risk to life and property, lowers long term public costs, improves FEMA grant eligibility and CRS rating.	High (>100k)	This project involves complex coordination and long term planning, as well as sustained funding. Buyout of homes would require significant outside funding to have an impact in the community.	Land Management Plan, Comprehensive Plan
3	Regulate all new construction in Severe Hazard areas; maintain high hazard zone designations in CBJ parcel data; update CBJ and T&H mapping to reflect hazard areas; establish special building/zoning codes for hazard areas	H	M	Community Development	Public Safety T&H Mapping to reflect hazard areas; establish special building/ zoning codes for hazard areas) ONLY	Long Term (>3 years)	Internal, FEMA HMGP	This project reduces risk to new construction in CBJ, creates informed land use and development decisions, creates accurate and transparent parcel information, improves building and zoning standards, and reduces municipal liability.	Low (0k-29k)	This project is technically feasible. CBJ has the legal authority and resources to implement new codes and zoning regulations.	Land Management Plan, CBJ Code, CBJ Historic District Design Standards,

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
4	Prohibit removal of vegetation in landslide areas	M	n/a	Community Development	-	Long Term (>3 years)	Internal	Prohibiting vegetation removal will increase slope stability and reduce landslide risk, increase public safety, maintain the natural aesthetics of Juneau, and serves as a low cost, nature based mitigation strategy that compliments engineering solutions.	Low (0k-29k)	This project is technically feasible- on CBJ land. Coby has the legal authority to prohibit vegetation removal, however not all landslide hazard zone lands are owned by CBJ. For a complete prohibition to be enacted, coordination with other land management agencies and private land owners would be required.	CBJ Code, Land Management Plan, Transportation Improvement Plan
5	Thorough geological mapping of soils and slopes to include settling and liquefaction risks.	H	M	Community Development	Lands and Natural Resources Department	Medium Term (1-3 years)	USGS, FEMA HMGP, ANTHC	This project increases the available data to decision makers to increase public safety, improved land use and development planning, protection of public and private industries, and supporting resilient community design. It also increases CBJ's access to state and federal funding by including high quality data in grant applications, and builds public trust through transparency.	High (>100k)	This project would require hiring contractors to conduct the studies. Support from DGGS and USGS is possible.	Land Management Plan, Comprehensive Plan, Buildable Sites Criteria and Findings

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
6	Require homeowners to notify renters of hazard prior to occupancy	L	M	Community Development	Business & Economic Development	Short Term (<1 year)	Internal	This project would increase community preparedness by ensuring both tenants and homeowners are aware of the risks associated with a property, supports emergency response and evacuation planning, and promotes equity and fairness by offering renters the same information that is readily available to homeowners.	Low (0k-29k)	This project is technically simple, and mainly requires legal, administrative, and policy coordination across CBJ branches. This project also aligns with risk communication best practices.	Land Management Plan, Housing Action Plan, CBJ Code
7	Increase code enforcement.	H	n/a	Community Development	-	Medium Term (1-3 years)	Internal budget	Increasing code enforcement improves public safety, preserves community standards, and reduces public long term costs by addressing issues in building proactively.	High (>100k)	This project is technically feasible, but would require CBJ to allocate more budget to code enforcement. Planning team noted that code enforcement department is already understaffed. Additional codes and effort to enforce them would cause additional strain/backlog unless staffing was increased.	CBJ Code
8	Update downtown fire hazard zone mapping to more accurately reflect highest hazard areas	L	n/a	CCFR	-	Medium Term (1-3 years)	Community Wildfire Defense Grant Program, US DOI, FEMA, AK DNR	Enhances emergency preparedness, improves land use and development decisions, supports fire prevention and mitigation measures. This project also protects historic and high density areas, and increased eligibility for state and federal funding. This would also reduce municipal liability and insurance risk.	High (>100k)	This project is technically feasible, but would most likely require hiring a contractor holding expertise in the area. This could require a large budget.	Comprehensive Plan, CBJ Code, Historic District Design Standards, Long Range Waterfront Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
9	Explore updating cigarette receptacles to prevent ashtray fires	L	n/a	CCFR	-	Medium Term (1-3 years)	Internal, Alaska DNR, Juneau Community Foundation	This project would reduce the risk of fires igniting near building and high traffic areas, protect public infrastructure, and reduce fire department strain by lowering call volume. It also would enhance public cleanliness and aesthetics and demonstrates proactive risk management.	Medium (30k-99k)	This project is technically feasible, and straightforward. Public ashtrays are readily available in multiple options and are relatively simple to install or retrofit.	Historic District Design Standards, CBJ Area Wide Transportation Improvement Plan, Long Range Waterfront Plan
10	Install warning signage in mapped landslide zones	M	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA HMGP, FEMA EMPG, ANTHC	Signs would inform residents and visitors that they are entering landslide areas. It is also a low cost, high impact risk communication tool, and encourages personal responsibility and informed decision making. Documented public warning can limit municipal liability and reinforce existing hazard maps and policy.	Medium (30k-99k)	This is technically a highly feasible project. Installing physical signage is logistically simple, low cost, and very little technical barriers. The main challenges with this project are site selection, public communication, and long-term maintenance.	Trails Plan, Area Wide Transportation Improvement Plan, Long Range Waterfront Plan,
11	Conduct an inventory and inspect high occupancy buildings and critical facilities and bridges to identify those needing seismic retrofitting, prioritize public buildings for upgrades, and complete renovations to strengthen vulnerable structures against earthquakes.	M	n/a	Engineering & Public Works	-	Long Term (>3 years)	FEMA HGMP, HUD CDBG, FEMA NEHRP Earthquake State Assistance Grant Program	Reduces risk of structural failure during earthquakes, strengthens critical facilities to maintain operation during times of distress, and minimizes infrastructure damage and economic loss by proactively retrofitting lowers repair cost and reduces downtime.	High (>100k)	This project is technically feasible, particularly if conducted in stages. There are challenges to completing this project however, such as the large amount of funding required, access to qualified engineering support, and access to privately owned facilities.	Area Wide Transportation Plan, Long Range Waterfront Plan, Housing Action Plan, CBJ Buildable Sites Criteria

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
12	Bring the DHS&EM "Quake Cottage" to Juneau for earthquake simulation and education	L	L	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal budget, FEMA NEHRP Earthquake State Assistance Grant Program, ANTHC	This project would provide hands-on education to residents by experiencing what an earthquake feels like in a safe, controlled setting. It would also engage youth and schools by offering a dynamic learning experience and promotes action through experience.	Low (0k-29k)	This project is highly feasible. It is a low-risk, high-impact educational tool that has been successfully deployed across Alaska.	Land Management Plan, Housing Action Plan
13	Elevate homes, businesses, and critical facilities in floodplains through targeted projects and grant programs to reduce flood risk, protect infrastructure, and preserve vulnerable neighborhoods—while also providing funding and resources to support elevation efforts.	H	M	Emergency Programs	Public Safety	Long Term (>3 years)	FEMA HMGP, FEMA FMA, HUD CDBG, ACCIMP, Tlingit-Haida Regional Housing Authority (THRHA), ANTHC	This project would reduce flood risk and property damage, aid in preserving vulnerable neighborhoods, and increase community resilience. This project would improve eligibility for flood insurance and lower premiums, as well as access more state and federal funding.	High (>100k)	This project is technically feasible and would be very effective at reducing flood damage. However, outside contractors would be required due to varying structure types, site conditions, and lack of in house CBJ expertise. Funding could be difficult to source and qualified contractors may be in low supply.	Coastal Management Plan, Housing Action Plan, Land Management Plan, Historic Design Standards, CBJ Code, Comprehensive Plan
14	Continue to coordinate and support USGS with installation of additional USGS telemetry gauges and real-time monitoring systems in areas like Suicide Basin and key dams, rivers, and lakes to track water levels during heavy rain and hazard events, improving early warning and flood response capabilities.	H	H	Engineering & Public Works	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	Internal budget, FEMA HMGP, FEMA FMA, EPA CWSRF, USDA NRCS RCPP, FEMA National Dam Safety Program State Assistance Grant, USGS, NOAA	This project would improve early warning for flood and glacial outburst events which would improve evacuation processes and inform better decision making. It would enhance flood response and strengthens interagency collaboration and increase the amount of reliable information available to the public.	Medium (30k-99k)	This project is technically feasible, especially in a support role aiding USGS who has access to proven infrastructure, strong agency support, and an established community presence. Some considerations would be funding sources and data integration between CBJ and USGS.	Comprehensive Plan, Trails Plan, Economic Development Plan, Area Wide Transportation Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
15	Update and improve flood mapping (annual for specific flood events; update FIRMS, coordinate with community led and federally led activities.	H	H	Community Development	Public Safety'Lands and Natural Resources Department/ Environmental	1-3 years	USACE Planning Assistance to States and Tribes, FEMA FMA, FEMA HMGP, ACCIMP	Accurate and current maps help residents, businesses, and first responders understand real flood risks and prepare accordingly. Current mapping also supports smarter development and land use planning. More accurate FIRMs also support fair and accurate flood insurance requirements.	High (>100k)	This project is technically feasible, but considerations must be made regarding interagency coordination, funding sources, and data collection. Local mapping is more flexible, but formal FIRM updates require navigating FEMA's process which can take several years.	Coastal Management Plan, Trails Plan, Buildable Sites Criteria
16	Explore terminal doppler radar coverage to predict rainfall more accurately (wind profiler (JAWS) is not publicly available. Need to identify good location that does not conflict with mountains	M	M	Lands & Resources	Lands and Natural Resources Department/ Environmental	Medium Term (1-3 years)	FEMA HMGP, FEMA FMA, NOAA, FAA, NWS	This project would improve rainfall and storm prediction accuracy, support timely and accurate early warnings, fill gaps in existing monitoring capabilities. It would also increase safety for air travel and marine operations and enable more effective emergency response and planning. This project would support mitigation efforts for other natural hazards as well such as flooding, landslide, and GLOFs.	Medium (30k-99k)	Exploring this project is entirely feasible and may lead to funding sources being uncovered among CBJ, FAA, NWS, and T&H. Implementing a new radar system would be logistically and financially challenging due to the mountainous terrain, infrastructure limitations, and interagency coordination requirements.	Coastal Management Plan, Long Range Waterfront Plan, Comprehensive Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
17	Upgrade and maintain bridges, culverts, and drainage systems to handle large-scale flood events, reduce stormwater runoff, and prevent street flooding and erosion, while offering support for homeowners to repair private drainage connections.	H	M	Engineering & Public Works	Facilities & Projects	Long Term (>3 years)	AK DOT, FEMA HMGP, FEMA FMA, EPA CWSRF, FHA Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program, FHA, Congressionally Directed Spending (CDS), USFWS, Denali Commission	This project would reduce street flooding and infrastructure damage, support erosion prevention, and aids in adapting to climate driven rainfall increases, and reduces maintenance costs and emergency repairs.	High (>100k)	This project is technically feasible and aligns with standard municipal engineering practices. Many components of this project can be phased, prioritized, and funded incrementally. However, some upgrades would be limited by private property ownership and complex permitting process.	Area wide Transportation Plan, Coastal Management Plan, Long Range Waterfront Plan, Land Management Plan
18	Require burn permits during dry conditions	L	n/a	CCFR	-	Short Term (<1 year)	Internal budget	Reduces risk of wildfires and property damage, supports clear communication and fire danger awareness. This project would also preserve air quality and environmental health.	Low (0k-29k)	This project is technically feasible and simple. CBJ has the authority to require burn permits, which is a simple and straight forward way to mitigate fire hazard in CBJ. A benefit of this project is the low cost, with CBJ likely breaking even or potentially making a profit on implementing this project.	CBJ Code
19	Initiate study identifying potential tsunami sources	M	M	Emergency Programs	Public Safety	Long Term (>3 years)	National Tsunami Hazard Mitigation Program (NTHMP) , DGGS	This project would allow CBJ to consider tsunami hazard risk with more comprehensive and accurate data, allowing for the most informed decision making possible on mitigation strategies of a potential tsunami.	High (>100k)	This project would require outside contractors to be hired, raising the cost of this study. However, data compiled during this project could open up new funding opportunities for CBJ.	Coastal Management Plan, Long Range Waterfront Plan, Comprehensive Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
										This project also follows best practices for hazard mitigation practices.	
20	Collaborate with Tsunami Ready Community Program and NWS to make Juneau Tsunami Ready and Storm Ready and ensure that schools and public buildings have means to receive emergency warnings	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal budget, FEMA EMPG, NTHMP	This project would provide CBJ with designations that strengthen their emergency preparedness, hazard mitigation efforts, and community resilience. It would improve CBJ's emergency communication infrastructure and increase preparedness in schools and public facilities. Achieving those designations would allow CBJ to receive formal designation of their disaster readiness.	Medium (30k-99k)	This project is technically straightforward and beneficial. These programs provide a structured framework for improving CBJ's public warning systems and emergency planning. The formal designations can create more funding opportunities for future mitigation projects.	Coastal Management Plan, Long Range Waterfront Plan, Comprehensive Plan
21	Explore a study to evaluate lifespan of built structure and future development along the coast (including airport and Wastewater Treatment Plant)	M	L	Engineering & Public Works	Facilities & Projects	Long Term (>3 years)	EDA Public Works and Economic Adjustment Assistance Programs	Provide insight to CBJ on how the developed coastline rates against changes in sea level rise, erosion, and other changing environmental conditions.	High (>100k)	This project would require hiring contractors. Support from USCS, USACE is possible.	Coastal Management Plan, Long Range Waterfront Plan, Area Wide Transportation Plan
22	Explore development of continuity of operations plan	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA EMPG, HSGP, FEMA Emergency Management Baseline Assessment Grant Program	This project ensures that essential government functions and services can continue during and after emergencies. This would improve disaster preparedness and response and minimize service disruptions to the public.	Medium (30k-99k)	This project is very feasible and standard action for municipal governments. The planning can begin at a basic level and scale in complexity over time.	Comprehensive Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
23	Provide non-digital options for and redesign CBJ website and T&H websites (to address Tribal membership) to include: Add a hazard information tab to the website where residents can find all information related to emergency preparedness and communication. Key information to include: - Final FEMA-approved HMP - Links to hazard resources (volcano activity, fire, smoke, etc.) - GIS hazard maps, including current FEMA FIRMs layer and annual river bank elevation - Emergency resource guide for residents that explains appropriate responses at the household scale and provides contact information to help ensure residents receive the care and services required before, during, and after major events - Provide information to residents for how to report hazard-related incidents and conditions to jurisdiction officials. This will include the development of a process to receive and disseminate the information to the designated jurisdiction officials. - Evacuation routes and emergency shelters - Distribute information about the need for and items included in a go-bag	H	M	Emergency Programs	Communications/ Public Safety	Medium Term (1-3 years)	Internal budget, FEMA EMPG, FEMA HMGP, AK DNR, USGS, EPA	This project would significantly enhance public safety, equity, and preparedness. It would improve public access to life saving information. It strengthens the entire community's emergency preparedness and response as well as enhances coordination between jurisdictions. It promotes awareness and use of critical programs and supports transparency and public trust. This would be a hub for the public to stay educated on emerging environmental risks.	Medium (30k-99k)	This project is technically feasible with moderate resource investment. This project would have enormous community benefit and would require website redesign, content development, and integration of non-digital outreach methods.	Comprehensive Plan, Economic Development Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
	CBJ	T&H									
	- Secure and disseminate information about pest and pathogen damage on tree species coupled with information on how to best control and manage the results of outbreaks. - Increase public awareness of NFIP and CRS and benefits of purchasing flood insurance by adding relevant information to the proposed hazard tab on the jurisdiction's website. - List and amounts of food/water per person for emergency kit on website - Provide information regarding ICS training for residents										
24	Align local IT and Cybersecurity policies and operations with best practices such as the CISA Cybersecurity Performance Goals and the Cyber Essentials Toolkit as well as the NIST Cybersecurity Framework and continually update current best practices. Educate public employees and contractors about email scams. Periodically send phony email scams to test CBJ employees and contractors.	M	n/a	Management Information Systems	-	Medium Term (1-3 years)	Internal budget, CISA State and Local Cybersecurity Grant Program, CISA Tribal Cybersecurity Grant Program	This project would improve CBJ's digital security position. By strengthening protection of public infrastructure and services, CBJ would reduce their risk of ransomware and phishing attacks. It would also foster a workplace culture of cybersecurity awareness and ensure compliance with state and federal security standards.	High (>100k)	This project is highly feasible. This would require phased implementation but would follow best practices for workplace cyberawareness.	Comprehensive Plan
25	Evaluate assessing critical facilities for snow load and ashfall capacity. Explore funding to retrofit any facility that does not meet recommended snow load of 30 pounds/sq foot.	L	M	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal budget, FEMA HMGP, HUD CDBG	This project would enhance the safety and durability of CBJ critical infrastructure. It would also reduce long term maintenance and emergency repair costs and prolonged closures due to building damage.	High (>100k)	May require hiring contractors with structural engineering expertise. Retrofitting buildings could potentially be complex, and funding availability will strongly influence retrofitting implementation	CBJ Code, Historic District Design Standards, Buildable Sites Criteria and Findings

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
26	Conduct a comprehensive inventory and condition assessment of all roads, bridges, culverts, ditches & shoulders. Follow-up after inundation events to document damages and prioritize mitigation	L	n/a	Engineering & Public Works	-	Long Term (>3 years)	USACE Planning Assistance to States and Tribes, FEMA HMGP, FHA STBGP	This project provides long term safety, planning, and financial benefits such as supporting proactive maintenance of infrastructure before failure occurs, allowing for scheduled repairs and/or upgrades and reduce long term costs. It also improves safety for drivers, cyclists, and pedestrians. This project would also establish a data driven basis for prioritizing upgrades and maintenance, allowing time for budgeting and infrastructure funding.	High (>100k)	This project is feasible using established engineering and asset management practices. Due to large quantity of infrastructure involved, this project would require a significant amount of time.	Area Wide Transportation Plan, Comprehensive Plan
27	Create a database that includes photo and condition inventory of all critical facilities and aging infrastructure to document current (pre-disaster) conditions and contents to aid in facility repair after a disaster event and prioritize for replacement or rehabilitation. Update the condition inventory annually and after a natural hazard event that causes damage. Continue to expand inventory	H	H	Emergency Programs	Facilities/ Public Safety	Medium Term (1-3 years)	Internal, FEMA HMGP	Supports faster and more accurate post disaster recovery by expediating insurance claims, FEMA aid, and repair or replacement decisions. This project also allows CBJ to prioritize critical facilities for rehab or replacement by having a pre disaster rank of facilities by structural integrity, functionality, and community importance.	High (>100k)	Funding sources and staffing limits may limit speed of photo inventory, but can be done incrementally over time.	Housing Action Plan, Land Management Plan, Economic Development Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
28	Create an education program to ensure that all properties are visibly numbered.	L	n/a	Community Development/ CCFR	-	Short Term (<1 year)	Internal	Improves emergency response time by having addresses clearly marked, which improves public safety. This project also would aid in property damage assistance and outreach efforts after a natural disaster. A by product of this project would improvement in postal and delivery services as well as utility and public works operations.	Low (0k-29k)	This is a simple and straightforward project. The main aspects of this project include public outreach, communication strategies, and coordination with local government and emergency services.	Housing Action Plan, Area Wide Transportation Plan
29	Revise existing disaster procedure to align current procedures to best practices as they move forward in exploring development debris management plan to include private residence protocols/guidelines.	M	n/a	Emergency Programs	-	Medium Term (1-3 years)	FEMA HMGP	This project improves post disaster cleanup efficiency, clarifies responsibilities for homeowners and CBJ, increases community readiness and understanding, as well as increases CBJ's eligibility for federal funding towards cleanup efforts.	Medium (30k-99k)	Involves multi step, cross departmental effort, disaster management expertise, and experience in community engagement. Referencing FEMA public assistance debris management guide and EPA debris management frameworks can provide a framework for this project.	Land Management Plan, Comprehensive Plan
30	Draft a debris management plan.	n/a	H	-	Public Safety	Short Term (<1 year)	FEMA HMGP, EPA	This project improves post disaster cleanup efficiency, clarifies responsibilities for homeowners and CBJ, increases community readiness and understanding, as well as increases CBJ's eligibility for federal funding towards cleanup efforts.	Medium (30k-99k)	CBJ concerns of being contractually limited to one waste management service provider in crises.	Land Management Plan, Comprehensive Plan, Economic Development Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
31	Draft an Emergency Action/Response Plan that includes information regarding evacuation and shelter plan. Include information on procedures for road closures, livestock and pets, storage, vehicles, assistance for evacuation and establish MOUs with partners through development.	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA HSGP, FEMA EMPG, FEMA HMGP	This project would improve the coordination of evacuation and shelter operations, establishes procedures for road closures and reentry, and protects vulnerable populations, as well as livestock and pets. Interagency coordination through MOUs create stronger relationships between neighboring communities and agencies.	Medium (30k-99k)	Requires coordination and cooperation with multiple agencies and jurisdictions. CBJ will have to assign staff to draft and maintain the plan.	Comprehensive Plan, Land Management Plan, Housing Action Plan
32	Encourage development and regular updates to a special needs registry for elderly and vulnerable populations (non-mobile) to ensure accurate planning for their preparedness, communication, and evacuation during emergencies.	M	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA EMPG	This project would enhance life saving measures by allowing first responders to identify and prioritize assistance for residents who cannot evacuate or shelter in place independently. It also improves disaster preparedness and evacuation planning by supporting equity and inclusion in emergency planning.	High (>100k)	This project would require regular maintenance and updating to provide accurate and current information. Regular updates would also need to be communicated to emergency services to maintain the value of the registry.	Area Wide Transportation Plan, Comprehensive Plan, EAP
33	Encourage utility companies to bury existing powerlines to reduce power outages caused by downed power lines and required buried power lines in new developments.	L	n/a	Community Development	-	Short Term (<1 year)	Internal	This would benefit CBJ by reducing power outages during storms, and improve continuity of services. This project would also increase infrastructure resilience and reduces long term maintenance and restoration costs.	Low (0k-29k)	This is a straight forward and low cost project for CBJ. Utility companies may not be inclined to perform burials due to increased upfront investment and slope stability concerns in CBJ.	Economic Development Plan, Area Wide Transportation Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
34	Establish community heating and cooling centers to provide relief for those who do not have access to heating or cooling on their own.	L	M	Emergency Programs	Public Safety	Short Term (<1 year)	Community Services Block Grant, American Red Cross, FEMA HMGP	Benefits include a practical, life saving strategy to support public health and safety during periods of extreme cold or heat, especially for vulnerable or underserved populations. It also supports CBJ's resilience to changing climate conditions, and reduces strain on medical facilities during crisis times and assists low income populations.	Medium (30k-99k)	This project is feasible, especially if utilizing existing public facilities with upgraded HVAC and operational support. Limiting factors may be site accessibility, staffing, and sustainable funding to keep designated shelters operational and modernized.	Housing Action Plan, Economic Development Plan, Comprehensive Plan
35	Explore benefits of joining the Firewise program.	M	L	Emergency Programs	Public Safety	Short Term (<1 year)	Internal budget	Strengthens wildfire prevention, build public awareness, and support community wide action to reduce fire risks. Being part of the Firewise program enhances CBJ eligibility for wildfire mitigation funding.	Low (0k-29k)	Low cost project, but would require forming a local Firewise board or committee. It would require committed local leadership, community participation, and integration with existing emergency and land management programs.	Land Management Plan, Comprehensive Plan
36	Identify vegetation/fuel types, previous burn areas, areas to mitigate, grant funding specifically to reduce/remove fuels in high wildfire/brushfire areas	L	M	Lands & Resources	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	Community Planning Assistance for Wildfire (CPAW)	Positions CBJ to reduce wildfire risk, plan defensible strategies and secure external funding.	Medium (30k-99k)	This project is technically feasible using GIS and remote sensing. Grant funding exists to support fuel reduction projects.	Land Management Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
37	Implement cybersecurity training for all municipal employees and elected officials.	M	M	Management Information Systems	Information Technology	Medium Term (1-3 years)	Internal budget, CISA State and Local Cybersecurity Grant Program, CISA Tribal Cybersecurity Grant Program	Ensures that CBJ can better protect sensitive data, maintain public trust, and defend against increasingly sophisticated cyber threats. This project also builds a cyber aware workforce and fulfills compliance with state and federal guidelines.	Medium (30k-99k)	This project is technically feasible and follows best practices for cybersecurity awareness in the workplace. Success of the project will depend on choosing appropriate delivery platforms to engage participants effectively.	Comprehensive Plan, Economic Development Plan
38	Install back-up generators at all critical facilities.	M	H	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal budget, FEMA HMGP, Alaska DEC	Ensures continuity of operations during power outages, reduces the risk of infrastructure of infrastructure failure, and keeps life saving equipment operational 24/7	High (>100k)	This project is technically feasible but will require accurate assessment of energy load requirements for each critical facility. Adherence to safety and environmental standards will be critical in generator selection. Maintenance programs on generators should be able to be performed by CBJ staff.	Land Management Plan, Comprehensive Plan
39	Investigate CBJ and public interest in participating in the CRS program. If interested, coordinate with the State Floodplain Coordinator to apply. T&H to support with representative. Implement Low Impact Development, Open Space Protection Plans, and Stormwater Management Regulations, which may allow for flood insurance discounts. Evaluate no adverse impact development.	H	M	Community Development	Business & Economic Development	Short Term (<1 year)	FEMA HMGP, FEMA FMA	Significant advantages in flood risk reduction, community resilience, and financial savings through flood insurance discounts. It encourages implementation of best practices in floodplain management, enhances community resilience, and strengthens collaboration with state and regional partners.	Medium (30k-99k)	This project requires extensive collaboration and buy-in from multiple agencies and the public.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
40	Investigate the benefits of the USDA NRCS mitigation programs for flood protection.	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, USDA	This project would allow CBJ to access technical assistance and expertise as well as financial support for flood mitigation projects. It would also enhance natural flood management and improve watershed health and water quality.	Low (0k-29k)	This project requires aligning local priorities with program eligibility, developing strong project proposals to become eligible and gain access to funding sources.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan
41	Notify property owners that they are located in an inundation area and provide resources on the website for notification. (NWS flash flood emergency alert system would be triggered)	M	M	Community Development	Public Safety/ Communications	Short Term (<1 year)	Internal budget	Improves response time to flood events, increases baselines preparedness levels of residents, and reduces property damage and loss.	Medium (30k-99k)	Collaboration with NWS would benefit this project due to their existing flood emergency alerts, which can amplify the effectiveness of notifications.	Land Management Plan, Housing Action Plan
42	Perform regular backups of municipal data and store this data in a format that can be recovered in the instance of a cyber attack or other event.	M	n/a	Management Information Systems	-	Short Term (<1 year)	Internal budget	This project would maintain operational continuity for CBJ, protect vital information, and allow for quick recovery from cyber attacks or other disruptive events.	Low (0k-29k)	This project is feasible, and will not require any resources outside of internal CBJ options. Investment in tools, training, and policies may be required in the future.	Comprehensive Plan, Economic Development Plan
43	Pursue funding for an engineering study to identify stormwater and snowfall drainage problem areas.	H	n/a	Engineering & Public Works	-	Medium Term (1-3 years)	EPA CWSRF, FEMA FMA, FEMA HMGP, Sewer Overflow and Stormwater Reuse Municipal Grants Program	This project would provide CBJ with more accurate and comprehensive data to address drainage issues in the jurisdiction, and proactively address flooding and runoff challenges which could have secondary issues like erosion and drainage backups.	High (>100k)	This project would most likely require hiring contractors with expertise in civil engineering and stormwater systems.	Land Management Plan, Long range Waterfront Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
44	Pursue funding for physical security enhancements for nonprofit and faith-based organizations	n/a	L	-	Public Safety/ Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, DOE, HUD, DHHS	Strengthens community safety, resilience, and social cohesion. This project also protects vulnerable community institutions and fosters collaboration between private and public sectors.	High (>100k)	Will require strategic/creative grant funding, and collaboration between private and public sectors.	Comprehensive Plan, Economic Development Plan
45	Support research to assess the potential impacts of a Mount Edgecumbe and other volcano eruptions on Juneau, building on evidence that a past eruption affected the area over 12,000 years ago.	L	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	USGS, Alaska DNR	Improves hazard awareness and risk assessment, enhances emergency planning and preparedness, and supports infrastructure resilience and protection. This project would also strengthen coordination with state and federal agencies.	Medium (30k-99k)	This project will require contracting the study to an organization with expertise in volcano research, which is inherently unpredictable. May be public dissatisfaction funding this study while there are seemingly more relevant hazard risks in CBJ currently.	Land Management Plan, Comprehensive Plan
46	Work with ADOT to review and update high-water flood assessments of bridges with an emphasis on structures at highest risk of impacts from flood waters.	L	L	Engineering & Public Works	Public Safety/ Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, USACE WRDA	This project would pinpoint bridges most at risk of high water events and support targeted mitigation projects and maintenance- all of which would improve public safety and emergency response.	Medium (30k-99k)	This project is feasible with collaboration from ADOT, which will open up more funding opportunities. Ensuring ADOT staff has expertise in bridge resilience will be extremely important.	Area Wide Transportation Plan, Land Management Plan
47	Provide opportunities for public to be involved in ongoing HMP process and create annual plan to keep HMP up to date and don't let it lapse	H	H	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, FEMA HMGP	Increase community awareness and ownership of HMP, improve plan quality and relevance, and ensure compliance with FEMA requirements.	Low (0k-29k)	This project is very feasible and currently ongoing. This is a low cost project that will build public trust and acceptance of HMP.	CBJ Code

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
48	Establish a community response team	H	H	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, Alaska Community Foundation, Rasmuson Foundation, Red Cross of Alaska	Expands CBJ's emergency response capacity and creates rapid localized response in crisis situations. This project also builds community resilience and self reliance.	Medium (30k-99k)	This project will require dedicated resources and trainings to members serving a role in the team.	Comprehensive Plan
49	Explore landslide ready community; predictive warning/forecasting including Infrasound Avalanche/Landslide monitoring and detection equipment	M	H	Emergency Programs	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	FEMA HMGP, FEMA EMPG, USGS, NOAA, USACE	This project reduces risk to homes, roads, and utilities and improves hazard forecasting and decision-making. It also facilitates targeted mitigation projects and builds community awareness and preparedness.	High (>100k)	This project will require significant resources for sensor installations and be technically complex. The need for ongoing maintenance and equipment calibration along with integration of diverse data streams will be costly.	Area Wide Transportation Plan, Land Management Plan
50	Replicate T&H emergency text notification system to CBJ wide	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA Emergency Notification Systems Grant Program	Provides rapid, direct emergency communication and increases reach across diverse populations. This project builds upon a proven, locally tested model and strengthens interagency coordination.	Medium (30k-99k)	This project will require collaboration with multiple jurisdictions, but has a proven template to replicate and will benefit all parties involved.	EAP, Housing Action Plan, Comprehensive Plan
51	Update Dam Safety Information	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA Dam Safety Program, FEMA HMGP, FEMA FMA, RIDEM BWRF, USDA NCRS CIG, SNEP Watershed Implementation Grant, IIJA Dam Removal Fund, USACE WRDA	Informs accurate risk assessments and hazard mapping, ensures regulatory compliance and reporting, guides EAP updates, and aids in infrastructure prioritization and maintenance.	Low (0k-29k)	Technically feasible, but accessing and compiling data from multiple sources, including private dam owners, could be time consuming. The information will regularly have to be updated as climate, land use, and infrastructure conditions change.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
52	Warning sirens and evacuation route signs throughout CBJ (flood, avalanche, landslide, tsunami)	L	L	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA HMGP, FEMA Emergency Notification Systems Grant Program	Provides immediate, life saving alerts, increases public awareness, and supports multi-hazard risk management.	Medium (30k-99k)	This project is straightforward and feasible. Major considerations will be site selection, system design and maintenance.	Area wide Transportation Plan, Coastal Management Plan, Long Range Waterfront Plan, Land Management Plan
53	Educate public on GLOF scenarios to prepare	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, FEMA EMPG	Reduce panic and confusion during flood events, increases public safety and preparedness, and enhances risk communication throughout the community.	Low (0k-29k)	This project is feasible. Main considerations will be determining effective ways to communicate with residents in GLOF hazard areas and getting notifications out in a timely manner.	Coastal Management Plan, Housing Action Plan
54	Implement green infrastructure	n/a	L	-	Facilities and Projects	Long Term (>3 years)	FEMA HMGP, FEMA FMA, EPA CWSRF	This project would reduce flooding and stormwater runoff, improve water quality, enhance climate resilience, and support hazard mitigation goals	Medium (30k-99k)	Construction expertise in CBJ may be limited, reducing the quantity of infrastructure that could be implemented in a timely manner. Public acceptance of such infrastructure may be low.	Housing Action Plan
55	Provide sandbags and instructions to residents including education on how to place sand bags around home	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, FEMA EMPG	Empowers residents to protect their property, reduces flood related damages and insurance claims, and enhances public preparedness and risk awareness.	Medium (30k-99k)	Popular project with public, however sandbags only provide limited protection which must be complemented with other mitigation measures. May be difficult to distribute sandbags quickly and equitably.	Housing Action Plan, Comprehensive Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
56	Investigate and pursue Alternative route between Douglas and Juneau for access if roads or bridge is inoperative to provide redundancy. Investigate alternative routes in isolated subdivisions.	H	M	Community Development	Business & Economic Development	Long Term (>3 years)	AKDOT, Internal, Denali Commission	Ensures emergency access and evacuation capabilities, reduces risk of isolation for vulnerable populations, and increases transportation system resilience. This project would also support economic and community stability.	High (>100k)	This project would require large financial resources, and expertise in multiple fields (construction, engineering, environmental compliance, etc.). The duration of this project would likely be measured by years.	Area Wide Transportation Plan, Long Range Waterfront Plan, Comprehensive Plan, Land Management Plan
57	Look at State of Iowa in addressing flood hazards	M	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal	This project would leverage proven flood mitigation techniques, access data driven flood risk assessment models, and gain insight into community engagement and education.	Low (0k-29k)	This project may be limited by available data State of Iowa is able to share. Geographical differences between Iowa and Southeast Alaska may limit the relevance of mitigation efforts and types of floods between jurisdictions.	Coastal Management Plan, Land Management Plan
58	Investigate short and long term mitigation actions to protect or selectively relocate residences, businesses, and critical facilities	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA HMGP	Reduces structural exposure to natural hazards, preserves community function and vital services, and reduces evacuation needs while increasing CBJ eligibility for grant funding.	High (>100k)	This project is feasible but contains legal and property right complexities. A long term mitigation project will require a significant amount of funding.	Comprehensive Plan, Land Management Plan, Housing Action Plan
59	Explore with community foundations and T&H implementation of disaster fund	M	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, Alaska Community Foundation, Rasmuson Foundation, Red Cross of Alaska	This project would provide immediate financial resources after disasters, support equitable assistance, enhances community preparedness and resilience, and increases funding flexibility.	High (>100k)	This project is feasible, but initial fundraising or fund allocating may be challenging. Balancing fund allocation among competing needs and stakeholders could limit sustained contributions over time.	Comprehensive Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
60	Develop areas and make available housing and property outside high hazard risk areas	H	H	Community Development	Business & Economic Development/ Facilities & Projects	Long Term (>3 years)	Internal, HUD, THRHA	This project would reduce risk to life and property, lowers the cost of emergency response and recovery, and supports sustainable land use and growth management.	High (>100k)	This project could be limited due to Juneau's geography, and lack of available developable land due to steep terrain, wetlands, and updated floodplains. New development would be costly due to poor soil and need for roads to be built in conjunction with land development.	Land Management Plan, Comprehensive Plan
61	Install HESCO barriers	H	n/a	Engineering & Public Works	-	Short Term (<1 year)	LIS process, FEMA HMGP	This project provides quick and adaptable flood protection, reduces damage to critical infrastructure and property, and supports other temporary and semi permanent solutions.	High (>100k)	This project is technically feasible, however land ownership rights may impact reception of HESCO barriers on private land, and a more permanent mitigation strategy may be needed in the future.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan
62	Install rip rap in conjunction with HESCO barriers to reduce erosion/undercutting of banks where the barriers are placed. Complete bank stabilization projects for areas destabilizing including WWTP	H	L	Engineering & Public Works	Facilities & Projects	Short Term (<1 year)	FEMA FMA, LID process, FEMA HMGP	This project prevents erosion and undercutting on riverbank, enhances longevity and effectiveness of other flood defenses. Mitigates sedimentation and water quality issues.	High (>100k)	This project would be in conjunction with another semi permanent project (HESCO) that would extend the lifespan of that installation. This project should be done at the same time as HESCO installation and not as a stand alone project. This would require more funding.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan
63	Increase affordable housing	n/a	M	-	Business & Economic Development / Facilities & Projects	Long Term (>3 years)	HUD CDBG, HUD IHBG, DHHS, AHFC, THRHA	Enhances community stability and diversity, reduces homelessness and housing insecurity, promotes inclusive growth and equity.	High (>100k)	Limited land available for development outside of hazard zones. Could be NIMBY problems of introducing high density housing in neighborhoods that	Housing Action Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
										currently do not have any high density buildings.	
64	Provide financial assistance for more heat pumps	n/a	L	-	Public Safety	Medium Term (1-3 years)	Air Source Heat Pumps Tax Credit, EPA, Alaska Heat Smart, AHFC, DOE	Reduces greenhouse gas emissions, lowers residential utility bills, lowers strain on utility load demand, supports energy resilience and independence, and improves indoor air quality and public health.	Medium (30k-99k)	This project is technically feasible, grants are available to fund heat pump purchases and installation.	Housing Action Plan
65	Update strategy and continue to upgrade emergency notification system.	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA Emergency Notification Systems Grant Program	This project would enhance system reliability and strengthen coordination across agencies, reduce confusion and panic during crises, and encourage community preparedness.	Medium (30k-99k)	Considerations of this project include technology adoption barriers in certain demographics, maintaining database for accuracy, and ensuring redundancy during power or internet outages.	Comprehensive Plan
66	Create joint CBJ/T&H flood dedicated staff member focused on GLOF and public engagement	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA FMA	This project would improve coordination between jurisdictions, increase focus on GLOF preparedness and risk reduction, support culturally inclusive emergency planning, and strengthens grant and funding opportunities.	High (>100k)	Requires sustained funding and multi jurisdictional support beyond the initial pilot period, recruiting and retaining a qualified staff member may take considerable time and money, and could require MOUs for shared authority and budgeting.	Land Management Plan, CBJ Code

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
67	Provide transparency in adopting future hazard area mapping & studies without political pressure due to insurance and property value.	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal	Builds public trust through openness and accountability, reduces legal and financial liability, and supports responsible development and land use planning.	Medium (30k-99k)	Will most likely be public pushback due to impacts on property values, insurability, and zoning changes. It will be critical to communicate technical findings in a clear and concise way.	CBJ Code
68	Mitigate erosion damage at Mendenhall Wastewater Treatment Plant	H	L	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, EPA CWSRF	This project protects essential public infrastructure, prevents costly damage and emergency repairs, reduces risk of environmental contamination, and ensures regulatory compliance.	High (>100k)	Will require contractors with expertise in erosion mitigation. This project would require significant funding, and construction staging may be difficult near an active treatment facility.	Land Management Plan, Long range Waterfront Plan, Coastal Management Plan
69	Survey Tlingit & Haida elders about any oral history of hazard events	M	M	Emergency Programs	Public Safety/ Elders Program	Medium Term (1-3 years)	BIA, Rasmuson Foundation, NPS Tribal Heritage Program, Sustainable Southeast Partnership (SSP), Sealaska Corporation	This survey would improve community preparedness, enhance hazard assessments, and preserve Indigenous knowledge regarding hazards that have not affected Juneau in recent history but may pose a risk greater than currently understood.	Medium (30k-99k)	The main considerations of this project will be finding skilled induvial who can translate/transcribe oral stories, and locating a large quantity of elders willing to participate in the survey.	Housing Action Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
70	Update and make available to public Dam flood inundation mapping on annual basis for HHPD and regular basis for Significant and Low hazard dams and document regular inspections	L	L	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA Dam Safety Program, FEMA HMGP, FEMA FMA, USDA NCRS CIG, SNEP Watershed Implementation Grant, IIJA Dam Removal Fund, USACE WRDA	This project would increase public confidence by displaying transparency by CBJ, supports regulatory compliance by aligning with Alaska Dam Safety Program requirements and FEMA conditions. It also would enable better EAP development, and aids in secure grant funding.	Medium (30k-99k)	May require consultant support to gather current data on all dams in the planning area, and public release of inundation zones may raise concerns about property values or safety issues. Coordination with ADNR and private dam owners will be required.	Coastal Management Plan, CBJ Code, Long range Waterfront Plan
71	Explore partnership to conduct seiche/ worst case scenario study for Lower Slate Lake Tailings Dam failure.	M	n/a	Engineering & Public Works	-	Medium Term (1-3 years)	Internal, FEMA Dam Safety Program, FEMA HMGP, FEMA FMA, USDA NCRS CIG, SNEP Watershed Implementation Grant, IIJA Dam Removal Fund, USACE WRDA, USGS	This study would provide critical information about the risks associated with a Lower Slate Lake Tailings Dam failure for Juneau. This would allow CBJ to evaluate potential mitigation actions needed to improve public safety, maintain environmental quality, and better understand the hazards that have the potential to affect Juneau.	High (>100k)	Require coordination with private dam owner, and hiring contractors to conduct the study. May take several years for study to conclude.	Coastal Management Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
72	Conduct monthly inspections of Salmon Creek Dam.	H	M	Emergency Programs	Public Safety/ Facilities & Projects	Short Term (<1 year)	Internal, FEMA Dam Safety Program, USACE	Monthly inspections would enhance public safety, prevent costly and dangerous emergencies, ensure water supply reliability, and build community confidence in the inspection process. This project would also ensure the there are no unexpected, expensive repairs needed to the dam.	Medium (30k-99k)	Requires an increase in budget and coordination with AEL&P to conduct inspections and share data.	Dam Safety Plan, Salmon Creek Dam EAP, Land Management Plan
73	Explore partnering with UAS to conduct seismic study to better understand fault lines in the immediate vicinity of Juneau.	L	L	Emergency Programs	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	Internal, FEMA NEHRP Earthquake State Assistance Grant Program, USGS	Seismic studies will improve CBJ's earthquake preparedness, reduce risk for critical infrastructure, and increase public awareness of the potential risk of a seismic event. Better understanding the fault lines nearby would provide better data to investigate previously mentioned studies in this MAP, providing a comprehensive understanding of hazard risk in CBJ	High (>100k)	Requires multi agency coordination and funding and may require technical expertise beyond the scope of CBJ and UAS.	Land Management Plan, Comprehensive Plan
74	Establish earthquake event exercises for schools.	M	M	School District	Public Safety/ Early Education	Short Term (<1 year)	FEMA HMGP, FEMA NEHRP Earthquake State Assistance Grant Program	Maintains earthquake risk awareness and increases safety of CBJ youth during a seismic event.	Low (0k-29k)	This project is simple and straightforward. It is also low cost which can be covered using internal budget, expediting the implementation of the project.	CBJ Code, School District Curriculum

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
75	Reinforce transportation infrastructure to combat riverine scour.	L	n/a	Engineering & Public Works	-	Long Term (>3 years)	AKDOT, FEMA HMGP	This project would strengthen critical infrastructure, keep more transportation routes open for evacuation and emergency and rescue teams, and increases longevity of critical infrastructure.	High (>100k)	This project would require navigating complex permitting and regulations, a limited construction window due to weather, flow, and biological constraints. There would also be traffic disruption during construction/retrofitting. Requires expertise in hydrologic related construction and engineering.	Area wide Transportation Plan, Coastal Management Plan, Long Range Waterfront Plan, Land Management Plan
76	Explore fish habitat protection during emergency situations by placing barriers in riverbed to provide protected fish habitat during poor water quality, extreme flows, and large quantities of debris in Mendenhall River.	n/a	M	-	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	USFWS, EPA, National Fish and Wildlife Foundation	This project would support aquatic ecosystem health even during new natural hazards, sustain subsistence and cultural practices, and strengthen grant funding applications for a variety of purposes.	Medium (30k-99k)	This project would require navigating complex regulations and permitting and may be a limited contractor pool to select from to implement the project. Numerous grants are available to aid in funding.	Coastal Management Plan
77	Develop team to cultivate relationships with mining industry to evaluate mining industry contributing to almost 50% of CBJ HAZMAT releases.	n/a	H	-	Government Affairs	Medium Term (1-3 years)	Internal	This project attempts to reduce mining caused hazardous materials spills, which will protect public health, preserve environmental quality, and support sustainable development.	Medium (30k-99k)	Could be lack of participation by mining companies due to regulatory fatigue, requires ongoing staffing commitment to coordinate meetings and data reviews, and differing jurisdictional authority may limit CBJ's oversight.	CBJ Code, Land Management Plan, Transportation Improvement Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
78	Maintain and practice marine hazmat spill containment exercises and equipment.	H	M	Docks & Harbors	Public Safety	Medium Term (1-3 years)	US DOT HMGP, US DOT ALERT	Practicing spill response increases the effectiveness of a response during a real hazmat response, demonstrates regulatory compliance, safeguards economic and environmental interests, and minimizes environmental damage.	Medium (30k-99k)	Increase of trainings could result in accelerated degradation of equipment, and scheduling and conducting multi-agency exercises can be logistically complex.	Coastal Management Plan, Long Range Waterfront Plan
79	Conduct updated commodity flow study to better understand the hazardous materials that come into and are produced within the community, including transportation of hazardous goods in the Gastineau Channel.	L	L	Lands & Resources	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	US DOT HMGP	This study improves local knowledge of the quantity and type of hazardous materials, which allows more accurate and timely emergency response and regulating in the event of a release.	High (>100k)	There could be roadblocks due to reluctance of private companies to share shipment details. It could be challenging to integrate different data sources with varying formats and detail quality.	Economic Development Plan, Area Wide Transportation Plan
80	Install cover/netting along coastal roadways where rock topples or falls are most prevalent, to prevent roadway blockage.	M	n/a	Engineering & Public Works	-	Medium Term (1-3 years)	FHA Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program, AK DOT, Internal	Installing netting along roadways will reduce the risk of vehicular damage, accidents, and injuries due to rockfall. Keeping rockfalls off the roadway also reduces strain on DOT crews.	Medium (30k-99k)	This project is technically feasible. Installing netting is common practice along many roadways where blasting rock has been conducted to build roadways. The main consideration is cooperation or support from other landowners who may own land along roadways where rockfall is common.	Area Wide Transportation Plan, Land Management Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
81	Create publicly available tool on website to report landslide observations and symptoms.	H	H	Emergency Programs	Public Safety/ Communications	Short Term (<1 year)	Internal, FEMA HMGP	This tool would promote community science, increase community engagement, and increase the amount of data collection possible for landslide hazard studies. It is a great source of cost-effective hazard monitoring.	Medium (30k-99k)	The main consideration of the project would be establishing a vetting process for data to screen potentially false or inaccurate reporting. Public adoption and use of the tool will require outreach to educate public of the tool's existence.	Land Management Plan, Trails Plan
82	Explore hardening/connectivity to reinforce underwater cables to be more resilient against tsunami waves and submarine landslides.	n/a	L	-	Public Safety/ Tidal Network	Medium Term (1-3 years)	DOE	This project maintains reliable communication to and from Juneau, while supporting emergency response and state government operations. It also increases infrastructure resilience and minimize economic impact.	High (>100k)	Coordination with cable owners will be essential, and multi agency coordination can be complex. Permitting may extend the timeline of concluding this project.	Coastal Management Plan
83	Build upon DGGS submarine landslide study to further understand risks of identified tsunami hazards, and potentially identify previously unknown sources of submarine landslides that may cause a tsunami.	L	L	Engineering & Public Works	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	National Tsunami Hazard Mitigation Program (NTHMP), USGS	Building upon the DGGS study would allow CBJ to further understand the potential impacts of submarine landslides. By increasing knowledge of this hazard, CBJ can make informed decisions about potential mitigation projects.	High (>100k)	This would be a resource intensive and technically demanding project. Coordination between state, federal, and academic partners will be required. The findings of this study may reveal vulnerabilities that require costly mitigation or policy decisions.	Land Management Plan, Comprehensive Plan
84	Obtain funding to create airplane mitigation "kit" to protect planes and airport operations during ashfall (plastic covering for engines, equipment to remove ash on planes, etc.)	n/a	L	-	Public Safety	Medium Term (1-3 years)	FEMA HMGP, FEMA EMGP, US DOT	These kits would protect aircraft, ensure air travel safety, support economic stability, and minimize disruptions to air travel.	Medium (30k-99k)	Would require extensive permitting, regulation, and collaboration with airport, FAA, and private air transportation service providers.	EAP, Comprehensive Plan, Area Wide Transportation Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
85	Broaden emergency volunteer program to distribute masks, tape windows, protect vehicles for residents including elderly and vulnerable populations.	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	FEMA EMGP, American Red Cross, AK Department of Health, AK DEC, Alaska Community Foundation, Sealaska Corporation, SSP	This project would protects community health, strengthens community bonds, and ensures all demographics are accounted for in a volcanic event.	Low (0k-29k)	Will require ongoing funding to replenish supplies and train new volunteers. Safety protocols must be developed for volunteers entering homes or assisting elderly. May require liability protection or waivers for volunteers providing home assistance.	Housing Action Plan, Economic Development Plan, Comprehensive Plan
86	Explore options to conduct study of local tidal and geologic shoreline conditions to better understand how a marine spill may be transported around the community.	L	M	Docks & Harbors	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	NOAA, USGS	Improves spill response. Protects ecosystem, and allows for areas of hazmat concentration to be identified and abated.	High (>100k)	Requires interdisciplinary coordination, and technical expertise is required for good data to be generated. The findings of this study could reveal vulnerabilities requiring costly mitigation.	Coastal Management Plan, Long Range Waterfront Plan
87	Harden dock and boat harbor facilities as well as bridges which cross the Gastineau Channel to better withstand tsunami and other hazard impacts.	M	M	Docks & Harbors & Engineering	Public Safety/ Facilities & Projects/ Transportation	Long Term (>3 years)	FEMA HMGP, AK DOT, US DOT, USFWS, Denali Commission	This project would not only strengthen infrastructure against tsunami hazards, but maintain transportation options and decrease the risk of travel delays due to repairing vessels or harbors.	High (>100k)	This project would require significant upfront costs, limited working windows due to tidal, environmental, and weather constraints. May require complex permitting through USACE, NOAA, and the State.	Coastal Management Plan, Area Wide Transportation Plan
88	Educate homeowners on potentially hazardous materials commonly found in homes of provide sources for such information.	M	M	Fire Department	Public Safety	Short Term (<1 year)	DOT HMEP, AK DNR	This project protects human health and safety, supports responsible waste management, and lowers the strain on poison control or emergency response.	Low (0k-29k)	Low cost project. Requires ongoing public engagement and may be difficult to motivate participation outside of specific events and emergencies.	Housing Action Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
89	Study and monitor infestations in Juneau (possibly grid surveys).	L	M	Lands & Resources	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	USFWS, AKDFG	This study protects forest health, reduces wildfire risk, and supports local economy by maintaining forest health and creating new jobs.	Medium (30k-99k)	Will require additional staffing and budget, at least seasonally. Can support other agencies such as ADNR, USFS, CBJ Lands & Resources. Will require annual training, and may reveal problems requiring expensive removal or treatment efforts.	Land Management Plan
90	Incorporate flood mitigation in local planning.	H	H	Community Development	Business & Economic Development	Medium Term (1-3 years)	Internal budget, USACE Planning Assistance to States and Tribes, USACE Tribal Partnership Program	This project would bring one of the most current hazards impacting Juneau into local planning, which would protect infrastructure, possibly lowering insurance premiums through NFIP and CRS, and aid in ecological preservation.	Medium (30k-99k)	May face resistance from property owners and developers due to impacts on property values and new regulations. Requires regularly updating flood data.	Land Management Plan, Comprehensive Plan
91	Develop a floodplain management plan and update it regularly.	H	M	Community Development	Public Safety/ Business & Economic Development	Medium Term (1-3 years)	USACE Planning Assistance to States and Tribes, USACE Tribal Partnership Program	This plan would be another tool to combat GLOFs, and aid in protecting life and property. It also has the potential to reduce the cost of disaster response and protect the environment and preserve neighborhoods.	High (>100k)	Requires cross department coordination, and needs regular updates based on new science.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan
92	Review ASCE 24-05 Flood Resistant Design and Construction (standard in the International Building Code) and consider adopting it in local building code.	M	L	Community Development	Public Safety/ Facilities & Projects/ Business & Economic Development	Short Term (<1 year)	Internal budget, FEMA HMGP	Creates more resilient new development, and supports responsible development while also mitigating against future structure damage caused by flooding.	Low (0k-29k)	May result in higher construction costs, which could slow development, and would require consistent enforcement.	CBJ Code, Housing Action Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
93	Encourage the use of porous pavement, vegetative barriers, and islands in large parking areas.	M	L	Community Development	Facilities & Projects	Short Term (<1 year)	Internal, FEMA FMA	Promotes groundwater recharge, improves water quality, and diminishes amount of runoff available for flooding.	Low (0k-29k)	This project is technically feasible and low cost, but actual results may be minimal due to only encouraging these actions.	CBJ Code, Housing Action Plan
94	Conduct NFIP community workshops to provide information and (non monetary) incentives for property owners to acquire flood insurance.	H	M	Community Development	Public Safety	Medium Term (1-3 years)	Internal, FEMA FMA	Increases public awareness about funding options to become more resilient to flooding, while encouraging induvial actions which could lower CBJ's financial responsibility in the event of a flood.	Low (0k-29k)	Will require time from CBJ staff to coordinate and conduct public workshops.	Coastal Management Plan, Land Management Plan
95	Complete and maintain FEMA elevation certificates for pre-FIRM and/or post-FIRM buildings.	H	M	Community Development	Facilities & Projects	Medium Term (1-3 years)	Internal, FEMA FMA	Reduces flood insurance premiums for property owners, supports safer building and renovation practices, and improves floodplain management and risk mapping.	Medium (30k-99k)	Considerations of this project will be logistics and cost of surveying a large number of buildings, and data management and quality control to ensure certificates meet FEMA requirements.	Housing Action Plan, CBJ Code
96	Explore offering (non monetary) incentives for building above the required freeboard minimum (code plus).	L	L	Community Development	Business & Economic Development	Short Term (<1 year)	Internal	Increases flood protection in new development, lowers flood insurance premiums, and enhances community resilience.	Low (0k-29k)	Non monetary incentives may not be sufficient alone to motivate all developers or homeowners.	Housing Action Plan
97	Start process of identifying new landfill location and or transfer site or expansion at existing site to include evaluation of CBJ facility that accepts disaster debris.	H	M	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal	Ensures long-term solid waste capacity, supports disaster resilience and rapid recovery, aids in aligning with FEMA and state disaster planning standards, and identifies opportunities for waste diversion and recycling.	Medium (30k-99k)	Identifying suitable new sites can be difficult due to geographic and environmental constraints.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
98	Educate Public on how to interact with HESCO barriers to make them more visually appealing.	H	n/a	Emergency Programs	-	Short Term (<1 year)	Internal budget, LID process	This project would improve public acceptance for emergency mitigation measures, enhances urban aesthetics and community pride, reduces vandalism, builds trust in local government response, and encourages community ownership and stewardship of the HESCO mitigation project.	Low (0k-29k)	Requires buy in from public to not modify barriers in a way that could compromise their integrity, and allocation of time and staff to develop a program and conduct outreach.	Housing Action Plan, Land Management Plan, Economic Development Plan
99	Partner with T&H and agencies to test soil after flood events to determine if contaminated.	H	M	Lands & Resources	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	EPA TAB, EPA TBA	This project would support informed cleanup and remediation, multi jurisdictional collaboration, builds scientific understanding of local flood impacts, and improves public awareness and safety guidance.	High (>100k)	Will require multi jurisdictional collaboration, high costs associated with sampling, laboratory analysis, and data management.	Coastal Management Plan, Land Management Plan
100	Explore including costs for post construction inspections for all private and public infrastructure development and repair and implementation of fees	M	L	Community Development	Facilities & Projects/ Business & Economic Development	Short Term (<1 year)	HUD	Ensures long term safety and quality of infrastructure, holds contractors and developers accountable, reduces future maintenance and emergency repair costs, and generates revenue to sustain inspection and compliance programs.	Medium (30k-99k)	Potential resistance from developers and contractors regarding additional fees, and fee structure will have to be debated and agreed upon before implementation to ensure they are reasonable.	CBJ Code, housing Action Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
		CBJ	T&H								
101	Gold Creek Flume & Flood Control rehabilitation & improvement	H	M	Engineering & Public Works	Lands and Natural Resources/ Environmental/ Governmental Affairs	Medium Term (1-3 years)	USACE Planning Assistance to States and Tribes, FEMA HMGP, STORM Revolving Loan Fund Program, USDA	This project reduces flood risk to downtown Juneau, protects historic and cultural assets, addresses aging infrastructure, and preserves property values.	High (>100k)	High capital expense will require grant funding, complex engineering expertise will be required. Potential community disruption during construction phases must be considered.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan
102	Highlands Drainage Infrastructure (Grizzly) rehabilitation & improvement or replacement to improve drainage to protect Egan Drive & High School & residences	H	M	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal budget, STORM Revolving Loan Fund Program, EPA	Protects critical transportation corridor, safeguards Juneau-Douglas High School, reduces flood risk to residential properties, and enhances stormwater management capacity.	High (>100k)	This project involves complex underground infrastructure that may complicate inspections and repairs. Grant funding will most likely be required.	Land Management Plan, Comprehensive Plan
103	Conduct a new water source investigation to determine a secondary/redundant source for if the primary water source is damaged	H	M	Engineering & Public Works	Facilities & Projects	Long Term (>3 years)	EPA WIIN, Emergency Community Water Assistance Grants in Alaska	Ensures continuity of drinking water during emergencies, increases community resilience and disaster readiness, reduces reliance on a single vulnerable source, and supports long term water supply planning.	High (>100k)	Potential high initial and operational costs for developing a new source. Contractors will need to be hired with expertise in identifying sustainable water sources.	Land Management Plan, Comprehensive Plan

Action ID	Mitigation Project (Action Description)	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/ Considerations	Other Plans to Include Development Action In
104	Assess and evaluate vulnerability to water supply infrastructure	H	M	Engineering & Public Works	Public Safety/ Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, EPA Water Infrastructure Finance and Innovation Act, EPA Drinking Water Infrastructure Grant - Tribal Set Aside Program, Emergency Community Water Assistance Grants in Alaska, EPA	This project would allow CBJ to identify critical weak points in the water supply system, informs asset management and capital planning, and increases eligibility for infrastructure and mitigation actions.	Medium (30k-99k)	Budget constraints may make this project difficult to implement.	Land Management Plan, Comprehensive Plan

FEMA APPROVAL LETTER

Plan Distribution List

The City and Borough of Juneau and the Tlingit & Haida's 2025 Multi-Jurisdictional Hazard Mitigation Plan Update is distributed to:

- City and Borough of Juneau
- Tlingit & Haida
- Federal Emergency Management Agency (FEMA)
- State of Alaska Division of Military and Veterans Affairs (DMVA), Department of Homeland Security and Emergency Management (DHS&EM)

Record of Changes

Hazard Mitigation Plans should be continually updated as circumstances change, new data becomes available, hazards are mitigated, etc. This Record of Changes Table is included to summarize and document changes to this document as they are made throughout time.

Change ID	Description of Changes	Date
01	Updated August 2012 CBJ HMP and included Tlingit & Haida as a participating jurisdiction	CBJ: T&H:

1. PLAN INTRODUCTION AND BACKGROUND

Hazard mitigation planning is required under the Disaster Mitigation Act of 2000 (DMA 2000) which identified the need for Tribal, Local, and State jurisdictions to coordinate mitigation planning and implement mitigation efforts. It also provided the legal basis for the Federal Emergency Management Agency's (FEMA) mitigation plan requirements for mitigation grant assistance.

1.1 PURPOSE

Disasters may cause loss of life, damage buildings and infrastructure, and have devastating effects on a community's economic, social, and environmental well-being. The CBJ and the T&H intend to reduce or eliminate the long-term risk to life and property from hazards by implementing a Hazard Mitigation Plan. The Plan is intended to reduce community risk and promote long-term sustainability by:

- Protecting the public and preventing loss of life and injury.
- Reducing harm to existing and future community assets.
- Preventing damage to a community's cultural, economic, and environmental assets.
- Minimize downtime and speed up recovery following disasters.
- Reducing the costs of disaster response and recovery and the exposure of first responders to risk.
- Help accomplish other community objectives, such as leveraging capital improvements, infrastructure protection, and economic resiliency.

1.2 HAZARD MITIGATION PLAN LAYOUT DESCRIPTION

The City and Borough of Juneau and Tlingit & Haida's 2025 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) Update consists of the following sections and appendices:

- **Executive Summary**

  Provides information to meet Element H- Additional State Requirements. Provides general history and background of Juneau, including historical trends for population, the demographic and economic conditions that have shaped the area, as well as the government and leadership within the CBJ and T&H. Lists hazards that impact the Planning Area, critical facilities, and prioritized Mitigation Action Plan (MAP).

- **Section 1- Introduction and Background**

  Defines what a hazard mitigation planning is and its purpose.

- **Section 2- Planning Process**

  Describes the planning process for the MJHMP update, identifies the CBJ and the T&H's Planning Team members, lists the meetings held as part of the planning process, and lists the key collaborators within the surrounding area. This section documents public outreach activities performed by the CBJ and the T&H (supporting documents are in Appendix D); including document reviews and relevant plans, reports, and other appropriate information data utilized for MJHMP update development.

- **Section 3- Risk Assessment (Hazard Analysis/Summary of Vulnerability)**

  Describes the process through which the Planning Team identified, screened, and selected the hazards for profiling in this version of the MJHMP Update. The hazard analysis includes the nature of the hazard, previous occurrences (history), location, extent, and impact of past events, and future event recurrence probability for each hazard. The influence of future climate conditions is also discussed within each hazard profile.

  Identifies the CBJ and T&H's potentially vulnerable assets—people, critical facilities, critical infrastructure, and residential/ non-residential buildings (where available). The resulting information

identifies the full range of hazards that the community could face and the potential damages and losses. Land use and development trends are also discussed.

- **Section 4- Mitigation Strategy**

  Defines the CBJ and T&H's mitigation strategy which provides a blueprint for reducing the potential losses identified in the vulnerability analysis. This section lists the community's policies, programs, available resources, and governmental authorities.

  Outlines specific mitigation goals and potential actions that the Planning Team selected and prioritized to address the risks facing Juneau. Provides a status update for projects identified in the 2012 HMP.

- **Section 5- Plan Maintenance**

  Describes the formal Plan maintenance process to ensure that the MJHMP remains an active and applicable document. This section includes an explanation of how the Planning Team intends to organize their efforts to ensure that updates and revisions to the MJHMP occur in an efficient, well-managed, and coordinated manner.

- **Section 6- Plan Update**

  This section describes changes in development since 2012; changes in mitigation priorities; and describes how the mitigation plan was integrated into other planning mechanisms.

- **Section 7- Plan Adoption**

  Describes the CBJ and T&H's adoption process of the MJHMP Update. Supporting documentation can be found in Appendix C.

- **Section 8- References**

  Lists reference materials and resources used to prepare this MJHMP Update.

- **Section 9- Appendices**

  Appendix A: Provides the CBJ and T&H's adoption resolutions.

  Appendix B: Provides the FEMA Local and Tribal Mitigation Plan Review Tools, which documents compliance with FEMA guidelines.

  Appendix C: Provides public outreach information, including survey responses.

  Appendix D: Delineates federal, state, and other potential mitigation funding sources. This section will aid the CBJ and the T&H with researching and applying for funds to implement their mitigation strategy.

  Appendix E: Provides FEMA Flood Insurance Rate Maps and Special Flood Hazard Exposure Assessment.

  Appendix F: Hazard History Detail

2. PLANNING PROCESS

This section provides an overview of the planning process; identifies the key collaborators and Planning Team members, documents public outreach efforts, and summarizes the review and incorporation of existing plans, studies, and reports used to update this MJHMP. Meeting information regarding the Planning Team and public outreach efforts are included below and outreach support documents are provided in Appendix D.

This section addresses Element A of the Local Mitigation Plan regulation checklist and a portion of Element A of the Tribal Mitigation Plan regulation checklist.

Regulation Checklist- 44 Code of Federal Regulations (CFR) § 201.6 Local Mitigation Plans
ELEMENT A. Planning Process
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process (Requirement 44 CFR § 201.6(b)(2))
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMENT A. Planning Process
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process? [44 CFR § 201.7(c)(1)]
A2. Does the plan document an opportunity for public comment during the drafting stage and prior to plan approval, including a description of how the tribal government defined "public"? [44 CFR § 201.7(c)(1)(i)]
A3. Does the plan document, as appropriate, an opportunity for neighboring communities, tribal and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? [44 CFR § 201.7(c)(1)(ii)]
A4. Does the plan describe the review and incorporation of existing plans, studies, and reports? [44 CFR § 201.7(c)(1)(iii]
A5. Does the plan include a discussion on how the planning process was integrated, to the extent possible, with other ongoing tribal planning efforts as well as other FEMA programs and initiatives? [44 CFR § 201.7(c)(1)(iv)]
Source: FEMA 2017 (Tribal)

2.1 OVERVIEW OF THE PLANNING PROCESS

The City and Borough of Juneau (CBJ) contracted Fairweather Science, LLC (Fairweather Science) to facilitate and guide the Planning Team through the HMP update process. The CBJ invited the Tlingit & Haida (T&H or Tribe) to join the Planning Team as a participating jurisdiction to pursue a Multi-Jurisdictional Hazard Mitigation Plan (MJHMP).

This MJHMP Update follows FEMA Guidance for Mitigation Planning:

- FEMA 2025 Local Mitigation Planning Policy Guide (Effective April 11, 2025).

- FEMA 2019 Tribal Mitigation Planning Handbook, which is a companion to the Tribal Mitigation Plan Review Guide, released by FEMA in 2017.

Table 5 describes Planning Team meetings convened to update this MJHMP, as well as other key dates.

Table 5- Summary of Planning Team Meetings and Other Key Dates

Date	Agenda
1/14/2025 1/16/2025	**Internal Introduction Meeting** Team introductions; project overview and schedule; discuss Planning Team members; discuss inclusion of Tlingit & Haida as a participating and adopting jurisdiction; set date for formal kickoff + risk assessment workshop with Planning Team and public; locations of vulnerable populations.
1/24/2025	**Project Survey and ArcGIS StoryMap** The public survey was posted on the CBJ and T&H websites and Facebook pages to inform the public about the project, invite residents to participate in the upcoming public meeting, and request information to inform the draft risk assessment.
1/28/2025	**Outreach to Underserved Populations** Fairweather Science delivered project flyers and printed copies of the project survey to 21 vulnerable populations locations throughout Juneau. These included Fireweed Apartments, Mendenhall Campground, Churchill Park, Creekside Park, Kodzoff Acres Mobile Home Park, Sprucewood Park, Switzer Village Mobile Park, Thunder Mountain Mobile Park, Wildflower Court, Juneau Pioneers Home, Riverview Senior Living, REACH, SAIL, JAMHI Family and Salmon Creek Clinic, The Glory Hall, Juneau Housing First, AWARE Shelter, St. Vincent de Paul, and Gastineau Human Services.
1/29/2025 2 pm	**Planning Team Kickoff + Risk Assessment Workshop** Project overview and schedule; review and update goals from the 2012 HMP; hazard review and identification; hazard history and discussion of significant events; review list of critical facilities from the 2012 HMP; initial ideas for mitigation projects.
1/29/2025 5 pm	**Public Kickoff + Risk Assessment Workshop** The purpose of this meeting was to introduce the project to the public and gather information from the public to inform the Risk Assessment. The meeting was hosted both in person, at the Assembly Chambers of City Hall, and via MS Teams for those not available to attend in person. The consultant presented a project overview and schedule to the public and reported on the results of the Planning Team's efforts earlier that day in the selection of hazards to be profiled. The consultant answered questions from the public and was supported by CBJ, T&H, and FEMA. *Members of the public in attendance*: Elizabeth Figus, Malachi Thorington, Sam Hatch, Jeff Hartman, Ke Mell
5/30/2025 - 6/9/2025	**Internal Review of Draft Risk Assessment** Address any Planning Team comments or edits on the Draft Risk Assessment before it is available for public/collaborator review.
6/17/2025- 7/1/2025	Risk Assessment public review and comment period
6/30/2025 1 pm	**Planning Team Mitigation Strategy Workshop** Discuss statuses of actions identified in the 2012 HMP; review, select, and prioritize a comprehensive list of mitigation projects.
6/30/2025 5:30 pm	**Public Comments on Draft Risk Assessment and Project Status** This meeting was an opportunity for the public to provide comments on the Draft Risk Assessment and suggest mitigation actions. A discussion on how the Planning Team will present historic landslide hazard information occurred. A summary of selected/prioritized mitigation actions was discussed with the public. *Members of the public/collaborators in attendance*: Larry Fanning, Ke Mell, Dave Hanna, Thomas Young-Bayer, Alex Soliman, Mark Sabbatini

2.2 HAZARD MITIGATION PLANNING TEAM

The following table identifies the CBJ and T&H hazard mitigation Planning Team.

Table 6- Hazard Mitigation Planning Team

City & Borough of Juneau		Tlingit & Haida	
Name	**Role/Position**	**Name**	**Role/Position**
Rob Dumouchel	PM- Special Projects Planning Manager	Sabrina Grubitz	PM- Public Safety Manager
Ryan O'Shaughnessy	Alternate PM- Emergency Programs Manager	Jason Wilson	Alternate PM- Director of Public Safety
Robert Barr	Deputy City Manager	Alisha Sell	First Responder Education Coordinator
Jill Lawhorne	Director of Community Development	Raymond Paddock	Environmental and Natural Resource Director
Forrest Courtney	Floodplain Manager	Leslie Isaacs	Senior Business Enterprise Director
Tom Mattice	Emergency Programs Manager	Stephanie Banua	Director of Facilities & Projects Tribal Operations
Denise Koch	Director of Engineering/Public Works	RJ Hill	Transportation Manager
Sam Russel	Assistant Fire Chief	Evanne Katasse Roberts	Public Safety
Chelsea Swick	HR Risk Management Officer	Mary Johnson	Senior Director of Tribal Family Services
Jake Thayer	Emergency Management Coordinator	Madeline Soboleff-Levy	General Counsel
Quinn Tracy	GIS Specialist	Charlene Robertson	Chief Financial Officer
Meredith Thatcher	Public Information Officer	Roald Helgesen	Chief Operating Officer
Nicole Ferrin	National Weather Service Senior Hydrologist	Gail Dabaluz	Deputy Chief Operating Officer
		Dixie Hutchinson	Communications Director
		Kendra Pountney	Sr. Director of Community & Behavioral Services
		Fran Houston (L'eeneidí)	Elder
		Mike Tagaban (Wooshkeetaan)	Elder
Contractor Team			
Laura Young		Project Manager- Fairweather Science	
Olivia Kavanaugh		Mitigation Planner- Fairweather Science	
Mason Page		Mitigation Planner- Fairweather Science	
Cooper Calahan		Mitigation Planner- Fairweather Science	
Malcolm Yerkes		Mitigation Planner- Fairweather Science	
Elizabeth Dean		Mitigation Planner- Fairweather Science	

2.3 Opportunities for Collaborators and Other Interested Parties to Participate

CBJ and T&H extended an invitation to a variety of collaborators with subject matter expertise and local knowledge and experience to participate in the planning process. These stakeholders included local and state collaborators, nonprofit organizations, community groups, and neighboring communities.

All collaborators were notified and invited to project meetings as well as to review and comment on the draft versions of the risk assessment, mitigation projects, and the draft HMP. Announcements were emailed to project collaborators on

- **January 27, 2025 (DHS&EM and FEMA):** Invitation to complete the project survey and attend the Planning Team Kickoff Meeting.
- **January 27, 2025 (All collaborators):** Invitation to complete the project survey and attend the Public Kickoff Meeting.
- **June 17, 2025 (Local collaborators, survey respondents, neighboring communities and public):** Invitation to review and comment on the Draft Risk Assessment.
- **July 10, 2025 (Local collaborators, survey respondents, neighboring communities and public):** Invitation to review and comment on the draft Mitigation Projects selected and prioritized by the Planning Team.
- **July 14, 2025 (Local collaborators, survey respondents, neighboring communities and public):** Invitation to review and comment on the Draft Hazard Mitigation Plan.

Table 7- List of Project Collaborators

Name	Agency/Position
Local Collaborators	
Emily Wright	CBJ- City Attorney
Derek Bos	CBJ- Police Chief
Carl Uchytil	CBJ- Port Director
Justin Spurrier	CBJ- Eaglecrest Ski Area Safety Manager
Dan Bleidorn	CBJ- Lands and Resources Manager
Catherine Melville	CBJ- Libraries IT Director
Chris Murray	CBJ- IT Director
Angie Flick	CBJ- Finance Director
Ashley Heimbigner	CBJ- Engineering & Public Works Grant Manager
Frank Hauser	Juneau School District Chief of Staff
Dave Palmer	Juneau International Airport Manager
Alekka Fullerton	City and Borough of Haines- Interim Manager
Emily Deach	City and Borough of Skagway- City Manager
John Leach	City and Borough of Sitka- City Manager
Steve Giesbrecht	City and Borough of Petersburg- Borough Manager
Sean Mackenzie	Municipality of Anchorage- Emergency Manager
Stephanie Banua	Tlingit & Haida, Director of Facilities & Projects
Royal T. Hill	Tlingit & Haida, Tribal Development Planner

Name	Agency/Position
Agatha Erickson	Tlingit & Haida, Associate General Counsel
Tracy Draper	Tlingit & Haida, Executive Assistant to the CEO
Lindsey Pierce	Tlingit & Haida, Environmental Coordinator
Tina Woods	Tlingit & Haida, Sr. Director of Community & Behavioral Services
Rhonda Butler	Tlingit & Haida- Emergency Operations Specialist
State-Wide Collaborators	
General	Alaska State Troopers
James Benzschawel	ANTHC- Emergency Preparedness Senior Program Manager
Jacquelyn Overbeck	ANTHC- Climate Adaptation Project Manager
Harmony Curtis	DCRA- Former State Floodplain Coordinator
Sally Cox	DCRA- State & Federal Programs Section Manager
Rebecca Rein	DCRA- RISK MAP Coordinator
Sarah Bailey	DCCED Division of Insurance- Supervisor
Megan Kohler	DEC- Administrative Services Director
Erin Leaders	DEC- Disaster Program Manager & Tribal Liaison
Jocelyn Fenton	Denali Commission- Director of Programs
Garrett Brooks	DHS&EM- State Hazard Mitigation Officer
John Andrews	DHS&EM- Hazard Mitigation Planner
Kim Barenburg	DHS&EM- HMGP Program Manager
Rick Dembroski	DHS&EM- BRIC Program Manager
Todd Russell	DHS&EM- THIRA Coordinator
Anthony Picasso	DHS&EM- Geohazard Mitigation Coordinator
Stephanie Kings	DHSS- Health Program Manager III
Nora Nieminski	DGGS- Geologist
Jennifer Athey	DGGS- Geologist & Operations Manager
Norman McDonald	DOF- Deputy Director of Fire Protection
Ken Murphy	ADOT&PF- Safety Officer
Kris Hess	DNR DMLW- Deputy Director
General	Alaska Earthquake Center
Scott Rupp	UAF SNAP- Director
Rick Thoman	UAF ACCAP- Alaska Climate Specialist
Federal Collaborators	
General	BIA- Tribal Climate Resilience
Sarah Walker	BIA- Tribal Operations
General	BLM- Alaska State Office
Dennis Wagner	EPA- Alaska Operations Office
Stacy Gundersen	FEMA Region 10- Tribal Liaison

Name	Agency/Position
Jennifer Adleman	FEMA Region 10- Alaska Community Planner
David Matthews	HUD- Senior Management Analyst (Alaska)
Ryan Metzger	National Weather Service, Warning Coordination Meteorologist
Liza Sanden	NOAA Regional Preparedness, Alaska Regional Preparedness and Scientific Support Coordinator
Taylor Donovan	RuralCap – Housing Director
Patricia Mitrowski	USCG, Search & Rescue, Immediate Past District Commodore
General	USACE Alaska District
Eric Koan	USDA- Rural Development, State Director
Keith Perkins	USDA- Rural Development, Area Director
Jeremy Karchut	USFWS, Alaska, Regional Historic Preservation Officer and Archaeologist
Christian Zimmerman	USGS, Alaska Science Center, Center Director
Scott Stihler	USGS, AVO, Geophysicist

2.4 PUBLIC INVOLVEMENT AND TRIBAL DEFINITION OF MEMBERSHIP

The Tribe defines "public" as all community members, tribally enrolled or not. Tlingit & Haida's mission statement is to safeguard the health and wellbeing of Tlingit & Haida employees, tribal citizens, communities, and neighbors. Citizenship is defined as tribally enrolled descendants with biological connection to the base enrollment with proof of lineage.

The public was encouraged to provide input regarding local hazards and ideas for mitigation projects via an online survey and at the project kickoff meeting held at Assembly Chamber on January 28, 2025. The link to the survey was available on the CBJ website, CBJ and T&H's Facebook pages and websites as well as local flood fighting social media groups beginning on January 23, 2025, and remained open through the project. As of July 10, 2025, a total of 115 responses has been received.

Several public notices discussing the hazard mitigation planning process, requesting public input, and to notify the public of the project were shared with members of the community. The notices were posted on the CBJ and T&H Websites and Facebook pages, as well as sent via email to project collaborators and the project email distribution list.

A notice of the availability of the draft risk assessment for public review and comment was published on the CBJ's website on June 16, 2025, and then shared on the CBJ's and T&H's Facebook pages. KTOO published a news article on the availability of the draft risk assessment with links to the plan, project survey, and project StoryMap on 6/18/2025.

Due to the desire to expedite plan completion to meet grant deadlines, an additional opportunity for public involvement was added to the process by releasing the Mitigation Action Projects selected and prioritized by the planning team for review on 07/10/2025. This was done in advance of the draft HMP being released for public review and comment to provide additional time for public consideration of the projects. A notice of availability was published on the CBJ website and then shared on the CBJ's and T&H's social media pages as well as an email notification sent out to project stakeholders and members of the public that have requested to be informed through the HMP update process.

Feedback received from the public was used in confirming natural hazards that impact the CBJ, level of concern of each hazard, and critical facilities that the public relies on. Additionally, the Planning Team

reviewed the list of mitigation projects that the public suggested; multiple publicly suggested mitigation actions were selected to be included in the Mitigation Action Plan.

Images provided by the public were used in the risk assessment update. Comments on social media pages regarding the draft risk assessment were used to update or clarify sections within the HMP update and potential mitigation projects were used to inform the Mitigation Action Plan.

Outreach support documents and survey results are provided in Appendix C.

2.5 Review and Incorporation of Existing Plans, Studies, and Reports

During this MJHMP update, the Planning Team and contractor reviewed and incorporated pertinent information from available resources. Newly collected data included available plans, studies, reports, and technical research listed in Table 8. The new data was reviewed and referenced throughout the document. A complete list of references is provided in Section 8.

Table 8- Documents Reviewed

Existing plans, studies, reports, ordinances, etc.	Contents Summary (How will this information improve mitigation planning?)	Data Used (How was this information incorporated into this MJHMP?)
2004 and 2012 City and Borough of Juneau Hazard Mitigation Plan	Review past hazard events, mitigation activities, and planning processes.	Compared hazard profiles, history, and impacts of events for risk assessment.
2023 State of Alaska Hazard Mitigation Plan (SHMP)	Defines statewide hazards and their potential locational impacts.	Compared hazard profiles, history, and impacts of events for risk assessment.
1965, 2004, 2008, and 2013 Juneau Comprehensive Plan	Sets forth a vision and goals for CBJ's future and provides the overall foundation for all land use regulation in the CBJ.	Cited information from the Plans throughout the MJHMP such as community background information, land use information, future goals of the community, and various figures and maps. (Note CBJ is currently updating their Comprehensive Plan)
2001 CBJ Area Wide Transportation Improvement Plan	Identifies and describes the need of transportation improvement projects the CBJ aims to pursue.	Used to gain background information regarding CBJ's transportation goals and challenges.
1994, 1999, and 2016 CBJ Land Management Plan	Identifies CBJ and its communities' goals, strategies, and available resources and assets to develop land.	Used to outline CBJ land use priorities and challenges in HMP section.
2004, 2022 CBJ Long Range Waterfront Plan		
2009 CBJ Historic District Design Standards		
2008 CBJ Coastal Management Program		
2016 CBJ Housing Action Plan		
1993 CBJ Trails Plan		
2006 CBJ Lands "Buildable Sites" Criteria and Findings		
2003 CBJ Subport Vicinity Revitalization Plan		
2015 CBJ Economic Development Plan		

Table 8- Documents Reviewed

Existing plans, studies, reports, ordinances, etc.	Contents Summary (How will this information improve mitigation planning?)	Data Used (How was this information incorporated into this MJHMP?)
2018 Juneau Renewable Energy Strategy		
2011 Willoughby District Land Use Plan		
1997 West Douglas Conceptual Plan		
2018 Lemon Creek Area Plan		
2015 Auke Bay Area Plan		
Juneau Townsite Historical Building Survey		
2022 Alaska Coastal Rainforest Center "Juneau's Changing Climate" Report	This report provides data relating to how past, current, and future climate conditions effect the marine and terrestrial ecosystems surrounding CBJ.	Reviewed document to understand how hazards outlined in the Risk Assessment may change due to future climate conditions. .
2022 Tetra Tech Downtown Juneau Landslide and Avalanche Hazard Assessment	Investigates the risk, magnitude, and history of avalanche and landslide hazards in the downtown Juneau area. Identifies and categorizes individual slide areas in Juneau.	Referenced report in the Ground Failure and Avalanche hazard profile to describe the history, extent, and location of past and future ground failure and avalanche events in Juneau.
2007 USACE Erosion Information Paper- Juneau, Alaska	Baseline shoreline/ bank destabilization assessment of the community.	Used to describe historical shoreline/ bank destabilization locations and impacts in Juneau.
1999 USGS Mendenhall River and Flood Profiles Report	Provides details on historic flood and bank destabilization events in the community.	Used to describe historical flood and bank destabilization locations and impacts in Juneau.
USACE National Inventory of Dams Database	Database that provides information on all dams in the United States.	Information on dams in Juneau was used in the Dam Failure profile
UAF/SNAP Database	Provides historical data and future projections on future climate conditions impacts, wildfire danger, and other applicable hazards.	Cited several figures and other data in hazard profiles.
January 2025 DHS&EM Disaster Cost Index	Provides details for historic statewide disasters.	Incorporated relevant disaster descriptions in each applicable hazard profile to strengthen the hazard history, extent, and impact sections.
2022 AEL&P Salmon Creek Dam Emergency Action Plan	Provides Salmon Creek Dam emergency protocol in event of a dam failure, as well as flood inundation map of downstream development.	Included inundation map in Dam Failure hazard profile as well as other relevant information.
NOAA Taku Winds Pamphlet	Provides information about Taku Winds events in Gastineau Channel including dates, maximum wind speeds.	Incorporated data into Severe Weather hazard profile, as well as narrate a unique weather event found only in Juneau and surrounding areas.
2023 Southeast Alaska Drought Report	Provides historical information about drought in Southeast Alaska with an emphasis on the 2016-2019 drought.	Referenced data in Severe Weather hazard profile.
2010 Alaska DEC Statewide Hazardous Materials Commodity Flow Study	Provides an update to 2005 information as well as additional data on the transportation of extremely hazardous goods, hazardous goods, and oil/petroleum products through Alaskan	Referenced data in Hazardous Materials Release hazard profile.

Table 8- Documents Reviewed

Existing plans, studies, reports, ordinances, etc.	Contents Summary (How will this information improve mitigation planning?)	Data Used (How was this information incorporated into this MJHMP?)
	communities, as well as provide critical information on transportation routes.	
2017 DGGS Tsunami Inundation Maps for Juneau, Alaska	Identify potential tsunami hazards for Juneau and model the extent of tsunami waves generated by tectonic and submarine landslide sources.	Referenced data in Tsunami hazard profile.
2025 Alaska's Changing Wildfire Environment 2.0	This document highlights recent wildfire trends in Alaska, their impacts to humans and wildlife, and how science can improve wildfire management decisions.	Data referenced in Wildland Fire and Urban (Community/Downtown) fire hazard profile.
2024 JEDC Juneau & Southeast Alaska Economic Indicators and Outlook	This report outlines the trends, challenges, and strengths of Juneau's economy up to 2024. The document also projects future job sector growth and migration trends of Juneau.	The relevant information was referenced in the Community Profile section related to Juneau's demographics and economy.
2025 Michael Baker HESCO Mapping and Surface Water Model Report	This report presents the H&H analysis of the Mendenhall River Valley in response to recent Suicide Basin GLOF events. Mapping shows the predicted protections as a result of the HESCO barrier installations.	The mapping was used to evaluate the potential numbers of protected critical facilities and residences at various flood stages.
Central Council of the Tlingit & Haida Indian Tribes of Alaska Climate Change Action Plan	This plan outlines CCTH's obstacles and plans to continue traditional use of natural resources as they are affected by future climate conditions.	Relevant information was referenced throughout the HMP in order to display how future climate conditions are impacting Juneau.
Dam Safety Project Data Sheets	Summarizes the details associated with dams.	Referenced data as part of the HHPD update.

2.6 Other Ongoing Tribal Efforts

Once the 2025 MJHMP is completed, Tlingit & Haida intends to apply for available Hazard Mitigation Assistance Grant funding and will work closely with CBJ and FEMA Region X in doing so. In addition, on completion of the 2025 MJHMP, information will be incorporated into future planning efforts and the creation of Tribal plans as well as other FEMA programs and initiatives. Specific integration processes can be found in Section 5.4.

Other ongoing Tribal efforts include:

- ANTHC's ongoing efforts to upgrade and replace critical water and wastewater infrastructure
- Tlingit & Haida's ongoing efforts to protect their culturally sacred sites
- Tlingit & Haida's ongoing efforts to increase food sovereignty in the community
- Tlingit & Haida's Public Safety Departments ongoing efforts to safeguard and serve employees, tribal citizens and communities with the following:
    - Court Service Officers Program: Provides security and support in court hearings, custody cases and wellness court proceedings.
    - First Responders Addiction & Recovery Education Program: Supports first responders with education and tools to handle opioid overdoses and addiction recovery.

- Office of Emergency Management: Dedicated to protecting people, lands, and traditions by preparing for, responding to, recovering from, and mitigating disasters. We work year-round to ensure the safety and resilience of communities through emergency planning, training, and coordination with local, state, and federal partners—honoring tribal sovereignty every step of the way.
- Tribal Homeland Security Program: Empowers tribal citizens, communities, and neighbors through CERT (Community Emergency Response Teams), first aid, and hazard mitigation training to enhance emergency preparedness.
- Tribal Access Program: Conducts criminal background checks and drug testing to ensure a safe environment for all within our communities.
- Tribal Emergency Operations Center: Activated during emergencies to coordinate disaster responses and recovery during floods, landslides, pandemics, and other emergencies.
- Tribal Occupational Health & Safety Program: Ensures a safe and healthy work environment through hazard identification, worksite inspections, and employee training.
- Village Public Safety Officer Program: Provides law enforcement, firefighting, medical services, and emergency management in communities across Southeast Alaska.

- Tlingit & Haida's Elderly Emergency Assistance Department provides limited emergency financial assistance to elderly tribal citizens who have urgent personal needs related to disasters or extenuating circumstances.
- Tlingit & Haida's Program Profiles are described in detail here: Program Profiles by Tlingit & Haida - Issuu.
  - Client Services include:
    - Burial Assistance
    - Child Care Development
    - Elderly Caregiver Support
    - Elderly Services
    - Employment Services for Re-entry & Recovery
    - Enrollment
    - Evergreen Elders Work Experience
    - General Assistance
    - Job Placement & Training
    - Temporary Assistance for Needy Family's
    - Tribal Vocational Rehabilitation
    - Work Experience
  - Community Services include:
    - Addiction & Recovery Education
    - Certified Tribal Artist
    - Community Advocacy
    - Community & Behavioral Services Healing Center
    - Co-Stewardship
    - Cultural Resources
    - Emergency Management
    - Environmental
    - Forestry
    - Indigenous Trades
    - Realty

- Seacoast Indigenous Guardians Network
- Self Governance
- Small Business Resource Center
- Tidal Network
- Traditional Food Security
- Tribal Transportation
- Veterans Benefits
- Village Public Safety Officer

- Court Services
  - Family Court Services
  - Tribal Court
  - Youth Healing to Wellness Court
- Education & Youth Services
  - Alaska Youth Stewards
  - Alumni Scholarship Assistance
  - College Student Assistance
  - Generations Southeast Community Learning Center
  - Head Start
  - Johnson O'Malley
  - Wayfinders
  - Youth Employment Services
  - Youth Wellness & Prevention
- Family Services
  - Child Support
  - Child Welfare
  - Elderly Emergency Assistance
  - Family Wellbeing

3. RISK ASSESSMENT

This section identifies and profiles the hazards that could affect the City and Borough of Juneau (CBJ) and Traditional Lands of Tlingit & Haida (T&H) within the CBJ boundary also referred to as the Planning Area.

This section addresses a portion of Element B of the Local and Tribal Mitigation Plans regulation checklists and a portion of Element G of the Local Mitigation Plans regulation checklist.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT B. Risk Assessment
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i)) B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area? B1-b. Does the plan include information on the location of each identified hazard? B1-c. Does the plan describe the extent for each identified hazard? B1-d. Does the plan include the history of previous hazard events for each identified hazard? B1-e. Does the plan include the probability of future events for each identified hazard, including the type, location and range of anticipated intensities? B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT G. High Hazard Potential Dams (HHPD) (Optional)
HHPD2. Did the plan address HHPDs in the risk assessment?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMENT B. Hazard Identification and Risk Assessment
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the tribal planning area? [44 CFR § 201.7(c)(2)(i)] B2. Does the plan include information on previous occurrences of hazard events and on the probability of future hazard events for the tribal planning area? [44 CFR § 201.7(c)(2)(i)] B3. Does the plan include a description of each identified hazard's impact of the tribal planning area? [44 CFR §201.7(c)(2) (ii)]
Source: FEMA 2017 (Tribal)

3.1 OVERVIEW

Hazard identification is the process of recognizing any natural events that may threaten an area. Natural hazards result from uncontrollable or unexpected natural events of sufficient magnitude. This plan also addresses several man-made and technological related hazards identified by the planning team and public. Historical hazards are noted, but all natural hazards that have the potential to affect the study area must be considered. Any hazards that are determined to be unlikely to occur or cause little to no damage, are eliminated from consideration.

A hazard analysis includes the identification, screening, and profiling of each hazard.

Hazard profiling entails describing hazards in terms of their nature, history, location, magnitude, frequency, extent, and probability (or risk, the possibility of something bad happening). Hazards are identified through historical and anecdotal information collected by members of the community, previous mitigation plans, studies, and study area hazard map preparations/reviews, when appropriate. Hazard maps are then used to define the geographic extent of a hazard, as well as define the approximate boundaries of the risk area.

3.2 HAZARD IDENTIFICATION AND SCREENING

On January 29, 2025, the Planning Team reviewed and updated the possible hazards from the existing HMP that could affect the area. The Planning Team then evaluated and screened the comprehensive list of potential hazards. They took into consideration a range of factors including prior knowledge of the hazard and the relative risk presented by each hazard, their ability to mitigate the hazard, and the known or expected availability of information on the hazard (Table 9).

The Planning Team determined that the following hazards pose a threat to Juneau and the Traditional Lands of Tlingit & Haida: Earthquake (Yoo aan ka.á), Severe Weather, Wildland and Downtown Fire, Ground Failure (Landslide), Tsunami and Seiches, Flood (Aan galañú), Shoreline/Bank Destabilization, Changes in Cryosphere (Glacier (Sít') and Avalanche (Dleit ñaadí)), Volcano, High Hazard Potential Dams (HHPD), Hazardous Materials Incident, and Cybersecurity Threat.

The City and Borough of Juneau and the Traditional Lands of Tlingit & Haida Indian Tribes of Alaska are in the same geographic area and thus experience the same vulnerability to hazards. The geographic planning area is also known as *Dzantik'i Héeni* which translates from Tlingit to "Flounder at the Base of the Creek".

The assets at risk of the identified hazards within the Planning Area are identified in Section 3.4.6.

Table 9- Identification and Screening of Hazards

Hazard	Updated from 2012 HMP or New Hazard?	Explanation
Earthquake	Updated	Earthquakes are of concern in the Planning Area because of the community's proximity to large fault systems, specifically the Queen Charlotte-Fairweather fault. Since the 2012 HMP was adopted, there have been 4 earthquakes, M5.0 or greater, that occurred within 100 miles of the Planning Area.
Severe Weather	Updated	Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida experiences severe weather events: heavy rain, atmospheric river, high wind, thunderstorm (lightning, hail), dense fog, heavy snow (Dleit çéedi), extreme cold, freezing rain/ice storms, drought, and extreme atmospheric heat. Since the 2012 HMP, there have been 122 severe weather events in the Planning Area (68 High Wind, 27 Winter Storm, 23 Heavy Snow (Dleit çéedi), 2 Frost/Freeze, and 2 Blizzard). After a heavy snow event in January 2024 multiple boats sank at the city boat harbor due to the heavy snowfall followed by heavy rain.
Wildland and Urban (Community/ Downtown) Fire	Updated	The Planning Area is in the EC7 Level II Ecoregion which is classified as Coastal Rainforests. This area is normally quite wet, but fires can occur in the Panhandle under dry conditions, which may become more frequent due to climate change (BLM 2020). According to the Alaska Interagency Coordination Center (AICC), 276 fires have occurred within the Planning Area in an 85-year period (1939-2024). The largest fire burned 56 acres near Berners Bay (Daxanáak)in 2018. This fire was caused by a campfire. Since the 2012 HMP, there have been 7 wildland fire events in the Planning Area.

Table 9- Identification and Screening of Hazards

Hazard	Updated from 2012 HMP or New Hazard?	Explanation
		The Alaska State Fire Marshal's office records fatalities due to community fires, and there have been 2 fatalities in the Planning Area from structure fires between 2020-2024.
Ground Failure (Landslide)	Updated	In September 2022, a landslide above Gastineau Avenue damaged homes and damaged power lines. In August 2023, a landslide was reported in the Starr Hill neighborhood. In July 2024, a Downtown Juneau apartment building was evacuated following a landslide that was triggered by heavy rain. Trees, large debris, and mud washed onto the road. Since the 2012 HMP, there have been 9 documented landslides in the Planning Area.
Tsunami and Seiches	Updated	The Planning Area has not been impacted by a damaging tsunami in recent history; however, historical tsunamis have resulted submarine landslides that caused underwater cable damage effecting the community in 1958. In 2017, Alaska Division of Geological & Geophysical Surveys (DGGS) completed tsunami inundation modeling/mapping for Juneau. Since the 2012 HMP, an 8.2 earthquake in the Gulf of Alaska resulted in 0.05 meters of runup the Planning Area. This event did not impact the community.
Flood	Updated	Riverine flooding and glacial outburst flooding are hazards in the Planning Area. Since the 2012 HMP, Suicide Basin has released some volume of its water almost every year, and in some cases multiple times in one year. This has led to severe Glacial Lake Outburst Floods (GLOFs), impacting the Mendenhall Valley. Since the 2012 HMP, there have been 21 flooding events in the Planning Area.
Shoreline/Bank Destabilization (Erosion)	New	The Planning Area is at risk of coastal and shoreline/bank destabilization. Historically, coastal shoreline/bank destabilization impacted Thane Road, Egan Drive, and the Gold Creek Delta. Riverine shoreline/bank destabilization is a much more frequent hazard, predominantly a secondary hazard caused by GLOFs in the Mendenhall River Valley. During the 2023 GLOF event, some areas of the Mendenhall Riverbank eroded as much as 20 to 150 feet. Since the 2012 HMP, there have been 4 shoreline/bank destabilization events in the Planning Area.
Changes in the Cryosphere (Glaciers and Snow Avalanche)	Updated	Glaciers and snow avalanche (Dleit ñaadí) hazards occur in the Planning Area, both inside and outside of the populated areas of Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida. The ice-dammed lake in Suicide Basin has flooded annually since 2011; some years have multiple smaller floods and some years have only one large flood. In 2014, an outburst flood from Suicide Basin caused the water level of Mendenhall Lake to gain 12 feet over the baseline and resulted in significant damage to riverside properties. In July of 2018, more than one billion cubic feet of water was unleashed into the Mendenhall River from Suicide Basin. In 2023, a glacial dam outburst from the Mendenhall Glacier's Suicide Basin caused record flooding and riverbank destruction along the lake and river. In 2024, a glacial dam outburst from Mendenhall Glacier's Suicide Basin caused historic flooding, inundating more than 100 homes, businesses, and public infrastructure in the valley along Mendenhall Lake and Mendenhall River. The Planning Area has experienced avalanche (Dleit ñaadí) hazards and actively monitors at least six avalanche path systems (Behrends, Gold Creek-Mt Juneau, Gold Creek – Snowslide Gulch, Greenhouse, Thane Road, White, and unmapped areas above Gastineau Avenue and South Franklin Street). In January 2024 two avalanches occurred after a significant snowfall event, but there were no reported damages.
Volcano	Updated	While the Planning Area is at low risk for experiencing the primary effects of a volcanic eruption, the large numbers of volcanoes in Alaska place Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida at risk for experiencing secondary effects of eruptions, such as ash fall. Several relatively recent volcanic eruptions have resulted in

Table 9- Identification and Screening of Hazards

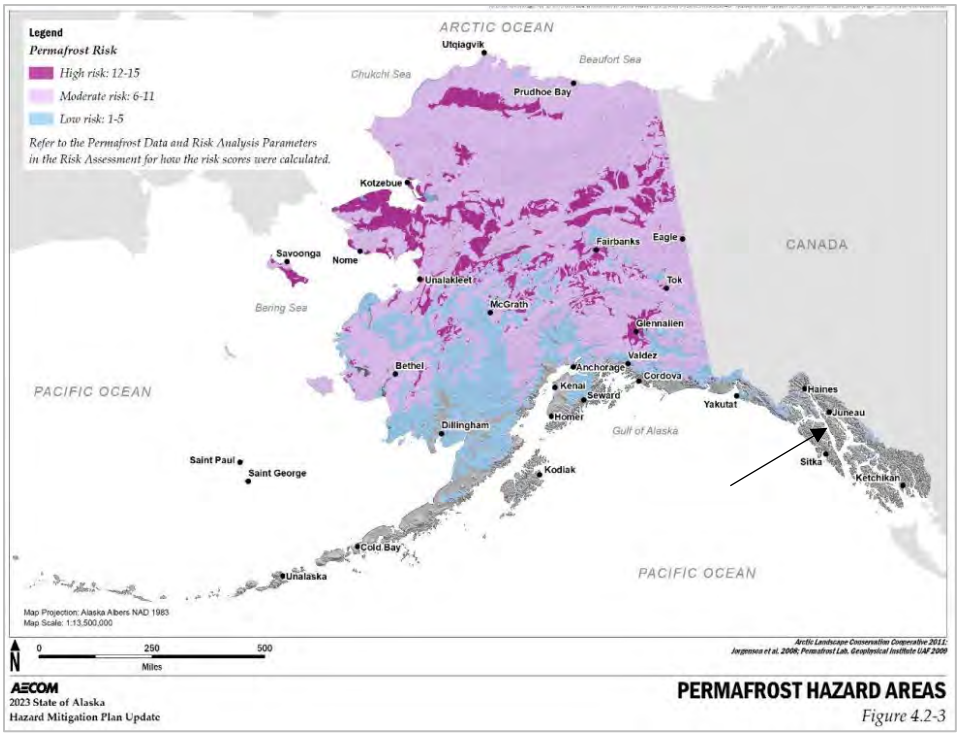
Hazard	Updated from 2012 HMP or New Hazard?	Explanation
		ash fall throughout the state, disrupting air traffic and, in extreme cases, making living conditions horrific and causing significant environmental damage even in areas hundreds of miles from the eruption.
Dam Failure- High Hazard Potential Dams (HHPD)	New	There are eight dams in the Planning Area- two are classified as High Hazard (Salmon Creek Dam and Douglas Island Dam), two are classified as Significant Hazard, and four are classified as Low Hazard. There has not been a dam failure of a High Hazard Potential Dam, but a failure would have an impact on the Planning Area.
Hazardous Materials	New	Between January 1st, 2012, and April 1st, 2025, the Planning Area experienced 3,113 recorded releases or spills. Based on historical data, the Planning Area experiences upwards of 10 hazardous materials releases per month (ADEC 2025). Mining operations make up about half of all releases in the Planning Area. About one third of the releases came from transportation by air, land, and sea. Residential releases make up less than 10% of all releases, and commercial activities make up about 5%. Utility provision makes up less than 1%
Cybersecurity	New	There have been at least 2 historical cyberattack impacts in the Planning Area. However, all residents, businesses, and government offices in the Planning Area are at risk of a cybersecurity attack.
Air Transportation	Moved to impact section within each hazard profile	Air Transportation was recategorized as an impact as a result of a hazard event and will be discussed within each hazard profile and overall vulnerability along with water transportation impacts.

3.2.1 HAZARDS NOT PROFILED IN THIS HMP UPDATE

Changes in the Cryosphere- Permafrost/Periglacial

Permafrost is found beneath nearly 85% of Alaska. It is thickest and most extensive in arctic Alaska north of the Brooks Range, present virtually everywhere and extending as much as 2,000 feet below the surface of the Arctic Coastal Plain. Southward from the Brooks Range it becomes increasingly thinner and more discontinuous, broken by pockets of unfrozen ground known as taliks, until it becomes virtually absent in Southeast Alaska (Aani) except for patches of high-elevation alpine permafrost.

The 2023 State of Alaska HMP identifies statewide permafrost hazard areas (Figure 11). Juneau (Dzantik'i Héeni) is in an area without permafrost. The Planning Team has confirmed that permafrost is not present in the Planning Area and resultant hazards (permafrost degradation and subsidence) are not of concern.



Source: 2023 State of Alaska HMP

Figure 11- Statewide Permafrost Hazard Areas and Risk

The following additional hazards have been identified as being present but will be addressed in other planning documents such as Emergency Action or Disaster Preparedness Plans or may be included in future updates to the Hazard Mitigation Plan.

Surface Transportation Interruptions

Since Juneau (Dzantik'i Héeni) is not connected to the continental road system, the community relies heavily on air freight and ocean freight to receive their goods. According to the McKinley Research Group, over 95% of all freight that comes to Southeast Alaska (Aani) communities is on a barge (KTOO 2021). Delays with these cargo ships can happen, which can lead to food shortages throughout the community. In June 2024, TOTE Maritime Alaska's ship MV North Star experienced delays due to mechanical issues, which lead to milk shortages in several grocery stores throughout Anchorage.

Due to its location, the Planning Area is especially vulnerable to potential longshoreman's strikes, policy trade wars, ship mechanical issues, and natural disasters that could delay the arrival of barges to the planning area (CBJ 2025).

Prolonged Power Outages

The main power utility in The Planning Area is Alaska Electric Light & Power (AEL&P), which supplies hydroelectric power. At the Snettisham Power Plant, power is generated from two sources of water, which capitalizes on Juneau's (Dzantik'i Héeni) abundance of water on an annual basis. Hydroelectric power has proven to be a cost-effective renewable source of energy for the planning area, but past incidents have shown that there may be vulnerabilities with certain components of the power source.

The main power source for the Snettisham Plant is the 138kV Snettisham electrical transmission line, which has had a history of damage from avalanches. In 2008, a large avalanche (Dleit ñaadí) destroyed tower 4/6, which eliminated hydroelectric power for the entire Planning Area, which forced the AEL&P to revert to diesel powered generators. To address future outage events due to avalanches, in 2009 AEL&P installed a large wedge to protect the transmission lines, which showed a major improvement with combating an

avalanche. Even though prolonged power outages from natural hazards are always a concern, recent efforts to mitigate the impact to the power source decreases the current concern.

Mass Casualty Incidents (including Cruise Ship Incidents)

While Downtown Juneau's tight streets are known to get congested in the summer months with tour buses and rental vehicles, there has been no tourism related mass casualty event in Juneau's history. Public input received through the project survey indicates some locals have expressed concerns with the congestion of streets due to the cruise industry, but more research would need to be conducted to assess the probability and impact of a future event, as well as the capabilities to deal with a catastrophic event involving a cruise ship incident.

Civil Unrest

Juneau, like any capital city, experiences protests and political demonstrations, particularly at the Alaska State Capitol Building. Throughout history, there hasn't been any major incident involving a protest escalating out of hand in Juneau, with most of these events remaining peaceful. Due to Downtown Juneau's tight streets and isolated location, a hostile protest in the future could cause a logistical and safety concern for residents, but a future study is recommended beyond this plan to assess the potential impacts of a civil unrest event in Juneau.

Major Infrastructure Failure

While all the hazards described in the risk assessment pose a potential threat to major infrastructure in the Planning Area, the complete failure of a critical facility is always a concern. Critical facilities like the hospital, airport, and port facilities failures and how the community responds to the failure are generally addressed in individual facility and community Emergency Action/Response Plans.

3.3 HAZARD PROFILES

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

- Nature (type)
- History (previous occurrences) Appendix F provides detailed historic events
- Location (hazard areas)
- Extent (includes magnitude and severity)
- Impact (provides general impacts associated with each hazard). Impacts associated with air transportation are addressed in each hazard.
- Probability of Future Events (likelihood of hazard occurring)
- Future Climate Conditions

Each hazard is assigned a rating based on the following criteria for magnitude/severity (Table 10) and probability of future events (Table 11). Estimating magnitude and severity are determined based on historic events using the criteria identified in the following tables.

Table 10- Hazard Extent (Magnitude/Severity) Criteria

Magnitude / Severity	Criteria
4- Catastrophic	• Multiple deaths. • Complete shutdown of facilities for 30 or more days. • More than 50 percent (%) of property is severely damaged.
3- Critical	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least two weeks. • More than 25% of property is severely damaged.

Magnitude / Severity	Criteria
2- Limited	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than one week. • More than 10% of property is severely damaged.
1- Negligible	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10% of property is severely damaged.

Table 11- Hazard Probability of Future Events Criteria

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

The hazards profiled for the City and Borough of Juneau (Dzantik'i Héeni) and Tlingit & Haida Planning Area are presented throughout the remainder of this section. The presentation order does not signify their importance or risk level.

3.3.1 EARTHQUAKE

3.3.1.1 Nature

An earthquake (Yoo aan ka.á) can be defined as any shift along the Earth's tectonic plates and faults due to accumulated strain built up by friction which precipitates a sudden movement or trembling of the Earth's crust. This sudden movement can be felt at sometimes very distant sites from the epicenter, and it usually occurs without warning. The movement can build rapidly after just a few seconds and cause significant, sometimes catastrophic, damage and severe numbers of casualties, and this often-violent motion or shaking is the most common effect of earthquakes.

Like sound, the motion of the ground is the strongest near the source and increases in concert with the amount of energy released. It also attenuates with distance, i.e., decreases in force as you travel farther away from the epicenter of the earthquake. An earthquake causes several types of waves both with the Earth's interior (seismic waves) and along the surface of the Earth (surface waves). Two distinct types of seismic waves are produced during an earthquake. Primary waves (P waves) are compressional and longitudinal in nature, and this causes back and forth oscillation in parallel to the direction of travel (the vertical motion). Secondary waves (S or shear waves) are slower in nature than the P waves and cause vibrations that are in the side-to-side plane (horizontal motion). Additionally, there are two types of surface waves: both Rayleigh and Love waves travel more slowly and usually cause considerably less damage than the seismic waves. A visual depiction of each of these waves is shown below (Figure 12).

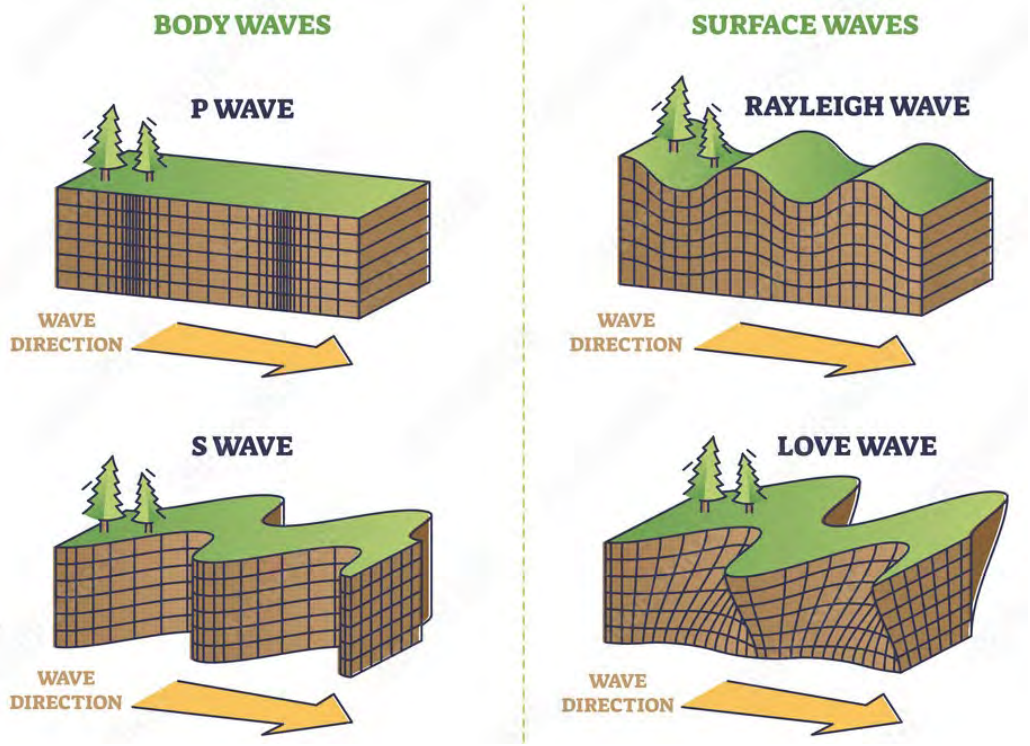


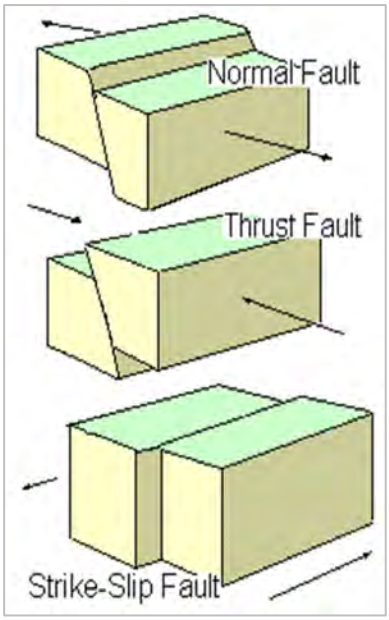
Figure 12- Types of Seismic Waves

Besides the motion and resultant damage, there are also several other effects which occur due to earthquakes. These are:

Fault Displacement: this is distinct movement on the surface along the two sides of a seismic fault. These displacements can be very considerable in both length and width, i.e., as much as 7 meters vertically and more than 60 kilometers along the rupture line. There are three general types of faulting. Strike-slip faults are where each side of the fault moves horizontally. Normal faults have one side dropping down relative to

the other side. Thrust (reverse) faults have one side moving up and over the fault relative to the other side. This type of faulting can cause severe damage to surface structures such as pipelines, roads, railways, and tunnels.

Liquefaction: when granular soil or sediments that is saturated becomes distorted due to the vibrations and surface movements. The empty spaces between the granules can collapse, and water pressure within the pores may increase enough to make the soil/sediments behave more like a fluid during the earthquake causing sometimes serious deformations. Horizontal movements (i.e., lateral spreading) of 5 meters are common but can be as much as 30 meters. Massive flows (i.e., flow failures) that are typically ten to a hundred meters can sometimes extend even to 6-7 kilometers. Liquefaction can also cause a considerable loss of bearing strength, and this can result in structures settling significantly or tipping severely. All of this can result in severe property damage including building and bridge collapse as well as landslides and avalanches.



Both the intensity and magnitude are considered during the measurement of the severity of earthquakes. The observed level of damage and effects on people, nature, and human structures are variables when describing the intensity. The severity of intensity generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. The scale most often used in the U.S. to measure intensity is the Modified Mercalli Intensity (MMI) Scale.

As shown in Table 12, the MMI Scale consists of 10 increasing levels of intensity that range from imperceptible to catastrophic destruction. Peak ground acceleration (PGA) is also used to measure earthquake intensity by quantifying how hard the earth shakes in each location or measured as acceleration due to gravity (g). The USGS describes the MMI Scale as:

> *"The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. Although numerous intensity scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli (MM) Intensity Scale.*
>
> *The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the non-scientist than the magnitude because intensity refers to the effects actually experienced at that place."*

The following table is an abbreviated description of the comparisons of earthquake magnitude, intensity, ground-shaking comparisons, perceived shaking, and damage.

Table 12- Magnitude/Intensity/Ground-Shaking Comparisons

Magnitude	Intensity	PGA: Acceleration (%g)	Perceived Shaking	Damage
1.0-3.0	I	<0.0464	Not felt	None
3.0-3.9	II-III	0.0464 - 0.297	Weak	None
4.0-4.9	IV	0.297 – 2.76	Light	None
	V	2.76 - 11.5	Moderate	Very light
5.0-5.9	VI	11.5 - 21.5	Strong	Light
	VII	21.5 - 40.1	Very Strong	Moderate

Magnitude	Intensity	PGA: Acceleration (%g)	Perceived Shaking	Damage
6.0-6.9	VIII	40.1 - 74.7	Severe	Moderate/Heavy
	IX	74.7 - 139	Violent	Heavy
7.0+	X+	>139	Extreme	Very Heavy

Adapted from: USGS (2008) and Er et al. (2010)

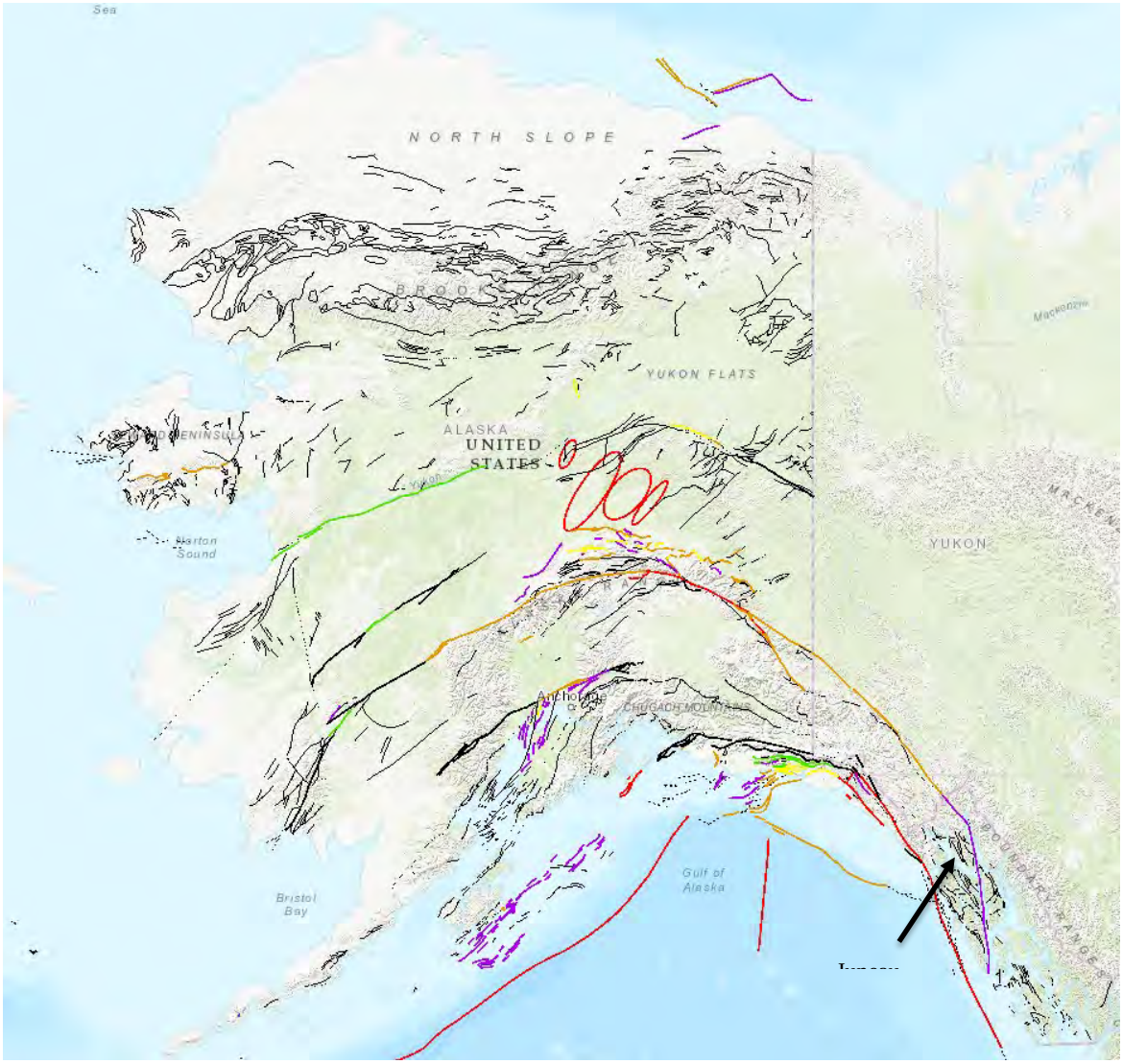
3.3.1.2 Location

Earthquakes are of concern in the Planning Area because of the community's proximity to large fault systems as well as the likelihood of the occurrence of landslides, avalanches, tsunamis and seiches resulting from a significant earthquake.

Many of the prominent faults in the region are thought to be active. An active fault, in general, is a type of fault along which continuous or intermittent movement is taking place; motion may be abrupt or, in some cases, may be very slow. The closest active fault to Juneau (Dzantik'i Héeni) and the Traditional Lands of the Tlingit & Haida with documented historic surface displacements is the Fairweather Fault, located approximately 90 miles to the west. This transform fault accommodates plate motion and runs mostly offshore along the southeastern Alaska coast, continuing southward into British Columbia as the Queen Charlotte Fault (DGGS 2016).

From the historic record of earthquakes, other active faults, including those that moved during the September 1899 earthquakes, are inferred to exist, but they have not yet been located and possibly either have not ruptured the surface or are concealed by glaciers or large bodies of water.

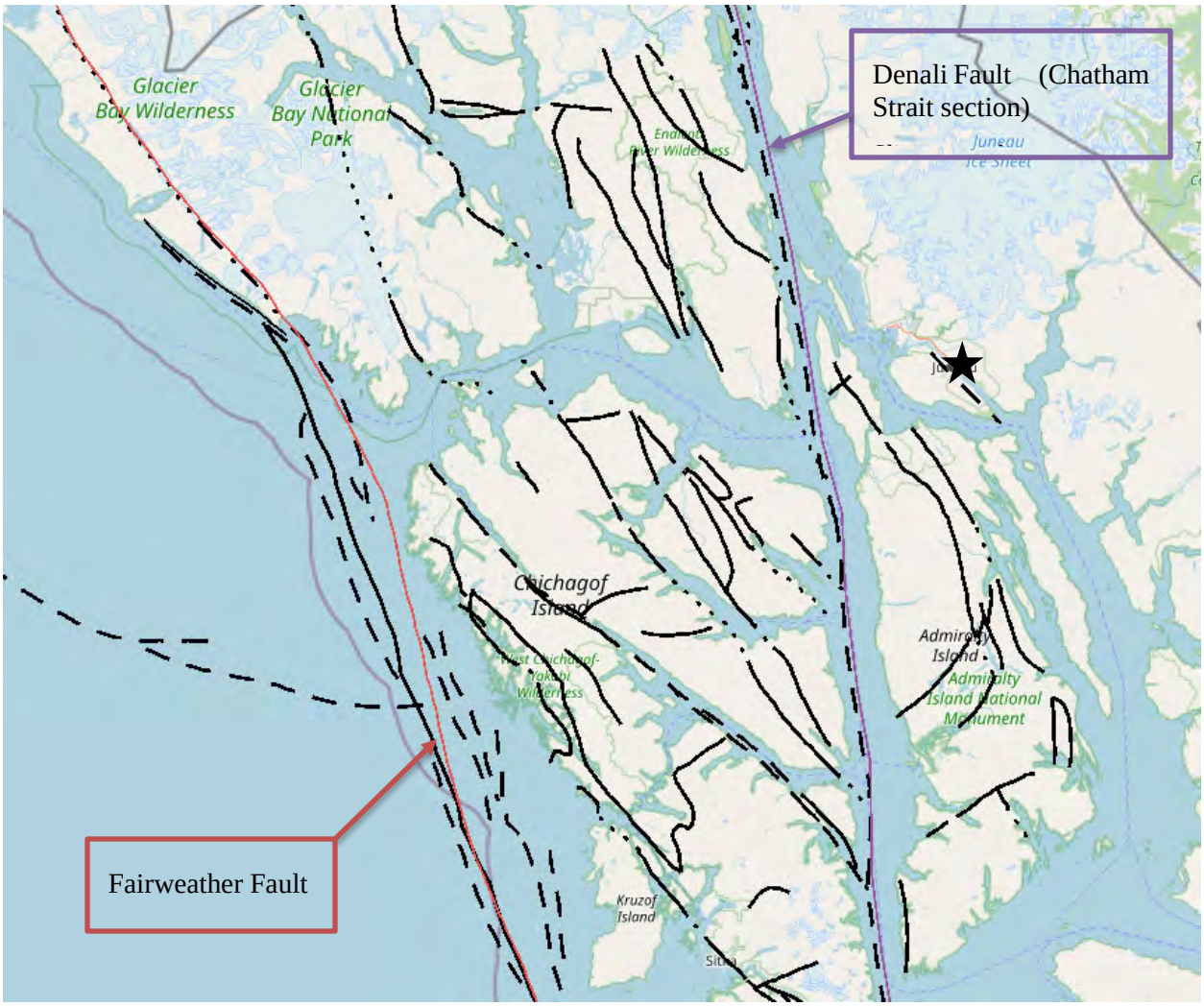
Figure 13 shows Alaska's earthquake faults and folds. The accompanying legend is below.



Source: DGGS Quaternary Fault and Folds Database (2013)

Figure 13- Alaska's Faults and Folds

Figure 14 is a zoomed in image of the Quaternary Fault and Folds near Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida. The legend above is applicable to this figure as well.



Note: The bold black fault lines are pre-quaternary faults that have not been active in the past 1.6 million years and are not named.
Source: DGGS Quaternary Fault and Folds Database (2013)

Figure 14- Faults and Folds Surrounding Juneau and Traditional Lands of Tlingit & Haida

3.3.1.3 History

Due to its location on the Fairweather fault, Juneau (Dzantik'i Héeni) has had a history of earthquakes, the most significant and recent being the M7.8-8.3 Lituya Bay Earthquake, which occurred in 1958 approximately 116 miles northwest of the planning area. See Appendix F for a full history of seismic activity in Southeast Alaska, as well as a table that references historical earthquakes within 100 miles of Juneau.

3.3.1.4 Extent (Magnitude and Severity)

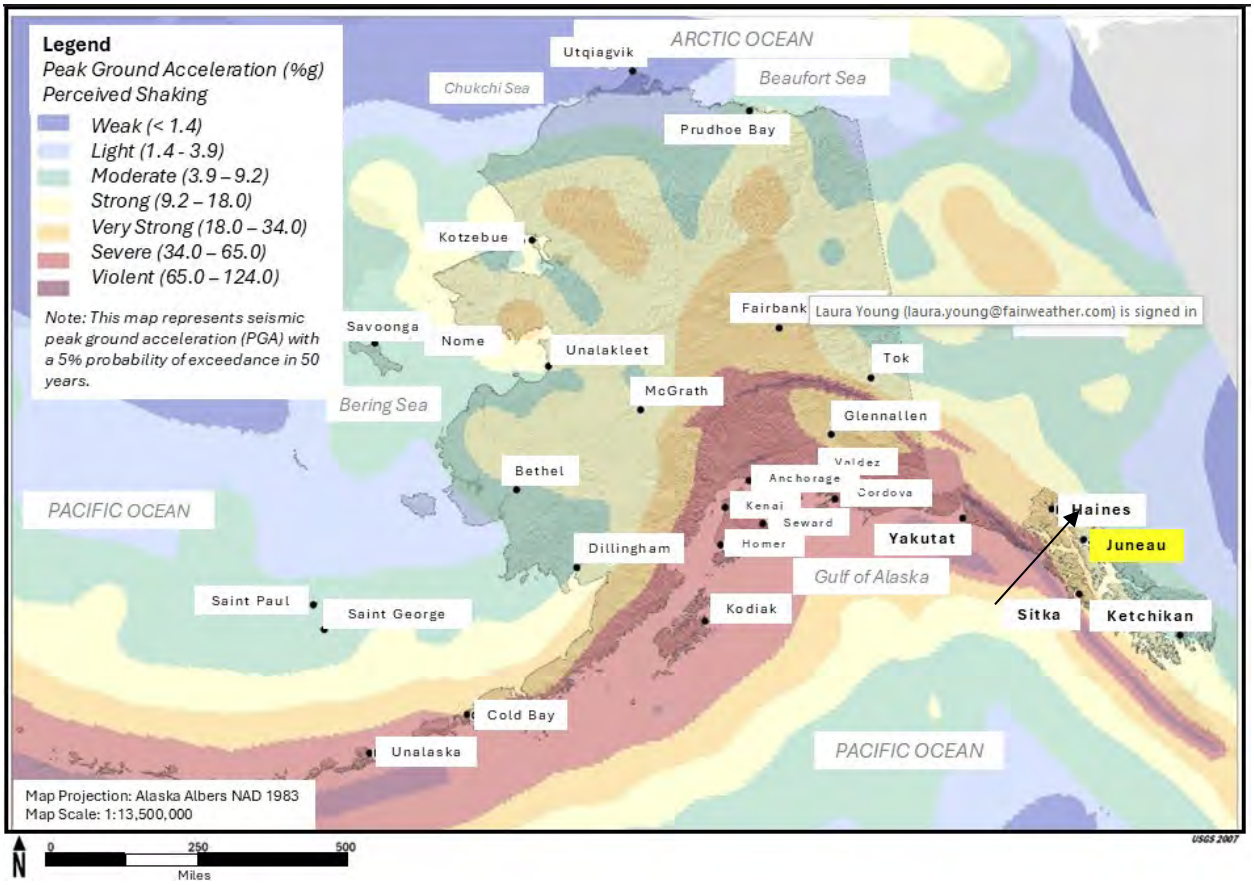
Intensity is a subjective measure of the strength of the shaking experienced in an earthquake. Intensity is based on the observed effects of ground shaking on people, buildings, and natural features. It varies from place to place within the disturbed region depending on the location of the observer with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

As shown on Figure 14, numerous major fault zones are close to Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida including the Fairweather fault and the Chatham Strait fault.

A M2.0 or less is called a microearthquake; they cannot even be felt by people and are recorded only on local seismographs. Events of about M4.5 or greater are strong enough to be recorded by seismographs all over the world. A M5.0 earthquake is a "moderate" event, a M6.0 characterizes a "strong" event, a M7.0 is a "major" earthquake, and a "great" earthquake exceeds M8.0. Great earthquakes occur once a year on average worldwide; some examples of Great earthquakes are British Columbia 1700, Chile 1960, and Alaska 1964. The MMI Scale is used to describe earthquake effects on structures (Table 12).

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

Figure 15 shows the statewide PGA and perceived shaking from earthquakes. The Planning Area lies on the border of the Strong (PGA 9.2-18.0 %g) and Very Strong (PGA 18.0-34.0 %g) categories.



Source: 2023 State of Alaska HMP

Figure 15- Statewide PGA and Perceived Shaking from Earthquakes

Since 1900, there have been 7 earthquakes that occurred within 100 miles of the Planning Area, and those events ranged in magnitude from M5.0 - M6.1.

Based on past event history and the criteria identified in Table 10, the magnitude and severity of earthquakes and resultant damages to people and infrastructure in the Planning Area are considered Limited where 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, and less than 10% of property would be severely damaged.

3.3.1.5 Impact

An earthquake could affect the entire Planning Area and surrounding areas. The dangers associated with earthquakes include ground shaking, surface faulting, ground failures/landslides, snow avalanches, seiches and tsunamis.

Most earthquake injuries and fatalities occur within buildings from collapsing walls and roofs, flying glass, and falling objects. As a result, the extent of the Planning Area's risk depends not just upon its location relative to known faults, magnitude of the quake, distance from the epicenter and its underlying geology and soils, but also on the design of its structures. Buildings that have not been constructed to meet seismic standards can pose major threats to life and the continued functioning of key public services during an earthquake. Older and historic buildings in Downtown Juneau would be more vulnerable to the impacts of a large earthquake. Earthquake damage would likely be area-wide with potential damage to critical infrastructure including the complete abandonment of key facilities. Impacts to community and individual drinking water wells (specific water supply infrastructure damages), in addition to temporary or permanent aquifer changes are also a potential consideration.

Throughout historical record, earthquake damage in the Planning Area has been limited. Due to its location on the Fairweather Fault, the Planning Area hasn't been prone to large earthquakes, which explains the minimal damage to infrastructure throughout recorded history. Still, there have been reported disturbances to the Planning Area from historically large earthquakes in Alaska. For example, the 7.1M 1971 Saint Elias Earthquake over 400 miles from the Planning Area reportedly shifted furniture and cracked plaster in the Mendenhall neighborhood.

Tsunami/Seiche Potential: Tsunamis (seismic sea waves) are generated by sudden vertical motion of the sea floor. Because the Fairweather and Denali/Chatham Strait fault systems are strike-slip (sideways motion parallel to the fault), they are not likely to generate tsunamis in The Planning Area (DGGS, 1998). However, earthquake ground shaking can indirectly cause locally generated waves by triggering landslides in the steep terrain nearby. If a major landslide enters sea water or occurs on the seafloor, a large local wave can be generated that can cause severe damage to people and facilities along nearby shorelines. Due to the wave's ability to travel from the source to the coast in a matter of minutes, this local wave can strike with little warning.

More information on potential tsunami/seiche impacts in The Planning Area can be found in Section 3.3.5.5.

Liquefaction Potential: The possibility of soil liquefaction is a significant concern for parts of the Planning Area. The Mendenhall Valley floor, as well as other areas of the city, may present a high risk of liquefaction in the event of an earthquake. To adequately assess the vulnerability to soil liquefaction, a soil assessment needs to be completed throughout the Planning Area.

Air Transportation Impacts: Impacts to air transportation associated with earthquakes are the potential for infrastructure damage to the Airport Terminal and Runway as well as potential tsunami related impacts to floatplanes landing or taking off if a significant wave occurs during that time. Communications, lighting, and power (as well as other utilities) after a significant earthquake could also impact planes during take-off and landing.

3.3.1.6 Probability of Future Events

While it is not possible to predict an earthquake, the USGS has developed earthquake probability maps that use the most recent earthquake rate and probability models.

Earthquake probability maps show the PGAs expected at a location with 10%, 5%, and 2% exceedance probabilities in 50 years.

- A 10% chance in 50 years means that statistically this earthquake happens on average every 500 years.

- A 5% chance in 50 years means that statistically this kind of earthquake happens every 1,000 years.
- A 2% chance in 50 years, is the rare, large earthquake, and statistically it happens on average every 2,500 years.

Figure 15 shows the earthquake probability/risk for the entire state of Alaska, including the Planning Area. Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida lies on the border of the Strong (PGA 9.2-18.0 %g) and Very Strong (PGA 18.0-34.0 %g) categories. Based on the MMI scale (Table 12), and depending on location, the Planning Area could experience light to moderate potential damage.

Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that there will be an earthquake of any magnitude within 100 miles of the Planning Area within the calendar year; there is a 1 in 1 year chance of occurring (1/1=100%); and based on the history of events, the probability of occurrence is greater than 33% likely per year.

3.3.1.7 Future Conditions

Future climate conditions are not expected to influence the nature, location, extent, impact, or recurrence probability of future earthquakes on human timescales, including changes to land use development or population patterns (DHS&EM 2023).

3.3.2 SEVERE WEATHER

3.3.2.1 Nature

Severe weather is any dangerous meteorological development that has the power to cause damage or disruption, including the loss of human life. Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida experience periodic severe weather events: heavy rain, atmospheric river, high wind, thunderstorm (lightning, hail), dense fog, heavy snow, extreme cold, freezing rain/ice storms, drought and extreme atmospheric heat.

Wind Women - Tlingit believes the North Wind (Xóon) had its power given to it by spirits that reside in mountain (Shaa) cliffs. Therefore, they never speak against North Wind, no matter how hard it blows.

A high caste man long ago married the daughter of East Wind (Dákde át). However, he heard North Wind also had a beautiful daughter. He married her as well and returned to his village, where his first wife lived. The daughter of East Wind grew jealous of how pretty the daughter of Northwind was. East Wind's daughter despised the sparkling clothing worn by the daughter of North Wind and how it made tinkling noises. She made the East Wind blow and it became warm and cloudy. Soon North Wind's daughter lost her sparkling clothing, and the icicles and frost melted.

The story explains how different winds brought different weather conditions. When these winds intensified, severe weather could become more prevalent. To this day, wind direction is a key factor in predicting weather events and assessing potential hazards.

Severe Weather Event	Nature of the Event
Heavy Rain	Heavy rain occurs when the precipitation rate is above 0.30 inches per hour (American Meteorological Society).
Atmospheric River	Atmospheric rivers are relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics. While atmospheric rivers can vary greatly in size and strength, the average atmospheric river carries approximately 593,000 cubic feet of water vapor, roughly equivalent to the average flow of water at the mouth of the Mississippi River. Exceptionally strong atmospheric rivers can transport up to 15 times that amount. When the atmospheric rivers make landfall, they often release this water vapor in the form of rain or snow (NOAA 2020b). Figure 17 describes atmospheric rivers in more detail.
High Winds	Strong winds pose a moderate threat to a community when they reach sustained speeds of 26 to 39 mph, or frequent wind gusts of 35 to 57 mph. High winds pose a high threat to a community when they reach sustained speeds of 40 to 57 mph. High winds pose an extreme threat to a community when they reach sustained speeds greater than 58 mph, or frequent wind gusts greater than 58 mph. While Alaska does not experience hurricanes, it experiences hurricane-force winds. Various wind scales equate wind speed to expected damage. Two widely used wind scales are the Beaufort Scale of Wind Strength and the Saffir-Simpson Hurricane Wind Scale, further explained below in Table 13 and Table 14.

Table 13- Beaufort Scale of Wind Strength

Force	Wind Speed (mph)	Damages
0	<1	Smoke rises vertically.
1	1-3	Direction shown by smoke drift but not by wind vanes.

Severe Weather Event	Nature of the Event

2	4-7	Wind felt on face; leaves rustle; wind vane moved by wind.
3	8-12	Leaves and small twigs in constant motion; light flags extended.
4	13-18	Raises dust and loose paper; small branches moved.
5	19-24	Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	25-31	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	32-38	Whole trees in motion; inconvenience felt when walking against the wind.
8	39-46	Twigs break off trees, generally impedes progress.
9	47-54	Slight structural damage (chimney pots and slates removed).
10	55-63	Trees broken or uprooted.
11	64-75	Trees uprooted; cars overturned.
12	75+	Wide-spread devastation, buildings damaged or destroyed.

Table 14- Saffir-Simpson Hurricane Wind Scale

Category	Sustained Winds (mph)	Damages
1	74-95	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

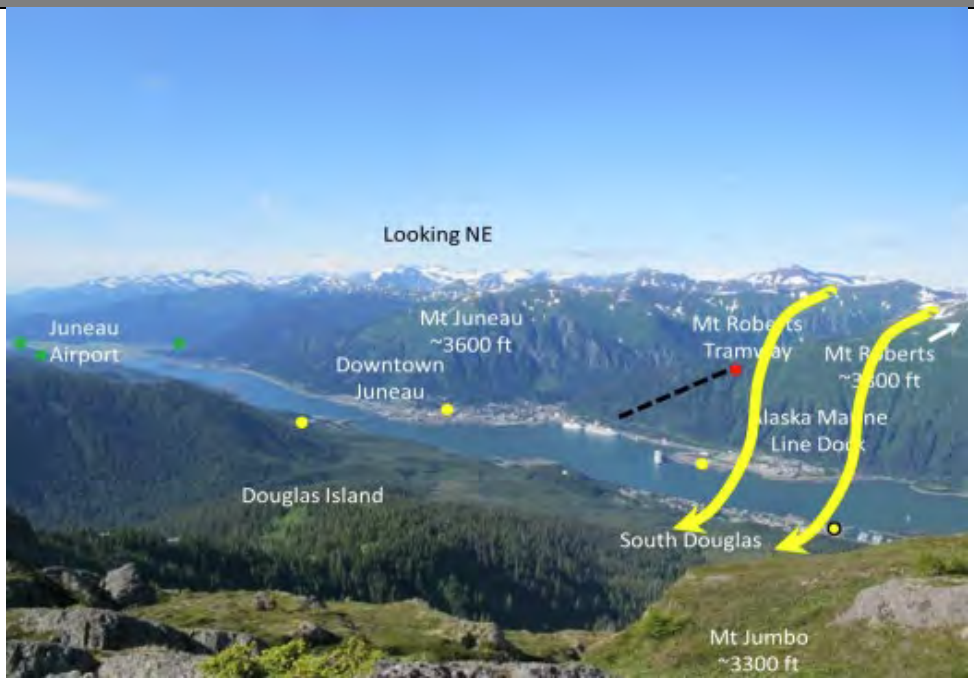
Severe Weather Event	Nature of the Event		
	5 (major)	157+	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

The Downtown Juneau and Douglas areas experience a unique phenomenon called Taku Winds. Taku Winds are mountain wave phenomenon generated over Gastineau Channel in the vicinity of Downtown Juneau and Douglas. Wind speeds vary based on the strength of the mountain wave. Weak mountain waves produce gusts from 35 to 50 mph, while strong mountain waves yield gusts from 60 to 100 mph. Hazards associated with Taku Winds range from the nuisance variety, such as overblown garbage cans, to dangerous, such as flying debris and overturned marine vessels (NWS 2025).

Several criteria need to be in place for Taku Winds to occur. First, a tight offshore oriented pressure gradient is necessary for strong winds (>40 mph) to develop over the Juneau Ice Field and ridgetops surrounding Downtown Juneau. Second, the wind must be strongest near ridgetop level and decrease in speed in the midlevel of the atmosphere. The image below shows that winds are strongest near the mountain barrier, become light above the mountain (which is called a critical level), and then reverse direction above the critical level. Third, the airmass below the ridges surrounding Gastineau Channel must be stable, which aids in amplifying the winds as they flow across the mountains east of Juneau (NWS 2025).

When the above criteria are in place, mountain wave development is likely. In the Planning Area, these mountain waves are called Taku Winds. Weather sensors located across Downtown Juneau and Douglas alert NWS forecasters to their occurrence, such as the South Douglas weather sensor data displayed to the right.

Figure 16 illustrates how northeasterly winds flow from the Juneau Ice Field across the ridge tops surrounding Downtown Juneau. When meteorological conditions are favorable, a mountain wave will develop over Gastineau Channel, causing strong turbulent flow to descend to the surface over Downtown Juneau, the channel south of Downtown, and Douglas.

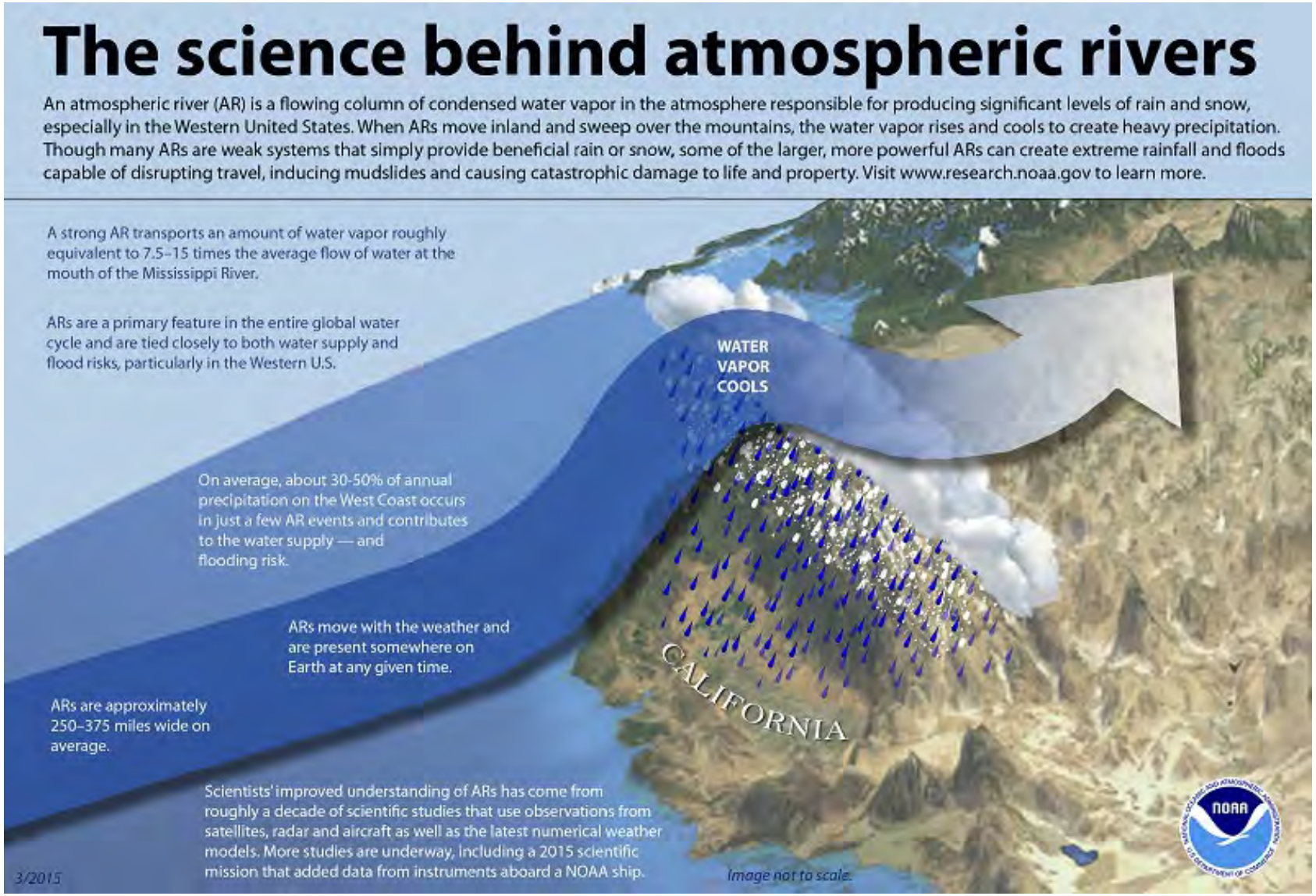
Severe Weather Event	Nature of the Event
	 Source: NWS 2025 **Figure 16- Illustration of a Taku Wind Event in Juneau and Traditional Lands of Tlingit & Haida**
Thunderstorm (Lightning, Hail)	Thunderstorms are caused by the turbulence and atmospheric imbalance that arise from combining unstable rising warm air and adequate moisture to form clouds and rain. A thunderstorm can intensify into a severe storm with damaging hail, high winds, and flash flooding. A thunderstorm is considered severe if wind reaches or exceeds 58 mph, produces a tornado, or drops surface hail at least 1.0 inches in diameter. Thunderstorms affect relatively small areas. The average thunderstorm is about 15 miles in diameter and lasts less than 30 minutes in any given location. **Lightning** exists in all thunderstorms, which is caused by a buildup of charged ions within the thundercloud. When lightning connects with a grounded object, electricity is released which can be harmful to humans and can start fires. Lightning is the most concerning hazard from thunderstorms in Southeast Alaska. **Hailstorms** are an outgrowth of thunderstorms in which ball or irregular shaped lumps of ice greater than 1.0 inches in diameter fall with rain. The size and severity of the storm determine the size of the hailstones. In Alaska, hailstorms are rare and cause little damage, unlike the hailstorms in Mid-Western states. The extreme conditions of atmospheric instability needed to generate hail of a damaging size (greater than 1.0 inch diameter) are highly unusual in Alaska. Small hail of pea-size has been observed periodically. Hailstones up to an inch in diameter are possible with thunderstorms in Southeast Alaska. Minor damage can occur from hailstones that are that size.
Dense Fog	Dense fog is defined as fog reducing visibilities to ¼ mile or less for an hour or longer. Fog usually forms under clearing skies after several days of rain. An inversion (stable atmosphere) forms in the valleys and channels that can last for several days. This inversion shelters the fog from mixing out from winds. The fog will last until the inversion mixes out due to winds picking up from a weather front moving into the area.

Severe Weather Event	Nature of the Event
	Dense fog episodes occur often in Southeast Alaska and can last as long as a week at a time. The most prolific time of year for dense fog to occur in the Planning Area is during the months of November and December. Dense fog is significant not only because it can pose a hazard to mariners and roadways, but it can also significantly affect aviation travel.
Heavy Snow	Heavy snow (Dleit çéedi) generally means snowfall accumulating to four inches or more in depth in 12 hours or less and six inches or more in depth in 24 hours or less. Local criteria for Juneau (Dzantik'i Héeni) is six inches or more in depth in 12 hours. A winter storm is a combination of heavy snow, blowing snow, and/or dangerous wind chills. A winter storm can be life-threatening. To develop, they require: • Cold air - Subfreezing temperatures (below 32ºF, 0ºC) in the clouds and/or near the ground to make snow and/or ice. • Moisture - The air must contain moisture to form clouds and precipitation. • Lift - A mechanism to raise the moist air to form the clouds and cause precipitation. Lift may be provided by any or all of the following: o The flow of air up a mountainside; o Fronts, where warm air collides with cold air and rises over the dome of cold air; and o Upper-level low pressure troughs. A snowstorm is an example of a winter storm. A snowstorm occurs when a mass of very cold air moves away from the polar region and collides with a warm air mass. The warm air rises quickly and the cold air cuts underneath it, causing huge cloud banks to form. As the ice crystals within the cloud collide, snow is formed. However, snow will only fall from the cloud if the temperature of the air between the bottom of the cloud and the ground is below 40 degrees Fahrenheit. A higher temperature will cause the snowflakes to melt as they fall through the air, turning them into rain or sleet. Like ice storms, the effects from a snowstorm can disturb a community for a prolonged period of time. Buildings and trees can collapse under the weight of heavy snow. Drifting snow is the uneven distribution of snowfall and snow depth caused by strong surface winds. Drifting snow may occur during or after a snowfall. *Duration of Winter – Raven (Yéil) went into the groundhog's house, who goes underground in September. After staying a while, Raven could not get out his hole. Groundhog had six toes, so he had to stay in the ground for six months, the duration of winter. To exit, Raven pulled off one of groundhog's toes. This is why winter is five months and groundhogs have five toes.*
Extreme Cold	Extreme cold is generally defined as a prolonged period of excessively cold weather. Extreme cold conditions are often, but not always, part of winter storms. In Alaska, extreme cold usually involves temperatures between -20 to -50°F or more. Criteria for extreme cold was updated in 2024 across the state based on local climatology. For Juneau (Dzantik'i Héeni), extreme cold warnings start at apparent temperatures (with or without wind) of -20F.
Freezing Rain and Ice Storm	Freezing rain and ice storms occur when the layer of freezing air is so thin that the raindrops do not have enough time to freeze before reaching the ground. Instead, the water freezes on contact with the surface, creating a coating of ice on whatever surface the raindrops contact.

<table>
<tr><th>Severe Weather Event</th><th>Nature of the Event</th></tr>
<tr><td>Drought</td><td>
A drought is a period of time when an area or region experiences below-normal precipitation. Droughts may range in severity but have many effects on the surrounding land and weather conditions. Droughts threaten people's livelihoods and can result in a water shortage, poor quality drinking water, poor air quality, loss or destruction of aquatic habitat, loss of vegetation or crops, and an increase in infectious diseases. Droughts are a slow-onset hazard and can last weeks, months, or even years. Because of the possible long duration of droughts, the impacts may last for years and can ripple through a community over time.

Drought conditions are classified in categories, which are described below:

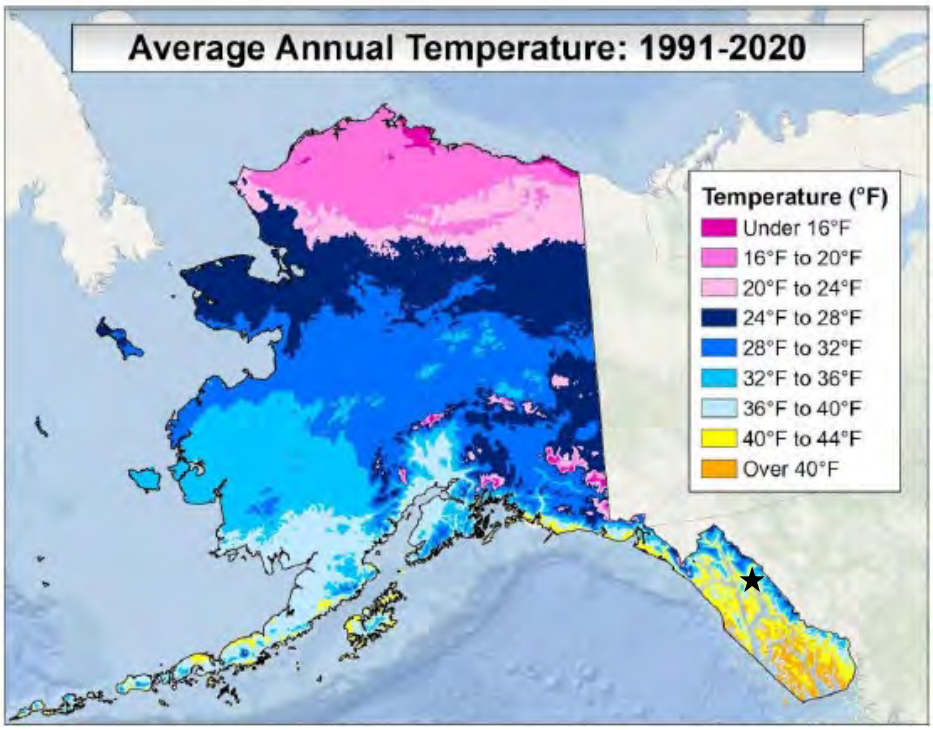
Table 15- Classifications of Drought Conditions
<table>
<tr><th>Category</th><th>Description</th><th>Possible Impacts</th></tr>
<tr><td>D0</td><td>Abnormally Dry</td><td>Going into drought:
Short-term dryness slowing planting, growth of crops or pastures
Coming out of drought:
Some lingering water deficits
Pastures or crops not fully recovered</td></tr>
<tr><td>D1</td><td>Moderate Drought</td><td>Some damages to crops, pastures
Streams, reservoirs, or wells low, some water shortages developing or imminent
Voluntary water-use restrictions requested</td></tr>
<tr><td>D2</td><td>Severe Drought</td><td>Crop or pasture losses likely
Water shortages common
Water restrictions imposed</td></tr>
<tr><td>D3</td><td>Extreme Drought</td><td>Major crop/pasture losses
Widespread water shortages or restrictions</td></tr>
<tr><td>D4</td><td>Exceptional Drought</td><td>Exceptional and widespread crop/pasture losses
Shortages of water in reservoirs, streams, and wells creating water emergencies</td></tr>
</table>
Source: U.S. Drought Monitor (USDM) 2025
</td></tr>
<tr><td>Extreme Atmospheric Heat</td><td>Extreme atmospheric heat, or extreme heat, is a prolonged period of unusually hot weather, often accompanied by high humidity, that can potentially harm human health and disrupt systems like infrastructure and ecosystems. Extreme atmospheric heat is defined differently based on geography. For example, while summertime temperatures of 100F might be normal in Pheonix, Arizona, those temperatures would be considered extreme heat in Southeast Alaska. While there is no definitive temperature that qualifies as "extreme atmospheric heat", NOAA has a temperature threshold of 80F in Southeast Alaska that would prompt a Heat Advisory (NWS 2025).</td></tr>
</table>



Source: NOAA 2023a

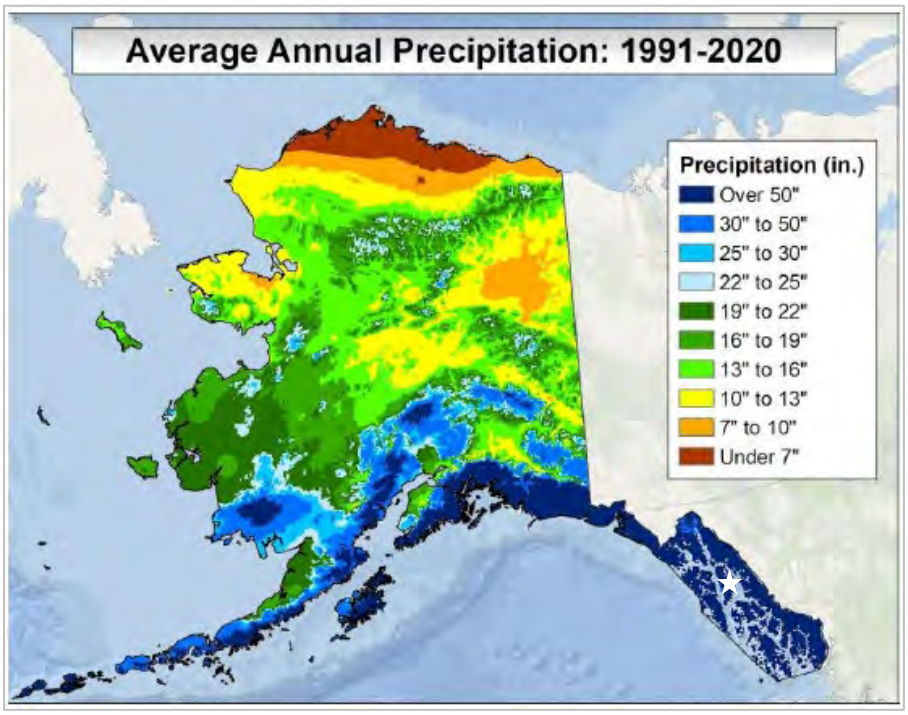
Figure 17- The Science Behind Atmospheric Rivers

Figure 18 shows Alaska's average annual temperature from 1991-2020 and Figure 19 shows Alaska's average annual precipitation from 1991-2020. These datasets are updated every 10 years.



Source: NOAA NCEI Gridded Normals

Figure 18- Alaska Average Annual Temperature 1991-2020



Source: NOAA NCEI Gridded Normals

Figure 19- Alaska Average Annual Precipitation 1991-2020

3.3.2.2 Location

The entire Planning Area experiences periodic severe weather impacts.

The Planning Area is historically impacted by severe weather events due to their location within a maritime climate area, which is characterized by cool summers, mild winters, and heavy year-round precipitation. This type of climate is typical of the southeastern and southern coastal areas of Alaska where the ocean exerts a modifying influence and causes relatively low seasonal and diurnal temperature variations.

Southeast Alaska (Aani) receives some of the heaviest precipitation in the state- using the new climate normal (1991-2020) the Juneau Airport averages 66.99 inches of rainfall annually, while Downtown Juneau averages 89.59 inches annually. The distance between Downtown Juneau and the Juneau Airport is 8.2 miles, and Downtown Juneau is tucked between the Coastal Mountains (Shaa) and Douglas Island (Deishú Áak'w). The Juneau International Airport (JIA) sits north of Douglas Island, more exposed to the ocean and prevailing winds. The large discrepancy between rainfall totals can be attributed to storms being able to more freely move across JIA, while storms are more likely to "sit" on top of Downtown Juneau and release more precipitation. Record rainfall at the Juneau airport was 4.93 inches in 24 hours on December 1, 2020 (xmacis NWS 2025).

Taku Winds are a phenomenon unique to the Planning area. The wind waves are created when offshore oriented pressure systems move over the Juneau Icefield and free fall over the Coast mountains into stable air above Gastineau Channel. These conditions create severe high wind events.

3.3.2.3 History

Severe weather like heavy rain, atmospheric rivers, and high wind is a relatively common occurrence in the Planning Area.

The Planning Area received its first ever severe thunderstorm warning on June 16, 2025. What began as a sunny afternoon in the planning area quickly escalated into a severe storm, with the sky darkening, heavy rain pouring down, and winds up to 60 mph (KTOO 2025). The National Weather Service identified the primary storm structure as a squall line, which is a line of thunderstorms often accompanied by strong, gusty winds and heavy precipitation (NWS 2025). Once the squall line reached the planning area, the accompanied wind gusts resulted in minor damage across the community, with the most significant occurring at the AJ Dock. The strong winds caused a cruise ship to break free from the dock after several of its mooring lines snapped under the pressure from the storm. After the winds subsided, the vessel was able to dock again without causing any damage to infrastructure (KTOO 2025). In the midst of the squall, a strong whirlwind known as a gustnado was observed near Juneau International Airport. A gustnado is defined as a small whirlwind that forms along thunderstorm outflows (NWS 2025). There has been no reported damage as result of the gustnado.

Source: Fox Weather 2025

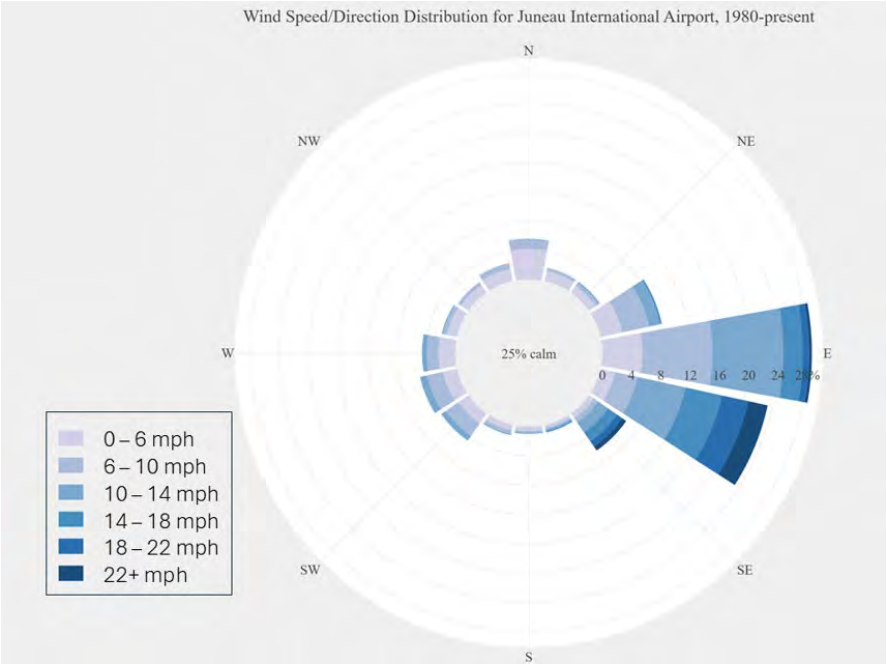
Figure 20- A Visible Gustnado Crossing Egan Drive During the 6/16/2025 Squall Line Event

See Appendix F for a detailed history of severe weather events in the planning area, as well as graphics that depict historic atmospheric data.

3.3.2.4 Extent (Magnitude and Severity)

Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida are vulnerable to the impacts from severe weather. The extent (magnitude and severity) of each severe weather event is listed below.

Severe Weather Event	Extent (Magnitude and Severity) of the Event
Heavy Rain	Heavy rain can cause flooding, overwhelm storm drains and culverts, and trigger landslides. The Planning Area receives 54 inches of precipitation annually at the airport, and 90 inches of precipitation in downtown annually, on average (NWS 2025). The Planning Area received a record annual precipitation of 88.31 inches in 2022, recorded at the JIA (KTOO 2023). Based on past events and the criteria identified in Table 10, the magnitude and severity of heavy rain in the Planning Area is considered **Critical**, where injuries and/or illnesses could result in permanent disability; with potential for critical facilities to be shut down for more than two weeks, and more than 25% of property would be severely damaged.
Atmospheric River	Due to its location on the western side of the North American continent, SE Alaska (including Juneau and Traditional Lands of Tlingit & Haida) is often the target for powerful ocean storms that form over the western and central Pacific Ocean and move eastward, steered by the prevailing westerly upper-level jet stream. These powerful low-pressure systems often have strong fronts associated with them. Fronts act like a conduit to channel warm, moist air northward and eastward ahead of the low-pressure system in what is called the "warm conveyor belt" (NOAA 2025). The strongest fronts are also regions of strong winds in the lower portions of the atmosphere. The stronger the winds, the more moisture that can be transported. If the lower-level winds blow from a southerly or southwesterly direction, they are also perpendicular to the steep terrain of SE Alaska. As this happens, the warm moist air is forced to rise, and rainfall amounts are enhanced. These fronts often slow down or even stall over the eastern Gulf of Alaska as they encounter the

Severe Weather Event	Extent (Magnitude and Severity) of the Event
	higher terrain to the east. This can cause the duration of the heavy rainfall to be extended to a many as 1 to 3 days (NOAA 2025). Atmospheric rivers are typically long, narrow plumes of enhanced atmospheric water vapor. They are identified and observed via integrated water vapor in satellite imagery and result in rainfall amounts of 2-9 inches, with some rates of >0.30 inches per hour or 3-6 inches per day. Often accompanying atmospheric rivers are high winds, which can add further damage by loosening trees in saturation-compromised soils and starting a cascading effect downslope from a windfall. The impacts of atmospheric rivers are exacerbated if they arrive onto already saturated soils, as is often the case in the Planning Area, especially in the fall season, or onto existing snowpack that can quickly melt when in contact with the warmer rainfall, a process that increases the amount of surface runoff, intensifies flooding, and increases the risk of landslides (ACRC 2022). Based on past events and the criteria identified in Table 10, the magnitude and severity of atmospheric rivers in the Planning Area are considered **Critical**, where injuries and/or illnesses could result in permanent disability; with potential for critical facilities to be shut down for more than two weeks, and more than 25% of property would be severely damaged.
High Winds	The Planning Area experiences severe storm conditions with wind speeds and gusts exceeding 70 mph. Figure 21 shows annual wind speed and direction distribution at the JIA from 1980-current. • Spokes in the rose point in the compass direction from which the wind was blowing (i.e., a spoke pointing to the right denotes a wind from the east). • Colors within each spoke denote frequencies of wind speed occurrence. • Size of the center hole indicates the % of calm winds.  Source: UAF/SNAP 2025b- Airport Winds **Figure 21- Annual Wind Speed/Direction Distribution in Juneau and Traditional Lands of Tlingit & Haida, 1980-Present** Based on past events and the criteria identified in Table 10, the magnitude and severity of high winds in the Planning Area is considered **Critical**, where injuries and/or illnesses could result in

Severe Weather Event	Extent (Magnitude and Severity) of the Event
	permanent disability; with potential for critical facilities to be shut down for more than two weeks, and more than 25% of property would be severely damaged.
Thunderstorm (Lightning, Hail)	The thunderstorms that occur in the Planning Area are usually the single-cell or "pulse" variety. They usually develop due to a combination of atmospheric instability and moisture triggered by surface heating from the sun. These storms generally last only 20-30 minutes and do not usually produce severe weather. The magnitude and severity of these thunderstorms is relatively mild in the Planning Area, partly due to the presence of an ice field that lies between the Planning Area and British Columbia, Canada. When a thunderstorm enters an ice field, the heat source of the storm gets cooled down, which causes the thunderstorm to slowly dissipate (APM 2024). Based on past events and the criteria identified in Table 10, the magnitude and severity of thunderstorms in the Planning Area is considered **Limited**, with potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.
Dense Fog	The JIA is located at the edge of a wetland, so it increases its chances of having a dense fog event. In a 30-year period, JIA received an average of 20.6 days of dense fog, according to the National Weather Service. Between August and December, there is an average of 12.3 days with less than a quarter mile of visibility due to dense fog. Based on past events and the criteria identified in Table 10, the magnitude and severity of dense fog in the Planning Area is considered **Limited**, with potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.
Heavy Snow	The Planning Area average 93.2 inches of snowfall per year. 10+ inches of snow have fallen within several hours in the Planning Area. Winter storms are common in Juneau and Traditional Lands of Tlingit & Haida. Since 2011, 35 winter storms have been recorded in the Planning Area. These winter storms have resulted in over 12 inches of snow accumulation over the span of a day, snow and rain mix which caused the existing snow to become compacted and difficult to remove, and overall increased snow removal costs including machinery and labor. Drifting snow has occurred in the Planning Area during severe storm events with snowfall and accompanying high winds. Based on past events and the criteria identified in Table 10, the magnitude and severity of heavy snow in the Planning Area is considered **Limited**, with potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.
Extreme Cold	The lowest temperature in the Planning Area was recorded in January 1972, when temperatures reached as low as -22ºF. The average annual low temperature in the Planning Area is 24ºF, which shows the rarity of extreme cold events in the area. Much of Southeast Alaska is in a temperate rainforest, which explains the abundance of rainfall and the mild temperature ranges year-round (NOAA 2025). Based on past events and the criteria identified in Table 10, the magnitude and severity of extreme cold in the Planning Area is considered **Limited**, with potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.

Severe Weather Event	Extent (Magnitude and Severity) of the Event
Freezing Rain and Ice Storm	Freezing rain and ice storms are not commonly reported in the Planning Area, but they have historically occurred. Reports range from one to five tenths of an inch of freezing rain and ice accumulating on the Planning Area's roads during previous occurrences. Based on past events and the criteria identified in Table 10, the magnitude and severity of freezing rain and ice storms in the Planning Area is considered **Limited**, with potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.
Drought	Although Southeast Alaska is one of the rainiest areas in North America, it was plagued by drought from October 2016 to December 2019. An "extreme drought" was declared by the U.S. Drought Monitor in summer 2019. This drought intensified to a D3 during the week of August 27, 2019, and affected 1.5% of Alaskan land (USDM 2025). During this drought period, the Planning Area received 4 consecutive daily record high temperatures, which contributed to the high evaporation in Southeast Alaska (UAF IARC 2023). 2018 was the dryest year in the Planning Area, with the lowest amount of precipitation. The Planning Area also saw a decrease in mountain snowpack during spring 2018 and 2019, which can contribute to lower water levels and increased stream temperatures when the snow melts (UAF IARC 2023). Based on past events and the criteria identified in Table 10, the magnitude and severity of droughts in the Planning Area is considered **Limited**, with potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.
Extreme Atmospheric Heat	Extreme atmospheric heat, while currently rare in the Planning Area, can have a significant impact on the community. Hotter than normal temperatures can lead to dry conditions, leaving forests at higher risk of a fire hazard. Prolonged periods of extreme heat can also accelerate the rate of glacial recession, causing secondary impacts such as glacial lake outburst floods, increased erosion, and diminished water quality. Extreme heat can also negatively affect wildlife, specifically anadromous fish (Yáat) who require cold water when growing and spawning in freshwater. (ACRC 2022).

Based on past severe weather events and the criteria identified in Table 10, the magnitude and severity of overall severe weather in the Planning Area is considered Limited to Critical, where injuries and/or illnesses could result in temporary to permanent disability; with potential for critical facilities to be shut down for more than a week, and 10-25% of property would be severely damaged.

3.3.2.5 Impact

The impacts of various historical severe weather events in the Planning Area are described below.

Severe Weather Event	Impact of the Event
Heavy Rain	The potential impacts of heavy rain include shoreline/bank destabilization and an increased flood risk. Floods onset from heavy rain can result in road washouts, injuries/loss of life, or drowning. Impacts from heavy rain in the Planning Area have included localized flooding of local rivers and streams, as well as triggering landslides by saturating soil. Beneficial impacts of large quantities of rain is that they also contribute increases in snowpack (NOAA 2025).

Severe Weather Event	Impact of the Event
Atmospheric River	Extreme precipitation in Southeast Alaska is more likely during atmospheric rivers with south-southwesterly moisture transport (Nash et al. 2024). Extreme precipitation events associated with atmospheric rivers trigger floods, landslides, and avalanches that threaten lives and livelihoods in Southeast Alaska (Nash et al. 2024). Not all atmospheric rivers cause damage; most are weak systems that often provide beneficial rain or snow that is crucial to the water supply. Atmospheric rivers are a key feature in the global water cycle and are closely tied to both water supply and flood risks (NOAA 2025). In the Planning Area, during the December 2020 atmospheric river event, there was extensive flooding, debris flows, and property damage in the communities of Mountainside, Twin Lakes, Glacier Highway near downtown, and in the Salmon Creek (ýáat héen) watershed, where a landslide damaged the pipeline that supplies water to the DiPAC (Macauley) salmon hatchery, resulting in the destruction of thousands of rearing fish (Yáat) (ACRC 2022). Source: UAF GI (2022). Photo Credit: Aaron Jacobs **Figure 22- Flooding near Jordan Creek following an Atmospheric River Event (December 2020)**
High Winds	High winds can result in downed trees and power lines, flying debris, transportation disruptions, damage to buildings, damage to vehicles, and injury or death. High winds can cause power outages, resulting in lack of heating, running water, refrigeration loss, and damage to water infrastructure, electronics and/or medical equipment. Impacts from high winds in the Planning Area have included loss of utilities, downed trees, damage to buildings and residences, and damage to the JIA. Taku Wind events have resulted in the following impacts: - December 2-3, 2007: 74 mph winds that produced freezing spray in Douglas Harbor. - January 11-17, 2011: 80+ mph winds that broke wind shields, overturned trailered boats, damaged infrastructure. - October 21, 2012: 67 mph winds that blew down trees and cut off power to over 2,000 Douglas and West Juneau residents. - May 2, 2014: 72 mph winds that caused minor damage to Douglas boat harbor.

Severe Weather Event	Impact of the Event
	- January 2-4, 2015: 70 mph winds that damaged car windows, caused power outages, and tore off house siding in Mendenhall Valley. - January 31, 2015: 80 mph winds that overturned bleachers, broke windows, and moved 15,000-pound gangway in Douglas Harbor parking lot. - June 16, 2025: A gustnado resulted from the squall line resulted in blowing a cruise ship off the dock into the channel.
Thunderstorm (Lightning, Hail)	Though these storms often catch people by surprise and pose a lightning threat, winds are often less than 50 mph. These wind gusts can still pose a hazard to aircraft but thunderstorms in the Planning Area simply are not tall enough to generate high winds. A much more common impact of thunderstorm activity in Alaska is wildfire. As wildfire danger rises, lightning strikes will become a more significant concern in Southeast Alaska.
Dense Fog	Dense fog events can create hazardous situations throughout Southeast Alaska. In the Planning Area, air travel can be interrupted by low visibility due to dense fog, which can result in the delay or cancellation of commercial flights. JIA has had to put numerous flights in a weather hold due to dense fog in the past. When a dense fog event creates poor visibility, driving and boating may become hazardous as well.
Heavy Snow	Heavy snow can impact a community by halting transportation in and out of a community. Until the snow can be removed, roadways and airports are impacted, even closed completely. With these services out of commission, supplies are not able to be brought into the community, and emergency and medical services are halted. Excess weight from accumulated snow on roofs, trees, and powerlines can cause them to collapse. Heavy snow can also damage light aircraft and cause small boats to sink. Once temperatures reach above freezing, the heavy snow will begin to thaw and can cause substantial flooding. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on the community. Heavy snow (Dleit çéedi) can lead to injury or death because of vehicle accidents. Other causalities can occur due to hypothermia caused by prolonged exposure to cold weather or overexertion while shoveling snow. Impacts from heavy snow in the Planning Area have included structural damages to buildings including the Juneau Clinic, dangerous road conditions, loss of utilities, snow removal, and have resulted in disaster declarations. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts. On January 9, 2022, there was damage to multiple commercial structures in the Planning Area due to snow loading. New snow from the storm was estimated to be at least an additional 2 feet leading to snow depths around 5-6 feet across the area. In 2024, two boats were sunk in the harbor after heavy snows followed by rain engulfed the boats and made travel to and around the harbor difficult to impossible. At least one boat house also collapsed on top of the boat it was protecting. A winter storm can last a few hours or several days, cut off utilities, and put older adults, children, sick individuals, and pets at greater risk. Winter storms create a higher risk of car accidents, hypothermia, frostbite, carbon monoxide poisoning, and heart attacks from overexertion. Winter storms can also cause property damage. Some impacts to homes and other infrastructure may include roof damage or collapse, water damage from frozen or broken pipes, and damage to building foundations.

Severe Weather Event	Impact of the Event
	Impacts from winter storms in the Planning Area have included loss of visibility, loss of utilities, snow load considerations, school closures, damage to critical facilities and infrastructure, and hindered snow removal efforts. While not common in Juneau (other than in Downtown Juneau during Taku Wind events), blowing and drifting snow can reduce visibility while driving. The combination of near-zero visibility and drifting snow can cause unexpected travel difficulties and accidents in remote areas during dangerously cold winter weather situations. Impacts from drifting snow in the Planning Area have included loss of visibility and dangerous road conditions.

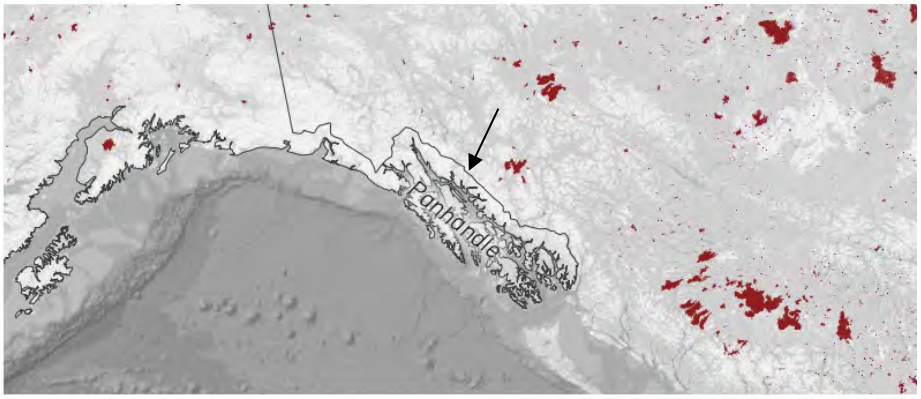
Source: APM 2024

Figure 23- Heavy Snow Sinking Boat (2024)

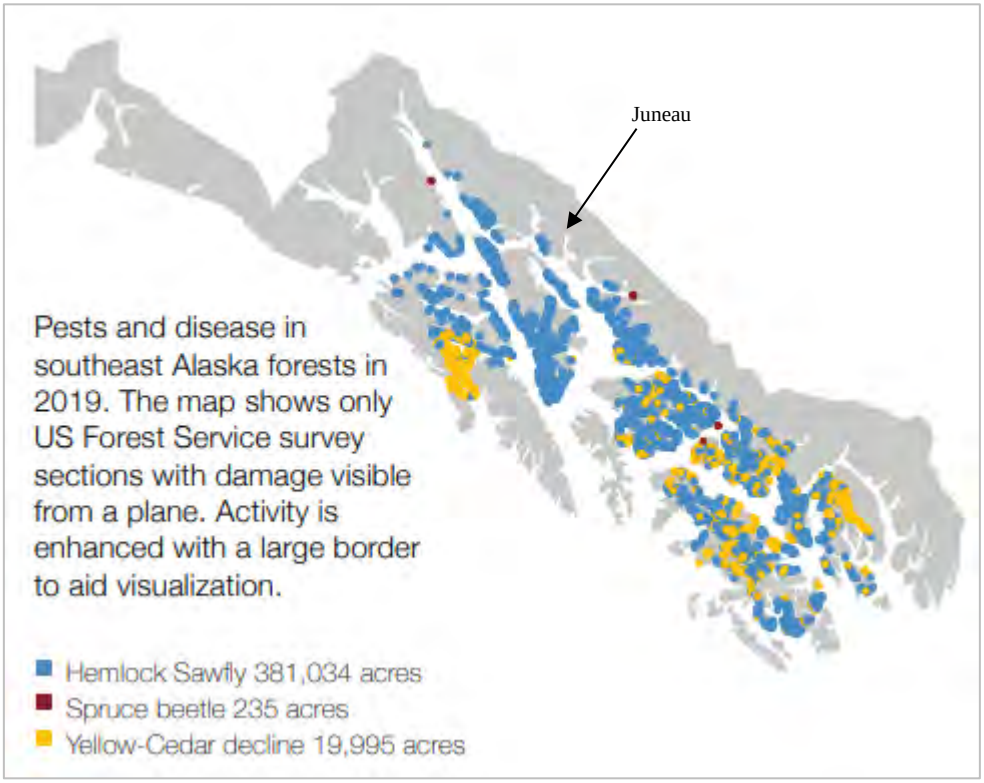
Source: PYB 2024

Figure 24- Heavy Snow Collapses Shelter on a Boat

Severe Weather Event	Impact of the Event
	 Source: KTOO 2024 **Figure 25- Low Visibility in Juneau and Traditional Lands of Tlingit & Haida due to Blizzard Conditions (2024)**
Extreme Cold	Since extreme cold events in the Planning Area are rare, so are its historical impacts. Still, it's important to identify the potential impacts an extreme cold event can have on Juneau and Traditional Lands of Tlingit & Haida in case of an occurrence. Extreme cold can impact a community by disrupting the flow of transportation within the community. With extreme cold temperatures, comes ice fog, which may ground an aircraft carrying supplies until conditions improve. Prolonged periods of cold in some areas can cause large bodies of water to freeze, disrupting shipping and increasing the likelihood of ice jams and associated flooding. Juneau has experienced harbor ice skimming during prolonged cold snaps; however ice jams have not been recorded. While Alaskans have engineered ways to stay warm during extreme cold, infrastructure can only withstand and function within a certain temperature range. Extreme cold can cause electric generation to malfunction or cause fuel to congeal in supply lines and storage tanks. Without electricity, heaters and furnaces do not work, and water/sewage pipes can freeze or rupture. A combination of extreme cold and little to no snow cover, increases the ground's frost depth, which can disturb pipes beneath the ground. While extreme cold can impact a community's infrastructure, the greatest danger from extreme cold is its impact on humans. Prolonged exposure to extreme cold can cause frostbite or hypothermia and become life-threatening very quickly. Infants and elderly people are most susceptible to these conditions. Carbon monoxide poisoning is another threat as people use supplemental heating devices without proper ventilation.
Freezing Rain and Ice Storm	Ice accumulations can damage trees, utility poles, and communication towers. Ice on communication towers can disrupt transportation, power, and communications within the

Severe Weather Event	Impact of the Event
	community. Ice storms are often the cause of automobile accidents, power outages, and personal injury. Impacts from freezing rain and ice storms in the Planning Area have included loss of utilities, automobile accidents, and slippery walking conditions.
Drought	Droughts can severely impact a community by causing shortages in safe drinking water, reducing air quality by increasing the risk of wildfires and dust storms, increasing the potential of illness and disease, and increasing economic burdens. Droughts can also impact the environment by reducing soil quality for vegetation, reduction or degradation of fish and wildlife habitat, and lowering the water level of lakes, ponds, or reservoirs which can hinder salmon spawning abilities. Lakes and reservoirs across southeast reached record lows during the 2016–2019 drought. Juneau and Traditional Lands of Tlingit & Haida is in a rainforest that is built for precipitation, so a long period of decreased precipitation can strain local reservoirs. Low water levels in Crater and Long Lake forced the Snettisham Hydroelectric Facility to disconnect power to large users like Greens Creek Mine. Warm water and low stream flows in 2019 kept salmon in deeper, cooler offshore waters and delayed their movement into streams to spawn. Due to insufficient cool water, the Macaulay Salmon Hatchery released some salmon fry months early out to salt water. These salmon impacts were much less severe than other parts of Alaska where 2019's unprecedentedly warm river and ocean surface waters caused massive die-offs (UAF-IARC 2023). On June 27, 2019, there was a statewide ban of purchasing fireworks due to the high to very high fire danger because of hot, dry weather. At the time, there were 130 active wildfires burning 273,521 acres across the state (USDM 2023). Figure 26 shows wildfires surrounding southeast Alaska during the extreme drought summers from 2016-2019. Several large fires especially in Yukon and British Columbia sent smoke into southeast Alaska.  Source: Hoell et al. 2022 **Figure 26- Wildfires Surrounding SE Alaska During the Drought of Summers 2016-2019** Additionally, the 2016-2019 SE Alaska drought caused outbreaks of bugs and invasive species (Figure 27) (UAF-IARC 2022b). A hemlock sawfly outbreak across southeast Alaska began in 2018, ultimately defoliating 530,000 acres of forest. The warm and dry conditions in 2018 and 2019 were indirectly tied to the outbreak. Sawfly are always present in southeast, but in normal, cool, and wet summers, fungal diseases keep sawfly numbers down. The drought limited this fungal growth, allowing sawfly larval populations to grow to outbreak status (UAF-IARC 2022b).

Severe Weather Event	Impact of the Event



Source: UAF-IARC 2022b

Figure 27- Bug Outbreaks in SE Alaska During the 2016-2019 Drought

Extreme Atmospheric Heat

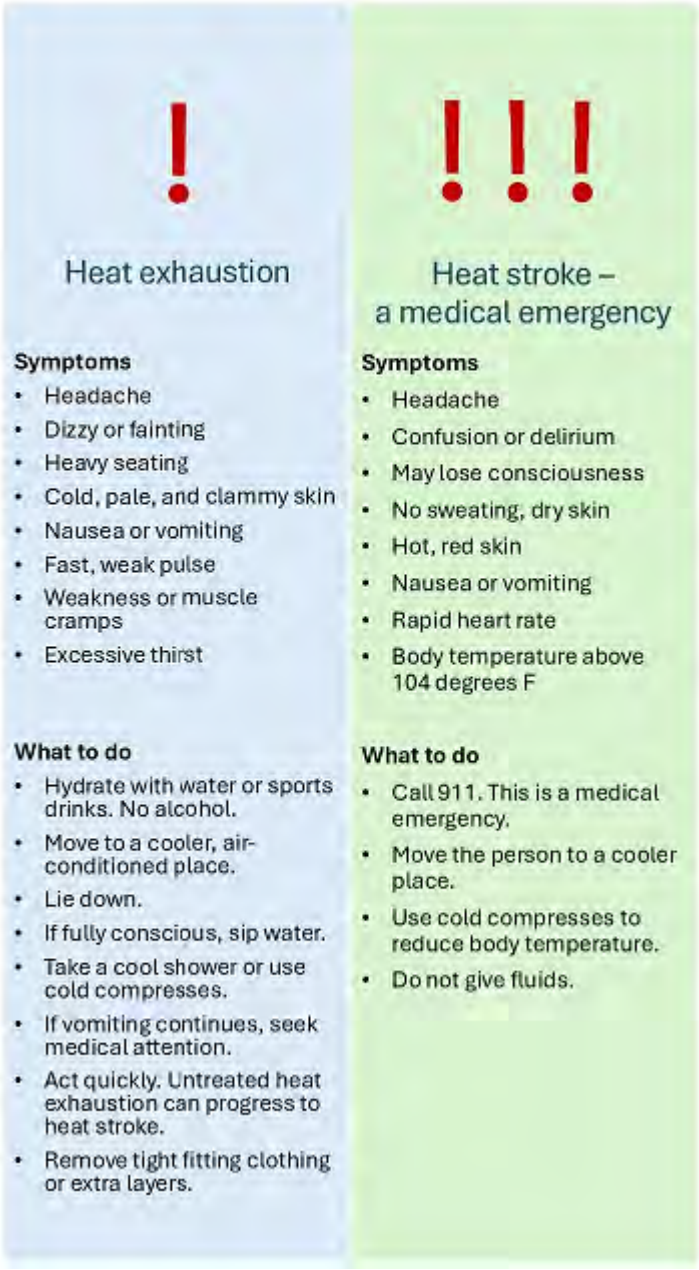
The impacts of extreme heat in Juneau are diverse. Extreme heat could rapidly melt snow and glacial ice which can result in increased wildfire risk later in the year. Reducing the amount of meltwater throughout the spring, summer, and fall can also result in less potential for hydroelectric power generation. A lack of water to generate hydroelectric power would cause CBJ to resort to more expensive, polluting diesel generators to supply the local energy grid. The 2016-2019 drought and its cumulative effects (including warmer than usual temperatures) reduced some reservoir levels too low to generate hydroelectric power (ACRC 2022). This impact in the future could be felt by Juneau even harder due to several key hydroelectric generators not being the traditional dam-reservoir system, but turbines placed in moving water systems. If meltwater is flowing down the mountain (Shaa) at a faster rate than normal due to high temperatures, the risk of the water body drying out or flows weakening to a point of not generating electricity later in the summer or fall increases.

Extreme heat can also impact humans in Juneau. High temperatures that are not common can catch the public off guard. Exposure to extreme heat can result in heat exhaustion, dehydration, and heat stroke. Vulnerable populations are likely to be impacted more severely. Medical centers may become overwhelmed during extended extreme heat events, risking loss of life in the community.

1 in 7 homes in Juneau have a heat pump, which is a greater percentage of homes that have air conditioning capabilities than Alaska as a whole, extreme heat still has the potential to impact 6/7 households in Juneau (EJ 2023). This could cause strain on community resources as the majority of the population retreats to available cooling centers.

The warming of fresh water due to extreme heat can impact salmon and trout. Beyond the detrimental effects on the fish, these conditions can limit both sport, guided, and subsistence

Severe Weather Event	Impact of the Event
	fisheries, costing Juneau residents money, enjoyment of recreation activities, and historical use of natural resources.



Source: Beaumont 2025

Figure 28- Heat Stroke vs Heat Exhaustion

Air Transportation Impacts	Impacts to air transportation associated with severe weather are the potential for delayed takeoffs or inability to land aircraft due to large accumulations of snow on runways, high winds making air travel dangerous, dense fog limiting visibility, icing of aircraft. Before aircraft transportation could resume, snow would have to be removed from the runways, the fog would have to dissipate, winds would have to relent, and aircraft would have to be properly de-iced.

3.3.2.6 Probability of Future Events

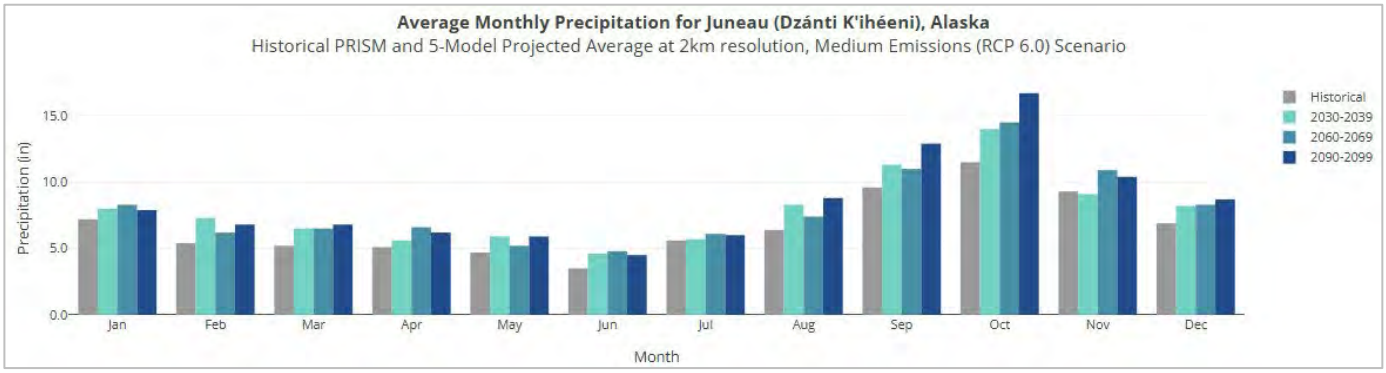
Severe Weather Event	Probability of the Event
Heavy Rain	Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a heavy rain event within the calendar year; there is a 1 in 1 year chance of occurring (1/1=100%); and the history of events is greater than 33% likely per year.
Atmospheric River	Based on previous occurrences and the criteria identified in Table 11, it is Likely that the Planning Area will experience an atmospheric river event in the next three years; there is a 1 in 3 years chance of occurring (1/3=33%); and the history of events is greater than 20% but less than or equal to 33% likely per year.
High Winds	Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a high wind event within the calendar year; there is a 1 in 1 year chance of occurring (1/1=100%); and the history of events is greater than 33% likely per year.
Thunderstorm (Lightning, Hail)	Based on previous occurrences and the criteria identified in Table 11, it is Likely that the Planning Area will experience a thunderstorm event in the next three years; there is a 1 in 3 years chance of occurring (1/3=33%); and the history of events is greater than 20% but less than or equal to 33% likely per year.
Dense Fog	Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a dense fog event within the calendar year; there is a 1 in 1 year chance of occurring (1/1=100%); and the history of events is greater than 33% likely per year.
Heavy Snow	Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a heavy snow event within the calendar year; there is a 1 in 1 year chance of occurring (1/1=100%); and the history of events is greater than 33% likely per year.
Extreme Cold	Based on previous occurrences and the criteria identified in Table 11, it is Possible that the Planning Area will experience an extreme cold event in the next five years; there is a 1 in 5 years chance of occurring (1/5=20%); and the history of events is greater than 10% but less than or equal to 20% likely per year.
Freezing Rain and Ice Storm	Based on previous occurrences and the criteria identified in Table 11, it is Possible that the Planning Area will experience a freezing rain/ice storm event in the next five years; there is a 1 in 5 years chance of occurring (1/5=20%); and the history of events is greater than 10% but less than or equal to 20% likely per year.
Drought	Based on previous occurrences and the criteria identified in Table 11, it is Likely that the Planning Area will experience a drought event in the next three years; there is a 1 in 3 years chance of occurring (1/3=33%); and the history of events is greater than 20% but less than or equal to 33% likely per year.
Extreme Atmospheric Heat	Based on previous occurrences and the criteria identified in Table 11, it is Likely that the Planning Area will experience an extreme atmospheric heat event in the next three years; there is a 1 in 3 years chance of occurring (1/3=33%); and the history of events is greater than 20% but less than or equal to 33% likely per year.

3.3.2.7 Future Conditions

Heavy Rain	
Nature	It is unlikely that future climate conditions will influence the nature of future heavy rain events in the Planning Area.

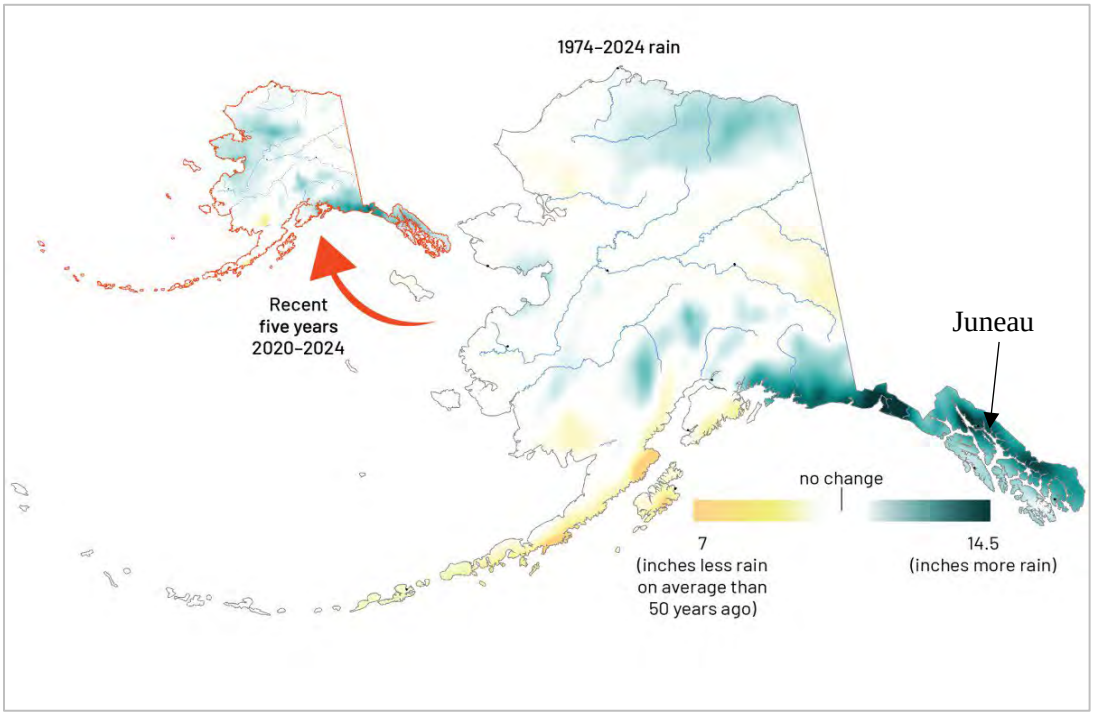
Heavy Rain	
Location	It is unlikely that future climate conditions will influence the location of future heavy rain events in the Planning Area.
Extent	It is likely future climate conditions will influence the magnitude and severity of heavy rains events in the Planning Area. Alaska has experienced an 11% increase in the amount of precipitation falling in very heavy events from 1958 to 2012 (2023 State of Alaska HMP). Extreme precipitation events have occurred throughout Alaska with increasing frequency. In the Planning Area, fall rainfall is projected to increase by 16% by the end of the century (EDS 2025). Using climate models, scientists explored whether precipitation is likely to increase, decrease, or remain the same in southeast Alaska. There likely won't be a noticeable change in the next few decades, but by 2050, precipitation may increase by as much as 14% in some areas (ACRC 2022). The change will occur in both summer and winter. Even so, there will continue to be years with less rain or snow than the past, and years with much more. See Figure 29 for historical and projected precipitation amounts for the Planning Area. Figure 34 shows the percent change in annual average precipitation from 1974–2024 in Alaska. Based on this data, the Planning Area has seen an annual increase of 10-14 inches of rain.
Impact	In the Planning Area, fall rainfall is projected to increase by 16% by the end of the century (UAF/SNAP 2025). With increased precipitation, the impact of heavy rain in the Planning Area may increase. These impacts may include increased flooding and road washouts throughout the community, as well as more landslides being triggered due to increased ground saturation. Impacts from heavy rain in the Planning Area have included localized flooding and landslides.
Probability	In the Planning Area, fall rainfall may increase by 16% in the next century (UAF/SNAP 2025a).
Population Patterns	As heavy rain events affect the entire Planning Area, it is not likely that future conditions of heavy rain will impact changes in the Planning Area population patterns.
Land Use Development	It is possible that future conditions of heavy rain will impact changes in the Planning Area land use development. An increase in frequency of heavy rains could oversaturate soil on the slopes above the Planning Area, leading to an increase in frequency and magnitude and severity of landslides. This could alter where new developments would be deemed safe and/or possible. Land use may also change due to development of landslide monitoring equipment and/or landslide barriers/diversion structures.

The University of Alaska Fairbanks's (UAF) Scenarios Network for Alaska and Arctic Planning (SNAP) depicts the Planning Area's historical and future precipitation amounts under a medium emissions (RCP 6.0) scenario (Figure 29).



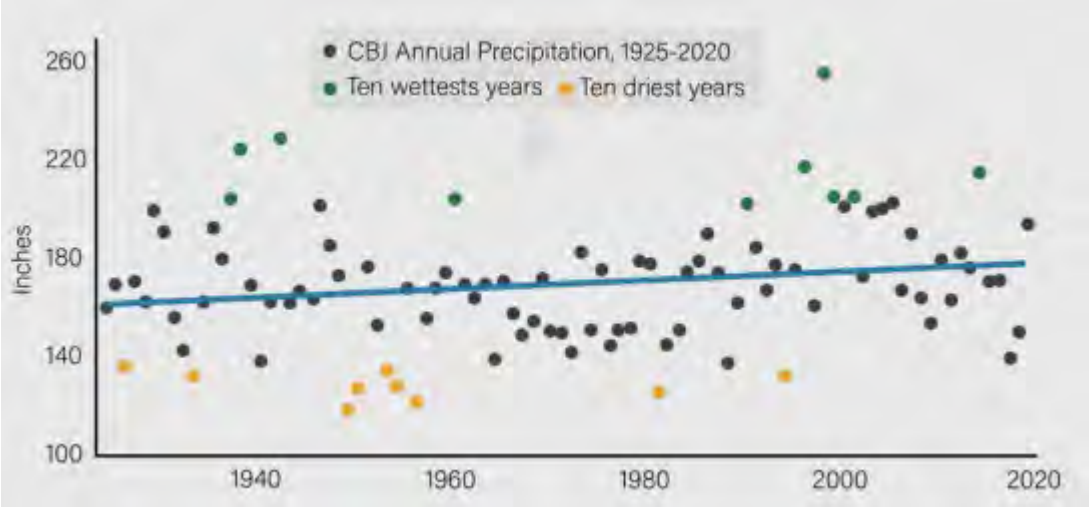
Source: UAF/SNAP 2025c- Community Climate Charts

Figure 29- Historical and Projected Precipitation Amounts for Juneau and Traditional Lands of Tlingit & Haida (Historical – 2099)



Source: ACCAP 2025

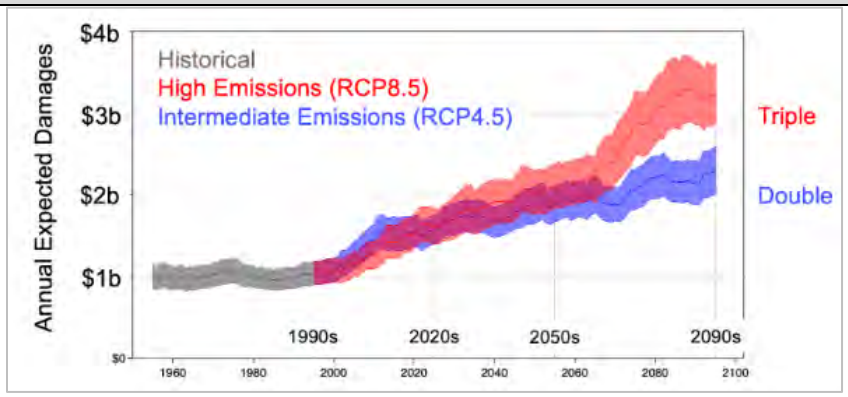
Figure 30- Percent Change in Annual Average Precipitation Statewide (1974-2024)



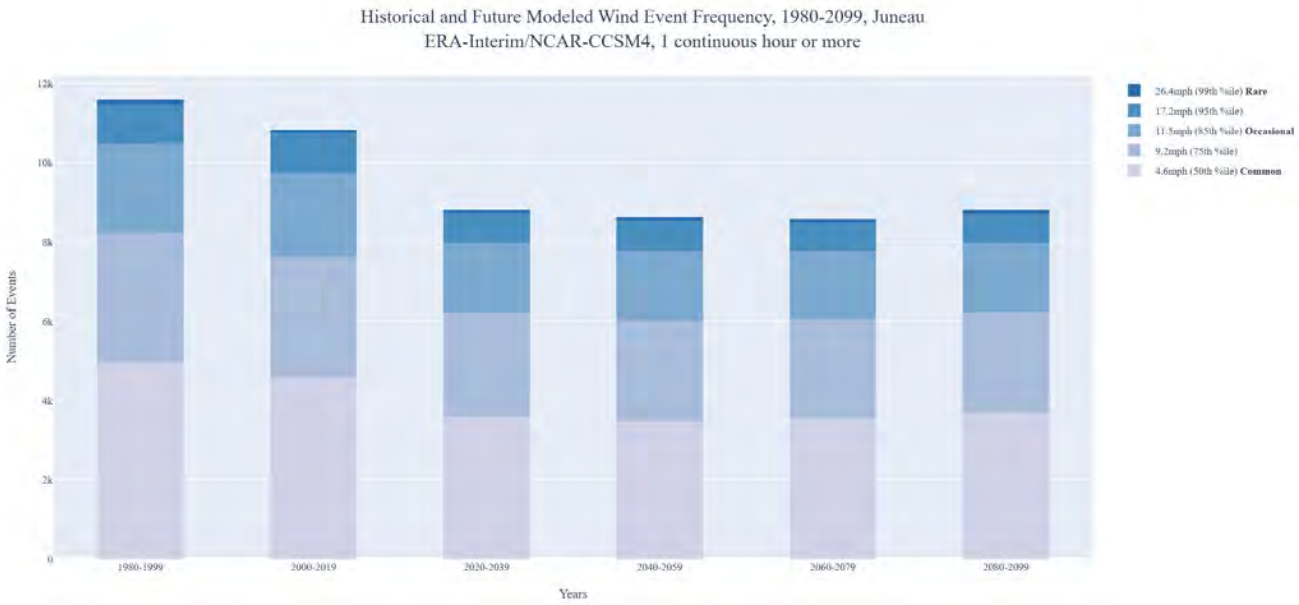
Source: Juneau Climate Report, 2022

Figure 31- Juneau and Traditional Lands of Tlingit & Haida Annual Precipitation

Atmospheric River	
Nature	It is unlikely that future climate conditions will influence the nature of future atmospheric river events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future atmospheric river events in the Planning Area.
Extent	With rising sea surface temperatures and increased vertically integrated horizontal vapor transport (IVT), atmospheric rivers are projected to increase in intensity, a process which appears to have already started (ACRC 2022). Atmospheric rivers generate most of the economic losses associated with flooding in the western United States and are projected to increase in intensity with future climate conditions. This is of concern as flood damage has been shown to increase exponentially with atmospheric river intensity (ACRC 2022).
Impact	Flood damages associated with atmospheric rivers have been found to increase exponentially with atmospheric river intensity so even a modest shift towards higher-intensity atmospheric rivers could have significant impacts on flood damages (2023 State of Alaska HMP). A research team at Scripps Institution of Oceanography at UC San Diego found that under different emission scenarios using the CMIP5 global climate model, the annual expected atmospheric river-related flood damages in the western United States could increase from $1 billion in the historical period to $2.3 billion in the 2090s under the RCP4.5 scenario or to $3.2 billion under the RCP8.5 scenario by the end of the century (Figure 32) (UCSD SIO 2022). Note: only counties in California, Nevada, Oregon, and Washington state were evaluated for this study and estimated losses were not calculated for Alaska.

Atmospheric River	
	 Source: (UCSD SIO 2022) **Figure 32- Estimated National Annual Increase in Damages from Atmospheric Rivers (1960-2100)** NOAA researchers found that models predicted increased low-elevation precipitation, but less high-elevation precipitation due to atmospheric rivers (NOAA 2023). The Planning Area sits at sea level, which is considered low elevation, therefore, may experience increased precipitation due to climate change's influence on atmospheric rivers.
Probability	NOAA researches atmospheric rivers to improve forecasting capabilities as well as to improve our understanding of atmospheric river impacts and how they may change over time with future climate conditions (NOAA 2023). NOAA's Modeling, Analysis, Predictions, and Projections (MAPP) and Climate Variability and Predictability (CVP) Programs support research to improve the capability to predict atmospheric rivers weeks to months in advance (NOAA 2023). Atmospheric rivers are natural parts of our global weather systems and could potentially begin to change in frequency due to future climate conditions (NOAA 2023). Researchers found that models predicted increased low-elevation precipitation, but less high-elevation precipitation. Studies like these, that model potential changes in atmospheric river events within the next century, are important tools for decision makers in areas where water supply might already be strained (NOAA 2023).
Population Patterns	As atmospheric river events affect the entire Planning Area, it is not likely that future conditions of atmospheric rivers will impact changes in Juneau and Traditional Lands of Tlingit & Haida population patterns.
Land Use Development	It is possible that future conditions of Atmospheric Rivers will impact changes in the Planning Area land use development. An increase in frequency or magnitude of Atmospheric rivers could oversaturate soil on the slopes above the Planning Area, leading to an increase in frequency and magnitude and severity of landslides. This could alter where new developments would be deemed safe and/or possible. Land use may also change due to the development of landslide monitoring equipment and/or landslide barriers/diversion structures.
High Wind	
Nature	It is unlikely that future climate conditions will influence the nature of future high wind events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future high wind events in the Planning Area.

High Wind	
Extent	High-wind events are projected by models to become more frequent in Alaska, with changes most noticeable in the northern and western coastal regions of Alaska (2023 State of Alaska HMP).
Impact	As high wind events are projected to increase (NOAA 2025), impacts from high wind events may increase. Impacts from high winds in the Planning Area have included loss of utilities, downed trees, damage to buildings and residences, and damage to the JIA. Taku Wind events have resulted in the following impacts: (NOAA 2025) December 2-3, 2007: 74mph winds that produced freezing spray in Douglas Harbor. January 11-17, 2011: 80+ mph winds that broke wind shields, overturned trailered boats, damaged infrastructure. October 21, 2012: 67 mph winds that blew down trees and cut off power to over 2,000 Douglas and West Juneau residents. May 2, 2014: 72 mph winds that caused minor damage to Douglas boat harbor. January 2-4, 2015: 70 mph winds that damaged car windows, caused power outages, and tore off house siding in Mendenhall Valley. January 31, 2015: 80 mph winds that overturned bleachers, broke windows, and moved 15,000-pound gangway in Douglas Harbor parking lot.
Probability	High-wind events are projected to become more frequent in the future (NOAA 2025). Figure 33 shows historical and future modeled wind frequency for the Planning Area from 1980-2099.
Population Patterns	As high wind events affect the entire Planning Area, with higher wind speeds in Downtown Juneau and Douglas, it is not likely that future conditions of high winds will impact changes in the Planning Area population patterns.
Land Use Development	It is possible that future conditions of high winds will impact changes in the Planning Area land use development. Increased land use development such as new housing developments may increase the potential of impacts from wind events due to clearing of trees, which act as natural wind breaks, and new power lines associated with increased housing will increase the potential of utility disruptions if trees are downed due to high winds. This would increase the potential for impacts to the Planning Area residents.



Source: UAF/SNAP 2025

Figure 33- Historical and Future Modeled Wind Frequency in Juneau and Traditional Lands of Tlingit & Haida, 1980-2099

Thunderstorm (Lightning, Hail)	
Nature	It is unlikely that future climate conditions will influence the nature of future thunderstorm events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future thunderstorm events in the Planning Area.
Extent	With the average annual temperature possibly increasing by about 9°F in the Planning Area by the end of the century, thunderstorms are predicted to become more frequent in southeast Alaska in the future. This is due to the increase of moisture in the air interacting with the warming temperatures (NSF 2025).
Impact	With the average annual temperature possibly increasing by about 9°F in the Planning Area by the end of the century, thunderstorms are predicted to become more frequent in southeast Alaska in the future, which could mean an increase in potential impacts as well (NSF 2021). An increase in thunderstorms increases the likelihood of lightning induced wildfire, which poses a public safety risk to the Planning Area.
Probability	As global temperatures continue to rise, thunderstorms may become more frequent in the future, due to the increase of moisture in the atmosphere from warming temperatures (NSF 2021).
Population Patterns	Due to the mild nature of thunderstorms in Southeast Alaska, thunderstorms are not anticipated to affect population patterns in the Planning Area with respect to future climate conditions.
Land Use Development	Due to the mild nature of thunderstorms in Southeast Alaska, thunderstorms are not anticipated to affect land use development in the Planning Area with respect to future climate conditions.

Dense Fog	
Nature	It is unlikely that future climate conditions will influence the nature of future fog events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future fog events in the Planning Area.
Extent	Due to a relatively low predicted future change in precipitation for Southeast Alaska in the next few decades, the magnitude and severity of dense fog events in the Planning Area should not be affected (UAF/SNAP 2025).
Impact	Due to a low change in the magnitude and severity of future dense fog events, the impact of future dense fog events is likely not going to change. Currently, dense fog events in the Planning Area create low visibility, which can interrupt air travel and make driving and boating hazardous.
Probability	Future conditions of dense fog are not anticipated to impact the probability of future dense fog events in the Planning Area, primarily due to the variability of predictive data.
Population Patterns	Future conditions of dense fog are not anticipated to affect future population patterns in the Planning Area.
Land Use Development	Future conditions of dense fog are not anticipated to affect future land use development in the Planning Area.

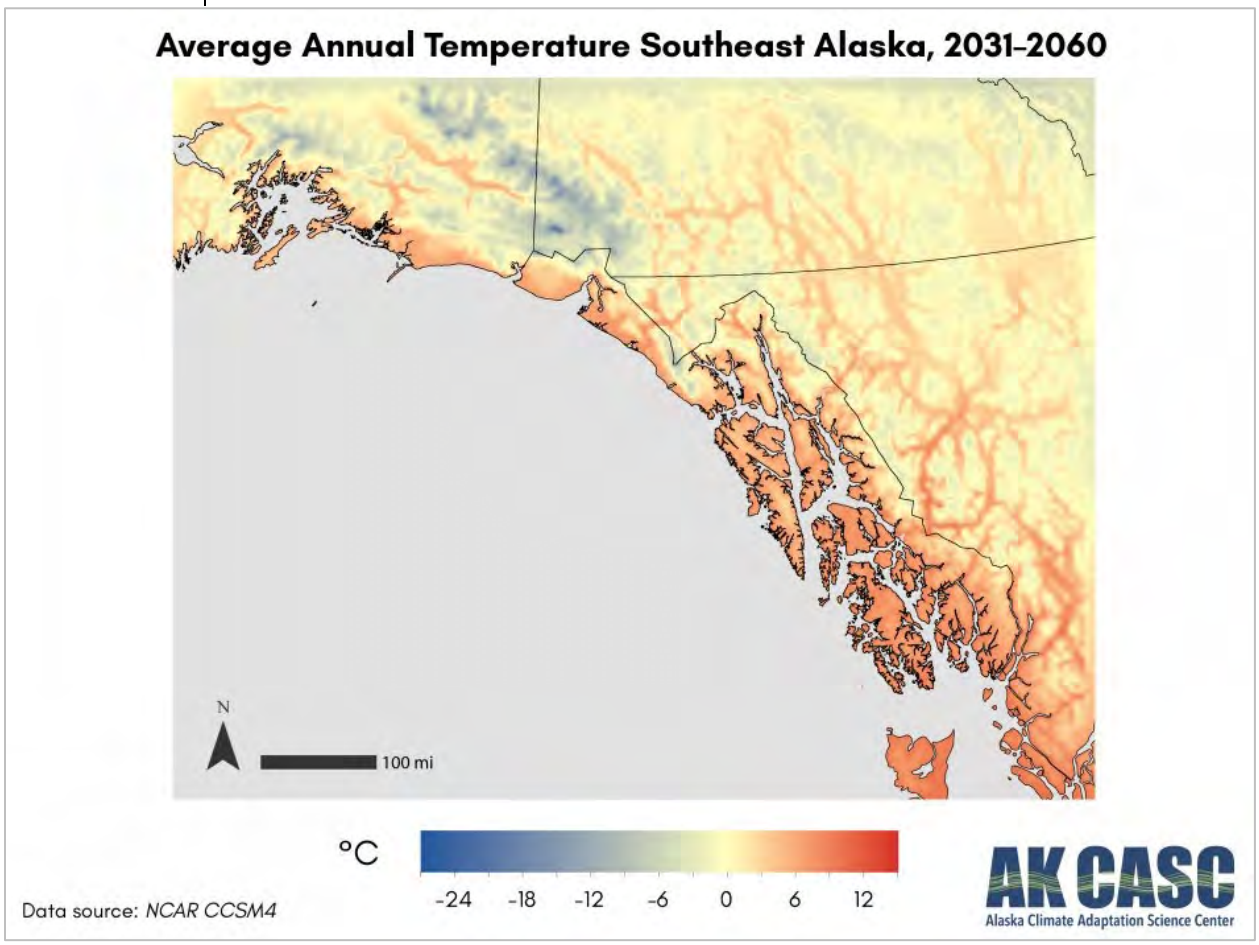
Heavy Snow	
Nature	It is unlikely that future climate conditions will influence the nature of future heavy snow events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future heavy snow events in the Planning Area.
Extent	The Planning Area experiences periodic drifting snow events that have caused snow buildup and blockages on roads, primarily in Downtown Juneau during Taku Wind events. Blowing and drifting snow in the Planning Area have caused school delays and closures. The magnitude and severity of drifting snow is partially tied to the predicted frequency of snowfall decreasing, which would decrease the opportunities for snow to drift. In southern and coastal parts of Alaska, large decreases in spring snowpack are expected by the mid-21st century, even with more winter precipitation because temperatures warm to above freezing, causing a shift from snow to rain or more melt during the winter (NPS 2020). The Planning Area experience severe storm conditions accumulating over 10-20 inches of snowfall within several hours. This could shift towards heavier rainstorms in the future due to rising temperatures, especially in the winter months. Climate scientists have suggested that warming temperatures, caused by the increase of greenhouse gases in the atmosphere, may be enabling longer and more intense cycles of droughts, floods, and winter storms (NPS 2020).
Impact	Within the next century, climatically driven changes in snow characteristics (decreasing snowfall, snowpack, and snowmelt) will affect hydrologic and ecological systems in Alaska (NPS 2020).

Heavy Snow	
	Projected future impacts are expected to reduce snowpack, while high wind events are projected to become more frequent, with the highest increases in the northern and western Alaska coastal regions (AK HMP 2023). How these factors will affect the impact of drifting snow events in the Planning Area is unknown. Impacts from reduced snowpack and less frequent snowfall will directly affect the spawning habitats for salmon. Reduced snow cover and winter precipitation in the form of snow, along with increased air temperature, are expected to increase stream water temperature (NPS 2020). During winter and spring, warmer waters could hasten development and growth of salmon eggs and fry, possibly leading to earlier life stage transitions (NPS 2020). Additionally, ecological impacts to spawning salmon from rising temperatures may be seen. During summer, warmer waters could increase physiological stress on adult salmon migrating to spawning grounds, potentially reducing spawning rates (NPS 2020). A shift from snow to rain impacts water storage capacity and surface water availability (UAF/SNAP). Juneau may have to release more water from Salmon Creek Reservoir throughout the year, which accounts for 30% of their drinking water (AELP 2025). A lack of snowpack during winter could also lead to less runoff to maintain reservoir levels throughout the summer and fall. Impacts from heavy snow in the Planning Area have included structural damage including commercial structures, residential homes, boats, boat houses, dangerous road conditions, loss of utilities, snow removal, and have resulted in disaster declarations (January 2022). The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on the Planning Area. Climate scientists have suggested that warming global temperatures may be enabling longer and more intense cycles of winter storms (NPS 2020) resulting in worsening impacts to the community. A winter storm can last a few hours or several days, cut off utilities, and put older adults, children, sick individuals, and pets are at greater risk. Winter storms create a higher risk of car accidents, hypothermia, frostbite, carbon monoxide poisoning, and heart attacks from overexertion. Future climate conditions are not likely to change any in of these impacts. Winter storms can also cause property damage. Some impacts to homes and other infrastructure may include roof damage or collapse, water damage from frozen or broken pipes, cracks in caulking due to extreme cold, damage to building foundations. These impacts are unlikely to change due to future climate conditions. Winter storms and cold temperatures can also impact vehicles by draining the battery, damaging the cooling system, thickening fluids, damaging the engine, and increasing the potential for vehicular accidents. These impacts may be less frequent due to future climate conditions creating less days below freezing. Impacts from winter storms in the Planning Area have included loss of visibility, loss of utilities, snow load considerations, school closures, damage to critical facilities and infrastructure, and hindered snow removal efforts.
Probability	Climate scientists have suggested that warming global temperatures may enable longer, more frequent, and more intense cycles of winter storms (NPS 2020). The amount of precipitation that falls as snow and the length of the snow-cover season both decrease as temperatures exceed 32°F more frequently (NPS 2020). Projected future climate conditions impacts are expected to reduce snowpack and promote glacial melt, reducing salmon habitat quality and diversity (NPS 2020). Models indicate a broad switch from snow-dominated to transitional annual hydrology across most of Southern and Coastal Alaska (ASHMP 2023). Therefore, as winter temperatures

Heavy Snow	
	continue to increase, the amount of snowfall will decrease and precipitation in the form of rain will be more common in winter months.
Population Patterns	It is not likely that future conditions influencing winter storms, heavy snow, or blizzards will impact changes in the Planning Area population patterns. The Planning Area, as well as the state of Alaska, are regularly impacted by snow events. There is not one area in the Planning Area that is more susceptible to these impacts over another area. Additionally, an increase in population would likely have similar impacts as land use development increases.
Land Use Development	It is possible that future conditions of heavy snow, winter storms, or blizzards will cause changes to the Planning Area's land use development. Increased snow and ice storm events will influence future land use development through transportation planning, with an increased focus on maintaining and improving roadways and transportation systems to withstand snow and ice storms. Utility planning could change as an increased frequency of snow and ice storms may prompt utilities to upgrade their infrastructure, such as burying power lines or using more robust materials, influencing land use decisions and potentially increasing costs for new developments. The authoritative bodies may require infrastructure designed to withstand snow/ice accumulation. This could lead to stricter building codes and standards for roofs, power lines, and other structures, encouraging designs that reduce vulnerability.

Extreme Cold	
Nature	It is unlikely that future climate conditions will influence the nature of future extreme cold events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future extreme cold events in the Planning Area.
Extent	Average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050 (USGCRP 2018). If global emissions continue to increase during this century, temperatures can be expected to rise 10°F to 12°F in the north, 8°F to 10°F in the interior, and 6°F to 8°F in the rest of the state (USGCRP 2018). In Southeast Alaska, surface temperatures are projected to increase by 1.8-5.4°F depending on season and projection model (Lader et al. 2020). In the Planning Area, average annual temperatures may increase by about 9°F by the end of the century (UAF/SNAP 2025a). Winter temperatures are increasing the most (+11°F), with winter maybe transitioning from below freezing to above freezing temperatures in the future (UAF/SNAP 2025a). Figure 34 shows Southeast Alaska's predicted average annual temperature from 2031-2060.
Impact	Due to future climate conditions, average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050 (USGCRP 2018). In the Planning Area, average annual temperatures may increase by about 9°F by the end of the century (UAF/SNAP 2025a). Winter temperatures are expected to increase the most (+11°F) and winter may transition from below freezing to above freezing temperatures in the future (UAF/SNAP 2025a). This increase in temperature could impact the Planning Area in many ways. Reduced snow cover and winter precipitation in the form of snow, along with increased air temperature, are expected to increase stream water temperature (NPS 2020). During winter and spring, warmer waters could hasten development and growth of salmon eggs and fry, possibly

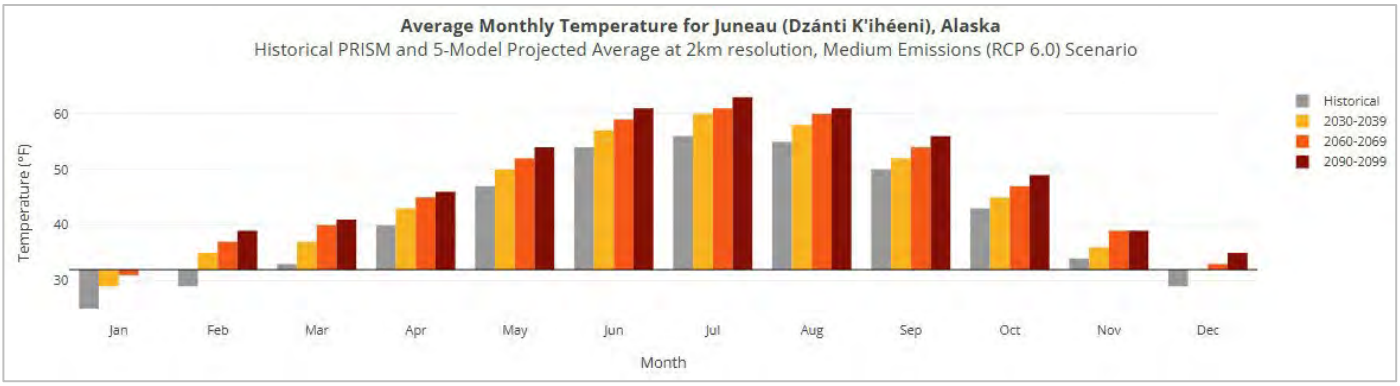
Extreme Cold	
	leading to earlier life stage transitions (NPS 2020). Additionally, ecological impacts to spawning salmon from rising temperatures may be seen. During summer, warmer waters could increase physiological stress on adult salmon migrating to spawning grounds, potentially reducing spawning rates (NPS 2020).
Probability	Due to future climate conditions, average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050 (USGCRP 2018; UAF/SNAP). In the Planning Area, average annual temperatures may increase by about 9°F by the end of the century (UAF/SNAP 2025a). Winter temperatures are increasing the most (+11°F) and winter may transition from below freezing to above freezing temperatures in the future (UAF/SNAP 2025a).
Population Patterns	Due to the rarity in Southeast Alaska, extreme cold events are not anticipated to affect population patterns in the Planning Area with respect to future climate conditions.
Land Use Development	Due to their rarity in Southeast Alaska, extreme cold events are not anticipated to affect land use development in the Planning Area with respect to future climate conditions.



Source: ACASC 2020

Figure 34- Predicted Average Annual Temperature Southeast Alaska, 2031-2060

The University of Alaska Fairbanks's (UAF) Scenarios Network for Alaska and Arctic Planning (SNAP) depicts Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida's historical and future projected temperatures under a medium emissions (RCP 6.0) scenario (Figure 35).

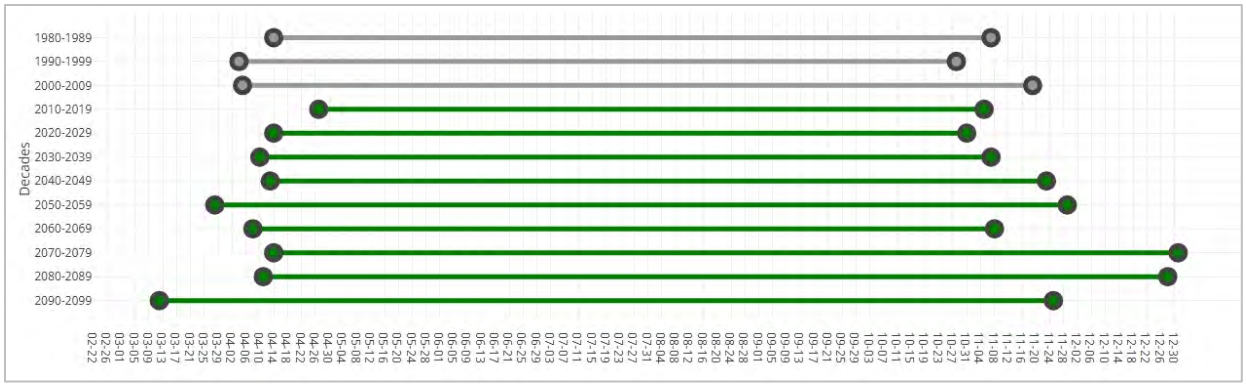


Source: UAF/SNAP 2025c- Community Climate Charts

Figure 35- Historical and Projected Temperatures for Juneau and Traditional Lands of Tlingit & Haida (Historical – 2099)

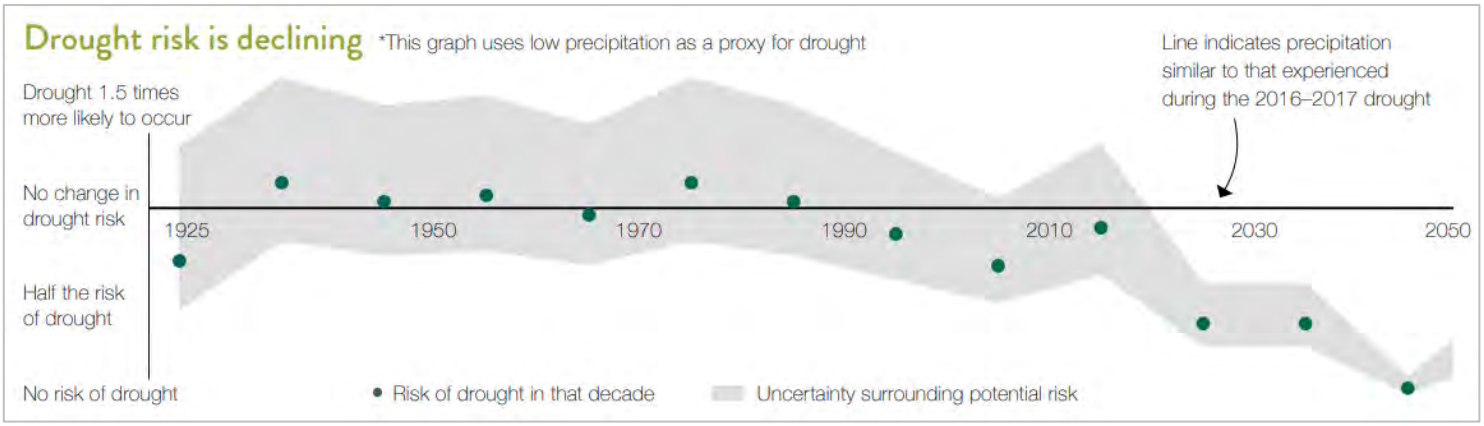
Freezing Rain and Ice Storms	
Nature	It is unlikely that future climate conditions will influence the nature of future freezing rain and ice storm events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future freezing rain and ice storm events in the Planning Area.
Extent	Alaska has experienced an 11% increase in the amount of precipitation falling in very heavy events from 1958 to 2012 (EPA 2016). As global temperatures continue to rise, freezing rain and ice storm events may be less severe than historical storms.
Impact	Due to future climate conditions, average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050 (USGCRP 2018), while the intensity and frequency of winter storms and other storm events is projected to increase, due to increased moisture in the atmosphere (Dixon et al. 2018). How these factors will affect the impact of freezing rain and ice storm events in the Planning Area is unknown.
Probability	Freezing rain and ice storm events are dependent on the ambient air mass temperature. Average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050 (USGCRP 2018; UAF/SNAP 2025). As global temperatures continue to rise, freezing rain and ice storm events may become less frequent as in previous decades.
Population Patterns	Due to the projected decrease in the future in Alaska, freezing rain and ice storms are not anticipated to affect population patterns in the Planning Area in respect to future climate conditions.
Land Use Development	Even though freezing rain and ice storms in Alaska are projected to decrease in the future, it is possible that future freezing events will cause changes in land use development in the Planning Area. Freezing rain events can create a buildup of ice on trees and power lines, with the extra weight increasing the risk of power outages due to lines getting damaged. An increase in these ice induced power outages could create the need for the development of a strategy by the electric companies in the Planning Area, such as burying power lines.

Drought	
Nature	It is unlikely that future conditions will influence the nature of future drought events in the Planning Area.
Location	It is unlikely that future conditions will influence the location of future drought events in the Planning Area.
Extent	Future climate conditions are increasing the intensity and length of severe weather events including droughts. Increased exposure to extremes will surpass the resilience of ecological and human systems. Already vulnerable communities may be unable to adapt, laying bare systemic inequalities and requiring emergency assistance (IPCC 2019). The U.S. Drought Monitor started in 2000. Since 2000, the longest duration of drought (D1–D4) in Alaska lasted 79 weeks beginning on July 17, 2018, and ending on January 14, 2020. The most intense period of drought occurred the week of August 27, 2019, where D3 affected 1.5% of Alaska land (USDM 2025).
Impact	Future climate conditions-driven effects upon hydrology, seasonal snowpack, and days above freezing temperatures will alter the water supply in snowmelt/glacier runoff fed streams and rivers in turn affecting the water supply for Alaskan communities, wildlife, and landscapes. In conjunction with lower ground-water levels, droughts can drive salinization in soil, estuaries, and wetlands along coastlines as seawater fills voids formerly occupied by fresh water. Indirect effects of future climate conditions-induced droughts include threats to the tourism industry, food insecurity, and threats to the Alaskan subsistence lifestyle (IPCC 2019). If the Planning Area experiences another extreme drought event, the impact could be substantial. If the primary power and water supply for the Planning Area are at an unusually low level due to a drought, the community would have to rely on non-renewable resources for power.
Probability	Scientists assessed whether the risk of drought in southeast Alaska is likely to increase or decrease in the future. The analysis examined the future risk of a low precipitation event like what drove the 2016–2019 drought. Based on this proxy, there is a declining chance of drought in the next three decades. In both summer and winter, drought will become about half as likely to occur by 2050, compared to the risk of a similar precipitation event during 1925–2020 (Figure 37) (UAF-IARC 2022c).
Population Patterns	Even though the chance of a future drought in the Planning Area is declining, it is possible that future droughts will cause changes in population patterns in the Planning Area due to changes in drinking water availability in new developments.
Land Use Development	It is possible that future droughts will cause changes in land use development in the Planning Area. Increased drought events will influence future land use development through water resource management as areas facing frequent droughts will need to prioritize efficient water use and management strategies. This could lead to the implementation of stricter regulations on water consumption and the development of infrastructure for water recycling and conservation.



Source: UAF/SNAP 2025d- Alaska Garden Helper

Figure 36- Historical and Projected Length of Growing Season in Juneau and Traditional Lands of Tlingit & Haida



Source: UAF-IARC 2022c

Figure 37- Future Drought Risk in SE Alaska due to Future Climate Conditions

Extreme Atmospheric Heat	
Nature	It is unlikely that future climate conditions will influence the nature of future extreme atmospheric heat events in the Planning Area.
Location	It is unlikely that future climate conditions will influence the location of future extreme atmospheric heat events in the Planning Area.
Extent	Future climate conditions are likely to influence the magnitude and severity of future extreme atmospheric heat events. Average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050 (USGCRP 2018). If global emissions continue to increase during this century, temperatures can be expected to rise 10°F to 12°F in the north, 8°F to 10°F in the interior, and 6°F to 8°F in the rest of the state (USGCRP 2018). In Southeast Alaska, surface temperatures are projected to increase by 1.8-5.4°F depending on season and projection model (Lader et al. 2020). In the Planning Area, average annual temperatures may increase by about 9°F by the end of the century (UAF/SNAP 2025).

Extreme Atmospheric Heat	
Impact	Future climate conditions are likely to influence future extreme atmospheric heat events. In the Planning Area, average annual temperatures may increase by about 9°F by the end of the century (UAF/SNAP 2025). Accelerated snow melt could decrease the availability of water to generate hydroelectric power during late summer and fall, increasing the Planning Area's reliance on diesel generators. Extreme heat could also potentially overwhelm cooling centers and medical facilities if the event persists over an extended period of time, due to causing heat stroke and heat exhaustion. Reduced snow cover and winter precipitation in the form of snow, along with increased air temperature, are expected to increase stream water temperature (NPS 2020). During winter and spring, warmer waters could hasten development and growth of salmon eggs and fry, possibly leading to earlier life stage transitions (NPS 2020). Additionally, ecological impacts to spawning salmon from rising temperatures may be seen. During summer, warmer waters could increase physiological stress on adult salmon migrating to spawning grounds, potentially reducing spawning rates (NPS 2020).
Probability	Future climate conditions are likely to increase the probability, frequency, and duration of extreme atmospheric heat. Due to future climate conditions, average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050 (USGCRP 2018; UAF/SNAP). In the Planning Area, average annual temperatures may increase by about 9°F by the end of the century (UAF/SNAP 2025a).
Population Patterns	It is possible extreme atmospheric heat influences population patterns in the Planning Area. While local, longtime residents may move away from Juneau due to heat, other people may view the Planning Area's warmer weather patterns as a favorable climate and decide to move there.
Land Use Development	Due to their rarity in Southeast Alaska, extreme atmospheric events are not anticipated to affect land use development in the Planning Area with respect to future climate conditions.

3.3.3 WILDLAND FIRE AND URBAN (COMMUNITY/DOWNTOWN) FIRE

Fires can be divided into the following categories:

- **Prescribed fires**: ignited under predetermined conditions to meet specific objectives, to mitigate risks to people and their communities, and/or to restore and maintain healthy, diverse ecological systems.
- **Wildland Fire**: any non-structure fire, other than prescribed fire, that occurs in the wildland.
- **Wildland Fire Use**: a wildland fire functioning in its natural ecological role and fulfilling land management objectives.
- **Urban (Community/Downtown) Fire**: fires that occur within a populated area, or more specifically occurs in the commercial or business district of a city. These fires pose great risk to surrounding structures and neighborhoods.
- **Wildland-Urban Interface Fires**: fires that burn within the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The potential exists in areas of wildland-urban interface for extremely dangerous and complex fire burning conditions which pose a tremendous threat to public and firefighter safety.

Both wildland and urban fires pose a risk to the residents and infrastructure in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida.

3.3.3.1 Nature

Wildland fires are types of fires which spread via the consumption of vegetation, and they often spread very quickly due to the amount of vegetation available. They begin sometimes unnoticed and cause dense smoke that is usually visible from several to tens of miles. Two principal causes are natural (e.g., lightning) and human activity (campfires, cigarettes, unattended burns). They more usually happen in forests or other areas with sufficient vegetation (e.g., prairies). Wildland fires are usually classified as to a specific type or locale such as: urban, tundra, interface or intermix fires, as well as prescribed fires.

There are four significant variables which contribute to the behavior and extent of wildland fires, and these can be used to identify potential areas that are more susceptible to wildland fires. These are:

- **Topography**: the amount and aspect of slopes influence how wildland fires spread and how quickly. Slopes that face south are subject to more solar radiation which makes them generally drier and more prone for wildfires. Sometimes ridge lines or ridge tops become a natural barrier to wildfires as fires spread more slowly downhill.
- **Fuel**: Wildland fires are heavily dependent on the type and extent of fuel, i.e., vegetation, present for their spread and occurrence. Certain species of plants are much more ignitable and will burn with greater intensity. The amount of combustible material available is referred to as the fuel load, and the denser the vegetation the more intense the wildland fire can become. The amount of dead matter, e.g., leaf litter, compared to living matter also considerably effects the nature of these fires. Periods of prolonged droughts cause a decrease in the moisture of both living and dead matter and significantly increase the odds of wildland fire occurrence and extent. Future climate conditions are now a factor as well. Lastly, the continuity of the fuel load is a main factor in both horizontal and vertical planes. The more continuous the fuel, the easier a fire will spread.
- **Weather**: Of all the factors which affect wildfires, weather is the most variable. The ignition and spread of a wildfire are dependent on humidity, temperature, winds, and lightning. Extreme bouts of weather, such as heat waves, high winds, or droughts, can lead to extensive wildfire activity. Dry seasons are generally becoming longer due to future climate conditions, and this has led to an increase in wildfires. Conversely, periods of increased rain and cooling decrease the odds of wildland fires and ease their containment as well.

- **Season**: The seasons with more vulnerability for wildfires are late summer and early autumn. This is generally the time when the fuel (vegetation) dries out. The moisture content drops sharply and the ratio to dead to living material increases. Though there are many factors which contribute to the extent and intensity of wildfires such as: wind speed and direction, fuel load and type, humidity, and topography, the most common causes of wildfires in Alaska, historically, have been lightning or human negligence.

Other hazards do influence the extent and frequency of wildland fires. These are, for example: infestations, lightning, and drought. If a wildland fire is not quickly and properly controlled, it can grow rapidly into a disaster or emergency. The smallest of wildfires can even threaten lives, resources, and destroy properties. Livestock and pets are also susceptible to wildfires. Some wildfires can precipitate the need for emergency food and water, evacuation, and temporary shelters.

Sometimes the effects of wildland fires can be catastrophic. They can destroy large areas of forest and other vegetation, damage the soil, waterways, and the land itself. Some soils may lose their capacity to keep moisture and support life for years after an intense wildfire.

Urban (Community/Downtown) Fire

An urban fire is a large destructive fire that is widespread throughout a community and involves one or more developed areas in the community. Urban fires are different from individual property fires as urban fires involve a larger portion of the community's-built environment. However, structure fires can quickly spread and result in an urban fire.

An urban fire is quick-moving and can become out of control in less than 30 seconds and can engulf a house within minutes. The heat alone from fire is deadlier than the actual flames with temperatures ranging from 100ºF at the floor to 600ºF at eye level. The heat can burn one's lungs and can melt one's clothes to their skin. If a room becomes hot enough from fire, it can create a flashover in which everything in the room ignites at once. Smoke and toxic gases, both products of fire, kill more people than the flames themselves. Oxygen is consumed, creating an atmosphere of colorless and odorless fumes that can cause drowsiness, disorientation, and shortness of breath and can lull a person into a deeper sleep without allowing enough time to escape. Fire itself may be bright, but the smoke that it produces can make evacuation from a building difficult or impossible.

The ignitability and spread-ability of structure fires is largely dependent on the type of construction the building and surrounding builds are. There are five basic groups of building construction used throughout the United States and are outlined below (Table 16).

Table 16- Types of Building Construction

Construction Type	Description
Type I (fire resistive) - Least combustible	Fire-resistive construction was originally designed to contain fire inside the building to one floor. This concrete and steel structure, called "fire resistive" when first built at the turn of the century, was intended to confine a fire with its construction. Faults in modern construction allow fire to spread over several floors in a fire-resistive building despite its steel-and-concrete structure by spreading through air-conditioning and heating ducts as well as from lower windows to windows above in a multi-story building.
Type II (non-combustible)	Non-combustible buildings have steel or concrete walls, floors, and structural framework. When a fire occurs inside a type II building, flames rising to the underside of the steel roof deck may conduct heat through the metal and ignite the combustible roof.
Type III (ordinary)	Ordinary construction is also called brick-and-joist construction. It has masonry bearing walls, but the floors, structural framework and roof are made of wood or other combustible material. Ordinary construction has been described by some firefighters as a "lumberyard enclosed by four brick walls."

Construction Type	Description
Type IV (heavy timber)	Heavy-timber construction is sometimes called "mill construction" because it was the type of structure used at the turn of the century to house textile mills. These buildings have masonry walls like type III buildings, but the interior wood consists of large timbers that can create large, radiated heat waves after the windows break during a blaze. A fire in a heavy-timber building can produce a tremendous conflagration with flames coming out of the windows, spreading fire to adjoining buildings.
Type V (wood frame) - Most combustible	Wood-frame construction is the most combustible of the five building types. The interior framing and exterior walls may be wood. A wood-frame building is the only one of the five types of construction that has combustible exterior walls.

Source: Vincent Dunn, Deputy Chief FDNY (retired)- Structural Fire Spread

Downtown Juneau contains several areas comprised of predominately older wooden structures near each other with inadequate structural fireproofing. Large areas of downtown have been designated “high hazard areas” due to the possibility of a conflagration. Prevailing high winds coming from the south intensify the problem as do the significant numbers of homes built on the hillside with no defensible space and few escape routes.

A fire downtown coupled with southerly winds could be catastrophic. The wind could push the fire through downtown while the rising heat from the fire would pre-heat the hillside fuels (vegetation and houses) and enable them to ignite more quickly. Such an event would cause the loss of significant property and commerce, destroy historic buildings, and may cause loss of lives.

Causes of structural fires vary. In the U.S., cooking is the leading cause of home fires, with the majority resulting from unattended cooking and human error. Fireplaces, candles, space heaters, cigarettes, lamps, and electrical wiring are also a common cause of structure fires in the U.S. Careless smoking is the leading cause of fatal fires and arson is the second leading cause of residential fire deaths. Since most structure fires are avoidable, fire prevention is a major focus of fire departments, as the best way to prevent fire damage is to prevent fire itself.

Fires in the wildland-urban interface are of particular concern because they are difficult to control. A structure fire can quickly ignite surrounding vegetation resulting in the spread of fire to nearby structures and vegetation. Without the application of aggressive fire suppression and protection of exposures, fires do not confine themselves to one building and can easily spread to other buildings. Alternatively, wildland fires that burn within the line, area, or zone where structures and other human development meet, can ignite nearby development (wildland fire urban interface).

3.3.3.2 Location

Wildland Fire

Figure 38 shows Juneau (Dzantik’i Héeni) and Traditional Lands of Tlingit & Haida’s wildfire exposure based on the LANDFIRE (Landscape Fire and Resource Management Planning Tools Project) 2024 Update data, which was released in April 2025.

Much of the Planning Area is categorized as having a Very Low to Infrequent exposure rating. There are small portions of the Planning Area with Moderate to High exposure ratings.

Figure 41 depicts the Level II Ecoregion classifications for the State of Alaska as well as the vegetation/landcover classes found throughout the State.

The Planning Area is in the EC7 Level II Ecoregion which is classified as Coastal Rainforests. This area is normally quite wet, but fires can occur in the Panhandle under dry conditions, which may become more frequent due to future climate conditions (BLM 2020). Under certain conditions, fires may occur near Juneau (Dzantik’i Héeni) and Traditional Lands of Tlingit & Haida when weather, fuel availability,

topography, and ignition sources combine. For the purposes of this HMP Update, all areas of Juneau and Traditional Lands of Tlingit & Haida within the CBJ political boundary are vulnerable to wildland fire impacts.

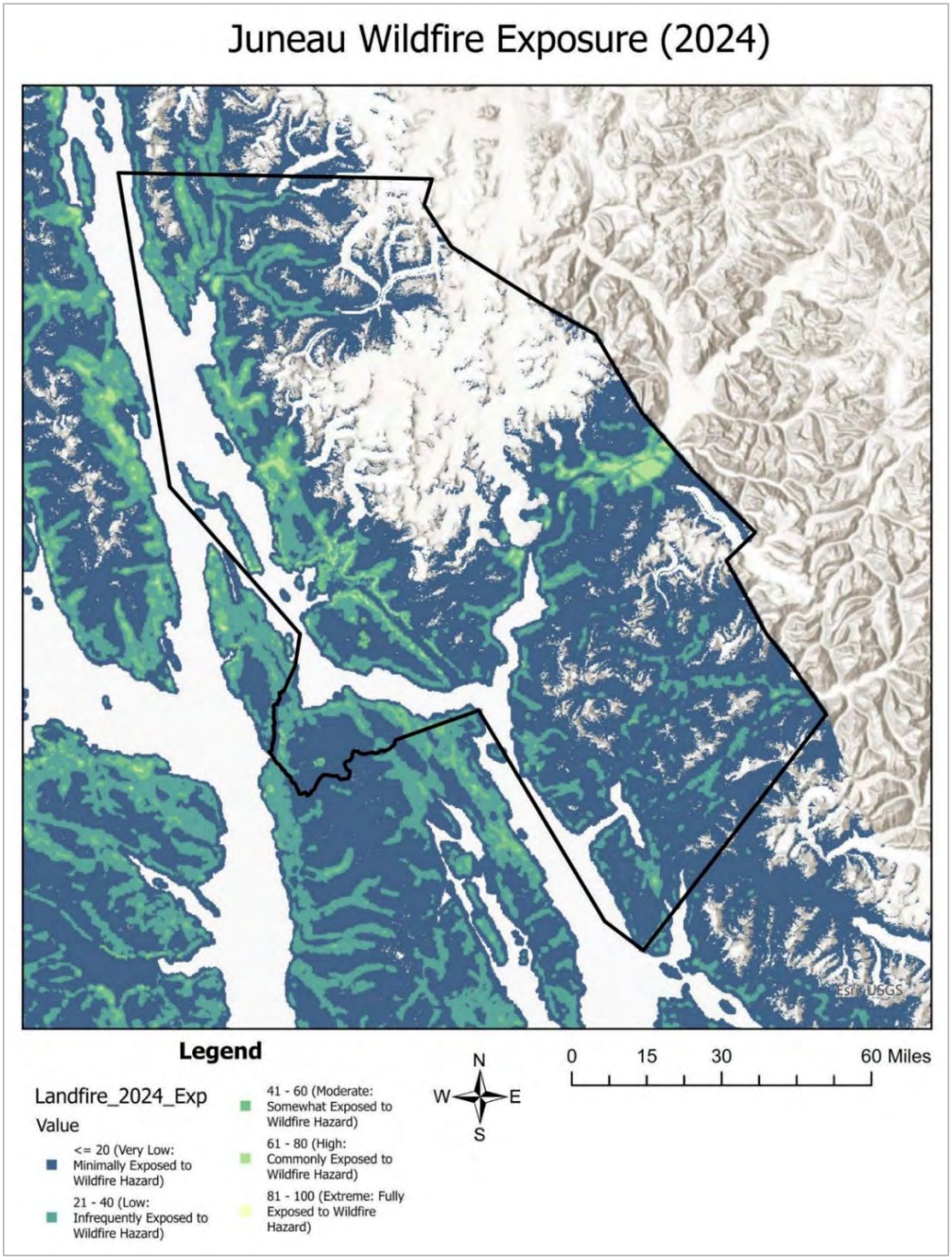
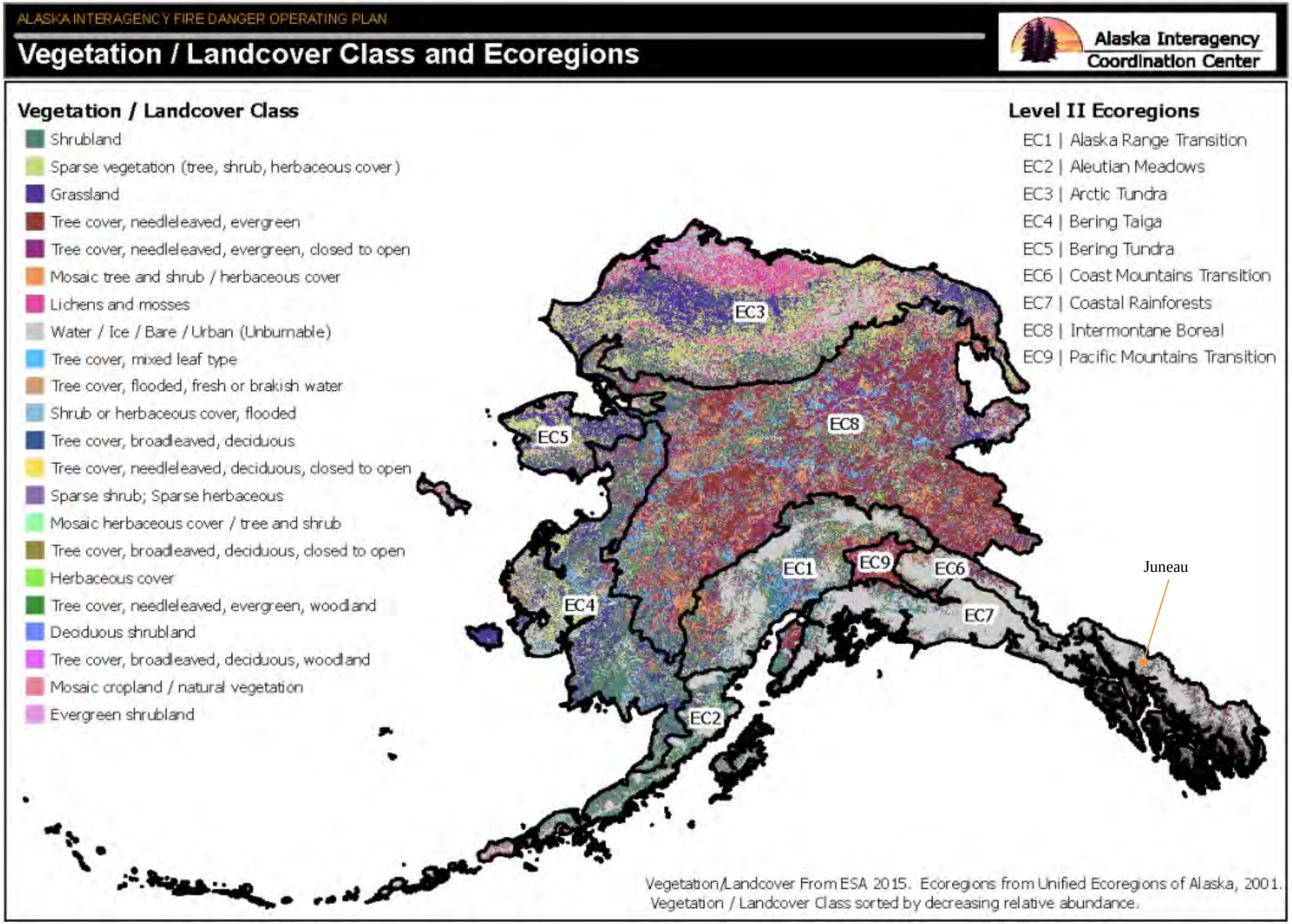


Figure 38- Juneau and Traditional Lands of Tlingit & Haida Wildfire Exposure (2024)



Source: BLM 2020

Figure 39- Vegetation/Landcover Class and Ecoregions of Alaska

If there is a fire in the Planning Area, the Juneau Fire Department will respond to calls. Since much of the Planning Area is surrounded by the Tongass National Forest, the US Forest Service also responds to wildfires that occur near the Planning Area.

Urban (Community/Downtown) Fire

Urban fires can occur in areas where a community interfaces with the surrounding forest or vegetation or because of a spreading structure fire. The Planning Area is surrounded by temperate rainforest, normally quite wet, but fires can occur in the region under dry conditions.

A multi-structure conflagration is of great concern because of the high vulnerability of the downtown area. Downtown Juneau contains several areas comprised of predominately older wooden structures near each other with inadequate structural fireproofing. The hazard areas are described below:

High Fire Hazard Area

The area between Main Street and Gastineau Avenue as far north as Sixth Street and south along Thane Road to the base of the Tram has been designated a High Fire Hazard Area. Buildings in this area are primarily Type V (wood-frame) construction and many of them are built directly upon creosote-coated pilings. Transient camps dot the hillside as do abandoned buildings. Prevailing winds are out of the south and blow directly from the area of highest hazard towards the rest of the city.

The daytime population of this area, which encompasses the cruise ship docks as well as many tourist shops and restaurants, increases exponentially in the summer months. Buildings in this area are very close together and often share walls, with few having sprinkler systems.

Residents of this area have limited egress options should a large fire start. Traffic congestion is common over the entire area, with room for only one way traffic on most roads. Gastineau Avenue, the heavily wooded street approximately 200 feet up the hillside from South Franklin, is a dead-end street with only one way in or out. It is a very narrow street with a significant parking problem, and it would be difficult for residents to evacuate the area in their cars. See Figure 40 below for a detailed map of the hazard area.

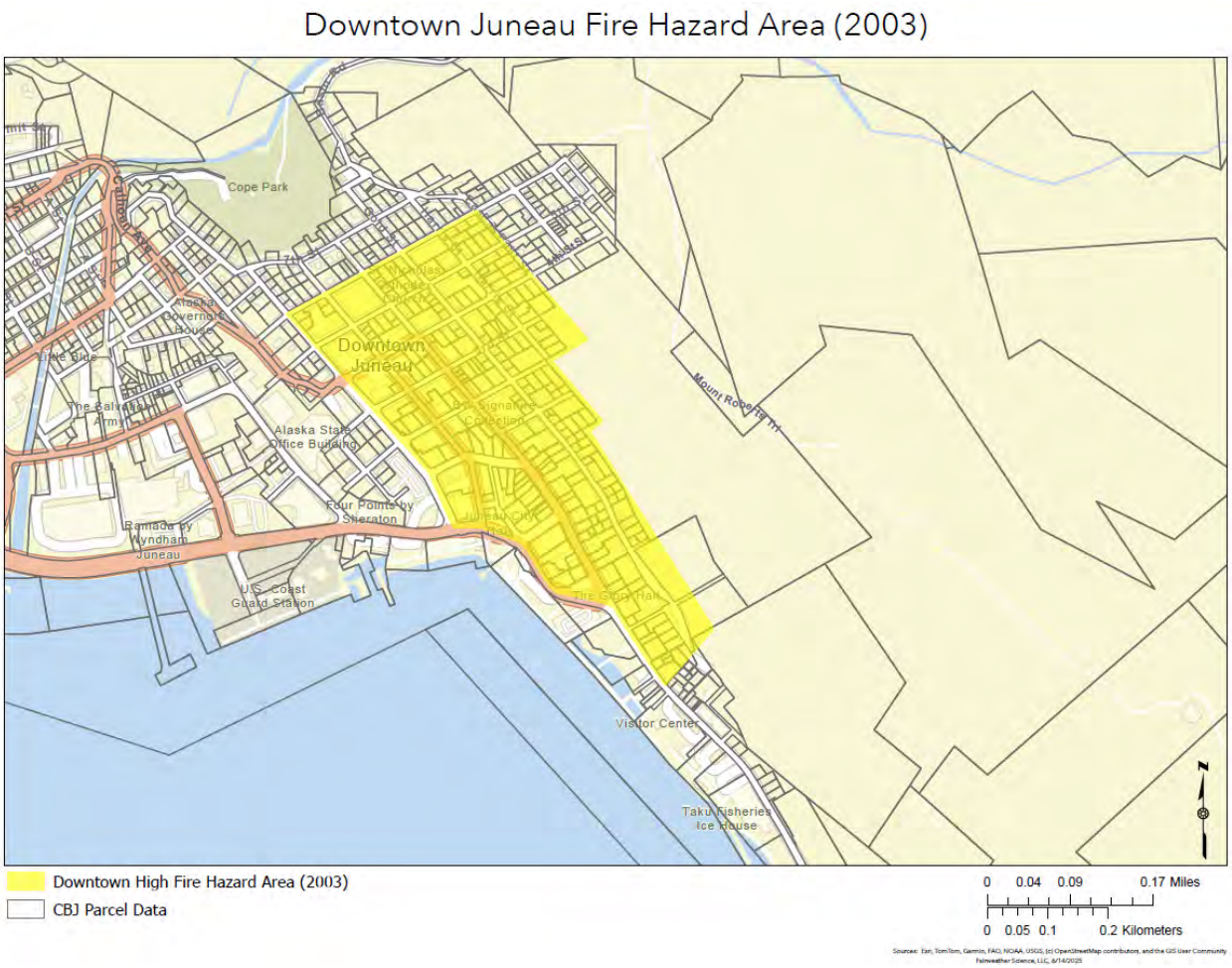


Figure 40- Urban Fire High Hazard Area of Downtown Juneau with Nearby Facilities (From the 2004 CBJ HMP)

3.3.3.3 History

Despite being in a coastal rainforest, the Planning Area has experienced historical wildfire events, the most significant and recent being the 1997 Berner's Bay (Daxanáak) fire, which burned 20 acres of land and was human caused. See Appendix F for a comprehensive table and map of historical wildfires within the planning area. Even though Downtown Juneau has avoided a conflagration event in its history, there have been several structure fires in the planning area that highlights the potential and risk for one of these events in the future. Appendix F highlights a past example of an urban fire in Downtown Juneau, as well as updated fire fatality data.

3.3.3.4 Extent (Magnitude and Severity)

Wildland Fire

Due to the few recorded historical wildland fire events as well as the criteria listed in Table 10, the magnitude and severity of wildland fire events in the Planning Area have been Limited with minor injuries, the potential for critical facilities to be shut down for more than one week, more than 10% of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Urban (Community/Downtown) Fire

The Planning Area has had a history of structure fires impacting the community, but the downtown district has avoided a mass conflagration event throughout history.

A High Fire Hazard Area has been established for approximately a 60- to 65-acre area of Downtown Juneau area as described above. This zone has the potential for an area-wide conflagration based on the number of older wooden structures, the common occurrence of high southerly winds, and a history of large fires in a similar type of neighborhood in nearby Douglas.

Due to the recorded community fires resulting in fatalities as well as the criteria listed in Table 10, the magnitude and severity of urban fires in the Planning Area are considered to be Critical, where injuries and/or illnesses could result in permanent disability; a complete shutdown of critical facilities may last for at least two weeks; and more than 25% of property would be severely damaged.

3.3.3.5 Impact

Wildland Fire

If wildfires are not adequately controlled in the Planning Area, the impacts from them could become an emergency or considerable disaster. Even smaller wildfires can threaten lives, resources, and destroy properties. Livestock and pets are susceptible to wildfires as well. Wildfires can precipitate the need for emergency food and water, evacuation, and temporary shelters.

The effects of wildland fires can become catastrophic. They can destroy large areas of forest and other vegetation, damage the soil, waterways, and the land itself. Some soils may lose their capacity to keep moisture and support life for years after an intense wildfire. Exposure of the land after a wildland fire may also lead to increased shoreline/bank destabilization and add to the siltation of rivers and streams. This increases the chances of flooding, degrades water quality, undermines structural stability of homes and infrastructure, and can significantly harm aquatic life.

Impacts to water supply (either from an overdraw from a tank or inability for a distribution system to recover required pressures) and repressurizing the distribution pipes after an event are also potential considerations for both wildland and urban fires. Large wildfires cause serious air quality impacts, even from great distances that can impact people and pets.

For many ecosystems, wildfires are critical features of the natural history. They can serve to help maintain renewal, biodiversity, and the ecological health of the land in general. This essential role which they serve for the local ecology has been incorporated into the planning process for fire management. Hence, the full range of fire management activities has been implemented in Alaska. This helps achieve the sustainability and health of the ecosystem. This includes the social consequences on firefighters in addition to ecological and economic factors. The natural and cultural resources that are potentially threatened, and other important values, all dictate the level and nature of the management response during a wildfire.

Urban (Community/Downtown) Fire

All structures in the Planning Area are vulnerable to urban fires, especially the structures located in the downtown historic district. The City and Borough of Juneau has a well-equipped fire department that responds to calls for structure fires and for natural vegetation fires.

At the minimum staffing requirements, Capital City Fire and Rescue operates with two fire engines, two ambulances, and two aircraft rescue and fire fighting trucks. The staffing numbers during a standard incident provides 8 firefighters for an incident outside of the Juneau International Airport, 10 firefighters during an on-airport emergency, and at least one to two chief level officers that are highly likely to respond. Any additional response is provided by volunteer firefighters and off-duty staff with the department.

In addition to fire related incidents, Capital City Fire and Rescue responds to all hazards, and would likely be the first line of defense for any disaster in the planning area.

Since 2012, urban fires in the Planning Area have resulted in the deaths of 6 community members.

Air Transportation Impacts: Wildland and urban fire can cause air transportation impacts including damage to structures that support air travel and fire fighting equipment and personnel. Smoke from wildland and urban fires can disrupt air transportation and in extreme scenarios, fire can damage runway areas making them not suitable for aircraft arrivals and departures.

3.3.3.6 Probability of Future Events

Wildland Fire

Based on previous occurrences and the criteria identified in Table 11, it is Possible that the Planning Area will experience a wildland fire event in the next five years; there is a 1 in 5 years chance of occurring (1/5=20%); and the history of events is greater than 10% but less than or equal to 20% likely per year.

Urban (Community/Downtown) Fire

Based on previous occurrences and the criteria identified in Table 11, it is Possible that the Planning Area will experience an urban fire event in the next five years; there is a 1 in 5 years chance of occurring (1/5=20%); and the history of events is greater than 10% but less than or equal to 20% likely per year.

3.3.3.7 Future Conditions

Wildland Fire

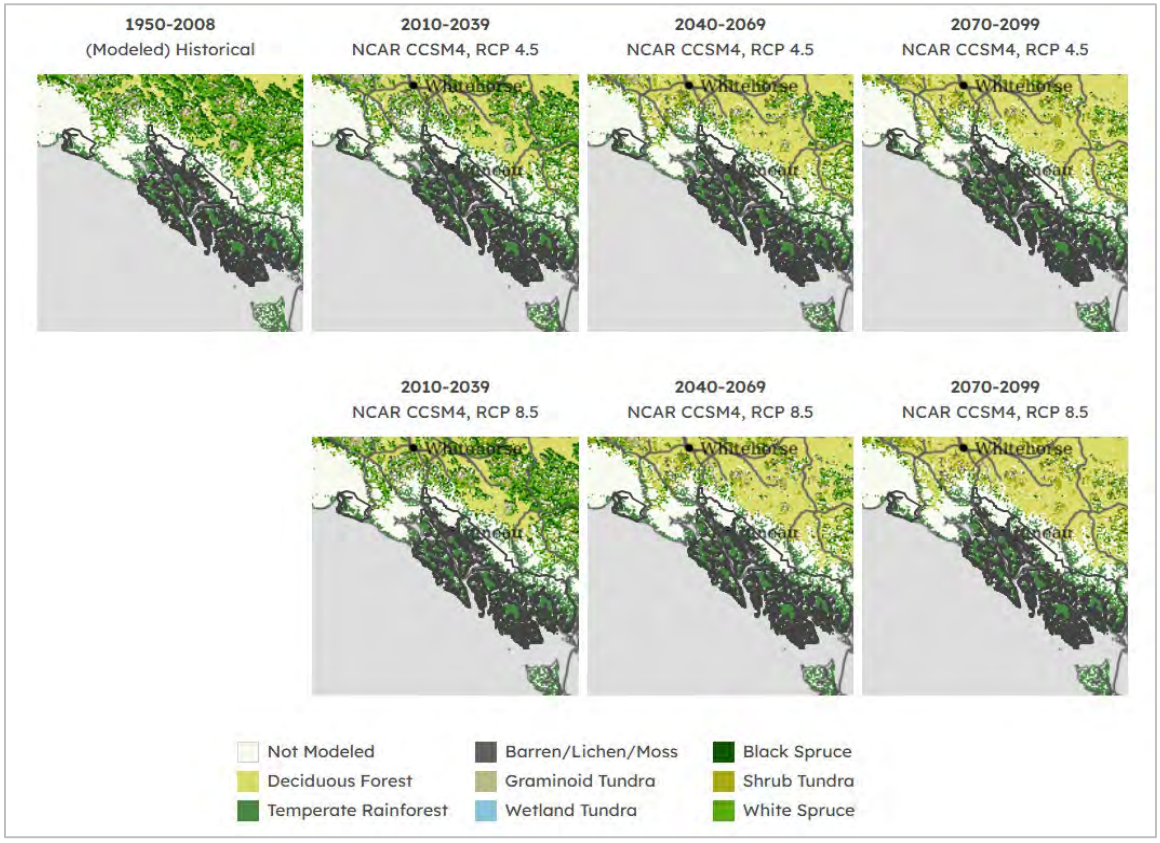
Changing Factor	Description of Future Conditions
Nature	The nature of wildland fires in the Planning Area is not anticipated to change in respect to future climate conditions.
Location	The location of wildland fires in the Planning Area is not anticipated to change in respect to future climate conditions.
Extent (Magnitude and Severity)	Due to future climate conditions, the extent (magnitude and severity) of wildland fires is expected to increase. Large wildfires have consumed more boreal forest in Alaska in the last ten years than in any other decade recorded, and the area burned annually is projected to double by 2050 (EPA 2022). Between 2015 and 2024, wildfire burned about 14 million acres, which accounts for nearly 4% of Alaska's total area (AFSC 2025).
Impact	Due to future climate conditions, the impact of wildland fires to the Planning Area is expected to increase. More frequent fires due to a change in future conditions increase the risk of health hazards and low visibility posed by the increase of smoke (AFSC 2025).
Probability of Future Events	Future climate conditions within Alaska are likely to result in increased drought and longer fire seasons and shifts in vegetation will influence the intensity and frequency of fires (IPCC 2019). A warming climate is also projected to increase the frequency and size of wildfires, potentially changing the type and extent of wildlife habitat favorable for some important subsistence species (USGCRP 2018). Large wildfires have consumed more boreal forest in Alaska in the last ten years than in any other decade recorded, and the area burned annually is projected to double by 2050 (EPA 2022). Warmer temperatures are also expected to worsen insect damage to forests across much of the state, which may increase the area of standing dead, highly flammable trees that would provide fuel for potential wildfires (EPA 2022).
Population Patterns	Wildland fires due to future climate conditions are not anticipated to impact population patterns in the Planning Area.
Land Use Development	As development in the Planning Area increases, especially in areas near the wildland-urban interface, so does the risk of human and economic impacts from wildland fires (Gallagher

Changing Factor	Description of Future Conditions
	2025). The creation of defensible space and buffers around infrastructure and property may reduce the risk of impacts.

In the Planning Area, the predominant vegetation type is Temperate Rainforest (UAF/SNAP 2025a). The following figures include data from the Tongass National Forest, but the data is relevant because much of the Planning Area is surrounded by the Tongass.

Figure 41 shows historical and projected changes in vegetation in the Planning Area from 1950 through year 2099 using the NCAR CCSM4 model. Future projections (2010-2099) are shown under two different scenarios of differing Representative Concentration Pathways (RCP), which is the trajectory of greenhouse gas concentrations in the atmosphere. Compared to current emissions, RCP 4.5 is a scenario representing a reduction in global emissions, while RCP 8.5 represents a scenario similar to, or possibly higher than, current global emissions trajectories.

This model does not predict a change in vegetation type in the Planning Area.

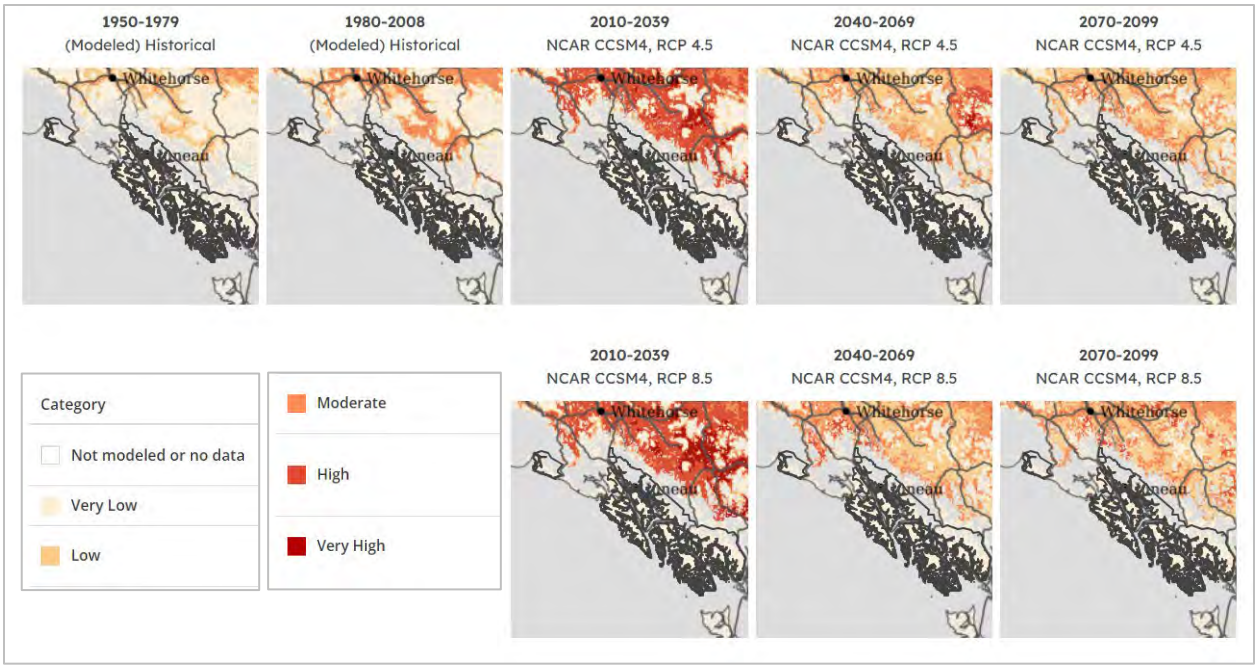


Source: UAF/SNAP 2025a- Northern Climate Reports

Figure 41- Projected Changes in Vegetation in Juneau and Traditional Lands of Tlingit & Haida

There are no historical or projected changes in vegetation type coverage in the Planning Area from 1950 through year 2099 using the NCAR CCSM4 model.

Figure 42 depicts historical and future projections of the flammability in the Planning Area using the NCAR CCSM4 model. This region has historically had Very Low flammability and is projected to continue to have Very Low flammability through 2099 under both emissions scenarios.



Source: UAF/SNAP 2025a- Northern Climate Reports

Figure 42- Historical and Projected Flammability Conditions in Juneau and Traditional Lands of Tlingit & Haida

Urban (Community/Downtown) Fire

Changing Factor	Description of Future Conditions
Nature	The nature of urban fires in the Planning Area is not anticipated to change in respect to future climate conditions.
Location	The location of urban fires in the Planning Area is not anticipated to change in respect to future climate conditions.
Extent (Magnitude and Severity)	Due to their urban nature, the extent of urban fires in the Planning Area is not anticipated to change in respect to future climate conditions.
Impact	Due to their urban nature, the impact of urban fires in the Planning Area is not anticipated to change in respect to future climate conditions.
Probability of Future Events	Future climate conditions are not anticipated to impact the probability of future urban fires in the Planning Area.
Population Patterns	Urban fires due to future climate conditions are not anticipated to impact population patterns in the Planning Area.
Land Use Development	Due to the high likelihood of an urban fire in the Planning Area, it is possible to impact future land use development, especially in the high hazard area of the downtown historic district. This could result in the replacement of wood-frame historic housing with more fire-resistant structures resulting in lower risk of urban fire impacts. As development in the Planning Area increases, especially in areas near the wildland-urban interface, so does the risk of human and economic impacts from wildland fires (Gallagher 2025).

3.3.4 LANDSLIDE

This section focuses on ground failure in terms of landslides- both subaerial (on land), and submarine (underwater). See Section 3.3.8 for information on snow avalanches.

3.3.4.1 Nature

Landslide is a generic term for a variety of downslope movements of earth material under the influence of gravity. Landslides occur naturally when inherent weaknesses in the rock or soil combine with one or more triggering events such as heavy rain, snowmelt, changes in groundwater level, and seismic or volcanic activity.

Some landslides occur rapidly, in mere seconds, while others might take weeks or longer to develop. Landslides usually occur in steep areas. Changing drainage patterns, groundwater level, slope and surface water (for example the addition of water to a slope from agricultural or landscape irrigation), roof downspouts, septic- tank effluent, or broken water or sewer lines can also cause landslides. Removal of vegetation from steep slopes can erode the integrity of the ground and lead to landslides.

Subaerial landslides occur above water and are the easiest to visualize. These landslides are most often caused by steep slopes rising directly out of the water, rapid shoreline/bank destabilization caused by glacial retreat or calving, heavy rains in coastal areas, frequent earthquakes, or volcanic eruptions (AEC 2020).

Submarine landslides occur underwater. The most common trigger of submarine landslides is slope over-steepening due to high rates of sediments being deposited on already steep slopes (AEC 2020). Other triggering factors include earthquakes, large tidal ranges that can expose unstable sediments and weaken their hold on the slope, construction activities (blasting, dredging) in coastal areas, or some combination of these (AEC 2020).

Three main factors influence landslides: topography, geology, and precipitation. Topography and geology are associated with each other; the steeper the slope, the greater the influence from gravity. Rock strength is important as certain bedrock formations or rock types appear to be more prone than others to landslides. Precipitation may erode and undermine slope surfaces. If precipitation is absorbed into the ground, it increases the pore water pressure and lubricates weak zones of rock or soil.

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

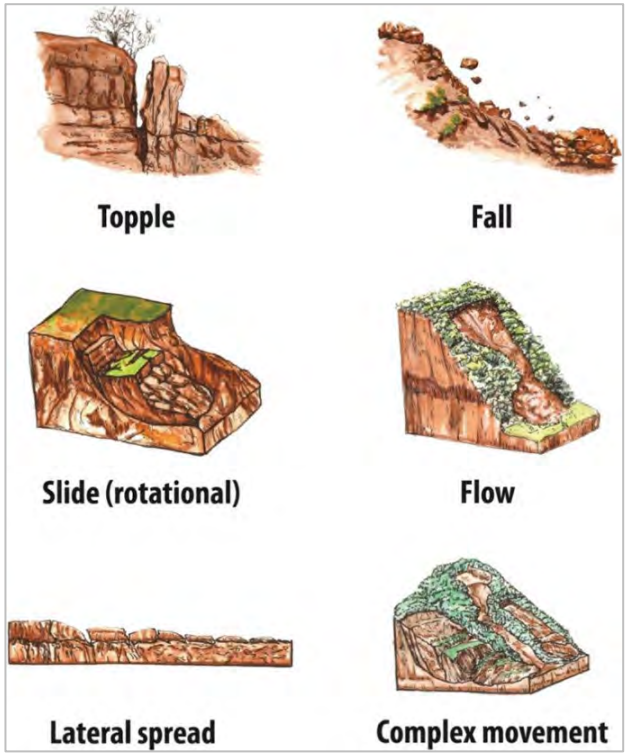
- **Earthquake** ground movement can trigger events ranging from rock falls and topples to massive slides.
- Intense or prolonged **precipitation** can cause slope over-saturation and subsequent destabilization failures such as landslides.
- **Drought** conditions may increase wildfire conditions where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

The USGS identifies six landslide types, distinguished by material type and movement mechanism including:

1. **Slides** are characterized by shear displacement along one or several surfaces. There are two general types of slides.
   - **A. Rotational slide**, the rupture surface is concave upward, and the mass rotates along the concave shear surface. Rotational slides, also called slumps, can occur in bedrock, debris, or earth.
   - **B. Translational slide**, the rupture surface is a smooth or gently rolling slope. In bedrock and earth, translational slides are sometimes called block slides if an intact mass slides down

the slope. If rock fragments or debris slide down a slope on a distinct shear plane, the movements are called rockslides or debris slides.

2. **Flows** are a moving mass that has differential internal movements that are distributed throughout the mass. They differ from slides by their higher water content and the distribution of velocities that resemble a viscous fluid. There are five basic categories of flows.



   A. Debris Flow: is a form of rapid mass movement combining loose rock, soil, organic matter, and water to create a slurry that mobilizes downslope. Debris flows are commonly caused by intense surface-water flow, due to heavy precipitation and rapid snowmelt, that erodes and mobilizes loose soil or rock on steep slopes. Debris flows also commonly mobilize from other types of landslides that occur on steep slopes, are nearly saturated, and consist of a large proportion of silt and sand-sized material. Debris-flow source areas are often associated with steep gullies, and debris-flow deposits are usually indicated by the presence of debris fans at the mouth of gullies. Fires that scald slopes of vegetation intensify the susceptibly of slopes to debris flows. Debris flows typically occur on slopes in the 20–45-degree range, like those surrounding Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida. Debris flows can also be caused by glacial lake outburst flooding.

   B. Debris Avalanche: is a variety of very rapid to extremely rapid debris flow. Typically, debris avalanches occur between 10-25 miles per hour, but speeds more than 100 miles per hour have occurred in the past.

   C. Earthflow: are characterized by an "hourglass" shape. The slope material liquifies and runs out, forming a bowl or depression at the head. The flow itself is elongated and usually occurs in fine-grained materials or clay-bearing rocks on moderate slopes and under saturated conditions. However, dry flows of granular material are also possible.

   D. Mudflow: A mudflow is an earthflow consisting of material that is wet enough to flow rapidly and that contains at least 50 percent sand-, silt-, and clay-sized particles. In some instances, for example in many newspaper reports, mudflows and debris flows are commonly referred to as "mudslides"

   E. Creep: Creep is the imperceptibly slow, steady, downward movement of slope-forming soil or rock. Movement is caused by shear stress sufficient to produce permanent deformation, but too small to produce shear failure. Creep is indicated by curved tree trunks, bent fences or retaining walls, tilted poles or fences, and small soil ripples or ridges. There are generally three types of creeps.

      1. *Seasonal*, where movement is within the depth of soil affected by seasonal changes in soil moisture and soil temperature.
      2. *Continuous*, where shear stress continuously exceeds the strength of the material.
      3. *Progressive*, where slopes are gradually reaching the point of failure under the influence of gravity.

3. **Lateral Spreads** involve the horizontal displacement of the surface. They often occur on gentle slopes that range between 0.3 degrees and 3 degrees. Lateral spreads can occur in rock, but this process is not well documented, and movement rates can be quite slow. They are more common in fine-grained soils, such as clay, especially if the soil has been remodeled or disturbed by construction, grading or similar activities. Loose granular soils commonly produce lateral spreads through liquefaction (where saturated soils are transformed from a solid into a liquefied state). Liquefaction can occur spontaneously because of changes in pore-water pressure or in response to vibrations such as those produced by seismic activity. Lateral spreads typically damage pipelines, utilities, bridges, and other structures having shallow foundations.
4. **Falls** occur when masses of rock or other material detach from a cliff or other steep slope and move downhill by free fall, rolling or bouncing. The movement is very quick. The typical slope angle involved is from 45 to 90 degrees. Rock falls occur when a rock on a steep slope becomes dislodged and falls down the slope. A rock fall may be a single rock, or a mass of rocks and the falling rocks can dislodge other rocks as they collide with the cliff. At the base of most cliffs is an accumulation of fallen material termed talus. Rock falls are a constant hazard along transportation routes through rocky terrain.
5. **Topples** are rocks and boulders that rotate forward and may become falls.
6. **Complex** is any combination of landslide types.

Subaerial and Submarine Landslide-Induced Tsunami

More information on subaerial and submarine landslide-induced tsunamis can be found in Section 3.3.5.

3.3.4.2 Location

Subaerial Landslides

The Planning Area is prone to landslides due to its steep slopes, heavy precipitation, saturated soil, and thick soil cover over bedrock. Soil creep and flow can be observed throughout the area as topsoil is pulled down slopes by gravity.

Many of Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida's landslide paths coincide with avalanche paths. There are additional areas of concern, however, such as the area above Gastineau Avenue and between Gastineau Avenue and South Franklin Street. Unmapped areas within the Borough remain to be studied for landslide hazards and will be included in future updates of this plan as resources become available to evaluate those areas for landslide hazards.

The original 2004 Hazard Mitigation Plan identified landslide hazard areas based on a 1992 study completed by Mears, Fesler and Fredston. Updated mapping conducted by Tetra Tech in 2022 identifies the study area as moderate, high, or severe hazard regarding ground failure. Based on the historic hazard areas identified in the 1992 and 2022 studies, a composite map was generated for this HMP update that identifies the location of historic landslide hazard areas.

The Tetra Tech Maps are not currently used for land use development and are noted to require more detailed site-specific investigations to determine risk. They are available for review on the City and Borough of Juneau's website. Below is a summary of their investigation and suggestions.

The Planning Area has a substantial documented history of subaerial landslides. There are approximately 45 landslide chutes defined as "Severe" that have runout areas terminating in neighborhoods or roadways (Tetra Tech 2022).

2022 Tetra Tech Downtown Juneau Landslide and Avalanche Hazard Assessment

In 2022, the City and Borough of Juneau contracted an engineering firm to investigate the landslide and avalanche hazards in Downtown Juneau and their findings are described below:

Surficial geology of the Study Area was updated, and landslide types were identified and mapped, including their initiation and runout zones. Landslide activity was mapped via historical air photo record review.

Initial mapping and the historical air photo record review were used to designate potential landslide hazards on a tripartite hazard designation system as requested by CBJ, consisting of Low, Moderate, and Severe designations. However, fieldwork and mapping revealed that a fourth designation of "High" might be warranted. It was concluded that a four-part landslide hazard designation system is required to adequately represent the landslide potential in the Study Area.

The main landslide types in the Study Area are debris slides, rockfalls, and debris flows. The former two initiate at higher elevations and may channelize to form debris flows at lower elevations. The debris flows form fans at the foot of the mountain slopes where the debris is deposited. These landslide types, as well as landslide areas that exhibit recurring activity, form the Severe landslide hazard designation category. Hazards designated as High include steep slopes where rockfalls occur but cause less damage than in locations where the hazards are designated as Severe.

The hazard of the potential deep-seated bedrock slide area is also mapped as Severe. It is anticipated that if the bedrock fails, it could produce a slide large enough to reach and enter the water. This potential should be confirmed and elucidated by further study, including geotechnical investigation and modelling.

The hazard designation for landslide hazards on the fluvial fan in Downtown Juneau has been mapped as Low. However, debris floods can be produced when large amounts of landslide debris suddenly enter Gold Creek from higher-hazard terrain located upstream of the downtown area. Given that over 60 years have passed since the completion of the flood-control channel in 1958, it may be desirable to update the hydrotechnical evaluation of Gold Creek, including the potential for debris-flood-related hazards, and a review of the monitoring and maintenance program for the flood-control channel.

More detailed assessment and investigation of the apparently developing deep-seated bedrock slide located near the top of Mt. Roberts is recommended to determine if there is active movement, and to identify the potential mechanisms and movement direction of the slide. A bedrock geologist or geotechnical engineer experienced with deep-seated landslides should investigate the area further on foot, recording strike, dip, and other relevant features and should be asked to suggest what additional work is required to allow modelling of a potential failure in this area.

Slope terrain modified by human activities, including roads, trails, cuts and fills, and other potential modifications affecting surface water runoff and slope loading, can have an effect on slope stability. A forestry road-deactivation format for slope review and the preparation of recommendations for proposed mitigations could be considered for future work. The intent of the work would be to mitigate or reduce the potential for damage resulting from slope instabilities that are attributable to abandoned or active infrastructure on the slope, especially linear infrastructure that tends to alter surface water drainage. It might not be possible to prevent all infrastructure-related slope instabilities but could reduce the likelihood that the infrastructure triggers slope instabilities or that it makes the effects of natural slope instabilities worse. A debris flow feature originally mapped by Swanston (1975) upslope of the southeast end of East Street should be further investigated in case a change in landslide hazard designation is warranted. This slope is presently mapped as having a High hazard, but the debris flow feature seems to have become active again in about 2011 (Google Street View 2022), and exposed soil still seemed to be present in 2013 (imagery from CBJ), There is also a cutline or trail upslope, so it is possible that the slope movement activity is related to a natural surface water drainage route being

obstructed by the trail and water consequently running where it should not. If this is not the case, and/or if the problem cannot be rectified, this landslide hazard may need to be redesignated as Severe.

Detailed records should be kept of known landslide activity, especially landslide activity that impacts developed areas. Information collected should include the date of the event; weather associated with the event; exact location(s) affected; boundaries of affected area; thickness, type(s), and volume(s) of debris cleaned up; photos of the site (including affected upslope areas); and, if/as applicable, costs of cleanup, costs of damage to property, injury, or loss of life. Supplemental information could include observations of upslope instabilities that could later be correlated with downslope impacts, e.g., slide debris accumulating in a gully that, months or years later, might be flushed down the gully in a major storm and impact developed areas. Workers on slopes, helicopter pilots, hikers, mountain bikers, and others who happen to observe upslope instabilities would ideally have an open invitation to report their observations to the CBJ. Photos and GPS coordinates for observations would help in documenting locations and conditions, as well as assisting possible follow-up efforts for investigators to locate event sites, and track slope and gully activity.

Periodic LiDAR and air photo flights, supplemented with digital elevation models and orthorectified imagery, would also help CBJ monitor upslope conditions.

The potential for debris floods has been identified as a possible hazard on the Gold Creek floodplain and the fluvial fan upon which the downtown area is built. Potential hazards from floods and debris floods should be further considered in an updated hydrotechnical engineering study, with the assistance of a geoscientist experienced in slope stability to further address potential upstream debris inputs to the creek channel. A hydrotechnical study would also provide an opportunity to review the monitoring and maintenance program for the existing flood-control channel.

Hazard Designation	Hazard Attribute Description
Low (L)	• Gentle to moderate slopes (0-26 degrees) • No signs of historical landslide activity on aerial photos • No written record of property damage or loss of life • Surficial geology and texture for classes I, II, and III • Estimated event probability is "Unlikely to Very Unlikely," with a return period of more than 100 years. Class I, II, and III terrain are generally not prone to active slope processes, and no landslide events were observed or reported, so it is unlikely a landslide event would happen in the future.
Moderate (M)	• Moderate to Moderately steep slopes (27-35 degrees) • May be signs of historical activity (scars on trees, vegetated debris lobes or scarps, historical activity visible by aerial photos) • Can include low lying areas within the runout zones of slides from nearby slopes • No apparent written record of property damage or loss of life • Superficial geology and texture for class IV • Estimated event probability is "Possible," with a return period of 10 to 100 years. This is the return period estimated for class IV terrain where slopes are susceptible to landslides, and where there might already be signs of landslides events. Therefore, landslide events could happen in the future.
High (H)	• Steep slopes (>35 degrees) • Areas where rockfall activity impacts individual trees but does not knock them over or destroy them • May have written record of property damage or loss of life

Hazard Designation	Hazard Attribute Description

	• At least two of the following criteria are met
	  o Thin layer of colluvium (Cv) present
	  o A maximum polygon slope of 70 to 80 degrees
	  o A mean polygon slope of 40 to 50 degrees
	• Estimated event probability is "Likely," with a return period of 5 to 30 years. This is the return period estimated for class IV terrain where slopes are known to be susceptible to landslides, and where there are signs of recent and/or historical landslide events. Therefore, landslide events are likely to keep happening in the future.

Severe (S)	• Steep to vertical slopes (>35 degrees) • Signs of recent activity either in aerial photographs or from field inspection (rockfall tracks, debris slide activity, debris flow paths, etc.) • May have written record of property damage or loss of life • Signs repeated historical activity • Surficial geology and texture for class V • Estimated event probability is "Very Likely to Almost Certain", with a return period of 1 to 20 years. This is the return period estimated for Class V terrain, where the slopes are highly susceptible to landslides, and where there are signs of recent landslide activity as well as repeated historical landslide activity. Therefore, landslide events are very likely to almost certain to keep happening in the future

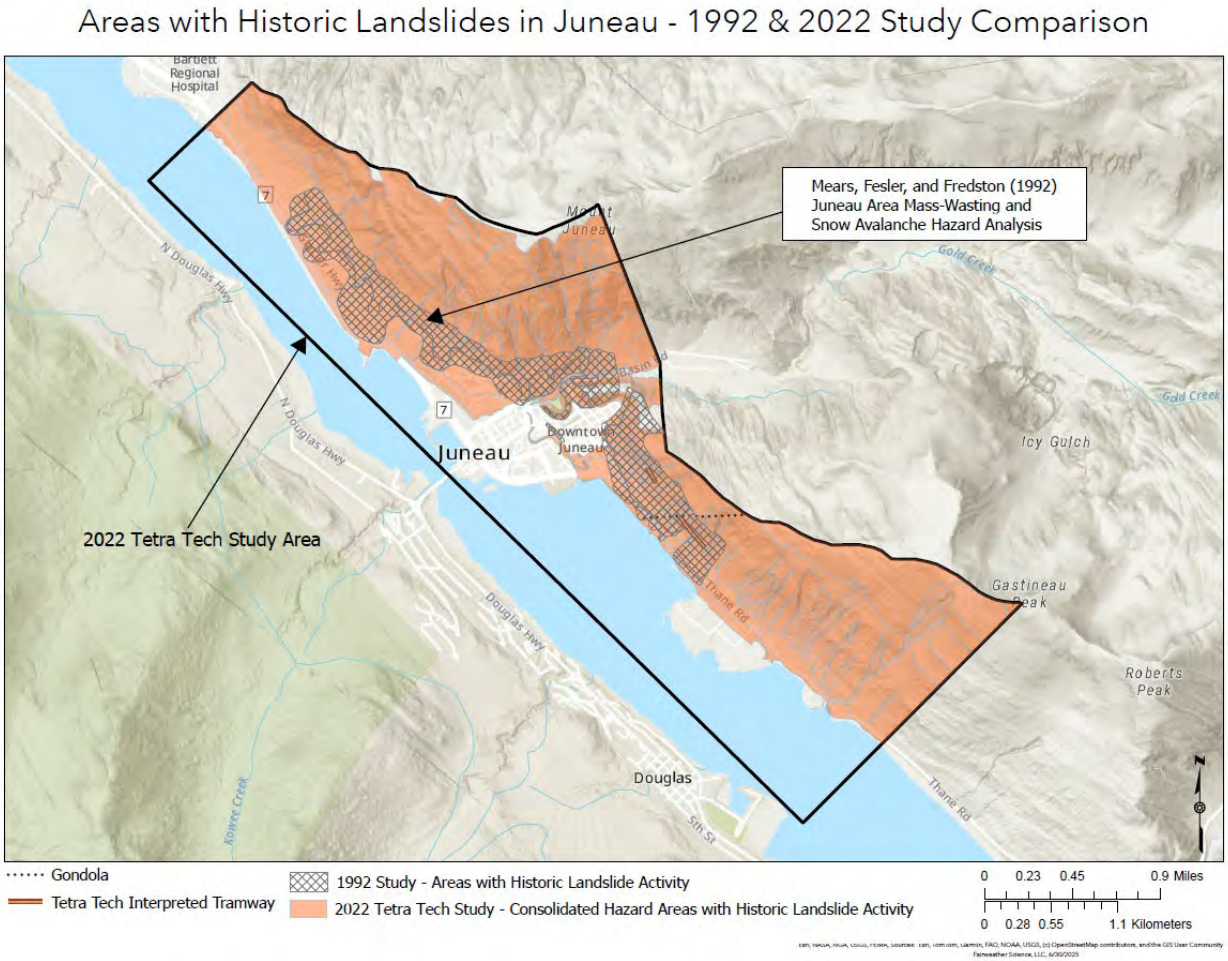


Figure 43- Historic Landslide Hazard Areas in Downtown Juneau

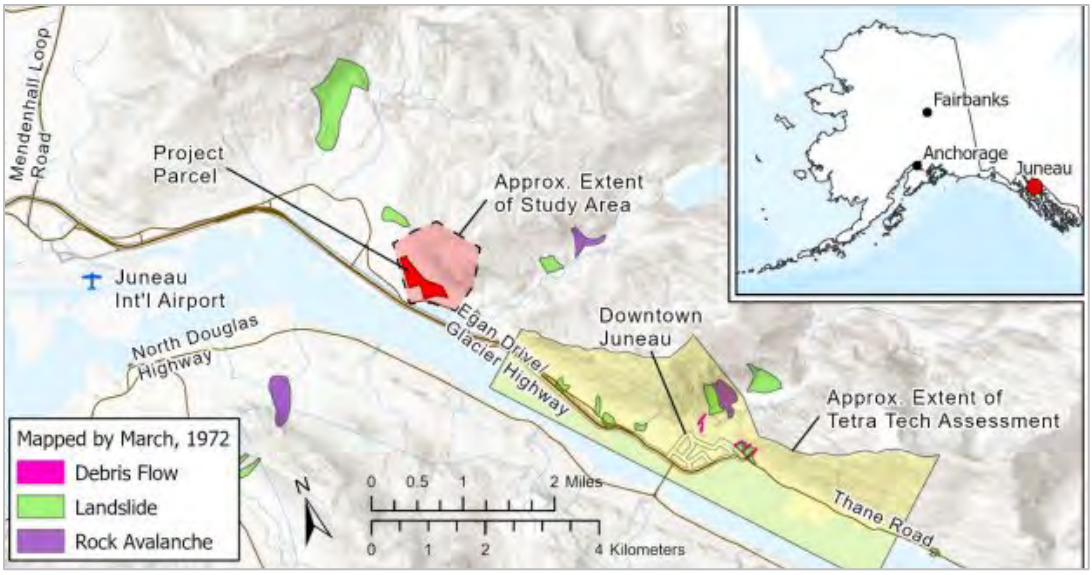
2024 Alaska Division of Geological & Geophysical Surveys Mass Movement Potential at Blackerby Land Parcel Report

In 2024, the Alaska Division of Mining, Land, and Water (DMLW) requested information from the Division of Geological & Geophysical Surveys (DGGS) regarding the slope stability of the Blackerby land parcel in Juneau, Alaska. Their findings are described below:

The Division of Geological & Geophysical Surveys assessment for the Blackerby parcel for the Division of Mining, Land and Water was conducted by first researching the known occurrences of landslides and debris flows in the area, collecting and processing new lidar data, estimating the relative susceptibility for both shallow landslides and channelized debris flows, and generating maps to show these susceptibilities.

On average, the parcel is moderately susceptible to shallow landslides, with the area around the drainage at the southeastern end having a higher susceptibility, and it is not likely to be inundated by a debris flow.

Landslide susceptibility mapping and slope stability analyses are essential for producing high-quality hazard maps and providing information to planners who can use these data to implement guidelines and directions for local planning and development. The results of the slope stability analysis and resultant maps can assist planners to evaluate site conditions and determine if additional investigations and mitigation measures are needed to address the identified hazards in this area.



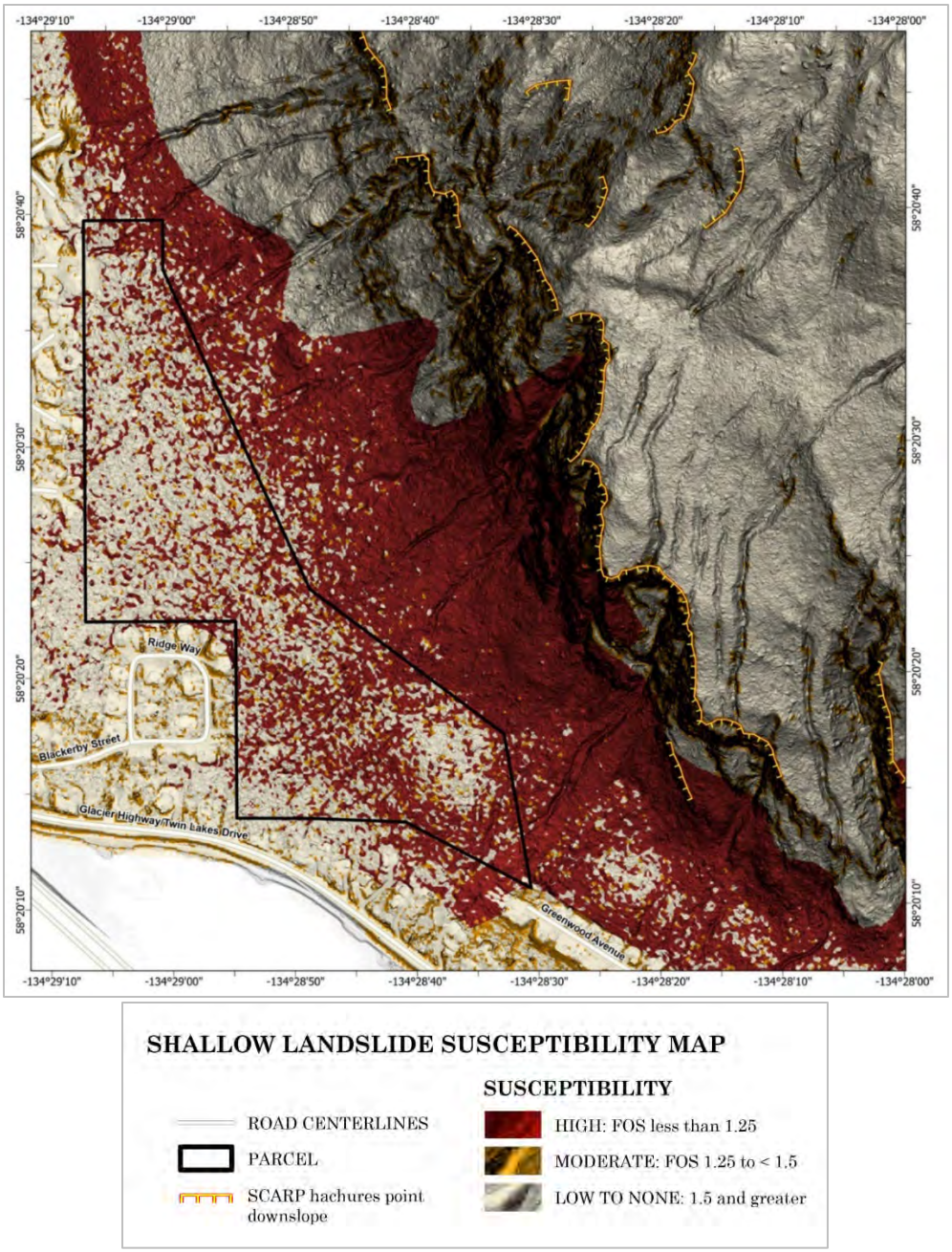
Source: DGGS 2025

Figure 44- 2024 DGGS Blackerby Parcel Study Area Map

The Shallow Landslide Susceptibility map (Figure 45) represents movement of a thin layer of slope materials (soils and bedrock mapped by Ford and Brew, 1973) that have a shallow failure plane. Movement types may include slumps, translational slides, earth flows, and complex combinations of these types. The map was prepared following protocols created by Burns and others (2012) and is based on the calculated factor of safety (FOS) for each soil type and slope angle. FOS calculations use assumed input values based on best judgment and with a conservative approach (DGGS 2024).

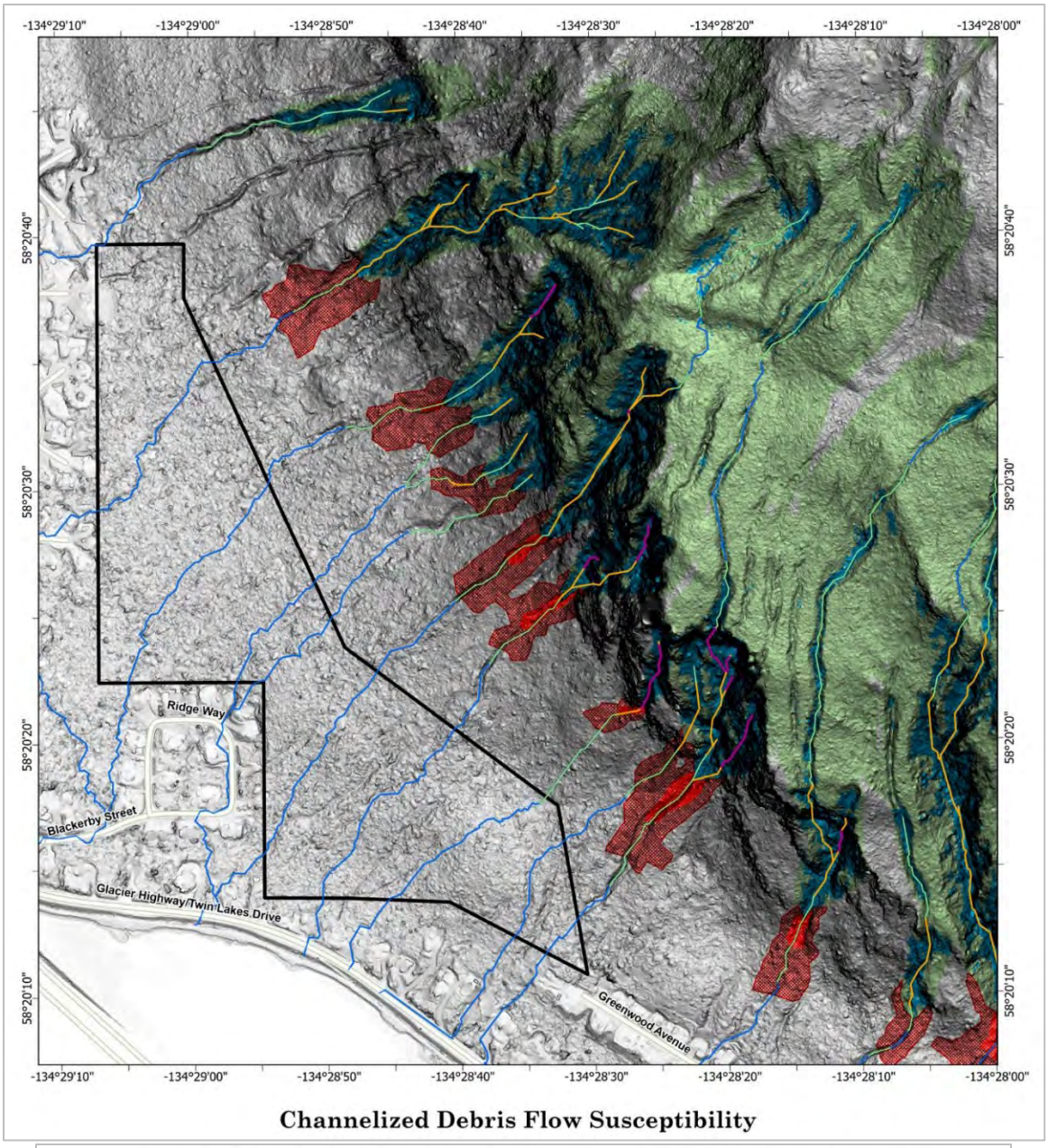
The Channelized Debris Flow Susceptibility map (Figure 46) depicts analyzed debris flow initiation catchments, transportation potential by streams, and the modeled extents of deposits. These zones were simulated following protocols created by Burns and others (2022) and are based on slope characteristics and the proximity to streams. Stabilization from vegetation is not included in the analyses. Because there are no mapped debris flows in the area, the map is based on an assumed "typical" event. The “extreme” event is scaled up from the assumed typical event.

The susceptibility maps are intended to provide users with relative hazard information regarding possible slope movement in the area, to guide regional and site-specific investigations for future development, and to assist in regional planning. They are not intended to replace site-specific engineering analyses (DGGS 2024). The susceptibility maps are not regulatory. Revisions can happen when new data or other information regarding factors that affect landslide and debris flow susceptibility are acquired or when future (new) events occur. It is possible that areas susceptible to landslides or debris flows were not identified on these maps (DGGS 2024).



Source: DGGS 2024

Figure 45- Shallow Landslide Susceptibility Map of the Blackerby Land Parcel (2024)



Source: DGGS 2024

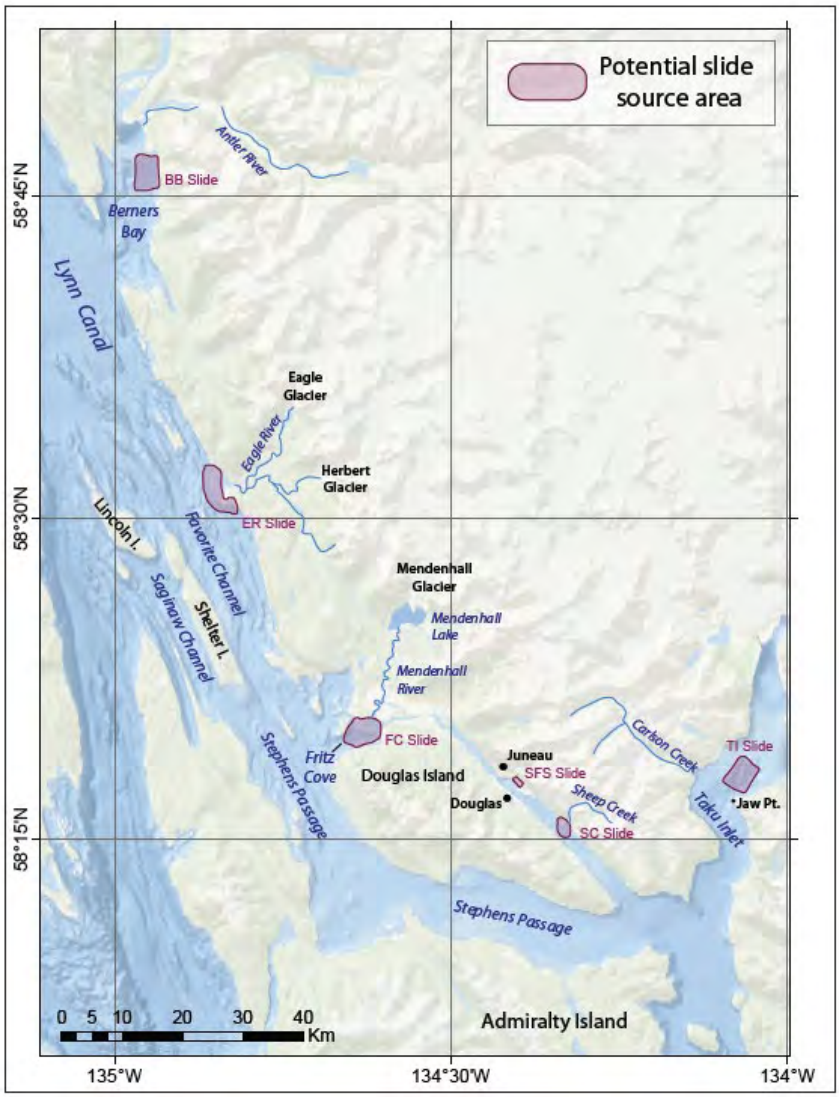
Figure 46- Channelized Debris Flow Susceptibility Map of the Blackerby Land Parcel (2024)

Submarine Landslide

The Planning Area does not have a robust history of submarine landslides. During the 1958 Lituya Bay Earthquake and mega tsunami near Yakutat (Yaakwdáat), it was reported that underwater cables in Lynn Canal, between the Planning Area and Skagway, were broken by submarine landslides (DGGS 2022).

Presently, there is little known about the potential for submarine landslides in the vicinity of Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida. However, the combination of high sedimentation rates, seismic activity, artificial fill, and history of submarine landslides in Alaska coastal communities with similar geologic settings (such as Seward, Valdez, and Whittier), lead to belief that there are several potential submarine landslide sites that could impact the Planning Area (DGGS 2022).

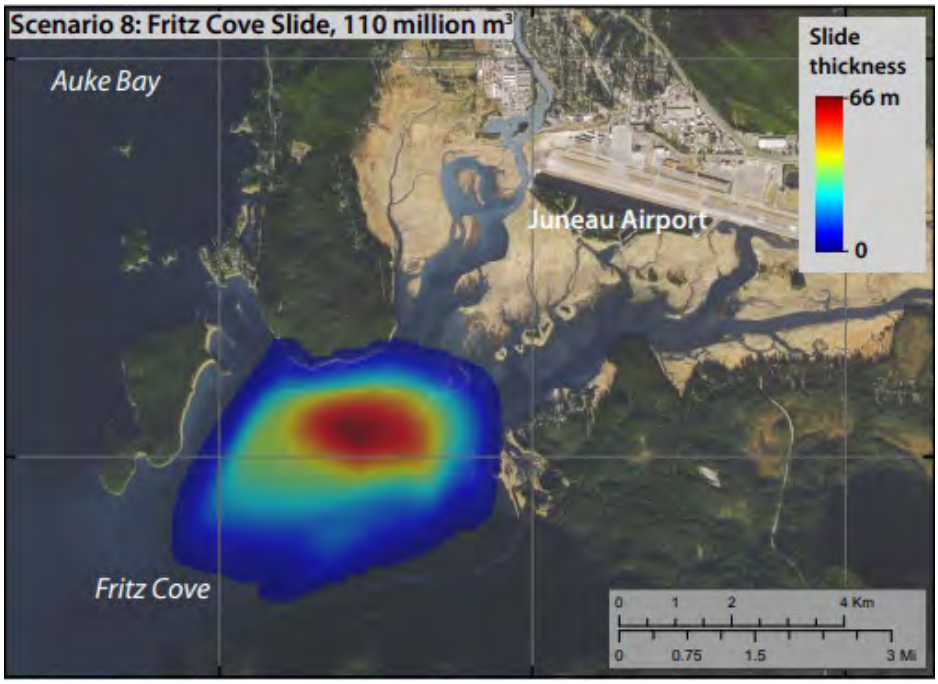
The most likely sites of submarine landslides that could affect Juneau and Traditional Lands of Tlingit & Haida are in Lynn Canal (Ch'áak' K̲wáan), Favorite, Saginaw, and Gastineau channels, and in Taku Inlet (DGGS 2022). The 6 primary locations are described in detail below.



Source: DGGS 2017

Figure 47- Locations of Potential Underwater Slides in Juneau and Traditional Lands of Tlingit & Haida

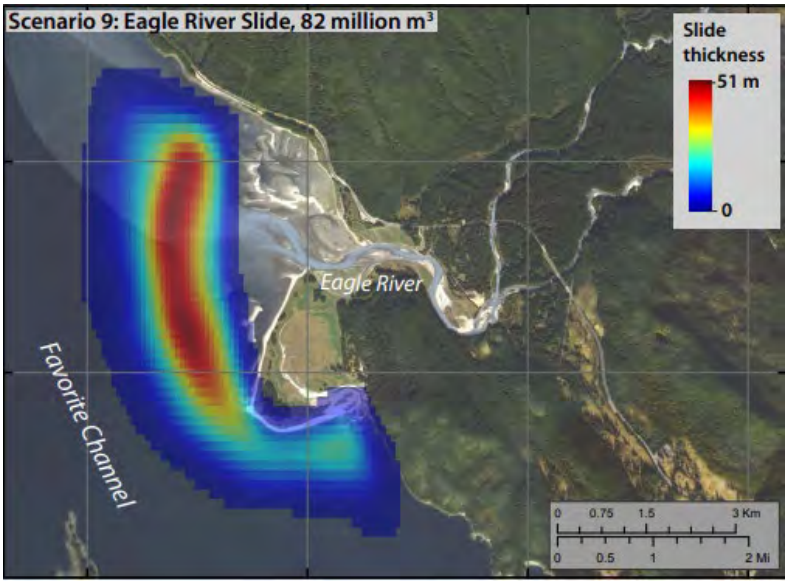
- **Head of Fritz Cove (FC Slide)**: Fritz Cove is a bay between the mainland and Douglas Island, about 8.1 miles from Downtown Juneau. The Mendenhall River deposits glacial sediments at the northern shore of the cove. Industrial areas, as well as the airport, are near Fritz Cove.



Source: DGGS 2017

Figure 48- Fritz Cove Potential Submarine Slide Area

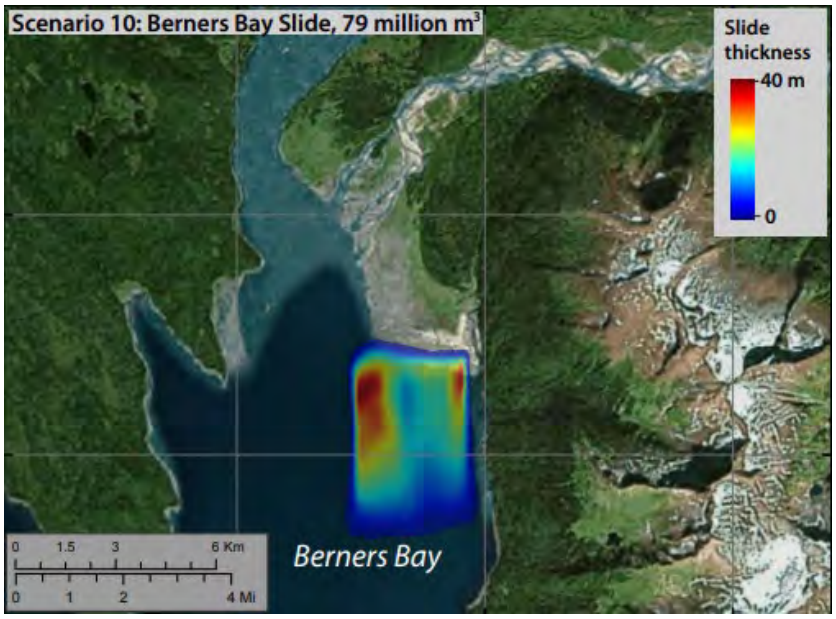
- **Offshore of Eagle River (ER Slide)**: The front of the Eagle River delta is in Favorite Channel approximately 20 miles north of Downtown Juneau. A state recreational area and two campgrounds are located at the mouth of Eagle River.



Source: DGGS 2017

Figure 49- Eagle River Potential Submarine Slide Area

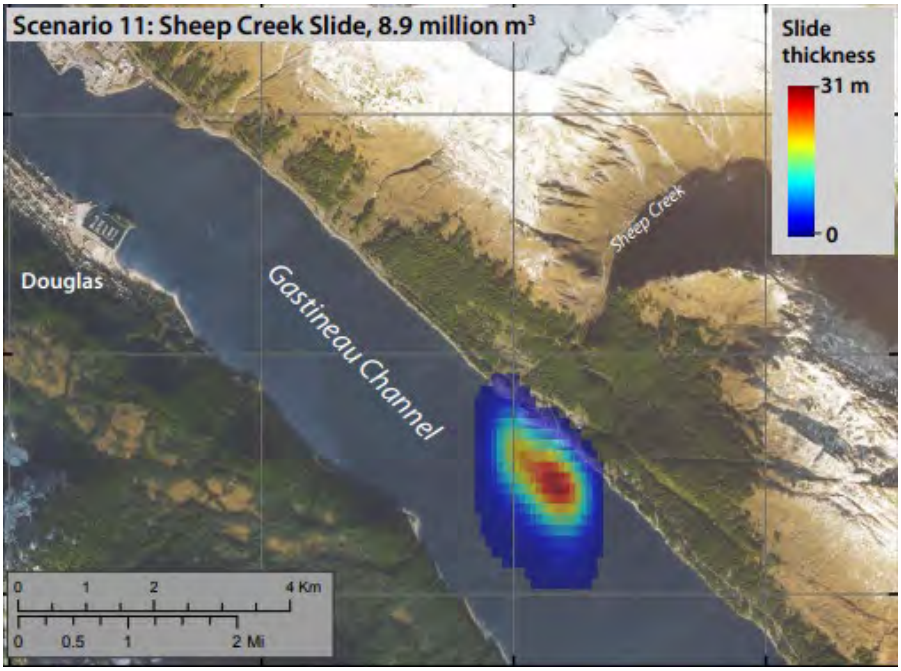
- **Berners Bay (BB Slide)**: Berners Bay is located 25 miles north of Downtown Juneau. It is an estuary fed by four glacial rivers including the Antler River, Berners River, Lace River, and Cowee Creek. Threatened infrastructure in this location include the Echo Cove boat ramp and parking lot, and several camping areas.



Source: DGGS 2017

Figure 50- Berners Bay Potential Submarine Slide Area

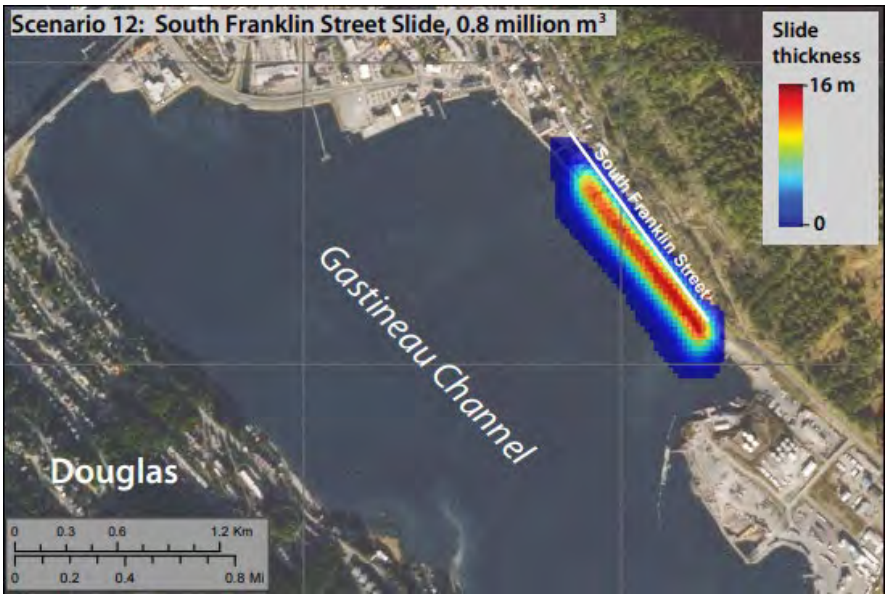
- **Offshore of Sheep Creek (SC Slide)**: Sheep Creek originates high in the Coast Mountains and empties into Gastineau Channel about 3.7 miles south of Downtown Juneau. The mouth of Sheep Creek has a well-formed delta that represents another potential location for a submarine landslide.



Source: DGGS 2017

Figure 51- Sheep Creek Potential Submarine Slide Area

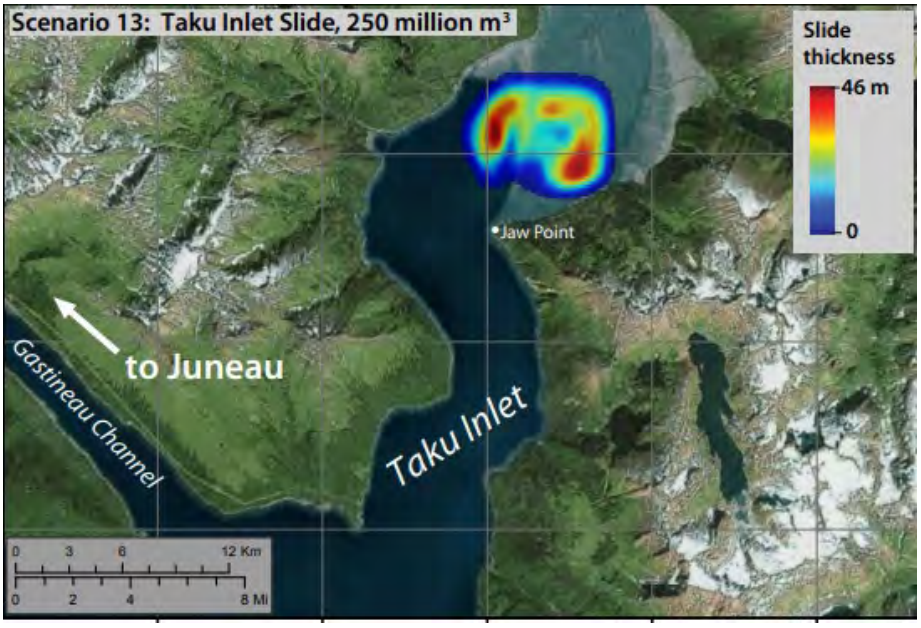
- **South Franklin Street (SFS Slide)**: Discovery of gold in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida created mining opportunities around the community as well as mine tailings and an excess of artificial fill material. Some of the fill was used to level off areas along South Franklin Street and increase its capacity of wharves on Gastineau Channel. In the event of significant ground shaking, it is possible that some of this material could slide into the channel.



Source: DGGS 2017

Figure 52- South Franklin Street Potential Submarine Slide Area

- **Taku Inlet (TI Slide)**: South of the Planning Area, the Taku River (T'aakú Héeni) as well as other smaller glacier-fed streams drain into the ocean and carry unconsolidated sediment to the head of Taku Inlet. It is possible that sediment at the head of Taku Inlet could fail and slide into the bottom of the inlet.



Source: DGGS 2017

Figure 53- Taku Inlet Potential Submarine Slide Area

3.3.4.3 History

For over 100 years, Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit and Haida have been impacted by recorded landslides, the most significant being the 1936 downtown landslide, which destroyed several buildings and killed 15 people. Appendix F includes details showing the recorded subaerial landslides in the planning area dating back to 1920.

3.3.4.4 Extent (Magnitude and Severity)

Damage from ground failure or landslides ranges from minor with minimal repairs required to a massive economic impact with the possible destruction of critical community infrastructure and potential loss of human life.

Subaerial Landslide

Subaerial landslides on mountains (away from bodies of water) in the Planning Area pose a threat to critical facilities or human life. Subaerial landslides near bodies of water also pose a threat to critical facilities or human life in the Planning Area as they may trigger a tsunami or seiche.

Landslides have been documented near bodies of water in the Planning Area, but these events still have the possibility to produce a tsunami or seiche. Ongoing monitoring and modelling of these areas is needed to identify if future subaerial landslides have the potential to trigger a tsunami. More information about tsunamis can be found in Section 3.3.5.

Subaerial landslides in the Planning Area have displayed large magnitudes and severity in the past, in the form of debris flows and flooding caused by debris dams. Limited reporting makes quantifying volumes of earth moved by landslides difficult, with the most specific report coming from the Gastineau Avenue 2022 landslide. "15 truckloads" of debris was removed during road clearing work (KTOO 2022). Based on the reporting of this event, dozens of truck loads of earth, boulders, and tree trunks have been mobilized during these events.

Subaerial landslides can cause secondary affects depending on their extent, including rerouting waterways and water runoff, increased shoreline/bank destabilization, and flooding.

Source: Tetra Tech 2022

Figure 54- 2020 Debris Flow Running onto Glacier Highway

Source: Tetra Tech 2022

Figure 55- 2020 Landslide Induced Debris Flow and Flooding

Based on available data and modelling, historical events, and the criteria identified in Table 10, the magnitude and severity of subaerial landslides and resultant damages to people and infrastructure in the Planning Area is considered to be Critical, with potential for critical facilities to be shut down for at least two weeks, and more than 25 percent of property or critical infrastructure being severely damaged.

Submarine Landslide

A landslide (both submarine and subaerial) has the ability to trigger a tsunami. Due to the Planning Area's location in the Inside Passage, and protection from the open ocean by islands, a submarine landslide-induced tsunami affecting the Planning Area has not occurred in recent history. However, due to the combination of high sedimentation rates, seismic activity, artificial fill, and history of submarine landslides in Alaska coastal communities with similar geologic settings (such as Seward, Valdez, and Whittier), there have been 6 locations of potential underwater landslides that could result in a tsunami that could impact the Planning Area.

Table 17- Extent of Potential Juneau and Traditional Lands of Tlingit & Haida Submarine Landslides

Scenario	Location of Potential Underwater Slide	Maximum Slide Volume, million cubic meters	Maximum Slide Thickness, meters
1	Head of Fritz Cove	110	66
2	Offshore of Eagle River	82	51
3	Head of Berners Bay	79	40
4	Offshore of Sheep Creek	9	31
5	South Franklin Street	0.8	16
6	Taku Inlet	250	46

Source: DGGS 2022

Based on available data and modelling, historical events, and the criteria identified in Table 10, the magnitude and severity of submarine landslides and resultant damages to people and infrastructure in the Planning Area is considered to be Limited with the potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.

3.3.4.5 Impact

Impacts associated with landslides may include tsunamis/seiches, surface subsidence, infrastructure/ building and/or road damage, and potential human injury or death.

Landslides are often associated with other hazards. For example, a landslide may occur during floods because both involve precipitation, runoff, and ground saturation. Landslides are also often associated with seismic and volcanic events. Some of the costliest landslides in American history were caused by the 1964 Good Friday earthquake. It has been estimated that ground failure caused about 60% of the damage.

The secondary effects of landslides can also be very destructive. Landslide-caused dams cause damage upstream due to flooding and downstream due to a flood which may develop because of a sudden dam break. Landslides can also cause tsunamis and seiches when slide material slides into a lake or sea, displacing large amounts of water.

Areas most vulnerable are deep bays and inlets adjacent to steep slopes, such as those that surround Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida. In these semi-enclosed basins, the water can oscillate to create a large wave, called a seiche, which can impact the shorelines several times before dissipating. The waves that destroyed much of old Valdez after the great 1964 earthquake were caused by an earthquake- triggered submarine slide. In 1958, an earthquake on the Fairweather fault triggered a large landslide that crashed into the head of Lituya Bay, generating a wave that stripped trees to an elevation of 1,700 ft. on the opposite shoreline. A non-earthquake related seiche occurred in Skagway Harbor in November 1994, destroying part of the state ferry dock and city boat harbor. A cruise ship wharf undergoing construction at the head of Taiya Inlet collapsed, while it was storing 9,000 cubic yards of riprap material on the pier foundation. This seiche was caused by a submarine landslide, which causes are not definitively known. Extensive studies suggest it was a result of several factors. An extreme low tide (1.2 meters below low water line) triggered a landslide in glacial sediments at the mouth of the Skagway River on the opposite side of the harbor, which had increased volume due to recent flooding. This likely triggered a submarine failure of unstable sediments beneath the PARN dock (ASHMP 2023).

There may be many similar unstable areas around Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida where damaging landslide-generated waves can occur as a result of earthquakes or other triggering events. Vertical seafloor motion resulting from a future earthquake in the Yakataga seismic gap could produce a damaging tsunami.

Subaerial Landslide

Subaerial landslides on mountains in the Planning Area have impacted numerous critical facilities and residences as the populated portion of the Planning Area is situated near or within historical landslide hazard areas. Roads have been the primary critical facilities affected by landslides in the past, but other critical facilities are within landslide hazard areas and future ground failure events could impact greater numbers of people and facilities. Private residences have been damaged or destroyed in past landslides as well. Landslides occurring in 1920 and 1936 resulted in the death of 19 individuals.

Eleven events have directly impacted critical facilities, including repeated blockages of Gastineau Avenue, Egan Drive, Glacier Highway, and damage incurred twice to the AWARE women's shelter. Of the recorded landslides affecting the Planning Area, Gastineau Avenue had recorded damages during 5 of these events. Besides being covered in debris and blocked to traffic until the debris was cleared, Gastineau Avenue also suffered from homes on the uphill side being swept downhill across the road, sometimes damaging or destroying homes on the downhill side of the road.

Other roadways that have been damaged or closed by landslides in the past include South Franklin Street, Ewing Street, North Douglas Highway, Salmon Creek Road, Glacier Avenue, Mary Ellen Way, Cordova Street, Fritz Cove Road, Thane Road, and the Glacier Highway. These roadways have been damaged and/or blocked by debris flows, homes being swept into the street, boulder debris, and flooding due to landslide created dams during heavy rainfall.

Non-roadway critical infrastructure that has been damaged or destroyed by landslide events include hotels, lodges, Juneau Cold Storage Facility, Macauley Salmon Hatchery, Juneau Veterinary Clinic, a small hydroelectric dam, Cope Park, the AWARE women's shelter, Juneau- Douglas High School, power lines, and a store.

The most devastating landslide in the Planning Area's history was on November 22, 1936, resulting in 15 deaths, the Juneau Cold Storage Facility was buried in three feet of mud and debris, and totally engulfed a general store, lodge, and two apartment buildings. Power lines were downed and most of Downtown Juneau was without power until new poles and lines could be erected. The exact duration of the power outage is not specified in historical records, but it is known that the community was without power for at least several days as rescue and recovery operations took priority over infrastructure repair (KTOO 2024). A lesser landslide in October of 1936 damaged the Alaskan Hotel when debris flow carrying a residential home entered the hotel from the uphill side.

Source: KTOO 2020

Figure 56- Downtown Juneau Damage After the 1936 Landslide

The July 1984 landslide severely damaged a small hydroelectric dam and the Juneau Veterinary Clinic, requiring 9 animals to be relocated to the Gastineau Humane Society.

The AWARE women's shelter has been damaged twice by landslides, first in 1998 and again in 2020. The 1998 event flooded the first floor with muddy water. The 2020 event caused saturated debris and water to flow into and pool in the parking lot and first floor of the building.

The 2019 landslide induced some minor flooding and debris flow on Juneau-Douglas High School grounds.

The 2020 landslide damaged a water pipe in Salmon Creek Reservoir Dam that supplied the Macauley Salmon Hatchery with fresh water. Due to limited freshwater, hatchery officials were required to decide which fish (Yáat) to prioritize, leading to the release of all their Chinook, Coho, and Rainbow trout smolt before they were biologically equipped to absorb saltwater, essentially destroying the fish. This caused Chinook Salmon sport fishing closures near Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida in Auke Bay (Áak'w), Fritz Cove, Gastineau Channel, and within 300 yards of the hatchery dock during the 2024 fishing season (KTOO 2024). The Planning Area accounts for 10% of angler days in Southeast Alaska, approximately 17,600 days. Chinook salmon are one of the most popular species to target. It is estimated that the 2024 sportfishing industry generated $271 million in Southeast Alaska (SEAGO 2025). While no direct accounting of the Planning Area's contribution is reported, it is possible the closure of Chinook salmon fishing had a negative impact on the economy measured in the hundreds of thousands or millions of dollars.

The September 26, 2022, landslide on Gastineau Avenue downed powerlines that left Douglas, North Douglas, Downtown Juneau, and Thane without power. 5,000 residents had their power restored in several hours, while approximately 50 customers power was out until the next day. Four homes were without power for a more extended period due to extensive damage to power infrastructure and meter bases (KTOO 2022).

Source: KTOO 2020

Figure 57- Macauley Salmon Hatchery Water Supply Damage Following a Landslide (2020)

Source: Peninsula 2022

Figure 58- Gastineau Avenue Landslide (2022)

Source: KTOO 2022

Figure 59- Gastineau Avenue Blockage Following a Landslide (9/26/2022)

Submarine Landslide

Underwater landslides generated by earthquakes have not been documented in the immediate vicinity of the Planning Area. It is important to note that it is possible for a submarine landslide to be non-detected if it did not result in visible impacts (tsunami/seiche).

Past submarine landslides in other locations in the Southeast Alaska have displayed the possibility of a future event affecting Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida with a landslide induced tsunami or seiche. The potential sites of future submarine landslides (see submarine landslides, location), have infrastructure present that could be affected.

- **Head of Fritz Cove**: A submarine landslide in the Head of Fritz Cove is relatively close (8.1 miles) to Downtown Juneau. In the event of a submarine landslide, the JIA, as well as residential and industrial areas, could incur damage. Tsunami waves could reach heights of 50 feet (DGGS 2022).
- **Offshore Eagle River**: While further away from Downtown Juneau (20 miles) than the Head of Fritz Cove, a state recreation area and two campgrounds would potentially be affected by a submarine landslide at this location.
- **Head of Berners Bay**: Echo Cove, a natural harbor that includes a boat ramp, parking lot, and several camping areas, could be affected by a submarine landslide in the Head of Berners Bay.
- **Offshore Sheep Creek**: This site has the potential for Thane Road and the waterfront of Douglas to be damaged by a submarine landslide offshore of Sheep Creek.
- **South Franklin Street**: If an underwater landslide occurred at South Franklin Street, residential structures and South Franklin Street itself could either have their structural integrity compromised or sluff off into the water completely, depending on the extent of the slide.
- **Taku Inlet**: Depending on the extent of the slide at the head of Taku Inlet, the entirety of Gastineau Channel could be inundated with tsunami waves. The submarine landslide itself in this location does not pose a threat to the Planning Area.

Air Transportation Impacts: Impacts to air transportation associated with landslides are indirect, due to the airport not located in landslide hazard zones. However, landslide impacts could prevent access to the airport by blocking roadways. A large landslide could block waterways and possibly flood airport infrastructure. If access to the airport was shutdown for an extended amount of time, it is possible that travel and supply delivery requirements could create strain on the marine transportation systems.

3.3.4.6 Probability of Future Events

Historically, the largest and most destructive landslides have been associated with more than 1.5 inches of rain in a 24-hour period. Precipitation records indicate that precipitation intensities of 2.0 inches in 24 hours can be expected at return periods of 5-10 years. Therefore, the conditions necessary for production of large landslides continue to prevail today even though major, destructive landslides do not occur frequently. Although the probability for ground failure is location-specific, the probability is likely, and increasing, due to future climate events (DHS&EM 2023).

Subaerial Landslide

Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a subaerial landslide event in the calendar year; there is a 1 in 1 year chance of occurring (1/1=100%); and the history of events is greater than 33% likely per year.

Submarine Landslide

Based on previous occurrences and the criteria identified in Table 11, it is Possible that the Planning Area will experience a submarine landslide event in the next five years; there is a 1 in 5 years chance of occurring (1/5=20%); and the history of events is greater than 10% but less than or equal to 20% likely per year.

3.3.4.7 Future Conditions

Changing Factor	Description of Future Conditions
Nature	It is unlikely future climate conditions will influence the nature of landslides in the future.
Location	It is possible that future climate conditions will influence the location of future landslides in Juneau and Traditional Lands of Tlingit & Haida. Landslide probability is location specific, and numerous variables must be considered. It is common for debris flows to recur in the same channel or to shift slightly. Other types of landslides may reoccur in the same place or the area directly adjacent to a previous landslide. Ground failures related to more frequent severe weather events, an increase in atmospheric rivers, and potential droughts are expected to appear in locations that were previously frozen and are now thawing. This includes areas that are immediately adjacent to recently thawed ground and where overlying vegetation has been removed. However, landslides also occur in areas with no prior known instabilities due to changing conditions such as increased rainfall, strong earthquake shaking, and human activities (DHS&EM 2023).
Extent (Magnitude and Severity)	It is likely that future climate conditions will influence the magnitude of future landslides in the Planning Area. Landslides are expected to increase in magnitude with increased areas of effect as glaciers continue to retreat and severe weather events increase in frequency (IPCC 2019). Future climate conditions are expected to increase landslide frequency of all intensities, and as people develop across the landscape, including into hazardous areas, there will likely be an increase in catastrophic outcomes in the future (DHS&EM 2023).
Impact	It is likely that future climate conditions will influence the impact of future landslides in the Planning Area. Landslides are projected to occur in areas where there is no history of previous events due to the destabilization of mountain slopes from an increase in atmospheric rivers, severe weather events, and glacial decline (IPCC 2019), which could increase future ground failure events and resultant impacts to Juneau and Traditional Lands of Tlingit & Haida.
Probability of Future Events	It is likely future climate conditions will influence the probability of future landslides in the Planning Area. Although the probability of ground failure is location-specific, it is likely, and increasing, due to a changing climate. Severe weather events such as precipitation and wind are a direct result of atmospheric warming. Atmospheric rivers are becoming increasingly common and increase the intensity and duration of precipitation events at regional and local scales. Landslide events are directly related to high intensity precipitation events, and those are likely to become more common over greater geographic regions of Alaska (DHS&EM 2023). Increases in tsunami-producing landslides in Southeast Alaska can also be attributed to retreating glaciers. Rock-ice face collapse is most common in areas with glaciers and steep topography, frequently the same areas that attract tourists (DHS&EM 2023).
Population Patterns	It is possible future climate conditions will influence population patterns in the Planning Area. Like much of Southeast Alaska, the Planning Area is experiencing a slight decline in population as an overall trend. By 2050, the population is estimated to be roughly 27,000, down from the current 31,119 (US Census 2025). While this may eventually mean less of the resident population living in landslide hazard areas, an increased growing season due to future climate conditions could lengthen the tourist season. An increase in tourists throughout the year could possibly increase the amount of people that are at risk of landslide hazards at any given moment, particularly due to the high landslide hazard areas encompassing Downtown Juneau, which is one of the tourist destinations for cruise ship passengers.

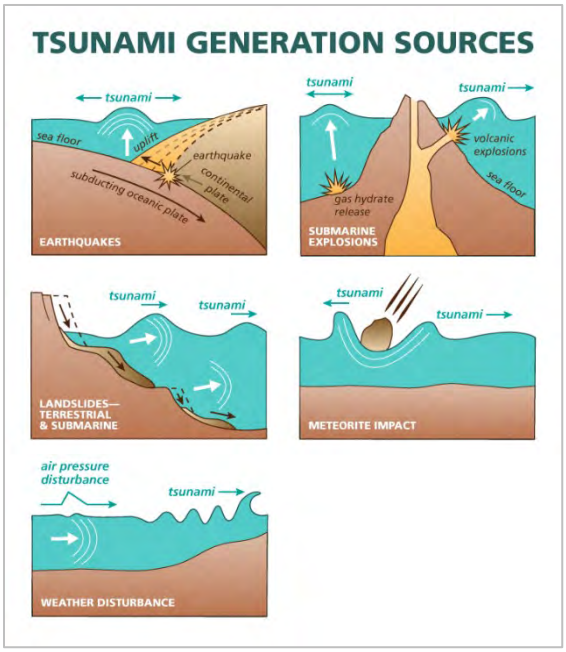
Changing Factor	Description of Future Conditions
Land Use Development	It is likely future climate conditions will influence future land use development in the Planning Area. Southeast Alaska generally is developed in narrow sections of land between the coast and steep, mountainous terrain. Much of the Planning Area's built environment is directly underneath or within landslide hazard areas. Limiting development and relocating existing development outside of landslide hazard areas would change the development in these areas. A landslide warning system could require infrastructure development, and more development outside of the landslide zones could increase land use to accommodate displaced residents. It is also possible that land developed in the future, or that has already been developed, may eventually become prone to landslide hazards.

3.3.5 TSUNAMI

3.3.5.1 Nature

A tsunami is a series of traveling waves of extremely long wavelength and period generated by a sudden vertical displacement of water. This displacement of water can be triggered by underwater volcanic eruptions, large subaerial or submarine landslides, or earthquakes at or below the ocean floor. In Alaska, seismically generated earthquakes near the subduction zone pose the primary tsunami threat to coastal communities. A seiche is an oscillating wave occurring within a partially or totally enclosed water body.

The different types and generation sources of tsunamis are described below:



- **Seismically generated tsunamis** are generated by an earthquake event. Seismically-generated tsunamis in Alaska most commonly occur along the subduction zone in the Aleutian Islands. Earthquakes have also generated tsunamis in the back arc area in the Bering Sea and the eastern boundary of the Aleutian Arc plate. Seismically-generated tsunamis typically reach land 20 to 45 minutes after starting. Tectonic tsunamis originating in the vicinity of the Aleutian Islands, Alaska Peninsula, and the Gulf of Alaska are of particular concern to Alaskans because waves can reach coastal communities within minutes to hours after the earthquake and may require immediate evacuation.

- **Landslide-generated tsunamis** can be generated by subaerial (land) or submarine (underwater) landslides. Landslides may be triggered by an earthquake and one earthquake may trigger multiple landslides and resulting tsunamis. These events are particularly dangerous because they can form the largest tsunami events as they possess the largest amount of kinetic energy, and they do not typically provide any warning before generating.

  An earthquake usually, but not always, triggers this type of landslide, and they are usually confined to the originating bay or lake location such as the historical 1958 Lituya Bay event and the more recent October 2015 700-foot-high landslide wave Taan Fjord event in Icy Bay. Some have been notable enough to register on earthquake monitoring equipment thousands of miles from Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida.

  A primary cause of submarine landslides in fjords is the accumulation of sediments on steep underwater slopes (DGGS 2017). Subaerial landslides can be initiated in slopes already on the verge of movement by rainfall, snowmelt, changes in water level, stream shoreline/bank destabilization, changes in ground water, earthquakes, volcanic activity, disturbance by human activities, or any combination of these factors.

- **Volcanic-generated tsunamis** are the least common type of tsunamis in Alaska, as only one volcanic eruption event that generated a tsunami has been confirmed in the state. In 1883, the Saint Augustine volcano triggered a tsunami when the north side of the mountain collapsed. The resulting tsunami inundated Port Graham with waves that were 30 feet high. On January 15, 2022, a large submarine volcano in Tonga erupted, which triggered a widespread Pacific-wide tsunami. The eruption was detected throughout parts of Alaska, as far north as Fairbanks, nearly 6,000 miles away. The National Tsunami Warning Center issued a tsunami advisory for much of the Alaskan coastline, as unusual and

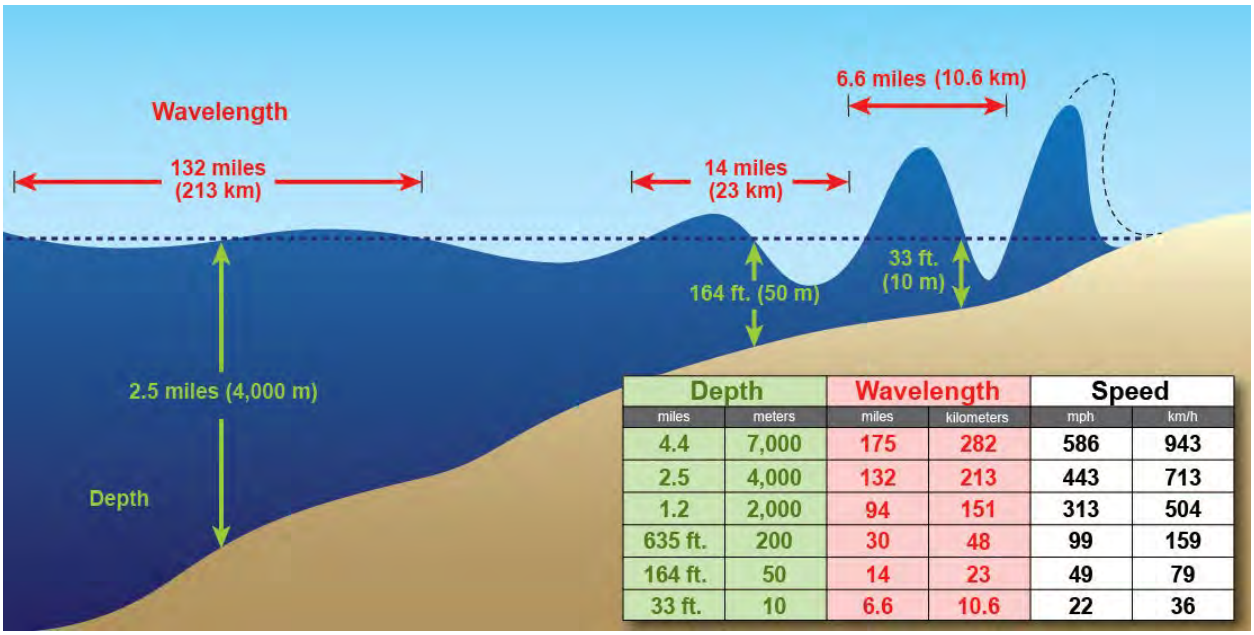
strong currents with waves up to 3 feet were predicted. The community of King Cove recorded waves of just over 2 feet, but no significant damage was reported. The National Tsunami Warning Center stated that an evacuation warning would have been issued if waves reached 3.2 feet.

- **Teletsunamis**, also called **ocean-wide tsunamis** or **distant tsunamis**, originate at a distant location, and are observed at or impact locations 620 miles (>1,000 km) away or over 3 hours travel time from their source. In many cases, tele-tsunamis can allow for sufficient warning time and evacuation. There is a slight risk in the western Aleutians and some parts of Southeast Alaska. Most tele-tsunamis that reached Alaska have not caused damage. Massacre Bay on Attu Island has historically received tele-tsunamis with less than one-ft recorded amplitudes. The 1960 Chilean tsunami caused damage to pilings at MacLeod Harbor, Montague Island (Prince William Sound area) and on Cape Pole, Kosciusko Island (southeast Alaska) where a log boom broke free.
- **Seiche** waves oscillate in partially or totally enclosed water bodies. They are caused by earthquakes, underwater landslides, atmospheric disturbances, or avalanches and can last from a few minutes to a few hours. The first wave can occur within a few minutes, giving virtually no warning time. The resulting effect is like bathtub water sloshing repeatedly from side to side. The reverberating water continually causes damage until the activity subsides. The factors for effective warning are like a local tsunami. Communities near large lakes, such as Lake Iliamna, may be vulnerable to seiche activity following an earthquake.

Many tsunamis are often undetected because of their long wavelengths. Some wavelengths are hundreds of miles long and only 3 feet high and cannot be felt by mariners as it passes beneath their vessel. The wavelength of the tsunami waves and their period will depend on the generating mechanism and the dimensions of the source event. If the tsunami is generated from a large earthquake over a large area, its initial wavelength and period will be greater. If the tsunami is caused by a local landslide, both its initial wavelength and period will be shorter.

The speed that a tsunami will travel will depend on the depth of the water it is travelling through. The tsunami will travel faster in deeper water and will begin to slow down once the depth of the water decreases. In the deep ocean, they can travel at speeds over 500 mph and have the capacity to cross entire oceans in one day.

As a tsunami enters shallow waters and nears land, it begins to slow down, the wavelengths decrease, waves grow in height, and currents intensify (Figure 60). Once the tsunami makes landfall, its speeds slow down to 20-30 mph.



Depth		Wavelength		Speed	
miles	meters	miles	kilometers	mph	km/h
4.4	7,000	175	282	586	943
2.5	4,000	132	213	443	713
1.2	2,000	94	151	313	504
635 ft.	200	30	48	99	159
164 ft.	50	14	23	49	79
33 ft.	10	6.6	10.6	22	36

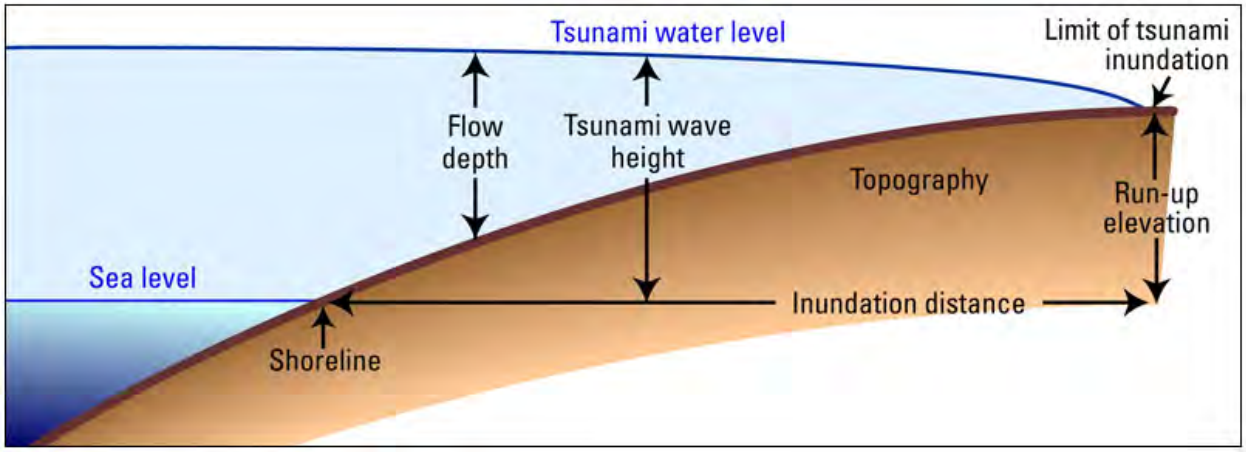
Source: NWS 2023c

Figure 60- Cross Section of a Tsunami Propagation

Some terms commonly used when describing tsunamis are below.

- **Inundation:** The horizontal distance inland that a tsunami penetrates, generally measured perpendicularly to the shoreline.
- **Inundation line:** Inland limit of wetting, measured horizontally from the mean sea level (MSL) line. The line between living and dead vegetation is sometimes used as a reference. In tsunami science, the landward limit of tsunami runup.
- **Runup:** Difference between the elevation of maximum tsunami penetration (inundation line) and the sea level at the time of the tsunami. In practical terms, runup is only measured where there is clear evidence of the inundation limit on the shore.

  Elevation reached by seawater measured relative to some stated datum such as mean sea level, mean low water, sea level at the time of the tsunami, etc., and measured ideally at a point that is a local maximum of the horizontal inundation. Where the elevation is not measured at the maximum of horizontal inundation this is often referred to as the inundation-height.
- **Run-up elevation:** The elevation above sea level of a tsunami at the limit of penetration
- **Flow depth:** Flow depth relates to the depth of the water from a tsunami, measured on shore in different locations; flow direction relates to the direction of this flow.
- **Tsunami wave height:** Difference between the elevation of the highest local water mark and the elevation of the sea level at the time of the tsunami. This is different from maximum runup because the water mark is often not observed at the inundation line, but maybe halfway up the side of a building or on a tree trunk.



Source: USGS 2010

Figure 61- Illustration of Common Tsunami Terms

3.3.5.2 Location

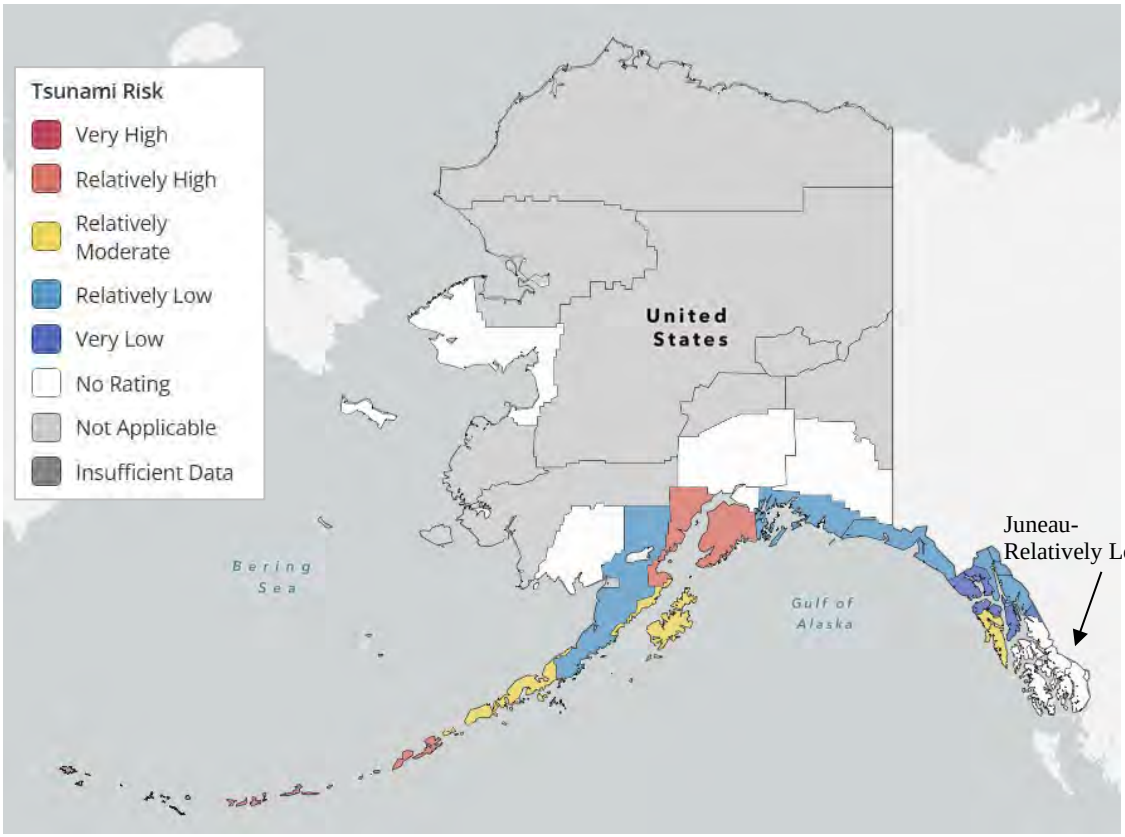
The 2023 Alaska State HMP identifies tsunami hazard areas across the state (Figure 62). The Planning Area is in an identified tsunami hazard area.

Source: 2023 State of Alaska HMP

Figure 62- Statewide Tsunami Hazard Areas

FEMA's National Risk Index provides the following map for Tsunami Risk in Alaska (Figure 63). The tsunami risk for the Planning Area is labeled as Relatively Low.

DGGS states that in Southeast Alaska, the likelihood of a tsunami is low, but impacts would be critical. The Planning Area is largely protected from the effects of seismically generated tsunamis due to the many islands and channels buffering Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida from the open ocean; however, DGGS notes that tsunamis generated from the Alaska-Aleutian Subduction zone (particularly segments KI, KP, PWS, and YY) to the west and the Cascadia subduction zone to the south have the potential to produce damaging tsunamis in the Planning Area. Tsunamis originating in these locations would likely travel trough the Icy Strait and Chatham Passage respectively (DGGS 2017). On the other hand, landslide-generated tsunamis present a more pressing hazard to the Planning Area. Unfortunately, according to DGGS, there is currently a gap in geotechnical data for submarine sediments around the Planning Area to allow for reliable modeling. Despite this, DGGS has identified 6 potential landslide locations at the head of Fritz Cove, offshore of Eagle River, the head of Berners Bay, offshore of Sheep Creek, South Franklin St., and the Taku Inlet that could influence a landslide-generated tsunami.



Source: FEMA 2025- National Risk Index (Tsunami)

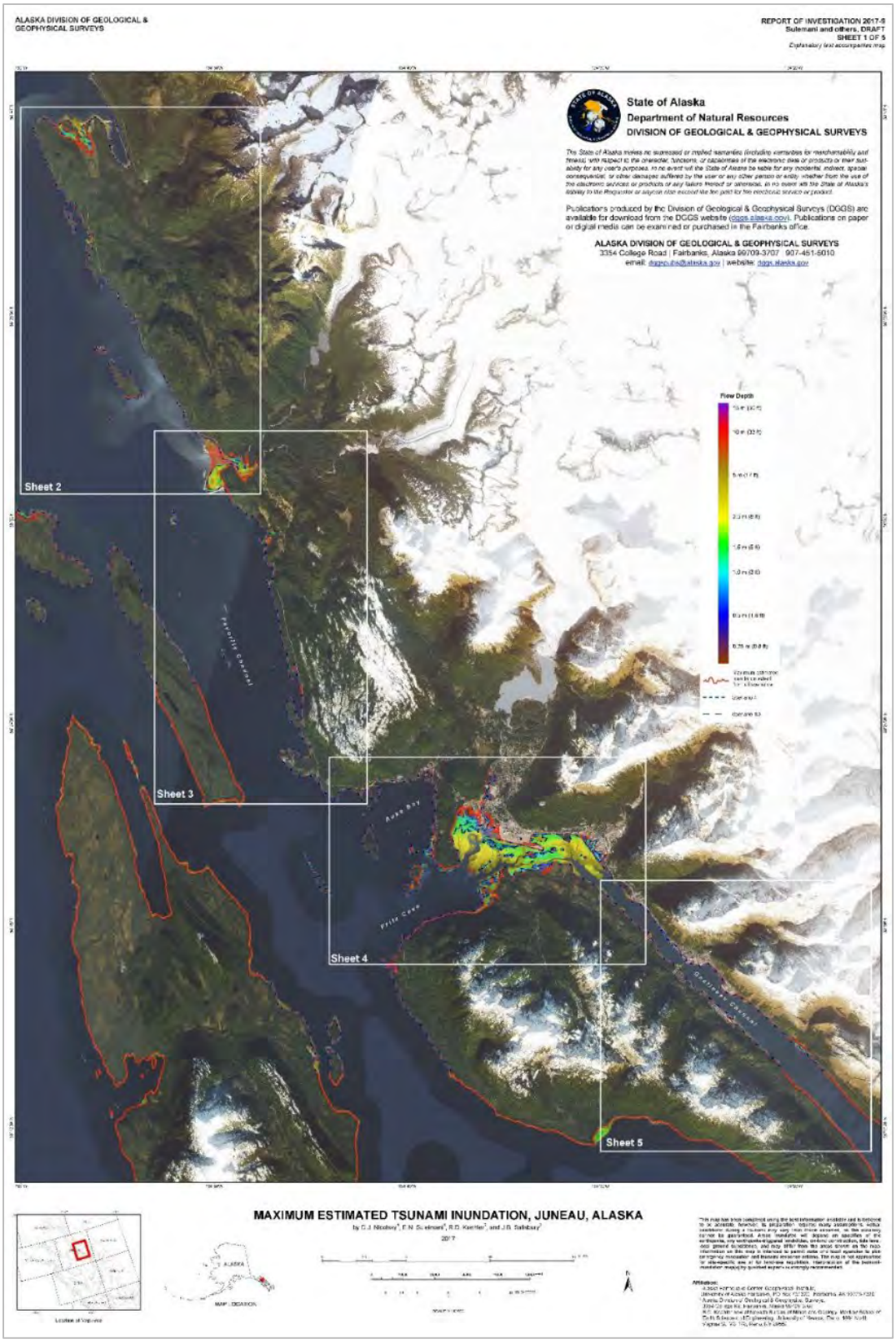
Figure 63- Alaska Tsunami Risk Map

3.3.5.3 History

Even though the Planning Area has not been impacted by a damaging tsunami in recent history, the effects of past landslide-generated tsunamis in Southeast Alaska highlight the potential impacts of a tsunami in the Planning Area. See Appendix F for a full history of tsunami events in Southeast Alaska.

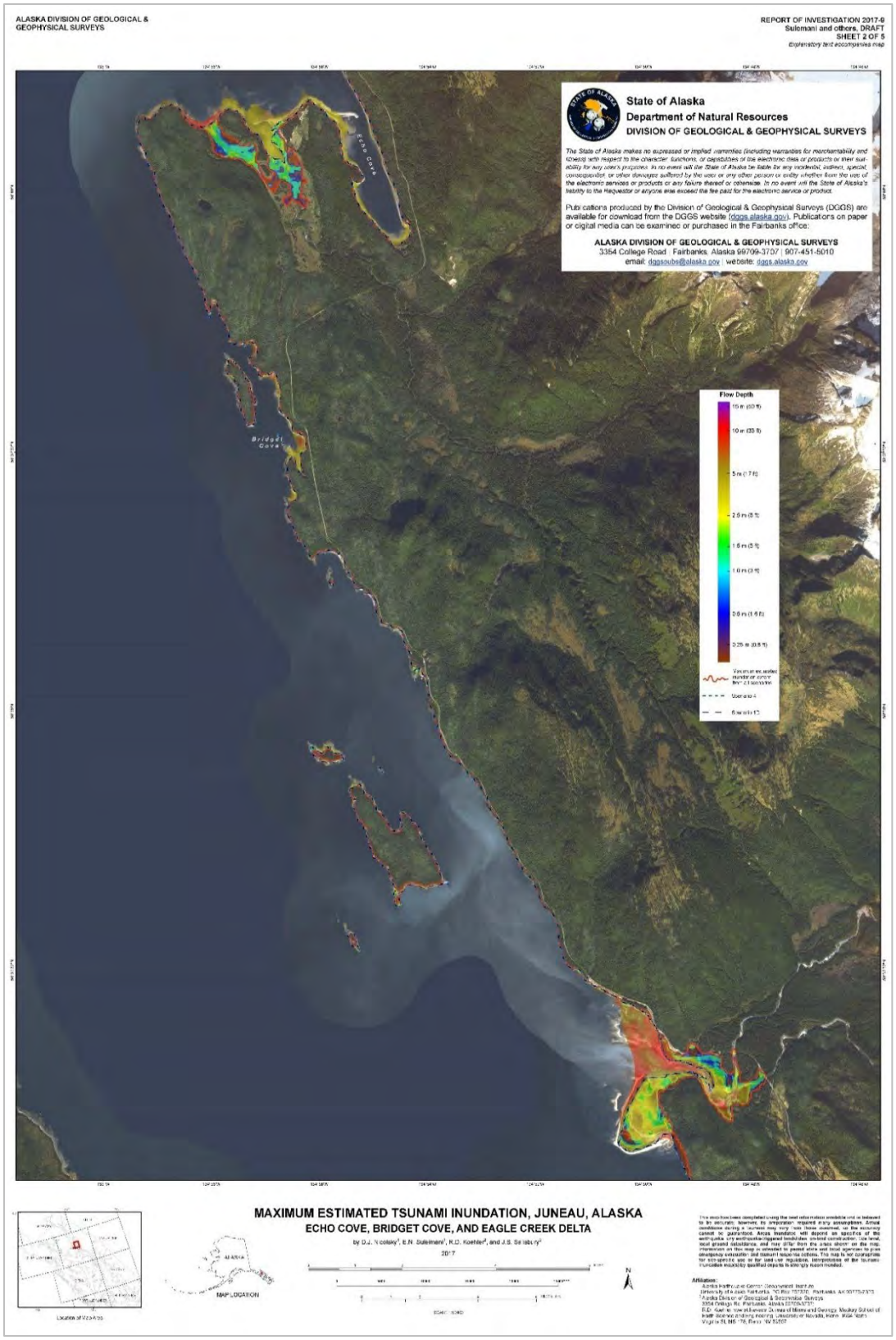
3.3.5.4 Extent (Magnitude and Severity)

DGGS has a library of tsunami inundation maps for many coastal communities that are threatened by tsunamis. The maximum estimated tsunami inundation and maximum flow depths in the Planning Area are shown below. This map combines the maximum inundation for both seismically generated and landslide induced tsunamis.



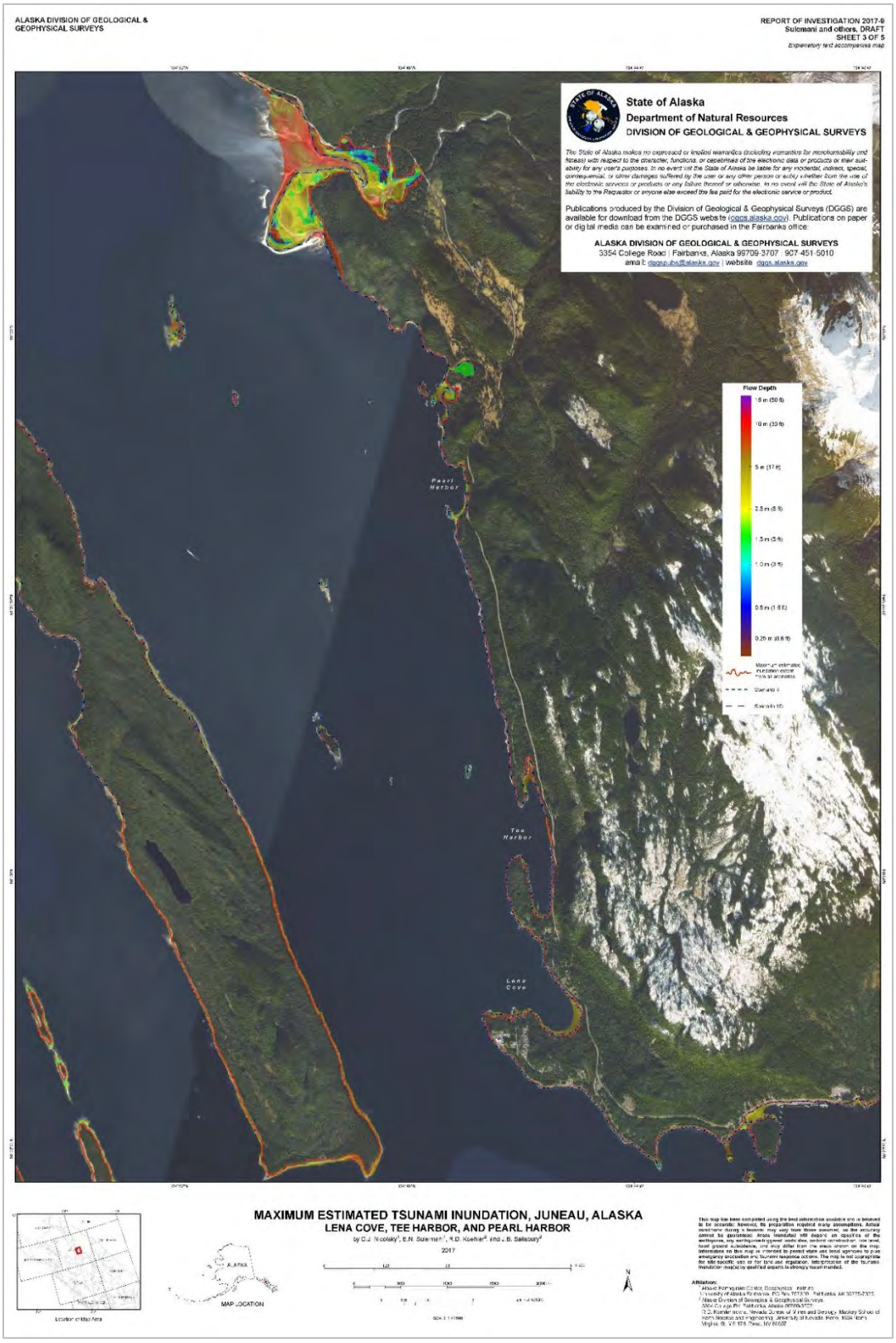
Source: DGGS 2017

Figure 64- Overview of Maximum Estimated Tsunami Inundation and Flow Depth in Juneau and Traditional Lands of Tlingit & Haida



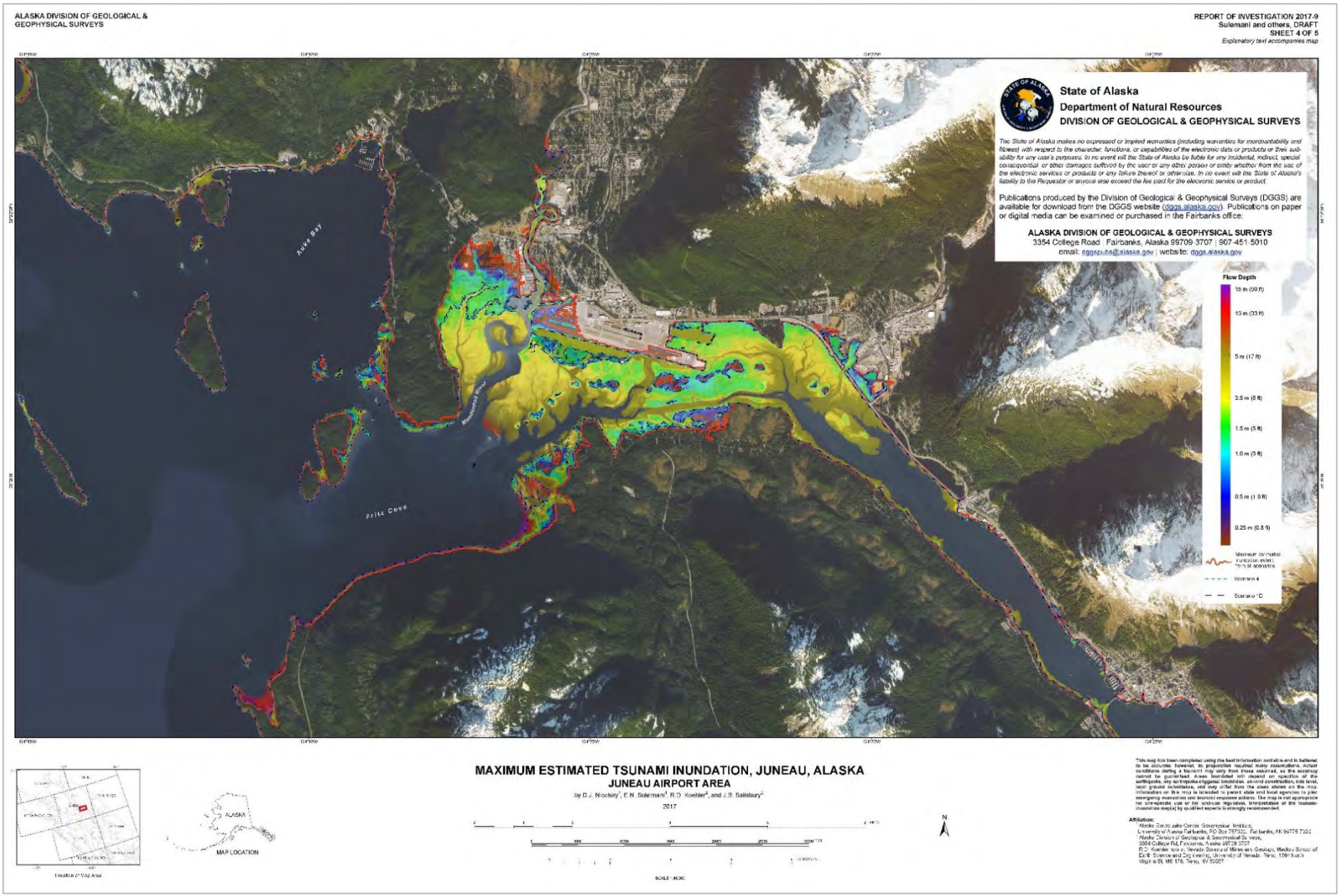
Source: DGGS 2017

Figure 65- Maximum Estimated Tsunami Inundation- Echo Cove, Bridget Cove, Eagle Creek Delta



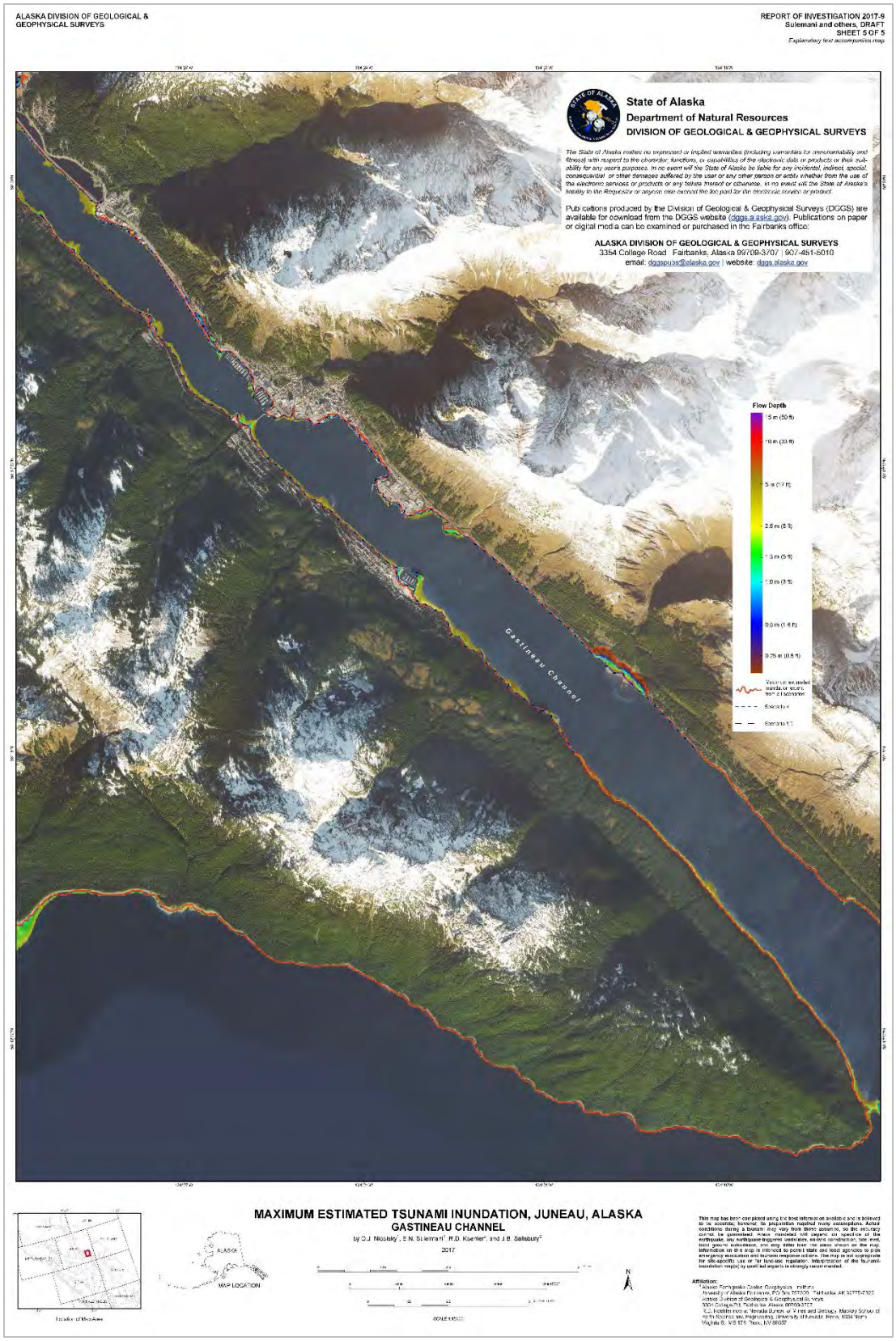
Source: DGGS 2017

Figure 66- Maximum Estimated Tsunami Inundation- Lena Cove, Tee Harbor, Pearl Harbor



Source: DGGS 2017

Figure 67- Maximum Estimated Tsunami Inundation- Juneau Airport Area



Source: DGGS 2017

Figure 68- Maximum Estimated Tsunami Inundation- Gastineau Channel

In addition to seismically generated tsunamis, DGGS has identified 6 specific areas in the Planning Area with a potential risk of landslide induced tsunamis; however, greater study of the underwater sediments around Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida are needed to properly identify unstable sediments. See Section 3.3.4 for these landslide locations and magnitude of possible events.

Based on historical events and the criteria identified in Table 10, the magnitude and severity from historical tsunamis have been Limited, but based on available tsunami inundation mapping, the extent of future tsunamis may be Limited with potential for critical facilities to be shut down for more than a week, and more than 10 percent of property or critical infrastructure being severely damaged.

3.3.5.5 Impact

Potential impacts from a tsunami will vary and are dependent on many factors, but impacts range from barely detectable to completely destructive. Tsunamis have an effect on beaches once they hit the shore, and may also affect mouths of bays, tidal flats, and the shoreline of large coastal rivers. Tsunamis can diffract around islands and land masses and since they are asymmetrical, the waves may be much stronger in one direction than the other, further affecting the surrounding coastal features. Tsunamis propagate outward from their source, so coasts in the "shadow" of land masses are typically safe from the effects of the tsunami.

Inundation extent and impacts may differ depending on the mechanism driver of the tsunami. DGGS provides information on the potential impact in the Planning Area for the different drivers of tsunamis.

For a **seismically generated tsunami**, DGGS states:

> *"Modeling results suggest that [2011 Tohoku Doubled*] scenario produces waves with wavelengths of several kilometers (miles) that produce a relatively uniform distribution of maximum tsunami heights around the community. The highest waves, up to 3 m (10 ft), occur in the Gastineau Channel and around the Juneau Airport, while significantly smaller tsunami heights of 1.0–1.2 m (3.2–3.9 ft) are predicted in Favorite Channel and farther north in Lynn Canal. There is a sharp change in tsunami heights in the middle of Gastineau Channel, where a bridge spans between Downtown Juneau and Douglas Island. The flow here is constricted by the narrows and thus long waves that enter the channel from the southeast are partially reflected. Only a part of the tsunami energy penetrates farther northwest through this narrows, resulting in decreased tsunami height in the upper Gastineau Channel. However, the waves are high enough to flood the area north of the airport. The low-lying areas south of the airport are flooded by smaller waves coming through Fritz Cove. North of Juneau, in the area of Favorite Channel and Lynn Canal, maximum tsunami wave heights are on the order of 1.0 m (3.3 ft), except for the mouth of the Eagle River, where the waves amplify up to 1.5 m (4.9 ft).*
>
> *Numerical results according to [2011 Tohoku] scenario qualitatively resemble those according to [2011 Tohoku Doubled] scenario, in that low-lying areas south of the airport are flooded, the highest waves occur in Gastineau Channel and around the Juneau Airport, and there is a sharp change in the modeled tsunami heights in the middle of Gastineau Channel. Overall, the spatial distribution of the maximum tsunami wave heights according to [2011 Tohoku] scenario has the same spatial pattern as that modeled according to scenario [2011 Tohoku Doubled] scenario. However, the maximum wave height for [2011 Tohoku] scenario is about half the size in Gastineau Channel (1.2–1.5 m [3.9–4.9 ft]) and about 1.5 times smaller in Lynn Canal (0.6–0.9 m [2.0–3.0 ft]).*
>
> *The hypothetical extent of inundation according to the 1964 event is less than that for the Tohoku-type rupture in the Gulf of Alaska. However, a repeat of 1964 may be a more realistic future event. For [1964 Doubled] scenario, the maximum flow depth occurs at the eastern end of the airport, where it reaches 2.5 m (8.2 ft) above the MSL datum and floods low-lying areas at the head of Gastineau Channel. The spatial extent of inundation and maximum wave heights according to*

scenario [1964 Doubled] are similar to those according to [2011 Tohoku]. In all cases, the low-lying areas and tidal flats around the airport could be inundated."

*Due to historic and other potential underestimations of tsunami wave-amplitude, sometimes by at least a factor of 2, the DGGS researchers modeled both the 1964 event and the 2011 Tohoku event with doubled coseismic slip, effectively doubling the modeled wave amplitude. This modeling aims to overcome the complicated tsunami-tide interactions that may have reduced historical observed tsunami extents and to provide a more accurate maximum extent of a tsunami event.

DGGS has identified 6 potential locations for a **landslide-generated tsunami**. Table 18 below describes potential impacts in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida.

Table 18- Impacts from Potential Landslide-Generated Tsunamis in Juneau and Traditional Lands of Tlingit & Haida

Location	Wave Height m (ft)	Narrative
Head of Fritz Cove	5-15 m (16-49 ft)	Numerical simulations indicate that waves can reach the northern coast of Auke Bay in 4–5 minutes and the western end of the airport runway in about 10 minutes. The landslide may cause significant inundation of wetlands in Gastineau Channel.
Offshore of Eagle River	10-11 m (33-36 ft)	The landslide may cause inundation of highway and damage to highway bridges across river due to debris carried by water. Waves propagating along Eastern shore of Favorite Channel could cause inundation of low-lying areas to the north and south of the Eagle River delta. The run-up on Lincoln and Shelter Islands could reach 6-7 m (20-23 ft).
Head of Berners Bay	Not Provided	The landslide has the potential to flood low-lying areas the estuary of Cowee Creek and the shores of Echo cove, including a landing strip on the northeastern side of the Cowee Creek mouth. The maximum run-up is west of lower Cowee Creek. Finally, the tsunami may propagate outside of Berners Bay (Daxʼanáak) into Lynn Canal (Ch'áak' Kwáan) and cause a local run-up in Bridget Cove and around Mab Island.
Offshore of Sheep Creek	6-7 m (20-23 ft) in Juneau, 7-9 m (23-30 ft) on Douglas Island	Modeling indicates that the tsunami reaches Thane Rd. and inundates low-lying areas on both sides of the channel. Waves propagate along Gastineau Channel and could reach Downtown Juneau in about 5 minutes.
South Franklin Street	4-5 m (13-16 ft) in Juneau, 3 m (10 ft) on Douglas Island	Waves may inundate the low -lying beach areas and Lawson Creek Delta on Douglas Island. Waves reach shores about 60 seconds after initial landslide.
Taku Inlet	10-15m (33-45 ft) near Jaw Point, 2 m (6.6 ft) in Gastineau Channel	Waves will significantly decrease in amplitude after multiple reflections within the inlet. The waves in Gastineau Channel will run-up 10 ft in low lying areas and reach Downtown Juneau in 6-7 minutes following the slide.

Source: DGGS 2017

Air Transportation Impacts: A significant tsunami could inundate some roadways to and from the airport and in an extreme event potentially inundate the runway and airport infrastructure from the south. Aircraft taking off or landing on the water (floatplanes) could be impacted directly by a significant wave causing damage to aircraft and people onboard the aircraft.

3.3.5.6 Probability of Future Events

Based on FEMA's Tsunami Risk Map, DGGS inundation mapping, and the criteria identified in Table 11, it is Possible that the Planning Area will experience a tsunami event in the next five years; there is a 1 in 5

years chance of occurring (1/5=20%); and the history of events is greater than 10% but less than or equal to 20% likely per year.

3.3.5.7 Future Conditions

Changing Factor	Description of Future Conditions
Nature	The nature of tsunami events in the Planning Area is not anticipated to change in the future.
Location	Local tsunamis are anticipated to become more of a concern in Southeast Alaska due to glacier retreat in fjords (DHS&EM 2023). Landslides that may induce a tsunami are projected to occur in areas that have not historically had landslides.
Extent (Magnitude/ Severity)	Local tsunamis are anticipated to become more of a concern in Southeast Alaska due to glacier retreat in fjords (DHS&EM 2023). Glacier ice provides lateral support for over steepened, ice-scoured slopes; when glaciers retreat, these slopes can destabilize (DHS&EM 2023).
Impact	As tsunami events become more frequent in a changing climate, the potential impacts to the Planning Area increase. The Planning Area has not been severely impacted by a recent tsunami event, but as the population has grown and more infrastructure has been developed, the potential for greater loss has increased.
Probability of Future Events	Local tsunamis due to subaerial slope failures are expected to become more common with changing climate. Retreating glaciers, thawing alpine permafrost, and increased rainfall all contribute to unstable slopes that may cause a tsunami if landslides or rockfalls enter a body of water (DHS&EM 2023).
Population Patterns	Due to the location of tsunami hazards in the Planning Area, it is possible that future tsunamis will impact future population patterns. Depending on the severity of the event, a tsunami in the Planning Area could displace residents located within the inundation area, which could leave some residents without viable housing options (WHO 2025).
Land Use Development	Due to the location of tsunami hazards in the Planning Area, it is likely that future tsunamis will impact future land use development particularly in coastal areas. If a tsunami event occurs in the Planning Area, the property values in affected areas may decrease, which could increase development in areas outside of the inundation area (USGS 2017). Additionally, land use development may change by elevating/relocating critical facilities out of the inundation area, restricting new development in the inundation area, and potential additional of tsunami sirens or another community warning system.

3.3.6 FLOOD

3.3.6.1 Nature

Flooding occurs when water accumulates in areas that typically do not hold water, and it can result when natural or artificial barriers such as stream banks and levees that would usually protect adjacent floodplains become compromised. Floodplains are the low-lying grounds adjacent to water bodies and are formed mainly of sediment deposits from past flooding events. Flooding is typically a natural event that is predictable based on rainfall patterns. It is considered a hazard when people and property are at risk.

Flooding is Alaska's most common natural hazard, causing major disruptions to local economies, damages to property and infrastructure, and occasionally loss of life. Development in floodplains is often a focus of mitigation, as flooding-related damages can occur when human development encroaches on floodplains when altering waterways, developing watersheds, and/or building inappropriately within a floodplain. Artificial fill, for example, can reduce an area's flood-carrying capacity thereby increasing the flood hazard.

Flooding (Aan galañú) in the Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida area is influenced by several factors including heavy snowpack, rapid temperature fluctuations, heavy precipitation, and ice dam activity.

Glacial lake outburst floods (GLOF) are a relatively new phenomena in the Planning Area. For the Mendenhall Valley, these have become a yearly occurrence since 2011, with the most extensive damages sustained to the Mendenhall Valley in 2023 and 2024.

The Planning Area also experiences flooding due to rainfall-runoff and snowmelt. Serious stream flooding can result when peak stream flows occur simultaneously with high tides. This can impact coastal areas, where most of the Planning Area's development is located, as well as higher elevation areas when streams get backed up. The greatest flooding threat to the Planning Area's coastal areas coincides with both high winds and high tides which can create storm surge and wave runup.

Flash Floods

These floods are characterized by a rapid rise in water. They are often caused by heavy rain on small stream basins, ice jam formation or by dam failure. They are usually swift moving and debris-filled, causing them to be very powerful and destructive. Steep coastal areas in general are subject to flash floods. Debris slides and mudslides are often associated with heavy rains.

Landslides, moraine dam failures, or a major glacial calving event into a large lake can also cause a flash flood to be generated downstream. Though this type of flash flood is rare, the impacts can be devastating. Another flash flood threat in the Planning Area is due to a dam failure. There are two High Hazard Potential Dams (HHPD), two Significant hazard dams, and 4 low hazard dams located in the Planning Area. The High Hazard Potential Dam profile is in Section 3.3.10.

Fluctuating Lake Level Floods

These floods occur from overflowing lakes. Generally, lakes buffer downstream flooding by storing large amounts of runoff. Flooding can occur during periods of excessive lake inflow that overwhelms a lake's storage capacity.

Glacial Lake Outburst Floods

A GLOF, also known as a jökulhlaup, is caused by the sudden release of water from a lake dammed by a glacier (Sít') or moraine. Glacial dams can fail by overtopping, earthquake activity, melting from volcanic activity, or draining through conduits in the glacier dam. Subglacial releases occur when enough hydrostatic pressure occurs from accumulated water to "float" the glacial ice. Water then drains rapidly from the bottom of the lake. Outburst floods can be incredibly destructive. Depending on the water volume released and downstream topography, outburst floods can cause extensive damage to downstream infrastructure and

threaten public safety. Estimating the magnitude and frequency of GLOFs differs from standard estimating methods because GLOFs are not sourced from rainfall or snowmelt data. Hydrologic characteristics of basins containing glacier-dammed lakes are subject to sudden changes, or glacier-outburst floods may develop in a river with no history of outburst flooding. A river with a history of outburst flooding may suddenly stop due to degradation of the ice dam of the impounding glacier (Neal, E. 2007).

Groundwater Floods

Groundwater flooding occurs when water accumulates and saturates the soil. The water table subsequently rises and floods low-lying areas, including homes, septic tanks, and other facilities. There is little information regarding groundwater flood risk in the Planning Area. The USGS maintains the Alaska Groundwater Database and data from 267 sites shows a range of groundwater depths dating back to 1956.

Rainfall-Runoff Floods

Runoff flooding is the most common type of flooding in Southeast Alaska. Weather systems that bring strong, prolonged rainfall differentiate rainfall runoff from other categories of flooding. Excessive prolonged rainfall, typically from organized Atmospheric River Events, can lead to flooding (Juneau Climate Report, 2022). Precipitation in the Planning Area typically remains in the form of rain from April until November. Debris slides and mudslides are possible. High elevation snow in late autumn can rapidly melt due to warm, southerly winds that precede the next storm. This early season runoff combines with heavy rains, causing streams and rivers to swell.

Rainfall events can occur year-round in the Southeast Alaska rainforest. The Planning Area receives as much as 26 inches (half of the yearly total) of precipitation from August through November. As such, rainfall-runoff flooding is prevalent in the Planning Area from late summer to early fall. The rainfall intensity, duration, distribution and geomorphic characteristics of the watershed all play a role in determining the magnitude of the flood (CBJ Flood Insurance Study, 2018). Atmospheric river events also lead to extreme rainfall and flooding events in the Planning Area.

Snowmelt Floods

These floods occur when the major source of water involved is melting snow. Unlike rainfall, which can reach the soil almost immediately, snowpack can store water for an extended period until temperatures rise and the snow melts. Once it begins to melt, the water runs off, infiltrates the soil, or both. However, snowmelt typically happens before soil thaws and therefore water is generally considered to be surface runoff. This can result in a rapid rise in river discharge. Snowmelt floods usually occur in the spring or early summer, when rapidly warming temperatures quickly melt the snow. Flood magnitude is impacted by spring weather patterns, snowpack distribution and depth, and geomorphic conditions of the watershed. Rainfall, high temperatures, melting glacier ice, and river breakup behavior can exacerbate snowmelt flood.

In Southeast Alaska, stream and river levels are usually very low during the spring thaw. It would take the combination of an above normal winter snowpack, unseasonably warm spring temperatures, and an unseasonably wet storm system to generate snowmelt flooding conditions in the Planning Area during spring. According to the National Weather Service, monthly climate normals from 1991-2020 for the Planning Area, March-June is the driest time of year with only 22% (14.47”) of the Planning Area’s annual rainfall precipitation occurring during these four months.

Storm Surge

Storm surge – water intrusion beyond the normal high tide line – can be caused by the combined effects of wind, atmospheric pressure, rainfall, and tidal conditions (Juneau Climate Report, 2022). Strong winds from a storm push ocean water toward the shore, leading to an unusual rise in sea level. This effect is further amplified by the low atmospheric pressure associated with the storm, which allows the ocean surface to rise even more. Coastal geography plays a major role in the extent of the surge. Some areas see less of a rise than others, with surge levels being influenced by the slope of the continental shelf or the shape of the

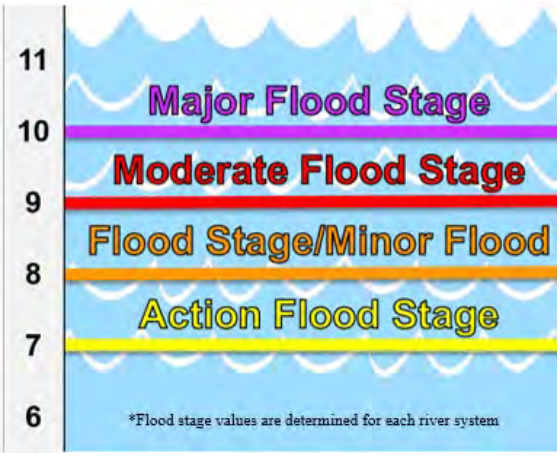
coastline. A shallow shelf typically results in a higher surge, while a steeper shelf reduces it. The Planning Area is characterized by deep fjords and narrow channels, which ensures that much of its coastline contains deep underwater shelves. This topography is one explanation as to why storm surges in the planning area are not a frequent occurrence. However, there are portions of the Gastineau Channel, like the northern portion near the airport, where a shallower slope can be found (ADFG 2025). These areas of the channel could be more susceptible to a storm surge event if combined with the above weather conditions. When a storm surge coincides with high tide, the water levels can become devastating. Although surges are most dangerous along the coast, they can also push far inland (Daak), endangering those who live miles away from the shore (2023 State of Alaska HMP). Storm surge is not historically a frequent occurrence in the Planning Area (NOAA Weather Event Database).

Flooding Terminology

Bankfull Stage: An established gage height at a given location along a river or stream, above which a rise in water surface will cause the river or stream to overflow the lowest natural stream bank somewhere in the corresponding reach.

Action Stage: The stage which, when reached by a rising stream, represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity.

Flood Stage: An established gage height for a given location above which a rise in water surface level begins to create a hazard to lives, property, or commerce. The issuance of flood advisories or warnings is linked to flood stage.



Minor Flooding: Defined to have minimal or no property damage, but possibly some public threat. A **flood advisory** product is issued to advise the public of flood events that are expected not to exceed the minor flood category.

Moderate Flooding: Defined to have some inundation of structures and roads near the stream. Some evacuations of people and/or transfer of property to higher elevations may be necessary. A **flood warning** should be issued if moderate flooding is expected during the event.

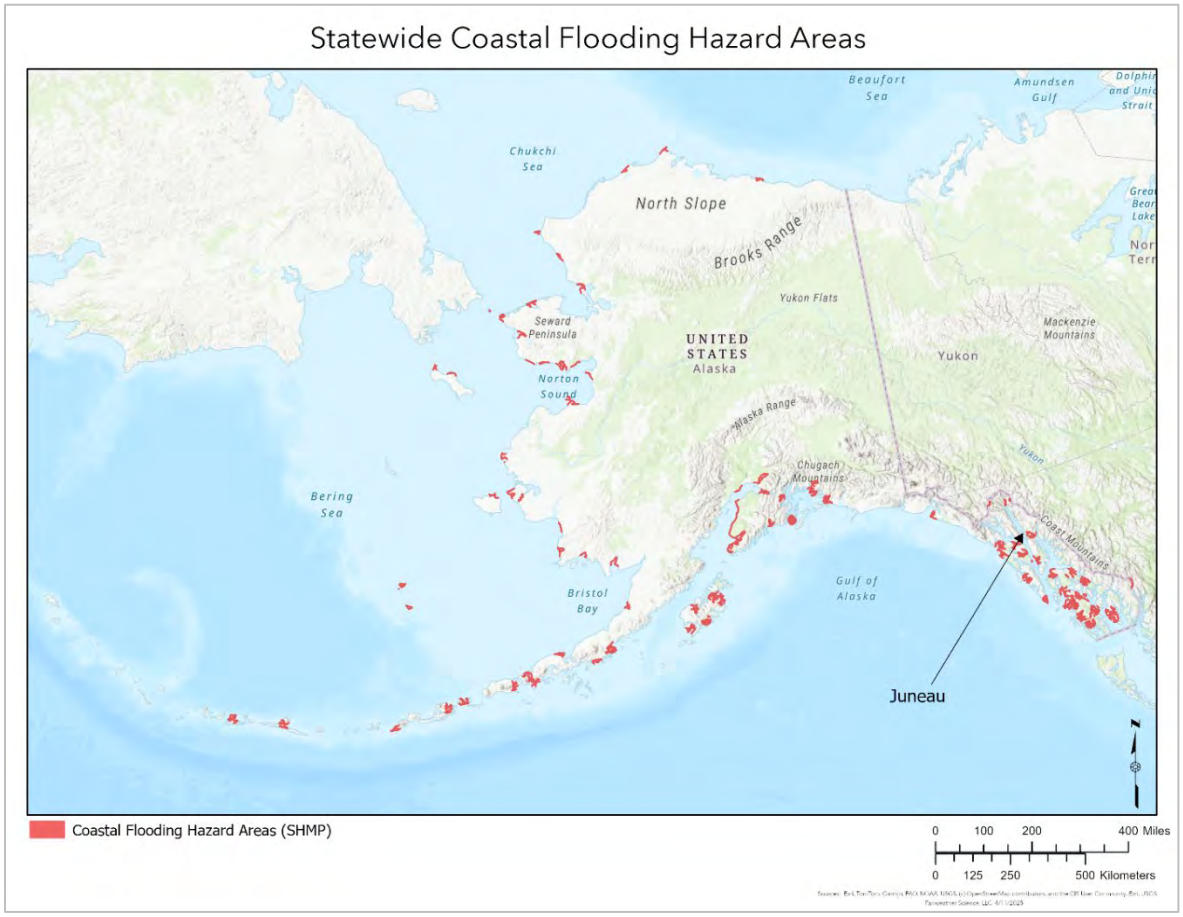
Major Flooding: Defined to have extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary. A **flood warning** should be issued if major flooding is expected during the event.

3.3.6.2 Location

The Planning Area is subject to riverine, GLOF and other types of flooding including coastal flooding. While coastal flooding has not historically been a significant concern according to the Planning Team, the 2023 State of Alaska HMP identifies statewide coastal flooding hazard areas using the following methodology:

> *Within a 10-mile buffer of DGGS-identified coastal flood-threatened communities, AECOM buffered the coastline by 0.5 mile to represent the hazard area (based on data from USACE, GAO, and IAWG).*

The Planning Area is in an identified coastal flooding hazard area.



Source: 2023 State of Alaska HMP

Figure 69- Statewide Coastal Flooding Hazard Areas

Since 2011, biannual or annual GLOFs have occurred on the Mendenhall River system due to releases from Suicide Basin, a side basin of the Mendenhall Glacier (Sít' Aant'aakú) above Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida. This has included historic water level rise and flow rates in the Mendenhall River and significant flooding of the low-lying areas along Mendenhall River - the most populated residential area in the Planning Area. The Taku River (T'aakú Héeni), which drains into Taku Inlet approximately ten miles south of the Planning Area, also experiences glacial outburst floods. These floods originate from Lake No Lake along the Tulsequah Glacier in British Columbia, located approximately 40 miles northeast of the Planning Area. As flood waters from the draining of Lake No Lake flow into the Taku River, flooding can happen with damages to remote cabins along the river.

The City and Borough of Juneau voluntarily participates in the National Flood Insurance Program (NFIP) and its initial flood hazard boundary maps were published in 1970. FEMA maintains regulatory flood maps called Flood Insurance Rate Maps (FIRMs), which insurance companies refer to when providing coverage to homeowners. These maps are available for viewing at the FEMA Map Service Center and are in Appendix E. The FIRMs for CBJ were updated in 2018 and revalidated 9/18/2020 and describe the location of flooding threats in the Planning Area. Participation in the NFIP is discussed further in Section 4.2.

The 2020 CBJ Flood Insurance Study identifies locations prone to flooding in the Planning Area. These locations are described in further detail, including their flood stages, below (note – the 2023 and 2024 GLOF events are not represented in the 2020 FIRMs as they had not yet occurred).

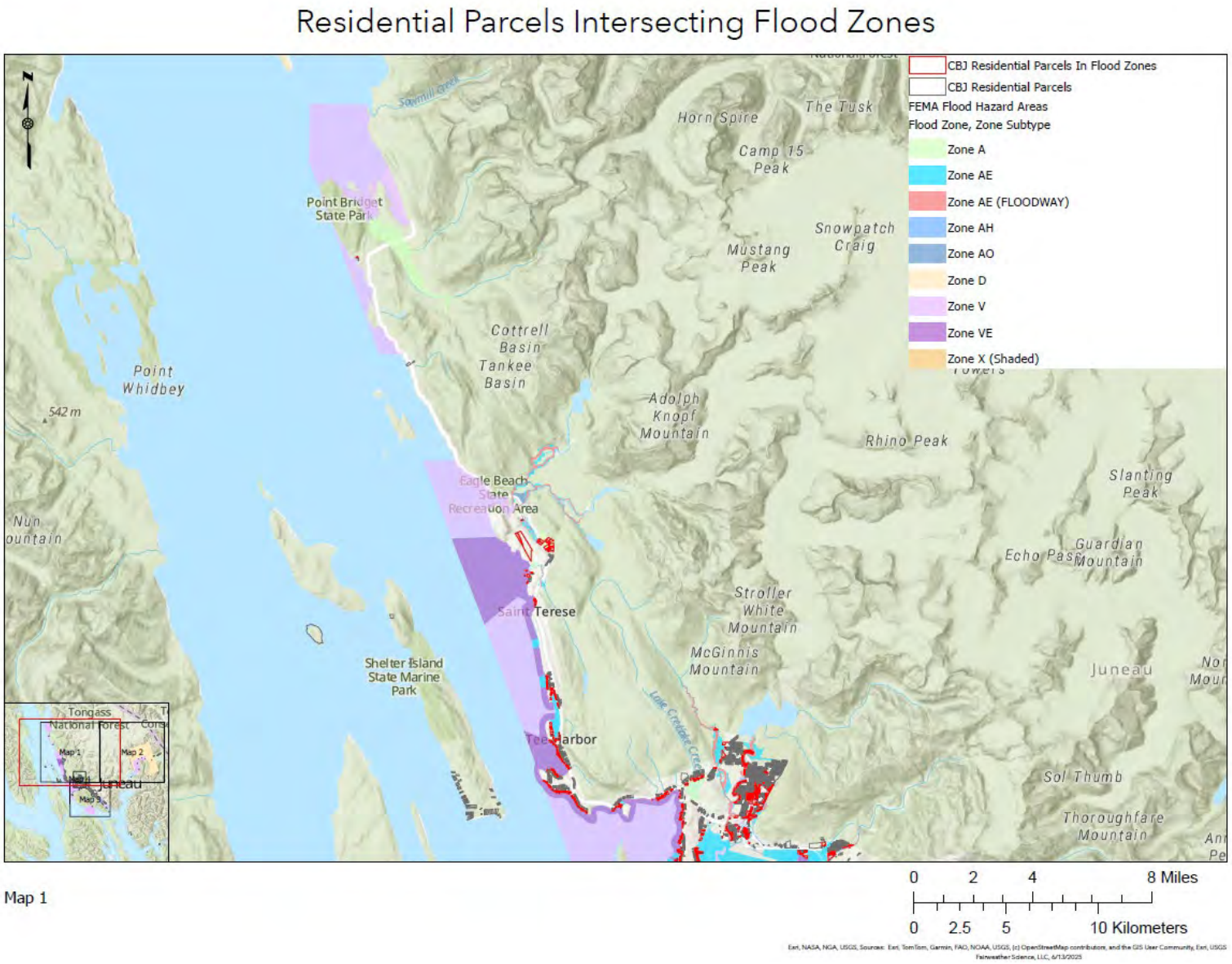


Figure 70- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 1 of 4)

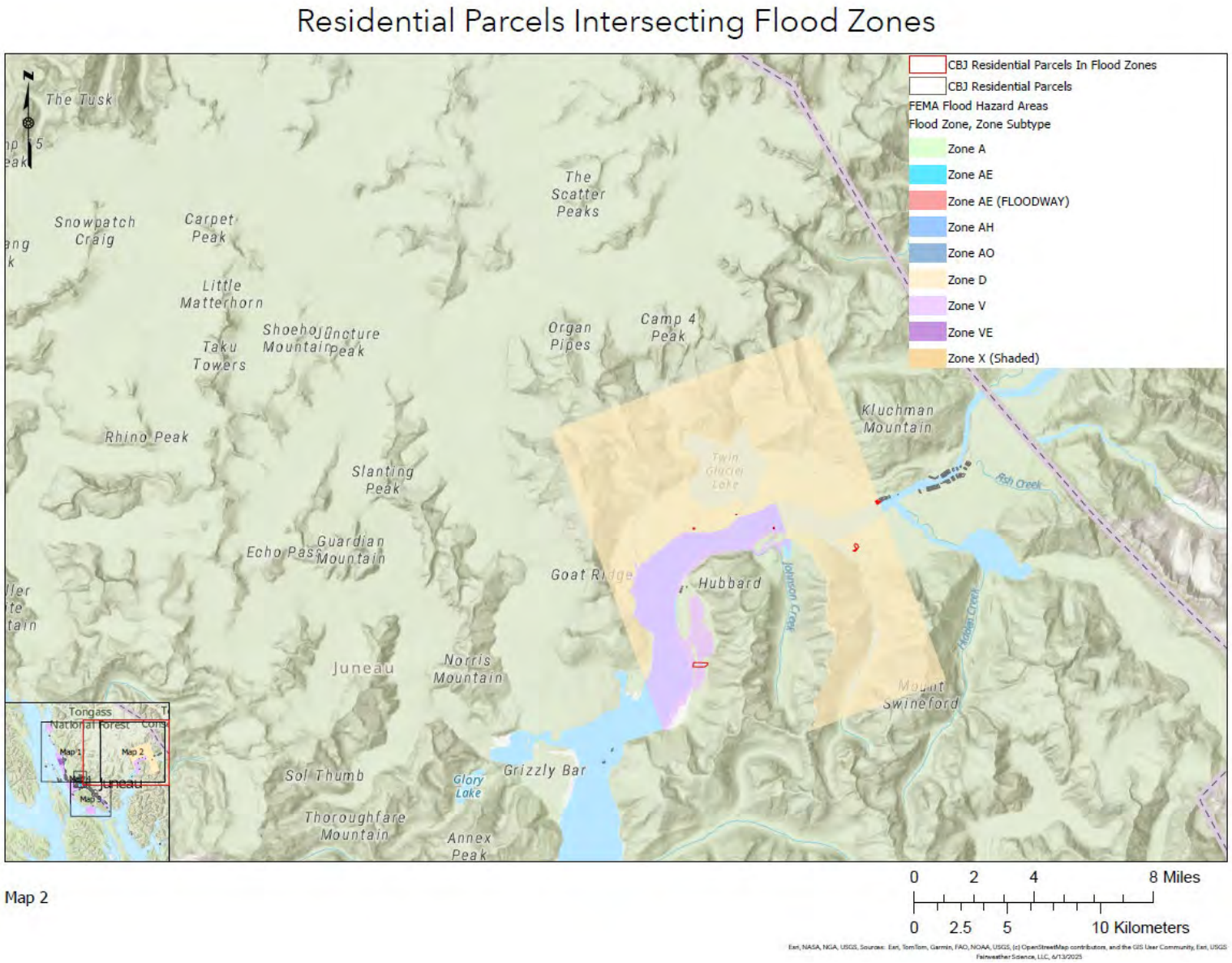
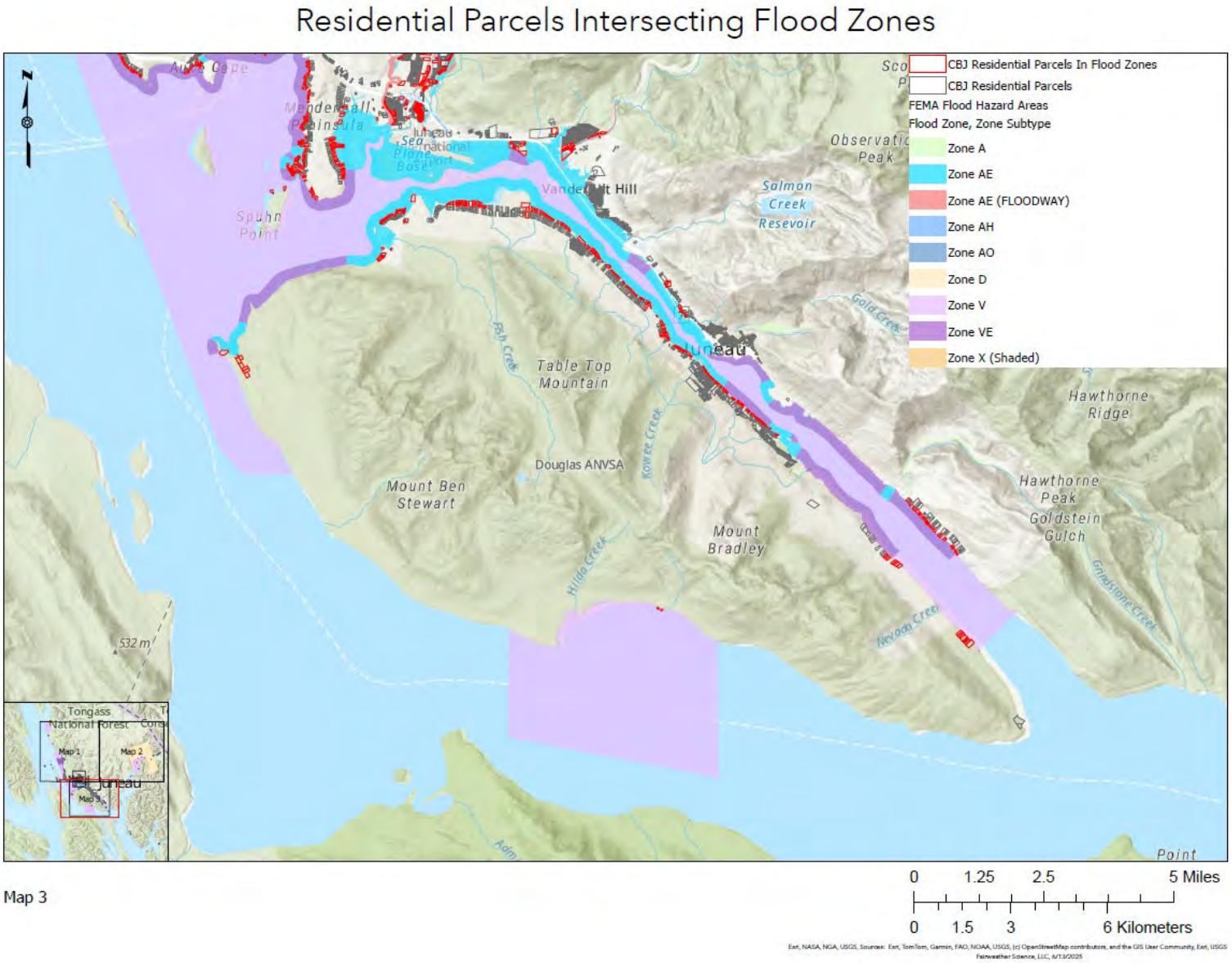


Figure 71- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 2 of 4)



Map 3

Figure 72- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 3 of 4)

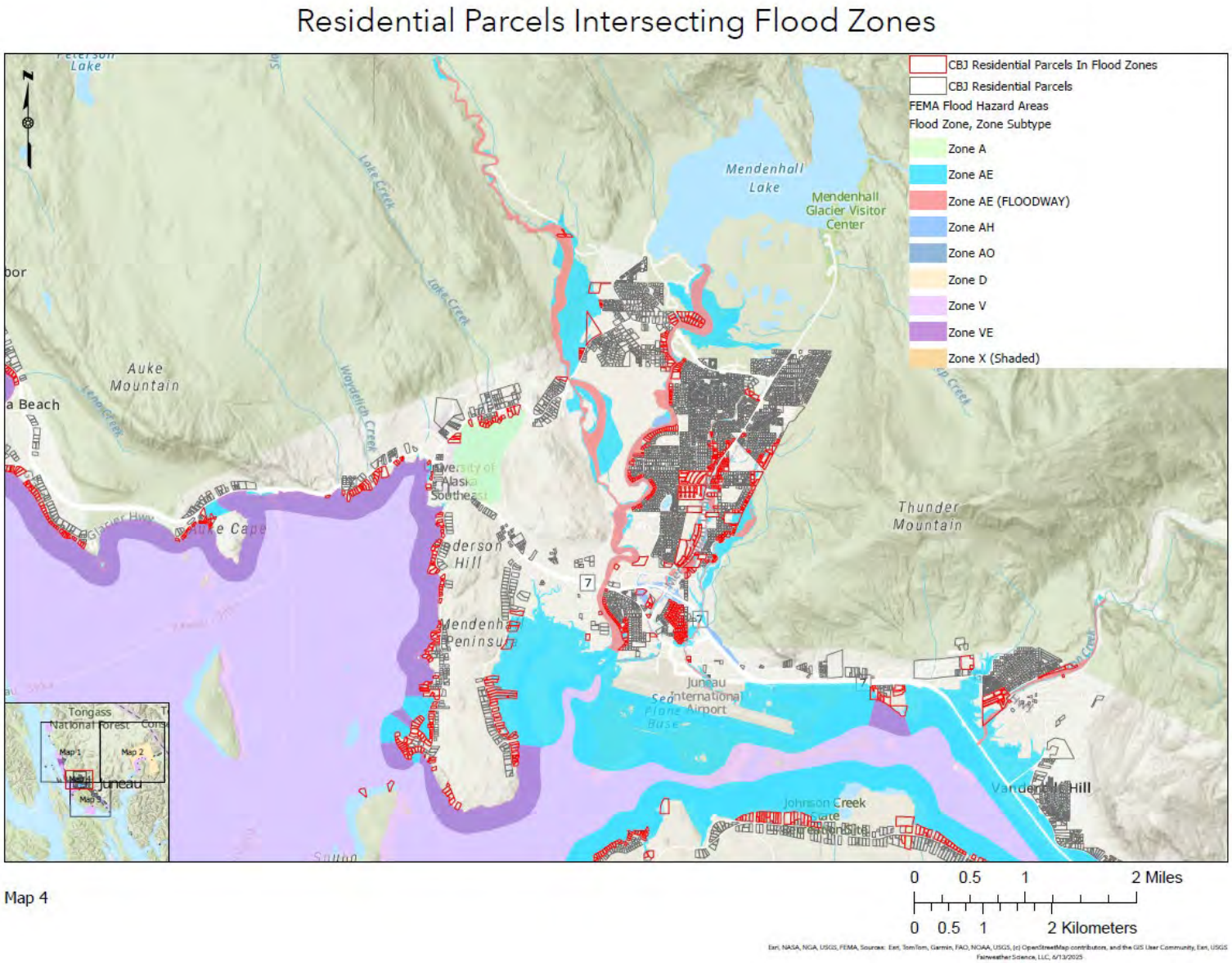


Figure 73- FEMA 2020 FIRM Residential Parcels in Flood Zones (Map 4 of 4)

Table 19- Locations of Principal Flood Problems

Flooding Source	Description of Flood Problems
All sources	Floods in the Juneau area can occur as a result of a combination of factors including heavy snowpack, temperature fluctuations, and precipitation. Since most development is along coastlines, most serious stream flooding will result when peak stream flows occur simultaneously with high tides. This causes streams to back up and flooding at higher elevations. High winds combined with high tides create storm surge and wave runup, representing the greatest flooding threat to the coastal areas. In addition to high tides and coastal storms, other flood problems are inadequate culverts and bridges which become blocked by debris and ice, developments that encroach onto and obstruct natural floodplains, high velocity flow, and situation of culverts. Along some creeks, there are stockpiles of logs which increase flooding if carried downstream to a constriction.
Mendenhall River	Moderate flooding has occurred in the past in Mendenhall Valley, primarily resulting from flood flows on the smaller streams. Except for Montana Creek, the streams in the valley flow through fairly dense residential areas with numerous bridges and culverts which cause most of the flooding. Largest recorded floods occurred in 1927 and 1943 (USACE, 1970).
Lemon Creek	Along Lemon Creek (Eix̲'gulhéen) is the Old Glacier Highway bridge, the only major constriction to this stream's flow. The most serious flooding of Lemon Creek occurs just above this bridge. Dredging of lower Lemon Creek ended in the mid-1980s and increased sedimentation within the channel will likely increase flooding risks in the vicinity.
Gold Creek	Flooding occurred prior to channelization in 1958. No serious events since.
Coastal – Gastineau Channel & Fritz Cove	Coastal flooding influences occur on the downstream reaches of the Mendenhall River, Duck Creek, and Lemon Creek (Eix̲'gulhéen). One-percent chance flood of 23.4 feet occurs at the downstream end of each stream study reach.

Source: CBJ Flood Insurance Study (Revised 2020)

Mendenhall River

The Mendenhall River flows out of the terminus of Mendenhall Glacier (Sít' Aant'aakú) at the northern edge of the valley and into Mendenhall Lake. Mendenhall Lake receives additional inflow from Nugget Creek, Steep Creek, and a few small tributaries. After exiting the lake, the river runs its 7-mile course through the Mendenhall Valley in a generally southward direction until it enters the salt water of the Gastineau Channel in Fritz Cove. Elevations in Mendenhall River Basin, an area of about 103 square miles, range from sea level to nearly 7,000 ft. A large part of the upper basin is covered by glaciers (Sít'), whereas the valley floor is relatively flat and covered with streets and housing developments. Muskeg and spruce forest cover most of the undeveloped regions of the valley. When minor flood stage occurs on the Mendenhall River, more extensive flooding is likely to occur on Montana and Jordan Creeks.

Table 20- Mendenhall River Flood Stages and Descriptions

Water Level	Flood Stage	Description
8 feet	Action	Action stage begins.
9 feet	Moderate	Water starts to cover Skaters Cabin Road between Skaters Cabin and West Glacier Trailhead, also water will flow into the Mendenhall Lake Campground. Action Stage begins at 8 feet.

Water Level	Flood Stage	Description
10 feet	Major	Water levels will inundate Mendenhall Campground with up to 3 feet of water covering low areas as well as up to 1.5 feet of water covering Skaters Cabin Road. Portions of West Glacier Trail will be impassable. Moderate Flooding.
14 feet	Major	Water starts to enter Northland St, Turn St, Stephen Richards Memorial Dr, Parkview & Center Ct. Up to 1 to 2 feet of water will cover Meander Way. Major Flooding. Inundation at View Drive at approximately 14.5 feet.
15 feet	Major	Up to 2 feet of water will be covering Killewich Dr. Water starts to enter the backyards of houses along the south side of Marion Dr., Rivercourt Way, Lakeview Ct, Center Ct, Parkview Ct, Turn St & Northland St could have up to 1.5 feet of water over the road. Up to 1 foot of water covering Riverside Dr at Tournure St.

Source: National Water Prediction Service/NOAA, 2025 measured on Mendenhall River near Auke Bay

Source: NOAA Gauge Photos at Mendenhall River near Auke Bay

Figure 74- Mendenhall Lake at Bankfull, at USGS Mendenhall River Gauge Reading of 9.0 feet

Source: NOAA Gauge Photos at Mendenhall River near Auke Bay

Figure 75- Flooding of the Mendenhall Campground from the 2011 GLOF at USGS gauge reading of 10.92 feet.

Montana Creek

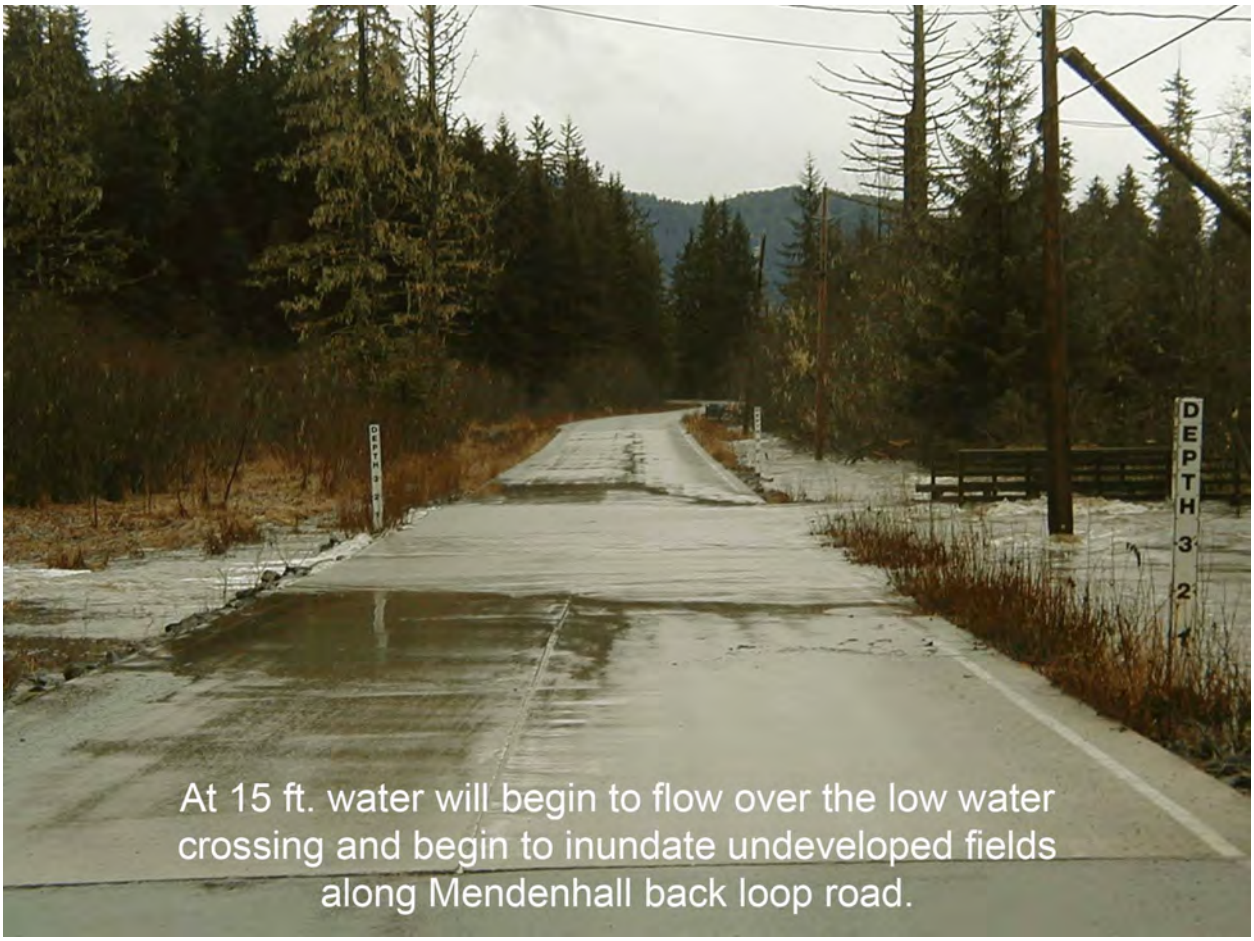
Montana Creek, in the back of the Mendenhall Valley, experiences some form of flooding roughly every three years (CBJ HMP 2012). This flooding is usually associated with heavy rain events in late summer or fall and/or early snow melt. Over time, changes to the stream bed have fluctuated such that new channels have been created and water can overrun Montana Creek Road. The State of Alaska DOT previously owned the road and reconstructed it in the 1990s. The reconstruction included a concrete portion of road designed to allow the creek to overflow it.

Table 21- Montana Creek Flood Stages and Descriptions

Water Level	Flood Stage	Description
14.5 feet	Major	Water begins flowing over the low water crossing on Montana Creek Road. Bankfull conditions at the gauge with water starting to inundate adjacent undeveloped fields along Mendenhall Loop Road.
15.5 feet	Major	Up to one half foot of water will flow over the low water crossing on Montana Creek Road after the community gardens. Water will approach and begin to inundate yards of residences along the Northwest side of Mendenhall Loop Road.
17 feet	Major	This is an estimate of the stage where the Mendenhall Loop Road near the Montana Creek gauge begins to flood. Houses on NE side of Mendenhall Loop Road will have water up to the foundation and become surrounded by water. Information from CBJ's 2009 Hazard Mitigation Plan states that: "At 17 feet, flood waters on Montana Creek cross the Back Loop Road. Several nearby residences would have water flowing into their land and possibly into their first floor. The residents along the back portion of Montana Creek Road would experience flood damages to their homes and property at a 17' flood stage. The Mendenhall Campground and Skater's Cabin areas would experience moderate flooding at this point. The record high water mark on the Montana Creek gauge near the Back Loop Road Bridge was 17.30', which occurred on October 20, 1998."
18 feet	Major	Water will be flowing across Back Loop Road near the Montana Creek bridge up to 1 foot in depth and will likely force the closure of the road. Residence on the Northwest side of Mendenhall Loop Road will flood to the top of foundation with several feet of water covering driveways and surrounding yards. As much as 3 feet of water is possible over the low water crossing on Montana Creek Road.

Water Level	Flood Stage	Description
20 feet	Major	Water completely covers Back Loop Road to a depth of 3 feet. The residence on Northwest side of Mendenhall Loop Road will experience major flooding, with water over stem walls and possibly flowing into homes. Surrounding yards and driveways will be covered by at least 3 feet of water.

Source: National Water Prediction Service/NOAA 2025



Source: NOAA Gauge Photos at Montana Creek

Figure 76- Gauge photo from Montana Creek at Mendenhall Loop Road at 15 feet

Jordan Creek

The headwaters of Jordan Creek (southeast portion of the Mendenhall Valley) originate at the base of Thunder Mountain. Moderate flooding or worse can impact the Jordan Creek subdivision area, as well as the businesses along the creek between Egan Drive and the airport.

Table 22- Jordan Creek Flood Stages and Descriptions

Water Level	Flood Stage	Description
9.2 feet	Moderate	This is the stage when Jordan Creek is at bankfull, and water will begin to inundate areas along the edges of the creek near Race Reality and Jordan Square. Action Stage.

Water Level	Flood Stage	Description
9.7 feet	Moderate	Water will inundate the Jordan Square's front and back parking lots, around Jordan Creek office condominiums with up to one foot of water. Some residential driveways will be flooded and cut off. Minor Flooding.
10.5 feet	Major	There will be some inundation of structures and roads near Jordan Creek with more than one foot of water. Some residential homes and commercial offices along the creek will see significant flooding. Moderate Flooding.
11 feet	Major	Widespread moderate inundation of structures and roads near Jordan Creek with Glacier Highway flooded with more than 3 feet of water.

Source: National Water Prediction Service/NOAA 2025

Source: NOAA Gauge Photos at Jordan Creek

Figure 77- Minor Flooding of the front parking lot of Jordan Square at River Stage 10 feet

Other Areas of Concern:

- Wickersham Avenue: Drainage above Wickersham is part of the run-out zone for the White path slide areas. This has created a large area of unstable alluvial material. Aside from the danger presented by the avalanche path itself, this drainage is subject to repeated flooding. In 1989, 1994 and in 2005 large rain events resulted in the culvert underneath Wickersham being plugged with debris and the subsequent flooding of Wickersham Ave and Glacier Hwy. Potential exists in a large enough event to affect Egan Dr. as well.

- Troy Ave/Judy Lane: Drainage areas here encompass the run-out zone for the Behrends/Mt Juneau avalanche slide paths. Steep terrain along with residue from avalanche debris periodically damage and plug large "grizzlies" which were built to contain this material and channel storm water.
- Douglas Island: Numerous creeks cascade down the slopes and impact existing developments and houses. Reconstruction work by CBJ has tried to identify and mitigate flooding issues. Changes to water flow occur on these slopes sometimes changing where the water eventually winds up and often increasing or decreasing established volumes. On 5th Street major flooding occurred and the road was reconstructed in 1996. Improvements made to drainage structures has reduced the impact to most residents but not eliminated them. Steady increases in the local rainfall over the past ten years has increased run off. Private property on 5th Street has been damaged twice since 1999.

Michael Baker 2025 Flood Inundation Mapping

A hydrologic and hydraulic analysis of the Mendenhall River Valley was conducted by Michael Baker International to evaluate current and future potential flood risk. A two-dimensional surface water model was developed using best available data to simulate a range of GLOF release events. Flood events were simulated and inundation maps were developed to show flood potential at different flood stages with and without HESCO barriers installed (HESCOs were installed in spring of 2025 to act as a temporary levee that will prevent floodwater from inundating adjacent infrastructure). The HESCO barriers were installed on the east bank of the Mendenhall River from Fireweed Lane to River Court Way. The HESCOs are being extended south (Phase 1A) and may be extended further (Phase 1B) to protect additional infrastructure.

The number of residences subject to flooding without HESCO installation based on 16' inundation was 963. Installation of the initial HESCO barriers results in 294 residences at risk. **The initial project installation is expected to protect 669 residences valued at $408M.**

(this will be updated with HESCO 1A installation for the final HMP)

For the purposes of this HMP Update, the 16' Inundation Maps with and without HESCO were used to determine vulnerability (and show the potential number of structures protected) based on the 2024 GLOF flood event. The 16' models were used based on them representing the 2024 flood event and with the HESCO barriers as they are now an existing condition. The complete set of Inundation Maps are located on the CBJ Website here: EPW – Mendenhall Flood Inundation Maps – City and Borough of Juneau and show different scenarios between 8' and 20' inundation with and without HESCO barriers. The Michael Baker International Flood Fighting Inundation Maps -16' With HESCO are shown in the following figures.

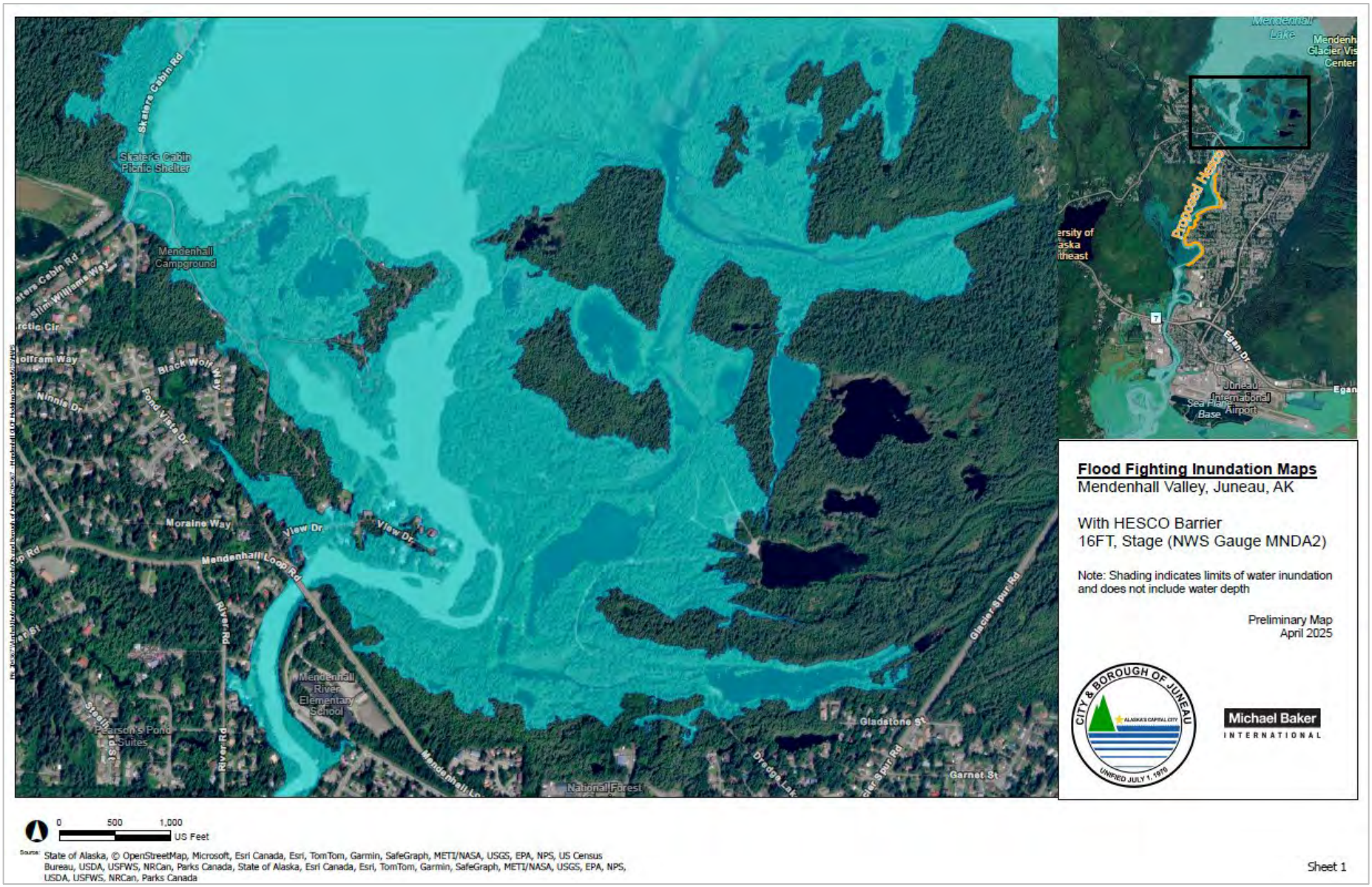


Figure 78- Michael Baker International 16' w/HESCO (Map 1 of 5)

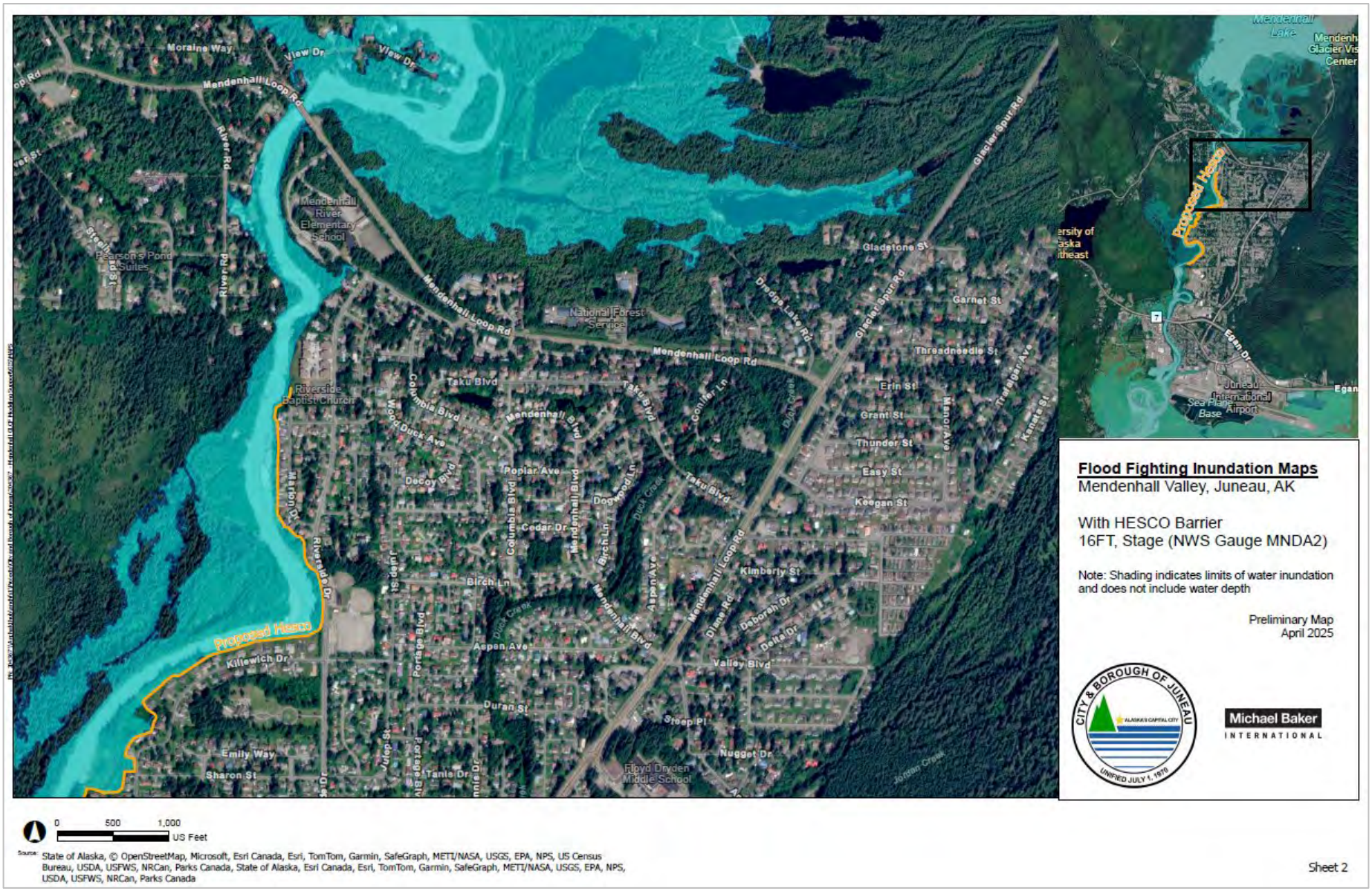


Figure 79- Michael Baker International 16' w/HESCO (Map 2 of 5)

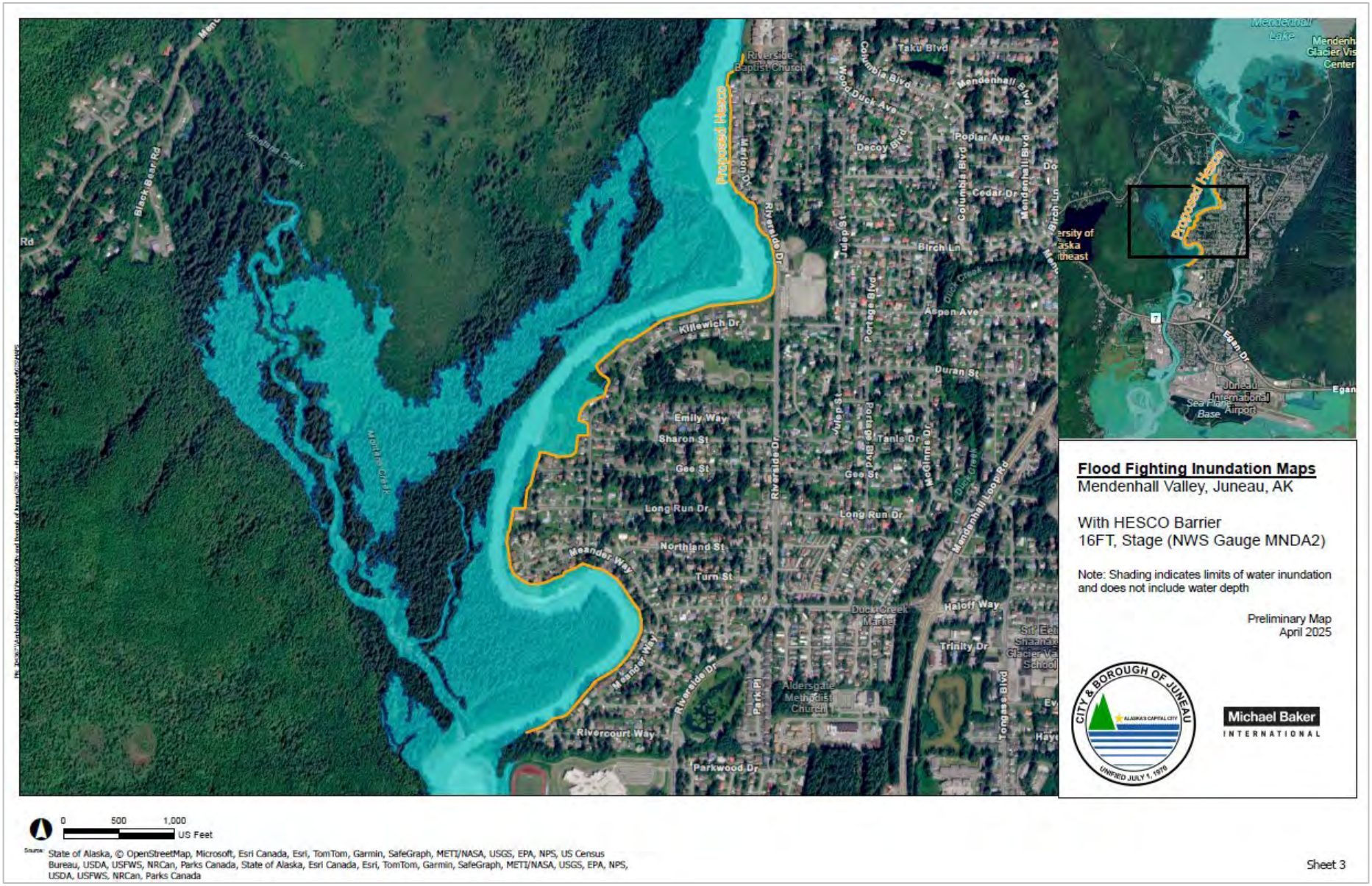


Figure 80- Michael Baker International 16' w/HESCO (Map 3 of 5)

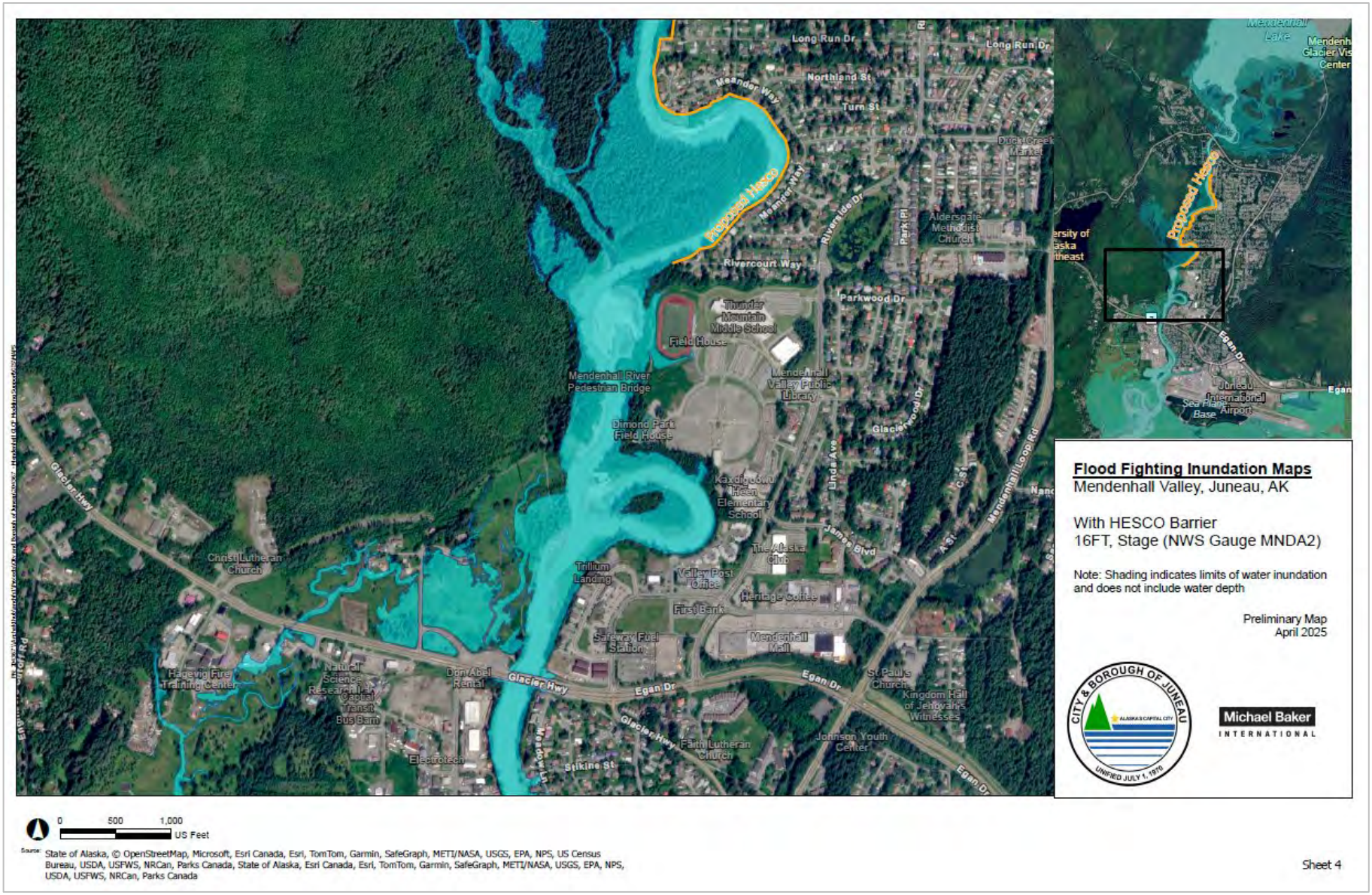


Figure 81- Michael Baker International 16' w/HESCO (Map 4 of 5)

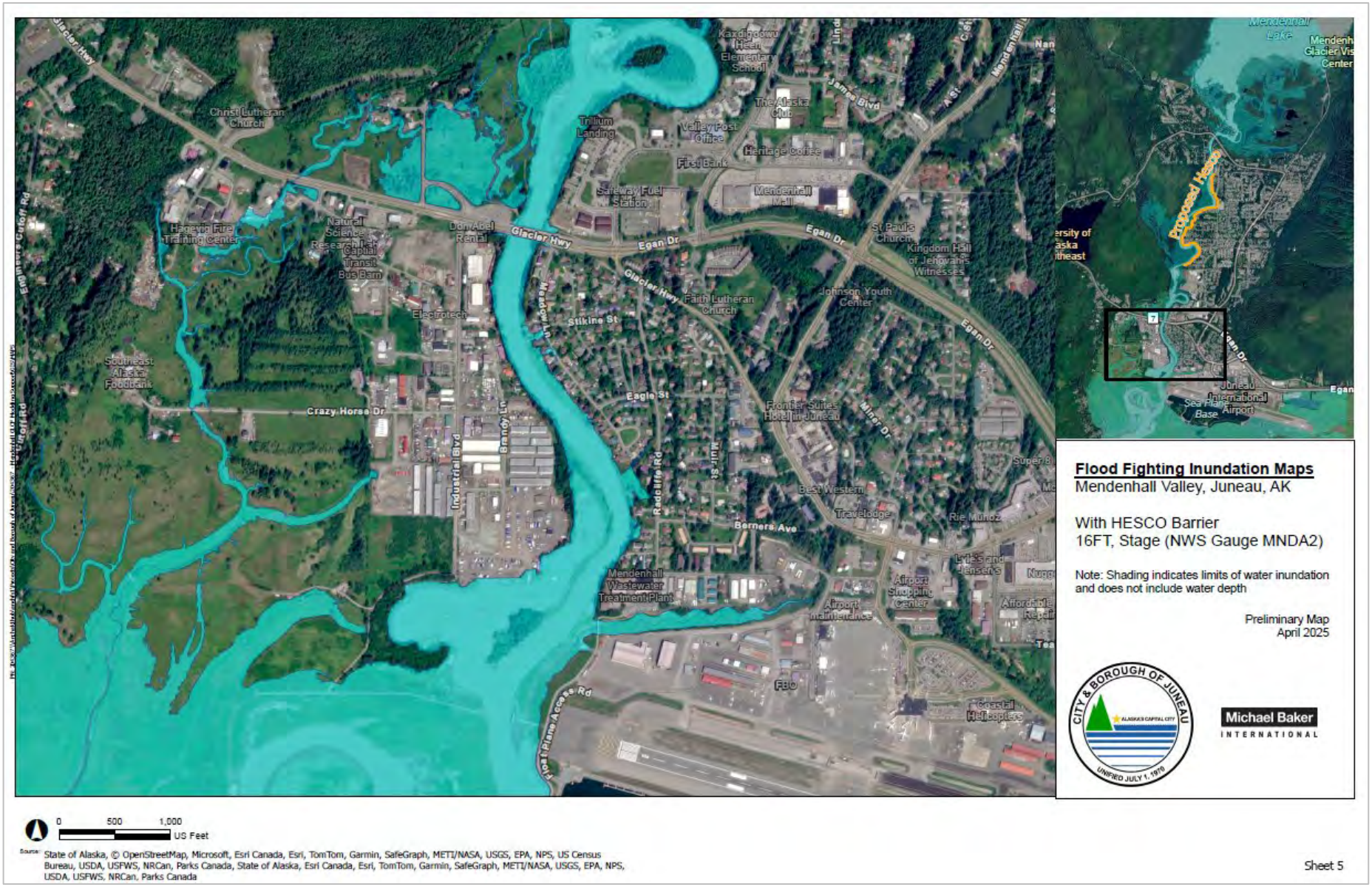
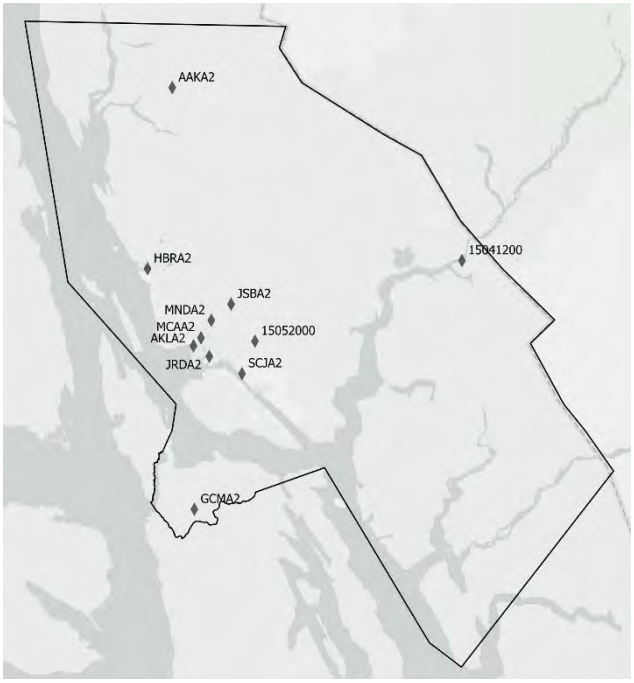


Figure 82- Michael Baker International 16' w/HESCO (Map 5 of 5)

Flood Monitoring

The National Weather Service's (NWS) Weather Forecast Office in Juneau monitors for flooding in Southeast Alaska in coordination with the Alaska-Pacific River Forecast Center in Anchorage. All flood watches and warnings are issued when conditions warrant by the local NWS office. The NWS works with local emergency managers to ensure that the appropriate actions are taken once a flood watch or warning is disseminated.



List of local monitoring stations (USGS/NOAA):

- **AAKA2**: Antler River below Antler Lake near Auke Bay
- **AKLA2**: Auke Lake near Auke Bay
- **GCMA2**: Greens Creek at Green Creek Mine
- **HBRA2**: Herbert River near Downtown Juneau
- **MCAA2**: Montana Creek at Mendenhall Loop Road Bridge near Auke Bay
- **MNDA2**: Mendenhall River near Auke Bay
- **JRDA2**: Jordan Creek near Downtown Juneau
- **JSBA2**: Glacial Lake 2.5 miles N of Nugget Creek near Auke Bay- USGS gage operated seasonally
- **SCJA2**: Salmon Creek near Downtown Juneau
- **15041200**: Taku River near Downtown Juneau
- **15052000**: Lemon Creek near Downtown Juneau

The USGS monitors Suicide Basin using imaging and laser sensor data. Two cameras take one image each per day and laser sensor data detects changes in the basin's water levels (National Weather Service, 2025).

Several research studies have been undertaken or are underway. The Alaska Climate Adaptation Science Center (CASC) funded a study of streamflow models in Southeast Alaska in collaboration with Oregon State University. This study intends to predict future streamflow changes for infrastructure planning, such as culvert replacement, bridge design, and floodplain restoration. End products include a high-resolution (4 km) climate model for Southeast Alaska, predictive stream discharge models for Southeast Alaska watersheds, and a searchable online map with past, current, and predicted streamflow information. CASC also funded a study to forecast the timing and size of outburst flood events at the glacier-dammed lake at Suicide Basin. This project aims to develop a comprehensive monitoring plan for Suicide Basin and create model accurate flood forecasting models.

3.3.6.3 History

For the last 15 years, Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida have experienced annual glacial lake outburst flooding throughout the Mendenhall Valley, the most significant and recent being the glacial outburst flood of August 2024, which saw just under 300 homes impacted with several feet of water. See Appendix F for details regarding historic flooding events in the planning area.

3.3.6.4 Extent (Magnitude and Severity)

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. The following factors contribute to flooding frequency and severity:

- Rainfall intensity and duration
- Antecedent moisture conditions
- Ice dynamics and glacier recession
- Snowmelt
- Atmospheric conditions
- Watershed conditions, including terrain steepness, soil types, amount, vegetation type, and development density.
- The existence of attenuating features in the watershed, including natural features such as lakes and human-built features such as dams.
- Flow velocity.
- Availability of sediment for transport, and the bed and embankment watercourse erodibility.
- Location of potentially impacted structures related to the base flood elevation as indicated with their certified high-water mark.

Historical GLOFs have resulted in a record high water level of 15.99 feet on the Mendenhall River in August 2024, with damages to at least 290 residences reported. The river remained in a flood stage for 28 hours. Other damages included road closures, significant shoreline/bank destabilization, contaminated floodwaters, inundated businesses and vehicles, and power outages. Non-GLOF events have resulted in a high-water level just under 11 feet in Jordan Creek, flooding roads, yards, and parking lots in the area.

Table 23- Extent of Historic Flood Events in Juneau and Traditional Lands of Tlingit & Haida

Date of Event	Flood Type	Water Level and Flow Rate
11/26/1984	Rainfall-Runoff	Montana Creek rose to a stage of 17.3 feet.
8/8/2001	Taku River / Glacial Lake Outburst	The river stage rose approximately 6 feet through the period, peaking at 41.9 ft (NOAA Storm Events Database).
6/25/2004	Taku River / Glacial Lake Outburst	The Taku River crested at 44.96 feet around 1530 on 6/25.
9/2/2006	Mendenhall River / Glacial Lake Outburst	Flood stage was approximately 9.6 feet which crested at 12.03 feet.
8/22/2007	Taku River / Glacial Lake Outburst	Discharges increased from 26,000 cfs to 41,600 cfs while water temperatures dropped from 47 to 39 degrees F. The river crested 5 ft below flood stage.
7/19/2011 – 7/22/2011	Mendenhall River / Glacial Lake Outburst	High water level of 10.92 feet in the Mendenhall River with a total discharge reaching 14,220 cfs.
8/19/2011- 8/22/2011	Mendenhall River / Glacial Lake Outburst	High water level of 10.26 feet in the Mendenhall River with a total discharge reaching 14,220 cfs.
7/9/2014 – 7/11/2014	Mendenhall River / Glacial Lake Outburst	High water level of 11.82 feet in the Mendenhall River with a total discharge reaching 19,900 cfs.

Date of Event	Flood Type	Water Level and Flow Rate
7/6/2016	Mendenhall River / Glacial Lake Outburst	High water level of 11.99 feet in the Mendenhall River with a total discharge reaching 16,300 cfs.
10/27/2017	Jordan Creek / Rainfall and Snowmelt	Jordan Creek crested at 10.97 feet, a new record.
7/19/2018	Mendenhall River / Glacial Lake Outburst	Mendenhall River crested at 10.92 ft.
12/2/2020	Southeast Alaska / Rainfall	Over 2 days, precipitation amounts in the Planning Area ranged from 5 to 7 inches, flooding Jordan Creek.
6/30/2021	Taku River / Glacial Lake Outburst	Taku River had a total record discharge of 137,000 cfs and record high water level of 45.54 feet.
8/10/2021 – 8/13/2021	Mendenhall River / Glacial Lake Outburst	Mendenhall Lake rose over moderate flood stage of 10 feet on 8/13/2021
7/21/2022	Taku River / Glacial Lake Outburst	A glacier-dammed lake outburst caused the Taku River to rise rapidly before reaching a crest of 43.4 feet.
10/1/2022	Jordan Creek / Rainfall	Jordan Creek crested at 10.98 feet in the late morning which was the second highest crest on record from the 2 to 3 inches of rain that fell over the previous 24 hours.
10/27/2022	Mendenhall River / Glacial Lake Outburst	High water level of 10.25 feet in the Mendenhall River with a total discharge reaching 12,200 cfs.
8/8/2023	Mendenhall River / Glacial Lake Outburst	High water level of 14.82 feet in the Mendenhall River with a total discharge reaching 25,200 cfs.
8/6/2024	Mendenhall River / Glacial Lake Outburst	High water level of 15.99 feet in the Mendenhall River with a total discharge exceeding 35,000 cfs.

Flood Insurance Study, Revised 2020

The City and Borough of Juneau participates in the National Flood Insurance Program (NFIP). FEMA conducted a Flood Insurance Study to identify the 1% (100-year) annual chance of flood in the Planning Area in 2020.

The Special Flood Hazard Area (SFHA) is the area affected by the 1-percent-annual-chance flood event. Flood risk varies across geographic regions in the Planning Area, with the highest number of buildings in the SFHA located within the region of East Valley. Borough-wide, there are 208 structures identified in the SFHA as of 2018 (updated in 2020). The results of the Special Flood Hazard Area Exposure Assessment from the 2018/2020 study are provided in Appendix E (due to the timing of the Flood Insurance Study (2020), the recent 2023 and 2024 GLOF events are not represented in this study).

Based on past flooding events and the criteria identified in Table 10, the magnitude and severity of flooding in the Planning Area is considered Critical, where injuries and/or illnesses could result in permanent disability; with potential for critical facilities to be shut down for more than two weeks, and more than 25% of property would be severely damaged.

3.3.6.5 Impact

Impacts from flood events are described below.

Shoreline/Bank Destabilization

Stream bank shoreline/bank destabilization involves the removal of material from the stream bank. When bank shoreline/bank destabilization is excessive, it becomes a concern because it results in loss of streamside vegetation, loss of fish habitat, and loss of land and property. High water flow storm surge floods scour (erode) coastal embankments, coastal protection barriers, and result in infrastructure and residential property losses. Additional impacts can include roadway embankment collapse and foundations exposure, and damaging impacts.

Past flooding events in the Planning Area have caused significant shoreline/bank destabilization. During the GLOFs on the Mendenhall River, floodwaters swept trees and buildings into the river as significant shoreline/bank destabilization occurred. In the August 2023 and 2024 GLOFs, two homes were undercut and fell into the Mendenhall River. Please see Section 3.3.7.5 for a detailed description of bank shoreline/bank destabilization impacts in the Planning Area.

Source: WJTV 2023

Figure 83- Mendenhall River Shoreline/Bank Destabilization (August 2023)

Photo Credit: Anonymous public submission via the project survey

Figure 84- Structure Swept Away by the Mendenhall River (August 2023)

Photo Credit: Marty McKeown, Juneau Resident

Figure 85- Mendenhall River Shoreline/Bank Destabilization on Riverside Dr (August 2023)

Contaminated water

Flood waters pose a health hazard by picking up contaminants and disease as they travel.

Outhouses, sewers, septic tanks, and livestock yards are all potential sources of disease transported by flood waters, especially if wastewater and sewage infrastructure sustain additional damages. Homes and possessions must be cleaned and sanitized after a flood, and many times must simply be discarded when the damage is too extensive. Public water supplies can be contaminated by flood waters and must be tested to ensure their safety and potability. Private well systems must also be tested and disinfected after a flood.

Lack of a water source is a significant concern for flood victims, especially if the flood has been extensive enough to contaminate the public water supply. In such a case, outside bottled water is at times the only source of clean water.

Past flooding events in the Planning Area have caused hazardous material spills, such as during the August 2023 GLOF in which three sewage lift stations were inundated and multiple fuel tanks were swept downstream, leading to suspect hazardous material spills. During the August 2024 GLOF, portions of the Mendenhall River and its floodwaters smelled of petroleum.

See Section 3.3.12 for more information on historical hazardous materials incidents in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida.

Critical Facilities Damage

Inundation cause damage to water and wastewater utilities, power, and communications infrastructure as well as roads, bridges, culverts, and other features. Debris carried by high-velocity floodwaters may also accumulate on bridge piers and in culverts, decreasing water conveyance and increasing loads which may cause feature overtopping or backwater damages.

Past flooding events in the Planning Area have caused significant damage to public infrastructure and critical facilities. In the August 2023 and August 2024 GLOFs, the local electric company had to cut power to residences along parts of the Mendenhall River due to floodwaters to prevent further damage to the utility and prevent safety incidents associated with electrocution. The water and wastewater treatment facilities along the Mendenhall River sustained damages due to compromised bank stabilization. Roadways have sustained damages, including Skaters Cabin Road, View Drive, and Killewich Drive. In October of 2024, another GLOF rendered Skaters Cabin Road impassable and the USFS Mendenhall Campground sustained some damages.

Table 24- Impact on Public Infrastructure due to Historic Flood Events in Juneau and Traditional Lands of Tlingit & Haida

Date of Event	Flood Type	Recorded Damages to Public Infrastructure
11/26/1984	Rainfall-Runoff and Storm Surge	Extensive damage to many road systems, public, private and non-profits properties was caused from mudslides and water shoreline/bank destabilization. The worst slide completely collapsed a portion of Fritz Cove Road.
2005	Large rainfall event	A large rain event resulted in the culvert underneath Wickersham Avenue being plugged with debris. Wickersham Avenue sustained damages with costs established at $15,000. This included work on Behrends Avenue (2012 Hazard Mitigation Plan).
7/19/2011 – 7/22/2011	Mendenhall River / Glacial Lake Outburst	No known critical facilities damage.
8/19/2011- 8/22/2011	Mendenhall River / Glacial Lake Outburst	Minor flooding in Mendenhall Lake Campground, on Skaters Cabin/West Glacier Spur Road and on View Drive.

Date of Event	Flood Type	Recorded Damages to Public Infrastructure
7/9/2014 – 7/11/2014	Mendenhall River / Glacial Lake Outburst	Significant flooding within the campground with 3-4 feet of water in places and 150 feet of road within the campground was damaged.
10/27/2017	Jordan Creek / Rainfall and Snowmelt	Estimated flood damage costs were around $100,000. The heavy rain also produced a debris flow along the Gold Creek Flume Trail and caused damage which cost about $80,000 to fix (NOAA Storm Events Database).
7/19/2018	Mendenhall River / Glacial Lake Outburst	Some damage sustained to the road system around Mendenhall Campground. The West Glacier spur road and the area around Skaters Cabin was flooded with three feet water.
12/2/2020	Southeast Alaska / Rainfall	Renninger Street, at the base of Heintzleman Ridge, which accesses a city water reservoir along with a middle school, was washed out from shoreline/bank destabilization on both sides of the road. Multiple large debris flows occurred along the lower and upper Salmon Creek Rd and damaged the penstock that brings water from the reservoir to the ALE&P power plant and CBJ water treatment facility.
8/8/2023	Mendenhall River / Glacial Lake Outburst	There was significant shoreline/bank destabilization downstream of Mendenhall Back Loop Bridge. There was significant flooding on View Drive, with the road blocked by several feet of water, as well as on Skaters Cabin Road. Mendenhall Lake Campground was completely underwater. Significant damage on four different streets including inundation of three sewage lift stations, and multiple fuel tanks swept downstream.
8/6/2024	Mendenhall River / Glacial Lake Outburst	Public utilities, infrastructure, and roadways were sustained severe damages. There were power outages. Storm drains were overwhelmed, and pressure led to flooding through manholes around Mendenhall Valley Library, behind the Safeway by Mendenhall River, and Brotherhood Bridge.
10/20/2024	Mendenhall River / Glacial Lake Outburst	Skaters Cabin Road impassable and the USFS Mendenhall Campground sustained some damages.

Source: NWS 2025b- Storm Events Database

Deposition

Deposition is the accumulation of soil, silt, and other particles on a river bottom or delta. For example, 4-foot diameter boulders were found after a Gold Creek flood event in the Planning Area. 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 shoreline/bank destabilization. River shoreline/bank destabilization and deposition together often lead to lateral stream movement.

Economic

Floods result in economic losses through business and government facility closure; utilities such as energy generation, communications, potable water, and wastewater; and transportation service disruptions. Floods result in excessive expenditures for emergency response and generally disrupt the community's normal function and quality of life.

Personal injury

Flooding causes more deaths than any other natural hazard nationwide. Swiftly flowing water presents a drowning hazard, regardless of the depth of the water. Even relatively shallow floodwaters of 6" may have a powerful current capable of pulling a human off their feet. Flood waters can also rise without warning, transforming a small brook into a raging torrent. Flood waters can also carry large objects with them, making it even more dangerous to be in the path of the flood.

Unpredictable and dangerous flood waters can pose a threat to motorists if they cover roadways. Water that appears shallow may in fact be very deep with a strong current, and caution must be taken when approaching any flooded roadway. Cars and other vehicles can be swept away by floods, making it very dangerous to attempt to drive over a flooded roadway. Culverts meant to allow water to flow under the road can quickly become overwhelmed by excessive water, causing the water to divert and flow over the road or even wash out the roadbed.

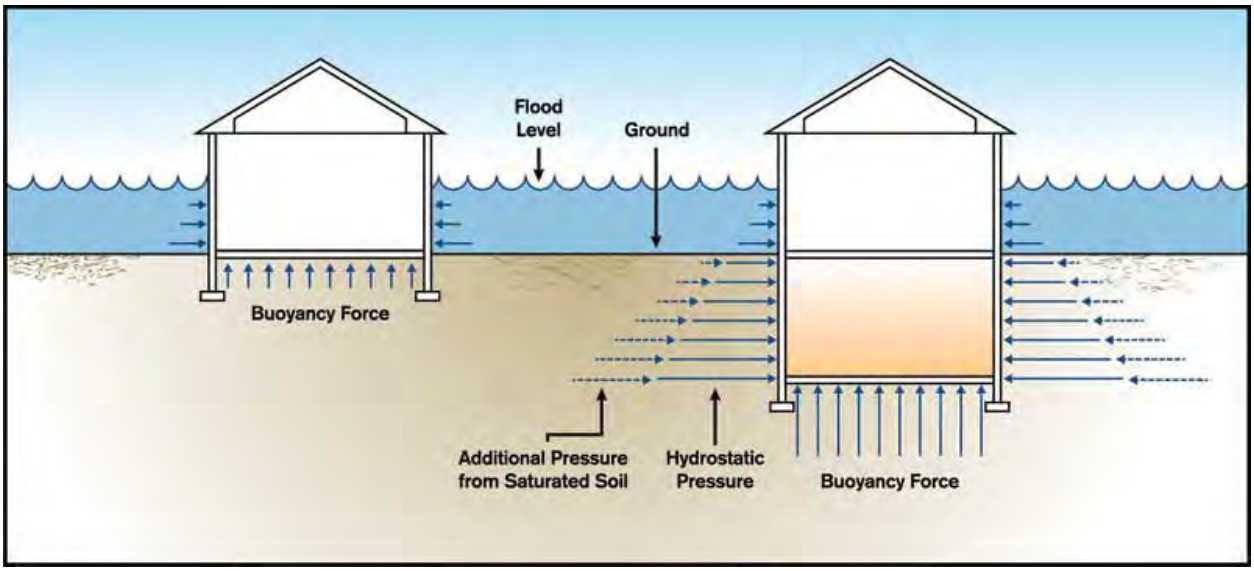
While residents in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida have had to temporarily seek emergency shelter during recent GLOFs, there have been no reported human casualties or injuries due to flooding. According to the President of the Central Council of Tlingit and Haida Indian Tribes of Alaska, one family's pet dog died due to the August 2024 GLOF.

Property Damage

Water inundation causes tremendous damage to homes and structures. Building materials become saturated with water and can swell, making doors and windows inoperable. Water-saturated building materials become much heavier than they would normally be, which can cause structural damage such as buckling and settling. Materials such as sheet rock can suck up water and lift it with a capillary-type action far above the original level of the flood water. When discussing damage from water inundation, it's important to distinguish the difference between hydrostatic and hydrodynamic force in the context of flooding. Hydrostatic force is the pressure exerted by standing water, and hydrodynamic force is the force exerted by moving water. Both forces can cause substantial damage to a structure through various forms of pressure. Figure 86 and Figure 87 illustrate these two types of forces.

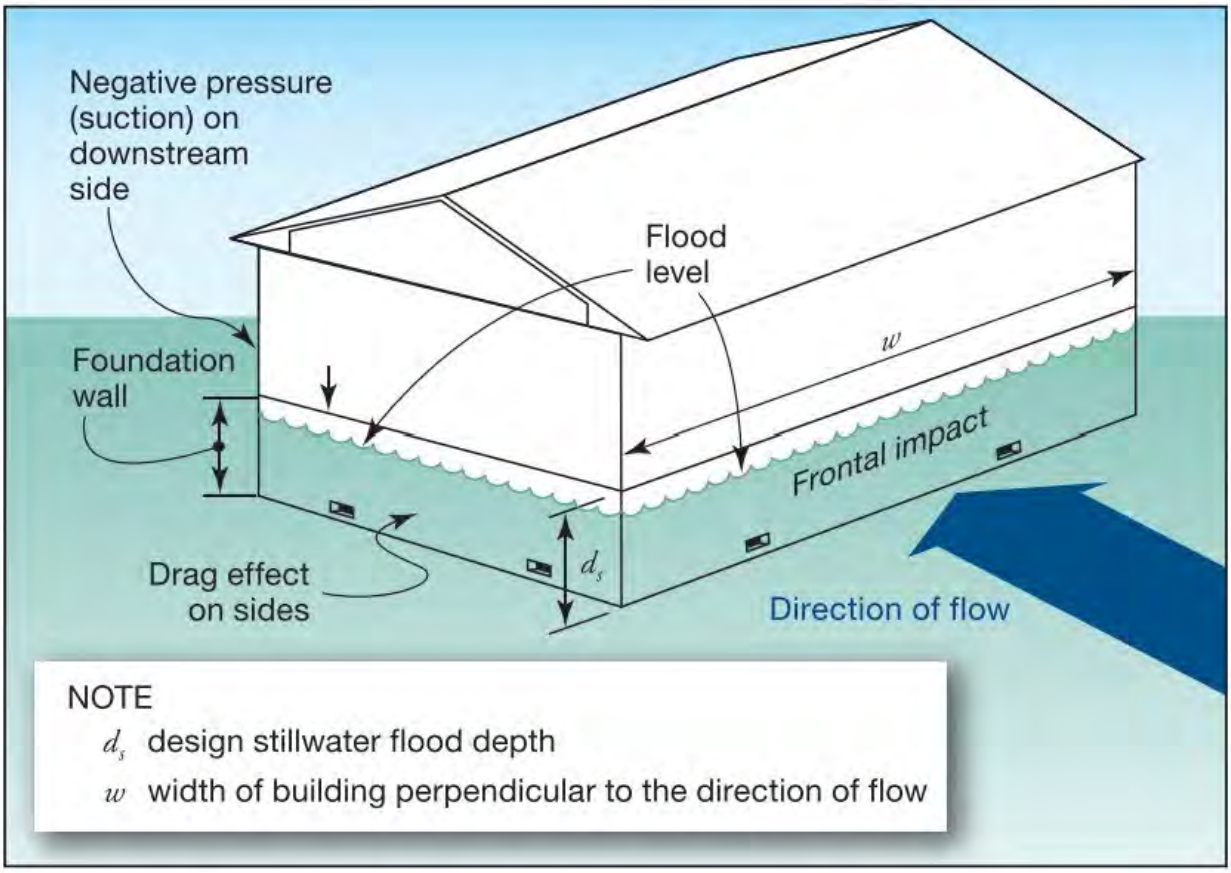
Mildew can quickly set in after a flood, destroying furnishings and causing a health hazard for those with allergies or respiratory conditions. Flood waters usually bring along large quantities of dirt and silt, which are left as deposits when the flood waters recede. Homes and possessions, if not excessively damaged by water, can be devastated by silt deposits.

Past flooding events in the Planning Area have resulted in significant property damages, including approximately 290 homes sustaining flood damages from 4 - 6 feet of standing water during the August 2024 GLOF. The August 2023 GLOF also caused significant property damage on four different streets, including the condemnation of residential structures and multi-story condos.



CSI 2015

Figure 86- Hydrostatic Force on a Structure



BASC 2025

Figure 87- Hydrodynamic Force on a Structure

Table 25- Impact on Private Property due to Historic Flood Events in Juneau and Traditional Lands of Tlingit & Haida

Date of Event	Flood Type	Recorded Damages to Property
11/26/1984	Rainfall-Runoff and Storm Surge	Flood waters over two feet deep covered several residential lots. An unknown number of homes sustained water damage
7/19/2011 – 7/22/2011	Mendenhall River / Glacial Lake Outburst	Water damage to at least one residential property on View Drive.
8/19/2011- 8/22/2011	Mendenhall River / Glacial Lake Outburst	No recorded property damage.
7/9/2014 – 7/11/2014	Mendenhall River / Glacial Lake Outburst	-
10/27/2017	Jordan Creek / Rainfall and Snowmelt	There was significant flooding in the Jordan Creek area with multiple homes and businesses flooded, with some water in their crawl space and/or homes.

Date of Event	Flood Type	Recorded Damages to Property
7/19/2018	Mendenhall River / Glacial Lake Outburst	There was minor flood damage to some homes that border the Mendenhall River along View Road.
12/2/2020	Southeast Alaska / Rainfall	Residences along Mary Ellen Way on Vanderbilt Hill had multiple debris flows that damaged homes and deposited debris into yards that blocked drainages to divert water into homes. A big debris flow was reported along Wire St which damages homes and blocked the Glacier Hwy. Another big debris flow was reported near the AWARE shelter along Glacier Hwy which deposited mud around the shelter and surrounding homes. A home was damaged by a debris flow on Cohen Dr near Tee Harbor as the debris smashed into the side of the home removing a significant portion of the structural support.
8/8/2023	Mendenhall River / Glacial Lake Outburst	The Riverside area of town near Riverside Condos had two homes undercut and collapse into the river. In total, there was significant damage on four different streets, including the condemnation of residential structures and multi-story condo. Total of 48 homes affected with 13 destroyed, 8 with major damage and 7 with minor.
8/6/2024	Mendenhall River / Glacial Lake Outburst	Approximately 290 homes sustaining flood damages from 4 – 6 feet of standing water
10/20/2024	Mendenhall River / Glacial Lake Outburst	There were reports of trees and debris floating down the river and water into some yards on View Drive.

Source: NWS 2025b- Storm Events Database

Air Transportation Impacts: Flooding along roadways and at airport facilities can impact transportation of goods and people if roadways and runways are inundated. Significant events may compromise runway surface integrity and potentially cause runway bank stabilization.

3.3.6.6 Probability of Future Events

Floods can occur in the Planning Area at any time because of its high probability of heavy rainfall; however, many flood damages are predictable based on rainfall and seasonal thaw patterns. Most of the annual precipitation is received from April through October with August being the wettest. This rainfall leads to flooding in early/late summer and/or fall. Floods are most likely in August, September, October, and November, during which approximately half of the Planning Area's average rainfall occur. Spring snowmelt increases runoff, which can cause excessive surface flooding. Glacial lake outburst floods most often occur in early to mid-summer, during the end of the snowmelt season. GLOF events have historically occurred in July and August. Localized flooding can be expected to occur on an annual basis. Structures abutting the floodplain are the most threatened by flooding.

Table 26- Flood Recurrence Probability Terminology

Event	Annual Chance of Occurrence	Additional Ways to Reference the Occurrence
10-year flood	10-percent	• During the span of a 30-year mortgage, a home has a 96-percent chance of being flooded at least once.
25-year flood	4-percent	• During the span of a 30-year mortgage, a home has a 71-percent chance of being flooded at least once.
50-year flood	2-percent	• During the span of a 30-year mortgage, a home has a 45-percent chance of being flooded at least once.
100-year flood	1-percent	• SFHA • During the span of a 30-year mortgage, a home has a 26-percent chance of being flooded at least once.

500-year flood	0.2-percent	• During the span of a 30-year mortgage, a home has a 6-percent chance of being flooded at least once.

Glacial Lake Outburst Floods

GLOFs have occurred annually, since 2011, in late summer through fall from Suicide Basin, predominantly affecting Mendenhall River Valley. It is expected that these events will continue on an annual basis or in multiple smaller releases in late summer to late fall until there is enough degradation of the ice dam of the impounding glacier (Sít') to prevent GLOFs from Suicide Basin. Estimating the magnitude and frequency of glacial-outburst floods differs from standard estimating methods because glacial-outburst floods are not sourced from rainfall or snowmelt. Hydrologic characteristics of basins containing glacier-dammed lakes are subject to sudden changes, or glacier-outburst floods may develop in a river with no history of outburst flooding. A river with a history of outburst flooding may suddenly stop due to degradation of the ice dam of the impounding glacier (Neal, E., 2007).

Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a GLOF event within the calendar year; there is a 1 in 1 year chance of occurring; and the history of events is greater than 33% likely per year.

Flooding due to Precipitation Events

Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a heavy rain event within the calendar year; there is a 1 in 1 year chance of occurring; and the history of events is greater than 33% likely per year. Based on previous occurrences and the criteria identified in Table 11, it is Likely that the Planning Area will experience an atmospheric river event in the next three years; there is a 1 in 3 years chance of occurring; and the history of events is greater than 20% but less than or equal to 33% likely per year. Flood damages associated with atmospheric rivers have been found to increase exponentially with atmospheric river intensity so even a modest shift towards higher-intensity atmospheric rivers could have significant impacts on flood damages (Corringham et al. 2022).

Coastal Flooding Events

Based on the previous occurrences and the criteria identified in Table 11, it is Possible that the Planning Area will experience coastal flooding in the next five years; there is a 1 in 5 years chance of occurring; and the history of events is greater than 10 % but less than or equal to 20% likely per year.

The National Weather Service Forecast Office in Juneau monitors for flooding in Southeast Alaska. They coordinate hydrological forecasts and warnings with their River Forecast Center in Anchorage. All flood watches and warnings are issued when conditions warrant. The National Weather Service works with local emergency managers to ensure that the appropriate actions are taken once a flood watch or warning is disseminated.

Based on previous occurrences and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience a flood event within the calendar year; there is a 1 in 1 year chance of occurring (1/1=100%); and the history of events is greater than 33% likely per year.

3.3.6.7 Future Conditions

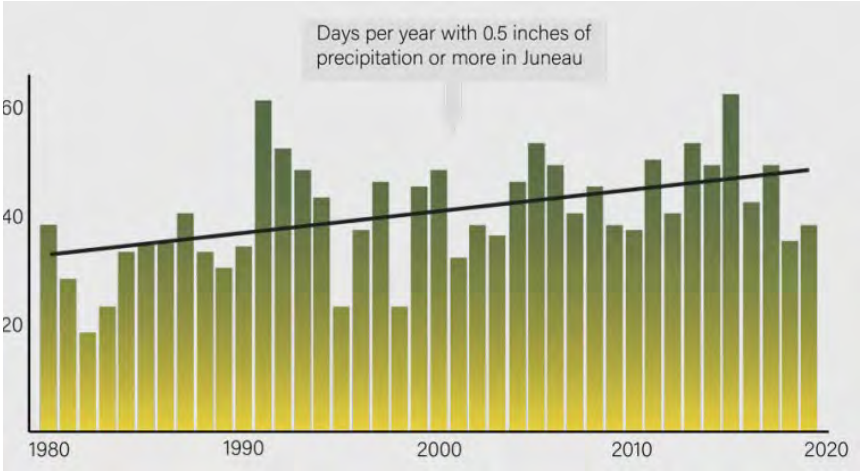
Changing Factor	Description of Future Conditions
Nature	Generally, the nature of flooding is not expected to change due to future climate conditions. GLOF is a relatively new hazard in the Planning Area's more densely populated areas. Due to the newness of the GLOF events, it is possible that the nature of this hazard could change due to future conditions.

Changing Factor	Description of Future Conditions
Location	It is possible that future climate conditions may influence the location of future flood hazard areas in the Planning Area as warmer temperatures and increased precipitation inundate streams already prone to flooding or smaller streams not historically flooded.
Extent (Magnitude/ Severity)	As heavy rainfall and atmospheric river events become more frequent, the magnitude and severity of flooding in the Planning Area is likely to increase. However, the magnitude of glacial lake outburst floods from Suicide Basin depend on how much water can be stored in the basin, which depends on ice dam thickness and the amount of remnant ice left behind in the basin by the retreat of Suicide Glacier. Thinning of the ice dam that blocks water from escaping the basin decreases the storage capacity, whereas melting of the remnant ice floating in the basin increases the amount of water that can be held. Because we don't know exactly how the drainage event begins, and the floods vary in magnitude from year to year, it is unclear whether floods from Suicide Basin will increase or decrease in size in the coming years (Juneau Climate Report 2022).
Impact	As the probability of annual precipitation increases in the Planning Area, so does the potential of flooding, which increases the potential impacts to Juneau and Traditional Lands of Tlingit & Haida. These increased impacts may include inundation and damage to homes and critical facilities, road flooding, and resultant shoreline/bank destabilization. More information is needed to determine whether floods from Suicide Basin will increase or decreases in size in the coming years.
Probability of Future Events	The probability of future flooding events is likely to increase due to increasing precipitation and heavy rainfall events. As precipitation increases, atmospheric rivers are becoming more frequent on the west coast. Atmospheric river events are increasingly common, as are rain on snow events, which increase the potential for localized flooding in the Planning Area (DHS&EM 2023). These impacts are exacerbated if they arrive onto already saturated soils, as is often the case in the Planning Area, especially in the fall season, or onto existing snowpack that can quickly melt when in contact with the warmer rainfall (Juneau Climate Report 2022). According to the EPA and NOAA records, coastal flooding events are increasing in frequency in Alaska (EPA 2022). According to the States at Risk Climate Change Preparedness Report Card, Alaska's coastal floodplain is expected to expand by over 15,000 square miles, which accounts for the greatest increase of any state (States at Risk 2015). Impacts of future climate conditions on coastal flooding in the Planning Area are difficult to predict. While melting glaciers in Southeast Alaska will generally contribute to global sea level rise, the Planning Area could experience around 3.9 feet of additional land-surface uplift by 2100 because of isostatic rebound (Alaska Coastal Rainforest Center). Estimating the magnitude and frequency of glacial-outburst floods differs from standard estimating methods because glacial-outburst floods are not sourced from rainfall or snowmelt. Hydrologic characteristics of basins containing glacier-dammed lakes are subject to sudden changes, or glacier-outburst floods may develop in a river with no history of outburst flooding. A river with a history of outburst flooding may suddenly stop due to degradation of the ice dam of the impounding glacier (Neal 2007). **Warming temperatures:** In Southeast Alaska, annual average temperatures are generally rising. This is mainly due to the absence of extremely cold years in recent decades. Winter and summer have seen the most significant temperature increases, while spring and autumn have seen much less change (Juneau Climate Report 2022).

Changing Factor	Description of Future Conditions

Increasing precipitation: Precipitation across the Planning Area varies. While precipitation occurs frequently throughout the year, it is usually light and manageable. Heavy rain is most common in the fall (August to October) as are damaging high winds associated with large Pacific storms. The Planning Area averages 230 days per year with "measurable" precipitation (at least 0.01 inch of liquid), including an average of 43 days with measurable snowfall. The average annual precipitation has increased approximately 20 inches over the past 96 years, with short-term variations during this time. This year-to-year and decade-to-decade variability will continue in the future even as the long-term trend of precipitation continues to increase.

Increasing heavy rainfall events: The Planning Area is experiencing a trend toward higher precipitation due to warming global temperatures. Continued warming is expected to increase the total number of atmospheric river events that impact North America's west coast. Trends of annual precipitation across Southeast Alaska from 1969 to 2018 show increases ranging from 4.7% to 15.1%. There is an increasing trend from 1980 to 2019 in the number of days per year that the JIA received more than 0.50 inches of precipitation (McFarland 2019).



Source: Juneau Climate Report, 2022

Figure 88- Days per year of precipitation greater than 0.5 inches

Deglacierization: Deglacierization, which rising climactic temperatures contribute to, is expected to continue at Mendenhall Glacier (Sít' Aant'aakú). The Mendenhall Glacier has retreated since its Little Ice Age maximum in the late 1800s, and about 1.3 miles since the U.S. Forest Service Mendenhall Glacier Visitor Center (MGVC) was built in 1962. The glacier continues to retreat and thin at high rates, with some of the highest observed thinning rates occurring from 2014 to 2019 (averaging about 9.8 feet/yr across the glacier). When observed thinning rates are projected forward in time and applied to surface and bed elevation maps of the glacier, the glacier continues to retreat at rates of about 55 yards/year. Lower or higher thinning rates result in rates of terminus retreat of 20-80 yards/year. In moderate climate warming scenarios, the glacier will barely be visible from the MGVC by 2050 (Alaska Coastal Rainforest Center, 2025).

Fed by runoff from rainfall, snowmelt, and deglacierization, GLOFs are expected to continue to pose a risk for at least the next half-decade (Kienholz, C. et al., 2020). GLOFs are difficult to predict, as multiple factors contribute to the magnitude of future floods. The thinning of the ice dam at Suicide Basin, which as of 2020 was dropping by 5 meters annually, is lessening the capacity of the basin to store water. However, floating ice in the basin is melting away, providing a larger reservoir to store water behind the dam. As Mendenhall Glacier retreats, the area of the basin that can store water is slowly increasing. Ice dynamics evolve quickly. Again, the coincidence of a GLOF with a period of high snow or ice melt could exacerbate flooding (Kienholz, C. et al., 2020).

Changing Factor	Description of Future Conditions
	Kienholz et al. (2020) studied the current conditions and outlook of GLOFs from Suicide Basin using in situ and remote sensing data focused on the 2018 and 2019 melt seasons. They propose a suspected mechanism for basin drainage, which is a dynamic subglacial conduit impacted by a number of factors including ice-dam thickness. At least since 2018, there has been a measured trend of ice-dam thinning which may continue and accelerate due to warming climate temperatures. At some unknown point, the Mendenhall Glacial may thin too much to form a substantial ice dam at all. Given current ice thickness at the entrance of Suicide Basin, it is predicted that the annual GLOF cycle may continue for another decade or two (Kienholz et al. 2020).
Population Patterns	It is highly likely that future flood events will cause changes in population patterns in the Planning Area as future floods may impact more homes, residents, and critical facilities resulting in current residents relocating out of flood prone areas.
Land Use Development	It is highly likely that future flood events will cause changes in land use development in the Planning Area. Glacial Lake Outburst Floods on the Mendenhall River and Taku River impact limited areas. Increased flood events may influence future land use development through zoning regulations that limit development in flood zones. Transportation infrastructure, such as roads, bridges, and culverts, may need to be designed to withstand increased flooding, influencing how and where they are built. There may be a greater emphasis on preserving and restoring natural ecosystems, such as wetlands and floodplains, which can absorb excess water and mitigate flooding risks. The installation of HESCO barriers in 2025 to mitigate the impacts of flood inundation due to GLOF events limits existing land uses by property owners. This may result in existing property owners relocating to other areas not subject to flooding. There may also be future activities that incorporate HESCO type mitigation (or other mitigation types) into current land use.

3.3.7 SHORELINE/BANK DESTABILIZATION

3.3.7.1 Nature

Shoreline/bank destabilization (erosion) is defined as wearing away of the ground surface as a result of the movement of wind, water, or ice. Shoreline/bank destabilization is a gradual process, but it can occur rapidly as the result of storms with significant precipitation, floods, permafrost degradation, or other events. Shoreline/bank destabilization may cause the destruction of property, development, and infrastructure, but is rarely linked to direct human death or injury.

Shoreline/bank destabilization poses a threat to communities where disappearing land threatens infrastructure and development. The Planning Area is primarily threatened by riverine shoreline/bank destabilization and to a lesser extent, coastal shoreline destabilization.

Riverine Shoreline/Bank Destabilization

Riverine shoreline/bank destabilization is similar to coastal shoreline/bank destabilization but occurs on a riverbed or riverbank rather than the coast. Riverine shoreline/bank destabilization is a natural process in almost any river but can be intensified by natural and human influence. The variables that influence the stability (or erodibility) of stream banks in riverine shoreline/bank destabilization include:

- Critical height of the slope
- Inclination of the slope
- Cohesive strength of the soil in the slope
- Distance of the structure in question from the shoulder of the stream bank
- Degree of stabilization of the surface of the slope
- Level and variation of groundwater within the slope
- Level and variation in level of water on the toe of the slope
- Tractive shear stress of the soil
- Frequency of rise and fall of the surface of the stream

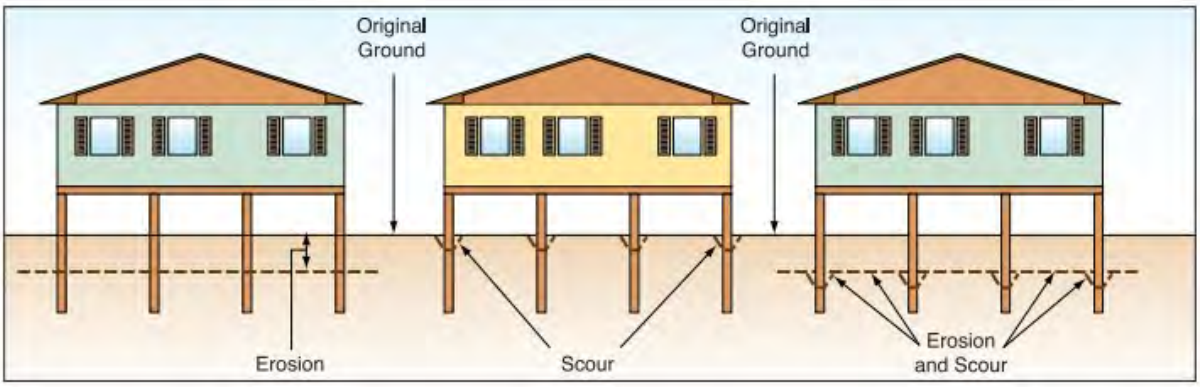
The most prevalent cause of riverine flooding in the Planning Area is caused by GLOFs, affecting the Mendenhall River and Mendenhall Valley.

Riverine Scour

Riverine scour is caused by the immense force of water flowing and build up of ice in and around the river channels. Scour may have different influences depending on the stability of the river channels; material deposition and scour are constant issues in less stable braided channels, whereas more stable meandering channels have occasional scour resulting from human activities like boat wakes and dredging.

Human influence to control scour often makes it worse, leading to progressed embankment loss or damage. Examples of control methods include groins, jetties, levees, or revetments. Glacial outburst flooding and more frequent and intense rain events can increase shoreline/bank destabilization and result in greater amounts of sediment loss.

Figure 89 shows the differences between shoreline/bank destabilization and scour. A building may be subject to either or both, depending on the building location.



Source: FEMA 2009- Erosion, Scour, and Foundation Design

Figure 89- Distinguishing Between Shoreline/Bank Destabilization and Scour

Coastal Shoreline/Bank Destabilization

Coastal shoreline/bank destabilization is described as the wearing or washing away of coastal lands. Coastal shoreline/bank destabilization occurs over the area near the top of the bluff out into the near-shore region to about the water depth of 30 feet. Coastal shoreline/bank destabilization is measured as the rate of change in the position or horizontal displacement of a shoreline over a period of time. Bluff recession is the most visible aspect of coastal shoreline/bank destabilization because of the dramatic change it causes to the landscape. As a result, this aspect of coastal shoreline/bank destabilization usually receives the most attention from the community.

Coastal shoreline/bank destabilization can occur from rapid, short-term, daily, seasonal, or annual natural events such as wind, waves, storm surge, coastal storms, and/or flooding. Human activities such as boat wakes and dredging may also play a factor. The most intense shoreline/bank destabilization often occurs during storms, particularly because the highest energy waves are generated under storm conditions.

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

Groins, jetties, seawalls, or revetments are human attempts to control shoreline/bank destabilization. As a result, these structures may lead to increased shoreline/bank destabilization on the opposite side of the structure.

Damage from coastal shoreline/bank destabilization is typically a gradual event. However, significant storm events can cause the ground beneath infrastructure and homes to weaken. In extreme but not unheard-of cases, homes built near the coast have fallen into the sea due to eroded cliffs.

Coastal scour

Scour occurs when floodwater passes around obstructions in the water column. As the water flows around an object, it must change direction and accelerate. Soil can be loosened and suspended by this process or by waves striking the object and be carried away.

Scour effects are generally localized, ranging from small to large shallow conical depressions in the sand around individual structures. Effects from scour increase with increasing flow velocity and turbulence, and with increasing soil erodibility.

A combination of natural and human-induced factors influences the shoreline/bank destabilization process in the Planning Area. For example, shoreline orientation and exposure to prevailing winds, open ocean swells and waves all influence shoreline/bank destabilization rates. These can be altered by human development by the addition of jetties, groins, and seawalls/revetments. Beach composition also influences

shoreline/bank destabilization rates. A beach comprised of primarily large rocks and boulders is more resistant to shoreline/bank destabilization compared to a beach comprised of silt and sand. Other factors that may influence coastal shoreline/bank destabilization include:

- Geomorphology
- Nature of coastal topography
- Embankment or shoreline type
- Embankment and shoreline exposure to wind and waves
- Structure types along the shoreline
- Proximity to shoreline/bank destabilization-inducing structures
- High hazard zone encroachment
- Development density
- Elevation of river embankment; or coastal dunes and bluff

3.3.7.2 Location

Shoreline/bank destabilization threats to the Planning Area are primarily due to riverine processes in the Mendenhall River. This is predominantly caused by heavy rainfall events in the summer and fall, as well as large, rapid water releases from GLOFs. The source of the GLOFs is melting glacier ice in Suicide Basin. The riverbank areas most affected are the oxbows around View Drive and the shoreline of Meander Way. Both the Brotherhood Bridge and the Mendenhall River Bridge have experienced riverine scour.

Coastal shoreline/bank destabilization risks are present across the entirety of Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida's coastline, but the areas affected in recent history are along Thane Road, the Gold Creek Delta, and Egan Drive (USACE 2007).

The USACE Erosion Assessment states that in the Planning Area, as of 2007, erosion is reported at multiple locations, which are described below.

> *Erosion along the Mendenhall River has primarily involved undeveloped land. The estimated erosion rate is **2 to 10 feet per year**. The river is close to cutting through an oxbow on the river. Limited erosion has been reported on Gold Creek and Montana Creek. Information provided in the community erosion survey indicates that coastal storms and high tides along Gastineau Channel were a cause of erosion. There is an erosion risk that has been reported at Vintage Park as well. An oxbow is reported to be nearly cut through.*
>
> *According to the community every oxbow in the stream has a potential for erosion. The Melvin Park area next to Riverside Drive, the embankment that protects the housing along Killewich, the city lands behind the high school, the housing behind the Post Office, Vintage Park, Meander Way, the wastewater plant, are reportedly subject to erosion unless the embankment is constantly repaired or replaced. The bridge on Lemon Creek at Old Glacier was a site of the "Emergency Gravel Extraction" in 2007 to prevent erosion of the stream bank. The community also reports problems at Brotherhood Bridge.* (USACE 2007)

Since the USACE Erosion Assessment was completed, the Planning Area has experienced even more intense riverine shoreline/bank destabilization due to recent glacial lake outburst floods. Neighborhoods along the Mendenhall River have experienced rapid shoreline/bank destabilization during these events, most notably along View Drive and the Riverside Neighborhood.

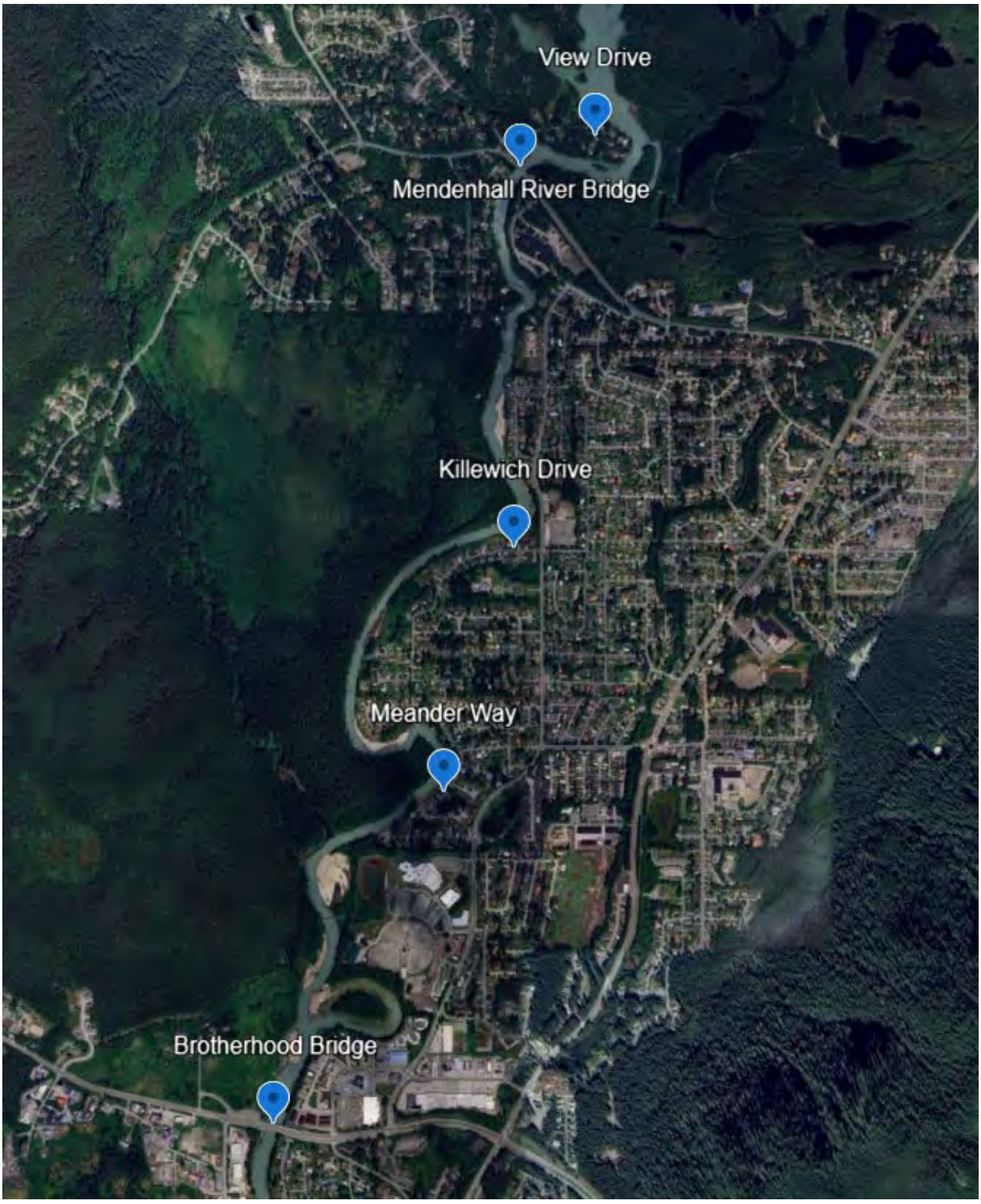


Figure 90- Historical Locations of GLOF- Caused Shoreline/Bank Destabilization

Figure 91- Historical Locations of Coastal Shoreline/Bank Destabilization in Juneau and Traditional Lands of Tlingit & Haida

3.3.7.3 History

The Planning Area has had a history of shoreline/bank destabilization since 1984, the most significant and recent being stemmed from the Mendenhall River's August 2023 flood event, which eroded over 100 ft of riverbank in several neighborhoods. Appendix F describes the history of shoreline/bank destabilization events in the planning area.

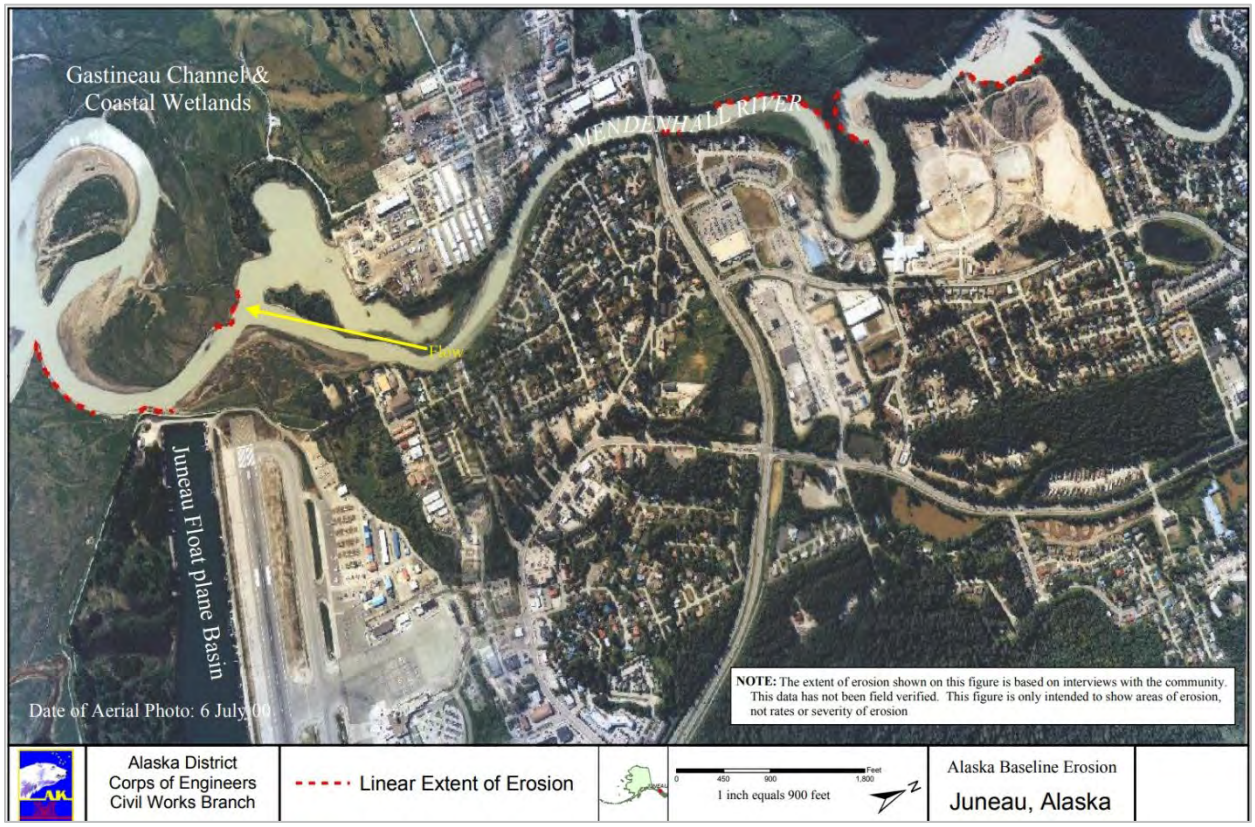
3.3.7.4 Extent (Magnitude and Severity)

Shoreline/bank destabilization is a natural phenomenon that occurs to practically every stream, river, and coastline on earth. However, the GLOF occurring in the Planning Area since 2011 has rapidly increased the rate of shoreline/bank destabilization, with some parts of the riverbank eroding **20-150 feet during a single event**. This has led to riverbank destabilization and the destruction of riparian corridors. This leads to an increase of sediment flowing which lowers water quality and degrades fish habitat (USGS 1999).

Before the GLOF events, the US Army Corps of Engineers estimated riverbank destabilization rates of 2-10 feet per year (USACE 2007). Since the recent GLOF events, there has been documented bank destabilization of 20-150 feet in a single flood (NWS 2025).

The linear extent of shoreline/bank destabilization in the Mendenhall River, as of 2007, is shown below. These areas were identified by members of the community. The map is intended to show areas of

shoreline/bank destabilization in the Planning Area and does not provide rates or severity of shoreline/bank destabilization (USACE 2007). While this map provides historical context of bank destabilization in the Mendenhall Valley, recent GLOF events have increased the extent of shoreline/riverbank destabilization in the Mendenhall Valley. More locations are now impacted by shoreline/riverbank destabilization due to GLOFs then in 2007.



Source: USACE 2007

Figure 92- Linear Extent of Erosion in Juneau and Traditional Lands of Tlingit & Haida (Mendenhall Valley) (2007)

Mature, healthy trees being undercut by shoreline/bank destabilization and falling into the river weaken the remaining bank, allowing more shoreline/bank destabilization to take place. This can lead to rapid bank degradation and increased sediment levels in the water, harming juvenile anadromous fish species or eggs. When and if the fallen trees settle in the river system, they offer potentially enhanced habitat for juvenile salmon. However, the immediate effect of losing riparian habitat accelerates the rate of shoreline/bank destabilization.

Source: KTOO 2018

Figure 93- Meander Way (Riverside Neighborhood) Shoreline/Bank Destabilization (2018)

Source: JE 2024

Figure 94- Mendenhall Riverbank Shoreline/Bank Destabilization (2024)

Source: USACE 2007

Figure 95- Brotherhood Bridge Trail Shoreline/Bank Destabilization (2007)

During floods, the increased water velocity interacts with the pilings supporting the Brotherhood Bridge and erodes the riverbed behind the pilings. This can potentially weaken the structural strength of the bridge.

Source: KTOO 2018

Figure 96- Flood Waters and Riverine Scour on Brotherhood Bridge Pilings (2018)

Based on past shoreline/bank destabilization events, past shoreline/bank destabilization mitigation efforts, and the criteria identified in Table 10, the magnitude and severity of shoreline/bank destabilization impacts in the Planning Area are considered Critical, where injuries and/or illnesses could result in permanent disability; with potential for critical facilities to be shut down for more than two weeks, and more than 25% of property would be severely damaged.

3.3.7.5 Impact

Impacts from shoreline/bank destabilization can range in severity and include loss of land and potentially any infrastructure built on the land. Other impacts include damage to public utilities (fuel headers and electric and water/wastewater utilities), loss of the Native aquatic habitats, high sediment loads reducing water quality, and economic impacts associated with the costs of trying to mitigate the impacts from shoreline/bank destabilization.

The following structures and critical infrastructure have been damaged from shoreline/bank destabilization:

Table 27- Impacts from Historical Shoreline/Bank Destabilization Events in Juneau and Traditional Lands of Tlingit & Haida

Date of Event	Type of Shoreline/Bank Destabilization	Location of Impact
11/26/1984	Coastal	• Egan Drive • Thane Road • Gold Creek Delta/Waterfront
12/23/2005	Coastal	• Glacier Highway • Auke Bay Marine Highway Dock System
07/19/2011	Riverine	• View Drive

Date of Event	Type of Shoreline/Bank Destabilization	Location of Impact
		• Mendenhall Lake Campground • Skaters Creek Cabin Road • West Glacier Spur Road
07/09/2014	Riverine	• View Drive • Back Loop Road • Mendenhall River Bridge
08/01/2020	Riverine	• View Drive • Meander Way • Skaters Creek Cabin Road • Mendenhall Lake Campground • Nugget Falls Trail System
08/08/2023	Riverine	• View Drive • Meander Way • Riverside Condos • Skaters Creek Cabin Road • Back Loop Bridge • Back Loop Foot Bridge • 3 Sewage Lift Stations • Fuel Tanks
08/06/2024	Riverine	• View Drive • Utility Poles • Killewich Drive • Emily Way • Sharon Street • Gee Street • Brotherhood Bridge

Source: NWS 2025

The majority of these roadways listed above were closed during the flood event due to being inundated with water. However, shoreline/bank destabilization damage occurred by water moving in and out of the neighborhoods and streets, causing shoulder and ditch destruction and deformation, undercutting the asphalt and destabilizing sections of roadways.

Source: WJTV 2023

Figure 97- Mendenhall River Shoreline/Bank Destabilization (August 2023)

Note the exposed foundation of the home, as well as extensive shoreline/bank destabilization on the other side of the river in the below photo.

Source: WJTV 2023

Figure 98- Riverside Home Shoreline/Bank Destabilization (August 2024)

Source: JE 2024

Figure 99- Brotherhood Bridge Trail Shoreline/Bank Destabilization Damage (August 2024)

Source: WJTV 2023

Figure 100- Riverside Neighborhood Residences Being Undercut and Destroyed by Rapid Riverine Shoreline/Bank Destabilization (August 2023)

Air Transportation Impacts: Shoreline/ bank destabilization impacts air transportation by potentially eroding airport infrastructure and/or roadways leading to the airport. If there was coastal flooding at JIA, the tarmac or auxiliary roadways could lead to no flights in and out of the airport until repairs could be made. Roadways leading to the airport could be destabilized during floods, heavy rain, or landslides which would cut off access to the airport, even if the airport remains unimpacted.

3.3.7.6 Probability of Future Events

Future climate conditions, such as more frequent and intense rain events or more frequent GLOFs can increase shoreline/bank destabilization and result in greater amounts of sediment loss. There has not been an updated shoreline/bank destabilization assessment in the Planning Area since 2007, and no updated forecast rates of shoreline/bank destabilization have been made.

A US National Science Foundation grant has been awarded to create better models and forecast the Suicide Basin glacial lake and its floods. The research will be conducted by researchers from University of Alaska Southeast, University of Alaska Fairbanks, and Carnegie Mellon University (NSF 2024). The research is expected to be completed by 2029. The new information gathered will provide a more definite probability of future events. However, based on recent historical trends, the likelihood of shoreline/bank destabilization caused by GLOFs in the future is Highly Likely.

Based on the 2007 USACE Baseline Erosion Assessment, historical impacts, shoreline/bank destabilization mitigation measures implemented, and the criteria identified in Table 11, it is Highly Likely that the Planning Area will experience an shoreline/bank destabilization event in the next three years; there is a 1 in 3 years chance of occurring (1/3=33%); and the history of events is greater than 20% but less than or equal to 33% likely per year.

3.3.7.7 Future Conditions

Changing Factor	Description of Future Conditions
Nature	It is unlikely future climate conditions will influence the nature of shoreline/bank destabilization.
Location	It is possible future climate conditions will influence the location of shoreline/bank destabilization in the Planning Area. Shoreline/bank destabilization due to increased frequency of glacial lake outburst floods should be anticipated until the glaciers outside the Planning Area recede to the point of not being able to contain melted water. It is also possible that due to glacial retreat, other dams could form other than the current Suicide Basin Dam (AK CASC 2020). This could lead to flooding hazards in unprecedented areas that would lead to shoreline/bank destabilization in new locations or waterways. An increase of future severe weather and atmospheric rivers could increase the frequency and extent of storm surges, which could cause coastal shoreline/bank destabilization in areas not currently experiencing those affects.
Extent (Magnitude/Severity)	It is likely future climate conditions will influence the magnitude and severity of shoreline/bank destabilization in the Planning Area. Increased severity and magnitude of winter storms, loss of glacial ice, and increased precipitation are already increasing the severity and magnitude of shoreline/bank destabilization events in Alaska, and the trend is expected to continue. This will lead to increased damage to infrastructure (AK CASC 2020).
Impact	It is likely future climate conditions will influence the impacts of shoreline/bank destabilization events in the Planning Area. The primary climatic forces affecting shoreline/bank destabilization in the Planning Area are changes in temperature, glacial lake water levels, precipitation, glacial stability, and storms. All of these factors are

Changing Factor	Description of Future Conditions
	anticipated to be affected by future climate conditions, which will result in increased localized impacts from shoreline/bank destabilization, including more structures along the banks of the Mendenhall River susceptible to shoreline/bank destabilization damage.
Probability of Future Events	It is likely future climate conditions will influence the probability of shoreline/bank destabilization in the Planning Area. Although the probability for shoreline/bank destabilization is location-specific, the probability is likely, and increasing, due to environmental factors. Severe weather events such as precipitation and wind are a direct result of atmospheric warming. Atmospheric rivers are becoming increasingly common and increase the intensity and duration of precipitation events at regional and local scales. Glacial Lake Outburst Floods will most likely increase in the near future until glaciers retreat and there is not enough ice to contain meltwater in volume to produce catastrophic flooding, which in turn causes extreme shoreline/bank destabilization. Shoreline/bank destabilization hazards are directly tied to flooding and severe weather events, and those are likely to become more common over greater geographic regions of Alaska, including Juneau and Traditional Lands of Tlingit & Haida (AK CASC 2020). Glacial Lake Outburst Floods are anticipated to persist during continual glacial retreat in the near future, furthering shoreline/bank destabilization events in the Mendenhall Valley (AK CASC 2020).
Population Patterns	It is possible future climate conditions will influence population patterns in the Planning Area. Like much of Southeast Alaska, the Planning Area is experiencing a slight decline in population as an overall trend. By 2050, the population is estimated to be roughly 27,000, down from the current 31,119 (USCB 2025). While this may eventually mean less of the resident population is living in shoreline/bank destabilization hazard areas, an increased growing season due to future climate conditions could lengthen the tourist season. An increase in tourists throughout the year could possibly increase the amount of people that are at risk of shoreline/bank destabilization hazards at any given moment, particularly due to the high shoreline/bank destabilization hazard areas encompassing the Mendenhall River Valley, which is on the way to Mendenhall Lake and Mendenhall Glacier, one of the most popular tourist destinations, especially for cruise ship passengers. Continuation or increased frequency of GLOFs and resultant shoreline/bank destabilization could cause residents to move out of the Mendenhall Valley, have their property bought out, or relocate out of the Planning Area entirely.
Land Use Development	It is likely future climate conditions will influence future land use development in the Planning Area. Southeast Alaska generally is developed in narrow sections of land between the coast and steep, mountainous terrain. Developments in the Planning Area are built similarly. The Mendenhall Valley contains development away from the coast, but the riverine shoreline/bank destabilization hazard is currently present and likely to persist. Due to an increase in atmospheric rivers, GLOFs, and other climatic factors predicted to become more frequent, the likelihood of shoreline/bank destabilization will increase. It is also possible that land developed in the near future, or that has already been developed, may eventually become prone to shoreline/bank destabilization hazards. Additionally, land use development may change by relocation of critical facilities and relocation or buyout of homes in the shoreline/bank destabilization area and restricting new development in the shoreline/bank destabilization area.

3.3.8 CHANGES IN THE CRYOSPHERE

The "cryosphere" is defined as those portions of Earth's surface and subsurface where water is in solid form, including sea, lake, and river ice, snow cover, glaciers, ice caps and ice sheets, and frozen ground (e.g., permafrost) (Figure 101). The components of the cryosphere play an important role in climate. Snow and ice reflect heat from the sun, helping to regulate the Earth's temperature. They also hold Earth's important water resources, and therefore, regulate sea levels and water availability in the spring and summer. The cryosphere is one of the first places where scientists can identify global future climate conditions.

Hazards of the cryosphere can be subdivided into four major groups:

- Glaciers (Sít')
- Permafrost and periglacial
- Sea ice
- Snow avalanche

Of these four major groups, glaciers (Sít') and snow avalanches (Dleit ñaadí) impact the Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida Planning Area. The remainder of this hazard profile will focus on glaciers and snow avalanches and historical/future impacts to the Planning Area. Due to the lack of permafrost and sea ice in the Planning Area, these hazards do not pose a risk to people and infrastructure in the Planning Area.

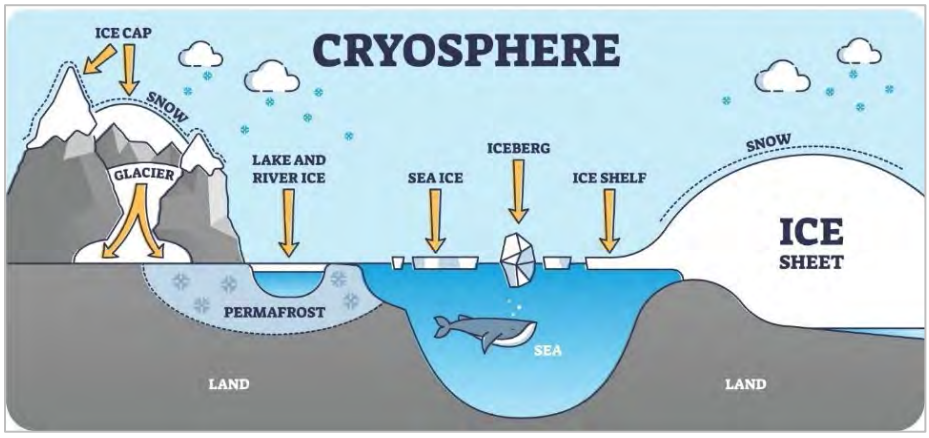


Figure 101- Components of the Cryosphere

3.3.8.1 Glacier

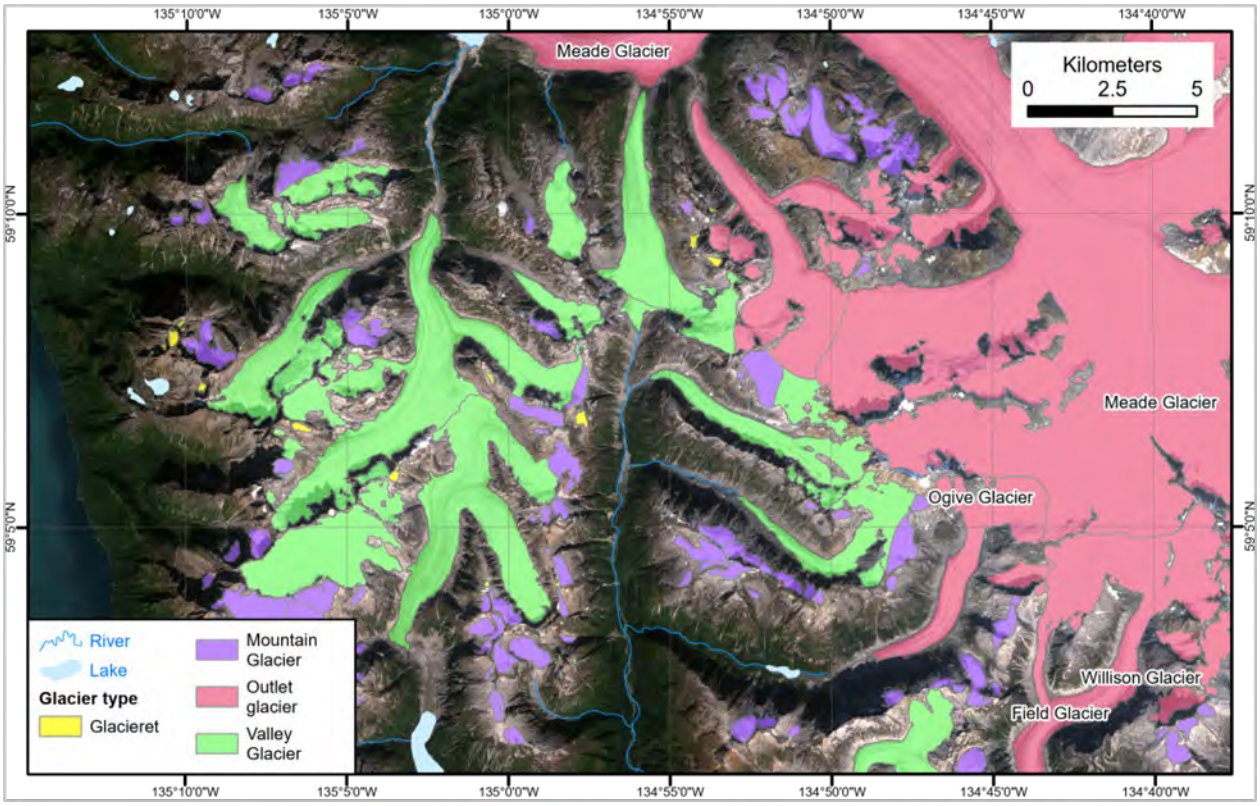
Nature (Glacier)

Glaciers (Sít') are made of compressed snow, which has survived summer, and transformed into ice. Over many years, layers of accumulated ice build into large, thickened ice masses. Due to the sheer mass of the accumulated ice, glaciers flow like very slow rivers. Most glaciers lie within mountain ranges that show evidence of a much greater extent during the ice ages of the past two-million years, and recent retreat in the past few centuries. Hazards related to glaciers include ice collapse (e.g., glacial calving and ice fall avalanche), glacial lake outburst flood, and glacial surge.

A plateau icefield is a large area of interconnected valley glaciers that form on a high, flat plateau or mountain mass. These icefields often have flat upper accumulation areas, which can make them sensitive to future climate conditions as snowlines rise.

- **Mountain glacier** is a glacier that is confined by surrounding mountain terrain
- **Valley glacier** is a mountain glacier whose flow is confined by valley walls

- **Outlet glacier** is a valley glacier which drains an inland ice sheet or ice cap and flows through a gap in peripheral mountains
- **Glacieret** is a very small ice mass with virtually no ice movement



Source: Davies et al. 2022

Figure 102- Type of Glaciers in the Juneau Icefield (2019)

Ice Collapse hazards result from large ice chunks breaking off from a glacier, either through glacial calving or as an ice fall avalanche. These hazards are almost impossible to predict and, in contrast to most other hazards in the cryosphere environment, they can happen independently of weather (e.g., heavy precipitation and rapid warming). In Alaska, ice collapses have on multiple occasions been triggered by earthquakes. Depending on the volume of ice collapse, these hazards can have tremendously devastating effects and can cause additional hazards, such as flooding and snow avalanches.

Glacial Calving is the breaking away of a mass of ice from a near-vertical ice face along the terminus of a glacier, often into a large body of water. Glacier calving can be accompanied by a loud cracking or booming sound as the blocks of ice break loose and crash into the water. The entry of the ice into the water can cause large, sometimes hazardous, waves that can swamp boats and inundate nearby shores. In July 2015, a M 6.3 earthquake occurred 120 miles west of Bear Glacier in Kenai Fjords, triggering a one-mile swath of ice to calve from the glacier and generating waves (a local tsunami) throughout the lagoon. The Planning Area was not impacted from this event.

Ice Fall Avalanches are triggered by new or existing cracks (crevasses) in the glacier ice that allow chunks of a glacier to detach and fall down the slope as a mass of broken ice. Like cornice collapses (see Snow Avalanche), the mass of these ice falls often triggers snow avalanches on the slope below as they hit the snowpack. Ice fall avalanches are unrelated to precipitation, temperature, or other typical snow avalanche factors.

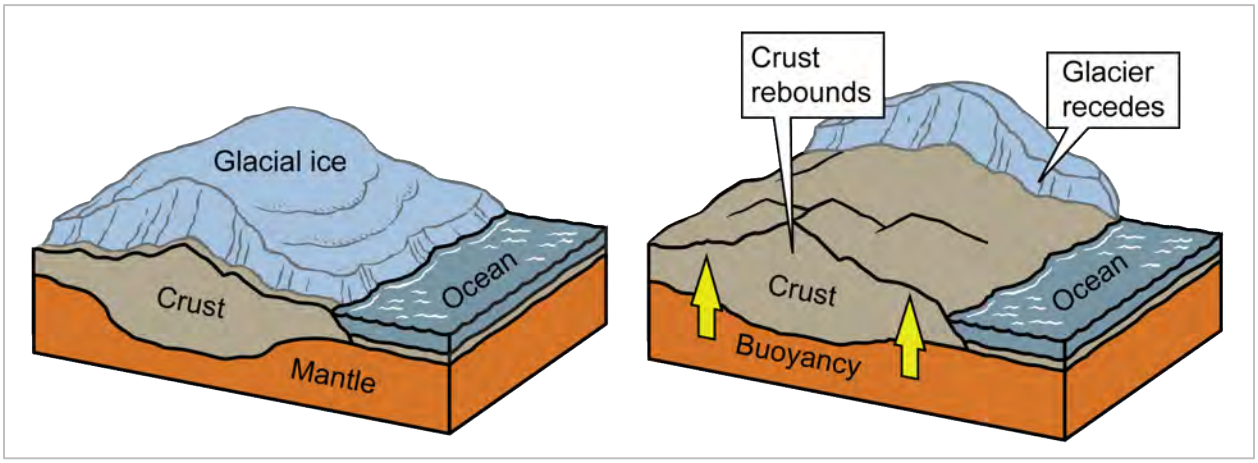
Glacial Lake Outburst Floods, also known as jökulhlaups, occur when water is rapidly released from a glacial lake due to the sudden failure of an ice or moraine dam, or to water overtopping the dam as a result of waves caused by mass wasting (landslide) of nearby unstable slopes that cause a landslide-generated tsunami. In the glacial system, ponds may form wherever water can be retained, and drainage restricted, resulting in five glacial lake types:

1. Ice-marginal lake: forms alongside a glacier when a tributary valley or distributary glacier gets dammed by the main trunk of a valley glacier or outlet glacier
2. Proglacial lake: forms at the terminus of a valley glacier or outlet glacier
3. Supraglacial lake: forms in depressions on top of a glacier
4. Englacial lake: forms within a glacier in enlarged conduits and cavities in the ice
5. Subglacial lake: forms underneath a glacier in a topographic depression, or by damming of subglacial debris; subglacial volcanic or geothermal activity can also cause a subglacial lake to form.

Outburst floods can be incredibly destructive; depending on the water volume released and downstream topography, outburst floods can cause extensive damage to downstream infrastructure and threaten public safety. Through collaboration between state agencies, universities, and local cities, a monitoring program has been established in Alaska for ice- dammed lakes at Bear Glacier in the Kenai Mountains, Valdez Glacier in the Chugach Mountains, Russell Lake at Hubbard Glacier in the Saint Elias Mountains near Yakutat (Yaakwdáat), and the Suicide Basin at Mendenhall Glacier (Sít' Aant'aakú). More information of glacial outburst floods can be found in Section 3.3.6.

Glacier Surge is when a glacier periodically undergoes a brief phase (typically lasting one to four years) of rapid flow, called a surge. Surges are generally interspersed with longer periods (typically 10–100 years) of near-stagnation. During a surge, a large volume of ice is displaced downstream at speeds of up to several yards per hour into an ice-receiving area, and the affected portion of the glacier is chaotically crevassed (i.e., cracked). In the interval between surges, the ice reservoir is slowly replenished by snow accumulation and normal ice flow, and the ice in the receiving area is greatly reduced by ablation (i.e., the natural removal of ice through melting, calving, and sublimation). A surging glacier can advance quickly and override the ground in front of it, destroying anything in its path and potentially damming water flow to create a glacial lake that is a potential source of outburst flooding. Surging glaciers can also be particularly dangerous after surging because highly crevassed glacier snouts are unstable and subject to a higher incidence of calving and ice fall avalanches.

Glacial Rebound is the rise of land masses after the removal of the huge weight of ice (glaciers). This results in land filling in the gap of where the glacier was and rising up relative to its previous elevation.



Source: Davies et al. 2022

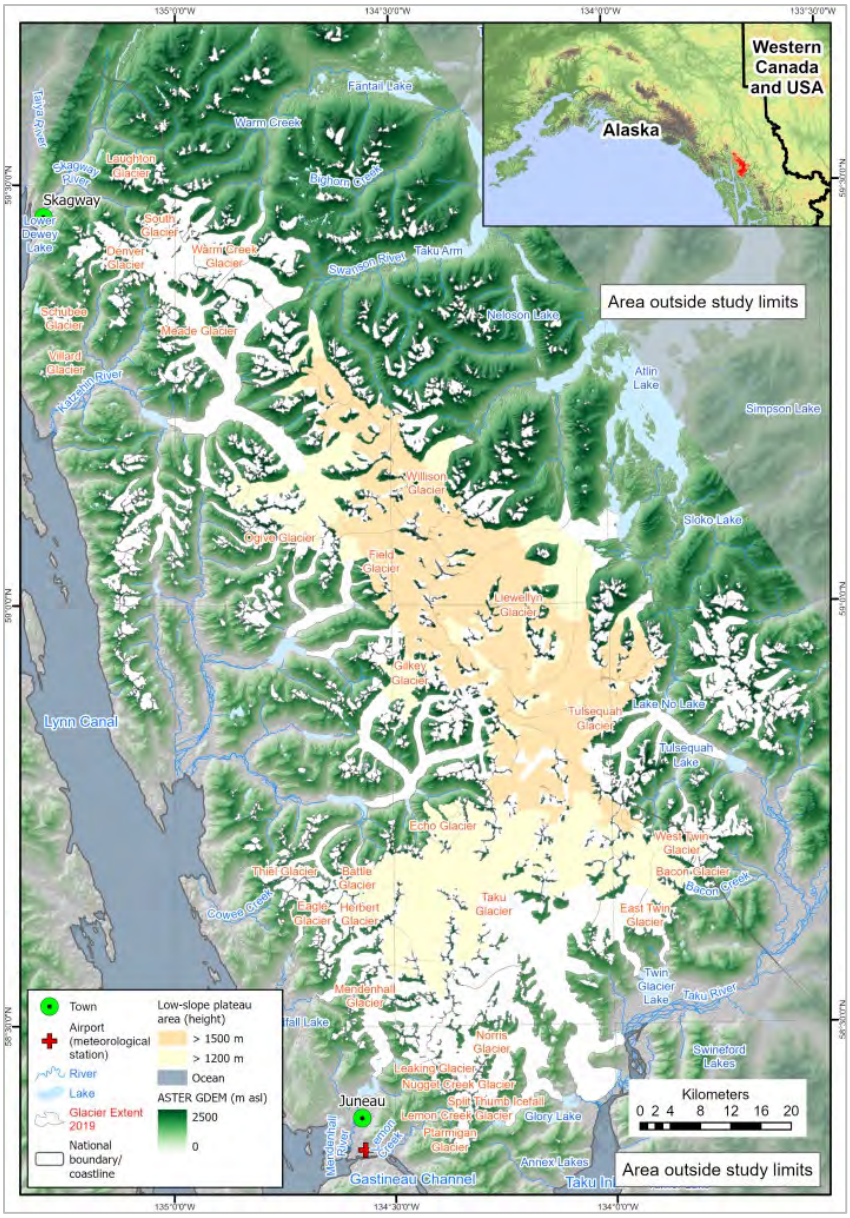
Figure 103- Illustration of Glacial Rebound

Location (Glacier)

In 2005, the inventory of glaciers in the Juneau Icefield was 1,113 glaciers. In 2019, it was found that 63 glaciers had disappeared since the 2005 inventory, with a reduction in glacier area of 262 m^2, or 422 km^2 (10.0%).

In 2019, the Juneau Icefield had 1,050 glaciers with a mean glacier area of 2.2 m^2, or 3.6 km^2 (Davies et al. 2022). These 1,050 glaciers were comprised of 40 outlet glaciers, that drained from the main interconnected plateau (covering 1,826.3 m^2, or 2,939.1 km^2), 145 valley glaciers covering 354.7 m^2, or 570.9 km^2, 584 small mountain glaciers covering 173.5 m^2, or 279.2 km^2, and just 281 small glacierets, covering 16.9 m^2 or 27.2 km^2 (Davies et al. 2022).

Covering approximately 1,500 mi^2 (3,900 km^2), the Juneau Icefield is one of the largest plateau icefields in the world.



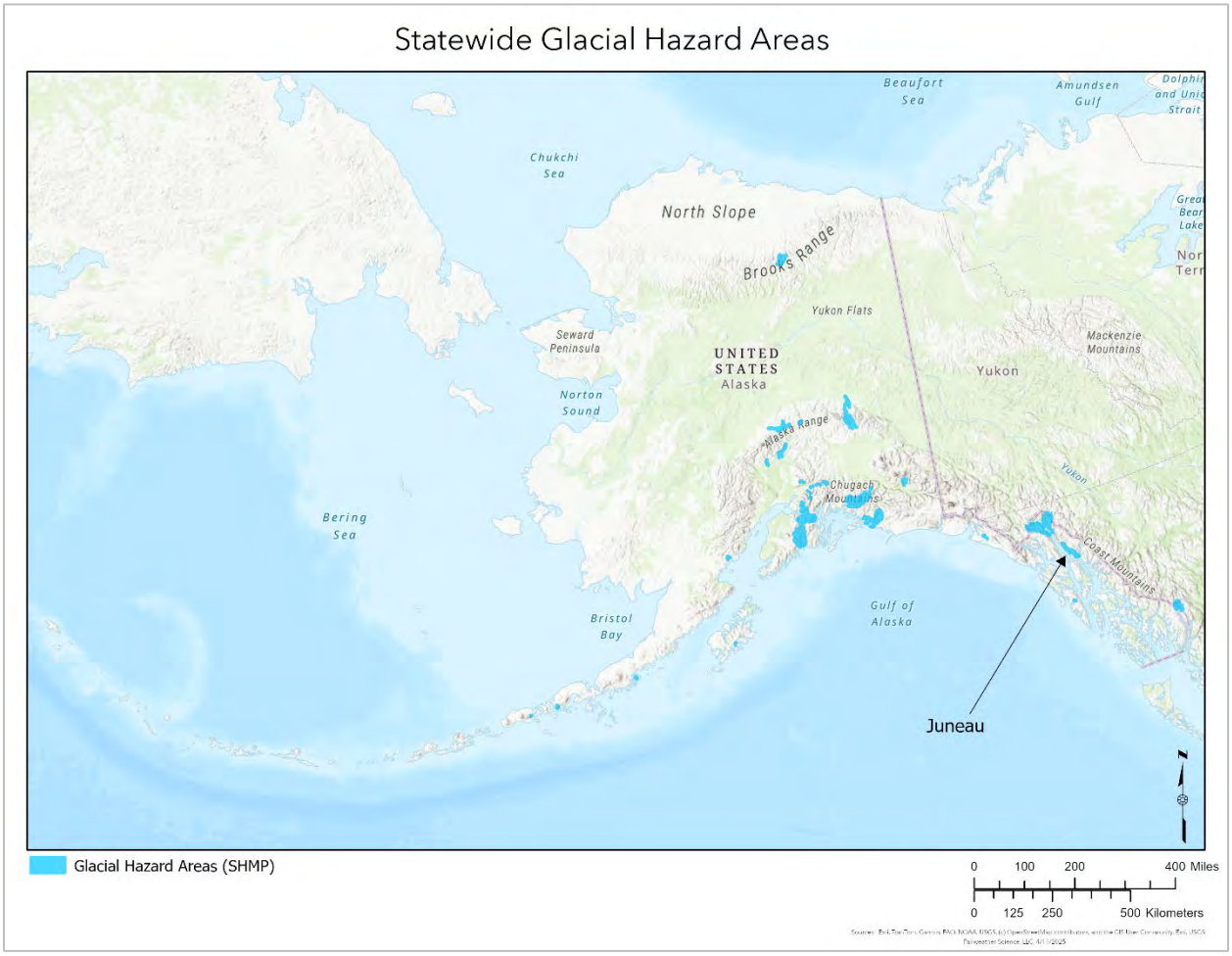
Source: Davies et al. 2022

Figure 104- Map of the Juneau Icefield with Named Glaciers

The Suicide Basin has formed a glacial dammed lake which has created a relatively new hazard risk for the Planning Area- GLOFs. More information on historical GLOF events and resultant impacts can be found in Section 3.3.6.

Figure 105- Mendenhall Glacier

The 2023 State of Alaska HMP identifies statewide glacial hazard areas (Figure 106). There are glacial hazard areas in the Planning Area, associated with the glaciers of the Juneau Ice Field (Figure 104).



Source: 2023 State of Alaska HMP

Figure 106- Statewide Glacial Hazard Areas

History

The Planning Area has been impacted by cryospheric hazards like snow avalanches (Dleit ñaadí) and glaciers since the 19th Century, the most significant and recent being a 1962 Behrends Ave avalanche, which damaged over 30 homes in its path. Appendix F details historic glacial images, as well as a full history of avalanche events in the planning area.

Extent (Magnitude/Severity) (Glacier)

In rapidly changing conditions, the frequency and extent of hazards can vary from the historical norm. For example, the occurrence of glacial lake outburst floods are becoming annual events in the Mendenhall Valley (DGGS 2023c). Glacial recession creates lakes of melted glacial ice dammed by ice, causing unpredictable floods, leading to shoreline/bank destabilization of riverbanks, destruction of riparian corridors, and inundation on structures and roadways. More information on historical GLOF events and resultant extent of the events can be found in Section 3.3.6.

A brief summary of the extent of historical GLOFs is below.

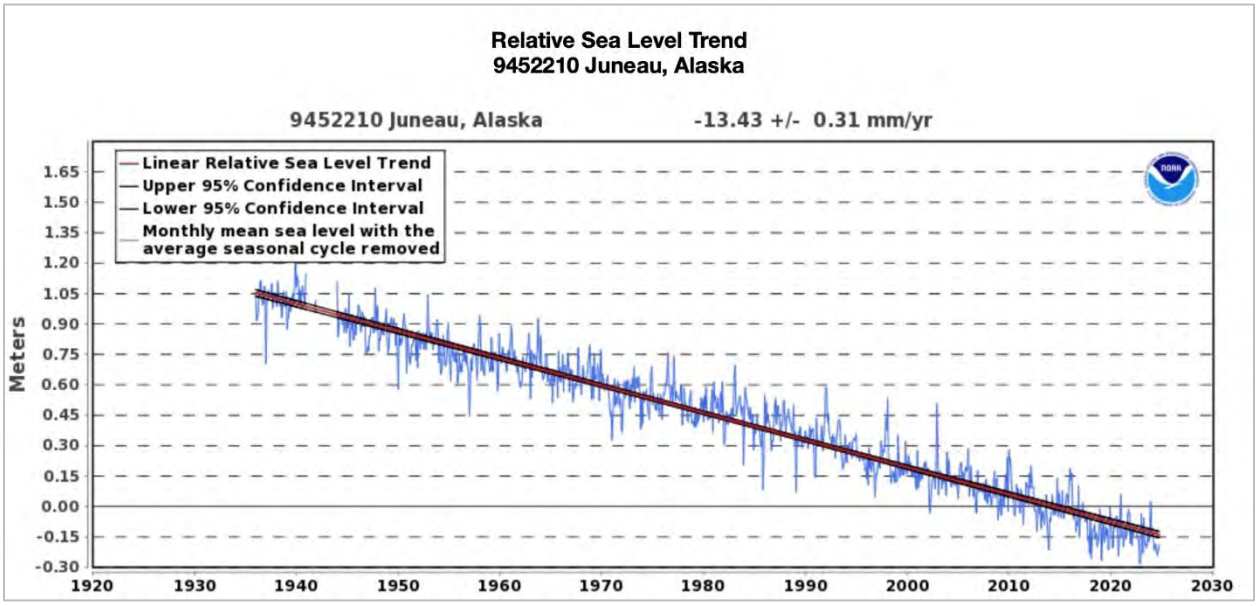
The Planning Area has experienced 12 GLOFs since 2011. During this period, the Mendenhall River has reached flood stages between 10.25 and 15.99 feet, measured from Mendenhall Lake stream gauge. The volume of water flowing downstream has varied from 12,200 cfs to 35,000 cfs. The estimated volume of water released from the two most impactful GLOFs (2023 and 2024) was 13 billion and 14.6 billion gallons, respectively (NWS 2024).

Based on past event history, location of these hazards, and the criteria identified in Table 10, the magnitude and severity of glacier hazards and resultant damages to people and infrastructure in the Planning Area are considered Critical, with injuries resulting in permanent disability, the potential for critical facilities to be shut down for more than two weeks, and more than 25% of property or critical infrastructure being severely damaged.

Impact (Glacier)

In Southeast Alaska, sea level rise is currently outpaced by land surface uplift (isostatic rebound) caused by receding glaciers. This region is currently experiencing extreme rates of land surface uplift and sea level change. Glaciers and icefields in the Coast Mountains have thinned rapidly since the end of the Little Ice Age approximately 250 years ago, and the associated unloading of the Earth's surface has led to land surface uplift (or glacial isostatic rebound) across the region. Current rates of uplift in the Planning Area average about 0.6 inches (15 mm) per year according to a model using GPS measurements (ACRC 2022).

As a result of isostatic rebound, the Planning Area is experiencing a relative decrease in sea level (ACRC 2022). Globally, sea level rise has averaged 0.06 inches per year over the last century, with current rates exceeding 0.12 inches per year. Because land surface uplift rates in the Planning Area have outpaced rates of sea level rise, the Planning Area has and continues to experience a relative decrease in sea level. Shoreline mapping has demonstrated that shorelines in the Planning Area have been raised by roughly 10 feet since uplift started in the late 1700s (ACRC 2022). Land surface uplift is predicted to continue for multiple centuries as a result of past and continued glacier ice loss around the Planning Area (ACRC 2022).



Source: NOAA 2025

Figure 107- Juneau and Traditional Lands of Tlingit & Haida Relative Sea Level Trend (1936-2024)

Isostatic rebound, while relatively slow, could diminish the strength of structure foundations and damage roadways, bridges, and culverts over time. If these impacts are neglected and not addressed as they develop,

isostatic rebound could cause damage to critical infrastructure in the Planning Area. This leads to compromising the strength of structure foundations and roadways, bridges, and culverts.

The other main impact from glacial hazards in the Planning Area are Glacial Lake Outburst Floods (GLOFs). See Section 3.3.6.5 for specific impacts from GLOF events.

Air Transportation Impacts: A changing cryosphere poses multiple potential impacts to air transportation in the Planning Area. Glacial recession is likely to increase runoff during heavy rains and in the spring when snow melts. This could trigger landslides more frequently which could limit or bar access to and from the airport. Receding glaciers could also create more glacial lakes and dams beyond the existing GLOF risk in Suicide Basin. GLOFs, specifically in the Mendenhall Valley, have the potential to impact the airport and access to the airport. An increase in avalanches could also block access to and from the airport.

Tlingit Story: The Story of Kasteen. The Tlingit and Haida have been living in what is now the Juneau area for time immemorial. They have a rich history of how their lives have evolved with the landscape. During the little ice age (1303-1850), the Grand Pacific Glacier churned into the ocean, creating deep fjords and displaced the Xunaa Tlingit for a time. One of the greatest examples of this is the story Kasteen, a member of the Chookanedí clan.

She lived in S'e Shuyee (End of the Glacial Silt), in modern day Glacier Bay during the 1700s. Per custom, Kaasteen was confined to her home in the backroom while entering womanhood. Out of boredom, she began calling to the glacier like a dog, throwing bones to it out her back window. The story describes how powerful a "woman in transition" can be, and the glacier responded to her calls. The Chookanedí people knew they had to flee, but someone had to stay behind to appease the glacier spirit. Kaasteen was engulfed in glacial silt and ice (some accounts state her grandmother took her place). Before they left, her clan left her sea otter furs and food, so she would be warm and not hungry after death. When the glacier receded, Chookanedí clan returned and renamed the place Sít' Eeti Geiyí (Bay in place of the Glacier).

Today, the story of Kaasteen is still very much in the minds and hearts of the Tlingit people. Her spirit aids travelers navigating ice choked water and she is still supplied and fed. The National Park Service partners with the Hoonah Indian Association, Huna Heritage Fund, and Hoonah City Schools to bring clan members to Margerie Glacier. Here, salmon (Yáat), seaweed (Daaw), and tobacco are lowered into the water so members can commune with the Glacier Girl, Kaasteen. This story symbolizes the power Tlingit women have in their communities and lands. It also shows the resilience of these clans to adapt to their world repeatedly, and how glaciers have impacted human inhabitants in Southeast Alaska for centuries (NPS 2025).

Probability of Future Events (Glacier)

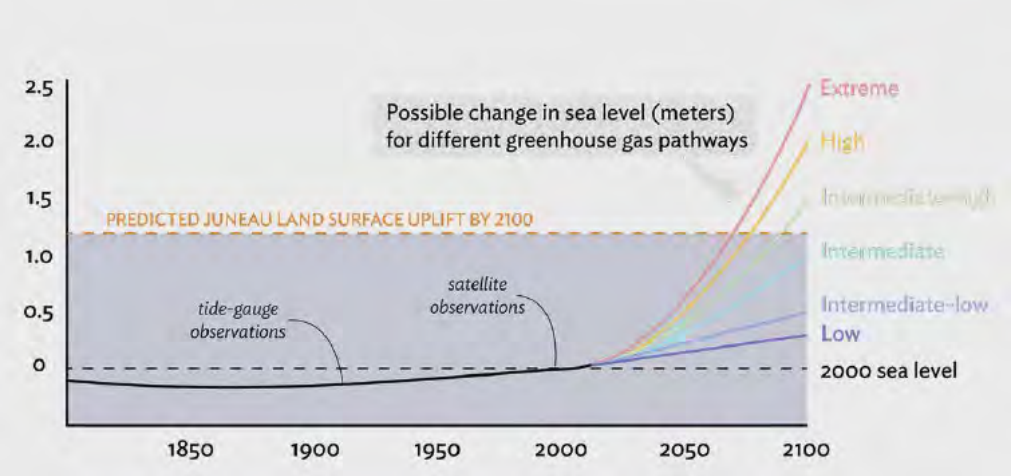
Due to documented changes and predicted future climate conditions, it is Highly Likely that glaciers in the Planning Area will experience changes (glacial melt, retreat, advancement, etc., depending on the glacier) in the next 3 years, and it is Highly Likely that glaciers will threaten critical facilities in the Planning Area in the next three years; there is a 1 in 3 years chance of occurring (1/3=33 percent); and the history of events is greater than 20 percent but less than or equal to 33 percent likely per year.

Ongoing monitoring of Mendenhall Glacier (Sít' Aant'aakú), specifically Suicide Basin is needed to measure the glacier's rate of retreat and to determine glacial lake levels. This will allow for better forecasting and understanding of GLOFs in the Planning Area.

Future Conditions (Glacier)

Glacier	
Changing Factor	**Description of Future Conditions**
Nature	Future climate conditions are likely to influence the nature of glacier hazards in Alaska. Since 2011, biannual or annual GLOFs have occurred on the Mendenhall River system due to releases from Suicide Basin, a side basin of the Mendenhall Glacier. This has included historic water level rise and flow rates in the Mendenhall River and significant flooding of the low-lying areas along Mendenhall River - the most populated residential area in the Planning Area. The Taku River, which drains into Taku Inlet approximately ten miles south of Juneau, also experiences glacial outburst floods. These floods originate from Lake No Lake along the Tulsequah Glacier in British

Glacier	
Changing Factor	**Description of Future Conditions**
	Columbia, located approximately 40 miles northeast of the Planning Area. As flood waters from the draining of Lake No Lake flow into the Taku River, flooding can happen with damages to remote cabins along the river.
Location	Future climate conditions are anticipated to impact the locations of glaciers throughout Alaska. As global temperatures increase, retreating glaciers are melting more rapidly than in documented history. As warmer temperatures and an increase of winter rain continues, more ice-dammed lakes are anticipated to form as new ice-dammed lakes are already forming at locations of retreated glaciers. Glaciers in the Planning Area are known and mapped. Based on ongoing study and forecasting efforts, new locations in the Mendenhall Valley may experience flooding due to GLOFs that have not experienced flooding before.
Extent	Future climate conditions are likely to influence the magnitude and severity of glaciers in the Planning Area. Much is still unknown how future climate conditions will impact Alaska's glaciers. There are many climate models to predict these changes, but it is still uncertain which model will come to fruition. Alaska DGGS has a Climate and Cryosphere Hazards Program (CCHP) that works to identify and predict the frequency and magnitude of new hazards that result from future conditions' impact on our glaciers in Alaska (DGGS 2023c). Based on recent historical events and predicted future temperatures, GLOFs are expected to increase in frequency until glaciers recede to a point of not being able to hold melted water (ACRC 2022). The magnitude of these GLOFs are difficult to predict. In the last ten years, the Planning Area has experienced multiple, smaller GLOFs in a single year as well as a single, destructive GLOF. If larger outburst events become more frequent, the extent and resultant impacts of these events could be catastrophic with dozens of homes, residents, and critical infrastructure impacted by these flooding and shoreline/bank destabilization events. Future sea level rise is dependent on greenhouse gas emissions. Assuming rebound rates remain steady, the Planning Area can expect to experience about 3.9 feet of additional land surface uplift by 2100. This uplift is roughly equal in magnitude to mid-range projections of global sea level rise by the end of the century, making it likely that sea level in the Planning Area will be roughly the same in 2100 as it is in 2020 (ACRC 2022).

Glacier	
Changing Factor	**Description of Future Conditions**
	 Source: ACRC 2022 **Figure 108- Juneau and Traditional Lands of Tlingit & Haida Sea Level Rise Scenarios (Through 2100)**
Impact	Future climate conditions are likely to influence the impact of glaciers in the Planning Area. Alaska's glaciers are in steep decline and are among the fastest melting glaciers on Earth. Retreating glaciers increases the potential of coastal shoreline/bank destabilization, GLOFs, and elevated storm surge during coastal storms and a loss of habitat for many plants and animals. Increased glacier melt will also affect Alaskan hydroelectric production, positively at first with greater stream flow but negatively over time as glaciers diminish (USGCRP 2018). If larger outburst events become more frequent, the extent and resultant impacts of these events could be catastrophic with dozens of homes, residents, and critical infrastructure impacted by these flooding and shoreline/bank destabilization events.
Probability of Future Events	Future climate conditions are likely to influence the probability of future glacial events in the Planning Area. During the last several decades, Alaska has warmed twice as fast as the rest of the United States, with the Arctic warming nearly four times as fast. Glaciers in the Southeast Alaska region are experiencing record high snow lines and an increasing rate of mass balance loss (Lader et al. 2020). Continually rising global temperatures will continue to threaten glaciers and associated hazards. In a rapidly changing climate, abrupt changes in, for example, the occurrence of glacial lake outburst floods are typical (DGGS 2023c).
Population Patterns	It is highly likely that future climate conditions will influence population patterns in the Planning Area. Approximately 30,000 people live in the Mendenhall Valley (USCB 2025), which has begun to experience severe GLOFs in the last decade. Continuation or increased frequency of GLOFs could cause residents to move out of the Mendenhall Valley, have their property bought out or relocated, or relocate out of the Planning Area entirely.
Land Use Development	It is highly likely that future climate conditions of glaciers will influence land use development in the Planning Area, specifically in the Mendenhall Valley. Additional USGS stream gauges may be installed, new zoning may restrict further development inside the Mendenhall River floodplain, and properties in the floodway may be bought out and reserved as green space, restricting future development.

Glacier	
Changing Factor	**Description of Future Conditions**
	GLOFs have already caused new land use development, with HESCO flood barriers being installed along stretches of the Mendenhall River in Spring 2025 (CBJ 2025). Further flood mitigation projects may also be implemented in the future.

3.3.8.2 Snow Avalanche

Nature (Snow Avalanche)

A snow avalanche (Dleit ñaadí) is a mass of snow, ice, and debris that releases and slides or flows rapidly down a steep slope, either over a wide area or concentrated in an avalanche chute or track. Avalanches reach speeds of up to 200 mph and can exert forces great enough to destroy structures and uproot or snap large trees. A moving avalanche may be preceded by an "air blast," which is also capable of damaging buildings. Snow avalanches commonly occur in the mountains of Alaska during the winter and spring as the result of heavy snow accumulations on steep slopes.

Large avalanches have the potential to kill people and wildlife, destroy infrastructure, level forests, and bury entire communities. Significant avalanche cycles (multiple avalanches naturally releasing across an entire region) are generally caused by long periods of heavy snow, but avalanche cycles can also be triggered by rain-on-snow events, rapid warming in the spring, earthquakes and wind (one of the most common urban triggers).

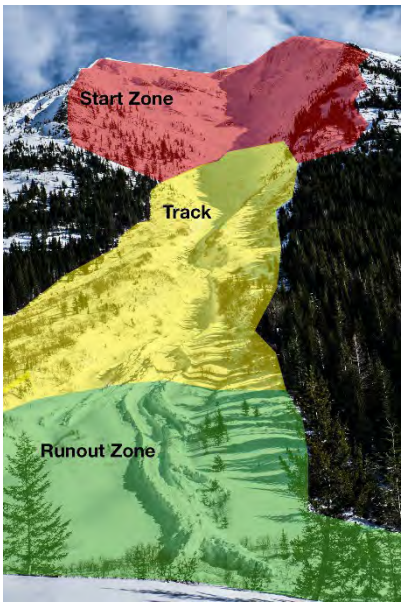
An avalanche releases when gravity-induced shear stress on or within the snowpack becomes larger than its shear strength. Triggers can be natural (e.g., rapid weight accumulation during or just after a snowstorm or rain event, warming temperatures, and seismic shaking) or artificial (e.g., human weight [more commonly animals in the urban paths] or avalanche-control artillery). There are five distinct avalanche types in Alaska that occur under varying snowpack and weather conditions. Each avalanche type is named based on its snow release characteristics.

Cornice Collapse occurs when an overhanging snow mass breaks, separates, or is released. Cornices form on ridge crests or shoulders adjacent to gullies due to wind blowing the snow. The cornice is an indicator of predominant wind directions, as the cornice is formed on the lee (i.e., downwind) side of topographic features. Over time, the cornice can develop weaknesses in its structure and its attachment to the slope may fail. A cornice collapse often triggers a loose snow or slab avalanche as it adds sudden and significant stress onto the snowpack below.

Loose Snow/Unconsolidated Avalanches, also known as point releases, initiate with a small amount of non- cohesive (loose) snow and quickly grow larger as they move downhill and entrain more snow. This type of avalanche typically carries relatively small amounts of powder snow and virtually no other debris. However, a loose snow avalanche may trigger a larger slab avalanche on the same slope.

A **Slab Avalanche** releases as a block of cohesive snow when snow particles have stuck together to form one or more resistant layers. There is a wide range of slab characteristics possible, running the gamut from "soft" slab (weakly cohesive snow) to "hard" slab (very cohesive snow), and from "storm" slab (release of recently deposited storm snow), to "persistent" and "deep persistent" slab (release of a slab that failed on a weak layer deeper down in the snowpack). Due to their large release masses, and because more snow is picked up along the way (snow entrainment), slab avalanches are the most destructive avalanche type. Human encounters with even small-sized slab avalanches are often fatal.

Slush Avalanches are fast-moving mixtures of snow and water. They release in isothermal snowpacks (snow temperature throughout the snowpack is 32°F) when liquid water permeates the snowpack and dramatically weakens the intergranular bond. Slush avalanches, therefore, typically occur in northern Alaska during the spring when warm temperatures and strong solar radiation quickly warm up the snowpack. Slush avalanches can release on slopes as gentle as 20 degrees. Their release is often slower than other avalanche types, but as the slushy snow runs downhill, they can reach speeds over 40 mph. Smaller, more fluid avalanches with higher water content are commonly referred to as slush flows.



An avalanche path comprises three main parts: starting zone, track, and run-out zone. Local topography determines the shape and size of each part. Steep gullies that contain a stream or creek in the summer often function as avalanche paths in the winter but avalanches also release and run on simple and complex open slopes.

The starting zone is also called the release area. This is the upper part of the avalanche path, where snow accumulates (creating a slab or point source release area), and the avalanche begins its downhill movement. Starting zones are commonly located in the headwaters of a drainage where snow is accumulated on lee-side aspects of topographic features. Starting zones on open slopes are more difficult to identify. Sometimes multiple starting zones join into one track (e.g., several creeks funneling into one major gully).

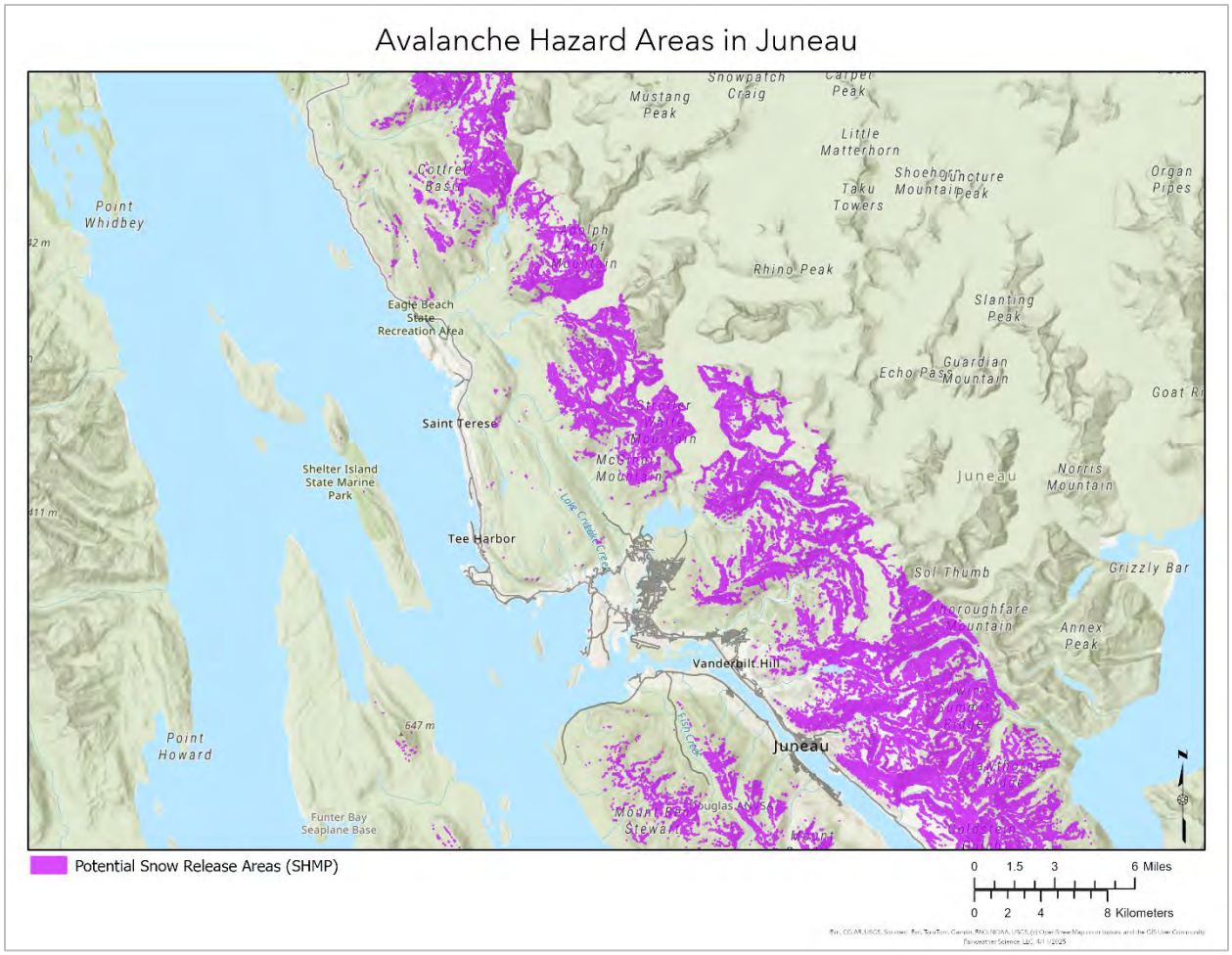
The track is the middle part of the path, where the avalanche transports the released snow downhill to the deposition (runout) zone. The avalanche accelerates and reaches its maximum velocity in the track, and can also pick up more snow, adding to its mass. The track can be comprised of both confined gullies and unconfined open slopes. Tracks can also branch onto adjacent slopes, creating successive avalanches.

The run-out zone is the bottom part of the path, where the avalanche slows down and deposits debris. The avalanche impact pressure, which is a function of its snow density, volume (i.e., mass), and velocity, determines the amount of damage the avalanche could potentially cause. This measure is used for designing mitigation structures to protect infrastructure and buildings that are in an avalanche risk zone.

Glide Avalanches are defined as the release of the entire snow cover because of gliding over the ground. Glide avalanches can be composed of wet, moist, or almost entirely dry snow. They typically occur in very specific paths, where the slope is steep enough and the ground surface is relatively smooth. The are often proceeded by full depth cracks (glide cracks), though the time between the appearance of a crack and an avalanche can vary between seconds and months. Glide avalanches are unlikely to be triggered by a person, are nearly impossible to forecast, and thus pose a hazard that is extremely difficult to manage.

Location (Snow Avalanche)

The 2023 State of Alaska HMP identifies statewide avalanche hazard areas (Figure 109). There are avalanche (Dleit ñaadí) hazard areas throughout the Planning Area. The areas of most concern are near Downtown Juneau due to the proximity to highly populated areas and dense construction.



Source: 2023 Alaska SHMP

Figure 109- Avalanche Hazard Areas in Juneau and Traditional Lands of Tlingit & Haida

In 2022, CBJ hired Tetra Tech to complete a hazard assessment for the occurrence of landslides and avalanches in the Downtown Juneau area. The purpose of this assessment was to update hazard maps that were created in the 1970s and adopted in 1987.

The avalanche hazard mapping identified 52 unique avalanche paths, each of which includes delineation of Severe, Moderate, and Low hazard areas. The paths were identified in three areas: Mt. Juneau (25 paths), Gastineau Avenue (11 paths), and Thane Road (16 paths). Individual avalanche paths within the Study Area were mapped to delineate an estimated 300-year avalanche path boundary for destructive avalanche flow. A summary of their findings and conclusions are as follows:

Avalanche hazard mapping identified 52 unique avalanche paths, each of which includes delineation of Severe and Moderate hazard areas. Areas located outside of the Severe and Moderate hazard areas are, by default, designated as Low hazard areas. Geographically, the paths were divided into three areas: Mt. Juneau (25 paths), Gastineau (11 paths), and Thane Road (16 paths)

The level of assessment completed to determine the avalanche hazard designation lines presented in this report is considered suitable for CBJ to determine whether land areas could be affected by snow avalanche hazards, according to the Low, Moderate, and Severe hazard designations.

Continued use of the three-avalanche hazard designation system is recommended, including Low, Moderate, and Severe hazard designations. These designations are based on the expected return period

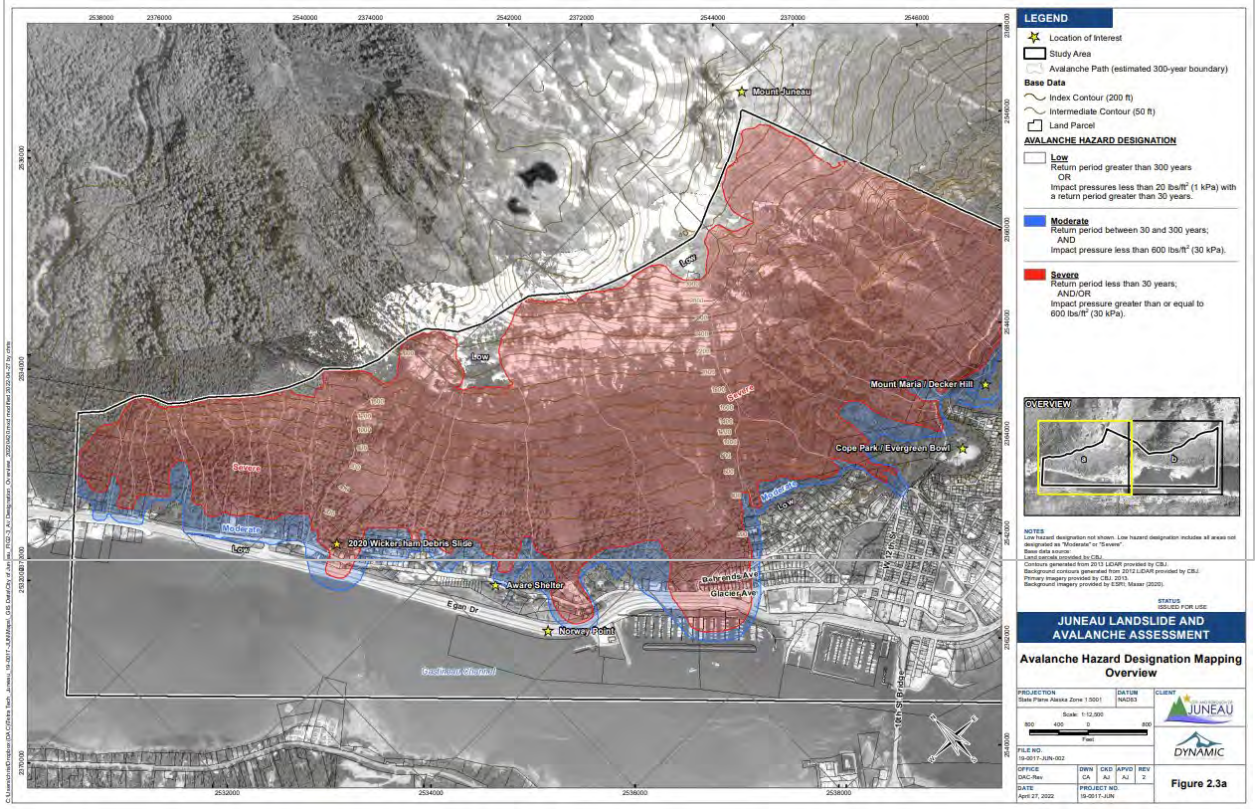
and impact pressure of avalanches, with threshold return periods at 30 and 300 years and threshold impact pressures at 20 lb/ft2 (1 kPa) and 600 lb/ft2 (30 kPa).

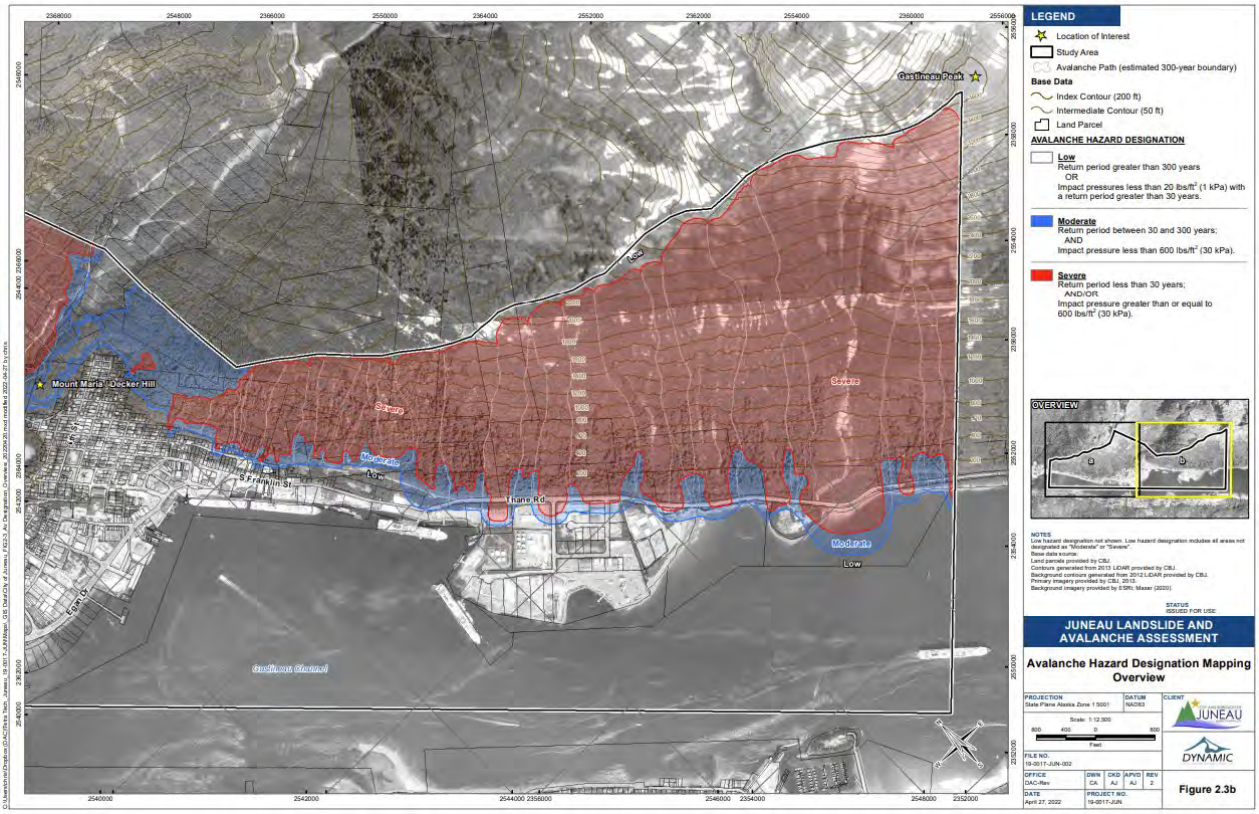
Four modifications to the current CBJ designation system (CBJ, 2001) were recommended to clarify and make the system more consistent with systems used in other parts of the world. These modifications are summarized in Section 2.2.2, but in summary include: (1) High Hazard/Severe Hazard/High Severity Zone designation is changed to "Severe"; (2) the Severe designation is modified to include both return period and impact pressure criteria by use of an "AND/OR" statement; (3) a definition is provided for the Low hazard designation; and (4) Low hazard designation is expanded to consider low impact pressure events (less than 20 lb/ft2 or 1 kPa), which is important for powder avalanche hazards.

To date, Tetra Tech – DAC are not aware of any published articles summarizing the project results; accordingly, the project team will maintain contact with the research team and integrate relevant information into the Tetra Tech – DAC study, as it becomes available. The results will also be reviewed for possible applicability to the landslide assessment work and referenced if/as applicable.

History

The Planning Area has been impacted by cryospheric hazards like snow avalanches (Dleit ñaadí) and glaciers since the 19th Century, the most significant and recent being a 1962 Behrends Ave avalanche, which damaged over 30 homes in its path. Appendix F details historic glacial images, as well as a full history of avalanche events in the planning area.





Source: Tetra Tech 2022

Figure 110- Avalanche Hazard Areas in Downtown Juneau

Extent (Magnitude and Severity) (Snow Avalanche)

An avalanche (Dleit ñaadí) can be incredibly destructive and have the potential to destroy everything in its path.

Much of the slopes in the CBJ planning area are designated as severe (Tetra Tech 2022). These areas could experience frequent, lower impact avalanche hazards with pressure between 200 pounds per square foot and 400 pounds per square foot (10 kPa to 20 kPa), or less frequent, more severe avalanche with impact pressures well in excess of 600 pounds per square foot (30kPa). This is enough pressure to destroy wood frame structures and break trees (Table 28).

Table 28- Avalanche Impact Pressures with Associated Damages

Potential Damage	Impact Pressure	
	Pounds/Square Foot	Kilopascals (kPa)
Break Windows	21	1
Push in doors, damage walls, roofs	62-125	3-6
Severely damage wood frame	209	10
Destroy wood frame structures, break trees	418-626	20-30
Destroy mature forests	1,044-2,090	50-100
Uproot mature spruce	2,090	100
Move large boulders	6,262	300
Move reinforced concrete structures	20,900	1,000

Source: Tetra Tech 2022

Based on past event history and the criteria identified in Table 10, the magnitude and severity of avalanches and resultant damages to people and infrastructure in the Planning Area are considered Critical, with injuries resulting in permanent disability, the potential for critical facilities to be shut down for at least two weeks, more than 25% of property or critical infrastructure being severely damaged.

Impact (Snow Avalanche)

Avalanches can be incredibly destructive and have the potential to destroy everything in their path and result in human deaths every year. Since 2020, 15 people have died in avalanches in Alaska (Avalanche.org 2025). None of these fatalities occurred in Southeast Alaska.

More than 70 buildings within 10 miles of Downtown Juneau have been hit, damaged, or destroyed by avalanches.

Air Transportation Impacts: When the Alaska Department of Transportation and Public Facilities (ADOT&PF) conducts avalanche mitigation, a Temporary Flight Restriction is activated, shutting down the Gastineau Channel Approach Flight Pattern. Indirect impacts could include limited access to the airport due to road closures after an avalanche.

Probability of Future Events (Snow Avalanche)

Due to changing future climate conditions, there is an expectation of an increase in Alaska's vulnerability to snow avalanche hazards (DGGS 2023d). DGGS's CCHP is working on projects that focus on quantifying changes in future snow avalanches in Southeast Alaska and understanding the impacts of these changes on natural resources, and people in their natural and built environments (DGGS 2023d).

Ballesteros-Canovas et al. (2018) predicts an increase in avalanche activity in the second half of the 21st Century, largely wet-snow avalanches due to increased air temperature and precipitation. However, as snow cover retreats upwards due to these same factors, the impacted area will also change to higher elevations (Ballesteros-Canovas et al. 2018).

Based on previous occurrences and the criteria identified in Table 11, it is Likely that there will be a snow avalanche event in the Planning Area in the next three years; there is a 1 in 3 years chance of occurring (1/3=33% percent); and the history of events is greater than 20 percent but less than or equal to 33 percent likely per year. Snow avalanche hazards are identified throughout the populated areas of the Planning Area and pose a threat to infrastructure or residents in the community.

Future Conditions (Snow Avalanche)

Snow Avalanche	
Changing Factor	**Description of Future Conditions**
Nature	Future climate conditions are not anticipated to influence the nature of snow avalanche hazards in Alaska.
Location	It is possible future climate conditions will influence the location of snow avalanche hazards in Alaska. As warmer, wetter winters become more prevalent, heavy-snow avalanches may occur on different slopes that have not historically experienced avalanches.
Extent	Future climate conditions are likely to influence the magnitude and severity of avalanches. Avalanche activity is determined by several factors, including snowpack type, internal liquid volume, air temperature, precipitation, elevation, slope, ground cover, etc. An increase in liquid content within snowpack, from increased December-March air temperature and January-February increased precipitation, will lead to greater occurrence of wet snow avalanches, especially in late winter/early spring (Ballesteros-Canovas et al. 2018).
Impact	Future climate conditions are likely to influence the impact of avalanches. As snowpack experiences greater liquid volume, avalanche risk will increase (Ballesteros-Canovas et al. 2018). As snowpack retreats to higher elevations due to reduced snowpack and quickened melt, the impacted area will also shift upwards. Impacts in this scenario will likely be due to loss of water supply, affecting culture, wildlife resources, and tourism (IPCC 2018). Infrastructure in avalanche hazard zones will also be impacted by an increase in frequency and extent of wet snow avalanches. Damage to structures will vary depending on the impact pressure of the avalanches (seeTable 28).
Probability of Future Events	Future climate conditions are likely to influence the probability of future avalanche events in the Planning Area. As future conditions continue to progress, there is an expectation of an increase in Alaska's vulnerability to snow avalanche hazards (DGGS 2023d). DGGS's CCHP is working on projects that focus on quantifying changes in future snow avalanches in Southeast Alaska and understanding the impacts of these changes on natural resources, and people in their natural and built environments (DGGS 2023d). Ballesteros-Canovas et al. (2018) predicts an increase in avalanche activity in the 2nd half of the 21st century, largely wet-snow avalanches due to increased air temperature and precipitation. However, as snow cover retreats upwards due to these same factors, the impacted area will also change to higher elevations (Ballesteros-Canovas et al. 2018).
Population Patterns	It is likely that future climate conditions will influence population patterns in the Planning Area. An increase in frequency or extent of avalanches caused by future conditions may result in more residents moving out of avalanche zones or out of the community completely.
Land Use Development	It is likely that future climate conditions will influence land use development in the Planning Area. Since avalanches are expected to increase in frequency (Ballesteros-Canovas et al. 2018), there could be an increase in avalanche mitigation structures and/or monitoring equipment on the slopes surrounding Juneau and Traditional Lands of Tlingit & Haida. Re-zoning, limiting development, and potential property buyout in high avalanche hazard zones are also possible in the future.

3.3.9 VOLCANO

3.3.9.1 Nature

A volcano is a vent or opening in the earth's crust from which molten lava (magma), pyroclastic materials, and volcanic gases escape and erupt. Volcanoes can unleash cataclysmic destructive power greater than nuclear bombs and can pose serious hazards if they erupt near populated regions.

The various types of volcanoes are described below.

Volcano Type	Characteristics
Fissure	Fissure volcanoes are produced by eruptions that occur along elongated fissures rather than at a central vent, thus releasing large volumes of fluid basaltic lava. Fissure eruptions frequently occur in monogenetic volcanic fields and may also occur in rift zones on shield volcanoes (NPS 2022a). Fissure eruptions typically produce liquid flows, but pyroclastics may also be ejected (AVO 2023). Fissure volcanoes are most often associated with oceanic ridges on diverging plate boundaries and can occur on land as well. In Alaska, the Aleutian Islands are home to several volcanoes that have been known to produce fissure volcanoes, like Mount Gareloi, which 1929 eruption produced several blocky lave flows (AVO 2025).
Shield	Shield volcanoes are gently sloping, convex shaped volcanic cones that are flatter near the summit (NPS 2022a). They are built over vast periods of time (up to a million years or longer) and with repeated eruptions. These volcanoes are much wider than they are tall and are the largest volcanoes on Earth- typically encompassing several tens to hundreds of square miles. In Alaska, shield volcanoes can be found at Wrangell-St. Elias National Park and Preserve and Bering Land Bridge National Preserve.
Dome	Dome volcanoes, sometimes referred to as lava domes, are formed by viscous magma being erupted effusively onto the surface and then piling up around the vent (NPS 2022a). These volcanoes are steep-sided and typically form in clusters. Most dome volcanoes are relatively small and have a limited volume of viscous lava. Dome eruptions are usually non-explosive, but growing domes may collapse to produce explosive eruptions and pyroclastic flows (NPS 2022a). They may collapse when they become over-pressured from gases trapped inside or become over-steepened. In Alaska, dome volcanoes can be found at Katmai National Park, Lake Clark National Park and Preserve, Wrangell-St. Elias National Park and Preserve, and Aniakchak National Monument.
Cinder Cone	Cinder cone volcanoes, sometimes called Ash-cinder, are the most common type of volcanoes in the world. Cinder cones that form over a linear fissure vent are elongated, and ones that form in areas with strong prevailing winds may be much taller on the downwind side. Elongated cinder cones may also form when the location of the vent shifts during the eruption (NPS 2022a). These volcanoes frequently have an asymmetric shape and are typically a few hundred feet tall but rarely get taller than 600 to 900 feet. Because cinder cones are usually monogenetic, there should not be a risk of eruption at an existing cinder cone. However, a new cinder cone may form nearby during an eruption (NPS 2022a). Precursors to cinder cone eruptions include earthquakes and rumblings near the volcano. In Alaska, cinder cone volcanoes can be found at Katmai National Park, Wrangell-St. Elias National Park and Preserve, Bering Land Bridge National Preserve, and Aniakchak National Monument.
Composite (Strato-volcano)	A composite volcano, commonly referred to as a stratovolcano, is conical with a concave shape that is steeper near the top. These mountains commonly have snow-covered peaks and stand high above the surrounding mountainous terrain (NPS 2022a). These volcanoes are complex because they experience multiple eruptions that can vary in eruption type and erupt lavas with a range of compositions. They may have multiple vents, but most composite

Volcano Type	Characteristics
	volcanoes have a main vent at the summit (NPS 2022a). Like mountains, composite volcanoes are subject to the forces of shoreline/bank destabilization. In Alaska, composite (strato) volcanoes can be found at Katmai National Park, Lake Clark National Park and Preserve, Wrangell-St. Elias National Park and Preserve, and Aniakchak National Monument.
Caldera	Caldera volcanoes are formed during large-volume volcanic eruptions when the underlying magma chamber is partially emptied and the ground above it subsides into it (NPS 2022a). Calderas are large volcanoes, typically larger than 0.6 miles in diameter, and their diameters are much wider than their included vents. Caldera volcanoes can be either explosive or nonexplosive (NPS 2022a). • Explosive calderas form during eruptions of silicic magmas that emit large-volume ash-flow tuffs and form Ultra-Plinian eruptive columns. The different types of explosive calderas vary in size, eruption magnitude, diameter, age, and whether they formed at summit of a preexisting volcano. • Nonexplosive calderas form on the summit of shield volcanoes during especially large eruptions of lava flows at either the summit or along flank rift zones. Shield volcanoes can experience several cycles of caldera collapse and subsequent infilling by lava flows. In Alaska, caldera volcanoes can be found at Katmai National Park, Wrangell-St. Elias National Park and Preserve, Bering Land Bridge National Preserve, and Aniakchak National Monument.

Figure 111 depicts each of these volcano types.

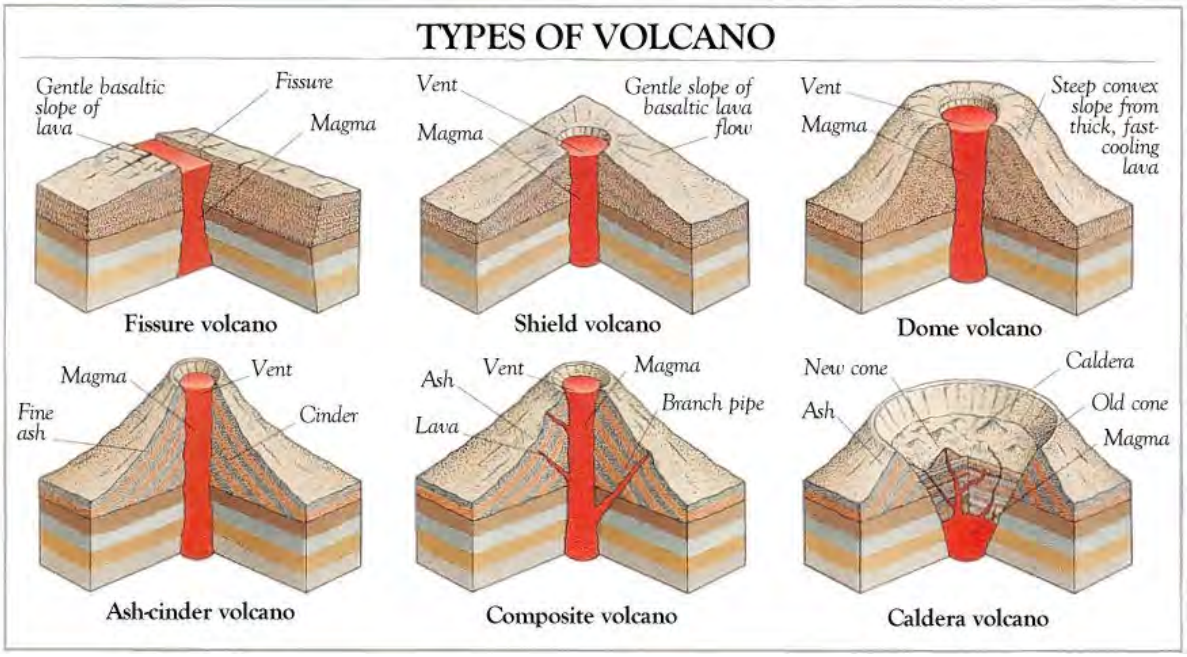


Figure 111- Types of Volcanoes

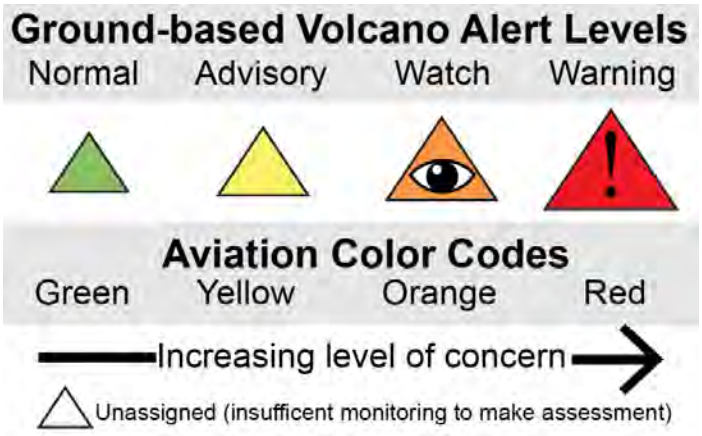
As there are many types of volcanoes, there are different types of volcanic eruptions. Some volcanoes may exhibit only one type of eruption during an event, while others may display an entire sequence of all three types in one event. These eruption classifications are described below.

Type of Volcanic Eruption	Characteristics
Magmatic	Magmatic eruptions are the most well-observed eruptions. Magmatic eruptions include the ejection of lava or tephra from a magma source within the earth. There is a significant range in the intensity, magnitude, explosivity, eruption rate, and amount of magma erupted during magmatic eruptions (NPS 2022b). Magmatic eruptions are generally described as being effusive or explosive. • Effusive eruptions are dominated by passive emission of lava. • Explosive eruptions are dominated by eruption of fragmental (pyroclastic) material.
Phreatomagmatic (Hydrovolcanic)	Phreatomagmatic eruptions are volcanic eruptions resulting from the interaction between magma and water. These eruptions are violently explosive and driven by steam explosions produced by the interaction of hot magma with surface water or shallow groundwater (NPS 2022b). Hydrovolcanic eruptions include tephra derived from juvenile magma.
Phreatic	Phreatic eruptions are driven by steam explosions due to the superheating of groundwater by a magmatic source. These eruptions blast out steam, water, ash, volcanic bombs, and volcanic blocks, but no new magma (NPS 2022b). The 2006 phreatic eruption of the Fourpeaked Volcano in Katmai National Park and Preserve sent an ash cloud 20,000 feet into the atmosphere (NPS 2022b).

Volcanoes are also categorized according to the age of their eruptive activity. Active volcanoes are those that are currently erupting or showing signs of unrest, such as unusual earthquake activity or significant new gas emissions. Dormant volcanoes are those that are not currently active but could become restless or erupt again. Extinct volcanoes are those that are considered unlikely to erupt again. This can be difficult to determine as a volcano could go tens of thousands of years, or longer, between eruptions.

Table 29- Volcano Alert Levels

Volcano Alert Level	Description
Normal/Green	Non-erupting volcano is exhibiting typical background activity (including steaming, seismic events, thermal feature, or degassing), as long as such activity is within the range of typical non-eruptive phenomena seen at the volcano.
Advisory/Yellow	Volcano is exhibiting signs of elevated unrest above known background activity.
Watch/Orange	Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain OR an eruption is underway that poses limited hazards including no or minor volcanic-ash emissions.
Warning/Orange	Major volcanic eruption is imminent, underway, or suspected but it poses limited hazards to aviation because of no or minor volcanic-ash emissions (e.g., an eruption with only substantial lava flows and no risk of ash production).
Watch/Red	Volcanic eruption is underway that poses limited hazards to ground-based communities but includes significant emission of ash into the atmosphere that could affect aviation (e.g. an ash plume that does not yield significant ashfall onto ground communities but does drift into air routes).
Warning/Red	Major volcanic eruption is imminent, underway, or suspected with hazardous activity both on the ground and in the air.
Unassigned	Volcanoes where ground-based instrumentation is insufficient to establish that a volcano is in a typical background level (GREEN / NORMAL). When activity at such a volcano increases to the point of being detected by remote sensing, distant seismic networks, or eyewitness reports, an alert level and color code are then assigned accordingly. When activity decreases, the volcano goes back to UNASSIGNED without going through GREEN / NORMAL.

Volcano Alert Level	Description
	

Source: USGS 2025b

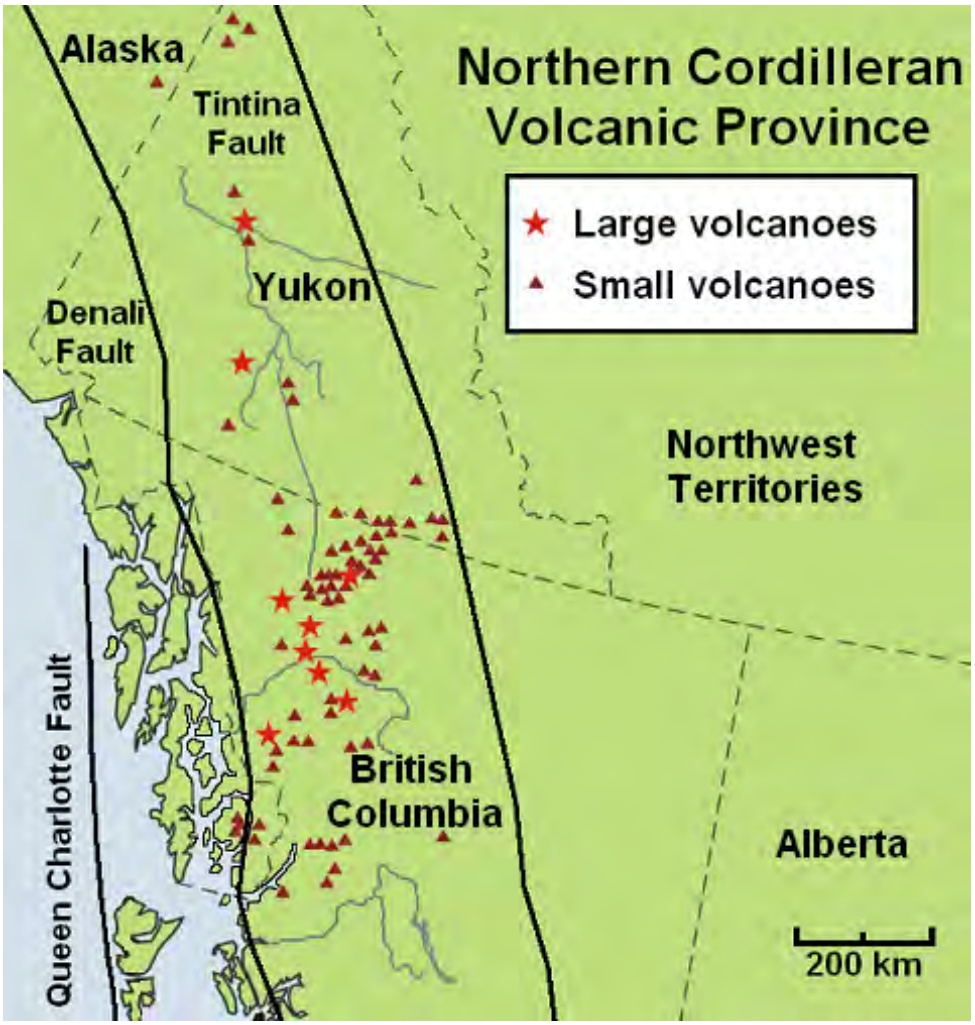
3.3.9.2 Location

According to the Alaska Volcano Observatory (AVO), Alaska has about 140 volcanoes and volcanic fields which have been active within the last two million years. Of these 140 volcanoes and volcanic fields, about 90 of them have been active within the last 11,000 years and may erupt again. More than 50 volcanoes out of the total 140 have been active since year 1760 (AVO 2023). There are over 80 volcanic centers in Alaska, but only 41 are considered active. Alaska's volcanoes make up over three-quarters of U.S. volcanoes that have erupted in the last two hundred years.

Alaska is home to 41 historically active volcanoes stretching across the entire southern portion of the State from the Wrangell (Shtax'héen) Mountains (Shaa) to the far Western Aleutians. "Historically active" refers to actual eruptions that have occurred within the period of recorded history, generally beginning in 1760. Since 1900, Alaska has maintained an average of 1-2 volcanic eruptions per year.

Most of Alaska's volcanoes are in the Aleutian Island Chain, which extends westward to the Kamchatka Peninsula in eastern Russia. Other volcanoes that have been active in the last few thousand years exist in southeastern Alaska and in the Wrangell Mountains. Smaller volcanoes, some active within the last 10,000 years, are found in interior Alaska and in western Alaska as far north as the Seward Peninsula (AVO 2023).

Outside of Alaska, there are several potentially active volcanoes in Western Canada, with the majority being in the Northern Cordilleran Volcanic Province. This province has had a storied history of eruptions in the last 10,000 years, with at least 5 volcanoes being considered potentially active today. The closest of these in proximity to the planning area is the Mount Edziza volcanic complex, which is located approximately 145 miles east of Juneau and Traditional Lands of Tlingit & Haida. Currently, there are no volcanoes in Canada monitored sufficiently, so more research and monitoring would need to be conducted to officially designate them as an active volcano (NRC, 2008).

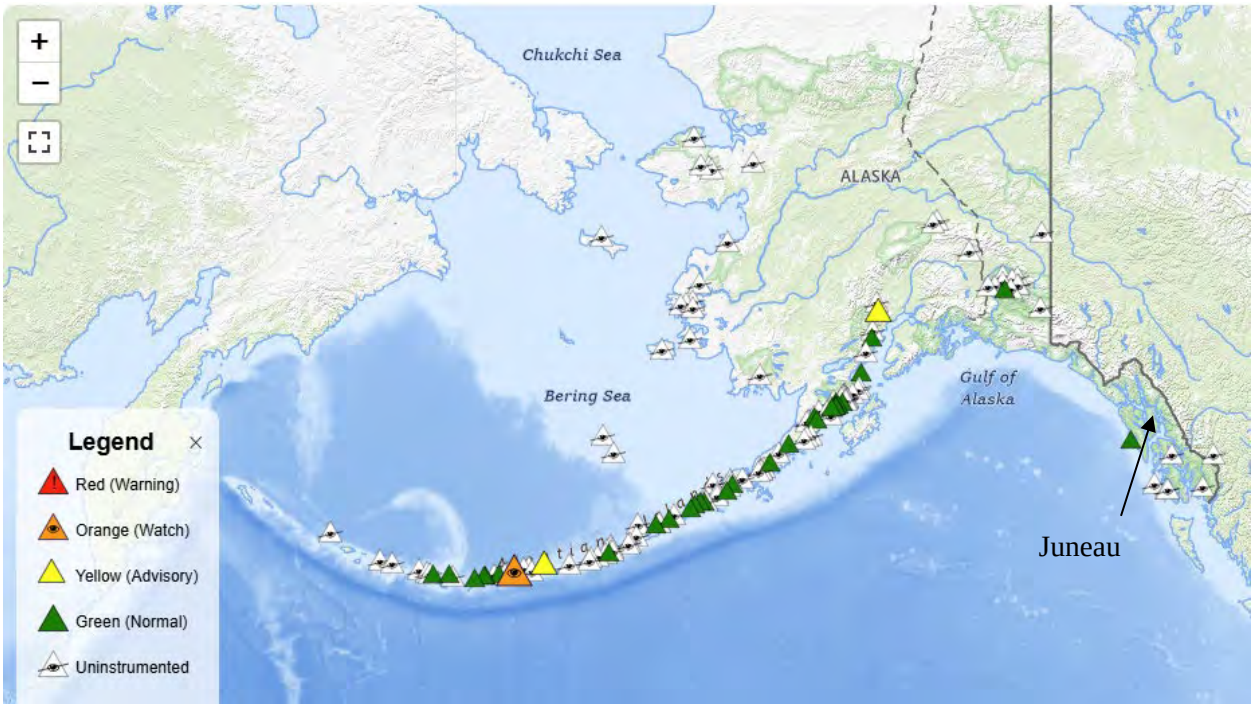


Source: NRC, 2008

Figure 112- Northern Cordilleran Volcanic Province East of Juneau

The closest historically active volcano to the Planning Area is Mount Edgecumbe. Located approximately 100 miles southwest of the Planning Area, this stratovolcano was classified as historically active in 2022, after the discovery of the intrusion of magma three miles below its surface (AVO, 2025). The Alaska Volcano Observatory (AVO) classifies a volcano as historically active if it has had a recent eruption or period of seismic activity within the start of written records in Alaska, about 300 years. The volcano in the Aleutian Island Chain closest to the Planning Area is Mt. Spurr (650 miles SW).

Figure 113 shows a map of Alaska's volcanoes and their alert level on April 25, 2025. There are 160 volcanoes included in this figure. The closest volcano to the Planning Area that is instrumented is Mt. Edgecumbe. Mt. Edgecumbe has been experiencing magmatic intrusion and associated seismicity since 2018 and has an advisory of Green (Normal).

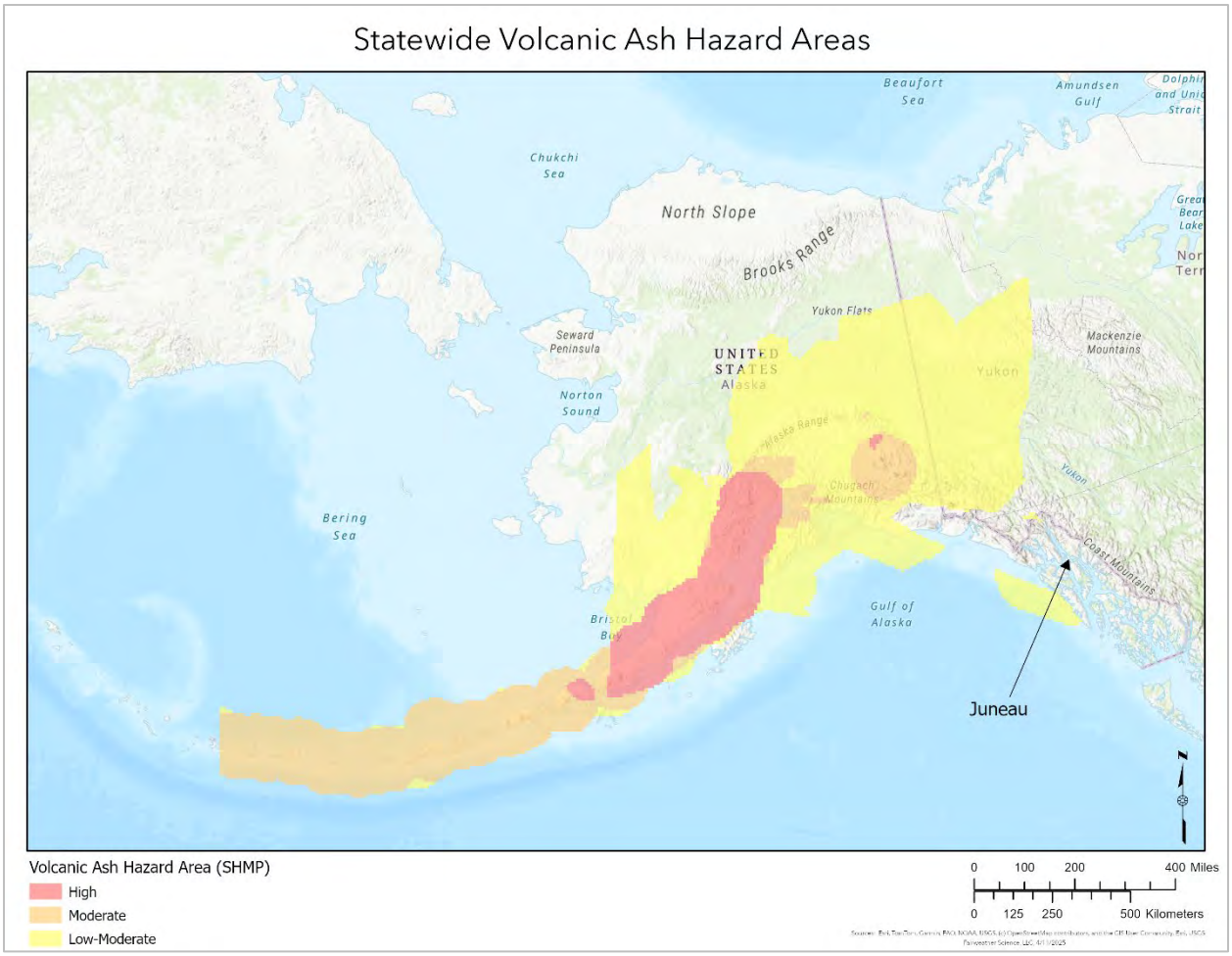


Source: Alaska Volcano Observatory- Volcano Status, accessed 4/25/2025

Figure 113- Alaska Volcano Status (4/25/2025)

The 2023 State of Alaska HMP provides the following map for volcanic ash hazard areas. While the Planning Area is not in the volcanic ashfall hazard area, it has historically been impacted by volcanic ashfall events.

The primary hazard to the Planning Area from a volcanic eruption is transportation disruptions from volcanic ashfall.



Source: 2023 State of Alaska HMP

Figure 114- Volcanic Ash Hazard Areas in Alaska

3.3.9.3 History

Even though the Planning Area hasn't been directly impacted by a volcanic eruption in its history, the abundance of volcanic activity in Alaska, as well as the variation in wind patterns increases the risk of an ashfall event in the planning area. The most significant and recent volcanic eruption that impacted Juneau (Dzantik'i Héeni) was the 1992 eruption of Mt. Spurr, with the ashfall from the event temporarily impacting air travel at the JIA. See Appendix F for an extensive history of major volcanic events in Alaska.

3.3.9.4 Extent

After a volcanic eruption, secondary hazards may pose a threat to surrounding and distant communities. Below are a sample of post-eruption hazards that may occur and the extent (magnitude and severity) of each.

Secondary Eruption Hazard	Extent of the Secondary Hazard
Lahars	Lahars are usually created by eruptions of shield volcanoes and stratovolcanoes. Lahar is a hot or cold mixture of rock fragments that flows down the slopes of a volcano, typically into a river valley. They can act as a mudflow or a debris flow. Lahars may occur with or without

Secondary Eruption Hazard	Extent of the Secondary Hazard
	a volcanic eruption- when high-volume or long-duration rainfall occurs. Lahars pick up materials as they travel and can grow up to 10 times their original size.
Landslides	Landslides are common during eruptions of stratovolcanoes because their massive cones typically rise thousands of feet above the surrounding terrain. If the moving rock debris is large enough and contains a large content of water and soil material, the landslide may transform into a lahar and flow down valley more than 50 miles from the volcano.
Lava Flows	Lava flows are streams of molten rock that pour or ooze from an erupting vent. Lava flows move slowly enough that people can typically outrun them, but they are extremely dangerous and will destroy everything in its path.
Pyroclastic Flows	Pyroclastic flows are the deadliest of the volcanic hazards. Pyroclastic flows are made up of a mixture of rock fragments, gases, and ash that travel quickly away from the volcanic vent. These pyroclastic flows are typically greater than 1,500 ºF and can travel at speeds up to 50 mph. Pyroclastic flows can be extremely destructive and deadly because of their high temperature and rate of speed that they travel.
Volcanic Gases	Volcanic gases are made up of water vapor (steam), carbon dioxide, ammonia, as well as sulfur, chlorine, fluorine, boron compounds, and several other compounds. Wind is the primary source of dispersion for volcanic gases. Life, health, and property can be endangered from volcanic gases within about 6 miles of a volcano. Acids, ammonia, and other compounds present in volcanic gases can damage eyes and respiratory systems of people and animals, and heavier-than-air gases, such as carbon dioxide, can accumulate in closed depressions and suffocate people or animals.
Volcanic Ash	Volcanic ashfall is the most common and widespread volcanic hazard. Volcanic ash is a mixture of rock, mineral, and glass particles that are expelled from a volcano during an eruption. These particles are very small and are low density, which allows them to travel long distances, typically by wind. These small particles can have jagged edges, which pose a hazard when breathed in or land on the skin. Ashfall can travel thousands of miles from the eruption site. While in the air, ash can cause problems for jet engines, forcing airlines to cancel flights. An ashfall that leaves a thick layer of ash may collect on homes, causing roof collapse, clogged gutters, or damage to other machinery. Animals may also be affected by volcanic ash by having difficulty finding food, or water and food sources are contaminated.

Due to Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida's relative distance from volcano and statewide volcanic ash areas (Figure 113 and Figure 114), impacts would mostly consist of air travel disruptions. It is not anticipated that the Planning Area will be directly impacted by secondary hazards such as lahars, volcano-induced landslides, lava flows, pyroclastic flows, or volcanic gases.

Based on previous occurrences and the criteria identified in Table 10, the magnitude and severity to the Planning Area from a volcanic eruption are considered Negligible with minor injuries, the potential for critical facilities to be shut down for less than 24 hours, less than 10% of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

3.3.9.5 Impact

Eruption types and wind conditions are a major determinant of the physical impacts a volcanic event will create, and the hazards it poses to a community. Due to Juneau and Traditional Lands of Tlingit & Haida's location, secondary hazards such as lahars, pyroclastic flows and clouds, and lava flows are of little threat to the region. Due to its ability to travel long distances from the source of an eruption, volcanic ashfall (and impacts to air travel) is the secondary hazard that may impact the Planning Area.

Ashfall is a general event that may affect all residents of the Planning Area. The elderly, the chronically ill, and the very young would experience the most severe respiratory distress from inhalation of volcanic ash. Poor visibility would endanger anyone having to travel, walk, or operate equipment during an ashfall event. It can also cause slippery roadway conditions, if wet, and may cause power outages.

While the Planning Area are at low risk for experiencing the predominant effects of a volcanic eruption, the substantial amount of volcanic activity in Alaska places the Planning Area at risk for experiencing secondary effects of eruptions, such as ash fall. Several relatively recent volcanic eruptions have resulted in ash fall throughout Alaska, disrupting air traffic and in some cases, negatively affecting living conditions and causing significant environmental damage, even in areas hundreds of miles from the eruption

The Planning Area has experienced volcanic ash in 1992 from the eruption of Mt. Spurr. As reported by the Juneau Empire, light ashfall made its way to the JIA, which temporarily stopped flights for Alaska Airlines and Delta Airlines. In recent studies, scientists discovered tephra deposits from an eruption of Mount Edgecumbe that occurred over 12,000 years ago all the way in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida (AVO 2025). More research needs to be conducted to further assess the impacts to the Planning Area after a potential eruption of Mount Edgecumbe but recently discovered activity beneath the volcano's surface illustrates the importance of increased monitoring to assess the potential impact of future hazards.

Air Transportation Impacts: If another eruption of the same magnitude as Novarupta occurred, the Planning Area could likely be impacted by another volcanic ashfall event. Another event of this magnitude could severely impact transportation in the Planning Area and halt the air travel for many days to weeks.

3.3.9.6 Probability of Future Events

The 2023 State of Alaska Hazard Mitigation Plan states the following regarding predicting volcanic eruptions:

> *"Geologists can make general long-term forecasts associated with individual volcano activities by carefully analyzing past activity, but these are based on trends and likelihood, rather than specific events or timelines. Short-range forecasts are often possible with greater accuracy.*
>
> *Signs of increasing activity can indicate that an eruption will follow within weeks or months. Magma moving upward into a volcano often causes a significant increase in small, localized earthquakes, and measurable carbon dioxide and compounds of sulfur and chlorine emissions increases. Shifts in magma depth and location can cause ground level elevation changes that can be detected through ground instrumentation or remote sensing observations."*

Based on the 2023 State of Alaska Hazard Mitigation Plan, previous occurrences, proximity of nearby volcanoes, and the criteria identified in Table 11, it is Possible the Planning Area will experience a volcanic ashfall event in the next five years; there is a 1 in 5 years chance of occurring (1/5=20 percent); and the history of events is greater than 10 percent but less than or equal to 20 percent likely per year.

3.3.9.7 Future Conditions

Future climate conditions are not expected to influence the nature, location, extent, impact, or recurrence probability of future volcanic eruptions on human timescales, including changes to land use development or population patterns in the Planning Area.

3.3.10 DAM FAILURE (HIGH HAZARD AND SIGNIFICANT HAZARD DAMS)

The Planning Team recognizes that a dam failure is not a natural hazard, but several of the hazards identified in this HMP could influence a dam failure in the Planning Area. Additionally, updated FEMA guidelines require that for a jurisdiction to be eligible for FEMA's Rehabilitation of High Hazard Potential Dam (HHPD) Grant Program, they must address HHPDs in their Hazard Mitigation Plan.

Note: As of 2025, FEMA is only funding projects for the rehabilitation of HHPDs. The Planning Team chose to include information on the two (2) Significant Hazard dams in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida in this section to explore non-FEMA funding available for the rehabilitation of non-HHPDs and in preparation in the event a Significant Hazard dam is reclassified to a HHPD before the next HMP update cycle.

Note: This hazard profile discusses dam failure, for information on glacial dams and resultant outburst flooding, see Sections regarding flood (Section 3.3.6) and cryosphere (glaciers) (Section 3.3.8).

3.3.10.1 Nature

A dam is a barrier across flowing water that obstructs, directs, or slows down the flow, often creating a reservoir, lake, or impoundment. Most dams have a section called a spillway or weir, over or through, which water flows, either intermittently or continuously. Dams commonly come in two types, embankment (the most common) and concrete (gravity, buttress, and arch). They also serve several purposes and provide essential benefits, including drinking water, irrigation, hydropower, flood control, and recreation (ADSP 2022).

Large or small, dams have a powerful presence that is frequently overlooked until a failure occurs. Dams fail in two ways, a controlled spillway release done to prevent full failure, or the partial or complete collapse of the dam itself. In each instance, an overwhelming amount of water, and potentially debris, is released. Dam failures are rare, but when they do occur, they can cause loss of life and immense damage to property, critical infrastructure, and the environment (ASDP 2022).

Dams are classified as High hazard, Significant hazard, or Low hazard. The classification is not based on whether a dam is deemed safe or unsafe, but rather the impact/magnitude of a potential failure.

- A **High Hazard** dam is one whose failure or mis-operation will result in a probable loss of human life.
- A **Significant Hazard** dam is one whose failure or mis-operation results in no probable loss of human life but may cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety, or welfare.
- A **Low Hazard** dam is one whose failure or mis-operation results in no probable loss of human life and low economic losses.

Dams are periodically inspected and given condition ratings. Each dam's hazard classification determines the frequency of inspection. The higher the classification, the more frequently the inspection is conducted. As part of each Alaska Dam Safety Program inspection, the major components of the dam are subjectively rated as satisfactory, fair, poor, or unsatisfactory. The major components being inspected are the embankment, the spillway, and the low-level outlet.

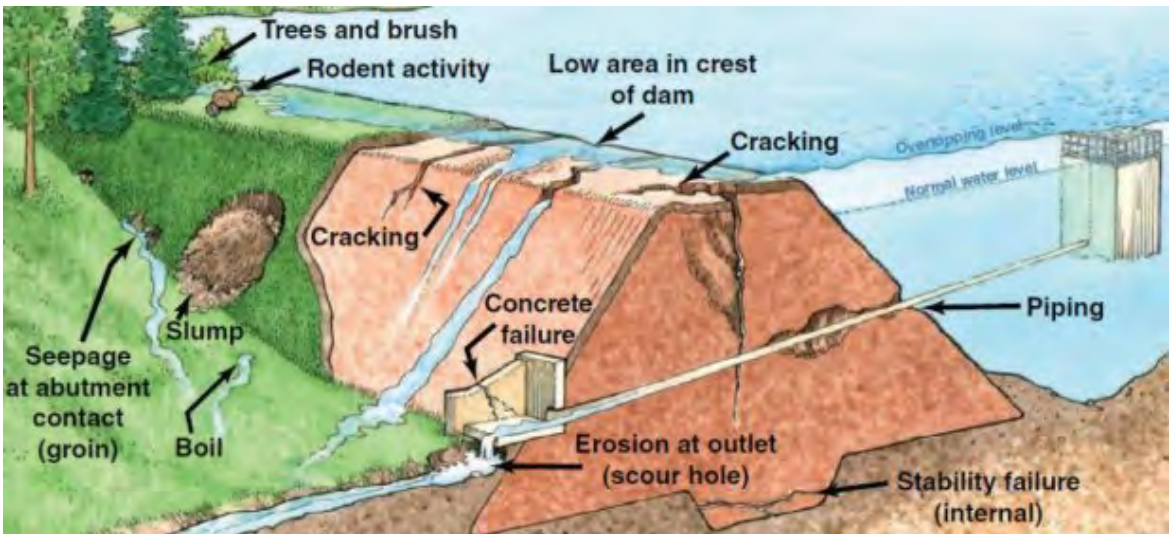
The following outlines criteria for a given condition rating.

- **Satisfactory**: No existing or potential dam safety deficiencies are recognized.
- **Fair**: No existing or potential dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in dam safety deficiency.
- **Poor**: A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. Poor may also be used when uncertainties exist as to critical analysis

parameters which identify a potential dam safety deficient. Further investigations and studies are necessary.

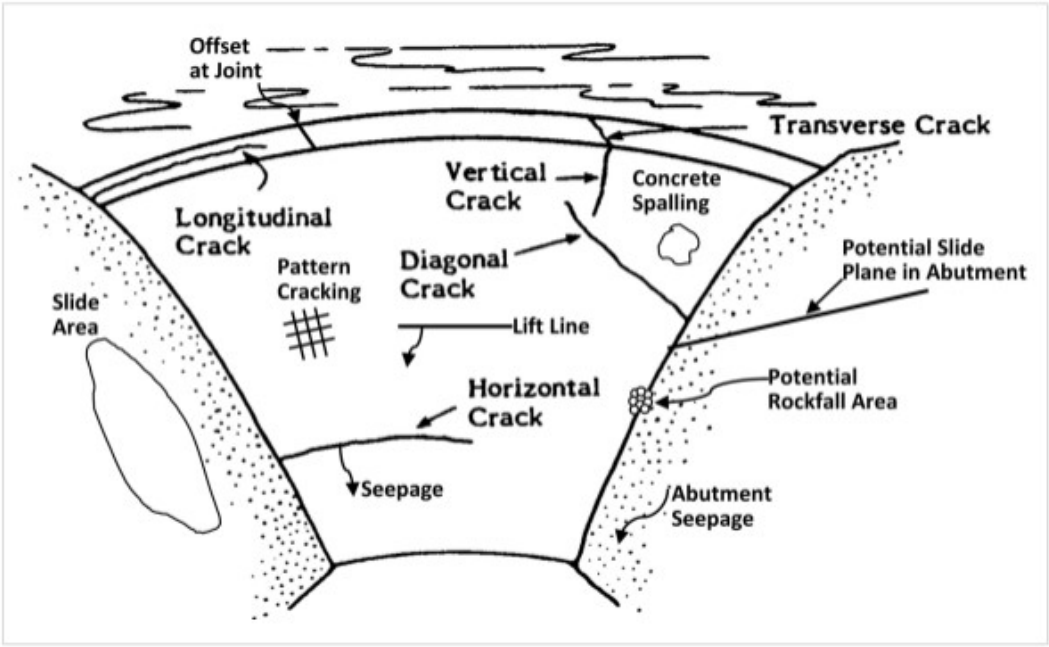
- **Unsatisfactory**: A dam safety deficiency is recognized as one that requires immediate or emergency remedial action for problem resolution.
- **Not rated**: The dam has not been inspected or has been inspected but, for unknown reasons, has not been rated.

The remainder of this hazard profile will focus on the dams where dam failure may impact human life and critical facilities in the Planning Area.



Source: FEMA Pocket Safety Guide for Dams and Impoundments- FEMA P-911/October 2016

Figure 115- Causes of Dam Failure



Source: FEMA Pocket Safety Guide for Dams and Impoundments- FEMA P-911/October 2016

Figure 116- Visible Signs of Potential Failure Mechanisms of Concrete Dams

3.3.10.2 Location

There are thirteen (13) dams in the Planning Area. Two (2) are High hazard, four (4) are Significant hazard, and the remaining seven (7) are classified as Low hazard. The two High hazard dams include Salmon Creek Dam and the Douglas Island Dam.

Table 30- Dam Locations in the Planning Area

Name	NID ID	Hazard Classification	Most Recent Inspection	Dam Owner	Condition
Salmon Creek Dam	AK00003	High	2022	Alaska Electric Light and Power Company	Satisfactory
Douglas Island Dam	AK00077	High	2024	City and Borough of Juneau	Fair
Pond 7 Dam	AK00307	Significant	2019	Hecla Greens Creek Mining Company	Satisfactory
Lower Slate Lake Tailings Dam	AK00308	Significant	2020	Coeur Alaska, Inc.	Satisfactory
Lower Slate Lake Tailings Back Dam	AK00320	Significant	2024	Coeur Alaska, Inc.	Satisfactory
Pond 10 Dam	AK00316	Significant	2025	Hecla Greens Creek Mining Company	Satisfactory
Annex Creek Dam	AK00004	Low	2022	Alaska Electric Light and Power Company	Satisfactory
Long Lake Dam	AK00044	Low	2019	Alaska Industrial Development and Export Authority	Fair
Sand Pit Dam	AK00317	Low	2018	Hecla Greens Creek Mining Company	Fair
Bart Lake Dam	AK84001	Low	2022	Alaska Electric Light and Power Company	Satisfactory
Mud Dump Ponds	AK00405	Low	2024	Coeur Alaska, Inc.	Fair
Camp Ponds Dam System	AK00406	Low	2024	Coeur Alaska, Inc.	Fair
Wolf Ponds Dam System	AK00407	Low	2024	Coeur Alaska, Inc.	Satisfactory

Source: NID 2025, ADNR 2025

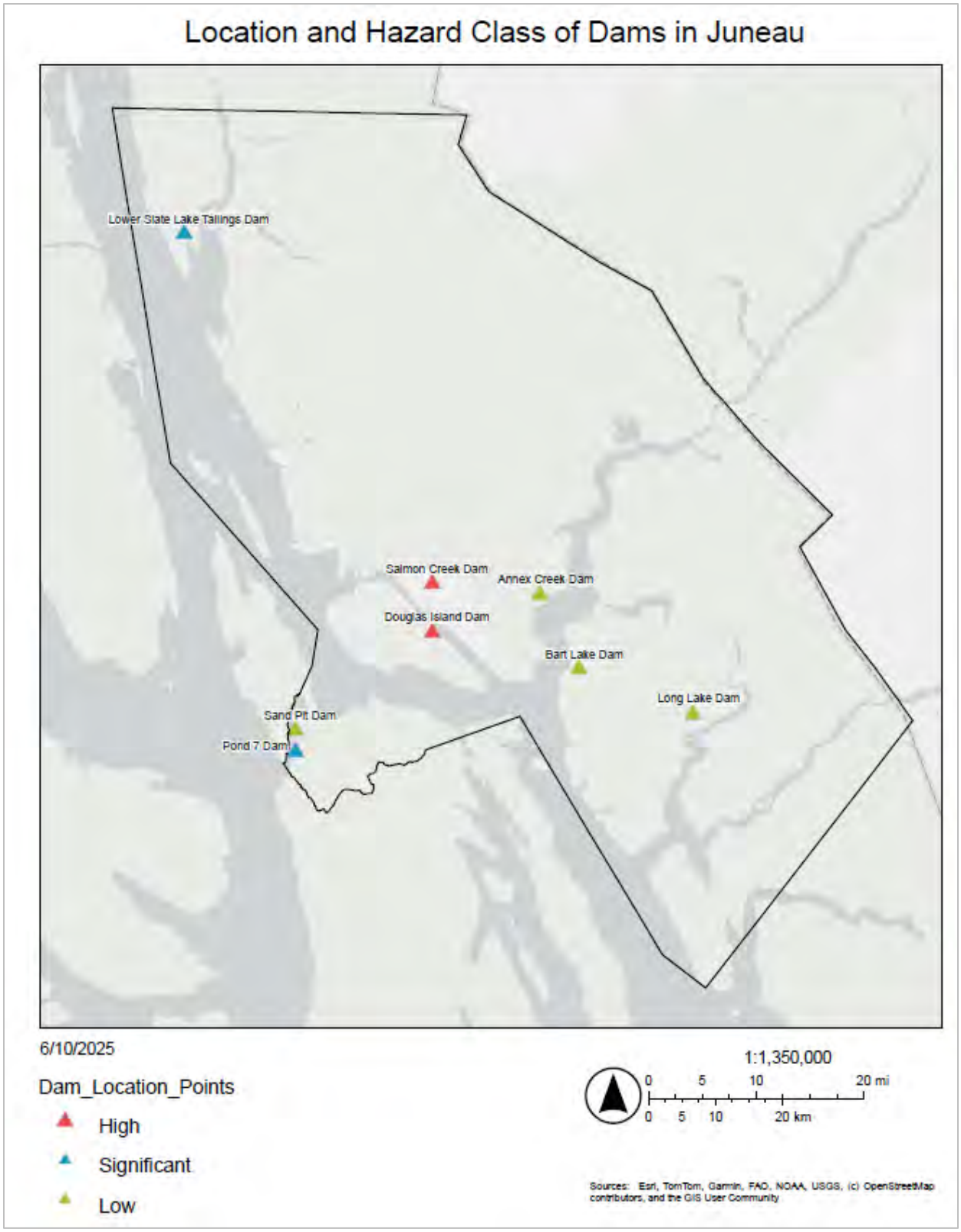


Figure 117- Location and Hazard Class of Dams in Juneau and Traditional Lands of Tlingit & Haida

Note that Lower Slate Lake Back Dam, Camp Ponds Dam System, Mud Dump Ponds Dam System, Wolf Ponds Dam System, and Pond 10 Dam are not included in the above map. The map will include these dams in the Final Draft of the MJHMP.

Specifications on the two (2) High hazard dams and four (4) Significant hazard dams in the Planning Area are below. Information on Low hazard dams in the Planning Area is not included.

NID ID #AK00003 Salmon Creek Dam	
Hazard Classification	High (Class I)
Owner	Alaska Electric Light and Power Company
Year Built	1914
Dam Type	Hydroelectric, Water Supply
Length x Height	648 ft x 175 ft
Drainage Area	5 sq. miles
Inspection Frequency	The most recent inspection was July 19, 2022. The owner performs informal monthly inspections of the dam. FERC inspects the dam annually and requires an independent engineer to perform a more thorough inspection and investigation every 5 years. AEL&P engineers inspect the dam as soon as possible after any earthquake felt in the Planning Area (AEL&P 2025).
Downstream Description	Salmon Creek Dam is located downstream of Salmon Creek Reservoir and upstream of Salmon Creek (ýáat héen). The dam is approximately 2.5 miles from Gastineau Channel, where Salmon Creek terminates near the Twin Lakes area between Downtown Juneau and the Mendenhall Valley.
Downstream Area	The Salmon Creek Dam structure discharges into Salmon Creek (ýáat héen), which flows into Gastineau Channel near the Twin Lakes area. The area downstream of the dam consists of dense vegetated riparian corridors until Salmon Creek reaches Twin Lakes. Besides several residences in the area, critical infrastructure located downstream of the dam includes Egan Drive, Macauley Salmon Hatchery, Ethel Lund Medical Center, Bartlett Regional Hospital, the Juneau Empire office building, and the Alaska Marine Highway terminal. Egan Drive is the primary roadway downstream of the dam. All infrastructure is approximately three miles downstream of the Salmon Creek Dam.
Downstream Dams	There are no dams immediately downstream of the Salmon Creek Dam.

NID ID #AK00003 Salmon Creek Dam	
Downstream Bridges	There are three bridges downstream of Salmon Creek dam. The first bridge is approximately one-half mile downstream, allowing the dirt/gravel road to continue upstream until it reaches Salmon Creek Reservoir. The second two bridges are approximately 2.5 miles downstream, the Egan Drive Bridge and the Glacier Highway Bridge, which are within 300 feet of each other.
Reservoir Area	Salmon Creek Reservoir has a maximum capacity of 18,000-acre feet and a surface area of 165 acres. The reservoir is irregularly shaped, with a general length (west to east) of approximately .9 miles and an average width of approximately 1,250 feet. The reservoir is surrounded by steep, rocky slopes in the alpine. The slopes appear stable with no evidence or shoreline/bank destabilization that could be indicative of loose soil or potential slides.
Downstream Development	Salmon Creek flows into Gastineau Channel 2.5 miles from the dam. Almost the entirety of downstream development is right on the coastline, off Egan Drive and the Glacier Highway. Critical Infrastructure includes Macauley Salmon Hatchery, Ethel Lund Medical Center, Bartlett Regional Hospital, the Juneau Empire office building, and the Alaska Marine Highway terminal.
General findings of the 2022 inspection	The condition assessment during the 2022 inspection was **Satisfactory**. No existing or potential dam safety deficiencies were recognized.
Potential Effects of a Dam Break	Potential effects include flooding and shoreline/bank destabilization of Salmon Creek which could bring debris downstream. Potential inundation of Egan Drive and Glacier Highway could limit access to Bartlett Regional Hospital, Ethel Lund Medical Center, or the Alaska Marine Highway terminal. The Macauley Salmon Hatchery could suffer from water contamination, pen damage leading to fish escapement or destruction, and water supply problems. This has happened in the past due to a 2020 landslide, which had a domino effect on the 2024 salmon sportfishing season around Juneau and Traditional Lands of Tlingit & Haida.
Recommended Hazard Potential Classification	The US Army Corps of Engineers, through the National Inventory of Dams, have classified this dam as High Hazard. Due to the downstream development and potential loss of life, this recommendation is accurate and justified based on current classification guidelines.

Source: AELP 2025, NID 2025

Source: AELP 2025

Figure 118- Salmon Creek Dam

NID ID #AK00077 Douglas Island Dam (aka Bear Creek Dam)	
Hazard Classification	High (Class I)
Owner	City and Borough of Juneau
Year Built	1937
Dam Type/Purpose	Flood Risk Reduction
Length x Height	91 ft x 26.5 ft
Drainage Area	4 sq. miles
Inspection Frequency	The most recent inspection date was December 6, 2024. The dam is inspected every three years. This dam is regulated by the State of Alaska. FERC requires an independent engineer to perform a more thorough inspection and investigation every 5 years.
Downstream Description	Douglas Island Dam is located on the East side of Douglas Island, which is east of the Planning Area across the Gastineau Channel. Downstream of the dam is Bear Creek, which flows through dense forest before flowing through Douglas and terminating in Gastineau Channel. Several miles downstream is a dock, but this is outside the flood zone of Douglas Island Dam.
Downstream Area	According to the 2022 Alaska Dam Safety Program Hazard Potential Classification and Jurisdictional Review, the Douglas Island Dam downstream area contains homes, industrial/commercial property, both primary and secondary roads, utilities, and water/wastewater lines or facilities.
Downstream Dams	There are no dams immediately downstream of the Douglas Island Dam.
Downstream Bridges	There are several culvert crossings and bridges immediately downstream of Douglas Island Dam, allowing Bear Creek to flow from Douglas Island Dam to Gastineau Channel.
Reservoir Area	The maximum impoundment volume is 3-acre feet, with a reservoir maximum storage surface area of 0.295 acres (ADSP 2022). The impoundment is rectangular in shape and the generally small size limits the size of a significant wave which may develop across the surface of the pond. The perimeter of the impoundment is wooded and undeveloped. The slopes are moderate to steep with no evidence of loose soils or slope instability.
Downstream Development	Downstream development includes a mix of critical infrastructure and private residences. The infrastructure includes both primary and secondary/rural roads, industrial or commercial property, power/communication utilities, water or wastewater treatment facilities, and homes. The proximity of development downstream of the dam begins approximately 600 feet downstream, and 10

NID ID #AK00077 Douglas Island Dam (aka Bear Creek Dam)	
	feet above the streambed (ADSP 2022). Bear Creek passes under 4th, 3rd, 2nd, and 1st Streets through culverts. The residential area adjacent to Bear Creek starts at the 500 block of H Street and continues to tidewater, near 1st and D Streets.
Overall assessment of the 2020 inspection	As reported in the 2020 inspection, the condition assessment of the dam was **Fair** (NID 2025).
Potential Effects of a Dam Break	Potential effects of dam failure would result in flooding of residential structures 600 feet downstream from the dam. Notable infrastructure at risk includes duplexes, office buildings, apartment buildings, and the Island Pub. Due to the small size of the reservoir, it is Unlikely that flood levels would result in catastrophic effects.

Source: ADSP 2022, NID 2025, Douglas Island Dam EAP (Revised 3/13/2025)

NID ID #AK00307 Pond 7 Dam	
Hazard Classification	Significant (Class II)
Owner	Hecla Greens Creek Mining Company
Year Built	2005
Dam Type	Flood Risk Reduction, Mining Tailings Runoff Collection
Length x Height	780 ft x 30 ft
Drainage Area	0.22 sq. miles
Downstream Description	Immediately downstream of the dam, there is a muskeg and dense forest mixture of landscape. There is one road owned and operated by Hecla Greens Creek Mining Company. Adjacent to the dam and its reservoir is a relatively small pit mining operation. The outflow of the dam flows into Hawk Inlet almost immediately. The downstream course from the dam is only 1,000 feet approximately.
Downstream Area	The area downstream of the dam consists of densely wooded areas, muskeg. The closest development, Hawk Inlet, encompasses a dock, housing, and supplies staging area for Hecla Greens Creek Mining Company. However, this is not in the path of downstream flow from Pond 7 Dam.
Downstream Dams	There are no dams downstream of Pond 7 Dam.

NID ID #AK00307 Pond 7 Dam	
Downstream Bridges	There are no bridges downstream of Pond 7 Dam.
Reservoir Area	The storage area is approximately 30.6-acre feet, 32.9-acre feet maximum, with a surface area of 2.94 acres. The shape of the reservoir is approximately triangular.
Downstream Development	The immediate downstream area of Pond 7 contains no development. Adjacent to the outflow area is Hawk Inlet, which Hecla Greens Creek Mining Company has developed with buildings, supplies and docks.
General findings of the 2019 inspection	Upon the most recent inspection (2019), the dam was found to be in **Satisfactory** condition.

Source: Hecla 2025, NID 2025

NID ID #AK00308 Lower Slate Lake Tailings Dam	
Hazard Classification	Significant (Class II)
Owner	Coeur Alaska Inc.
Year Built	2010
Dam Type	Tailings
Length x Height	480 ft x 63 ft
Drainage Area	1.05 sq. miles
Downstream Description	Lower Slate Lake Tailings Dam is located on Slate Lake, which outlet runoff flows into Slate Creek and eventually Berners Bay. The outflow, and Slate Creek, are surrounded by dense vegetation consisting of mature stands of timber common in Southeast Alaska. There are no developments downstream of the dam.
Downstream Area	The channel downstream of the spillway consists of a wide riprapped channel that becomes overgrown with dense vegetation including trees and brush once the channel transitions to a natural streambed and eventually flows into Slate Creek. The width of the channel appears to be sufficient to convey flow away from the dam without impacting discharge capacity. The channel downstream of the spillway passes through a wooded and overgrown area for approximately 0.75 miles before reaching Slate Creek. Beyond the confluence, the channel continues through a wooded area before flowing below into Berners

NID ID #AK00308 Lower Slate Lake Tailings Dam	
	Bay 0.3 miles downstream.
Downstream Dams	There are no dams immediately downstream of Lower Slate Lake Tailings Dam.
Downstream Bridges	There are no bridges and/or culverts downstream of Slate Lake Tailings Dam.
Reservoir Area	The impoundment is generally an oval shape with a slight bottleneck in the area of the dam. The impoundment is generally narrow in shape, limiting the size of the waves which may develop across the surface of the pond. The impoundment is 0.6 miles long and has an average width of 1,500 feet. The surface area is 53 acres. The perimeter of the impoundment is lined on two sides by mining company roadways to the North and the East. The slopes along the west side are moderate to steep while the slopes along the east side are flat to moderate with no evidence of loose soils or slope instability.
Downstream Development	There is no downstream development below Slate Lake Tailings Dam.
General findings of the 2020 inspection	The most recent inspection (2020) found the dam to be in **Satisfactory** condition.
Potential Effects of a Dam Break	A dam break could result in serious flooding in the Slate Creek drainage, which poses no hazards to any development. However, mine employees working on or near the dam could be at risk of flooding, as well as any recreators downstream of the dam at the time of failure. Depending on the severity of the dam failure, its possible boats in Berners Bay could experience rough seas due to increased wave activity.

Source: Coeur 2025, NID 2025

NID ID #AK00320 Lower Slate Lake Tailings Back Dam	
Hazard Classification	Significant (Class II)
Owner	Coeur Alaska, Inc.
Year Built	2024
Dam Type	Tailings storage

NID ID #AK00320 Lower Slate Lake Tailings Back Dam	
Length x Height	400 ft x 35 ft
Drainage Area	436 acres
Downstream Description	Lower Slate Lake Tailings Back Dam is located between Upper Slate Lake and Lower Slate Lake, which outlet runoff flows into Slate Creek and eventually Berners Bay. The outflow flows into Lower Slate Lake 500 feet below the dam. The outflow is a vegetated creek bottom with no development.
Downstream Area	The channel downstream of the spillway consists of a relatively narrow channel that contains dense vegetation (mostly brush). This extends approximately 500 feet before entering Lower Slate Lake.
Downstream Dams	Lower Slate Lake Tailings Dam is 2,500 feet downstream of the Lower Slate Lake Tailings Back Dam
Downstream Bridges	There are no bridges downstream of Lower Slate Lake Tailings Back Dam.
Reservoir Area	The impoundment is generally rectangular, surrounded by thick timber. It is approximately 1,200 feet long North to South, and 450 feet wide East to West. The reservoir is 393-acre feet, with a surface area of 24 acres.
Downstream Development	Downstream development includes one mining operations road which leads to Lower Slate Lake Tailings Dam, which is also downstream of the Lower Slate Lake Tailings Back Dam.
General findings of the 2020 inspection	The dam was inspected June 3, 2024, and was found to be in **Satisfactory** condition.
Potential Effects of a Dam Break	A dam failure could impact the Lower Slate Lake Tailings Dam, which is downstream. This additional stress could lead to cascading dam failure affects, flooding the Slate Creek drainage before entering Berners Bay. Besides the downstream dam and its access road, no development is at risk due to dam failure.

NID ID #AK00316 Pond 10 Dam	
Hazard Classification	Significant (Class II)
Owner	Hecla Greens Creek Mining Company

NID ID #AK00316 Pond 10 Dam	
Year Built	2017
Dam Type	Flood Risk Reduction, Mining Tailings Runoff Collection
Length x Height	535 ft x 35 ft
Drainage Area	88 acres
Downstream Description	Immediately downstream of the dam, spillway pours into the Pond 7 Dam reservoir. Beyond Pond 7 Dam reservoir, there is a muskeg and dense forest. There is one road owned and operated by Hecla Greens Creek Mining Company.
Downstream Area	The area downstream of the dam is the Pond 7 Dam reservoir, which is generally rectangular, manmade reservoir lined with a synthetic containment liner. Beyond the reservoir is the Pond 7 dam, and then densely wooded area.
Downstream Dams	The Pond 7 Dam is downstream of Pond 10 dam.
Downstream Bridges	There is one bridge downstream, which is on top of the spillway allowing liquid to flow from Pond 10 Dam into the Pond 7 Dam reservoir.
Reservoir Area	The reservoir is generally triangular in shape, with a perimeter of approximately 1,500 feet. The volume capacity is 93 acre feet with a surface area of 7.1 acres
Downstream Development	Downstream developments include one mining operations bridge that goes over the spillway of Pond 10 Dam, and Pond 7 dam reservoir and Pond 7 Dam is also downstream of the Pond 10 Dam.
General findings of the 2020 inspection	The most recent inspection was May 27, 2025 and the dam was found in **Satisfactory** condition.
Potential Effects of a Dam Break	A potential dam break of Pond 10 Dam would impact Pond 7 Dam, which could induce that dam to break as well. If that occurred, mining tailings would no longer be contained and released into the natural environment.

3.3.10.3 History

Based on available records, there has never been a significant failure of a High Hazard or Significant Hazard dam in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida.

3.3.10.4 Extent

Heavy rainfall and flood events may affect the structural integrity of dams that would affect the Planning Area. Other natural hazards that are less predictable/ forecastable, like landslides or earthquakes, can also impact the structural integrity of dams and could lead to failure.

Salmon Creek Dam

AELP, the owner of the Salmon Creek Dam, has made their inundation mapping available, along with evacuation routes.

Source: AELP 2025

Figure 119- Salmon Creek Dam Inundation and Evacuation Area

The possible extent of a Salmon Creek Dam failure would result in flooding of the Twin Lakes area, to include Egan Drive, Glacier Highway, Channel Drive, Hospital Drive, and Salmon Creek Lane. Critical Infrastructure inundated by a dam failure would include Macauley Salmon Hatchery, Ethel Lund Medical Center, Bartlett Regional Hospital, the Juneau Empire office building, and the Alaska Marine Highway terminal.

Douglas Island (Bear Creek) Dam

The Douglas Island dam is owned by CBJ. The dam attenuates Bear Creek flows during precipitation events. It should not impound water normally. It is unlikely the dam will be impounding water during a significant earthquake. Stacking events is not common in assessing dam failure consequences. Credible failure that causes risk to downstream life and property is during a significant precipitation event (DNR, 2025).

Bear Creek encounters its first creek side house as it flows into a primarily residential area of Douglas approximately 600 feet downstream of the dam. It proceeds / passes under 4th, 3rd, 2nd, and 1st Streets via culverted crossings, before discharging into Gastineau Channel. The residential area adjacent to Bear Creek starts at the 500 block of "H" Street and continues to tidewater, near 1st and "D" Streets.

Figure 120- Douglas Island Dam Estimated Hazard Area

The possible extent of a dam failure of the Douglas Island Dam could result in flood inundation of both critical infrastructure and private residences. The 3/13/2025 Emergency Action Plan identifies 11 residential structures for notification of a dam failure. The Alaska Dam Safety Program identified infrastructure including both primary and secondary/rural roads, industrial or commercial property, power/communication utilities, water or wastewater treatment facilities, a small boat harbor, and homes in a 2022 inspection report. The dam has the potential to flood a large section of Douglas. Notable infrastructure at risk includes duplexes, office buildings, apartment buildings, and the Island Pub.

Based on the history of no past dam failures and the criteria identified in Table 10, the magnitude and severity of dam failure in the Planning Area is Negligible as there has never been a major failure; however, if a High or Significant Hazard Dam in the Planning Area were to fail, the extent of dam failure could be Significant with multiple deaths and severe injuries; medium shutdown of some critical infrastructure and facilities; 20% to 50% of residential and 10-25% of commercial structures are severely damaged; and large impacts to local operations for long amounts of time.

3.3.10.5 Impact

In the Planning Area, severe storms, flooding, ground failure events, or seismic activity could all bring enough rain and/or snowfall or topographic change to cause a dam failure. The age and conditions of dams also poses a risk to the structural integrity of dams.

Dam failures result in impacts such as damage or destruction to homes and critical facilities in the inundation area, potential loss of life, overtopping of roads which may lead to shoreline/bank destabilization and traffic disruption, and funding required to rehabilitate failed dams.

A dam failure will also cause secondary impacts to upstream and downstream flooding potential while the dam is not in operational order. Extreme precipitation events could impact drainages more severely than usual, due to space normally protected by the controlled release of a dam no longer afforded shielded from increased water flow.

A dam failure could generate a large and destructive flash flood. Salmon Creek Dam is listed as a High Hazard Potential Dam in the State of Alaska's 2023 Hazard Identification and Risk Assessment. This dam is owned by the Alaska Electric Light and Power Company (AEL&P) and regulated by the Federal Energy Regulatory Commission (FERC).

Air Transportation Impacts: A high hazard dam failure could impact air transportation, even if the JIA itself is not impacted directly. The JIA is not currently in a high hazard dam flood inundation zone. However, access to the airport could be impacted by a dam failure caused flood- specifically Egan Drive being inundated by a Salmon Creek Dam failure.

3.3.10.6 Probability of Future Events

According to the Alaska Dam Safety Program:

> *Dam owners conduct routine monitoring and inspection of dams within the state on the previously identified schedule, with priority placed on those dams which pose the greatest potential threat. However, to fully determine the probability of a future event, a full engineering inspection would need to be completed on each dam, something beyond the scope of this program. The majority of these more thorough inspections are conducted by an independent agency hired by the dam owner, FERC, or the USACE.*
>
> *Dams undergoing repair and/or reconstruction are required to be designed to pass at least the 1%-annual-chance rainfall event with one foot of freeboard. The most critical and hazardous dams are required to meet a spillway design standard much higher than passing the runoff from a 1%-annual-chance rainfall event. Although not all the dams have been shown to withstand the 1%-annual-chance rainfall event, most of the dams meet this standard due to original design requirements or recent spillway upgrades.*

The probability for dam failure reduces when the dam is properly maintained and receives a "Satisfactory" condition rating. The table above identifies the condition rating of each dam in the Planning Area based on their most recent inspection.

Based on the criteria listed in Table 11 and the most recent condition assessments, it is Unlikely that the Planning Area will experience a dam failure event in the calendar year; there is a less than 10% annual

probability of occurring, where injuries and/or illnesses could result in temporary to permanent disability; with potential for critical facilities to be shut down for more than a week, and 10% of property would be severely damaged. Failure depends on loading conditions (precipitation, seismic, deferred maintenance, vandalism, etc).

3.3.10.7 Future Conditions

Nature	Future climate conditions are unlikely to influence the nature of future dam failures in Juneau and Traditional Lands of Tlingit & Haida.
Location	Future climate conditions are unlikely to influence the location of future dam failures in the Planning Area. However, changing factors that influence the potential of a dam failure (heavy rains, flooding) may result in a dam failure of a dam that has not previously failed.
Extent	It is possible that future climate conditions will influence the magnitude and severity of dam failure in the Planning Area. A potential outcome of changing climate in Alaska is an increase in extreme precipitation events which are likely to lead to more severe floods and a greater risk of dam failure.
Impact	It is possible that future climate conditions will influence the impact of dam failure in the Planning Area. Increased precipitation is likely to lead to more frequent dam failures of dams with conditions of Poor or Fair, unless dam deficiencies are addressed. The impact of these dam failures may include damage to homes and critical facilities in the inundation area, potential loss of life, overtopping of roads which may lead to shoreline/bank destabilization and traffic disruptions, and funding required to rehabilitate failed dams.
Probability of Future Events	It is possible that future climate conditions will influence the probability of future events. Increased precipitation and frequency of severe weather events could contribute to more stress on dams in the Planning Area. At present, there is no comprehensive assessment of climate-related vulnerability and risks to existing dams. Additionally, there are no common design standards concerning the repair or modification of existing dams nor for the design and construction of new dams operated in the face of changing climate risk. Engineers use the best data available during dam inspections, which could lead to safety modifications in the future as future climate conditions change the loading conditions of a dam.
Changes in Population Patterns	It is possible that future dam failures will cause changes in population patterns the Planning Area as residents may relocate in and out of potential future inundation areas.
Changes in Land Use Development	It is possible that future climate conditions will influence changes in land use development in the Planning Area. Dam failure inundation areas may become unsuitable for future development to reduce future losses, or development will be restricted in inundated areas. Alternatively, if population migration occurs into an inundation area, a dam may be reclassified from Significant to High hazard.

The information below summarizes the influence of future climate conditions on the hazards that may impact the potential for a dam failure in the Planning Area.

Hazard	Future Conditions		Influence on Dam Failure Probability	
	Extent	Probability of Future Events	Extent	Probability of Future events
Flood	Increase	Increase	Increase	Increase
Landslide	Increase	Increase	Increase	Unknown
Heavy Snow	Increase	Increase rainfall	Increase	Increase
Heavy Rain	Increase	Increase	Increase	Increase
Earthquake	No change	No change	No Change	No Change

As future climate conditions are influencing the extent and recurrence probability of several hazards that influence the potential of a dam failure, the likelihood of cascading impacts of upstream and downstream flooding potential increases. USGS recently updated their seismic hazard map and climate change/future conditions are not expected to change the extent or probability of earthquakes. See the individual hazard profiles for information on how future climate conditions may influence/impact future land use development and population patterns in Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida.

3.3.11 CYBERSECURITY

3.3.11.1 Nature

A cyberattack is the deliberate and malicious attempt to compromise the security of computer systems, networks, devices, or data. These types of incidents aim to steal sensitive information, disrupting operations, gain unauthorized access, or demand ransom payments.

Financial, communication, information, and security systems across all public and private sectors are vulnerable to acts of cyberwarfare, cyberterrorism, and cybercrime.

Common threat actors are motivated by a variety of outcomes.

- **Cybercriminals** are individuals or groups that use computers, networks, and digital tools to commit illegal activities, often driven by financial gain, data theft, or the desire to cause disruption. They operate with malicious intent, using tactics such as unauthorized access to systems, phishing to trick individuals into revealing sensitive information, and deploying malware like ransomware or spyware to damage, steal, or lock data. Cybercriminals also engage in identity theft and financial fraud, exploiting digital platforms for credit card theft, online scams, and money laundering. They remain a persistent and evolving threat to digital security.
- **Nation-States** represent a significant threat, notably to national security, due to their involvement in sophisticated, long-term cyber operations known as advanced persistent threats (APTs). These activities are typically well-funded, highly targeted, and are driven by threat actors who are often highly motivated and well-educated. Their goal is to gather intelligence, gain strategic advantages, disrupt, or even destroy systems. The persistence and skill of these actors, combined with substantial funding, make their actions harder to detect and counter.
- **Terrorist Groups** leverage digital tools and cyber tactics to advance their agendas, often targeting critical systems to disrupt operations, spread propaganda, or instill fear. Their activities may include launching cyberattacks, exploiting vulnerabilities to gain access to sensitive systems, or using online platforms to recruit, fundraise, and coordinate their efforts. These groups pose significant threats by combining ideological motives with increasingly sophisticated cyber capabilities.
- **Thrill-Seekers** Thrill-Seeker are individuals motivated by excitement or the challenge of hacking into systems. They often lack malicious intent but enjoy testing their skills and exploring systems for personal satisfaction. Examples include:
    - **Script kiddies**, who use pre-made tools to disrupt systems without deep technical knowledge, and
    - **Gray hat hackers**, who exploit vulnerabilities to gain attention or highlight security flaws. While their actions may not always aim to cause harm, they can still result in unintended disruptions and pose risks to organizations.
- **Insider Threats** are increasing and can be categorized into the following types:
    - **Unintentional Insiders**: Also known as incautious insiders, these employees do not intend to cause harm but may inadvertently expose the organization to risks. This can result from careless actions, such as mishandling data, falling for phishing scams, or ignoring security protocols due to lack of awareness.
    - **Intentional Insiders**: Individuals who deliberately misuse their access to harm the organization, often for personal gain, such as financial reward, or to act on personal grievances. These insiders may act alone or collaborate with external threat actors. Although this type of insider threat is less common, this type of insider has the potential to cause a great deal of harm.
    - **Collusive Threats**: In this scenario, an insider collaborates with an external threat actor or another insider to exploit organizational systems, data, or resources. Collusive threats are

particularly dangerous because they combine internal access with external malicious intent, making detection and prevention more challenging.

- **Third-Party Threats**: These are risks posed by external vendors, contractors, or partners who have authorized access to certain organizational systems or data. Even though they are not employees, they can inadvertently or intentionally compromise security, especially if their security practices are weak or they become compromised by threat actors.

- **Hackers** are not all the same; the level of threat they pose, if any, varies widely, making it important to differentiate between the various types of hackers based on their motivations and actions. While hackers can present a threat, they are not inherently threat actors. Hackers use their technical skills to manipulate or explore systems, with intentions ranging from constructive problem-solving to malicious exploitation:
  - **Black Hat Hackers**: Operate with malicious intent, targeting systems to steal data, cause disruption, or exploit vulnerabilities for personal or financial gain.
  - **White Hat Hackers**: Ethical hackers who work with organizations to identify and fix vulnerabilities, enhancing cybersecurity defenses.
  - **Gray Hat Hackers**: Operate in a gray area, hacking into systems without permission to expose vulnerabilities, sometimes offering to fix them for a fee.
  - **Green Hat Hackers**: Beginners in the hacking community who are eager to learn from experienced hackers.
  - **Blue Hat Hackers**: Professionals hired by organizations to test systems for vulnerabilities before launch.
  - **Red Hat Hackers**: Focus on countering black hat hackers, often using aggressive tactics to stop malicious actors.
  - **Script Kiddies**: Inexperienced individuals who use pre-written scripts or tools to hack, motivated more by boredom or curiosity than technical knowledge.
  - **Hacktivists**: Politically or socially motivated hackers who use their skills to advance causes or ideologies.

Understanding these distinctions is critical to addressing cybersecurity threats while recognizing that not all hackers are malicious actors.

3.3.11.2 Location

The entire State of Alaska, including the City and Borough of Juneau and Tlingit & Haida are vulnerable to cybersecurity incidents. Any person, infrastructure, or entity that relies on the internet is vulnerable to cybersecurity threats.

3.3.11.3 History

The number of global cyber events has increased annually. The most significant and recent cyber event in Juneau (Dzantik'i Héeni) was the 2025 hacking of Juneau School District's Powerschool software. Appendix F highlights the history of cyber events in Alaska, as well as major global cyber events.

3.3.11.4 Extent

Cybersecurity threats and outcomes vary. The following table describes the types of attacks with examples of the threat and potential outcomes.

Table 31- Cybersecurity Threats and Potential Outcomes

Malware	Malicious software, such as viruses, worms, Trojans, ransomware, and spyware, is used to infect and compromise a computer or network. Malware can cause damage, steal information, or provide unauthorized access.
Phishing	Phishing attacks involve tricking individuals into revealing sensitive information, such as passwords or financial details, by posing as a legitimate entity. Phishing emails, websites, and messages are common tools for attackers.
Denial-of-Service	An attack that overwhelms a target system or network with traffic, rendering it inaccessible.
Distributed Denial-of-Service	An attack that involves multiple compromised devices (a botnet) flooding a target with traffic, making it impossible to function effectively.
Man-in-the-Middle	In these attacks, an attacker intercepts and possibly alters communications between two parties without their knowledge. This can lead to data interception, eavesdropping, or impersonation.
SQL Injection	Attackers inject malicious SQL code into input fields of a web application to manipulate a database, potentially gaining unauthorized access or extracting data.
Zero-Day Vulnerabilities	Attackers leverage security vulnerabilities in software or hardware that are not yet known to the vendor or public. These vulnerabilities are known as "zero-days."
Brute Force	Attackers attempt to gain access to an account or system by trying all possible password combinations until the correct one is found.
Dictionary	Attackers use precompiled lists of common passwords to guess login credentials.
Social Engineering	This involves manipulating individuals into divulging confidential information or performing actions that compromise security. It often relies on psychological manipulation.
Ransomware	Attackers encrypt a victim's data and demand a ransom in exchange for the decryption key. Payment does not guarantee data recovery, and it encourages further attacks.
Insider Attacks	Malicious or negligent actions by individuals within an organization can pose significant cybersecurity risks, as they may have access to sensitive information and systems.
Supply Chain	Attackers target suppliers, vendors, or partners to compromise the security of products or services, which can affect downstream organizations and consumers.
Internet of Things	Devices connected to the internet, such as smart appliances and sensors, can be targeted to gain unauthorized access or control.

Based on the lack of historical events, the magnitude and severity of cybersecurity events in the Planning Area are considered Negligible with the potential of minor injuries; no shutdown of critical infrastructure and facilities; scattered incidental residential and commercial structure damage; and few or no operations impacted for short amounts of time.

3.3.11.5 Impact

Cyber related impacts range from minimal disruptions to catastrophic depending on the length of the incident, sensitivity of data, affected systems (internal and external). For example, a stolen encrypted laptop could have a minimal impact where a ransomware attack which encrypts CBJ and T&H's data could have a catastrophic impact on their ability to continue to operate, economic loss, public confidence, as well as emergency responders' ability to respond.

Globally, cyberattacks were estimated to have cost 8 trillion dollars in 2023 (FBI 2023). That number is expected to be 9.5 trillion in 2024, 10.5 trillion in 2025, and 13.8 trillion by 2028 (FBI 2023).

The elderly and disabled are more vulnerable to cyberattacks due to limited digital literacy, dependence on technology for daily activities and medical supplies, and increased susceptibility to exploitation by cybercriminals.

Cyberattacks on critical infrastructure such as dams, traffic lights, and power grids have the potential to cause significant harm to public safety, the economy, the environment, and national security. Specific potential impacts may include:

- **Dam failure**: A cyberattack on a dam's control systems could lead to the failure of gates, valves, or even the dam itself. If the dam releases water unexpectedly, it could result in catastrophic flooding, affecting downstream communities, agriculture, and infrastructure. Dams are often essential for water supply, hydroelectric power generation, and irrigation. A failure could disrupt these services, leading to economic losses, particularly in agriculture and energy. The most notable potential dam failure concerning CBJ would be Salmon Creek Dam due to its importance to electricity generation to CBJ, and major roadways downstream of the dam and its potential inundation area.
- **Public safety**: A cyberattack on traffic control systems can cause widespread traffic light outages, resulting in severe congestion and traffic jams. In high-traffic areas, this could lead to accidents, including collisions, injuries, and fatalities. In the event of an emergency (fire, medical, or police), malfunctioning traffic lights could delay first responders, exacerbating the situation and potentially leading to more severe outcomes.
- **Power infrastructure**: Cyberattacks targeting the electrical grid can lead to massive power outages affecting entire cities or regions. This could last for hours, days, or longer, depending on the severity of the attack. A power outage could shut down critical infrastructure, including hospitals, water treatment plants, and communication networks, severely impacting daily life and public health.

Air Transportation Impacts: Cyberattacks targeting the JIA could lead to catastrophic repercussions in the region as a whole. Disruption of air traffic control and communications systems could result in aircraft grounding or crashes until the attack could be resolved. A cyber attack targeting ticketing systems, baggage handling, or gate assignments could result in disruption of flight schedules, missed flights by ticket holders, or prevent passengers from moving through security with their luggage. These attacks could last for hours or days. Due to the lack of alternative transportation options in the Planning Area, the impact of a cyberattack for even a short period of time could be severe.

3.3.11.6 Probability of Future Events

As the reliance on the internet and smart devices continues to grow, so does vulnerability. The number of cyberattacks continues to increase annually, and the costs of these attacks are estimated to increase to 13.8 trillion dollars by 2028 (DHS&EM 2025). See Appendix F for historic cyberattack details.

Based on the increasing number of cybersecurity events globally, it is Highly Likely (greater than 90% annual probability of occurring) that there will be an attempted cybersecurity event in the Planning Area in the calendar year; however, based on the security systems in place by the City and Borough of Juneau and Tlingit & Haida IT Departments, it is Possible that CBJ and T&H will experience an impactful cybersecurity event in the next five years; there is a 1 in 5 years chance of occurring (1/5=20%); and the history of events is greater than 10% but less than or equal to 20% likely per year.

The extent of these possible events may range from stealing an encrypted laptop to full data breach and data extortion that leaves CBJ and T&H without access to data, potential public lack of confidence in security, and financial implications.

3.3.11.7 Future Conditions Including Future Climate Conditions

Future climate conditions are not anticipated to influence future cybersecurity events in the Planning Area. Increases in population, accessibility to technology, and land use development (to support increases in population) will result in increases in instances of cyber threat due to the increase in users of the internet and smart devices. Decreases in population may result in decreases in cyber events due to decreased internet usage.

3.3.12 HAZARDOUS MATERIALS RELEASE

3.3.12.1 Nature

Hazardous materials incidents are an incredibly common hazard affecting communities. These events can happen at any scale, from poorly maintained vehicles leaking fluids onto roadways and parking spots to large scale incidents that can disrupt the normal functioning of a community as well as whole ecosystems. Because of the breadth of scope of hazardous materials incidents, many go unreported and undetected, further complicating mitigation efforts.

Hazardous materials incidents can be unintentional or intentional, like pouring household chemicals into the drain instead of disposing of them properly. Unfortunately, bad actors (individuals or groups who attack and invade digital systems with malicious intent) can exploit these necessary but hazardous materials to cause harm.

In addition to a standalone hazardous materials incident, naturals hazards such as floods can rupture tanks and overturn containers, create domino effects and compounding the difficulty of normal response and recovery activities.

The Federal Motor Carrier Safety Administration identifies nine classes of hazardous materials (FMCSA 2013):

1. Explosives
2. Gases
3. Flammable Liquid and Combustible Liquid
4. Flammable Solid, Spontaneously Combustible, and Dangerous When Wet
5. Oxidizer and Organic Peroxide
6. Poison (Toxic) and Poison Inhalation Hazard
7. Radioactive
8. Corrosive
9. Miscellaneous

The United Nations uses a similar but slightly different classification system, which was used in the 2010 Alaska Statewide Hazardous Material Commodity Flow Study. This system follows the same major categories but expands on sub-categories, providing finer detail.

United Nations Hazardous Materials Classification System

Classification	Definition
1	49 CFR Part 173.50 -- Explosive Materials. An explosive means any substance or article, unless otherwise classified, which is (a) designed to function by explosion, or (b) which (by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion.
1.1	Division 1.1 consists of explosives, which have a mass explosion hazard. A mass explosion is one, which affects almost the entire load instantaneously.
1.2	Division 1.2 consists of explosives, which have a projection hazard but not a mass explosion hazard.
1.3	Division 1.3 consists of explosives, which have a fire hazard and either a minor blast hazard or a minor projection hazard, or both, but not a mass explosion hazard.
1.4	Division 1.4 consists of explosives, which present a minor explosion hazard. The explosive effects are largely confined to the package, and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

United Nations Hazardous Materials Classification System

Classification	Definition
1.5	Division 1.5 consists of very insensitive explosives. This division is comprised of substances that have a mass explosion hazard, but they are so insensitive that they offer very little probability of initiation or of transition from burning to detonation under normal transport conditions.
1.6	Division 1.6 consists of extremely insensitive articles, which lack a mass explosive hazard. This division is comprised of articles which contain only extremely insensitive detonating substances, and which demonstrate a negligible probability of accidental initiation or propagation.
2	49 CFR Part 173.115 – Gas Materials
2.1	Division 2.1 means that any material that is a gas at 20C (68F) or less and 101.3 kPa (14.7 psi) of pressure, and that (a) is ignitable when in a mixture of 13% or less by volume with air, or (b) has a flammable range with air of at least 12%, regardless of the lower limit.
2.2	Division 2.2 materials are non-flammable, non-poisonous compressed gases including compressed gas, liquefied gas, pressurized cryogenic gas and compressed gas in solution. They include any material or mixture that (a) exerts in the packaging an absolute pressure of 280 kPa (41psia or greater at 20C (68F), and (b) does not meet the definition of Divisions 2.1 and 2.3.
2.3	Division 2.3 materials are gases that are poisonous by inhalation and are (a) known to be so toxic to humans that they pose a health hazard during transportation, or (b) in the absence of adequate data on human toxicity, are presumed toxic to humans because when tested on laboratory animals they have an LC50 value of not more than 5000 ml/m3.
3	49 CFR Part 173.120 – Flammable Liquid Materials
	A flammable liquid is (a) any liquid having a flash point of not more than 60.5C (141F), or (b) any material in a liquid with a flash point at or above 37.8C (100F) that is intentionally heated and offered for transportation, or transported, at or above its flash point in a bulk packaging. A distilled spirit of 140 proof or lower is considered to have a flash point no lower than 23C (73F).
	A combustible liquid is any liquid that does not meet the definition of any other hazard class and has a flash point above 60.5c (141F) and below 93C (200F). The classification of a material as a combustible liquid is strictly for transportation within the United States and is not recognized internationally. However, 49CFR Part 173.120(b)(2) provides for Class 3 Flammable Materials with flash points at or above 38C (100F) and up to 60.5C (141F) which do not meet the definition of any other hazard class, to be reclassified as combustible liquids for transportation by highway and rail. For shipments involving any air, water, or international movement, these materials are Class 3 Flammable Materials.
4	49 CFR Part 173.124 – Flammable Solid Materials
4.1	Division 4.1 Flammable Solid includes any of the following three types of flammable solid material: Wetted explosives, which, when dry, are explosives of Class 1, other than those of compatibility group A, which, when wetted, suppress the explosive properties, and materials specifically authorized by name in the HMT or by the Associate Administrator for Hazardous Materials Safety. Self--reactive materials that are liable to undergo, at normal or elevated temperatures, a strongly exothermal decomposition caused by excessively high transport temperatures or by contamination. Readily combustible solids that may (a) cause a fire through friction, or (b) show a burning rate faster than 2.2 mm (0.087 inch) per second under specified test procedures, or any metal powders that can be ignited and react over the whole length of a sample in ten minutes or less under specified test procedures.

United Nations Hazardous Materials Classification System

Classification	Definition
4.2	Division 4.2 Spontaneously Combustible material includes (a) liquid or solid pyrophoric material, which (even in small quantities and without an external ignition source), can ignite within five minutes after coming in contact with air under specified test procedures, or (b) self heating material which (when in contact with air and without an energy supply), is liable to self--heat and which exhibits spontaneous ignition, or under specified test procedures would be classed as a Division 4.2 material.
4.3	Division 4.3 Dangerous When Wet material are ones which (a) by contact with water are liable to become spontaneously flammable, or (b) give off flammable or toxic gas at a rate greater than one liter per kilogram of material per hour under specified test procedures.
5	49 CFR Part 173.127 & 128 – Oxidizer & Organic Peroxide Materials
5.1	Division 5.1 Oxidizer material is a material which may (generally by yielding oxygen), cause or enhance the combustion of other materials.
5.2	Division 5.2 Organic Peroxide material is any organic compound containing oxygen (O) in the bivalent --O--O-- structure which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals, with some exceptions.
6	49 CFR Part 173.132 & 134 – Poison Materials
6.1	Division 6.1 those materials, other than gases, which (a) are known to be so toxic to humans as to afford a hazard to health during transportation, or (b) in the absence of adequate data on human toxicity, are presumed to be toxic to humans because they fall within specified oral, dermal, or inhalation toxicity ranges when tested on laboratory animals, or (c) are irritating materials (with properties similar to tear gas), which cause extreme irritation, especially in confined spaces.
6.2	Division 6.2 materials are (a) infectious substances which are viable microorganisms (or their toxins) which cause or may cause disease in humans or animals., (b) those agents listed in 42CFR part 72.3 of the Department of Health and Human Services regulations, or (c) any other agents which cause or may cause severe disabling or fatal disease.
7	49 CFR Part 173.403 – Radioactive Materials
	A Radioactive Material is any material having a specific activity greater than 0.002 micro curie per gram (MCi/g).
8	49 CFR Part 173.136 – Corrosive Materials
	A Corrosive Material is a liquid or solid which causes visible destruction or irreversible alteration in human skin tissue at the site of contact, or a liquid which has a severe corrosion rate on steel or aluminum in accordance with specified criteria.
9	49 CFR Part 173.140 – Miscellaneous Materials
	A Miscellaneous Hazardous Material is one which presents a hazard during transportation but does not meet the definition of any other hazard class. This includes (a) any material, which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to any employee to prevent the performance of assigned duties, or (b) any material which meets the definition in 49CFR Part 171.8 for an elevated temperature.
ORM--D	49 CFR Part 173.144 – Other Regulated Materials

United Nations Hazardous Materials Classification System

Classification	Definition
	An ORM--D Material is a material such as a consumer commodity, which (although otherwise subject to the regulations) presents a limited hazard during transportation because of its form, quantity, and packaging. It must be a material for which exceptions are provided in the HMT. In addition to the limited quantity exceptions from labeling, specification packaging and placarding, ORM--D materials are also excepted from the shipping paper requirements unless the material is a hazardous substance, hazardous waste, marine pollutant, or the material is offered or intended for transport by air.

Source: ADEC 2010

ADEC identifies multiple pathways which, when present, can lead to human exposure to contaminants. It follows a path from release mechanism to impacted media, receptors, and exposure pathway.

Release Mechanism	
Spills	Leaks
Direct Discharge	Burning
Impacted Media	
Surface Soil (0-2 feet below ground surface)	Subsurface soil (2-15 feet below ground surface)
Air	Sediment
Groundwater	Surface water
Biota	
Exposure Pathways	
Direct Contact	Incidental Soil Ingestion
	Dermal Absorption of Contaminants from Soil
	Dermal Absorption of Contaminants in Groundwater and Surface Water
Ingestion	Ingestion of Groundwater
	Ingestion of Surface Water
	Ingestion of Wild and Farmed Foods
Inhalation	Inhalation of Outdoor Air
	Inhalation of Indoor Air
	Inhalation of Volatile Compounds in Tap Water
	Ingestion of Fugitive Dust

Source: Guidance on Developing Conceptual Site Models, ADEC 2017

The physical state or characteristic of a hazardous material changes the possible exposure pathways and how humans or the environment may be impacted by the material.

Aerosol releases enter the surrounding atmosphere as a gas, sometimes because of a fire. They are spread because of wind and geography. These releases can spread vast distances and potentially affect communities very quickly, particularly at-risk community members such as the young, elderly, or infirm.

Terrestrial liquid releases come from land-based sites, storage, or transportation; as they spread, their hazardous materials can infiltrate the soil, groundwater, and runoff into nearby waterbodies or municipal drainage systems.

Marine liquid releases occur offshore generally due to accidents aboard ships transporting hazardous materials or using them for onboard operations. These releases spread depending on the tides, wind, and bathymetry; and they can affect marine, tidal, and onshore ecosystems.

Particulate matter is a solid or liquid particle, like aerosol releases. Harmful particulate matter, measure less than 10 micrometers, with those measuring less than 2.5 micrometers posing the greatest risk to human health. These miniscule particles are inhalable, capable of damaging lungs and entering bloodstreams. They can be released directly from a source such as a construction sites, fields, unpaved roads, smokestacks, or fires. Additionally, they can be created as reactions of simpler compounds, such as sulfur dioxide and nitrogen oxides, common pollutants emitted from power plants, industry, and combustion engines (EPA 2024).

Based on the historical hazardous materials incidents in the Planning Area, the following types of contaminants have been released:

Ammonia (anhydrous)	Gasoline	Propylene Glycol
Asphalt	Glycol (other)	Sodium Hypochlorite
Aviation Fuel	Grease	Solvent
Bilge Oil	Hydraulic Oil	Synthetic Oil
Bunker Fuel	Hydrochloric Acid	Tetrachloroethene
Chlorine	Kerosene	Transformer Oil
Creosote	Lead	Transmission Oil
Diesel Fuel	Mill Slurry	Urea
Gear Oil	Perchloroethylene	Used Oil
Ethylene Glycol	Process Water	Zinc and Zinc Slurry
Fluorinated Fire foam	Propane	Unknown substances

Source: ADEC 2025

Other hazardous materials include per- and polyfluoroalkyl substances (PFAS) or “forever” chemicals. Juneau receives waste materials from cruise ships (currently unregulated for PFAS contaminants) and rural SE communities, which has the potential to introduce PFAS into the wastewater treatment system, solid waste system, and the surrounding environment.

3.3.12.2 Location

Hazardous materials releases can occur anywhere within a community, due to their nature, scope of scale, and the fact that they are often caused by human actions and errors. However, there are locations and activities at these locations associated with larger, more harmful releases. These locations include major air, marine, and roadway transportation routes; industrial areas which use, process, or produce hazardous materials; and contaminated sites such as brownfields, superfund sites, and disused or dilapidated industrial areas.

The Planning Area receives all shipping via the JIA and marine vessels. The 2010 Alaska Statewide Hazardous Material Commodity Flow Study, the most recent commodity flow study, lists the Inside Passage as the 3rd largest marine corridor for hazardous materials by volume. It was recorded that 3,803,035 pounds of hazardous materials travelled through the Inside Passage over the 3-year period 2007-2009. The Inside Passage is also the largest passage for Hazard Classes 1.1 (mass explosives) and 1.5 (very insensitive explosives), as well as within the top 5 marine corridors for classes 1.4 (minor hazard explosives), 3 (flammable liquids), 5.1 (oxidizer material), 5.2 (organic peroxide material), 7 (radioactive material), 8

(corrosive material), and 9 (miscellaneous hazardous material). Particularly, the Inside Passage is within the top 5 marine corridors for the following substances: bromine, mercuric chloride, and nitric acid. While there is significant data from the Inside Passage, airline carriers were not compelled to report commodity flow data, leading to a data gap for hazardous materials transported by air, not a false negative of their presence. There are no routes by pipeline or rail included in this HMP update.

In addition to the transportation of hazardous materials, mapping historical spills creates a heatmap of activity, helping to identify problem areas or repetitive spills. At the same time, this data relies upon reported releases, meaning that irresponsible industrial sites or illegal dumping may not be captured properly by historical mapping.

The figures below show historical spills, contaminated sites, and solid waste sites, respectively. Currently, there are 62 open contaminated sites in the Planning Area (DEC 2025).

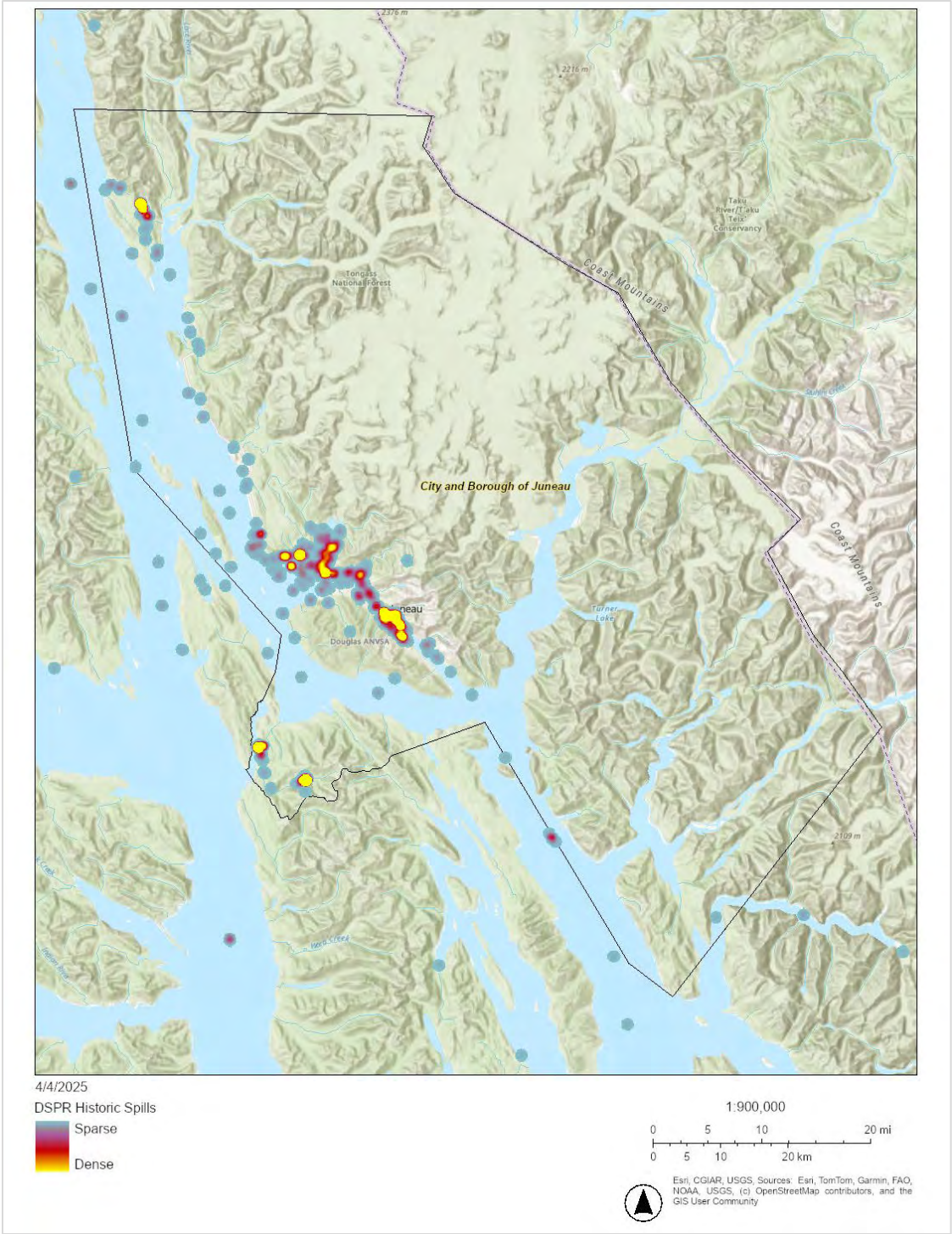


Figure 121- History and Concentration of Hazardous Materials Incidents in Juneau and Traditional Lands of Tlingit & Haida

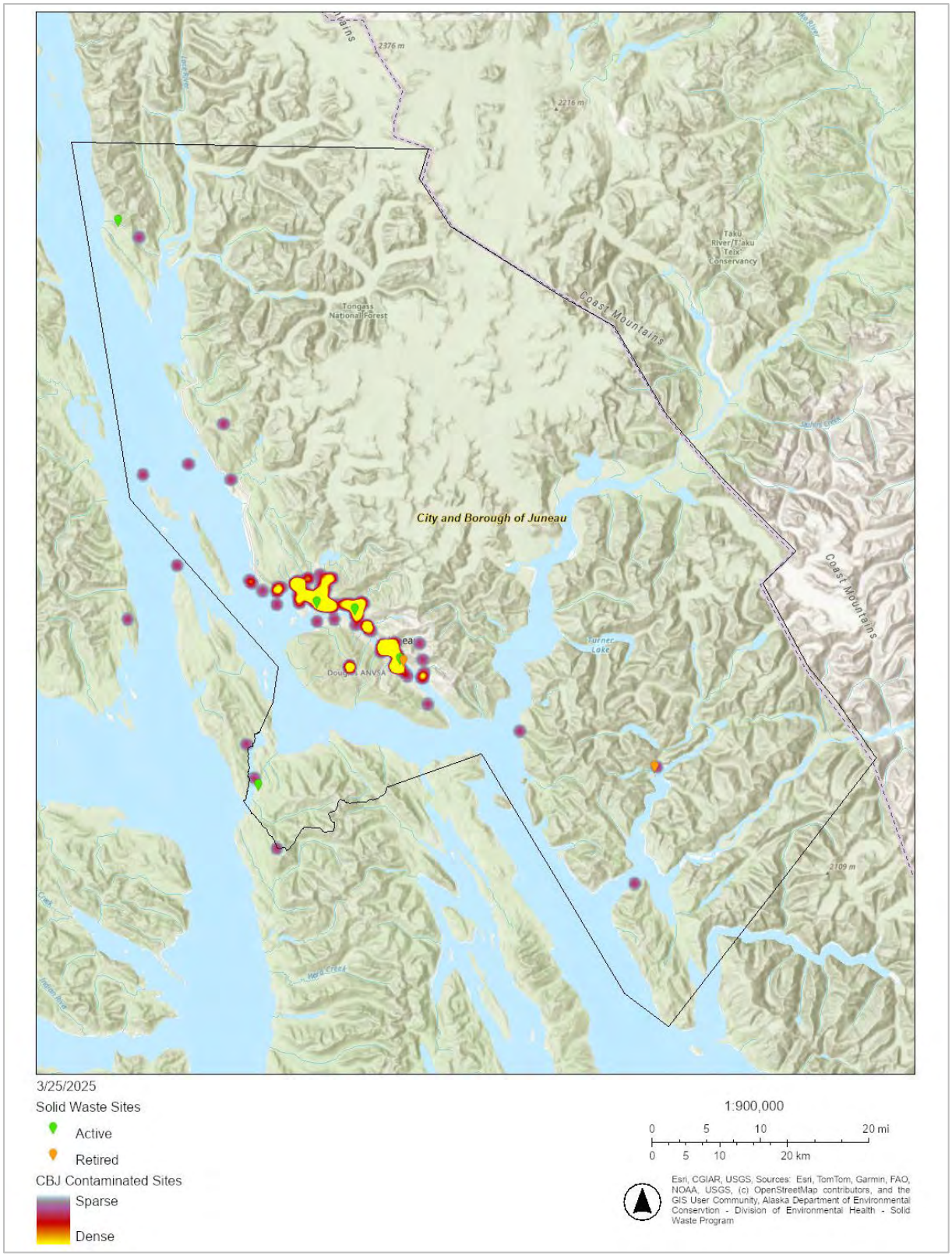


Figure 122- Contaminated Sites and Solid Waste Sites in Juneau and Traditional Lands of Tlingit & Haida

Due to its remote location, bulk fuel facilities are critical to Juneau and Traditional Lands of Tlingit and Haida's ability to respond to emergencies and support daily life. There are currently 33 bulk fuel facilities in the planning area with a fuel capacity ranging from 1,000 to 200,000 gallons, with a total capacity of 670,000 gallons. These diesel and gas facilities are a combination of federal, state, municipal, and privately owned property.

3.3.12.3 History

The Planning Area experiences a variety of hazardous materials release annually, with many releases stemming from mining operations. Between January 1, 2012, and April 1, 2025, the Planning Area experienced 3,113 recorded releases or spills. Based on historical data, the Planning Area experiences upwards of 10 hazardous materials releases per month (ADEC 2025). See Appendix F for a comprehensive list of different types of releases that the planning area experiences annually.

3.3.12.4 Extent (Magnitude and Severity)

The extent of a hazardous materials incident is linked directly to the quantity of the release and the local conditions at the time of incident, such as incident scope, material in question, method of incident, affected media, and local weather conditions. These variables make each release unique and, thus, that much more difficult to predict and mitigate. Table 32 below shows the historical releases with the greatest extents for their category of substance in the Planning Area, from 1-gallon events to a 105,581-gallon release of mill slurry on January 31, 2024. The table captures historic releases from when the last HMP was updated in 2012 to 2025.

Table 32- History and Extent of Hazardous Materials Incidents in Juneau and Traditional Lands of Tlingit & Haida

Extremely Hazardous Substance						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
2/7/2014	Other	Container, Other	Hydrochloric Acid	1	Gallons	Intentional Release
11/12/2014	Mining Operation	Container, Other	Hydrochloric Acid	200	Gallons	Human Error
4/29/2024	Mining Operation	Tank, Other, Mobile	Ammonia (Anhydrous)	1	Pounds	Overfill
8/10/2024	Vessel	Other	Chlorine	200	Gallons	Equipment Failure
Hazardous Substance						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
1/29/2012	Air Transportation	Heavy Equipment	Ethylene Glycol (Antifreeze)	600	Gallons	Intentional Release
3/12/2012	Mining Operation	Container, Other	Other	300	Gallons	Human Error
12/20/2013	Mining Operation	Other	Zinc	1,200	Pounds	Puncture
2/24/2014	Other	Refrigeration System	Propylene Glycol	100	Gallons	Equipment Failure
3/14/2019	Mining Operation	Fuel Pump	Urea (Solid)	100	Gallons	Other
8/3/2019	Vessel	Other	Other	2,378	Gallons	Human Error
9/17/2019	Bulk Fuel Terminal	Fire Suppression System	Firefoam-fluorinated<=2016	925	Gallons	Equipment Failure

Hazardous Substance						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
9/17/2019	Bulk Fuel Terminal	Fire Suppression System	Firefoam-fluorinated<=2016	100	Gallons	Other
12/18/2019	Mining Operation	Container, Other	Other	50	Gallons	Human Error
1/26/2020	Mining Operation	Other	Other	325	Gallons	Collision/Allision
2/21/2020	Mining Operation	Pipe or Line	Ethylene Glycol (Antifreeze)	170	Gallons	Equipment Failure
3/3/2020	Other	Tank, Other	Other	200	Gallons	Equipment Failure
9/30/2020	Commercial/ Retail/Office	Refrigeration System	Propylene Glycol	50	Gallons	Leak
2/18/2021	Highway Maintenance Station	Tank, Other, Aboveground	Other	10,000	Gallons	Human Error
5/12/2021	Mining Operation	Container, Other	Ethylene Glycol (Antifreeze)	100	Gallons	Human Error
6/1/2022	Mining Operation	Heavy Equipment	Other	40,000	Pounds	Rollover/Capsize
8/19/2022	Mining Operation	Pipe or Line	Other	100	Gallons	Line Failure
11/8/2023	Air Transportation		Propylene Glycol	300	Gallons	Line Failure
1/12/2024	Mining Operation	Other	Zinc Slurry	3,600	Gallons	External Factors
1/31/2024	Mining Operation	Pipe or Line	Mill Slurry	105,581	Gallons	Line Failure
3/14/2024	Mining Operation	Tank, Other, Aboveground	Other	370	Gallons	Human Error
6/6/2024	Mining Operation	Other	Other	220	Gallons	Human Error
10/24/2024	Mining Operation	Other	Other	180	Gallons	Human Error
10/31/2024	Mining Operation	Container, Other	Other	60	Gallons	Human Error
11/12/2024	Other	Tank, Other	Firefoam-fluorinated >2016	77	Gallons	Human Error

Non-Crude Oil						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
4/16/2016	Air Transportation	Tank, Other	Aviation Fuel	500	Gallons	Overfill
4/17/2016	Air Transportation	Unknown	Aviation Fuel	440	Gallons	Leak
1/3/2017	Air Transportation	Other	Aviation Fuel	300	Gallons	Equipment Failure
1/3/2017	Air Transportation	Other	Aviation Fuel	275	Gallons	Overfill

Non-Crude Oil						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
5/6/2018	Air Transportation	Other	Aviation Fuel	400	Gallons	Leak
6/28/2018	Air Transportation	Tank, Other, Mobile	Aviation Fuel	300	Gallons	Overfill
3/12/2019	Air Transportation	Tank, Other, Mobile	Aviation Fuel	250	Gallons	Overfill
3/18/2019	Bulk Fuel Terminal	Pipe or Line	Aviation Fuel	500	Gallons	Human Error
6/14/2019	Other	Other	Asphalt	700	Gallons	Human Error
5/14/2020	Vehicle	Pipe or Line	Aviation Fuel	500	Gallons	Human Error
9/18/2020	Air Transportation	Tank, Other, Mobile	Aviation Fuel	250	Gallons	Other
11/3/2020	Air Transportation	Tank, Other, Mobile	Aviation Fuel	250	Gallons	Equipment Failure
5/21/2021	Air Transportation	Pipe or Line	Aviation Fuel	500	Gallons	Line Failure
5/21/21	Air Transportation	Pipe or Line	Aviation Fuel	300	Gallons	Line Failure
6/11/2021	Commercial/Retail/Office	Unknown	Asphalt	700	Gallons	Unknown
10/22/2021	Air Transportation	Tank, Other, Mobile	Aviation Fuel	500	Gallons	Collision/Allision
10/22/2021	Air Transportation	Tank, Other, Mobile	Aviation Fuel	250	Gallons	Collision/Allision
11/26/2021	Bulk Fuel Terminal	Tank, Other, Aboveground	Aviation Fuel	500	Gallons	Valve Failure
8/5/2022	Commercial/Retail/Office	Tank, Other, Aboveground	Asphalt	1640	Gallons	Unknown
8/5/2022	Commercial/Retail/Office	Tank, Other, Aboveground	Asphalt	1000	Gallons	Unknown
9/17/2022	Other	Tank, Other, Mobile	Asphalt	615	Gallons	Containment Overflow
10/12/2022	Commercial/Retail/Office	Fuel Pump	Aviation Fuel	350	Gallons	Unknown
10/18/2022	Air Transportation	Fuel Pump	Aviation Fuel	340	Gallons	Overfill
11/14/2022	Air Transportation	Tank, Other, Mobile	Aviation Fuel	300	Gallons	Overfill
12/13/2022	Air Transportation	Other	Aviation Fuel	300	Gallons	Human Error

Process Water						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
6/2/2013	Mining Operation	Pipe or Line	Process Water	100	Gallons	Containment Overflow
8/4/2018	Mining Operation	Container, Other	Process Water	800	Gallons	Equipment Failure
3/8/2022	Mining Operation	Tank, Other, Aboveground	Process Water	600	Gallons	Overfill
3/15/2024	Mining Operation	Heavy Equipment	Process Water	100	Gallons	Equipment Failure

Process Water						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
8/17/2024	Mining Operation	Tank, Other	Process Water	200	Gallons	Equipment Failure
10/5/2024	Mining Operation	Pipe or Line	Process Water	50	Gallons	Human Error
1/5/2025	Mining Operation	Other	Process Water	101	Gallons	Equipment Failure

Unknown Substance						
Spill Date	Facility Type	Source Type	Substance SubType	Quantity Released	Substance Unit	Cause SubType
5/30/2012	Unknown	Unknown	Unknown	10	Gallons	Unknown
6/20/2012	Unknown	Unknown	Unknown	15	Gallons	Unknown
7/21/2012	Unknown	Unknown	Unknown	2	Gallons	Unknown
9/14/2012	Unknown	Unknown	Unknown	10	Gallons	Unknown
10/9/2012	Unknown	Unknown	Unknown	2	Gallons	Unknown
11/2/2012	Unknown	Unknown	Unknown	5	Gallons	Unknown
4/4/2013	Unknown	Unknown	Unknown	5	Gallons	Unknown
11/4/2013	Other	Unknown	Unknown	10	Gallons	Unknown
4/5/2014	Unknown	Unknown	Unknown	5	Gallons	Unknown
5/22/2014	Residence	Tank, Heating, Underground	Unknown	250	Gallons	Corrosion
6/23/2014	Unknown	Unknown	Unknown	5	Gallons	Unknown
9/7/2014	Vehicle	Unknown	Unknown	5	Gallons	Vehicle Leak, All
2/25/2015	Harbor/Port/Marina	Unknown	Unknown	5	Gallons	Unknown
5/12/2015	Air Transportation	Unknown	Unknown	15	Gallons	Unknown
8/11/2016	Unknown	Unknown	Unknown	5	Gallons	Unknown
6/27/2017	Harbor/Port/ Marina	Tank, Other, Mobile	Unknown	10	Gallons	Sinking
7/25/2017	Other	Container, Other	Unknown	2	Gallons	Cargo Not Secured
2/11/2018	Harbor/Port/ Marina	Unknown	Unknown	5	Gallons	Unknown
7/16/2021	Other	Drum(s)	Unknown	10	Gallons	Unknown
3/16/2023	Harbor/Port/ Marina	Drum(s)	Unknown	5	Gallons	Human Error
2/16/2024	Unknown	Unknown	Unknown	2	Gallons	Unknown
6/15/2024	Vessel	Unknown	Unknown	3.5	Gallons	Unknown
6/25/2024	Water/ Wastewater Facility	Unknown	Unknown	50	Gallons	Unknown
7/29/2024	Vessel	Unknown	Unknown	1	Gallons	Unknown
12/4/2024	Other	Drum(s)	Unknown	45	Gallons	Cargo Not Secured

Based on number and size of historical events and the criteria identified in Table 10, the magnitude and severity of hazardous materials incidents in the Planning Area is considered Limited to Negligible, with injuries and/or illnesses that do not result in permanent disability or are treatable by first aid; minor quality

of life lost, shutdown of some critical facilities for 24 hours to a week, and more than 10% of property is severely damaged.

3.3.12.5 Impact

The impact of a hazardous materials incident will depend upon the nature of the material as well as its location and extent.

Residents who live, work, and recreate nearby incidents will be affected to a greater degree than those farther from a gaseous or airborne source. Residents with asthma, breathing issues, and the elderly, young, and sick will be particularly affected by such an incident.

Flora and fauna may also be affected by the incident. Releases that enter waterbodies may affect the waterbody itself, the life within, and the surrounding soil, creating contamination that may require significant effort to remediate. Those contaminants may enter the food chain, affecting everything from algae to humans if they come into direct contact with the contaminated water or eat contaminated fish, wildlife, or vegetation.

Acute health effects from a hazardous materials release can include:

- Chemical Exposure: Depending on the type of hazardous material, exposure can lead to symptoms such as respiratory distress, skin burns, eye irritation, nausea, vomiting, and headaches.
- Toxicity: Exposure to highly toxic substances can cause severe poisoning, organ damage, and even death.
- Asphyxiation: Some hazardous materials, like certain gases, can displace oxygen and lead to asphyxiation when inhaled in high concentrations.
- Physical Injuries: Explosive releases or fires involving hazardous materials can cause physical injuries such as burns, cuts, and blunt force trauma.
- Psychological Trauma: Witnessing or being affected by a hazardous materials incident can lead to psychological trauma, including post-traumatic stress disorder and anxiety.

Long-term health effects from a hazardous materials release can include:

- Chronic Illnesses: Exposure to hazardous materials may lead to chronic health conditions, including cancer, respiratory diseases, neurological disorders, and reproductive problems.
- Delayed Effects: Some hazardous substances have delayed health effects, with symptoms appearing days, months, or even years after exposure.

Additionally, a hazardous material release can result in impacted populations requiring:

- Evacuation: To protect public safety, authorities may order evacuations of affected areas, displacing residents from their homes.
- Temporary Shelter: Evacuated individuals may require temporary shelter, food, and medical care.

While all citizens are vulnerable to the effects of hazardous materials, the socially vulnerable and at-risk populations are at most risk. These populations may have difficulty with medical issues, poverty, extremes in age, and communications due to language barriers. These populations suffer a disproportionate impact due to:

- Constrained financial resources potentially hampering evacuation
- Limited access to healthcare
- Limited access to information

Air Transportation Impacts: Air transportation impacts associated with hazardous materials vary. Spills of hazardous materials at airport infrastructure may result in flight delays and costs associated with

cleanup and in major events have occurred in-flight resulting in aircraft crashes and loss of life.

3.3.12.6 Probability of Future Events

Based on the history of previous events and the criteria identified in Table 11, it is Highly Likely that the City and Borough of Juneau and Tlingit & Haida will experience a hazardous material incident of any magnitude in the calendar year; there is a 100% annual probability of occurrence. This is due directly to the everyday nature of smaller spills such as poorly maintained vehicles and traffic accidents that spill coolant, oil, and fuel into roadways and drainage systems. On the other hand, larger incidents have a much lower probability but a significantly higher potential extent and impact.

3.3.12.7 Future Conditions

Changing Factor	Description of Future Conditions
Location	It is unlikely that future climate conditions will affect the nature of hazardous materials events in Juneau and Traditional Lands of Tlingit & Haida.
Extent (Magnitude/Severity)	Future climate conditions are altering the location of natural hazards such as, extreme weather, and wildfires; and facilities which do not have experience with these types of hazards may not be prepared to address them. As future climate conditions intensifies natural hazards, it is possible that new locations which produce, store, and transport hazardous materials may be affected.
Impact	As future climate conditions intensifies natural, it is possible that local response times will increase with severity of events. As response times increase, hazardous materials releases may go unaddressed for longer, permitting much greater release volumes and spread.
Probability of Future Events	As future climate conditions intensifies natural hazards, the associated increase in extent of hazardous materials releases will increase potential impact of these events. With new locations and longer releases over larger areas, it is possible that a higher volume of released material has a greater chance of affecting populations, ecosystems, and the environment near and far from the release site.
Population Patterns	It is possible that future climate conditions will influence the probability of future hazardous materials incidents. While smaller spills and releases are already highly likely within a year and happen frequently from residential sources or traffic accidents, the rising intensity and frequency of natural hazards that may result in a hazardous materials incident will likely increase the probability of larger incidents from producers, transporters, and storage facilities. Population patterns are impacted when spills result in long-term removal and remediation where contaminants are not compatible with residential locations. If future spills occur in populated areas, residents could relocate to other areas.
Land Use Development	It is possible that future hazardous materials incidents will influence population patterns and where people will want to live. As many natural hazards are intensifying and becoming more frequent due to future climate conditions, increased hazardous materials incidents may force people to move away from hazardous areas. For instance, if a storm causes a chemical plant to leak or spill, nearby populations might be forced to relocate quickly to avoid exposure to toxic substances or drinking water supplies. If there are historic or potential incidents, residents may seek to live as far from the source as possible.

3.4 SUMMARY OF VULNERABILITY

This section outlines the risk and vulnerability processes from various hazard impacts in determining potential losses for the community.

This section addresses the remaining portion of Element B of the Local and Tribal Mitigation Plans regulation checklists.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT B. Risk Assessment
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii)) B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards? B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction? B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMENT B. Hazard Identification and Risk Assessment
B3. Does the plan include an overall summary of the vulnerability of the tribal planning area? [44 CFR § 201.7(c)(2)(ii)]
Source: FEMA 2017 (Tribal)

3.4.1 VULNERABILITY OVERVIEW

A vulnerability analysis estimates the exposure extent that may result from a hazard event, within a given area and with a given intensity. This analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures. This then allows the communities to focus their efforts and attention on areas with the greatest risk of damage.

The City and Borough of Juneau and Tlingit & Haida (Juneau assets) are in the same geographic area, and thus, experience the same vulnerability to hazards.

Table 33 shows the overview of the City and Borough of Juneau and Tlingit & Haida's infrastructure hazard vulnerability.

Table 33- Vulnerability Overview

Hazard	Area's Hazard Vulnerability			
	% of CBJ's Critical Facilities	% of T&H's Critical Facilities	% of Residences	% of Population
Earthquake	75/75= 100%	32/32= 100%	12,757/12,757= 100%	31,382/31,382= 100%
Severe Weather	75/75= 100%	32/32= 100%	12,757/12,757= 100%	31,382/31,382= 100%
Wildland Fire and Urban (Community/Downtown) Fire	75/75= 100%	32/32= 100%	12,757/12,757= 100%	31,382/31,382= 100%
Landslide	16/75=21%	13/32= 41%	1,126/12,757= 9%	2,770/31,382= 9%
Tsunami	9/75=12%	1/32= 3%	1,049/12,757= 8%	2,581/31,382= 8%
Flood	12/75=16%	6/32= 19%	2,410/12,757= 19%	5,929/31,382= 19%
Shoreline/Bank Destabilization	26/75=36%	0/32= 0%	1,844/12,757= 14%	4,536/31,382= 14%

Table 33- Vulnerability Overview

Hazard		Area's Hazard Vulnerability			
		% of CBJ's Critical Facilities	% of T&H's Critical Facilities	% of Residences	% of Population
Changes in the Cryosphere	Glacier	11/75=15%	1/32= 3%	4,576/12,757= 36%	11,257/31,382= 36%
	Avalanche	1/75= 1%	0/32= 0%	189/12,757= 1%	465/31,382= 1%
Volcano		75/75= 100%	32/32= 100%	12,757/12,757= 100%	31,382/31,382= 100%
Cybersecurity		75/75= 100%	32/32= 100%	12,757/12,757= 100%	31,382/31,382= 100%
Hazardous Materials		75/75= 100%	32/32= 100%	12,737/12,757= 99%	31,333/31,382= 99%
Dam Failure		34/75= 45%	2/32= 6%	98/12,757= 1%	241/31,382= 1%

3.4.2 Cultural and Sacred Site Sensitivity

The Planning Team has reviewed the hazard areas and where cultural and sacred sites fall within those areas. This information is considered sensitive and confidential and questions regarding this information should be addressed to the Tlingit and Haida Emergency Manager.

3.4.3 Population and Building Stock

The number of parcels in the Planning Area was calculated using the most current (2024) CBJ parcel data. The total number of parcels was filtered for residential units, filtered to remove any duplicated Site Addresses, and then multiplied by a unit multiplier. The unit multiplier (M) was assigned for each residential type to account for multiple groups living on the same parcel.

Apartment (M=8), Cabin (M=1), Condo lot (M=10), Duplex (M=2), Economic unit (M=1), Fourplex (M=4), Mobile home park (M=80), Mobile on lot (M=1), Single family (M=1), Single family with apartment (M=2), Townhouse (M=1), Triplex (M=3), Zero lot line (M=2).

(In property assessment, an "economic unit" refers to a group of parcels that are used together for a shared economic purpose, regardless of whether they are contiguous or owned by the same entity. This concept is crucial for determining the overall value of the property for tax purposes.)

# of affected parcels x unit multiplier (M) = # of residences

The value of residences was determined by multiplying the number of residences by an estimated replacement cost per housing type. The estimated replacement cost was determined by using a 2022 HUD dataset (*Total Development Cost (TDC) for Affordable Housing Under the Native American Housing Assistance and Self-Determination Act of 1996 (NAHASDA)*) replacement values for the Tlingit & Haida and Douglas Indian Association Tribes. This dataset accounts for additional costs of labor and materials in Alaska and is more accurate than US Census values.

1-bedroom: $486,015 (Apartment, Mobile home park, Mobile on lot)

3-bedroom: $615,771 (Cabin, Condo lot, Duplex, Economic unit, Fourplex, Single family, Townhouse, Triplex, Zero lot line)

5-bedroom: $728,750 (Single family with apartment)

# of residences x replacement cost = $ of residences

The number of people/total population was determined by multiplying the average number of people per household (2.46) by the number of residences.

average number of people per household x # of residences = # of people (total population)

Note: The Alaska Department of Labor and Workforce Development (DOLWD) reported that Juneau (Dzantik'i Héeni) and Traditional Lands of Tlingit & Haida's 2024 population was 31,436. There is a slight discrepancy in total population (-54 people) due to the methodology used in this Risk Assessment. The estimated population was determined by multiplying the total number of residences by the average number of people per household (2.46).

Table 34- Estimated Population and Residential Building Inventory

Housing Type	Replacement Value (each)	Unit multiplier	# of parcels	# of residences	# of people	$ of residences
	RC	M	P	R= M x P	= R x 2.46	= R x RV
Apartment	1 bedroom- $486,015	8	103	824	2,027	$400,476,360
Mobile home park		80	15	1200	2,952	$583,218,000
Mobile on lot		1	224	224	551	$108,867,360
Cabin	3 bedroom- $615,771	1	33	33	81	$20,320,443
Condo lot		10	75	750	1,845	$461,828,250
Duplex		2	308	616	1,515	$379,314,936
Economic unit		1	22	22	54	$13,546,962
Fourplex		4	107	428	1,053	$263,549,988
Single family		1	5,028	5,028	12,369	$3,096,096,588
Townhouse		1	192	192	472	$118,228,032
Triplex		3	44	132	325	$81,281,772
Zero lot line		2	854	1,708	4,202	$1,051,736,868
Single family with apartment	5 bedroom- $728,750	2	800	1,600	3,936	$1,166,000,000
		Total:	**7,805**	**12,757**	**31,382**	**$7,744,465,559**

3.4.4 VULNERABILITY ASSESSMENT METHODOLOGY

An analysis was conducted to assess the risks of each identified hazard. This analysis looked at the potential effects of each hazard on values of critical facilities at risk without considering the probability or level of damage. The analysis also represents the number of people at risk from each hazard but does not estimate the number of potential injuries or deaths.

The critical facilities identified in the 2012 HMP were used as the foundation to complete this analysis. The Planning Team provided information on newly constructed facilities and these critical facilities were then mapped using GIS and the most current tax assessed values were used for the estimated value. Publicly available GIS layers regarding Juneau and Traditional Lands of Tlingit & Haida's risk to natural hazards were then overlayed on the critical facilities layer to complete the risk assessment.

Hazard	Methodology
Earthquake	Earthquake hazard areas were identified using the 2023 State of Alaska HMP GIS hazard layers.
Severe Weather	It is assumed that all identified critical facilities and residences (100%) are threatened by severe weather.
Wildland and Community Fire	Wildland Fire: The LANDFIRE (Landscape Fire and Resource Management Planning Tools Project) 2024 Update data, which was released in April 2025, was used to assess Juneau and Traditional Lands of Tlingit & Haida's wildfire exposure, and relative risk. Community Fire: It is assumed that all identified critical facilities and residences (100%) are threatened by community fire.

Hazard	Methodology
Tsunami	Tsunami hazard areas were identified through DGGS tsunami inundation mapping the Planning Area. The Composite Landslide scenario was used to determine the critical facilities and residences at risk of the worst-case scenario of a tsunami. The "worst-case" inundation line encompasses the maximum extent of flooding from all model simulations of all source scenarios and historical observations.
Landslide	Subaerial landslide hazard areas were identified through the 2022 TetraTech study "*Downtown Juneau Landslide and Avalanche Hazard Assessment*". GIS layers of these hazard areas were provided to CBJ and the consultant for use. This analysis only produced landslide hazard areas in the Downtown Juneau area. Landslide areas outside of Downtown Juneau were not assessed as this data was not available at the time of this HMP Update process. This is an identified data gap and if this data becomes available, future versions of this HMP may assess additional landslide areas in Juneau and Traditional Lands of Tlingit & Haida. Submarine landslide hazard areas were identified through the 2017 DGGS tsunami inundation modelling report. Submarine landslides do not pose a direct threat to critical facilities in the Planning Area, but can trigger a tsunami event. Loss estimations due to a landslide-induced tsunami are included in the tsunami loss estimations (Maximum Tectonic Inundation).
Flood	Flood hazard areas were identified using the most current (9/18/2020) FEMA Flood Insurance Rate Maps flood areas. For the Mendenhall Valley, GLOF hazard areas were identified using the May 2025 Michael Baker Mendenhall Valley Flood Fighting Maps for a 16-foot GLOF event WITH HESCO Barriers. (FEMA requires us to use the most current available data. The 16' w/HESCO was used based on the 2024 flood event, the existing condition of the installed HESCO barrier, and the 2025 Michael Baker model predicting what is anticipated to be protected.) Facilities and residences in both identified flood hazard areas were combined into a single dataset, with duplicates removed, to assess Juneau and Traditional Lands of Tlingit & Haida's flood risk.
Dam Failure	Available inundation mapping for the two High Hazard Potential Dams (Salmon Creek Dam and Douglas Island Dam) was used as the basis of determining critical facilities and residences at risk from a dam failure of a High hazard dam. Losses from a dam failure of Significant or Low hazard dam in the Planning Area was not assessed in this Risk Assessment.
Shoreline/Bank Destabilization	Shoreline/bank destabilization hazard areas were identified by buffering all waterbodies in the Planning Area by 200 feet. This methodology may overestimate the total number of structures vulnerable to shoreline/bank destabilization as not every waterbody (lakes) is experiencing shoreline/bank destabilization or experiencing it at the same rate.
Changes in the Cryosphere	Glacier hazard areas were identified using the 2023 State of Alaska HMP GIS hazard layers. The 2023 State of Alaska states the following regarding their methodology: *DGGS identified potential glacier hazard risk zones as any flowline, area, or waterbody (as defined by the National Hydrography Dataset within 1 km (0.62 mi) of a glacier (as defined by the Randolph Glacier Inventory 5.0). These flowline, areas, and waterbodies were buffered by 3 km.* Avalanche hazard areas were identified through the 2022 TetraTech study "*Downtown Juneau Landslide and Avalanche Hazard Assessment*". GIS layers of these hazard areas were provided to CBJ and the consultant for use. Avalanche areas outside of Downtown Juneau were not assessed as this data was not available at the time of this HMP Update process. This is an identified data gap and if this data becomes

Hazard	Methodology
	available, future versions of this HMP may assess additional avalanche areas in Juneau and Traditional Lands of Tlingit & Haida.
Cybersecurity	It is assumed that all identified critical facilities and residences (100%) have the potential to be threatened by a cybersecurity event.
Hazardous Materials Release	Hazardous materials incident hazard areas were identified by buffering all roads in the Planning Area by a quarter mile (0.25 miles). This analysis did not account for topography of the areas within the buffer area. This Risk Assessment does not account for marine or airborne spills.

3.4.5 DATA LIMITATIONS

The provided vulnerability estimates use the best data currently available, and the methodologies used result in a risk approximation. These estimates may be used to understand relative risk from hazards and potential losses. However, uncertainties are inevitable in any loss estimation. This is due in part from incomplete scientific knowledge or data concerning hazards and their effects on the built environment. As well as the use of approximations and simplifications, when necessary, for a comprehensive analysis.

It should be noted that the results from the quantitative vulnerability assessment are limited to the exposure of people, buildings, and critical facilities and infrastructure to the identified hazards. It was beyond the scope of this MJHMP Update to develop a more detailed or comprehensive assessment of risk. A more comprehensive assessment may include loss of facility/system function, annualized losses, people injured or killed, shelter requirements, and/or economic losses. Mitigation actions to close data gaps such as continued studies to evaluate hazards completely have been recommended as mitigation projects. Such impacts may be addressed with future updates of this MJHMP Update or other planning documents.

3.4.6 CRITICAL FACILITIES INVENTORY

A critical facility is defined as a facility that provides essential products and services to the public. Critical facilities assist in preserving the quality of life for residents and Tribal Citizens in the Planning Area and fulfilling important public safety, emergency response, and disaster recovery functions.

The critical facilities profiled in this plan include the following:

- Government facilities
- Emergency response services
- Medical facilities
- Educational facilities
- Transportation facilities
- Utilities
- Community facilities

The Planning Team chose to only include facilities in which they (CBJ and T&H) are the owner of and can therefore apply for funding to implement their mitigation strategy to protect their assets.

Table 35- City & Borough of Juneau's Critical Facilities and Infrastructure in Juneau

										Hazards													
																		CS					
Facility Type	# of Occupants	Facility	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner	Land Owner	EQ	SW	WF/CF	LS	TS	FL	DF	ER	GL	AV	VO	HAZMAT	CYBER
Government	200	City Hall (Municipal Building)	155 S. Seward Street	58.299767	-134.406804	$ 31,289,916	C1	CBJ	CBJ	x	x	x	x				x			x	x	x
	30	Public Works Consolidated Shop	7100 Glacier Highway	58.358862	-134.533782	$ 33,634,781	S1	CBJ	CBJ	x	x	x								x	x	x
	30	Water Department Shop	2520 BARRETT AVENUE	58.368635	-134.608144	$ 7,988,741	W2	CBJ	CBJ	x	x	x								x	x	x
	30	Centennial Hall	144 Willoughby Avenue	58.299794	-134.410822	$ 40,205,594	S4	CBJ	CBJ	x	x	x	x							x	x	x
	30	Mt Jumbo Facility	409 D Street, Douglas	58.27594	-134.39578	$ 17,373,619	C1	CBJ	CBJ	x	x	x								x	x	x
Emergency Response	23	Glacier Fire Station (Airport Fire station)	1700 Crest St	58.35847	-134.573949	$ 24,656,162	W2	CBJ	CBJ	x	x	x								x	x	x
	23	Juneau Fire Station	820 Glacier Ave	58.300993	-134.420829	$ 29,156,407	W2	CBJ	CBJ	x	x	x	x							x	x	x
	23	Douglas Fire Station & Library	1016 3rd St	58.276719	-134.395049	$ 20,228,485	S4	CBJ	CBJ	x	x	x						x		x	x	x
	23	Auke Bay Fire Station	11900 Glacier Hwy	58.387594	-134.649485	$ 6,736,034	C1	CBJ	CBJ	x	x	x								x	x	x
	23	Lynn Canal Fire Station	17900 Glacier Hwy	58.409648	-134.757102	$ 5,103,829	W2	CBJ	CBJ	x	x	x								x	x	x
	96	Juneau Police Department	6255 Alaway Ave	58.357036	-134.507313	$ 31,627,937	RM1	CBJ	CBJ	x	x	x								x	x	x
Medical	1304	Bartlett Regional Hospital	3260 Hospital Drive	58.32942	-134.466029	$ 103,357,204	S4	CBJ	CBJ	x	x	x								x	x	x
Transportation	100	Juneau International Airport	1873 Shell Simmons Dr	58.359816	-134.583449	$ 87,833,800	RM1	CBJ	CBJ	x	x	x		x	x					x	x	x
	25	Statter Harbor(Office Building)	11497 Auke Bay Harbor Road	58.383553	-134.644638	$ 3,400,794	S1	CBJ	CBJ	x	x	x								x	x	x
	25	Amalga Harbor Boar Launch & Facility	25498 Amalga Harbor Road	58.491339	-134.788446	$ 20,000,000	C2	CBJ	CBJ	x	x	x			x		x			x	x	x
	25	Auke Bay Loading Facility	13555 GLACIER HIGHWAY	58.382356	-134.691197	$ 9,750,300	C1	CBJ	CBJ	x	x	x			x					x	x	x
	25	Intermediate Vessel Float	13575 GLACIER HIGHWAY	58.294743	-134.399476	$ 1,114,050	N/A	CBJ	CBJ	x	x	x			x					x	x	x
	25	Downtown Cruise Ship Berths	704 S Franklin St	58.296754	-134.401739	$ 47,242,650	N/A	CBJ	CBJ	x	x	x	x	x	x					x	x	x
Utility	25	Juneau-Douglas Wastewater Treatment Plant	1540 Thane Road	58.286901	-134.382728	$ 15,678,043	S4	CBJ	CBJ	x	x	x	x		x		x	x	x	x	x	x
	25	Mendenhall Wastewater Treatment Plant	2009 Radcliffe Road	58.360256	-134.596796	$ 74,416,839	RM1	CBJ	CBJ	x	x	x					x			x	x	x
	25	Auke Bay Wastewater Treatment Plant	11909 Glacier Hwy	58.387439	-134.647457	$ 2,617,885	S1	CBJ	CBJ	x	x	x					x			x	x	x
	Bulk Fuel	Statter Harbor Food and Fuel LLC	11687 Glacier HWY	58.38620	-134.64495	$ 1,324,270	n/a	Statter Harbor Food and Fuel LLC	Statter Harbor Food and Fuel LLC	x	x	x				x				x	x	x
	Bulk Fuel	Bulk Plant Facilities - Structure Petro 49	0 Jacobsen Dr.	58.28948	-134.39329	$ 3,658,437	n/a	Petro 49 Inc	Petro 49 Inc	x	x		x			x	x	x		x	x	x
	Bulk Fuel	Aurora Fuel Dock	1401 Harbor Way	58.30359	-134.42860	-	n/a	CBJ Lands & Resources	CBJ Lands & Resources	x	x		x			x	x			x	x	x
	Bulk Fuel	Airport Helipad Lease	0 Yankukin Dr.	58.35548	-134.56028	$ 88,765	n/a	CBJ Airport	CBJ Airport	x	x			x		x	x			x	x	x
	Bulk Fuel	Aero Services Juneau	Parcel 3-B16-0-100-008-0 Lot 8 Block J	58.36000	-134.59000	-	n/a	Aero Services Juneau	CBJ	x	x					x	x			x	x	x
	Bulk Fuel	Alaska Airlines - Juneau	1873 Shell Simmons Drive	58.35928	-134.58323	-	n/a	Alaska Airlines	State of Alaska	x	x					x	x			x	x	x

										Hazards													
																			CS				
Facility Type	# of Occupants	Facility	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner	Land Owner	EQ	SW	WF/CF	LS	TS	FL	DF	ER	GL	AV	VO	HAZMAT	CYBER
	Bulk Fuel	Alaska Army National Guard - Juneau Readiness Center	12300 Mendenhall Loop Road	58.38944	-134.64781	-	n/a	Alaska Army National Guard	State of Alaska - Dept of Education	x	x	x				x				x	x	x
	Bulk Fuel	Alaska Army National Guard - Juneau AAOF	8425 Livingston Way	58.35740	-134.56874	-	n/a	Alaska Army National Guard	CBJ - Airport	x	x					x				x	x	x
	Bulk Fuel	Alaska Electric Light & Power - Auke Bay Generation Station	12480 Mendenhall Loop Rd	58.38706	-134.64447	-	n/a	AELP	AELP	x	x	x				x				x	x	x
	Bulk Fuel	Alaska Electric Light & Power - Gold Creek		58.30000	-134.42000	$ 896,000	n/a	AELP	AELP	x	x		x			x	x			x	x	x
	Bulk Fuel	Alaska Electric Light & Power - Juneau - Industrial Power Plant	2500 Barrett Avenue	58.36737	-134.60832	$ 1,805,400	n/a	AELP	AELP	x	x					x				x	x	x
	Bulk Fuel	Alaska Electric Light & Power - Lake Dorothy		58.23008	-134.05225	-	n/a	AELP	AELP	x	x					x				x	x	x
	Bulk Fuel	Alaska Electric Light & Power - Lemon Creek	5601 Tonsgard Court	58.35369	-134.49617	$ 13,457,100	n/a	AELP	AELP	x	x					x	x			x	x	x
	Bulk Fuel	Alaska Electric Light & Power - Snettisham		58.20747	-134.14919	-	n/a	Alaska Energy Authority	Alaska Energy Authority	x	x					x	x			x	x	x
	Bulk Fuel	Alaska Power & Telephone - Auke Mountain Microwave Tower		58.39000	-134.72000	-	n/a	Alaska Power & Telephone	US Forest Service	x	x	x				x				x	x	x
	Bulk Fuel	AT&T - Juneau - Lena Point	17103 Lena Loop Road	58.39057	-134.76867	$ 5,193,400	n/a	AT&T	AT&T	x	x	x				x				x	x	x
	Bulk Fuel	USCG Station Juneau	345 Egan Drive	58.29853	-134.41254	-	n/a	USCG	USCG	x	x		x			x	x			x	x	x
	Bulk Fuel	Coastal Fuel, Inc	Juneau International Airport	58.35816	-134.58116	-	n/a	CBJ Airport	CBJ Airport	x	x					x				x	x	x
	Bulk Fuel	Colaska - Secon/AggPro Juneau	5771 Concrete Way	58.35393	-134.50203	$ 1,207,700	n/a	Coalaska	Coalaska	x	x					x	x			x	x	x
	Bulk Fuel	Delta Western - Juneau Airport	1873 Shell Simmons Drive	58.36000	-134.59000	-	n/a	Delta Western	CBJ Airport	x	x					x				x	x	x
	Bulk Fuel	FAA - Coghlan Island - CBL NDB PX		58.35927	-134.69930	-	n/a	FAA	FAA	x	x					x				x	x	x
	Bulk Fuel	FAA - Juneau - JDL LDA SX		58.36000	-134.64000	-	n/a	FAA	FAA	x	x					x				x	x	x
	Bulk Fuel	FAA - Juneau - JNU LDIN 1		58.35204	-134.57328	-	n/a	FAA	FAA	x	x			x	x	x	x			x	x	x
	Bulk Fuel	FAA - Juneau - JNU LDIN 2 SX		58.35231	-134.57039	-	n/a	FAA	FAA	x	x			x	x	x	x			x	x	x
	Bulk Fuel	FAA - Juneau - JNU LDIN 3		58.36000	-134.64000	-	n/a	FAA	FAA	x	x					x				x	x	x
	Bulk Fuel	GCI Communication Corp. - JUN - DC & ES	1580 Thane Road	58.28665	-134.38285	$ 242,600	n/a	GCI	CBJ Lands & Resources	x	x		x			x		x		x	x	x
	Bulk Fuel	Juneau DOT&PF 7-Mile Office Complex	6860 Glacier Highway	58.36000	-134.53000	-	n/a	ADOT&PF	ADOT&PF	x	x					x				x	x	x
	Bulk Fuel	NorthStar Helicopters North Douglas Helibase	6910 North Douglas Highway	58.33206	-134.49825	$ 2,336,900	n/a	Northstar Helicopters North Douglas Helibase	Northstar Helicopters	x	x					x	x			x	x	x
	Bulk Fuel	Petro 49 - Juneau - Auke Bay Marina	11739 Glacier Highway	58.38644	-134.64531	-	n/a	Petro 49 - Juneau - Auke Bay Marina	Petro 49	x	x	x				x				x	x	x
	Bulk Fuel	Petro 49 - Juneau - Petro Marine Goldbelt Marina	76 Egan Drive	58.29926	-134.40959	$ 1,177,716	n/a	Petro 49 - Juneau - Petro Marine Goldbelt Marina	Goldbelt	x	x		x	x		x	x			x	x	x
	Bulk Fuel	Riverbend Elementary School	2901 Riverside Drive	58.37536	-134.59190	-	n/a	CBJ Juneau Schools	CBJ Juneau Schools	x	x					x	x			x	x	x
	Bulk Fuel	ADOC - Lemon Creek Correctional Center	2000 Lemon Creek Road	58.36266	-134.48345	-	n/a	ADOC	ADOC	x	x					x	x			x	x	x

										Hazards													
																		CS					
Facility Type	**# of Occupants**	**Facility**	**Address**	**Latitude**	**Longitude**	**Estimated Value**	**Building Type**	**Facility Owner**	**Land Owner**	**EQ**	**SW**	**WF/CF**	**LS**	**TS**	**FL**	**DF**	**ER**	**GL**	**AV**	**VO**	**HAZMAT**	**CYBER**
	Bulk Fuel	University of Alaska - Southeast	12300 Mendenhall Loop Road	58.39122	-134.64665	-	n/a	University of Alaska - Southeast	University of Alaska - Southeast	x	x	x				x				x	x	x
Education	339	Auke Bay Elementary School	11869 Glacier Hwy	58.387598	-134.648095	$ 14,977,982	W2	CBJ	CBJ	x	x	x					x			x	x	x
	338	Harborview Elementary School	1255 Glacier Ave	58.30354	-134.424796	$ 24,022,388	C2	CBJ	CBJ	x	x	x	x							x	x	x
	284	Kaxdigoowu Héen Elementary School	2901 Riverside Dr	58.366039	-134.604889	$ 19,023,878	W2	CBJ	CBJ	x	x	x			x					x	x	x
	316	Mendenhall River Community School	9001 Mendenhall Loop Rd	58.400178	-134.578973	$ 19,945,024	W2	CBJ	CBJ	x	x	x						x		x	x	x
	283	Sayéik: Gastineau Community School	1507 3rd St	58.279083	-134.399633	$ 17,029,466	RM1	CBJ	CBJ	x	x	x						x		x	x	x
	322	Sít' Eetí Shaanáx – Glacier Valley Elementary School	3400 Tongass Blvd # 111	58.382608	-134.57255	$ 15,496,144	W2	CBJ	CBJ	x	x	x								x	x	x
	466	Dzantik'i Heeni Middle School	1600 Renninger St	58.361662	-134.512888	$ 30,768,098	W2	CBJ	CBJ	x	x	x								x	x	x
	395	Floyd Dryden Middle School	10014 Crazy Horse Dr	58.366039	-134.604889	$ 119,392,931	W2	CBJ	CBJ	x	x	x		x						x	x	x
	592	Juneau-Douglas High School: Yadaa.at Kalé	1639 Glacier Ave	58.305138	-134.427854	$ 100,637,593	C2	CBJ	CBJ	x	x	x	x							x	x	x
	618	Thunder Mountain Middle School	3101 Diamond Pk Lp	58.379948	-134.587984	$ 69,950,604	S1	CBJ	CBJ	x	x	x								x	x	x
Community	30	Downtown Juneau Public Library	292 Marine Way	58.298562	-134.403701	$ 24,980,329	C1	CBJ	CBJ	x	x	x	x	x	x		x			x	x	x
	30	Mendenhall Valley Public Library	3025 Dimond Park Loop	58.377798	-134.589235	$ 32,585,779	W2	CBJ	CBJ	x	x	x								x	x	x
	50	Adair-Kennedy Memorial Park	3820 Mendenhall Loop Rd	58.389114	-134.570266	$ 473,488	W2	CBJ	CBJ	x	x	x						x		x	x	x
	50	Savikko Park	101 Savikko Road	58.272977	-134.385753	$ 1,211,204	W2	CBJ	CBJ	x	x	x		x			x	x		x	x	x
	50	Twin Lakes Park	3499 Glacier Hwy	58.332838	-134.472927	$ 2,894,960	W2	CBJ	CBJ	x	x	x			x	x				x	x	x
	50	Cope Park	1001 Calhoun Ave	58.304922	-134.412522	$ 400,331	W2	CBJ	CBJ	x	x	x	x							x	x	x
	50	Riverside Rotary Park	3300 Riverside Dr	58.381	-134.5856	$ 500,000	W2	CBJ	CBJ	x	x	x								x	x	x
	50	Melvin Park	4098 Riverside Dr	58.382302	-134.582287	$ 378,793	W2	CBJ	CBJ	x	x	x					x	x		x	x	x
	-	Evergreen Cemetery	601 Seater St	58.304533	-134.42506	-	N/A	CBJ	CBJ	x	x	x	x							x	x	x
	-	Alaska Memorial Park	3839 Riverside Dr	58.389655	-134.58654	$2,428,915	W2	Dyemond LLC	Private	x	x	x			x		x	x		x	x	x
	-	Taku Indian of the Raven Tribe Cemetery	0 3rd St	58.280228	-134.40171	-	N/A	Ross Estate Cemetery	Private	x	x	x						x		x	x	x
Total:	6,448					$ 1,141,899,265				75	75	49	16	9	12	34	26	11	1	75	75	75

Hazards:
EQ: Earthquake; SW: Severe Weather; WF/UF: Wildland Fire/Urban Fire; LS: Landslide; TS: Tsunami; FL: Flood; DF: Dam Failure: ER: Erosion (Shoreline/Bank Destabilization); CS: Cryosphere: GL: Glacier; AV: Avalanche; VO: Volcano; HAZMAT: Hazardous Materials Incident; CYBER: Cybersecurity

Table 36- Tlingit & Haida's Critical Facilities and Infrastructure in Juneau

Facility Type	# of Occupants	Facility Name	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner (T&H)	Land Owner (T&H)	Hazards												
										EQ	SW	WF/CF	LS	TS	FL	DF	ER	CS		VO	HAZMAT	CYBER
																		GL	AV			
Government	0	Blue Storage Bldg	383 Village St	58.2998	-134.4068	$205,900	S2	T&H	T&H	x	x	x	x							x	x	x
	6	AK Seafood Building	5731 Concrete Way	58.358	-134.521	$1,175,200	S2	T&H	T&H	x	x	x								x	x	x
	0	Driftwood Warehouse Building	429 W Willoughby Ave	58.30058	-134.5158	$348,955	W2	T&H	T&H	x	x	x	x							x	x	x
	210	Andrew Hope Bldg & Condo	320 W Willoughby Ave	58.3019	-134.4197	$9,135,899	S1	T&H	T&H	x	x	x	x							x	x	x
	20	Edward Thomas Bldg (Airport Annex)- Historical Archives	9097 Glacier Hwy	58.355	-134.576	$3,145,557	W2	T&H	T&H	x	x	x								x	x	x
	100	T&H Community & Behavioral Services Healing Center	400 W Willoughby Ave	58.3019	-134.4197	$6,720,000	S1	T&H	T&H	x	x	x	x							x	x	x
	150	T&H Building	410 W Willoughby Ave	58.3019	-134.4197	$10,080,000	S1	T&H	T&H	x	x	x	x							x	x	x
	80	Driftwood Lodge Building	435 W Willoughby Ave	58.3019	-134.4197	$8,156,588	W2	T&H	T&H	x	x	x	x							x	x	x
	10	Smokehouse Catering Building & Procurement Warehouse	1721 Anka St (1722 & 1723)	58.362	-134.498	$6,234,500	S2	T&H	T&H	x	x	x								x	x	x
	12	219 S Franklin	219 S Franklin St	58.2998	-134.4068	$2,035,546	W2	T&H	T&H	x	x	x	x							x	x	x
	0	Franklet Bldg	379 Village St	58.301321	-134.4167	$417,553	N/A Empty Lot	T&H	T&H	x	x	x	x							x	x	x
	8	Bonnell Bldg	5750 Concrete Way	58.358	-134.521	$2,328,420	S2	T&H	T&H	x	x	x								x	x	x
	5	Sacred Shine - Bldg	1721 Anka St	58.362	-134.498	$2,845,435	S2	T&H	T&H	x	x	x								x	x	x
	5	1725 Anka St (SR)	1725 Anka St	58.362	-134.498	$2,845,435	S2	T&H	T&H	x	x	x								x	x	x
	0	Thane Building	4400 Thane Road	58.267	-134.357	$1,000,000	N/A Empty Lot	T&H	T&H	x	x	x		x	x			x		x	x	x
	0	Tee Harbor	17900 Glacier Hwy	58.410678	-134.7551	$4,443,400	N/A Raw Land	T&H	T&H	x	x	x								x	x	x
	0	Warehouse	535 Willoughby Ave	58.3019	-134.4197	$944,313	N/A Empty Lot	T&H	T&H	x	x	x	x							x	x	x
	6	TANF/Child Care - 1st Bank	3075 Vintage Blvd	58.3545	-134.482	$2,002,833	W2	T&H	T&H	x	x	x			x					x	x	x
Utility	20	SGC Channel Dr Bldg	2631 Channel Dr	58.289	-134.41	$4,074,500	S1	T&H	T&H	x	x	x	x		x					x	x	x
Education	20	Demmert Bldg- HeadStart	9095 Glacier Hwy	58.3545	-134.5755	$1,957,659	W2	T&H	T&H	x	x	x								x	x	x
	40	Generations Southeast (VTRC)	3239 Hospital Dr	58.2786	-134.4107	$4,068,239	S2	T&H	T&H	x	x	x				x				x	x	x
	0	Early Education Campus Project - Juneau	8181 Glacier Hwy	58.36153	-134.5506	$4,500,000	N/A Raw Land	T&H	T&H	x	x	x			x					x	x	x
	40	JCC LEARN Building	8001 Glacier Hwy	58.355	-134.576	$808,953	W2	T&H	T&H	x	x	x			x					x	x	x
Community	100	JTHCC Building	3235 Hospital Dr	58.2789	-134.411	$665,116	W2	T&H	T&H	x	x	x			x	x				x	x	x
	30	Driftwood Event Space	429 W Willoughby Ave	58.30058	-134.5158	$2,703,074	W2	T&H	T&H	x	x	x	x							x	x	x
	8	Alter Bldg (2nd Chance Program)	324 Village St	58.30191	-134.415	$395,900	W2	T&H	T&H	x	x	x	x							x	x	x
	0	Honsinger Neighborhood Center	7880 Honsinger Dr	58.354	-134.521	$1,012,165	N/A Empty Lot	T&H	T&H	x	x	x								x	x	x
	15	Haven House 1	3200 Malissa Drive	58.3775	-134.5697	$576,000	W1	T&H	T&H	x	x	x								x	x	x
	15	Haven House 2	3202 Malissa Dr	58.2786	-134.4107	$1,002,900	W2	T&H	T&H	x	x	x								x	x	x
	7	Gaaja Hit	250 Village St	58.2998	-134.4068	$500,000	W2	T&H	T&H	x	x	x	x							x	x	x

Facility Type	# of Occupants	Facility Name	Address	Latitude	Longitude	Estimated Value	Building Type	Facility Owner (T&H)	Land Owner (T&H)	Hazards												
										EQ	SW	WF/CF	LS	TS	FL	DF	ER	CS		VO	HAZMAT	CYBER
																		GL	AV			
	15	Reentry and Recovery	1921 Allen Ct	58.362	-134.498	$625,000	W2	T&H	T&H	x	x	x								x	x	x
	15	Alaway Ave	6205 Alaway Ave	58.355	-134.576	$953,022	W2	T&H	T&H	x	x	x								x	x	x
Total	**937**					**$87,908,062**																

Hazards:

EQ: Earthquake; SW: Severe Weather; WF/UF: Wildland Fire/Urban Fire; LS: Landslide; TS: Tsunami; FL: Flood; DF: Dam Failure: ER: Erosion (Shoreline/Bank Destabilization); CS: Cryosphere: GL: Glacier; AV: Avalanche; VO: Volcano; HAZMAT: Hazardous Materials Incident; CYBER: Cybersecurity

	FEMA Building Types
W1	Light wood frames single or multiple-family dwellings of one or more stories in height
W1A	Light wood frame multi-unit, multi-story residential buildings with plan areas on each floor or greater than 3,000 square feet
W2	Wood frame commercial and industrial buildings with a floor area larger than 5,000 square feet. For commercial and industrial buildings with less than 5,000 square feet, the W2 type can be used as well.
S1	Steel moment-resisting frame buildings
S2	Braced steel frame buildings
S3	Light metal buildings
S4	Steel frame buildings with cast-in-place concrete shear walls
S5	Steel frame buildings with unreinforced masonry infill walls
C1	Concrete moment-resisting frame buildings
C2	Concrete shear wall buildings
C3	Concrete frame buildings with unreinforced masonry infill walls
PC1	Tilt-up buildings
PC2	Precast concrete frame buildings
RM1	Reinforced masonry buildings with flexible floor and roof diaphragms
RM2	Reinforced masonry buildings with rigid floor and roof diaphragms
URM	Unreinforced masonry bearing wall buildings
MH	Manufactured housing

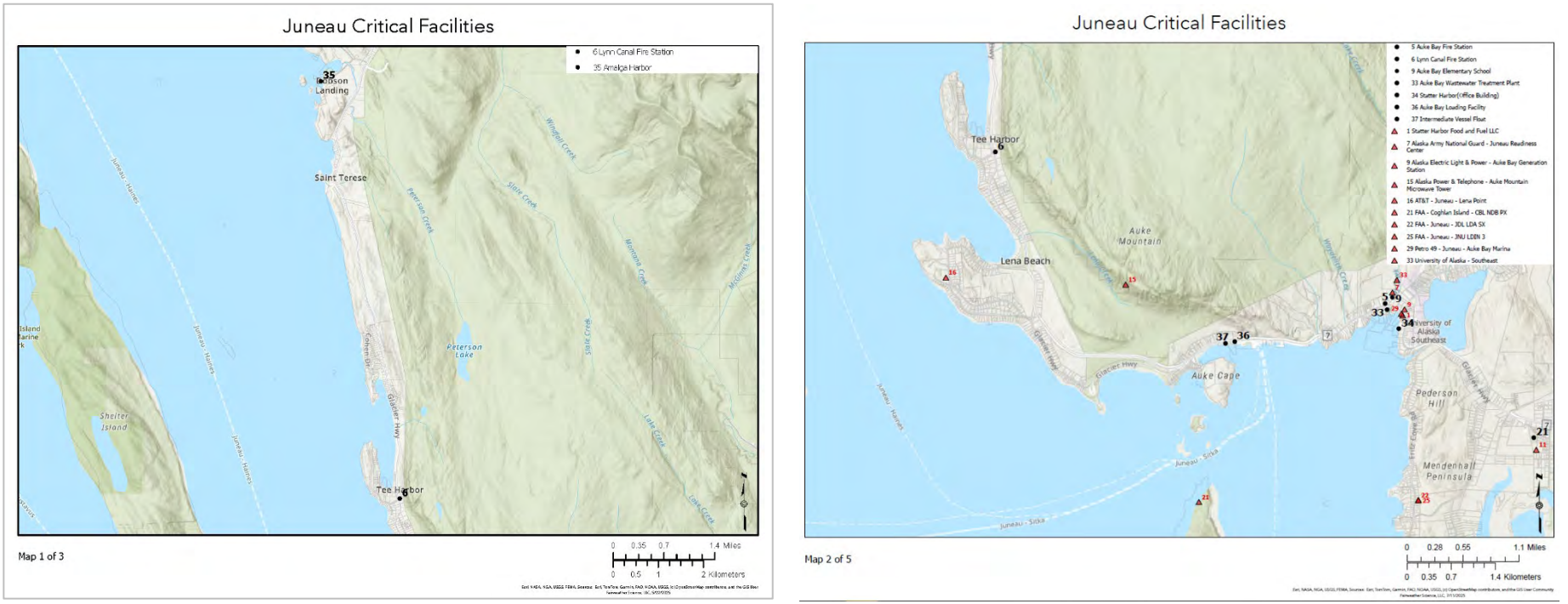


Figure 123- Map of City and Borough of Juneau's Critical Facilities - North

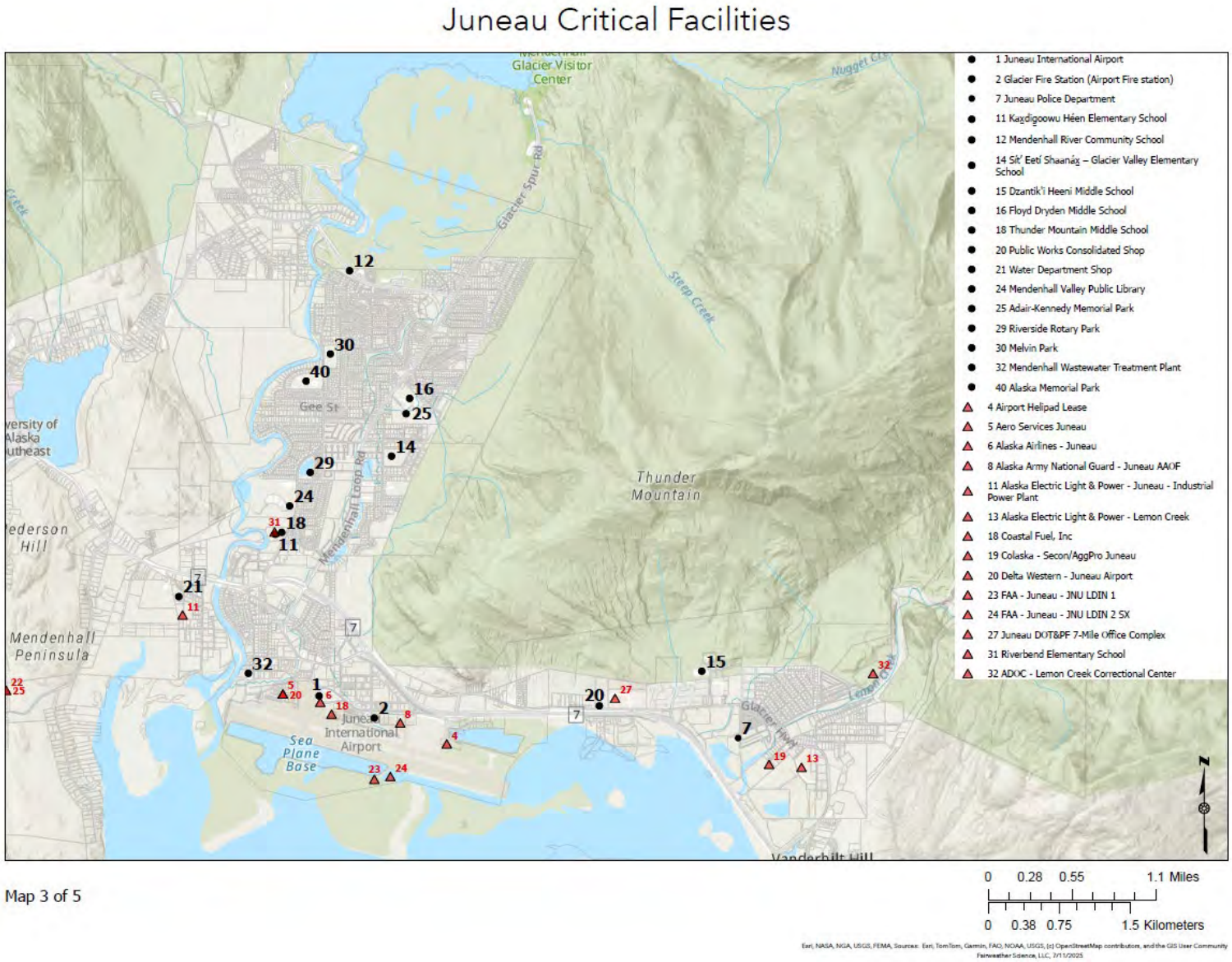


Figure 124- Juneau's Critical Facilities- Airport and Mendenhall Valley Area

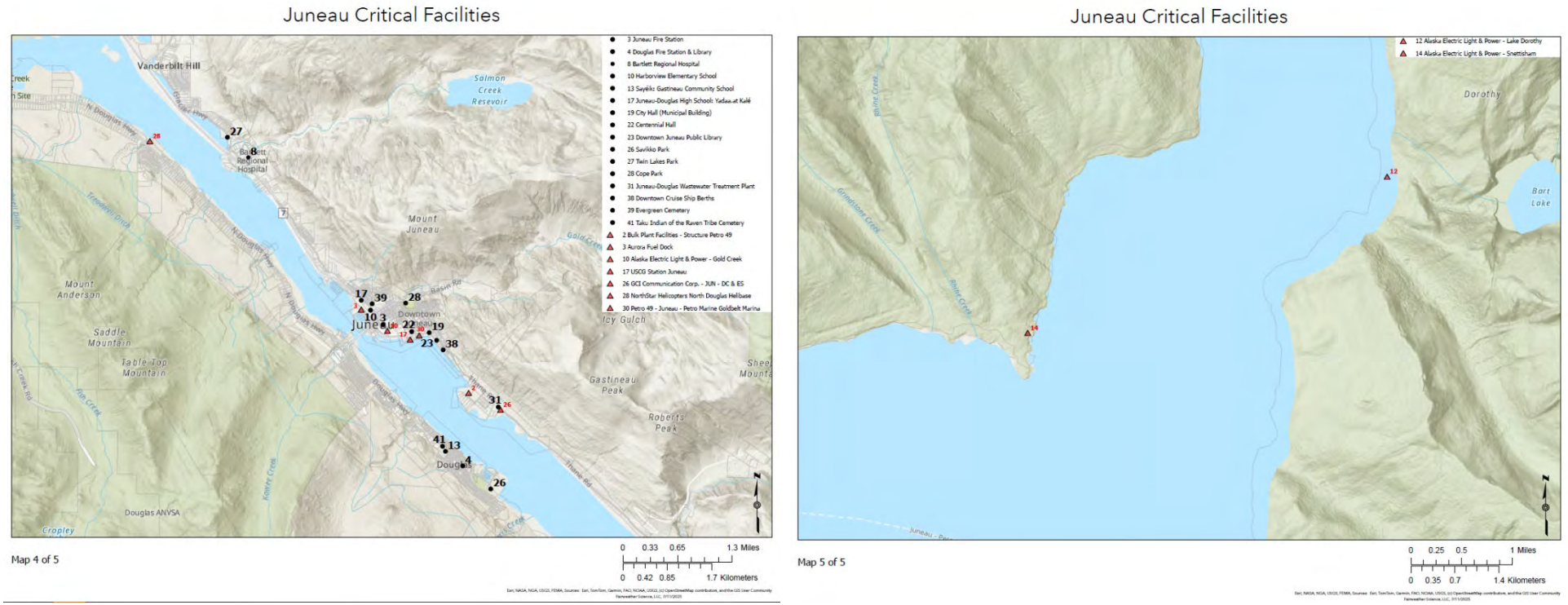


Figure 125- Map of City and Borough of Juneau's Critical Facilities- Downtown Juneau and Douglas Area

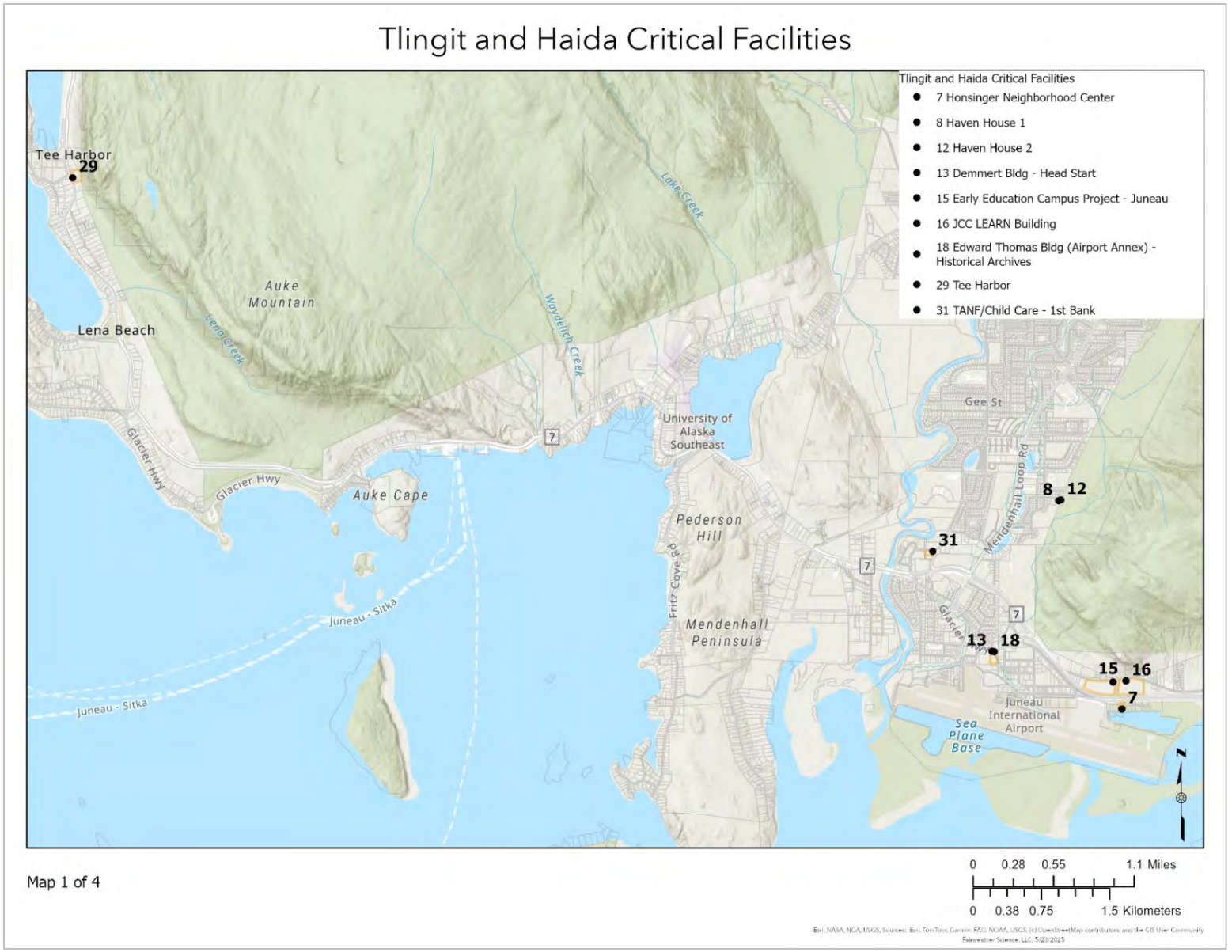


Figure 126- Map of Tlingit & Haida's Critical Facilities- Tee Harbor, Airport, and Mendenhall Valley Area

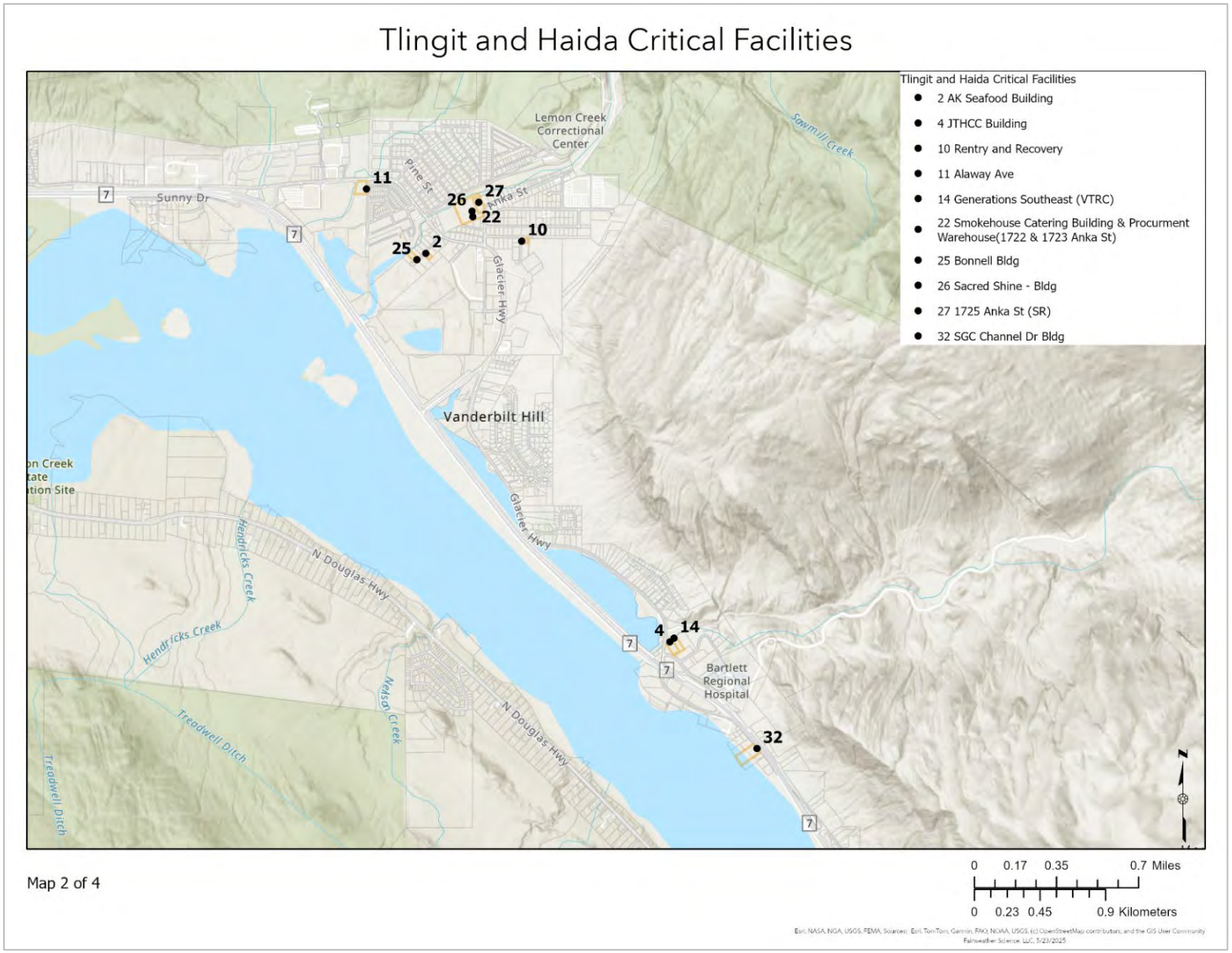


Figure 127- Map of Tlingit & Haida's Critical Facilities- Lemon Creek Area

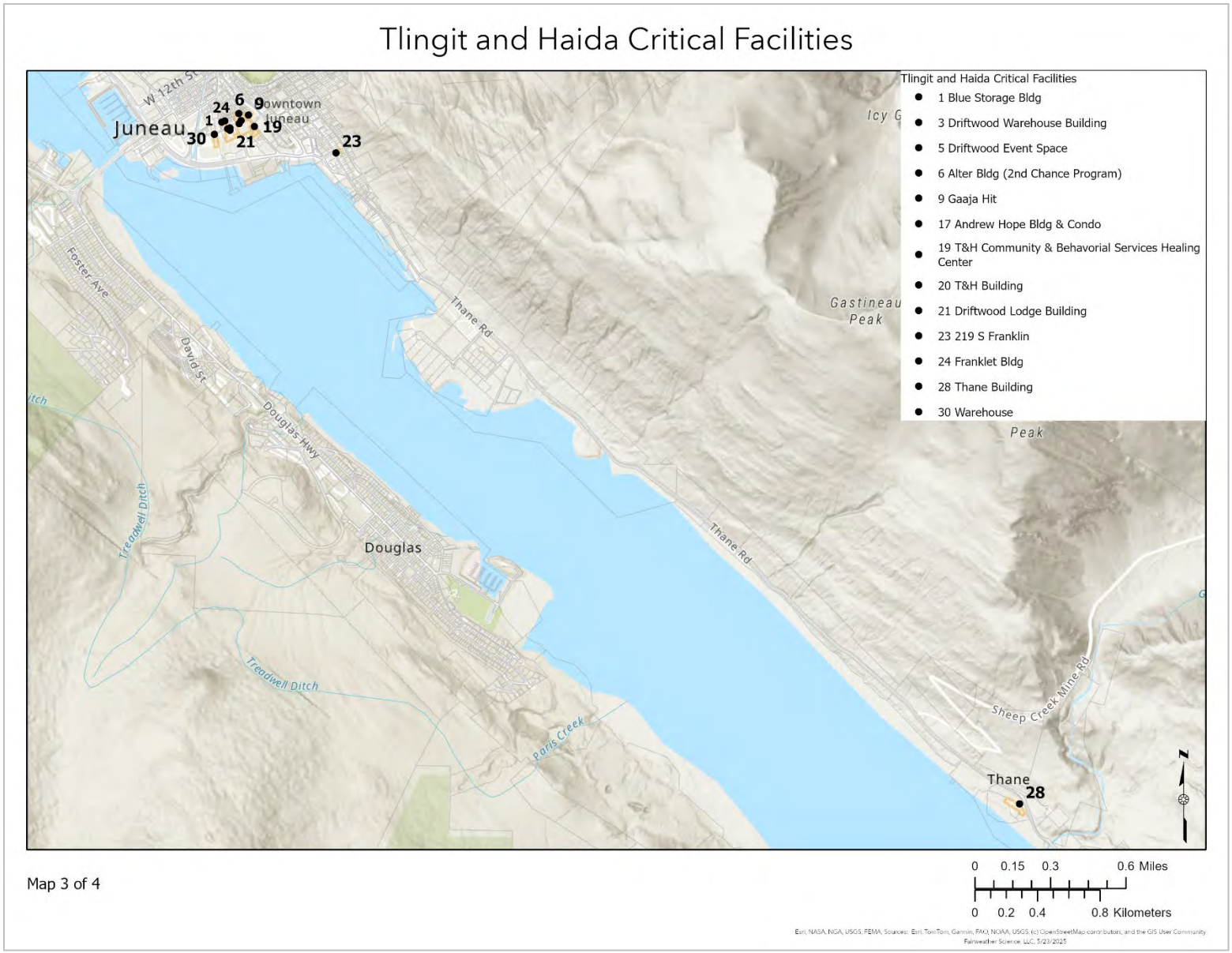


Figure 128- Map of Tlingit & Haida's Critical Facilities- Downtown Juneau and Thane Area

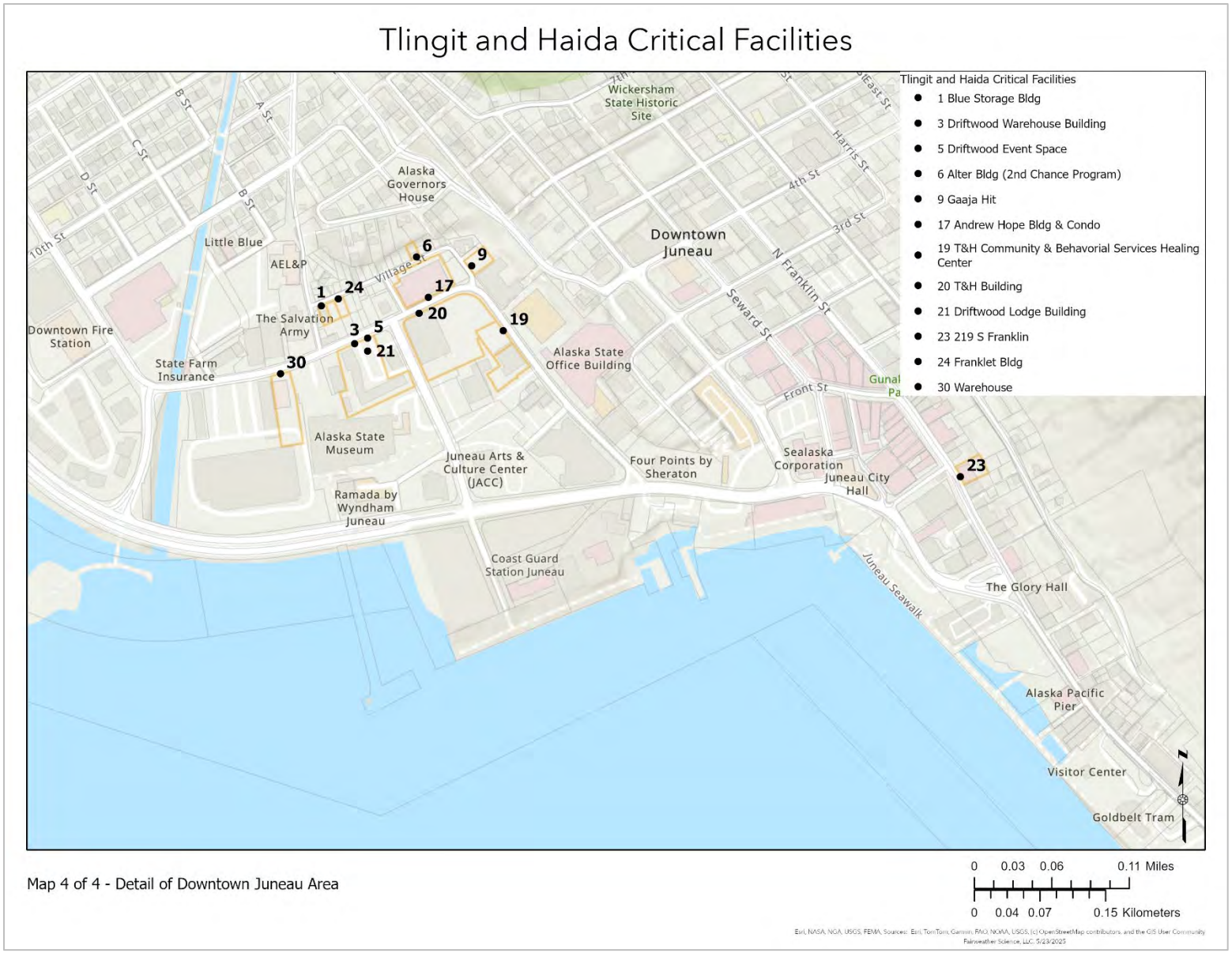


Figure 129- Map of Tlingit & Haida's Critical Facilities- Detail of Downtown Juneau

3.4.7 VULNERABILITY EXPOSURE ANALYSIS

Table 37- Vulnerability Exposure Analysis- City and Borough of Juneau

	Government Facilities	Emergency Response	Medical	Transportation	Utility	Education	Community	Total
Earthquake	# of CFs: 5 $ of CFs: $130,492,651 # of Occ: 320	# of CFs: 6 $ of CFs: $117,508,854 # of Occ: 211	# of CFs: 1 $ of CFs: $103,357,204 # of Occ: 1,304	# of CFs: 6 $ of CFs: $169,341,594 # of Occ: 225	# of CFs: 36 $ of CFs: $124,101,055 # of Occ: 75	# of CFs: 10 $ of CFs: $431,244,108 # of Occ: 3,953	# of CFs: 11 $ of CFs: $65,853,759 # of Occ: 360	**# of CFs: 75 $ of CFs: $1,141,899,265 # of Occ: 6,448**
Severe Weather	# of CFs: 5 $ of CFs: $130,492,651 # of Occ: 320	# of CFs: 6 $ of CFs: $117,508,854 # of Occ: 211	# of CFs: 1 $ of CFs: $103,357,204 # of Occ: 1,304	# of CFs: 6 $ of CFs: $169,341,594 # of Occ: 225	# of CFs: 36 $ of CFs: $124,101,055 # of Occ: 75	# of CFs: 10 $ of CFs: $431,244,108 # of Occ: 3,953	# of CFs: 11 $ of CFs: $65,853,759 # of Occ: 360	**# of CFs: 75 $ of CFs: $1,141,899,265 # of Occ: 6,448**
Wildland/ Urban Fire	# of CFs: 5 $ of CFs: $130,492,651 # of Occ: 320	# of CFs: 6 $ of CFs: $117,508,854 # of Occ: 211	# of CFs: 1 $ of CFs: $103,357,204 # of Occ: 1,304	# of CFs: 6 $ of CFs: $169,341,594 # of Occ: 225	# of CFs: 36 $ of CFs: $124,101,055 # of Occ: 75	# of CFs: 10 $ of CFs: $431,244,108 # of Occ: 3,953	# of CFs: 11 $ of CFs: $65,853,759 # of Occ: 360	**# of CFs: 75 $ of CFs: $1,141,899,265 # of Occ: 6,448**
Landslide	# of CFs: 2 $ of CFs: $71,495,510 # of Occ: 230	# of CFs: 1 $ of CFs: $29,156,407 # of Occ: 23	-	# of CFs: 1 $ of CFs: $47,242,650 # of Occ: 25	# of CFs: 7 $ of CFs: $21,652,796 # of Occ: 25	# of CFs: 2 $ of CFs: $124,659,981 # of Occ: 930	# of CFs: 3 $ of CFs: $25,380,660 # of Occ: 80	**# of CFs: 16 $ of CFs: $319,588,004 # of Occ: 1,343**
Tsunami	-	-	-	# of CFs: 2 $ of CFs: $135,076,450 # of Occ: 125	-	# of CFs: 1 $ of CFs: $119,392,931 # of Occ: 395	# of CFs: 2 $ of CFs: $26,191,533 # of Occ: 80	**# of CFs: 5 $ of CFs: $280,660,914 # of Occ: 600**
Flood	-	-	-	# of CFs: 5 $ of CFs: $165,940,800 # of Occ: 200	# of CFs: 3 $ of CFs: $15,678,043 # of Occ: 25	# of CFs: 1 $ of CFs: $19,023,878 # of Occ: 284	# of CFs: 3 $ of CFs: $30,304,204 # of Occ: 80	**# of CFs: 12 $ of CFs: $230,946,925 # of Occ: 589**
Shoreline/Bank Destabilization	# of CFs: 1 $ of CFs: $31,289,916 # of Occ: 200	-	-	# of CFs: 1 $ of CFs: $20,000,000 # of Occ: 25	# of CFs: 19 $ of CFs: $115,535,385 # of Occ: 75	# of CFs: 1 $ of CFs: $14,977,982 # of Occ: 339	# of CFs: 4 $ of CFs: $28,999,241 # of Occ: 130	**# of CFs: 26 $ of CFs: $210,802,524 # of Occ: 769**
Cryosphere-Glacier	-	# of CFs: 1 $ of CFs: $20,228,485 # of Occ: 23	-	-	# of CFs: 3 $ of CFs: $19,579,080 # of Occ: 25	# of CFs: 2 $ of CFs: $36,974,490 # of Occ: 599	# of CFs: 5 $ of CFs: $4,492,400 # of Occ: 150	**# of CFs: 11 $ of CFs: $54,274,455 # of Occ: 797**
Cryosphere-Avalanche	-	-	-	-	# of CFs: 1 $ of CFs: $15,678,043 # of Occ: 25	-	-	**# of CFs: 1 $ of CFs: $15,678,043 # of Occ: 25**

Table 37- Vulnerability Exposure Analysis- City and Borough of Juneau

	Government Facilities	Emergency Response	Medical	Transportation	Utility	Education	Community	Total
Volcano	# of CFs: 5 $ of CFs: $130,492,651 # of Occ: 320	# of CFs: 6 $ of CFs: $117,508,854 # of Occ: 211	# of CFs: 1 $ of CFs: $103,357,204 # of Occ: 1,304	# of CFs: 6 $ of CFs: $169,341,594 # of Occ: 225	# of CFs: 36 $ of CFs: $124,101,055 # of Occ: 75	# of CFs: 10 $ of CFs: $431,244,108 # of Occ: 3,953	# of CFs: 11 $ of CFs: $65,853,759 # of Occ: 360	**# of CFs: 75** **$ of CFs: $1,141,899,265** **# of Occ: 6,448**
Dam Failure	-	-	-	-	# of CFs: 33 $ of CFs: $31,388,288 # of Occ: 0	-	# of CFs: 1 $ of CFs: $2.894,960 # of Occ: 50	**# of CFs: 34** **$ of CFs: $34,283,248** **# of Occ: 50**
HAZMAT	# of CFs: 5 $ of CFs: $130,492,651 # of Occ: 320	# of CFs: 6 $ of CFs: $117,508,854 # of Occ: 211	# of CFs: 1 $ of CFs: $103,357,204 # of Occ: 1,304	# of CFs: 6 $ of CFs: $169,341,594 # of Occ: 225	# of CFs: 36 $ of CFs: $124,101,055 # of Occ: 75	# of CFs: 10 $ of CFs: $431,244,108 # of Occ: 3,953	# of CFs: 11 $ of CFs: $65,853,759 # of Occ: 360	**# of CFs: 75** **$ of CFs: $1,141,899,265** **# of Occ: 6,448**
Cybersecurity	# of CFs: 5 $ of CFs: $130,492,651 # of Occ: 320	# of CFs: 6 $ of CFs: $117,508,854 # of Occ: 211	# of CFs: 1 $ of CFs: $103,357,204 # of Occ: 1,304	# of CFs: 6 $ of CFs: $169,341,594 # of Occ: 225	# of CFs: 36 $ of CFs: $124,101,055 # of Occ: 75	# of CFs: 10 $ of CFs: $431,244,108 # of Occ: 3,953	# of CFs: 11 $ of CFs: $65,853,759 # of Occ: 360	**# of CFs: 75** **$ of CFs: $1,141,899,265** **# of Occ: 6,448**

CFs: Critical Facilities
Occ: Occupants (this value is determined by the number of occupants in the facility. This does not account for the potential total population affected by the hazard event)

Table 38- Vulnerability Exposure Analysis- Tlingit & Haida (Juneau assets)					
	Government Facilities	Utility	Education	Community	Total
Earthquake	# of CFs: 18 $ of CFs: $64,065,534 # of Occ: 612	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	# of CFs: 4 $ of CFs: $11,334,851 # of Occ: 100	# of CFs: 9 $ of CFs: $8,433,177 # of Occ: 205	**# of CFs: 32** **$ of CFs: $87,908,062** **# of Occ: 937**
Severe Weather	# of CFs: 18 $ of CFs: $64,065,534 # of Occ: 612	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	# of CFs: 4 $ of CFs: $11,334,851 # of Occ: 100	# of CFs: 9 $ of CFs: $8,433,177 # of Occ: 205	**# of CFs: 32** **$ of CFs: $87,908,062** **# of Occ: 937**
Wildland/Urban Fire	# of CFs: 18 $ of CFs: $64,065,534 # of Occ: 612	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	# of CFs: 4 $ of CFs: $11,334,851 # of Occ: 100	# of CFs: 9 $ of CFs: $8,433,177 # of Occ: 205	**# of CFs: 32** **$ of CFs: $87,908,062** **# of Occ: 937**
Landslide	# of CFs: 9 $ of CFs: $38,044,754 # of Occ: 552	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	-	# of CFs: 3 $ of CFs: $3,598,974 # of Occ: 45	**# of CFs: 13** **$ of CFs: $45,718,228** **# of Occ: 617**
Tsunami	# of CFs: 1 $ of CFs: $1,000,000 # of Occ: 0	-	-	-	**# of CFs: 1** **$ of CFs: $1,000,000** **# of Occ: 0**
Flood	# of CFs: 2 $ of CFs: $3,002,833 # of Occ: 6	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	# of CFs: 2 $ of CFs: $5,308,953 # of Occ: 40	# of CFs: 1 $ of CFs: $665,116 # of Occ: 100	**# of CFs: 6** **$ of CFs: $13,051,402** **# of Occ: 166**
Shoreline/Bank Destabilization	-	-	-	-	**# of CFs: 0** **$ of CFs: $0** **# of Occ: 0**
Cryosphere- Glacier	# of CFs: 1 $ of CFs: $1,000,000 # of Occ: 0	-	-	-	**# of CFs: 1** **$ of CFs: $1,000,000** **# of Occ: 0**
Cryosphere- Avalanche	-	-	-	-	**# of CFs: 0** **$ of CFs: $0** **# of Occ: 0**
Volcano	# of CFs: 18 $ of CFs: $64,065,534 # of Occ: 612	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	# of CFs: 4 $ of CFs: $11,334,851 # of Occ: 100	# of CFs: 9 $ of CFs: $8,433,177 # of Occ: 205	**# of CFs: 32** **$ of CFs: $87,908,062** **# of Occ: 937**
Dam Failure	-	-	# of CFs: 1 $ of CFs: $4,068,239 # of Occ: 40	# of CFs: 1 $ of CFs: $665,116 # of Occ: 100	**# of CFs: 2** **$ of CFs: $4,733,355** **# of Occ: 140**

Table 38- Vulnerability Exposure Analysis- Tlingit & Haida (Juneau assets)

	Government Facilities	Utility	Education	Community	Total
HAZMAT	# of CFs: 18 $ of CFs: $64,065,534 # of Occ: 612	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	# of CFs: 4 $ of CFs: $11,334,851 # of Occ: 100	# of CFs: 9 $ of CFs: $8,433,177 # of Occ: 205	**# of CFs: 32** **$ of CFs: $87,908,062** **# of Occ: 937**
Cybersecurity	# of CFs: 18 $ of CFs: $64,065,534 # of Occ: 612	# of CFs: 1 $ of CFs: $4,074,500 # of Occ: 20	# of CFs: 4 $ of CFs: $11,334,851 # of Occ: 100	# of CFs: 9 $ of CFs: $8,433,177 # of Occ: 205	**# of CFs: 32** **$ of CFs: $87,908,062** **# of Occ: 937**

CFs: Critical Facilities
Occ: Occupants (this value is determined by the number of occupants in the facility. This does not account for the potential total population affected by the hazard event)

Table 39- Vulnerability Exposure Analysis- Residences and People at Risk

	# of residences at risk	$ of residences at risk	# of people at risk
Earthquake	12,757	$7,744,465,559	31,382
Severe Weather	12,757	$7,744,465,559	31,382
Wildland/Urban Fire	12,757	$7,744,465,559	31,382
Landslide	1,126	$697,526,468	2,770
Tsunami	1,049	$626,583,583	2,581
Flood	2,410	$1,405,416,738	5,929
Shoreline/Bank Destabilization	1,844	$1,125,450,788	4,536
Cryosphere- Glacier	4,576	$2,808,961,234	11,257
Cryosphere- Avalanche	189	$122,213,153	465
Volcano	12,757	$7,744,465,559	31,382
Dam Failure	98	$59,942,910	241
HAZMAT	12,737	$7,732,150,139	31,333
Cybersecurity	12,757	$7,744,465,559	31,382

These values were calculated using the most current (2024) CBJ parcel data.

The parcel data was overlayed with each hazard data/layer and parcels at risk were analysed using the Intersect function in GIS. The affected parcels were filtered for residential units and then multiplied by a unit multiplier. The unit multiplier (M) was assigned for each residential type to account for multiple groups living on the same parcel.

Apartment (M=8), Cabin (M=1), Condo lot (M=10), Duplex (M=2), Economic unit (M=1), Fourplex (M=4), Mobile home park (M=80), Mobile on lot (M=1), Single family (M=1), Single family with apartment (M=2), Townhouse (M=1), Triplex (M=3), Zero lot line (M=2).

# of affected parcels x unit multiplier (M) = # of residences at risk

The value of residences at risk was determined by multiplying the number of residences at risk by an estimated replacement cost per housing type. The estimated replacement cost was determined by using a 2022 HUD dataset (*Total Development Cost (TDC) for Affordable Housing Under the Native American Housing Assistance and Self-Determination Act of 1996 (NAHASDA)*) replacement values for the Tlingit & Haida and Douglas Indian Association Tribes. This dataset accounts for additional costs of labor and materials in Alaska and is more accurate than US Census values.

1-bedroom: $486,015 (Apartment, Mobile home park, Mobile on lot)

3-bedroom: $615,771 (Cabin, Condo lot, Duplex, Economic unit, Fourplex, Single family, Townhouse, Triplex, Zero lot line)

5-bedroom: $728,750 (Single family with apartment)

# of residences at risk x est. replacement cost = $ of residences at risk

The number of people at risk was determined by multiplying the average number of people per household (2.46) by the number of residences at risk.

average number of people per household x # of residences at risk = # of people at risk

3.4.8 LAND USE IN JUNEAU AND TRADITIONAL LANDS OF TLINGIT & HAIDA

The Juneau and Traditional Lands of Tlingit & Haida Planning Area is roughly the size of Delaware and encompasses approximately 3,255 sq. miles of land. It is bounded to the west by Lynn Canal (Ch'áak' K̲wáan); on the east by the Canadian border; on the south by the Petersburg (Séet Ká) Borough; and on the north by the Haines Borough. The Planning Area consists of water and rugged mountains and glacial icefields making up approximately 90% of the geographic footprint.

The City and Borough of Juneau is currently updating its Comprehensive Plan and regularly updates its Land Management Plan. The Comprehensive Plan covers the political boundaries of the City and Borough.

Existing development is concentrated in the area of land between the sea and steeply rising mountains to the northeast on the mainland; along the eastern and northern coastline of Douglas Island; as well as the flat, glacial plain of the Mendenhall Valley.

The CBJ Community Development Department (CDD), Planning Commission and the Assembly manage land use according to the Land Use Code which defines the zoning district land uses according to the categories defined in the table below. Maps of land use designations within the CBJ are found on the CBJ Website from the 2013 Comprehensive Plan and are currently being updated.

Table 40- City and Borough of Juneau Land Use Designations

Land Use Type	Description
Conservation Area (CA)	Conservation Areas consist of CBJ-owned Parks and Recreation Department-managed lands with recognized high value environmental qualities that are set aside for the protection and management of the natural environment with recreation, such as fishing, hiking and non-motorized boating, as a secondary objective. These may be non-anadromous fish watercourses or areas adjacent to anadromous fish streams that have been designated Stream Protection Corridors (SC), greenbelts, or high value wetlands. No development should be permitted other than structures, roads and trails necessary for the maintenance and protection of
Stream Protection Corridor (SC)	On CBJ-owned lands, a SC-Stream Protection Corridor designation serves to protect anadromous fish streams and their tributaries from development that could cause pollution, erosion, depletion of groundwater infiltration or otherwise could degrade the stream corridor and its biological functions. Upon first designation, a 200-foot-wide corridor on both sides of the bank would be included within the designated corridor along anadromous fish water bodies included within the Alaska Department of Fish and Game Inventory adopted by the CBJ Assembly. However, this "base" designation should be revised and the length and breadth of the specific corridor should be determined by a scientific/biological assessment of the functionality and habitat value of the particular stream segment; the width and length of the protected corridor may be more or less than the 200-foot base protection zone. No development should be permitted other than passive, non-motorized trails, their support systems and, under special circumstances, roads and parking areas necessary for the maintenance and protection of the resources therein or to facilitate managed non-motorized public access for education and passive recreation activities. These lands should be zoned to prevent residential, commercial, and industrial development, as well as resource extraction activities. The CBJ should retain ownership of these lands. On publicly-owned lands that are not owned by the CBJ, a SC-Stream Protection Corridor designation is fixed at 200 feet from the ordinary high water mark of the shorelines of the anadromous fish creeks, streams, and lakes listed in the most recently CBJ-adopted ADF&G inventory of anadromous fish streams.
Natural Area Park (NP)	Natural Area Parks are CBJ-owned lands characterized by areas of natural quality designed to serve the entire community by providing fish and wildlife habitat, open space/natural areas, access to water, and opportunities for passive and dispersed recreation activities. No development should be permitted other than structures, roads and trails necessary for the maintenance and protection of the resources or for managed public access for education and passive recreation purposes; this may include parking areas, educational kiosks, cabins, rest stations and similar convenience services for the recreational enthusiast. These lands should be zoned to prevent residential, commercial, and

Land Use Type	Description
	industrial development, as well as resource extraction activities. The CBJ should retain ownership of these lands.
Recreational Service Park (RS)	Recreation Service Parks include CBJ-owned lands with parks developed for active recreation, programmed use, and/or community gardens. Recreation, parking, playgrounds and fields, ski lifts, All-Terrain Vehicle (ATV) riding parks, rifle ranges, operations and maintenance-related structures are possible uses or components of RS designated lands. These lands should be zoned to prevent residential, commercial, and industrial development, as well as resource extraction activities beyond those accessory to park development. The CBJ should retain ownership of these lands. As many of the existing RS-designated lands are smaller than the minimum area required for a unique zone, these lands must be within the zoning district that surrounds or abuts them.
Federal Park (FP)	Federal Parks are public lands owned by federal agencies and managed for recreational use.
State Park (SP)	State Parks are public lands owned by state agencies and managed for recreational use.
Recreational Resource (REC)	Land primarily under federal or state management for a range of resources, such as timber, minerals, fish and wildlife and recreation uses, including recreation cabins. Uses may include small-scale, visitor-oriented, and/or seasonal recreational facilities. These lands should be zoned to prevent residential, commercial, and industrial development.
Watershed (WS)	Watershed lands are in natural, largely undisturbed states that provide, or could in the future provide, water supplies for domestic water consumption. Any development within WS-designated lands should be designed and/or use Best Management Practices to avoid negative impacts to water quality. Watersheds are overlay land use designations that transcend other land use designation boundaries.
Hazard Area (HA)	Hazard Area lands have characteristics that could pose hazards to the general public and, therefore, development therein should be prohibited or, if allowed, should be designed and operated in such a way as to ameliorate any adverse impacts associated with the identified hazard. Examples of hazardous lands include areas with moderate to high potential for avalanche or mass-wasting/landslide events. Lands within Hazard Area designations may be zoned for a mix of zoning districts, most particularly the same district as the surrounding lands. CBJ-owned lands in hazard areas should be retained in CBJ ownership. Hazard areas are overlay land use designations that transcend other land use designation boundaries. Although any zoning district could be overlaid by the HA land use designation, residential densities should be kept low in areas designated as within hazard areas in regulatory maps, unless substantial effort to protect residents is made in project design and construction. The Hazard Areas shown on the Comprehensive Plan Land Use Maps are general in nature; regulatory maps must be based on careful scientific review of site-specific conditions and will be more specific.
Scenic Corridor/Viewshed (SCV)	This designation is suitable for CBJ-owned and other public lands whose views of, or whose near and/or distant views from the locale, are deemed as spectacular and/or represent a significant and important representation of the visual character of the CBJ. The views of, or from, the designated SCV land area toward public vista points or viewscapes: 1. demonstrate a scenic view of great natural beauty, a spectacular landscape, an important historic building or site; 2. provide views of the aurora borealis, sea, harbors, or of a cityscape that is a “signature” viewscape of the CBJ; and, 3. is valued by residents and visitors alike and conveys the Juneau area as a special place. Lands within the scenic corridor or viewscape should be protected from visual intrusion or obstructions from structures, night light and glare, invasive flora, and/or other similar elements that would diminish the visual prominence of the viewscape. Lands within SCV designations may be zoned for a mix of zoning districts, most particularly the same district as the surrounding lands; however, any new zoning request or rezoning application should identify specific view corridors

Land Use Type	Description
	that would be protected by any new development therein. Land uses that do not require view-blocking structures should be permitted, such as public vista plazas and seating areas, community gardens, boat launch facilities, fishing areas or utility poles.
Institutional and Public Use (IPU)	Lands that are in public ownership and dedicated for a variety of public uses, such as the University of Alaska Southeast; local, state and federal government uses; and for such public facilities as community gardens, schools, libraries, fire stations, treatment plants, and public sanitary landfills. Included are potential sites for future boat harbors, schools, parks, farmers markets, publicly-supported arts events, permitted arts or food-service kiosks or sales activities, parking facilities and road and public transit system easements. Also included are public aircraft facilities. The public use of these lands will vary widely, so IPU-designated lands can be under any zoning district, with the uses thereon appropriate for that zone as regulated in the Table of Permissible Uses (CBJ 49.25.300); the zone of any particular public use should be the same district as the surrounding or abutting lands.
Resource Development (RD)	Land to be managed primarily to identify and conserve natural resources until specific land uses are identified and developed. The area outside the study area of this Comprehensive Plan is considered to be designated Resource Development. As resources are identified or extracted from these lands, they should be re-designated and rezoned appropriately
Rural Dispersed Residential (RDR)	These lands are characterized by dispersed, very low density development not provided with municipal sewer or water. Densities are intended to permit one dwelling unit per acre or larger lot sizes, based on existing platting or the capability of the land to accommodate on-site septic systems and wells. Uses may also include small-scale, visitor-oriented, seasonal recreation facilities.
Rural/Low Density Residential (RLDR)	Rural residential land at densities of one to three dwelling units per acre, based on existing platting and capability of the land to accommodate on-site septic systems and wells or whether the land is served by municipal water and sewer service.
Urban/Low Density Residential (ULDR)	These lands are characterized by urban or suburban residential lands with detached single-family units, duplex, cottage or bungalow housing, zero-lot-line dwelling units and manufactured homes on permanent foundations at densities of one to six units per acre. Any commercial development should be of a scale consistent with a single family residential neighborhood, as regulated in the Table of Permissible Uses (CBJ 49.25.300).
Medium Density Residential (MDR)	These lands are characterized by urban residential lands for multifamily dwelling units at densities ranging from 5 to 20 units per acre. Any commercial development should be of a scale consistent with a residential neighborhood, as regulated in the Table of Permissible Uses (CBJ 49.25.300).
Medium Density Residential – Single Family Detached (MDR/SF)	These lands are characterized by single-family detached homes at densities ranging from 10 to 20 units per acre. Only single-family detached homes, single-family detached homes with an accessory apartment, cottage houses and bungalow houses are permitted within this zone. Any commercial development should be of a scale consistent with a single-family residential neighborhood, as regulated in the Table of Permissible Uses (CBJ 49.25.300).
High Density Residential (HDR)	These lands are characterized by urban residential lands suitable for new, in-fill or redevelopment housing at high densities ranging from 18 to 60 units per acre. Commercial space may be an element of developments on properties under this designation, as regulated in the Table of Permissible Uses (CBJ 49.25.300).
Traditional Town Center (TTC)	These lands are characterized by high density residential and non-residential land uses in downtown areas and around shopping centers, the University, major employment centers and public transit corridors, as well as other areas suitable for a mixture of retail, office, general commercial, and high density residential uses at densities at 18 or more residential units per acre. Residential and non-residential uses could be combined within a single structure, including off-street parking. Ground floor retail space facing roads with parking behind the retail and housing above would be an appropriate and efficient use of the land.

Land Use Type	Description
Marine Mixed Use (M/MU)	These lands are characterized by high density residential and non-residential land uses in areas in and around harbors and other water-dependent recreational or commercial/industrial areas. Typically, neighborhood serving and marine-related retail, marine industrial, personal service, food and beverage services, recreational services, transit and transportation services should be allowed and encouraged, as well as medium- and high density residential uses at densities ranging from 10 to 60 residential units per acre. Ground floor retail space facing roads with parking behind the retail and housing above would be an appropriate and efficient use of the land. Float homes, live-a-boards, and house boats, if necessary, services (such as sewer) are provided to berthing locations, are appropriate for these areas.
Bonus-Eligible Area (BE)	Bonus-Eligible areas are shown on the Bonus-Eligible Area Overlay District Map. Areas within the Bonus-Eligible Overlay District may be considered for inclusion in bonus-eligible overlay districts adopted into the zoning maps; such bonus-eligible overlay districts may be designed to achieve a particular purpose, such as the Affordable Housing Overlay District (AHOD) or a Transit Oriented Development Overlay District (TOD). Regardless of the name given to such an overlay district in the zoning map set, the intent of the BE designation is to encourage the development of relatively dense, mixed use, pedestrian-oriented land uses in close proximity to high levels of transit service. Particular details of how both the AHOD and TOD Overlay Districts are envisioned are included throughout this Plan, and with particularity in Chapters 4 (AHOD) and 3 (TOD). The goals, objectives, and bonuses that are relevant or applicable to either AHOD or TOD have a high degree of overlap, and a single bonus-eligible area and associated set of land use permitting requirements may suffice to meet the need for both overlays that are expressed in this Plan. The BE area is defined as that portion of the Urban Service Area that is, at the time of map adoption: 1. Within ½ mile distance of, and not separated by a water body from, a public transit route with regular service that is ½ hour or less on average; 2. Not within the Mendenhall Wetlands State Game Refuge; 3. Not within the Juneau International Airport; and, 4. Not within a Light Industrial (LI), Heavy Industrial (HI), or Waterfront Commercial/Industrial (WCI)
Commercial (C)	Lands devoted to retail, office, food service or personal service uses, including neighborhood retail and community commercial centers, such as shopping centers and malls, office complexes or other large employment centers. Mixed retail/residential/office uses are allowed and encouraged. Residential and non-residential uses could be combined within a single structure, including off-street parking. Residential densities ranging from 18- to 60-units per acre are appropriate in this area, with even higher densities appropriate in mixed-use or transit-oriented developments. Ground floor retail space facing roads and housing above would be an appropriate and efficient use of the land.
Light Industrial (LI)	Land to be developed for heavy commercial or light industrial uses such as small- to medium- scale food processing; printing and other business services; wholesale trade; research and development laboratories; light manufacturing processes; metal fabrication; warehousing, trucking; animal kennels; crematoria; indoor and outdoor storage; car, boat, and heavy equipment sales; and repair and maintenance activities. Residential units should be limited to caretaker units where the occupant works directly for or owns the business for which the occupant is caretaking.
Heavy Industrial (HI)	Land to be developed for heavy industrial uses such as large scale food production and/or processing; large-scale or industrial-related repair activities; metal fabrication; wholesale trade; manufacturing processes; warehousing; outdoor storage; trucking; animal kennels; crematoria; repair and maintenance uses; resource extraction and processing such as gravel pits, rock crushing facilities, cement batch plants, asphalt plants, fuel tanks, stump dumps, salvage yards, landfill sites; aircraft facilities; and other similar large-scale or noisy and/or noxious industrial activities. Some recreational uses should be permitted, including sport vehicle, All Terrain Vehicle (ATV) or snowmobile motor-course facilities, shooting ranges, and other similar noise-generating uses. Residential office, retail, and personal service uses are not to be allowed, except that residential caretaker facilities should be permitted.

Land Use Type	Description
Marine Commercial (MC)	Land to be used for water-dependent commercial uses such as marinas/boat harbors, marine vessel and equipment sales and repair services, convenience goods and services for commercial and sport fishing, marine recreation and marine tourism activities such as food and beverage services, toilet and bathing facilities, bait and ice shops, smallscale fish processing facilities, hotels and motels, and similar goods and services to support mariners and their guests. Float homes, house boats, and live-aboards would be residential uses to be allowed within an MC district.
Waterfront Commercial/Industrial (WCI)	Land to be used for water-dependent heavy commercial and industrial uses such as marine transportation terminals, large or small boat marinas, boat repair, shipyards, marine freight handling areas, fish buying and processing plants, ice plants, marine hatcheries, and marine parks. Residential uses would not be allowed in Waterfront Commercial/Industrial Districts, with the exception of caretaker units.

Source: 2013 Comprehensive Plan of the City and Borough of Juneau

Housing Background

Housing remains a long-term challenge facing the community. The current Land Management Plan contains recommendations for near-term property disposals as well as the long-term process for providing public utilities and disposing of additional CBJ property. Proceeds from property sales are to be deposited in the municipal land fund. These long-term projects take many years to complete, therefore it is very important to minimize the use of the Land Fund for other projects and to maintain the fund at a healthy level so CBJ can continue to provide a responsible land management program in the future.

CBJ property represents a significant resource for the community. Municipal facilities include fire stations, a ski area, schools, City Hall, public works facilities, airport, pools, libraries, ball fields, museums, rock quarries, gravel pits, parks, docks and harbors are all located on City land. While the City has thousands of acres of wilderness available for future expansion of the municipality, some of which can be utilized for housing, constraints associated with access, wetlands, and hazard areas limit development.

Private land holdings within the CBJ include over 1,500 parcels across 9,600 acres that have not been developed. The lots cross all zoning types with almost 300 zoned as D1 (single-family dwelling). Similar to CBJ properties, private land holdings will need to be evaluated for suitability for development.

Juneau and Traditional Lands of Tlingit & Haida Land Management Timeline

1995 Land Management Plan - The CBJ's first land management plan, adopted in 1995 and updated in 1999, laid the foundation for management of one of the community's most important resources - 23,000 acres of municipally-owned land. The plan placed significant emphasis on the land disposal program, reflecting the Assembly's growing concern about Juneau's housing situation. The Assembly indicated a strong interest in selling some of CBJ's land as a means of stimulating construction of much- needed housing.

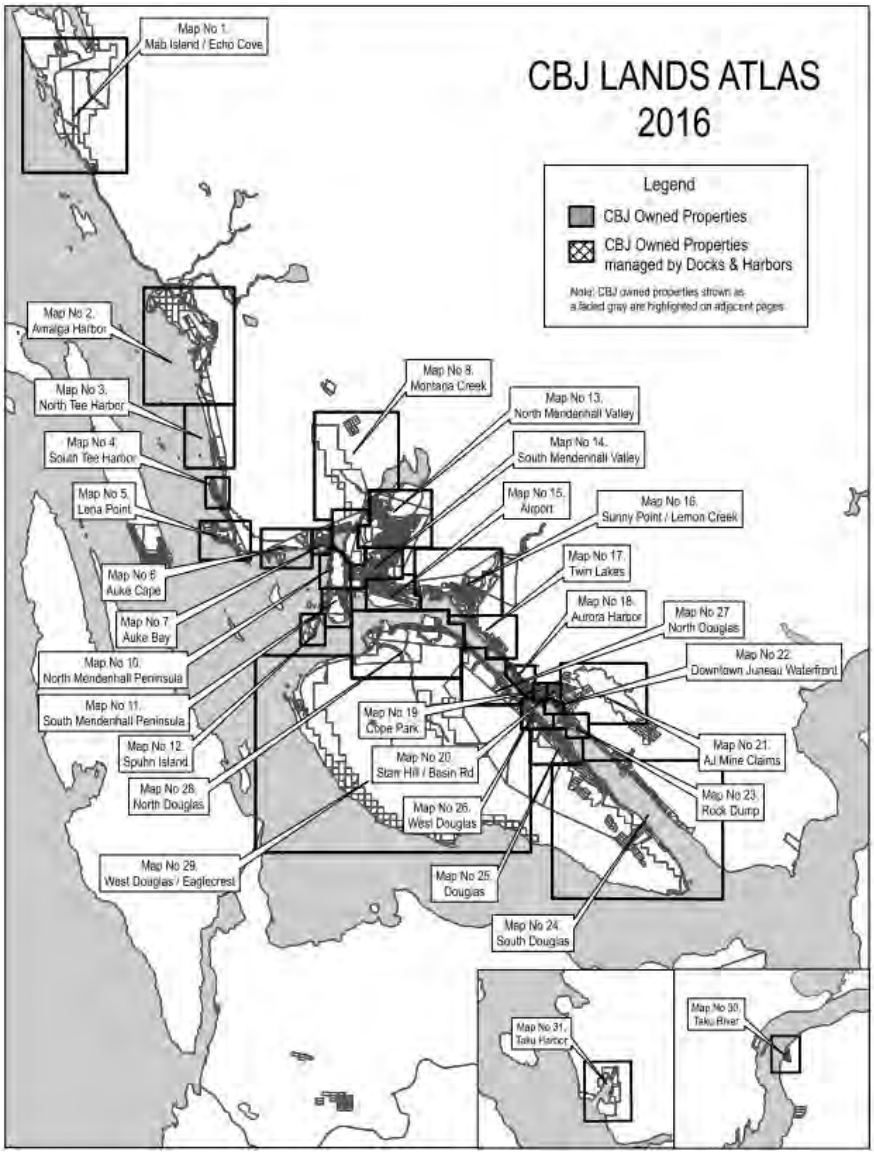
2015 Land Management Plan Update - Land Development since 1995

- Mental Health Trust lawsuit settled, resulting in additional CBJ land for disposal in consideration in North Douglas and Mendenhall Peninsula. Many of the lots are remote and unsuitable for near term development.
- CBJ sold or donated 116 lots.
- Lemon Creek new construction includes Costco, Concrete Way, Breeze Inn, Home Depot, expansion of Alaskan Brewery.
- CBJ new construction includes new police station, Treadwell Ice Arena, Thunder Mountain High School, new ball fields, new trails, Dimond Park Aquatic Center.
- Eaglecrest Ski Area converted to electric lifts, added two more chairlifts and a Learning Center.

- CBJ Harbor and Schools have been upgraded and remodeled.
- JIA has expanded its runway, dredged float plane pond.
- JIA terminal has expanded to accommodate new security requirements.
- Sewer lines have been extended to accommodate increased density in Urban Service Area.
- Expanded cellular communication tower network.
- New NOAA research facility at Lena Point.
- New USFS and NWS offices on Mendenhall Loop Rd.
- New forest research facility on Auke Lake.
- University Alaska Southeast/ National Guard collaborated for UAS Recreation Center/Gamble-Sperl Joint Use Facility.
- Holy Trinity Church rebuilt after fire.
- Town Center Mall site redeveloped into Walter Soboleff Center by Sealaska after fire.
- State Capital complex improved.
- Former armory site converted into the Juneau Arts and Culture Center (JACC).
- Construction of Downtown Transportation Center.
- Lena Point Subdivision.

<u>Planned Land Development in 2015</u>

- New Dimond Park Library.
- Large Ship Floating Dock.
- Expanding launch ramps and docks in Statter Harbor.
- Construction of State Library, Archives, and Museum (SLAM) building.



Source: CBJ Land Management Plan 2016 Update

Figure 130- CBJ Owned Lands Atlas

Suitable Future Development Opportunities

Although the community has seen several housing developments completed, supply continues to lag behind demand with the result that even though 30 years have elapsed since the first Land Management Plan was adopted; housing supply continues to be a problem for the Planning Area. The Lands Division completed a survey of all CBJ property to determine which areas would be most appropriate for new development. The Buildable Lands Study recommended that the Lands Division concentrate new development in the Switzer Creek area near Dzantik'i Heeni Middle School, Lemon Creek (Eix̲'gulhéen) and Pederson Hill. The City has extensive land holdings on Douglas Island, however, few of these areas have developed access, and a large portion have been classified as wetlands. A new road will likely have to be constructed to develop these properties and slope stability analyses will need to be performed to identify lands suitable for construction due to the topography.

In the future, it is likely that although most readily developable land suitable for residential use in the community is held by the private sector, the Lands Division will be tasked with making land available for

housing. The City has provided land for less than market value for the High School Home Building program and will continue to identify property that will be suitable for the program in the future. Although the need for new housing is immediate, subdivision developments have extended timelines. For example, work on the Lena Subdivision began in 1999 and the first land sale occurred in 2007. Several lots remain to be sold in this subdivision at the present time. Careful planning and subdivision development of the most appropriate City land holdings will be necessary to help provide additional land for new housing construction. In order to facilitate this development, the Land Fund will need to remain intact so that capital will be available to fund new projects.

Supply & Demand, Land

Of the 1,034,240 acres of land in the City & Borough of Juneau, approximately 15,000 acres are zoned for residential use and approximately 60% of that land is vacant (this does not include commercially zoned parcels that could support housing). The Comprehensive Plan of the City & Borough of Juneau states that 10 residential units or greater per acre is the minimum density needed to produce affordable housing for moderate to lower income households. Significant up-zonings within the CBJ, as well as changes to density limits in the Land Use Code, have increased the amount of land allowed to be developed with up to 10 units per acre or greater. Currently there are approximately 2,400 acres of residentially zoned land with allowed densities of 10 units or more within the City & Borough. Most of this land is vacant.

The majority of the land within the City and Borough is in public ownership. The federal, state and municipal governments all have significant land holdings. Most of the federal land is part of the Tongass National Forest and is not available for public development. The state land is either dedicated towards specific state interests, such as parks, or is unsuitable for development because of steep topography. The University, Mental Health Trust and Native Corporations all have land holdings in Juneau and Native Corporations are some of the most active developers within the area. Community expansion will, therefore, be primarily dependent upon use of the CBJ's land base. For the foreseeable future, the supply of private land will only be increased by the disposal of CBJ land. One of the purposes of the Land Management Plan is to provide for the orderly and timely disposal of CBJ property suitable for development.

In 2006 the CBJ completed the Buildable Lands Study which identified all CBJ owned parcels larger than 1/4 acre within or near the Urban Service Area and were not designated for parks, open space, greenbelts, schools, or zoned industrial, commercial or waterfront. Further investigation into slopes, access roads, airport flight safety hazards, avalanche and mass-wasting hazards narrowed the search down to 12 parcels that would be suitable for potential building sites. Those 12 parcels were the subject of closer studies of slopes and evaluation of wetlands. The study concluded that, "of the 12 sites, only four have portions of land that are less than 18 percent slopes and are devoid of watercourses and high-value (Class A or B) wetlands and, therefore, would be suitable for residential development."

The four sites are located in Lemon/Switzer Creek, Mendenhall Peninsula, Thunder Mountain and North Douglas.

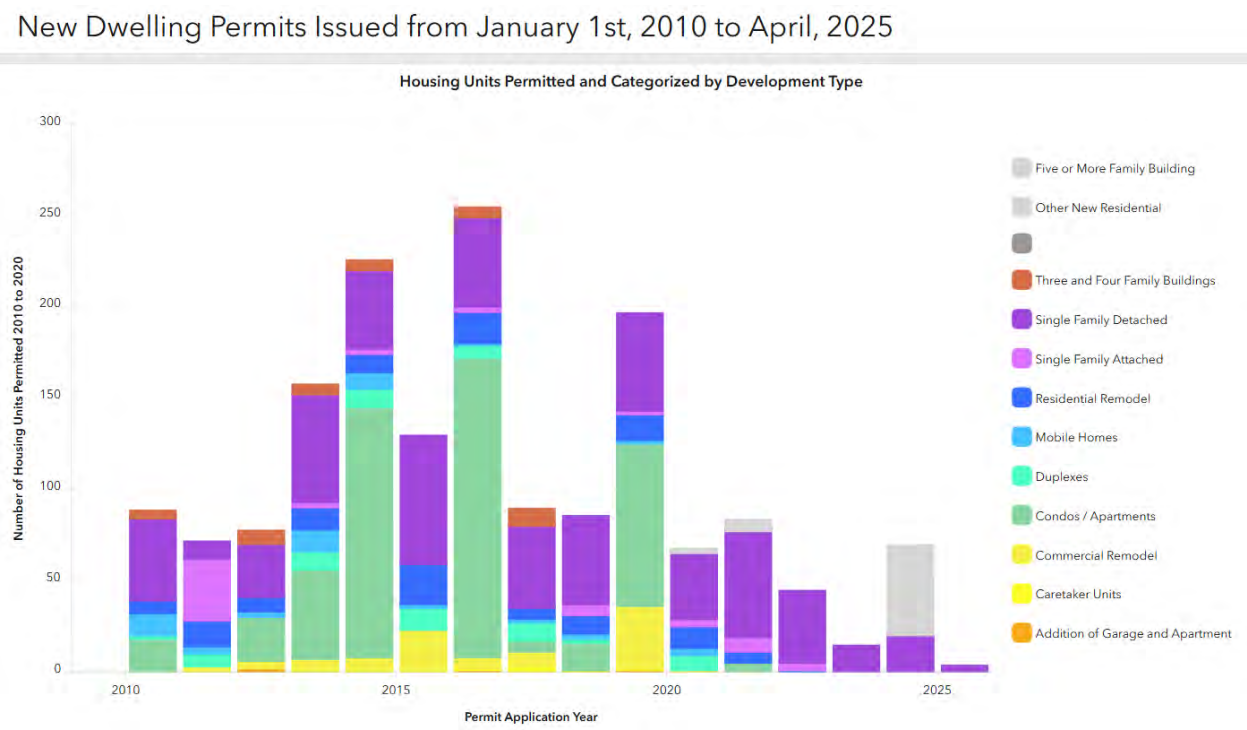
Before the Mendenhall Peninsula and North Douglas areas are developed, it is necessary to improve the access roads and bring utilities to the parcels. A sewer line was extended along Glacier Highway to the base of Pederson Hill, adding Pederson Hill (also known as Hill 560) to the list of the best areas to develop. Since the 2006 Buildable Lands Study, two areas were determined to be the most suitable to start developing for housing. Those were Pederson Hill and the Switzer Creek Area. Individual studies focusing on those two areas have been completed. The 2010 Pederson Hill Access Study states that there are "several challenges for development, including steep slopes, wetlands, numerous creeks and drainages, anadromous fish habitat, challenging access and eagle (Ch'áak') nests." With that being said, the study showed five potential routes to provide access to developable areas. The Switzer Lands Residential Development Study was completed in 2012 to evaluate potential development areas and estimate the development costs and phasing in those areas. In the conclusion of that study it highlighted that "development areas are identified in the study area with consideration given to steep terrain, wetlands, creeks, waters of the United States,

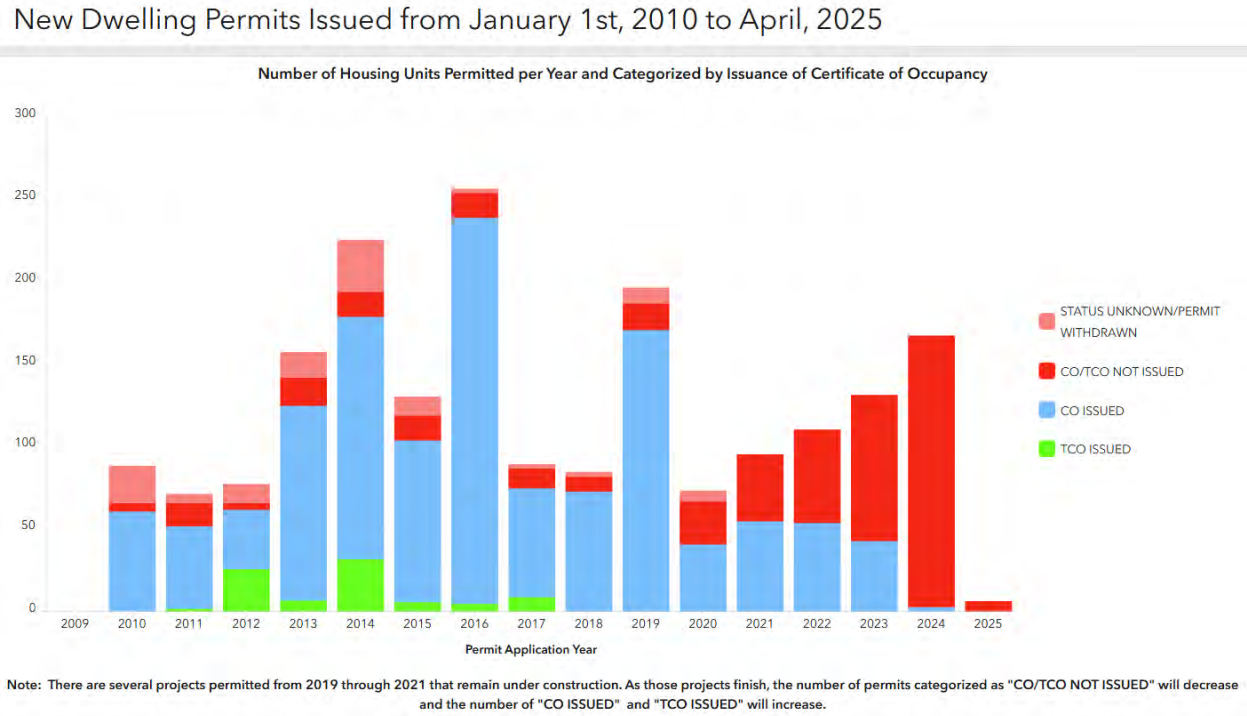
flood zones, anadromous fish habitat, and eagle nesting areas." The study contained three main development areas and ideas of how to develop them.

In general, the best land for development is already in private ownership. Acquired directly from the federal or state governments through early homesteading or other disposal programs, the existing privately-owned property tends to be located on flatter, well drained and more accessible areas than the large, CBJ-owned parcels. The majority of the CBJ land could be characterized as remote, large parcels with moderate to steep slopes and lacking developed access or utilities. Given these circumstances, a large portion of CBJ land has been classified Rural Reserve; in this category, land use decisions have been deferred until a future time when the population, access and services have expanded.

The demand for residential property is directly related to the number of housing units needed in the community. The cost of land affects the sale price of housing. High-priced lots combined with high development costs have resulted in unaffordable housing. Therefore, the affordability of a house is, in part, related to the cost of the land. The affordability of property, in turn, is a key factor in the demand for residential lots. It is estimated that the cost of a lot is approximately 25% of the cost of a single-family house. The cost of land is subject to local market forces. If the CBJ increases the supply of privately-owned property through a disposal program, it can potentially stimulate the housing market to meet demand.

Just as the Planning Area residents should have a variety of housing choices, there needs to also be a healthy choice of residential and commercial land to purchase. It is in the community's interest that a sufficient supply of lots are available to provide citizens with a choice of location and a range of prices. One of the goals of the Land Management Plan is to increase the private land base, as needed, to stimulate or maintain adequate housing opportunities. With guidance from the Pederson Hill Access Study and Switzer Lands Residential Development Study, the CBJ is working on developing the Switzer and Pederson Hill areas. The first phase of development in the Switzer area will be for an 11-acre multi-family subdivision. Planning is underway for the Pederson Hill area to be developed for approximately 200 small single-family lots with a portion of multi-family development that could include 100 additional units. Once these areas have been subdivided and the needed infrastructure is complete, they could be disposed of for a variety of housing developments.





Source: CBJ Community Development Department, 2025

Figure 131- CBJ Dwellings and Occupancy Rates (2010-2025)

Supply & Demand, Housing

There is currently a strong demand for housing in the Planning Area. The Assembly's highest priority is to ensure adequate and affordable housing for all CBJ residents. There is an inadequate supply of housing to provide residents with adequate choice in housing size, location and price, resulting in residents paying

more than 30% of their income (for housing). Planning Area residents need additional affordable housing which is not currently being met by the private sector.

The Planning Area has many distinguishing characteristics that make its housing market unique. The community is only accessible by air or sea and has a wide range of demographics. The US Coast Guard has a station in Juneau, and they do not have their own base housing and are expecting a new icebreaker in August of 2025. There are also several seasonal housing demands: legislative session, tourism, fishing season workers, etc. There are also mine employees that come to and from Juneau for short periods of time. According to the 2016 Housing Action Plan, 1980 units are needed by 2046, or 66 units per year.

Current Developments

A total of 1,333 new housing units were permitted, built, and issued certificates of occupancy within the City and Borough of Juneau between January 2010 through April 2025 (an average of 88 units annually over the 15-year period). Since units take a while to construct, certificates of occupancy are usually not issued the same year as the building permit.

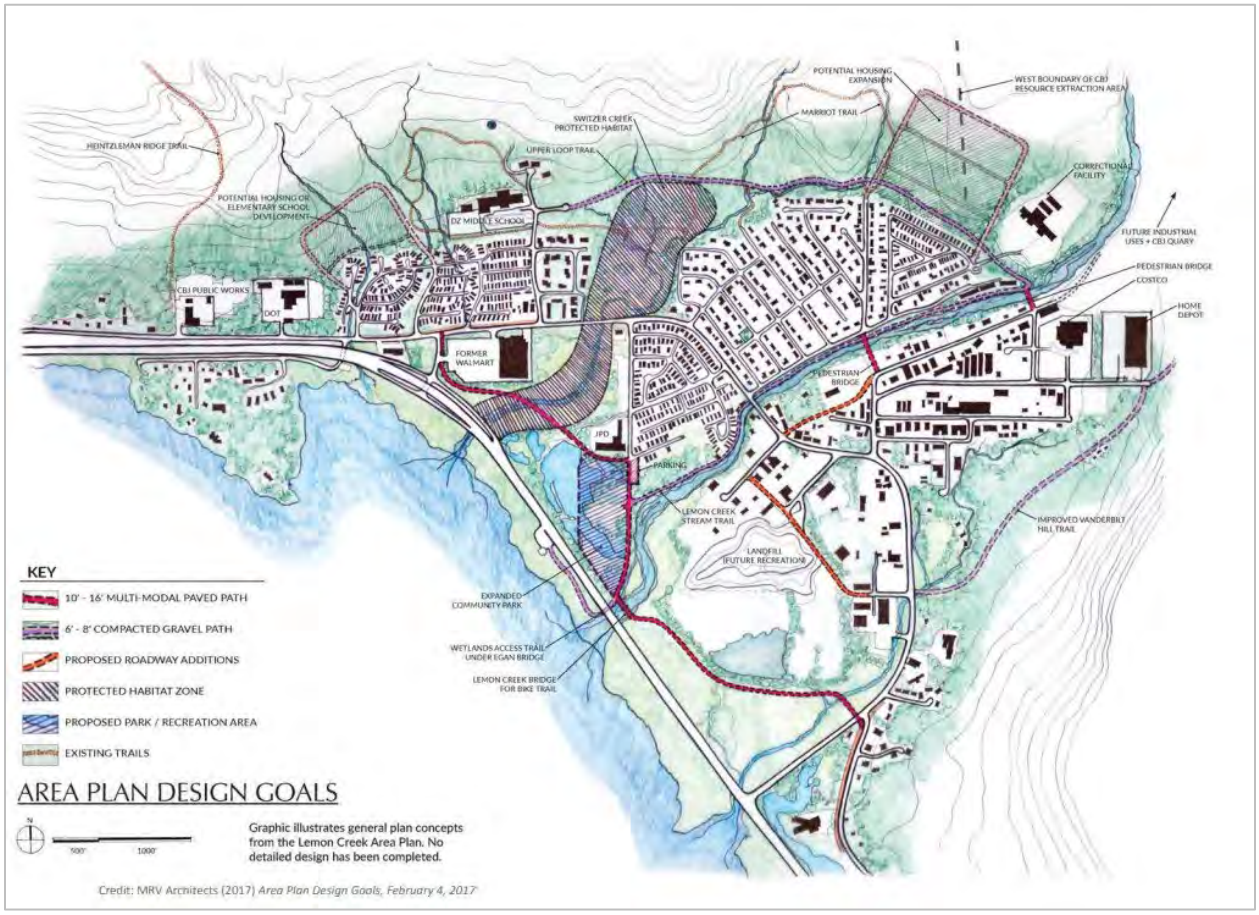
Lands staff continuously reviews zoning designations of CBJ land holdings and identify areas that would be suitable for near term rezoning to support increased housing density. The CBJ Comprehensive Plan provides direction for rezoning and any request for rezoning will conform to the adopted Comprehensive Plan. An example of this ongoing review for rezoning is CBJ parcel LND-1430. This large property located uphill from North Douglas Highway contains 655 acres and stretches from near the Juneau Douglas Bridge to the Bonnie Brea neighborhood. Portions of this parcel have recently been rezoned. This region contains significant potential for increased housing density.

3.4.9 FUTURE DEVELOPMENT

Most CBJ land is located on steep slopes which greatly increases development costs. Additionally, much of the CBJ land consists of wetlands which pose unique construction and regulatory challenges. Road access and utilities are also significant factors in the developability of CBJ lands. Most parcels of land will require expensive access roads which often will not have lots adjacent to them to supplement development costs. An example of this is the CBJ property holdings in Pederson Hill. CBJ acquired private property to gain access routes to the developable portions of this area. Another significant factor is that many of the parcels are not served by municipal sewer or water such as the Mendenhall Peninsula. The combination of: accessibility, physical constraints, and presence or absence of utilities are factors often overlooked by the public when considering the role that the CBJ can play in the future development of the community. Undoubtedly development costs will be much greater than what developers of flatter land have experienced in the past. Land prices are likely to increase because of higher development costs.

Since the 2016 Land Management Plan Update, the Planning Area has experienced several additional challenges to developing additional land, beyond the constraints previously described. Landslide and avalanche hazard mapping in Downtown Juneau was completed by Tetra Tech in 2022. The mapping shows severe hazard risk in much of the land surrounding Downtown Juneau, requiring higher development costs and lower density associated with development in severe hazard areas.

Secondly in 2011, the Mendenhall Valley, home to 46% (according to 2022 Tourism Survey) of CBJ residents, began experiencing Glacial Lake Outburst Floods (GLOFs) on a nearly annual basis. Mendenhall Valley GLOFs have a history and the potential of being much more catastrophic floods than the Mendenhall Valley has experienced due to rapid snowmelt, heavy rains, or other precipitation caused flooding. Many questions remained unanswered in 2025 about how GLOFs will continue to impact the Mendenhall Valley. The events have already influenced land development with CBJ installing HESCO barriers to mitigate impact of future GLOFs. It is not known how the barriers, and GLOFs will affect property values near the Mendenhall River. Until further analysis is completed and flood inundation maps are modeled, further land use development in the Mendenhall Valley to increase housing will be more difficult and costly.



3.4.10 SUBSISTENCE AND FOOD SOVEREIGNTY IN ALASKA

Food security/sovereignty and future climate conditions are two of Alaska's most daunting challenges. Alaska is warming twice as fast as the global average, which affects the ability to access traditional hunting (Haines-al'ooni), fishing, and gathering areas. Between 2000 and 2010, over 30% of Alaska Natives were consistently food insecure and were twice as likely to be food insecure when compared to white populations (Alaska Food Systems 2023).

Alaskans import 95% of their store-bought food, which is shipped through long supply chains. In rural Alaska, once supplies enter the state, they are flown into the villages and deliveries are weather-dependant. Extreme weather events and seasonality make rural communities, far beyond the end of the road, susceptible to weeks without food delivery, and the food that arrives often has a high spoilage rate due to long travel time and poor storage conditions (UAF AFPC 2023).

Alaska's supply chain is vulnerable and in turn, food supply is unstable- this was most recently highlighted by the 2018 earthquake in Southcentral Alaska that disrupted air traffic and the COVID-19 global pandemic with its associated supply chain breakdowns. The Port of Alaska in Anchorage is the state's primary inbound cargo-handling facility and nearly 80% of the goods entering the states comes through the Port of Alaska.

On February 9, 2022, Alaska Governor Mike Dunleavy issued Administrative Order 3311 establishing the Alaska Food Security and Independence Task Force. The task force was charged with being "responsible for recommendations on how to increase all types of food production and harvesting in Alaska, and to identify any statutory or regulatory barriers preventing our state from achieving greater food security (UAF

AFPC 2023). A subsequent report was drafted over three months by the University of Alaska Fairbanks and the Alaska Food Policy Council (AFPC) on behalf of the Alaska Food Security and Independence Task Force and was released in March 2023. The report discussed the food insecurity issues in Alaska and provided recommendations for improving Alaska's food security and independence which draw a roadmap for the State administration, legislators, and Alaska's food producers to make Alaska more food secure the next time the supply chain is disrupted (UAF AFPC 2023). Some of their recommendations include

- Identify barriers that farmers, stock growers, fishermen, mariculture professionals, and others engaged in the growing, harvesting, or raising of food face when starting a business or getting their products into the Alaska market. Provide recommendations on how the State can address those obstacles, including through administrative or statutory changes.
- Assess the levels of wild game and fish harvests in Alaska. Suggest measures that would increase the abundance and harvest of wild game, fish, and food by Alaskans.
- Recommend a program to assist communities and households impacted by fishery shortfalls and disasters.
- Assess the need for disaster food caches within the State; and how the caches can be developed utilizing Alaskan-sourced foods.
- Identify research needed to support and encourage increased consumption and production of Alaskan foods sourced within the State.

Since 2022, the Tlingit & Haida Food Security Program partnered with the US Department of Agriculture to distribute Tlingit & Haida traditional foods to Tribal Citizens in Southeast Alaska, Anchorage, and Seattle (KTOO 2025). The program aimed to promote self sufficiency, and to reduce reliance on food shipped from the Lower 48.

Approximately $500,000 was annually utilized to distribute thousands of pounds of salmon, black cod, and herring roe. This money was part of the Local Food Purchase Assistance Agreement Program which was intended to encourage local governments to buy from farmers and food producers. That aligned with the Tribe's goal to keep more traditional foods that are harvested in Southeast Alaska in the fridges and freezers of Tribal Citizens.

However, in March 2025, Tlingit & Haida announced its traditional food distributions were canceled as the federal government canceled a funding agreement with the Tribe. The USDA notice to Tlingit & Haida said that the Tribe's community food distributions "no longer effectuates agency priorities and that termination of the award is appropriate" (KTOO 2025).

Tlingit & Haida says the Tribe remains committed to food sovereignty and is actively looking for alternative funding to continue these vital programs in the future (Your Alaska Link 2025). Traditional Food Security Manager, Aaron Angerman, states:

> *"Tlingit & Haida will continue to search for funding to support our mission to promote food sovereignty by connecting Tribal Citizens with traditional foods. Tribal Citizens need the tools to be self-sufficient and decrease reliance on the food systems of the Lower 48. Distributions of Indigenous foods are a great opportunity to fuel the next generations of stewards of our traditional lands and seas."*

Source: Your Alaska Link 2025

Figure 132- Tlingit & Haida Food Security Program Gathering Traditional Foods for Distribution to Tribal Citizens

Despite the loss of funding for the traditional food distributions, there are other food distribution programs in Juneau (UWSEAK 2025). These include:

- Helping Hands Food Bank of Juneau
- Resurrection Lutheran Church
- Saint Brendan's Episcopal Church
- Salvation Army- Juneau Corps
- Shepherd of the Valley Lutheran Church
- Southeast Alaska Food Bank
- Douglas Community United Methodist Church
- Division of Public Assistance: Alaska Food Stamp Program
- The Glory Hall
- Love INC- Juneau
- Southeast Alaska Food Bank
- St. Vincent de Paul

4. MITIGATION STRATEGY

This section outlines the process for preparing a mitigation strategy. The mitigation strategy provides the blueprint for the implementation of desired activities which will enable the community to continue to save lives and preserve infrastructure by systematically reducing hazard impacts, damages, and community disruption.

This section addresses Element C of the Local and Tribal Mitigation Plans regulation checklists.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT C. Mitigation Strategy
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))
C2-a. Does the plan contain a narrative description or a table/list of their participation activities?
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?
C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii))
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))
C5-a. Does the plan describe the criteria used for prioritizing actions?
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMEN.T C. Mitigation Strategy
C1. Does the plan include a discussion of the tribal government's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including an evaluation of tribal laws and regulations related to hazard mitigation as well as to development in hazard-prone areas? (Requirement 44 CFR § 201.7(c)(3) and 201.7(c)(3)(iv)))
C2. Does the plan include a discussion of tribal funding sources for hazard mitigation projects and identify current and potential sources of Federal, tribal, or private funding to implement mitigation activities (Requirement 44 CFR § 201.7(c)(3)(iv) and 201.7(c)(3)(v))
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.7(c)(3)(i))
C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.7(c)(3)(ii))
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized, implemented, and administered by the tribal government? (Requirement 44 CFR § 201.7(c)(3)(iii))
C6. Does the plan describe a process by which the tribal government will incorporate the requirements of the mitigation plan into other planning mechanisms, when appropriate? (Requirement 44 CFR § 201.7(c)(4)(iii))

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMEN.T C. Mitigation Strategy
C7. Does the plan describe a system for reviewing progress on achieving goals as well as activities and projects identified in the mitigation strategy, including monitoring implementation of mitigation measures and project closeouts? (Requirement 44 CFR § 201.7(c)(4)(ii) and 201.7(c)(4)(v)))
Source: FEMA 2017 (Tribal)

4.1 Existing Authorities, Policies, Programs, and Resources

The City and Borough of Juneau and Tlingit & Haida's existing authorities, policies, programs, and resources available for hazard mitigation are described in the tables below.

Table 41 and Table 42 describes the City and Borough of Juneau and Tlingit & Haida's capabilities available for hazard mitigation.

Table 41 City and Borough of Juneau's Capability Assessment

Capability/Tool	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
Regulatory Tools		
Building Codes	Yes	CBJ Title 19 – Building Regulations governs this topic and is administered by CBJ's Building Division within Community Development Department
Zoning ordinances	Yes	CBJ Title 49 – Land Use; Title 49 is in the process of being entirely rewritten for the first time since 1987. Elements related to zoning, subdivisions, and natural hazards will be evaluated and considered for modifications to better meet the current context of Juneau's built environment.
Land use ordinance	Yes	CBJ 49.70, Article IV – Flood Hazard Areas CBJ 49.70, Article II – Hillside Development CBJ 49.70.300 Avalanche hazard areas CBJ 49.70.305 Landslide hazard assessment disclaimer
Subdivision ordinances or regulations	Yes	CBJ 49.15 Article IV - Subdivisions
Special purpose ordinances	Yes	CBJ Title 53 – Property Acquisition and Disposal governs this topic and is administered by CBJ's Lands Division CBJ 49.70.400(b)(4) – FIRMs dated September 18, 2020 are adopted
Emergency Operations Plan	Yes	Last updated 2016: https://juneau.org/wp-content/uploads/2017/08/Res2766_Adopting_Emergency_Operations_Plan_and_repealing_Res_2219.pdf
Comprehensive Plan	Yes	Yes, the plan has a chapter on Natural Resources and Hazards. A new update is starting in 2025, the last update was 2013: https://juneau.org/index.php?gf-download=2017%2F08%2F20170316UPDATEComp.Plan2013WEB.pdf&form-id=22&field-id=11&hash=44bf8467abf6aacec02114d42e16e845d6a7d6c9ebb1b73a4e0e299b018299a8
Land Use Plan	Yes	See 2013 Comprehensive Plan for chapters on Land Use, Land Use Maps, Community Form, and Housing: https://juneau.org/index.php?gf-download=2017%2F08%2F20170316UPDATEComp.Plan2013WEB.pdf&form-id=22&field-id=11&hash=44bf8467abf6aacec02114d42e16e845d6a7d6c9ebb1b73a4e0e299b018299a8
Other Plans	Yes	Capital Improvements Plan - Updated annually https://juneau.org/engineering-public-works/cip Includes hazard mitigation actions, for example: outburst flooding improvements and agency coordination, and areawide drainage improvements Climate Adaptation Plan - 2011 Climate Action & Implementation Plan: https://juneau.org/wp-content/uploads/2017/03/CAP_Final_Nov_14.pdf Targets climate change mitigation actions Economic Development Plan - Last updated 2015: https://juneau.org/index.php?gf-

Capability/Tool	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
		download=2017%2F04%2F20150226040900.pdf&form-id=22&field-id=11&hash=31de1f216e74ac6949171748d44eb9657f2d2811197144ef3157fb54f64c4342 There is also an economic development chapter in the Comprehensive Plan: https://juneau.org/index.php?gf-download=2017%2F08%2F20170316UPDATEComp.Plan2013WEB.pdf&form-id=22&field-id=11&hash=44bf8467abf6aacec02114d42e16e845d6a7d6c9ebb1b73a4e0e299b018299a8 Stormwater Management Plan - 2010 CBJ Manual of Stormwater Best Management Practices: https://juneau.org/index.php?gf-download=2020%2F04%2FAug_2010_Manual_Stormwater_BMPs_000.pdf&form-id=22&field-id=11&hash=581c45dce35d00c8364cd4a45efbd39603644cf417001fca5c30086d3347bc07 Transportation Plan - 2001 Area Wide Transportation Plan: https://juneau.org/index.php?gf-download=2020%2F01%2FPRINT-VERSION_Area-Wide-Transportation-Plan.FINAL.pdf&form-id=22&field-id=11&hash=540b91e22ac9efa21b48601fb9e0efd0de86fe7310a3a648bd4be25d31e903bb 2009 Non-Motorized Transportation Plan: https://juneau.org/index.php?gf-download=2017%2F04%2FJNMTPFinalwithMaps.pdf&form-id=22&field-id=11&hash=59f9e767b73777f6b16ec52cc854893f6518657e7ca4e329a1c5fbbc3b09c431 See 2013 Comprehensive Plan for chapter on Transportation https://juneau.org/index.php?gf-download=2017%2F08%2F20170316UPDATEComp.Plan2013WEB.pdf&form-id=22&field-id=11&hash=44bf8467abf6aacec02114d42e16e845d6a7d6c9ebb1b73a4e0e299b018299a8 Challenges with emergency access are mentioned in plans, along with the need for a second crossing to Douglas Island
Mutual Aid Agreements	Yes	CBJ is not road-connected to any other municipality and traditional mutual aid with neighboring jurisdictions (e.g., firefighting) is very difficult. CBJ is covered under the Alaska Intrastate Mutual Aid System and AK WARN. CBJ and Central Council of Tlingit & Haida Indian Tribes of Alaska have a MOA to promote communication and coordination to reduce duplication of efforts and provide effective responses to public safety matters, including law enforcement, search and rescue, emergency response, and disaster response within CBJ.
Administrative/Technical Specialists		
Chief Building Official	Yes	Jeff Hedges jeffrey.hedges@juneau.gov Chief Building Official is supported by 4 building inspectors and one code compliance officer
Planner or engineer with knowledge of land development and land management practices	Yes	Jill Lawhorne Jill.Lawhorne@juneau.gov Planning is supported by a Planning Manager and nine full-time planners
Engineer or professional trained in construction practices related to buildings	Yes	John Bohan, Chief CIP Engineer john.bohan@juneau.gov The Engineering Projects Division has 14 total staff positions
Planner or engineer with an understanding of natural and/or human-caused hazards	Yes	Jill Lawhorne Jill.Lawhorne@juneau.gov Planning is supported by a Planning Manager and nine full-time planners

Capability/Tool	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
Floodplain Administrator	Yes	Forrest Courtney Forrest.Courtney@juneau.gov Community Development Department
Surveyors	Yes	The CBJ hires licensed surveyors as needed
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	Yes	Yes, CBJ has multiple internal subject matter experts and has funded multiple hazard related studies, mainly focused on flood, landslides and avalanches
Personnel skilled in Geographic Information System (GIS) and/or Hazards U.S.-Multi Hazard (Hazus-MH) software	Yes	CBJ has a two person GIS team that works with hazard related information
Scientists familiar with the hazards of the jurisdiction	Yes	Yes, CBJ has multiple internal subject matter experts and has funded multiple hazard related studies, mainly focused on flood, landslides and avalanches
Emergency Manager	Yes	Ryan O'Shaughnessy Ryan.oshaughnessy@juneau.gov and Tom Mattice Tom.Mattice@juneau.gov make up the Emergency Management team
Grant Writers	Yes	Yes, CBJ has a grants manager who seeks funding, and a finance employee focused on emergency management grant administration
Public Information Officer	Yes	Yes, Meredith Thatcher Meredith.thatcher@juneau.gov and Ashley Heimbigner Ashley.Heimbigner@juneau.gov
Planning Commission	Yes	CBJ 49.10 Article I – Planning Commission https://juneau.org/community-development/planning-commission The Planning Commission consists of nine members and meets twice a month to review and update the Comprehensive Plan and Capital Improvement Program, as well as city and state projects. The Commission also reviews private and public development plans for compliance with adopted codes and plans.
Financial Resources		
General Funds	Yes- can exercise this authority with Borough Assembly approval	
Community Development Block Grants (CDBG)	CDBG funding has typically been passed through to non-profit partners.	
Capital Improvement Project Funding	Yes. CIP projects often include hazard-related elements like improved stormwater management features. CIP dollars will likely be used to support glacial outburst flood mitigation. CIP funds also support buildings with secondary purposes like emergency sheltering and incident command.	
Authority to levy taxes for specific purposes	Yes- can exercise this authority with voter approval	
Federal funding programs (non-FEMA)	CBJ has applied for USGS grant funds in the past for steep slope imagery; similar programs could be used in the future to evaluate hazards. USACE created federally-funded Silver Jacket Maps.	
Fees for water, sewer, gas, or electric services	Rate payer fees contribute to utility infrastructure maintenance, replacement, and upgrade.	
State funding programs	Grant programs administered by the Alaska Department of Conservation could be used to support hazard mitigation-related betterments in CBJ capital projects.	

Capability/Tool	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
Education & Outreach		
Community newsletters	There is not an overarching CBJ newsletter, however, some departments/divisions have newsletters for their specific constituencies.	
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs, public events)	Juneau is a StormReady community https://www.weather.gov/stormready/ak-sr and conducts regular avalanche public education programs for the general public and in schools.	
Local news	Juneau has limited local news – one newspaper (Juneau Empire), a public radio station (KTOO), and no TV news station.	
Organizations that represent/advocate for/interact with underserved and vulnerable communities	Juneau has a robust non-profit community and there are numerous organizations that perform advocacy work for underserved and vulnerable communities.	
Social media	CBJ has active social media accounts and a full-time PIO.	
Other	CBJ is working with a consulting firm to create a strategic communications plan for the organization, it should be complete by the end of June 2025.	

Table 42 Tlingit & Haida's Capability Assessment

Capability/Tool	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
Regulatory Tools		
Building Codes	Yes	Complies with State Building Code and best practices. Recently applied for funding to support building codes
Zoning ordinances	Yes	Specific to Cultural Sites and complies with local regulations
Land use ordinance	Yes	Specific to Cultural Sites and complies with local regulations
Subdivision ordinances or regulations	Yes	Specific to Cultural Sites and complies with local regulations
Emergency Operations Plan	Yes	2025 Update
Economic Development Plan	Yes	2023 Funds were pursued to complete a Tlingit & Haida Comprehensive Economic Development Strategy. Northern Economics is developing this Strategy.
Tlingit & Haida Long Range Transportation Plan	Yes	2015
Tlingit & Haida's Climate Adaptation Plan	Yes	2025
Tlingit & Haida Housing Plan	Yes	2025

Capability/Tool	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
Stormwater Plan	Yes	For new development and best practices
Other	Yes	General maintenance to reduce risk (tree trimming, clearing drainage systems) for residential housing Warning Systems: Need redundancy in training. Hazard Data & Information: Need additional training DTA: Need assistance/training to develop grant applications and Tribal declaration development
Administrative/Technical Specialists		
Tribal Council/Governing Body	Yes	Improve coordination between departments for development of plans (COOP)
Tribal Executive	Yes	Strong Tribal President who champions Emergency Management and Mitigation Strategies
Mitigation Planning Committee	Yes	Strong leadership support
Business Committees	Yes	Internal for Tribal Businesses; Coordination with Southeast Conference
Mutual Aid Agreements	Yes	CBJ, USCG, AK Sea Dogs, State of Alaska (in process to pursue Tribal Liaison)
Code Inspector	Yes	One current, could use additional staffing
Environmenta/Natural Resources Specialist	Yes	Strong environmental department
Emergency Manager	Yes	Strong emergency management department. Need additional staffing as all staff have additional responsibilities. Urgently need logistics staffing support.
Community Planner	Yes	Deputy COO is strong. Could always use additional staffing support
Housing Specialist	Yes	Works closely with housing authorities
Engineer	No	Hire consultants as needed
Historian/Cultural Advisor	Yes	One current, could use additional staffing
Finance/Grants Specialist	Yes	Strong team would benefit from staffing a technical project manager to help define project purpose and need
Administrative Staff	Yes	Three current, could use additional staffing (minimum of 2 more)
Personnel skilled in Geographic Information System (GIS) and/or Hazards U.S.-Multi Hazard (Hazus-MH) software	Yes	Strong GIS department
Financial Resources		
Capital Improvements Project Funding	Yes	
Gaming Revenue, Enterprise Revenues	Yes	
Fees for Water, Sewer, Gas, or Electric Services	No	
Fees from Festivals, Campsites, and Recreational Areas	Yes	
Permits and Other Fees	No	
Federal Funding (BIA, Housing and Urban Development	Yes	

Capability/Tool	Existing Yes/No?	Comments (Year of most recent update; problems administering it, etc.)
Contract Services	Yes	
Other	Yes	Federal funding and Tribal Enterprises; project dependent with a combination of in-kind and cash contributions

A list of federal, state, local, and private programs available for implementing mitigation projects are listed in Appendix D.

The City and Borough of Juneau and Tlingit & Haida considers the following as opportunities associated with their existing capabilities:

- Changes in leadership, administration, and staffing provide diverse experience to support the community.

Challenges of existing capabilities include:

- Changes in leadership, administration, and staffing can slow down progress towards projects important to the community due to lack of political environment and historic context.

4.1.1 Ability to Expand and Improve Resources

The City and Borough of Juneau and Tlingit & Haida are continuously improving and expanding their technical and human resources through participation in this MJHMP update; training; and hiring subject matter expertise as needed. Specific areas that the Planning Team have identified to expand and improve resources include:

- Continued grant-writing training for CBJ and Tlingit & Haida employees.
- Pursue funding for development and updating existing community plans (COOP, emergency operations plan, land use plan, climate adaptation plan, comprehensive plan, economic development plan, transportation plan, etc.).
- Establish a formal role for the Hazard Mitigation Planning Team to develop a sustainable process to implement, monitor, review, and evaluate mitigation actions and HMP effectiveness.
- Continue to have a strong relationship between CBJ and Tlingit & Haida to achieve mitigation goals to strengthen the community and reduce vulnerabilities to hazards.
- Continue strong working relationships with agencies that assist with data collection and assessing vulnerabilities to hazards in Juneau and Traditional Lands of Tlingit & Haida.

4.2 NFIP Participation and Repetitive Loss

The function of the National Flood Insurance Program (NFIP) is to provide flood insurance at a reasonable cost to homes and businesses located in floodplains. In trade, the participating community regulates new development and substantial improvement to existing structures in the floodplain or requires developers to build safely above flood heights to reduce future damage to new construction. The program is based upon mapping areas of flood risk and requiring local implementation to reduce flood damage primarily through requiring the elevation of structures above the base (100-year or 1% chance) flood elevations.

The City and Borough of Juneau has been an active and compliant member of the National Flood Insurance Program since 1981 (Emergency program start date 5/09/1970) with the most recent Flood Insurance Rate Maps [FIRMS] and Flood Insurance Study updated 09/18/2020). As such, City and Borough of Juneau residents are able to purchase flood insurance to protect their property against flood losses.

Specific NFIP participation activities include:

- Regular Community Assistance Visits. The most recent CAV was pending as of February 2025.
- Continuing to prohibit new development in Special Flood Hazard Areas.
- Mitigation actions, including investigating buying out/elevating/relocating properties in the SFHAs.
- Permitting required if proposing to build in SFHAs.
- Continuing to work with FEMA to update the FIRMs.
- The City and Borough of Juneau has Letter of Map Changes (LOMC-63) and Revalidation (REVAL - 2) documents on file.
- The Towns follow all State/FEMA permitting requirements.
- Regularly working to address compliance issues if they arise.

NFIP Topic	
Staff Resources	
Who is responsible for floodplain management in your community? Do they serve any roles other than Community Floodplain Administrator (FPA)?	Forrest Courtney, Planner, Jill Lawhorne, Floodplain Manager
Is the Community FPA or NFIP Coordinator a Certified Floodplain Manager?	Planner is in process of CFM
Is floodplain management an auxiliary function?	Senior Planner is assigned floodplain management as core element of the position
Explain NFIP administration services (e.g., permit review, GIS, inspections, engineering capability).	CBJ is a fully staffed local government with local platting authority; CBJ CDD & Engineering work closely on permit review; CDD has 2 FTEs for GIS – a Specialist and a Tech
What are the barriers to running an effective NFIP program in the community, if any?	FIRM maps are for the 100 year flood event; Juneau is dealing with GLOFs but is required to meet FIRM regs for the 100 year event. The FIRM regs need modernization and to flex for non-100 year flood events – especially since the CLOMR process takes more time than Juneau has between potential GLOFs
Insurance Summary	
How many NFIP policies are in the community?	888 policies in force; $391,351 in premiums; $293,331,000 insurance in force
What is the total premium and coverage?	
How many claims have been paid out in the community?	83 claims for $4,148,485
What is the total amount of paid claims?	
How many of the claims were for substantial damage?	TBD
How many structures (residential and non-residential) are exposed to flood risk within the community?	Residences - 2,410 ($1.4B) (5,929 people) Critical Facilities - 16 ($243M)
Are there any repetitive or severe repetitive loss structures in the community?	7 repetitive loss properties and 1 severe repetitive loss property
Describe any areas of flood risk with limited NFIP policy coverage.	Due to privacy laws, CBJ is unable to disclose this information. The CBJ has requested and been approved for an ISAA (Information Sharing Access Agreement) with FEMA to obtain information on NFIP policies and coverage but has yet to receive the signed ISAA or data.

NFIP Topic	
How does the community teach property owners or other stakeholders about the importance of flood insurance?	Neighborhood outreach meetings, Flood insurance informational meetings with assistance from FEMA Region X staff
What digital sources (like the FEMA Map Service Center, National Flood Hazard Layer) or non-regulatory tools does the community use?	FEMA, National Flood Hazard Layer (NFHL). FEMA Flood Hazard and Risk Data Viewer, and FEMA Map Service Center
Compliance History	
Is the community currently suspended from the NFIP?	No
Are there any outstanding compliance issues? (i.e., current violations)?	Yes, to be addressed during CAV
How does the community identify substantially damaged/improved structures? What is the process to make sure these structures are brought into compliance?	Building officials and others conduct windshield survey after hazard event or responds to calls from public to inspect. Official notices that the building is not suitable for occupancy. Once the repairs have been made, the building official is requested to conduct an inspection (or uses 3rd party inspectors) and recertify that the building is suitable for occupancy. Substantial damage/improvement assessments are complete for structures within the mapped special flood hazard area. • Building (market) value is obtained from the Assessors Office • Building Permit, labor costs included determines project cost.* • *For bank stabilization, only cost of what is directly under the home for foundation is calculated. • If repair/improvement costs exceed 40% of the building's value, CBJ will prepare a detailed accounting record. • Building permits, zoning permits, and floodplain development permits shall clearly note for the record that CBJ has completed a substantial damage/improvement assessment.
When was the most recent Community Assistance Visit (CAV or Community Assistance Contact (CAC)?	2011
Is a CAV or CAC scheduled or needed?	Yes
Regulation	
When did the community enter the NFIP?	3/1/1982
Are the FIRMs digital or paper?	Digital- FEMA FMSC
How does the community enforce local floodplain regulations and monitor compliance?	Floodplain development permits are for work within the mapped floodplain and floodway. CBJ 49.70.400
Do floodplain development regulations meet or exceed FEMA or state minimum requirements? If so, in what ways?	Regulations exceed federal minimum standards by requiring a CLOMR/LOMR approved by FEMA prior to issuing a permit for development within a mapped floodway that intends to cause a rise [CBJ 49.70.400(i)(3)].
How are Letters of Map Change (LOMCs) tracked and compiled?	Historic LOMCs and permits are managed by the Community Development Department.
Explain the permitting process.	Community FPA, State, FEMA NFIP Flood Insurance Manual Community FPA, FEMA CRS Coordinator, ISO representative CRS manual
Community Rating System (CRS)	
Does the community participate in CRS? If so, what is the community's CRS Class Ranking?	Not at this time- CBJ exploring pursuing participation in CRS.

NFIP Topic	
What categories and activities provide CRS points, and how can the class be improved?	N/A
Does the plan include CRS planning requirements?	No

4.3 ALASKA DAM SAFETY PROGRAM

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT G. High Hazard Potential Dams (HHPD) (Optional)
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs? HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency? HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners? HHPD2. Did the plan address HHPDs in the risk assessment? HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?
Source: FEMA 2025 (Local)

Section 2 lists the documents that were used in the development of this MJHMP update, including those used for the HHPD Section. Dam safety inspections and inundation mapping data was provided by the Dam Safety Office or dam owner.

The City and Borough of Juneau participates in the Alaska State Dam Safety Program. The State Dam Safety Program was created to facilitate the enforcement of the primary dam inspection law (11 AAC 93.150, Article 3 Dam Safety). The law states that dam owners are responsible for the safe operation, maintenance, repair, and rehabilitation of a dam, which are the essential elements in preventing dam failure; furthermore, dam owners are liable for the consequences of accidents or failures of their dams.

According to the State of Alaska 2022 HMP Update, the following have been identified as program limitation/challenges:

- Adequate staffing is an important aspect to program performance. In 2021, the State of Alaska had two full time employees in the Dam Safety Office. The State Dam Safety Engineer stated that AS 46.17 allows the office to utilize consultants when necessary to execute the Alaska Dam Safety Program.
- Dam owners are responsible for the safe operation, maintenance, and emergency action planning for their respective dams. Many dam owners would welcome additional resources to support the safety of their dams (i.e., EAP development, infrastructure rehabilitation, additional engineering analysis, etc). Many industries would benefit from more accurate/precise survey data, updated seismic mapping, and an updated PMP/AEP hydrologic study. These tools would benefit more than just dam owners.

How the City and Borough of Juneau works with local dam owners and/or the state dam safety agency: The City and Borough of Juneau works with the State of Alaska Dam Safety office in conjunction with Alaska General Laws. Specifically, § 11AAC 93.164: Owner's Emergency Action Plans. The City and Borough of Juneau coordinates with the Dam Safety Program to update EAPs for CBJ-owned dams. The City and Borough of Juneau also work closely with the Dam Safety Office during dam inspections and to address any dam safety deficiencies to CBJ-owned dams in a timely manner.

Limitations and how the City and Borough of Juneau are attempting to address deficiencies: One limitation to dam safety in the Planning Area is that the CBJ does not own some of the dams in the Planning Area. As the CBJ is not the owner, they are unable to directly resolve the compliance and safety issues. The City and Borough of Juneau is committed to continuing to work with the Dam Safety Office and dam owners in the Planning Area to ensure the safety of residents. Additional issues are cascading dam failures from dams located above in the watershed.

Another limitation is that there has never been a significant dam failure in the Planning Area, which may give a false representation of the Planning Areas' risk of a dam failure. This could also be a reason the dam owners may not have the urgency to address the safety concerns. Through this plan and additional outreach efforts, the City and Borough of Juneau is dedicated to sharing the Planning Areas risk to potential dam failure.

Several selected mitigation actions have been selected to address some of the limitations identified. Specifically, developing a team to cultivate relationships with mining industry could support meaningful improvements and identify where CBJ can support private owners in dam safety.

4.4 MITIGATION GOALS

The Planning Team developed their mitigation goals and potential mitigation actions to address current and future potential hazard impacts for the residents in the Planning Area and its critical facilities and infrastructure.

Mitigation goals are general guidelines that describe what a community wants to achieve in terms of hazard mitigation and loss prevention from future events. Community-wide visions are made into goal statements, which are typically long-range, policy-oriented statements. The Planning Team developed various mitigation goals and potential mitigation actions to address identified potential hazard impacts for the Planning Area. The results from the exposure analysis were used as a basis for updating the mitigation goals and actions.

Additionally, actions that are classified as Multi-Hazard (MH) seek to mitigate multiple hazards at once.

The goals from the 2012 HMP were reviewed by the planning team in the January 29, 2025, kickoff meeting.

- Utilize existing or available methods of hazard mitigation that do not require a significant financial investment by the CBJ.
- Determine the most cost-effective method by which to reduce the avalanche hazard in the CBJ.
- Introduce simple, low-cost methods that reduce vulnerability to hazards, promote public education of hazards, or have secondary benefits to the CBJ.
- Obtain more accurate information regarding hazards to which the CBJ is vulnerable.
- Promote mitigation measures that can be undertaken by home and business owners.

The planning team revised their goals to more broadly address the people, critical facilities, infrastructure, and cultural and natural resources across the Planning Area.

Table 43 lists the City and Borough of Juneau and Tlingit & Haida's strategic mitigation goals which form the foundation for the following processes and culminate within the Mitigation Action Plan (MAP) depicted in Table 47.

Table 43 Mitigation Goals

ID	Goal Description
1	Implement actions which protect the lives and property of the City and Borough of Juneau and Tlingit and Haida residents.
2	Implement actions which protect the City and Borough of Juneau and Tlingit and Haida critical facilities and infrastructure.
3	Implement actions which protect the City and Borough of Juneau and Tlingit and Haida cultural, historical, natural, economic, and agricultural resources.

4.5 MITIGATION ACTIONS

The Planning Team assessed the 2012 HMP's existing mitigation actions status and provided an explanation as to any changes that have occurred. The Planning Team defined the existing MJHMP's mitigation projects status as: "Completed", "Ongoing", "Deferred" or "Deleted".

- **Completed**- projects that have been completed since the 2012 HMP.
- **Ongoing**- projects that have been started but not completed since the 2012 HMP or occur annually.
- **Deferred**- projects that have not been started since the 2012 HMP, but the Planning Team aims to complete in the next 5 years with this MJHMP Update.
- **Deleted**- projects that have not been started since the 2012 HMP, and the Planning Team no longer wants to pursue.

Status updates from existing projects from the 2012 HMP are below (Table 44).

Table 44 Status of Mitigation Actions from 2012 HMP

Action ID	Action Description	Status	Outcome from 2025 MAP Selection/Prioritization
1	Continue to educate residents about Avalanche Hazard risks and area.	**Ongoing**- This action occurs annually.	Selected as part of MAP
2	Encourage homeowners to undertake mitigation actions for their own homes.	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Aspects of this are included in new Action 23.
3	Utilize appropriate methods of structural avalanche control (snow fences, diversion structures)	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Aspects of this are included in new Actions associated with critical facilities.
4	Reforestation of past avalanche slide areas	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Aspects of this are included in new Actions associated with critical facilities.
5	Establish regular avalanche evaluation and forecasting during winter months	**Ongoing**- CBJ started this project.	Selected as part of MAP and combined with Action 1.
6	Progressively buy out homes in high hazard zones.	**Deferred**- This previously identified action has not been started and will be incorporated into the MAP.	Selected with revisions as part of MAP
7	Prohibit all new construction in Severe Hazard Zones	**Ongoing**- This previously identified action has been started and will be incorporated into the MAP.	Selected with revisions as part of MAP; combined aspects with actions 7, 8, 9.
8	Maintain "high hazard zone" designation to titles of properties	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Selected with revisions as part of MAP; combined aspects with actions 7, 8, 9.
9	Update CBJ mapping to reflect high and moderate hazard areas as determined in CBJ-funded studies	**Ongoing**- This previously identified action was completed (2022 Tetra Tech studies) and will be included to continue to collect data for all CBJ	Selected with revisions as part of MAP; combined aspects with actions 7, 8, 9.
10	Utilize existing drainage system above Gastineau Avenue.	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Planning team did not select this project as part of the MAP.

Action ID	Action Description	Status	Outcome from 2025 MAP Selection/Prioritization
11	Prohibit removal of vegetation in landslide areas	**Ongoing**- This previously identified action has been started and will be incorporated into the MAP.	Selected as part of MAP.
12	Restrict Construction in landslide zones.	**Deferred**- This previously identified action has not been started and will be incorporated into the MAP.	Selected with revisions as part of MAP; combined aspects with actions 7, 8, 9.
13	Buy out affected properties.	**Deferred**- This previously identified action has not been started and will be incorporated into the MAP.	Selected with revisions as part of MAP and combined with action 6
14	Structural reinforcement of unstable slopes.	**Deleted**- This previously identified action has been started and was not selected as a standalone project.	Planning team did not select this project as part of the MAP.
15	Thorough geological mapping of soils and slopes.	**Ongoing**- This previously identified action has been started and will be incorporated into the MAP.	Selected as part of MAP.
16	Link "high hazard" designation to titles of properties	**Deferred**- This previously identified action has not been started and will be incorporated into the MAP.	Selected with revisions as part of MAP.
17	Require homeowners to notify renters of hazard prior to occupancy	**Deferred**- This previously identified action has not been started and will be incorporated into the MAP.	Selected as part of MAP.
18	Code changes: Mandatory sprinklers for structures in hazard zones, including downtown Juneau.	**Completed**- This previously identified action has been completed.	Planning team reports that this has been completed for new construction.
19	Restrict open burning/ campfires in hazard areas	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Planning team did not select this project as part of the MAP.
20	Increase code enforcement.	**Ongoing**- This previously identified action has been started and will be incorporated into the MAP.	Selected as part of MAP.
21	Update downtown fire hazard zone mapping to more accurately reflect highest hazard areas	**Deferred**- This previously identified action has not been started and will be incorporated into the MAP.	Selected as part of MAP.
22	Provide incentives for business owners to incorporate fire protection measures	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Planning team did not select this project as part of the MAP.
23	Restrict smoking in the downtown area	**Deleted**- This previously identified action has not been started and was not selected as a standalone project.	Planning team did not select this project as part of the MAP.
24	Place cigarette receptacles in strategic location to discourage careless disposal (change to look at revising to address fires in disposal)	**Ongoing**- This action has been started and CBJ has placed additional cigarette receptacles in downtown area. This previously identified action has been started and will be incorporated into the MAP.	Selected as part of MAP and updated to improve receptacles to prevent receptacle fires.

The Planning Team then considered, reviewed, and selected new projects from a comprehensive list of 194 potential actions (from the last HMP update, recommendations from the public and planning team, and

results of the risk assessment) identified during this MJHMP update process. The Planning Team decided if they wanted to "Select" or "Consider [and remove]" each new project that they reviewed. The Planning Team only selected those actions that they intend to and can implement during the MJHMPs five-year lifecycle within the MAP.

- **Selected**- proposed new projects that the Planning Team did select to incorporate into the MAP.
- **Considered**- proposed new projects that the Planning Team did not select to incorporate into the MAP.

Projects not selected during the prioritization process were either combined with other actions or removed as they were not identified as priorities to the planning team at this time. Removed projects are shown in the following table.

Table 45 Mitigation Actions Not Selected

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Notes
2012 HMP	2	Encourage homeowners to undertake mitigation actions for their own homes.	Ongoing	Aspects of this are included in new Action 23.
2012 HMP	3	Utilize appropriate methods of structural avalanche control (snow fences, diversion structures)	Not Started	Aspects of this are included in new Actions associated with critical facilities.
2012 HMP	4	Reforestation of past avalanche slide areas	Not Started	Aspects of this are included in new Actions associated with critical facilities.
2012 HMP	8	Maintain "high hazard zone" designation to titles of properties	Not Started	Selected with revisions as part of MAP; combined aspects with actions 7, 8, 9.
2012 HMP	10	Utilize existing drainage system above Gastineau Avenue.	Not Started	Planning team did not select this project as part of the MAP.
2012 HMP	14	Structural reinforcement of unstable slopes.	Not Started	Planning team did not select this project as part of the MAP.
2012 HMP	18	Code changes: Mandatory sprinklers for structures in hazard zones, including downtown Juneau.	Completed for new construction	Planning team reports that this has been completed for new construction.
2012 HMP	19	Restrict open burning/ campfires in hazard areas	Not Started	Planning team did not select this project as part of the MAP.
2012 HMP	22	Provide incentives for business owners to incorporate fire protection measures	Not Started	Planning team did not select this project as part of the MAP.
2012 HMP, 2017 Draft	23	Restrict smoking in the downtown area	Not Started	Planning team did not select this project as part of the MAP.
2017 Draft	28	Continue annual Lemon Creek Dredging		Private project by SECON
2017 Draft	31	Monitor fire conditions and post "today's fire conditions" signs		This is ongoing and aspects are included in other actions.
2017 Draft	32	Use social media to alert and educate public if a wildfire danger threat develops		This is ongoing and aspects are included in other actions.
2017 Draft	33	Prepare for impacts resulting from excessive wildfire smoke		This is ongoing and aspects are included in other actions.
General	41	Advertise and coordinate household hazardous waste drop-off days.		This is ongoing and aspects are included in other actions.

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Notes
General	45	Conduct a GIS assessment of gravel roads, topography, and wetlands/waterbodies to determine the best location for interventions to improve the safety of and minimize runoff from gravel roads.		Under current code, generally, roads have to be paved in the Urban Service Area unless nonconforming (pre-date requirements)
General	48	Develop and implement a Forestry Management Plan.		Planning team did not select this project as part of the MAP.
General	51	During periods of drought/low water availability, encourage residents to implement water-saving measures such as installing low flow showerheads and toilets, turning off water while brushing teeth or while doing other cleaning chores. Running the dishwasher and clothes washer only when full		Planning team did not select this project as part of the MAP.
General	52	Encourage drought-tolerant landscape design by incorporating drought tolerant practices into landscaping or using permeable driveways and surface to reduce runoff and promote groundwater recharge.		Planning team did not select this project as part of the MAP.
General	55	Enhance Planning and Building Official processes for land use development through use of 3rd party inspectors/professional services.		Juneau unlike most AK comm. has professional staffing, platting authority and permit system coming online this year; further the applicant is responsible for providing special inspections / stamped plans, reports, etc.
General	60	Improve municipal environmental review and oversight of development-related permitting.		Planning team did not select this project as part of the MAP.
General	61	Address inadequate structural fireproofing in Downtown Juneau buildings, especially historic district		Planning team did not select this project as part of the MAP.
General	63	Install cameras and warning signs where illegal dumping occurs frequently to act as deterrence for future dumping or spills.		This is already being done.
General	64	Install non-structural restraints for large furniture such as bookcases, filing cabinets, heavy televisions, and appliances in critical facilities to prevent toppling damage and resultant injuries to small children, elderly, and pets.		Planning team did not select this project as part of the MAP.
General	69	Purchase cameras and a software with Artificial Intelligence (AI) capability to detect fires in forested areas		Planning team did not select this project as part of the MAP.
General	70	Purchase Tesla Powerwall(s) for backup power supply at key critical facilities		Planning team did not select this project as part of the MAP.
General	73	Retrofit historic structures (residential and non-residential) with dry floodproofing		Planning team did not select this project as part of the MAP.

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Notes
Survey	77	Implement flood control measures such as a dam or levee to regulate water flow at Mendenhall Lake and the river, or another permanent glacial lake outburst flood (GLOF) mitigation.		Aspects of this are included in new Actions
Survey	84	Reduce/limit cruise ship numbers to limit impacts on local infrastructure		Not relevant to HMP Scope.
Survey	85	Implement landscaping ordinance for water gardens, erosion, and flood prevention		Planning team did not select this project as part of the MAP.
Survey	90	Residents need access to SMEs for consulting support that is not a conflict of interest with CBJ		Planning team believes there are adequate SMEs available.
Survey	93	Bulk purchase flood prevention barriers		Aspects of this are included in new Actions and already complete with HESCO
Survey	95	Provide emergency kits to low-income households		Not relevant to HMP Scope.
Survey	100	Improve Mendenhall Back Loop Road (wider shoulders, lower speed limit, less truck and bus traffic)		Not relevant to HMP Scope.
Survey	107	Rename Mendenhall River flood gauge to Mendenhall Lake Flood gauge to improve public understanding of the hazard		Not relevant to HMP Scope and not within CBJ authority.
Survey	110	Expand foodbank to be able to respond to disaster events		Not relevant to HMP Scope.
Survey	111	Build in redundancies for our transportation		Aspects of this are included in new Actions
Survey	115	Provide education and incentives for shared transportation		Not relevant to HMP Scope.
Survey	118	More public announcements		Aspects of this are included in new Actions
Survey	120	Close roads during disaster events to prevent additional damages		Aspects of this are included in new Actions
Survey	123	Help deliver and install sandbags and materials		Aspects of this are included in new Actions
Survey	124	Provide disaster kits and checklists		Aspects of this are included in new Actions
Survey	129	Build a shelter with sanitation (water, food, clothing, cleaning supplies for distribution).		Already have shelter facilities
Risk Assessment	146	Update communication and visual monitoring systems on cruise ships, cargo vessels, and other maritime vehicles that move HAZMAT in the Inside Passage to reduce collisions.		Not relevant to HMP Scope and not within CBJ authority.
Risk Assessment	148	Add HAZMAT siren for community wide hazard of an aerial release.		Aspects of this are included in new Actions
Risk Assessment	152	Reinforce/ relocate DiPAC (MaCauley) Salmon Hatchery water supply line.		This is a private project.

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Notes
Risk Assessment	159	Construct vertical evacuation towers in appropriate locations if found to be a feasible alternative to traditional evacuation methods in areas at risk to tsunami damage.		Planning team did not select this project as part of the MAP.
Risk Assessment	164	Establish watershed-based planning initiatives to address flood hazards with neighboring jurisdictions.		Not relevant to CBJ.
Risk Assessment	165	Form a citizen plan implementation steering committee to monitor progress on local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.		Aspects of this are included in new Actions
Risk Assessment	166	Limit the percentage of allowable impervious surface within developed parcels.		Already implemented.
Risk Assessment	169	Require developers to construct on-site retention basins for excessive stormwater and as a firefighting water source.		Planning team did not select this project as part of the MAP - already limited buildable land.
Facebook	174	Implement seasonal sales tax targeting tourists to fund construction of a levee.		Planning team did not select this project as part of the MAP.

4.6 Evaluating and Prioritizing Mitigation Actions

To determine which actions would be included in the MAP, the Planning Team evaluated and prioritized each proposed mitigation action. The MAP represents the mitigation projects and programs to be implemented through the cooperation of multiple departments in the City and Borough of Juneau and Tlingit & Haida.

To consider the opportunities and constraints of implementing each mitigation action, the Planning Team reviewed the simplified Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) evaluation criteria (Table 46). A qualitative statement is provided regarding the benefits and costs and, where available, the technical feasibility for each action considered for implementation.

Table 46 Evaluation Criteria for Mitigation Actions

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

Table 46 Evaluation Criteria for Mitigation Actions

Evaluation Category	Discussion "It is important to consider…"	Considerations
Economic	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
Environmental	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, state, and federal laws

On June 30, 2025, the Planning Team prioritized 104 hazard mitigation actions (94 for CBJ and 85 to T&H) that were selected to be included in the Mitigation Action Plan (MAP).

The Planning Team defined their project rating categories with a high, medium, or low priority:

- **High priority** actions are associated with actions that the Planning Team deemed most important to the CBJ and T&H.
- **Medium priority** actions are associated with actions that the Planning Team deemed important to the CBJ and T&H.
- **Low priority** actions are associated with actions that the Planning Team deemed of less importance to the CBJ and T&H.

Prioritizing the mitigation actions within the MAP was completed to provide the jurisdictions with an implementation approach for completing the actions in the five-year lifecycle of this MJHMP.

4.7 MITIGATION ACTION PLAN (MAP)

The City and Borough of Juneau and the Tlingit & Haida's MAP, Table 47, depicts how each mitigation action will be implemented and administered by the Planning Team. The MAP details each selected mitigation action, its priority, the responsible entity, the anticipated implementation timeline, and provides a brief explanation as to how the overall benefit/costs and technical feasibility were taken into consideration.

Table 47 City and Borough of Juneau and Tlingit & Haida's 2025 Mitigation Action Plan

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
2012 HMP	1	Continue to educate residents about Avalanche Hazard risks and area and establish regular avalanche evaluating and forecasting during winter months	Ongoing	Y	N	M	n/a	Emergency Programs	-	Short Term (<1 year)	EPA Environmental Justice Small Grants (EJSG) Program, internal budget, FEMA HMGP, HUD CDBG, FEMA EMPG	This project would enhance public safety by reducing the risk of avalanche injury or deaths, inform decision- making for residents and visitors, supports better emergency response and planning, and protects critical infrastructure and property.	Medium (30k-99k)	This project is technically feasible; the education of residents can be achieved with existing CBJ staff. Avalanche forecasting is a well-established practice in snowy, mountainous areas. CBJ could consider partnering NOAA, NWS, local ski resorts, and AAIC.	Land Management Plan, Trails Plan	x	x	x	x	x	x	x	x	x	x	x	x
2012 HMP, 2017 Draft, General, Survey	2	Facilitate federal buyout programs for homes in high hazard areas	Not Started	Y	Y	M/H	M/H	Emergency Programs	Public Safety	Long Term (>3 years)	Internal, CWDGP, FEMA HMGP, HUD	Reduces risk to life and property, lowers long term public costs, improves FEMA grant eligibility and CRS rating.	High (>100k)	This project involves complex coordination and long-term planning, as well as sustained funding. Buyout of homes would require significant outside funding to have an impact on the community.	Land Management Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	
2012 HMP, Survey	3	Regulate all new construction in Severe Hazard areas; maintain high hazard zone designations in CBJ parcel data; update CBJ and T&H mapping to reflect hazard areas; establish special building/zoning codes for hazard areas	Not Started	Y	Y	H	M	Community Development	Public Safety T&H Mapping to reflect hazard areas; establish special building/ zoning codes for hazard areas) ONLY	Long Term (>3 years)	Internal, FEMA HMGP	This project reduces risk to new construction in CBJ, creates informed land use and development decisions, creates accurate and transparent parcel information, improves building and zoning standards, and reduces municipal liability.	Low (0k-29k)	This project is technically feasible. CBJ has the legal authority and resources to implement new codes and zoning regulations.	Land Management Plan, CBJ Code, CBJ Historic District Design Standards,	x	x	x	x	x	x	x	x	x	x	x	
2012 HMP	4	Prohibit removal of vegetation in landslide areas	Ongoing	Y	N	M	n/a	Community Development	-	Long Term (>3 years)	Internal	Prohibiting vegetation removal will increase slope stability and reduce landslide risk, increase public safety, maintain the natural aesthetics of Juneau, and serve as a low cost, nature-based mitigation strategy that compliments engineering solutions.	Low (0k-29k)	This project is technically feasible- on CBJ land. CBJ has the legal authority to prohibit vegetation removal, however not all landslide hazard zone lands are owned by CBJ. For a complete prohibition to be enacted, coordination with other land management agencies and private land owners would be required.	CBJ Code, Land Management Plan, Transportation Improvement Plan	x										
2012 HMP, 2017 HMP Update Draft, General, Survey	5	Thorough geological mapping of soils and slopes to include settling and liquefaction risks.	Ongoing	Y	Y	H	M	Community Development	Lands and Natural Resources Department	Medium Term (1-3 years)	USGS, FEMA HMGP, ANTHC	This project increases the available data to decision makers to increase public safety, improved land use and development planning, protection of public and private industries, and supporting resilient community design. It also increases CBJ's access to state and federal funding by including high quality data in grant applications and builds public trust through transparency.	High (>100k)	This project would require hiring contractors to conduct the studies. Support from DGGS and USGS is possible.	Land Management Plan, Comprehensive Plan, Buildable Sites Criteria and Findings	x									x	

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
2012 HMP	6	Require homeowners to notify renters of hazard prior to occupancy	Not Started	Y	Y	L	M	Community Development	Business & Economic Development	Short Term (<1 year)	Internal	This project would increase community preparedness by ensuring both tenants and homeowners are aware of the risks associated with a property, supports emergency response and evacuation planning, and promotes equity and fairness by offering renters the same information that is readily available to homeowners.	Low (0k-29k)	This project is technically simple, and mainly requires legal, administrative, and policy coordination across CBJ branches. This project also aligns with risk communication best practices.	Land Management Plan, Housing Action Plan, CBJ Code	x	x	x	x	x	x	x	x	x	x	x	
2012 HMP	7	Increase code enforcement.	Ongoing	Y	N	H	n/a	Community Development	-	Medium Term (1-3 years)	Internal budget	Increasing code enforcement improves public safety, preserves community standards, and reduces public long-term costs by addressing issues in building proactively.	High (>100k)	This project is technically feasible, and would require CBJ to allocate more budget to code enforcement. Planning team noted that code enforcement department is already understaffed. Additional codes and effort to enforce them would cause additional strain/backlog unless staffing was increased.	CBJ Code	x	x	x	x	x	x	x	x	x	x	x	
2012 HMP	8	Update downtown fire hazard zone mapping to more accurately reflect highest hazard areas	Not Started	Y	N	L	n/a	CCFR	-	Medium Term (1-3 years)	Community Wildfire Defense Grant Program, US DOI, FEMA, AK DNR	Enhances emergency preparedness, improves land use and development decisions, supports fire prevention and mitigation measures. This project also protects historic and high density areas, and increased eligibility for state and federal funding. This would also reduce municipal liability and insurance risk.	High (>100k)	This project is technically feasible, and would most likely require hiring a contractor with expertise in the area. This could require a large budget.	Comprehensive Plan, CBJ Code, Historic District Design Standards, Long Range Waterfront Plan									x		
2012 HMP	9	Explore updating cigarette receptacles to prevent ashtray fires	Ongoing	Y	N	L	n/a	CCFR	-	Medium Term (1-3 years)	Internal, Alaska DNR, Juneau Community Foundation	This project would reduce the risk of fires igniting near building and high traffic areas, protect public infrastructure, and reduce fire department strain by lowering call volume. It also would enhance public cleanliness and aesthetics, and demonstrates proactive risk management.	Medium (30k-99k)	This project is technically feasible, and straightforward. Public ashtrays are readily available in multiple options and are relatively simple to install or retrofit.	Historic District Design Standards, CBJ Area Wide Transportation Improvement Plan, Long Range Waterfront Plan									x		
2017 Draft	10	Install warning signage in mapped landslide zones	-	Y	Y	M	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA HMGP, FEMA EMPG, ANTHC	Signs would inform residents and visitors that they are entering landslide areas. It is also a low cost, high impact risk communication tool, and encourages personal responsibility and informed decision making. Documented public warning can limit municipal liability and reinforces existing hazard maps and policy.	Medium (30k-99k)	This is technically a highly feasible project. Installing physical signage is logistically simple, low cost, and very little technical barriers. The main challenges with this project are site selection, public communication, and long-term maintenance.	Trails Plan, Area Wide Transportation Improvement Plan, Long Range Waterfront Plan,	x			x							

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
2017 Draft	11	Conduct an inventory and inspect high occupancy buildings and critical facilities and bridges to identify those needing seismic retrofitting, prioritize public buildings for upgrades, and complete renovations to strengthen vulnerable structures against earthquakes.	-	Y	N	M	n/a	Engineering & Public Works	-	Long Term (>3 years)	FEMA HGMP, HUD CDBG, FEMA NEHRP Earthquake State Assistance Grant Program	Reduces risk of structural failure during earthquakes, strengthens critical facilities to maintain operation during times of distress, and minimizes infrastructure damage and economic loss by proactively retrofitting lowers repair cost and reduces downtime.	High (>100k)	This project is technically feasible, particularly if conducted in stages. There are challenges to completing this project however, such as the large amount of funding required, access to qualified engineering support, and access to privately owned facilities.	Area Wide Transportation Plan, Long Range Waterfront Plan, Housing Action Plan, CBJ Buildable Sites Criteria									x		
2017 Draft	12	Bring the DHS&EM "Quake Cottage" to Juneau for earthquake simulation and education	-	Y	Y	L	L	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal budget, FEMA NEHRP Earthquake State Assistance Grant Program, ANTHC	This project would provide hands-on education to residents by experiencing what an earthquake feels like in a safe, controlled setting. It would also engage youth and schools by offering a dynamic learning experience and promotes action through experience.	Low (0k-29k)	This project is highly feasible. It is a low-risk, high-impact educational tool that has been successfully deployed across Alaska.	Land Management Plan, Housing Action Plan									x		
2017 Draft, Survey, Risk Assessment	13	Elevate homes, businesses, and critical facilities in floodplains through targeted projects and grant programs to reduce flood risk, protect infrastructure, and preserve vulnerable neighborhoods—while also providing funding and resources to support elevation efforts.	-	Y	Y	H	M	Emergency Programs	Public Safety	Long Term (>3 years)	FEMA HMGP, FEMA FMA, HUD CDBG, ACCIMP, Tlingit-Haida Regional Housing Authority (THRHA), ANTHC	This project would reduce flood risk and property damage, aid in preserving vulnerable neighborhoods, and increase community resilience. This project would improve eligibility for flood insurance and lower premiums, as well as access more state and federal funding.	High (>100k)	This project is technically feasible and would be very effective at reducing flood damage. However, outside contractors would be required due to varying structure types, site conditions, and lack of in house CBJ expertise. Funding could be difficult to source and qualified contractors may be in low supply.	Coastal Management Plan, Housing Action Plan, Land Management Plan, Historic Design Standards, CBJ Code, Comprehensive Plan								x		
2017 Draft, Survey, Risk Assessment	14	Continue to coordinate and support USGS with installation of additional USGS telemetry gauges and real-time monitoring systems in areas like Suicide Basin and key dams, rivers, and lakes to track water levels during heavy rain and hazard events, improving early warning and flood response capabilities.	-	Y	Y	H	H	Engineering & Public Works	Lands and Natural Resources Department	Medium Term (1-3 years)	Internal budget, FEMA HMGP, FEMA FMA, EPA CWSRF, USDA NRCS RCPP, FEMA National Dam Safety Program State Assistance Grant, USGS, NOAA	This project would improve early warning for flood and glacial outburst events which would improve evacuation processes and inform better decision making. It would enhance flood response and strengthens interagency collaboration and increase the amount of reliable information available to the public.	Medium (30k-99k)	This project is technically feasible, especially in a support role aiding USGS who has access to proven infrastructure, strong agency support, and an established community presence. Some considerations would be funding sources and data integration between CBJ and USGS.	Comprehensive Plan, Trails Plan, Economic Development Plan, Area Wide Transportation Plan								x	x		
2017 Draft, Survey	15	Update and improve flood mapping (annual for specific flood events; update FIRMS, coordinate with community led and federally led activities.	-	Y	Y	H	H	Community Development	Public Safety'Lands and Natural Resources Department/ Environmental	1-3 years	USACE Planning Assistance to States and Tribes, FEMA FMA, FEMA HMGP, ACCIMP	Accurate and current maps help residents, businesses, and first responders understand real flood risks and prepare accordingly. Current mapping also supports smarter development and land use planning. More accurate FIRMs also support fair and accurate flood insurance requirements.	High (>100k)	This project is technically feasible, but considerations must be made regarding interagency coordination, funding sources, and data collection. Local mapping is more flexible, but formal FIRM updates require navigating FEMA's process which can take several years.	Coastal Management Plan, Trails Plan, Buildable Sites Criteria								x		

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
2017 Draft	16	Explore terminal doppler radar coverage to predict rainfall more accurately (wind profiler (JAWS) is not publicly available. Need to identify good location that does not conflict with mountains	-	Y	Y	M	M	Lands & Resources	Lands and Natural Resources Department/ Environmental	Medium Term (1-3 years)	FEMA HMGP, FEMA FMA, NOAA, FAA, NWS	This project would improve rainfall and storm prediction accuracy, support timely and accurate early warnings, fill gaps in existing monitoring capabilities. It would also increase safety for air travel and marine operations and enable more effective emergency response and planning. This project would support mitigation efforts for other natural hazards as well such as flooding, landslide, and GLOFs.	Medium (30k-99k)	Exploring this project is entirely feasible and may lead to funding sources being uncovered among CBJ, FAA, NWS, and T&H. Implementing a new radar system would be logistically and financially challenging due to the mountainous terrain, infrastructure limitations, and interagency coordination requirements.	Coastal Management Plan, Long Range Waterfront Plan, Comprehensive Plan							x	x				
2017 Draft, Survey, Risk Assessment	17	Upgrade and maintain bridges, culverts, and drainage systems to handle large-scale flood events, reduce stormwater runoff, and prevent street flooding and erosion, while offering support for homeowners to repair private drainage connections.	-	Y	Y	H	M	Engineering & Public Works	Facilities & Projects	Long Term (>3 years)	AK DOT, FEMA HMGP, FEMA FMA, EPA CWSRF, FHA Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program, FHA, Congressionally Directed Spending (CDS), USFWS, Denali Commission	This project would reduce street flooding and infrastructure damage, support erosion prevention, and aids in adapting to climate driven rainfall increases, and reduces maintenance costs and emergency repairs.	High (>100k)	This project is technically feasible and aligns with standard municipal engineering practices. Many components of this project can be phased, prioritized, and funded incrementally. However, some upgrades would be limited by private property ownership and complex permitting process.	Area wide Transportation Plan, Coastal Management Plan, Long Range Waterfront Plan, Land Management Plan			x				x	x				
2017 Draft	18	Require burn permits during dry conditions	-	Y	N	L	n/a	CCFR	-	Short Term (<1 year)	Internal budget	Reduces risk of wildfires and property damage, supports clear communication and fire danger awareness. This project would also preserve air quality and environmental health.	Low (0k-29k)	This project is technically feasible and simple. CBJ has the authority to require burn permits, which is a simple and straight forward way to mitigate fire hazard in CBJ. A benefit of this project is the low cost, with CBJ likely breaking even or potentially making a profit on implementing this project.	CBJ Code									x			
2017 Draft	19	Initiate study identifying potential tsunami sources	-	Y	Y	M	M	Emergency Programs	Public Safety	Long Term (>3 years)	National Tsunami Hazard Mitigation Program (NTHMP) , DGGS	This project would allow CBJ to consider tsunami hazard risk with more comprehensive and accurate data, allowing for the most informed decision making possible on mitigation strategies of a potential tsunami.	High (>100k)	This project would require outside contractors to be hired, raising the cost of this study. However, data compiled during this project could open up new funding opportunities for CBJ. This project also follows best practices for hazard mitigation practices.	Coastal Management Plan, Long Range Waterfront Plan, Comprehensive Plan	x	x										

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
2017 Draft	20	Collaborate with Tsunami Ready Community Program and NWS to make Juneau Tsunami Ready and Storm Ready and ensure that schools and public buildings have means to receive emergency warnings	-	Y	Y	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal budget, FEMA EMPG, NTHMP	This project would provide CBJ with designations that strengthen their emergency preparedness, hazard mitigation efforts, and community resilience. It would improve CBJ's emergency communication infrastructure and increase preparedness in schools and public facilities. Achieving those designations would allow CBJ to receive formal designation of their disaster readiness.	Medium (30k-99k)	This project is technically straightforward and beneficial. These programs provide a structured framework for improving CBJ's public warning systems and emergency planning. The formal designations can create more funding opportunities for future mitigation projects.	Coastal Management Plan, Long Range Waterfront Plan, Comprehensive Plan		x									
2017 Draft	21	Explore a study to evaluate lifespan of built structure and future development along the coast (including airport and Wastewater Treatment Plant)	-	Y	Y	M	L	Engineering & Public Works	Facilities & Projects	Long Term (>3 years)	EDA Public Works and Economic Adjustment Assistance Programs	Provide insight to CBJ on how the developed coastline rates against changes in sea level rise, erosion, and other changing environmental conditions.	High (>100k)	This project would require hiring contractors. Support from USCS, USACE is possible.	Coastal Management Plan, Long Range Waterfront Plan, Area Wide Transportation Plan	x	x	x	x	x	x	x	x	x	x	x	
2017 Draft	22	Explore development of continuity of operations plan	-	Y	Y	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA EMPG, HSGP, FEMA Emergency Management Baseline Assessment Grant Program	This project ensures that essential government functions and services can continue during and after emergencies. This would improve disaster preparedness and response and minimize service disruptions to the public.	Medium (30k-99k)	This project is very feasible and standard action for municipal governments. The planning can begin at a basic level and scale in complexity over time.	Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x
General	23	Provide non-digital options for and redesign CBJ website and T&H websites (to address Tribal membership) to include: Add a hazard information tab to the website where residents can find all information related to emergency preparedness and communication. Key information to include: - Final FEMA-approved HMP - Links to hazard resources (volcano activity, fire, smoke, etc.) - GIS hazard maps, including current FEMA FIRMs layer and annual river bank elevation - Emergency resource guide for residents that explains appropriate responses at the household scale and provides contact information to help ensure residents receive the care and services required before, during, and after major events - Provide information to residents for how to report hazard-related incidents and conditions to jurisdiction officials. This will include the	-	Y	Y	H	M	Emergency Programs	Communications/ Public Safety	Medium Term (1-3 years)	Internal budget, FEMA EMPG, FEMA HMGP, AK DNR, USGS, EPA	This project would significantly enhance public safety, equity, and preparedness. It would improve public access to life saving information. It strengthens the entire community's emergency preparedness and response as well as enhances coordination between jurisdictions. It promotes awareness and use of critical programs and supports transparency and public trust. This would be a hub for the public to stay educated on emerging environmental risks.	Medium (30k-99k)	This project is technically feasible with moderate resource investment. This project would have enormous community benefit and would require website redesign, content development, and integration of non-digital outreach methods.	Comprehensive Plan, Economic Development Plan	x	x	x	x	x	x	x	x	x	x	x	x

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
		development of a process to receive and disseminate the information to the designated jurisdiction officials. - Evacuation routes and emergency shelters - Distribute information about the need for and items included in a go-bag - Secure and disseminate information about pest and pathogen damage on tree species coupled with information on how to best control and manage the results of outbreaks. - Increase public awareness of NFIP and CRS and benefits of purchasing flood insurance by adding relevant information to the proposed hazard tab on the jurisdiction's website. - List and amounts of food/water per person for emergency kit on website - Provide information regarding ICS training for residents -																										
General	24	Align local IT and Cybersecurity policies and operations with best practices such as the CISA Cybersecurity Performance Goals and the Cyber Essentials Toolkit as well as the NIST Cybersecurity Framework, and continually update current best practices. Educate public employees and contractors about email scams. Periodically send phony email scams to test CBJ employees and contractors.	-	Y	N	M	n/a	Management Information Systems	-	Medium Term (1-3 years)	Internal budget, CISA State and Local Cybersecurity Grant Program, CISA Tribal Cybersecurity Grant Program	This project would improve CBJ's digital security position. By strengthening protection of public infrastructure and services, CBJ would reduce their risk of ransomware and phishing attacks. It would also foster a workplace culture of cybersecurity awareness and ensure compliance with state and federal security standards.	High (>100k)	This project is highly feasible. This would require phased implementation, but would follow best practices for workplace cyberawareness.	Comprehensive Plan											x
General	25	Evaluate assessing critical facilities for snow load and ashfall capacity. Explore funding to retrofit any facility that does not meet recommended snow load of 30 pounds/sq foot.	-	Y	Y	L	M	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal budget, FEMA HMGP, HUD CDBG	This project would enhance the safety and durability of CBJ critical infrastructure. It would also reduce long term maintenance and emergency repair costs and prolonged closures due to building damage.	High (>100k)	May require hiring contractors with structural engineering expertise. Retrofitting buildings could potentially be complex, and funding availability will strongly influence retrofitting implementation	CBJ Code, Historic District Design Standards, Buildable Sites Criteria and Findings				x	x			x				

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
General	26	Conduct a comprehensive inventory and condition assessment of all roads, bridges, culverts, ditches & shoulders. Follow-up after inundation events to document damages and prioritize mitigation	-	Y	N	L	n/a	Engineering & Public Works	-	Long Term (>3 years)	USACE Planning Assistance to States and Tribes, FEMA HMGP, FHA STBGP	This project provides long term safety, planning, and financial benefits such as supporting proactive maintenance of infrastructure before failure occurs, allowing for scheduled repairs and/or upgrades and reduce long term costs. It also improves safety for drivers, cyclists, and pedestrians. This project would also establish a data driven basis for prioritizing upgrades and maintenance, allowing time for budgeting and infrastructure funding.	High (>100k)	This project is feasible using established engineering and asset management practices. Due to large quantity of infrastructure involved, this project would require a significant amount of time.	Area Wide Transportation Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	
General	27	Create a database that includes photo and condition inventory of all critical facilities and aging infrastructure to document current (pre-disaster) conditions and contents to aid in facility repair after a disaster event and prioritize for replacement or rehabilitation. Update the condition inventory annually and after a natural hazard event that causes damage. Continue to expand inventory	-	Y	Y	H	H	Emergency Programs	Facilities/ Public Safety	Medium Term (1-3 years)	Internal, FEMA HMGP	Supports faster and more accurate post disaster recovery by expediating insurance claims, FEMA aid, and repair or replacement decisions. This project also allows CBJ to prioritize critical facilities for rehab or replacement by having a pre disaster rank of facilities by structural integrity, functionality, and community importance.	High (>100k)	Funding sources and staffing limits may limit speed of photo inventory, but can be done incrementally over time.	Housing Action Plan, Land Management Plan, Economic Development Plan	x	x	x	x	x	x	x	x	x	x	x	x
General	28	Create an education program to ensure that all properties are visibly numbered.	-	Y	N	L	n/a	Community Development/ CCFR	-	Short Term (<1 year)	Internal	Improves emergency response time by having addresses clearly marked, which improves public safety. This project also would aid in property damage assistance and outreach efforts after a natural disaster. A by product of this project would improvement in postal and delivery services as well as utility and public works operations.	Low (0k-29k)	This is a simple and straightforward project. The main aspects of this project include public outreach, communication strategies, and coordination with local government and emergency services.	Housing Action Plan, Area Wide Transportation Plan	x	x	x	x	x	x	x	x	x	x	x	x
General	29	Revise existing disaster procedure to align current procedures to best practices as they move forward in exploring development debris management plan to include private residence protocols/guidelines.	-	Y	N	M	n/a	Emergency Programs	-	Medium Term (1-3 years)	FEMA HMGP	This project improves post disaster cleanup efficiency, clarifies responsibilities for homeowners and CBJ, increases community readiness and understanding, as well as increases CBJ's eligibility for federal funding towards cleanup efforts.	Medium (30k-99k)	Involves multi step, cross departmental effort, disaster management expertise, and experience in community engagement. Referencing FEMA public assistance debris management guide and EPA debris management frameworks can provide a framework for this project.	Land Management Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	
General	30	Draft a debris management plan.	-	N	Y	n/a	H	-	Public Safety	Short Term (<1 year)	FEMA HMGP, EPA	This project improves post disaster cleanup efficiency, clarifies responsibilities for homeowners and CBJ, increases community readiness and understanding, as well as increases CBJ's eligibility for federal funding towards cleanup efforts.	Medium (30k-99k)	CBJ concerns of being contractually limited to one waste management service provider in crises.	Land Management Plan, Comprehensive Plan, Economic Development Plan	x	x	x	x	x	x	x	x	x	x	x	

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
General	31	Draft an Emergency Action/Response Plan that includes information regarding evacuation and shelter plan. Include information on procedures for road closures, livestock and pets, storage, vehicles, assistance for evacuation and establish MOUs with partners through development.	-	Y	Y	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA HSGP, FEMA EMPG, FEMA HMGP	This project would improve the coordination of evacuation and shelter operations, establishes procedures for road closures and reentry, and protects vulnerable populations, as well as livestock and pets. Interagency coordination through MOUs create stronger relationships between neighboring communities and agencies.	Medium (30k-99k)	Requires coordination and cooperation with multiple agencies and jurisdictions. CBJ will have to assign staff to draft and maintain the plan.	Comprehensive Plan, Land Management Plan, Housing Action Plan	x	x	x	x	x	x	x	x	x	x	x	
General, Survey	32	Encourage development and regular updates to a special needs registry for elderly and vulnerable populations (non-mobile) to ensure accurate planning for their preparedness, communication, and evacuation during emergencies.	-	Y	Y	M	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA EMPG	This project would enhance life saving measures by allowing first responders to identify and prioritize assistance for residents who cannot evacuate or shelter in place independently. It also improves disaster preparedness and evacuation planning by supporting equity and inclusion in emergency planning.	High (>100k)	This project would require regular maintence and updating to provide accurate and current information. Regular updates would also need to be communicated to emergency services to maintain the value of the registry.	Area Wide Transportation Plan, Comprehensive Plan, EAP	x	x	x	x	x	x	x	x	x	x	x	
General	33	Encourage utility companies to bury existing powerlines to reduce power outages caused by downed power lines and required buried power lines in new developments.	-	Y	N	L	n/a	Community Development	-	Short Term (<1 year)	Internal	This would benefit CBJ by reducing power outages during storms, and improve continuity of services. This project would also increase infrastructure resilience and reduces long term maintenance and restoration costs.	Low (0k-29k)	This is a straight forward and low cost project for CBJ. Utility companies may not be inclined to perform burials due to increased upfront investment and slope stability concerns in CBJ.	Economic Development Plan, Area Wide Transportation Plan	x	x	x	x	x	x	x	x	x	x	x	
General	34	Establish community heating and cooling centers to provide relief for those who do not have access to heating or cooling on their own.	-	Y	Y	L	M	Emergency Programs	Public Safety	Short Term (<1 year)	Community Services Block Grant, American Red Cross, FEMA HMGP	Benefits include a practical, life saving strategy to support public health and safety during periods of extreme cold or heat, especially for vulnerable or underserved populations. It also supports CBJ's resilience to changing climate conditions, and reduces strain on medical facilities during crisis times and assists low income populations.	Medium (30k-99k)	This project is feasible, especially if utilizing existing public facilities with upgraded HVAC and operational support. Limiting factors may be site accessibility, staffing, and sustainable funding to keep designated shelters operational and modernized.	Housing Action Plan, Economic Development Plan, Comprehensive Plan							x				
General	35	Explore benefits of joining the Firewise program.	-	Y	Y	M	L	Emergency Programs	Public Safety	Short Term (<1 year)	Internal budget	Strengthens wildfire prevention, build public awareness, and support community wide action to reduce fire risks. Being part of the Firewise program enhances CBJ eligibility for wildfire mitigation funding.	Low (0k-29k)	Low cost project, but would require forming a local Firewise board or committee. It would require committed local leadership, community participation, and integration with existing emergency and land management programs.	Land Management Plan, Comprehensive Plan								x		
General	36	Identify vegetation/fuel types, previous burn areas, areas to mitigate, grant funding specifically to reduce/remove fuels in high wildfire/brushfire areas	-	Y	Y	L	M	Lands & Resources	Public Safety'Lands and Natural Resources Department/ Environmental	Medium Term (1-3 years)	Community Planning Assistance for Wildfire (CPAW)	Positions CBJ to reduce wildfire risk, plan defensible strategies and secure external funding.	Medium (30k-99k)	This project is technically feasible using GIS and remote sensing. Grant funding exists to support fuel reduction projects.	Land Management Plan								x		

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
General	37	Implement cybersecurity training for all municipal employees and elected officials.	-	Y	Y	M	M	Management Information Systems	Information Technology	Medium Term (1-3 years)	Internal budget, CISA State and Local Cybersecurity Grant Program, CISA Tribal Cybersecurity Grant Program	Ensures that CBJ can better protect sensitive data, maintain public trust, and defend against increasingly sophisticated cyber threats. This project also builds a cyber aware workforce and fulfills compliance with state and federal guidelines.	Medium (30k-99k)	This project is technically feasible and follows best practices for cybersecurity awareness in the workplace. Success of the project will depend on choosing appropriate delivery platforms to engage participants effectively.	Comprehensive Plan, Economic Development Plan												x
General	38	Install back-up generators at all critical facilities.	-	Y	Y	M	H	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal budget, FEMA HMGP, Alaska DEC	Ensures continuity of operations during power outages, reduces the risk of infrastructure of infrastructure failure, and keeps life saving equipment operational 24/7	High (>100k)	This project is technically feasible but will require accurate assessment of energy load requirements for each critical facility. Adherence to safety and environmental standards will be critical in generator selection. Maintenance programs on generators should be able to be performed by CBJ staff.	Land Management Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x
General	39	Investigate CBJ and public interest in participating in the CRS program. If interested, coordinate with the State Floodplain Coordinator to apply. T&H to support with representative. Implement Low Impact Development, Open Space Protection Plans, and Stormwater Management Regulations, which may allow for flood insurance discounts. Evaluate no adverse impact development.	-	Y	Y	H	M	Community Development	Business & Economic Development	Short Term (<1 year)	FEMA HMGP, FEMA FMA	Significant advantages in flood risk reduction, community resilience, and financial savings through flood insurance discounts. It encourages implementation of best practices in floodplain management, enhances community resilience, and strengthens collaboration with state and regional partners.	Medium (30k-99k)	This project requires extensive collaboration and buy-in from multiple agencies and the public.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan			x			x						
General	40	Investigate the benefits of the USDA NRCS mitigation programs for flood protection.	-	Y	Y	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, USDA	This project would allow CBJ to access technical assistance and expertise as well as financial support for flood mitigation projects. It would also enhance natural flood management and improve watershed health and water quality.	Low (0k-29k)	This project requires aligning local priorities with program eligibility, developing strong project proposals to become eligible and gain access to funding sources.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan						x						
General	41	Notify property owners that they are located in an inundation area and provide resources on the website for notification. (NWS flash flood emergency alert system would be triggered)	-	Y	Y	M	M	Community Development	Public Safety/ Communications	Short Term (<1 year)	Internal budget	Improves response time to flood events, increases baselines preparedness levels of residents, and reduces property damage and loss.	Medium (30k-99k)	Collaboration with NWS would benefit this project due to their existing flood emergency alerts, which can amplify the effectiveness of notifications.	Land Management Plan, Housing Action Plan	x	x	x	x		x	x	x		x	x	

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
General	42	Perform regular backups of municipal data and store this data in a format that can be recovered in the instance of a cyber attack or other event.	-	Y	N	M	n/a	Management Information Systems	-	Short Term (<1 year)	Internal budget	This project would maintain operational continuity for CBJ, protect vital information, and allow for quick recovery from cyber attacks or other disruptive events.	Low (0k-29k)	This project is feasible, and will not require any resources outside of internal CBJ options. Investment in tools, training, and policies may be required in the future.	Comprehensive Plan, Economic Development Plan												x
General	43	Pursue funding for an engineering study to identify stormwater and snowfall drainage problem areas.	-	Y	N	H	n/a	Engineering & Public Works	-	Medium Term (1-3 years)	EPA CWSRF, FEMA FMA, FEMA HMGP, Sewer Overflow and Stormwater Reuse Municipal Grants Program	This project would provide CBJ with more accurate and comprehensive data to address drainage issues in the jurisdiction, and proactively address flooding and runoff challenges which could have secondary issues like erosion and drainage backups.	High (>100k)	This project would most likely require hiring contractors with expertise in civil engineering and stormwater systems.	Land Management Plan, Long range Waterfront Plan	x	x	x	x	x	x	x	x	x	x	x	
General	44	Pursue funding for physical security enhancements for nonprofit and faith-based organizations	-	N	Y	n/a	L	-	Public Safety/ Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, DOE, HUD, DHHS	Strengthens community safety, resilience, and social cohesion. This project also protects vulnerable community institutions and fosters collaboration between private and public sectors.	High (>100k)	Will require strategic/creative grant funding, and collaboration between private and public sectors.	Comprehensive Plan, Economic Development Plan	x	x	x	x	x	x	x	x	x	x	x	x
General	45	Support research to assess the potential impacts of a Mount Edgecumbe and other volcano eruptions on Juneau, building on evidence that a past eruption affected the area over 12,000 years ago.	-	Y	Y	L	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	USGS, Alaska DNR	Improves hazard awareness and risk assessment, enhances emergency planning and preparedness, and supports infrastructure resilience and protection. This project would also strengthen coordination with state and federal agencies.	Medium (30k-99k)	This project will require contracting the study to an organization with expertise in volcano research, which is inherently unpredictable. May be public dissatisfaction funding this study while there are seemingly more relevant hazard risks in CBJ currently.	Land Management Plan, Comprehensive Plan					x						
General	46	Work with ADOT to review and update high-water flood assessments of bridges with an emphasis on structures at highest risk of impacts from flood waters.	-	Y	Y	L	L	Engineering & Public Works	Public Safety/ Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, USACE WRDA	This project would pinpoint bridges most at risk of high water events and support targeted mitigation projects and maintenance- all of which would improve public safety and emergency response.	Medium (30k-99k)	This project is feasible with collaboration from ADOT, which will open up more funding opportunities. Ensuring ADOT staff has expertise in bridge resilience will be extremely important.	Area Wide Transportation Plan, Land Management Plan				x	x		x	x	x			
Survey	47	Provide opportunities for public to be involved in ongoing HMP process and create annual plan to keep HMP up to date and don't let it lapse	-	Y	Y	H	H	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, FEMA HMGP	Increase community awareness and ownership of HMP, improve plan quality and relevance, and ensure compliance with FEMA requirements.	Low (0k-29k)	This project is very feasible and currently ongoing. This is a low cost project that will build public trust and acceptance of HMP.	CBJ Code	x	x	x	x	x	x	x	x	x	x	x	x
Survey	48	Establish a community response team	-	Y	Y	H	H	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, Alaska Community Foundation, Rasmuson Foundation, Red Cross of Alaska	Expands CBJ's emergency response capacity and creates rapid localized response in crisis situations. This project also builds community resilience and self reliance.	Medium (30k-99k)	This project will require dedicated resources and trainings to members serving a role in the team.	Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Survey	49	Explore landslide ready community; predictive warning/forecasting including Infrasound Avalanche/Landslide monitoring and detection equipment	-	Y	Y	M	H	Emergency Programs	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	FEMA HMGP, FEMA EMPG, USGS, NOAA, USACE	This project reduces risk to homes, roads, and utilities and improves hazard forecasting and decision-making. It also facilitates targeted mitigation projects and builds community awareness and preparedness.	High (>100k)	This project will require significant resources for sensor installations and be technically complex. The need for ongoing maintenance and equipment calibration along with integration of diverse data streams will be costly.	Area Wide Transportation Plan, Land Management Plan	x	x		x								
Survey	50	Replicate T&H emergency text notification system to CBJ wide	-	Y	Y	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA Emergency Notification Systems Grant Program	Provides rapid, direct emergency communication and increases reach across diverse populations. This project builds upon a proven, locally tested model and strengthens interagency coordination.	Medium (30k-99k)	This project will require collaboration with multiple jurisdictions, but has a proven template to replicate and will benefit all parties involved.	EAP, Housing Action Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x
Survey	51	Update Dam Safety Information	-	Y	Y	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA Dam Safety Program, FEMA HMGP, FEMA FMA, RIDEM BWRF, USDA NCRS CIG, SNEP Watershed Implementation Grant, IIJA Dam Removal Fund, USACE WRDA	Informs accurate risk assessments and hazard mapping, ensures regulatory compliance and reporting, guides EAP updates, and aids in infrastructure prioritization and maintenance.	Low (0k-29k)	Technically feasible, but accessing and compiling data from multiple sources, including private dam owners, could be time consuming. The information will regularly have to be updated as climate, land use, and infrastructure conditions change.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan						x					
Survey	52	Warning sirens and evacuation route signs throughout CBJ (flood, avalanche, landslide, tsunami)	-	Y	Y	L	L	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA HMGP, FEMA Emergency Notification Systems Grant Program	Provides immediate, life saving alerts, increases public awareness, and supports multi-hazard risk management.	Medium (30k-99k)	This project is straightforward and feasible. Major considerations will be site selection, system design and maintenance.	Area wide Transportation Plan, Coastal Management Plan, Long Range Waterfront Plan, Land Management Plan	x	x		x	x	x	x	x	x	x	x	
Survey	53	Educate public on GLOF scenarios to prepare	-	Y	Y	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, FEMA EMPG	Reduce panic and confusion during flood events, increases public safety and preparedness, and enhances risk communication throughout the community.	Low (0k-29k)	This project is feasible. Main considerations will be determining effective ways to communicate with residents in GLOF hazard areas and getting notifications out in a timely manner.	Coastal Management Plan, Housing Action Plan			x	x			x					
Survey	54	Implement green infrastructure	-	N	Y	n/a	L	-	Facilities and Projects	Long Term (>3 years)	FEMA HMGP, FEMA FMA, EPA CWSRF	This project would reduce flooding and stormwater runoff, improve water quality, enhance climate resilience, and support hazard mitigation goals	Medium (30k-99k)	Construction expertise in CBJ may be limited, reducing the quantity of infrastructure that could be implemented in a timely manner. Public acceptance of such infrastructure may be low.	Housing Action Plan	x		x				x	x	x			

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Survey	55	Provide sandbags and instructions to residents including education on how to place sand bags around home	-	Y	Y	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal, FEMA EMPG	Empowers residents to protect their property, reduces flood related damages and insurance claims, and enhances public preparedness and risk awareness.	Medium (30k-99k)	Popular project with public, however sandbags only provide limited protection which must be complemented with other mitigation measures. May be difficult to distribute sandbags quickly and equitably.	Housing Action Plan, Comprehensive Plan			x	x			x					
Survey & Planning Team	56	Investigate and pursue Alternative route between Douglas and Juneau for access if roads or bridge is inoperative to provide redundancy. Investigate alternative routes in isolated subdivisions.	-	Y	Y	H	M	Community Development	Business & Economic Development	Long Term (>3 years)	AKDOT, Internal, Denali Commission	Ensures emergency access and evacuation capabilities, reduces risk of isolation for vulnerable populations, and increases transportation system resilience. This project would also support economic and community stability.	High (>100k)	This project would require large financial resources, and expertise in multiple fields (construction, engineering, environmental compliance, etc.). The duration of this project would likely be measured by years.	Area Wide Transportation Plan, Long Range Waterfront Plan, Comprehensive Plan, Land Management Plan	x	x	x	x		x	x	x	x	x	x	
Survey	57	Look at State of Iowa in addressing flood hazards	-	Y	Y	M	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal	This project would leverage proven flood mitigation techniques, access data driven flood risk assessment models, and gain insight into community engagement and education.	Low (0k-29k)	This project may be limited by available data State of Iowa is able to share. Geographical differences between Iowa and Southeast Alaska may limit the relevance of mitigation efforts and types of floods between jurisdictions.	Coastal Management Plan, Land Management Plan			x				x					
Survey	58	Investigate short and long term mitigation actions to protect or selectively relocate residences, businesses, and critical facilities	-	Y	Y	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA HMGP	Reduces structural exposure to natural hazards, preserves community function and vital services, and reduces evacuation needs while increasing CBJ eligibility for grant funding.	High (>100k)	This project is feasible but contains legal and property right complexities. A long term mitigation project will require a significant amount of funding.	Comprehensive Plan, Land Management Plan, Housing Action Plan	x	x	x	x	x	x	x	x	x	x	x
Survey	59	Explore with community foundations and T&H implementation of disaster fund	-	Y	Y	M	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, Alaska Community Foundation, Rasmuson Foundation, Red Cross of Alaska	This project would provide immediate financial resources after disasters, support equitable assistance, enhances community preparedness and resilience, and increases funding flexibility.	High (>100k)	This project is feasible, but initial fundraising or fund allocating may be challenging. Balancing fund allocation among competing needs and stakeholders could limit sustained contributions over time.	Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x
Survey	60	Develop areas and make available housing and property outside high hazard risk areas	-	Y	Y	H	H	Community Development	Business & Economic Development/ Facilities & Projects	Long Term (>3 years)	Internal, HUD, THRHA	This project would reduce risk to life and property, lowers the cost of emergency response and recovery, and supports sustainable land use and growth management.	High (>100k)	This project could be limited due to Juneau's geography, and lack of available developable land due to steep terrain, wetlands, and updated floodplains. New development would be costly due to poor soil and need for roads to be built in conjunction with land development.	Land Management Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Survey	61	Install HESCO barriers	-	Y	N	H	n/a	Engineering & Public Works	-	Short Term (<1 year)	LIS process, FEMA HMGP	This project provides quick and adaptable flood protection, reduces damage to critical infrastructure and property, and supports other temporary and semi permanent solutions.	High (>100k)	This project is technically feasible, however land ownership rights may impact reception of HESCO barriers on private land, and a more permanent mitigation strategy may be needed in the future.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan			x	x			x					
Survey	62	Install rip rap in conjunction with HESCO barriers to reduce erosion/undercutting of banks where the barriers are placed. Complete bank stabilization projects for areas destabilizing including WWTP	-	Y	Y	H	L	Engineering & Public Works	Facilities & Projects	Short Term (<1 year)	FEMA FMA, LID process, FEMA HMGP	This project prevents erosion and undercutting on riverbank, enhances longevity and effectiveness of other flood defenses. Mitigates sedimentation and water quality issues.	High (>100k)	This project would be in conjunction with another semi permanent project (HESCO) that would extend the lifespan of that installation. This project should be done at the same time as HESCO installation and not as a stand alone project. This would require more funding.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan			x				x					
Survey	63	Increase affordable housing	-	N	Y	n/a	M	-	Business & Economic Development / Facilities & Projects	Long Term (>3 years)	HUD CDBG, HUD IHBG, DHHS, AHFC, THRHA	Enhances community stability and diversity, reduces homelessness and housing insecurity, promotes inclusive growth and equity.	High (>100k)	Limited land available for development outside of hazard zones. Could be NIMBY problems of introducing high density housing in neighborhoods that currently do not have any high density buildings.	Housing Action Plan	x	x	x	x		x	x	x	x	x		
Survey	64	Provide financial assistance for more heat pumps	-	N	Y	n/a	L	-	Public Safety	Medium Term (1-3 years)	Air Source Heat Pumps Tax Credit, EPA, Alaska Heat Smart, AHFC, DOE	Reduces greenhouse gas emissions, lowers residential utility bills, lowers strain on utility load demand, supports energy resilience and independence, and improves indoor air quality and public health.	Medium (30k-99k)	This project is technically feasible, grants are available to fund heat pump purchases and installation.	Housing Action Plan							x					
Survey	65	Update strategy and continue to upgrade emergency notification system.	-	Y	Y	H	M	Emergency Programs	Public Safety	Medium Term (1-3 years)	FEMA Emergency Notification Systems Grant Program	This project would enhance system reliability and strengthen coordination across agencies, reduce confusion and panic during crises, and encourage community preparedness.	Medium (30k-99k)	Considerations of this project include technology adoption barriers in certain demographics, maintaining database for accuracy, and ensuring redundancy during power or internet outages.	Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x
Survey	66	Create joint CBJ/T&H flood dedicated staff member focused on GLOF and public engagement	-	Y	Y	H	H	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA FMA	This project would improve coordination between jurisdictions, increase focus on GLOF preparedness and risk reduction, support culturally inclusive emergency planning, and strengthens grant and funding opportunities.	High (>100k)	Requires sustained funding and multi jurisdictional support beyond the initial pilot period, recruiting and retaining a qualified staff member may take considerable time and money, and could require MOUs for shared authority and budgeting.	Land Management Plan, CBJ Code	x	x	x	x	x	x	x	x	x	x	x	x

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select? CBJ	Select? T&H	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
Survey	67	Provide transparency in adopting future hazard area mapping & studies without political pressure due to insurance and property value.	-	Y	Y	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	Internal	Builds public trust through openness and accountability, reduces legal and financial liability, and supports responsible development and land use planning.	Medium (30k-99k)	Will most likely be public pushback due to impacts on property values, insurability, and zoning changes. It will be critical to communicate technical findings in a clear and concise way.	CBj Code	x	x	x	x	x	x	x	x	x	x	x	
Planning Team	68	Mitigate erosion damage at Mendenhall Wastewater Treatment Plant	-	Y	Y	H	L	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, EPA CWSRF	This project protects essential public infrastructure, prevents costly damage and emergency repairs, reduces risk of environmental contamination, and ensures regulatory compliance.	High (>100k)	Will require contractors with expertise in erosion mitigation. This project would require significant funding, and construction staging may be difficult near an active treatment facility.	Land Management Plan, Long range Waterfront Plan, Coastal Management Plan	x	x	x	x	x	x	x	x	x	x	x	x
Risk Assessment	69	Survey Tlingit & Haida elders about any oral history of hazard events	-	n/a	Y	M	M	Emergency Programs	Public Safety / Elders Program	Medium Term (1-3 years)	BIA, Rasmuson Foundation, NPS Tribal Heritage Program, Sustainable Southeast Partnership (SSP), Sealaska Corporation	This survey would improve community preparedness, enhance hazard assessments, and preserve Indigenous knowledge regarding hazards that have not affected Juneau in recent history but may pose a risk greater than currently understood.	Medium (30k-99k)	The main considerations of this project will be finding skilled induvial who can translate/transcribe oral stories, and locating a large quantity of elders willing to participate in the survey.	Housing Action Plan	x	x	x	x	x	x	x	x	x	x		
Risk Assessment	70	Update and make available to public Dam flood inundation mapping on annual basis for HHPD and regular basis for Significant and Low hazard dams and document regular inspections	-	Y	Y	L	L	Emergency Programs	Public Safety	Medium Term (1-3 years)	Internal, FEMA Dam Safety Program, FEMA HMGP, FEMA FMA, USDA NCRS CIG, SNEP Watershed Implementation Grant, IIJA Dam Removal Fund, USACE WRDA	This project would increase public confidence by displaying transparency by CBJ, supports regulatory compliance by aligning with Alaska Dam Safety Program requirements and FEMA conditions. It also would enable better EAP development, and aids in secure grant funding.	Medium (30k-99k)	May require consultant support to gather current data on all dams in the planning area, and public release of inundation zones may raise concerns about property values or safety issues. Coordination with ADNR and private dam owners will be required.	Coastal Management Plan, CBJ Code, Long range Waterfront Plan						x					
Risk Assessment	71	Explore partnership to conduct seiche/ worst case scenario study for Lower Slate Lake Tailings Dam failure.	-	Y	N	M	n/a	Engineering & Public Works	-	Medium Term (1-3 years)	Internal, FEMA Dam Safety Program, FEMA HMGP, FEMA FMA, USDA NCRS CIG, SNEP Watershed Implementation Grant, IIJA Dam Removal Fund, USACE WRDA, USGS	This study would provide critical information about the risks associated with a Lower Slate Lake Tailings Dam failure for Juneau. This would allow CBJ to evaluate potential mitigation actions needed to improve public safety, maintain environmental quality, and better understand the hazards that have the potential to affect Juneau.	High (>100k)	Require coordination with private dam owner, and hiring contractors to conduct the study. May take several years for study to conclude.	Coastal Management Plan		x	x			x	x					

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Risk Assessment	72	Conduct monthly inspections of Salmon Creek Dam.	-	Y	Y	H	M	Emergency Programs	Public Safety/ Facilities & Projects	Short Term (<1 year)	Internal, FEMA Dam Safety Program, USACE	Monthly inspections would enhance public safety, prevent costly and dangerous emergencies, ensure water supply reliability, and build community confidence in the inspection process. This project would also ensure the there are no unexpected, expensive repairs needed to the dam.	Medium (30k-99k)	Requires an increase in budget and coordination with AEL&P to conduct inspections and share data.	Dam Safety Plan, Salmon Creek Dam EAP, Land Management Plan						x						
Risk Assessment	73	Explore partnering with UAS to conduct seismic study to better understand fault lines in the immediate vicinity of Juneau.	-	Y	Y	L	L	Emergency Programs	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	Internal, FEMA NEHRP Earthquake State Assistance Grant Program, USGS	Seismic studies will improve CBJ's earthquake preparedness, reduce risk for critical infrastructure, and increase public awareness of the potential risk of a seismic event. Better understanding the fault lines nearby would provide better data to investigate previously mentioned studies in this MAP, providing a comprehensive understanding of hazard risk in CBJ	High (>100k)	Requires multi agency coordination and funding, and may require technical expertise beyond the scope of CBJ and UAS.	Land Management Plan, Comprehensive Plan	x	x				x				x		
Risk Assessment	74	Establish earthquake event exercises for schools.	-	Y	Y	M	M	School District	Public Safety/ Early Education	Short Term (<1 year)	FEMA HMGP, FEMA NEHRP Earthquake State Assistance Grant Program	Maintains earthquake risk awareness and increases safety of CBJ youth during a seismic event.	Low (0k-29k)	This project is simple and straightforward. It is also low cost which can be covered using internal budget, expediting the implementation of the project.	CBJ Code, School District Curriculum	x	x				x				x		
Risk Assessment	75	Reinforce transportation infrastructure to combat riverine scour.	-	Y	N	L	n/a	Engineering & Public Works	-	Long Term (>3 years)	AKDOT, FEMA HMGP	This project would strengthen critical infrastructure, keep more transportation routes open for evacuation and emergency and rescue teams, and increases longevity of critical infrastructure.	High (>100k)	This project would require navigating complex permitting and regulations, a limited construction window due to weather, flow, and biological constraints. There would also be traffic disruption during construction/retrofitting. Requires expertise in hydrologic related construction and engineering.	Area wide Transportation Plan, Coastal Management Plan, Long Range Waterfront Plan, Land Management Plan			x								
Risk Assessment	76	Explore fish habitat protection during emergency situations by placing barriers in riverbed to provide protected fish habitat during poor water quality, extreme flows, and large quantities of debris in Mendenhall River.	-	N	Y	n/a	M	-	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	USFWS, EPA, National Fish and Wildlife Foundation	This project would support aquatic ecosystem health even during new natural hazards, sustain subsistence and cultural practices, and strengthen grant funding applications for a variety of purposes.	Medium (30k-99k)	This project would require navigating complex regulations and permitting, and may be a limited contractor pool to select from to implement the project. Numerous grants available to aid in funding.	Coastal Management Plan			x	x		x					

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Risk Assessment	77	Develop team to cultivate relationships with mining industry to evaluate mining industry contributing to almost 50% of CBJ HAZMAT releases.	-	N	Y	n/a	H	-	Government Affairs	Medium Term (1-3 years)	Internal	This project attempts to reduce mining caused hazardous materials spills, which will protect public health, preserve environmental quality, and support sustainable development.	Medium (30k-99k)	Could be lack of participation by mining companies due to regulatory fatigue, requires ongoing staffing commitment to coordinate meetings and data reviews, and differing jurisdictional authority may limit CBJ's oversight.	CBJ Code, Land Management Plan, Transportation Improvement Plan										x	
Risk Assessment	78	Maintain and practice marine hazmat spill containment exercises and equipment.	-	Y	Y	H	M	Docks & Harbors	Public Safety	Medium Term (1-3 years)	US DOT HMGP, US DOT ALERT	Practicing spill response increases the effectiveness of a response during a real hazmat response, demonstrates regulatory compliance, safeguards economic and environmental interests, and minimizes environmental damage.	Medium (30k-99k)	Increase of trainings could result in accelerated degradation of equipment, and scheduling and conducting multi-agency exercises can be logistically complex.	Coastal Management Plan, Long Range Waterfront Plan										x	
Risk Assessment	79	Conduct updated commodity flow study to better understand the hazardous materials that come into and are produced within the community, including transportation of hazardous goods in the Gastineau Channel.	-	Y	Y	L	L	Lands & Resources	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	US DOT HMGP	This study improves local knowledge of the quantity and type of hazardous materials, which allows more accurate and timely emergency response and regulating in the event of a release.	High (>100k)	There could be roadblocks due to reluctance of private companies to share shipment details. It could be challenging to integrate different data sources with varying formats and detail quality.	Economic Development Plan, Area Wide Transportation Plan										x	
Risk Assessment	80	Install cover/netting along coastal roadways where rock topples or falls are most prevalent, to prevent roadway blockage.	-	Y	N	M	n/a	Engineering & Public Works	-	Medium Term (1-3 years)	FHA Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program, AK DOT, Internal	Installing netting along roadways will reduce the risk of vehicular damage, accidents, and injuries due to rockfall. Keeping rockfalls off the roadway also reduces strain on DOT crews.	Medium (30k-99k)	This project is technically feasible. Installing netting is common practice along many roadways where blasting rock has been conducted to build roadways. The main consideration is cooperation or support from other landowners who may own land along roadways where rockfall is common.	Area Wide Transportation Plan, Land Management Plan	x										
Risk Assessment	81	Create publicly available tool on website to report landslide observations and symptoms.	-	Y	Y	H	H	Emergency Programs	Public Safety / Communications	Short Term (<1 year)	Internal, FEMA HMGP	This tool would promote community science, increase community engagement, and increase the amount of data collection possible for landslide hazard studies. It is a great source of cost-effective hazard monitoring.	Medium (30k-99k)	The main consideration of the project would be establishing a vetting process for data to screen potentially false or inaccurate reporting. Public adoption and use of the tool will require outreach to educate public of the tool's existence.	Land Management Plan, Trails Plan	x										
Risk Assessment	82	Explore hardening/connectivity to reinforce underwater cables to be more resilient against tsunami waves and submarine landslides.	-	N	Y	n/a	L	-	Public Safety/ Tidal Network	Medium Term (1-3 years)	DOE	This project maintains reliable communication to and from Juneau, while supporting emergency response and state government operations. It also increases infrastructure resilience and minimize economic impact.	High (>100k)	Coordination with cable owners will be essential, and multi agency coordination can be complex. Permitting may extend the timeline of concluding this project.	Coastal Management Plan	x	x									

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Risk Assessment	83	Build upon DGGS submarine landslide study to further understand risks of identified tsunami hazards, and potentially identify previously unknown sources of submarine landslides that may cause a tsunami.	-	Y	Y	L	L	Engineering & Public Works	Public Safety/ Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	National Tsunami Hazard Mitigation Program (NTHMP), USGS	Building upon the DGGS study would allow CBJ to further understand the potential impacts of submarine landslides. By increasing knowledge of this hazard, CBJ can make informed decisions about potential mitigation projects.	High (>100k)	This would be a resource intensive and technically demanding project. Coordination between state, federal, and academic partners will be required. The findings of this study may reveal vulnerabilities that require costly mitigation or policy decisions.	Land Management Plan, Comprehensive Plan	x	x										
Risk Assessment	84	Obtain funding to create airplane mitigation "kit" to protect planes and airport operations during ashfall (plastic covering for engines, equipment to remove ash on planes, etc.)	-	N	Y	n/a	L	-	Public Safety	Medium Term (1-3 years)	FEMA HMGP, FEMA EMGP, US DOT	These kits would protect aircraft, ensure air travel safety, support economic stability, and minimize disruptions to air travel.	Medium (30k-99k)	Would require extensive permitting, regulation, and collaboration with airport, FAA, and private air transportation service providers.	EAP, Comprehensive Plan, Area Wide Transportation Plan					x				x			
Risk Assessment	85	Broaden emergency volunteer program to distribute masks, tape windows, protect vehicles for residents including elderly and vulnerable populations.	-	Y	Y	H	M	Emergency Programs	Public Safety	Short Term (<1 year)	FEMA EMGP, American Red Cross, AK Department of Health, AK DEC, Alaska Community Foundation, Sealaska Corporation, SSP	This project would protects community health, strengthens community bonds, and ensures all demographics are accounted for in a volcanic event.	Low (0k-29k)	Will require ongoing funding to replenish supplies and train new volunteers. Safety protocols must be developed for volunteers entering homes or assisting elderly. May require liability protection or waivers for volunteers providing home assistance.	Housing Action Plan, Economic Development Plan, Comprehensive Plan					x				x			
Risk Assessment	86	Explore options to conduct study of local tidal and geologic shoreline conditions to better understand how a marine spill may be transported around the community.	-	Y	Y	L	M	Docks & Harbors	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	NOAA, USGS	Improves spill response. Protects ecosystem, and allows for areas of hazmat concentration to be identified and abated.	High (>100k)	Requires interdisciplinary coordination, and technical expertise is required for good data to be generated. The findings of this study could reveal vulnerabilities requiring costly mitigation.	Coastal Management Plan, Long Range Waterfront Plan										x		
Risk Assessment	87	Harden dock and boat harbor facilities as well as bridges which cross the Gastineau Channel to better withstand tsunami and other hazard impacts.	-	Y	Y	M	M	Docks & Harbors & Engineering	Public Safety/ Facilities & Projects/ Transportation	Long Term (>3 years)	FEMA HMGP, AK DOT, US DOT, USFWS, Denali Commission	This project would not only strengthen infrastructure against tsunami hazards, but maintain transportation options and decrease the risk of travel delays due to repairing vessels or harbors.	High (>100k)	This project would require significant upfront costs, limited working windows due to tidal, environmental, and weather constraints. May require complex permitting through USACE, NOAA, and the State.	Coastal Management Plan, Area Wide Transportation Plan	x	x	x	x	x	x	x	x	x	x	x	x
Risk Assessment	88	Educate homeowners on potentially hazardous materials commonly found in homes of provide sources for such information.	-	Y	Y	M	M	Fire Department	Public Safety	Short Term (<1 year)	DOT HMEP, AK DNR	This project protects human health and safety, supports responsible waste management, and lowers the strain on poison control or emergency response.	Low (0k-29k)	Low cost project. Requires ongoing public engagement and may be difficult to motivate participation outside of specific events and emergencies.	Housing Action Plan										x		

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Risk Assessment	89	Study and monitor infestations in Juneau (possibly grid surveys).	-	Y	Y	L	M	Lands & Resources	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	USFWS, AKDFG	This study protects forest health, reduces wildfire risk, and supports local economy by maintaining forest health and creating new jobs.	Medium (30k-99k)	Will require additional staffing and budget, at least seasonally. Can support other agencies such as ADNR, USFS, CBJ Lands & Resources. Will require annual training, and may reveal problems requiring expensive removal or treatment efforts.	Land Management Plan									x			
Risk Assessment	90	Incorporate flood mitigation in local planning.	-	Y	Y	H	H	Community Development	Business & Economic Development	Medium Term (1-3 years)	Internal budget, USACE Planning Assistance to States and Tribes, USACE Tribal Partnership Program	This project would bring one of the most current hazards impacting Juneau into local planning, which would protect infrastructure, possibly lowering insurance premiums through NFIP and CRS, and aid in ecological preservation.	Medium (30k-99k)	May face resistance from property owners and developers due to impacts on property values and new regulations. Requires regularly updating flood data.	Land Management Plan, Comprehensive Plan							x				
Risk Assessment	91	Develop a floodplain management plan and update it regularly.	-	Y	Y	H	M	Community Development	Public Safety/ Business & Economic Development	Medium Term (1-3 years)	USACE Planning Assistance to States and Tribes, USACE Tribal Partnership Program	This plan would be another tool to combat GLOFs, and aid in protecting life and property. It also has the potential to reduce the cost of disaster response and protect the environment and preserve neighborhoods.	High (>100k)	Requires cross department coordination, and needs regular updates based on new science.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan							x				
Risk Assessment	92	Review ASCE 24-05 Flood Resistant Design and Construction (standard in the International Building Code) and consider adopting it in local building code.	-	Y	Y	M	L	Community Development	Public Safety/ Facilities & Projects/ Business & Economic Development	Short Term (<1 year)	Internal budget, FEMA HMGP	Creates more resilient new development, and supports responsible development while also mitigating against future structure damage caused by flooding.	Low (0k-29k)	May result in higher construction costs, which could slow development, and would require consistent enforcement.	CBJ Code, Housing Action Plan							x				
Risk Assessment	93	Encourage the use of porous pavement, vegetative barriers, and islands in large parking areas.	-	Y	Y	M	L	Community Development	Facilities & Projects	Short Term (<1 year)	Internal, FEMA FMA	Promotes groundwater recharge, improves water quality, and diminishes amount of runoff available for flooding.	Low (0k-29k)	This project is technically feasible and low cost, but actual results may be minimal due to only encouraging these actions.	CBJ Code, Housing Action Plan							x				
Risk Assessment	94	Conduct NFIP community workshops to provide information and (non monetary) incentives for property owners to acquire flood insurance.	-	Y	Y	H	M	Community Development	Public Safety	Medium Term (1-3 years)	Internal, FEMA FMA	Increases public awareness about funding options to become more resilient to flooding, while encouraging induvial actions which could lower CBJ's financial responsibility in the event of a flood.	Low (0k-29k)	Will require time from CBJ staff to coordinate and conduct public workshops.	Coastal Management Plan, Land Management Plan							x				
Risk Assessment	95	Complete and maintain FEMA elevation certificates for pre-FIRM and/or post-FIRM buildings.	-	Y	Y	H	M	Community Development	Facilities & Projects	Medium Term (1-3 years)	Internal, FEMA FMA	Reduces flood insurance premiums for property owners, supports safer building and renovation practices, and improves floodplain management and risk mapping.	Medium (30k-99k)	Considerations of this project will be logistics and cost of surveying a large number of buildings, and data management and quality control to ensure certificates meet FEMA requirements.	Housing Action Plan, CBJ Code							x				
Risk Assessment	96	Explore offering (non monetary) incentives for building above the required freeboard minimum (code plus).	-	Y	Y	L	L	Community Development	Business & Economic Development	Short Term (<1 year)	Internal	Increases flood protection in new development, lowers flood insurance premiums, and enhances community resilience.	Low (0k-29k)	Non monetary incentives may not be sufficient alone to motivate all developers or homeowners.	Housing Action Plan							x				

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select?		Priority (H, M L)		Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
				CBJ	T&H	CBJ	T&H																				
Facebook & Planning Team	97	Start process of identifying new landfill location and or transfer site or expansion at existing site to include evaluation of CBJ facility that accepts disaster debris.	-	Y	Y	H	M	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal	Ensures long-term solid waste capacity, supports disaster resilience and rapid recovery, aids in aligning with FEMA and state disaster planning standards, and identifies opportunities for waste diversion and recycling.	Medium (30k-99k)	Identifying suitable new sites can be difficult due to geographic and environmental constraints.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan	x	x	x	x	x	x	x	x	x	x	x	
Facebook	98	Educate Public on how to interact with HESCO barriers to make them more visually appealing.	-	Y	N	H	n/a	Emergency Programs	-	Short Term (<1 year)	Internal budget, LID process	This project would improve public acceptance for emergency mitigation measures, enhances urban aesthetics and community pride, reduces vandalism, builds trust in local government response, and encourages community ownership and stewardship of the HESCO mitigation project.	Low (0k-29k)	Requires buy in from public to not modify barriers in a way that could compromise their integrity, and allocation of time and staff to develop a program and conduct outreach.	Housing Action Plan, Land Management Plan, Economic Development Plan			x				x				
Facebook	99	Partner with T&H and agencies to test soil after flood events to determine if contaminated.	-	Y	Y	H	M	Lands & Resources	Lands and Natural Resources/ Environmental	Medium Term (1-3 years)	EPA TAB, EPA TBA	This project would support informed cleanup and remediation, multi jurisdictional collaboration, builds scientific understanding of local flood impacts, and improves public awareness and safety guidance.	High (>100k)	Will require multi jurisdictional collaboration, high costs associated with sampling, laboratory analysis, and data management.	Coastal Management Plan, Land Management Plan	x	x	x			x	x	x			x	
General	100	Explore including costs for post construction inspections for all private and public infrastructure development and repair and implementation of fees	-	Y	Y	M	L	Community Development	Facilities & Projects/ Business & Economic Development	Short Term (<1 year)	HUD	Ensures long term safety and quality of infrastructure, holds contractors and developers accountable, reduces future maintenance and emergency repair costs, and generates revenue to sustain inspection and compliance programs.	Medium (30k-99k)	Potential resistance from developers and contractors regarding additional fees, and fee structure will have to be debated and agreed upon before implementation to ensure they are reasonable.	CBJ Code, housing Action Plan	x	x	x	x	x	x	x	x	x	x	x	x
Planning Team	101	Gold Creek Flume & Flood Control rehabilitation & improvement	-	Y	Y	H	M	Engineering & Public Works	Lands and Natural Resources/ Environmental/ Governmental Affairs	Medium Term (1-3 years)	USACE Planning Assistance to States and Tribes, FEMA HMGP, STORM Revolving Loan Fund Program, USDA	This project reduces flood risk to downtown Juneau, protects historic and cultural assets, addresses aging infrastructure, and preserves property values.	High (>100k)	High capital expense will require grant funding, complex engineering expertise will be required. Potential community disruption during construction phases must be considered.	Land Management Plan, Coastal Management Plan, Long Range Waterfront Plan							x				
Planning Team	102	Highlands Drainage Infrastructure (Grizzly) rehabilitation & improvement or replacement to improve drainage to protect Egan Drive & High School & residences	-	Y	Y	H	M	Engineering & Public Works	Facilities & Projects	Medium Term (1-3 years)	Internal budget, STORM Revolving Loan Fund Program, EPA	Protects critical transportation corridor, safeguards Juneau-Douglas High School, reduces flood risk to residential properties, and enhances stormwater management capacity.	High (>100k)	This project involves complex underground infrastructure that may complicate inspections and repairs. Grant funding will most likely be required.	Land Management Plan, Comprehensive Plan							x				

Source	Action ID	Mitigation Project (Action Description)	Status (Completed, On-going, Not Started)	Select? CBJ	Select? T&H	Priority (H, M L) CBJ	Priority (H, M L) T&H	Responsible Department (CBJ)	Responsible Department (T&H)	Timeframe	Potential Funding	Benefit	Potential Cost	Technical Feasibility/Considerations	Other Plans to Include Development Action In	Landslide	Tsunami/Seiches	Erosion	Cryosphere (Glacier and Avalanche)	Volcano	HHPD	Flooding	Severe Weather	Wildland & Downtown Fire	Earthquake	HAZMAT Incident	Cyber Threat
Planning Team	103	Conduct a new water source investigation to determine a secondary/redundant source for if the primary water source is damaged	-	Y	Y	H	M	Engineering & Public Works	Facilities & Projects	Long Term (>3 years)	EPA WIIN, Emergency Community Water Assistance Grants in Alaska	Ensures continuity of drinking water during emergencies, increases community resilience and disaster readiness, reduces reliance on a single vulnerable source, and supports long term water supply planning.	High (>100k)	Potential high initial and operational costs for developing a new source. Contractors will need to be hired with expertise in identifying sustainable water sources.	Land Management Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x
Planning Team	104	Assess and evaluate vulnerability to water supply infrastructure	-	Y	Y	H	M	Engineering & Public Works	Public Safety/ Facilities & Projects	Medium Term (1-3 years)	FEMA HMGP, EPA Water Infrastructure Finance and Innovation Act, EPA Drinking Water Infrastructure Grant - Tribal Set Aside Program, Emergency Community Water Assistance Grants in Alaska, EPA	This project would allow CBJ to identify critical weak points in the water supply system, informs asset management and capital planning, and increases eligibility for infrastructure and mitigation actions.	Medium (30k-99k)	Budget constraints may make this project difficult to implement.	Land Management Plan, Comprehensive Plan	x	x	x	x	x	x	x	x	x	x	x	x

4.8 MONITORING AND REVIEWING MITIGATION ACTIONS

Mitigation goals and actions identified in this MJHMP will be monitored during the annual review. This process is described in detail in Section 5.3.

In general, during each annual review, each department or agency currently administering a mitigation project will need to submit required documentation to the MJHMP project manager for review. FEMA provided quarterly reports are most used as they provide information on the status of the mitigation project, detail any changes made to the project, and describe implementation problems and appropriate strategies to overcome them. Other reporting forms that may be used include administration plans or agency-specific reporting tools.

5. PLAN MAINTENANCE

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

This section addresses Element D of the Local Mitigation Plans regulation checklist and the remaining portion of Element A of the Tribal Mitigation Plans regulation checklist.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT D. Plan Maintenance
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMENT A. Planning Process
A6. Does the plan include a description of the method and schedule for keeping the plan current (monitoring, evaluating, and updating the mitigation plan within the plan update cycle)? [44 CFR § 201.7(c)(4)(i)]
A7. Does the plan include a discussion of how the tribal government will continue public participation in the plan maintenance process? [44 CFR § 201.7(c)(4)(iv)]
Source: FEMA 2017 (Tribal)

5.1 PLANNING TEAM MJHMP MAINTENANCE COMMITMENT

The City and Borough of Juneau and Tlingit & Haida are responsible for monitoring, evaluating, and updating the 2025 Hazard Mitigation Plan in accordance with 44 CFR §201.6 and 44 CFR §201.7. The City and Borough of Juneau and Tlingit & Haida are committed to annually reviewing the Plan and CBJ and T&H staff will work to complete their review responsibilities.

5.2 CONTINUED PUBLIC INVOLVEMENT

The City and Borough of Juneau and Tlingit & Haida are dedicated to continued public involvement to update this MJHMP. In order to continue public involvement within the next 5 years, some of their selected mitigation actions include:

- Action 23: Provide non-digital options for and redesign CBJ website and T&H websites (to address Tribal membership) to include: Add a hazard information tab to the website where residents can find all information related to emergency preparedness and communication. Key information to include:
    - Final FEMA-approved HMP
    - Links to hazard resources (volcano activity, fire, smoke, etc.)
    - GIS hazard maps, including current FEMA FIRMs layer and annual riverbank elevation
    - Emergency resource guide for residents that explains appropriate responses at the household scale and provides contact information to help ensure residents receive the care and services required before, during, and after major events
    - Provide information to residents for how to report hazard-related incidents and conditions to jurisdiction officials. This will include the development of a process to receive and disseminate the information to the designated jurisdiction officials.
    - Evacuation routes and emergency shelters
    - Distribute information about the need for and items included in a go-bag
    - Secure and disseminate information about pest and pathogen damage on tree species coupled with information on how to best control and manage the results of outbreaks.
    - Increase public awareness of NFIP and CRS and benefits of purchasing flood insurance by adding relevant information to the proposed hazard tab on the jurisdiction's website.
    - List and amounts of food/water per person for emergency kit on website
    - Provide information regarding ICS training for residents
- Action 47: Provide opportunities for public to be involved in ongoing HMP process and create annual plan to keep HMP up to date and don't let it lapse.

Additionally, an electronic copy of the MJHMP will be available on the CBJ and Tlingit & Haida's websites along with contact information to direct public comments or suggestions regarding the MJHMP.

Finally, the CBJ and Tlingit & Haida will continue public involvement by publishing a survey on their website and social media (similar to the survey used in this MJHMP Update), prior to the annual review and after a significant hazard event. This survey will ask the public for details of the event (how fast did the wind blow, total snowfall, how deep were flood waters, etc.), including how they were impacted, and suggestions for future mitigation activities. This will help in streamlining the plan update in 2030.

5.3 IMPLEMENTING, MONITORING, EVALUATING, AND UPDATING THE MJHMP

This MJHMP was updated as a collaborative effort. To build upon previous hazard mitigation planning efforts and successes, the City and Borough of Juneau and Tlingit & Haida will continue to use the Planning Team to monitor, evaluate, and update the MJHMP. Each authority identified in the Mitigation Action Plan will be responsible for implementing those selected projects for pursuit and determining whether their respective actions were implemented effectively. The primary point of contact will be the hazard mitigation Planning Team leader for each jurisdiction (Emergency Manager for CBJ and Public Safety Manager for Tlingit & Haida). The Planning Team leader will coordinate local efforts to monitor, evaluate, revise, and document the MJHMP actions' status.

The City and Borough of Juneau and Tlingit & Haida will review their successes in achieving the MJHMP's mitigation goals and implementing the Mitigation Action Plan's activities and projects during the annual review process.

The Annual Review Checklist below provides the basis for future MJHMP evaluations by guiding the Planning Team with identifying more or new threatening hazards, adjusting to changes to, or increases in, resource allocations, and garnering additional support for MJHMP implementation.

To ensure that all data is assembled for discussion with the Planning Team, the Planning Team leaders will initiate the annual review two months prior to the scheduled planning meeting date. The findings from these reviews will be presented at the annual Planning Team meeting. Each review, as shown on the Annual Review Worksheet, will include an evaluation of the following:

- Determine CBJ and Tlingit & Haida authorities, outside agencies, collaborators, and resident's participation in MJHMP implementation success.
- Identify risk changes for each identified and newly considered hazards.
- Consider land development activities and related programs' impacts on hazard mitigation.
- Mitigation Action Plan implementation progress.
- Evaluate MJHMP local resource implementation.

Recognizing that this is a living document, the Planning Team will document changes that need to be made to the MJHMP after each annual revision or a disaster, as conditions warrant. These documented revisions will also reflect changes to priorities and funding strategies that may have been implemented.

A full update of the Plan will commence a year in advance of the current Plan expiration date in order to ensure CBJ and Tlingit & Haida always have an approved Plan and are eligible for federal funding. The update will be completed every five years. The Planning Team will involve the public in the Plan update process by holding an advertised annual public meeting to present recommended revisions and solicit input. Notifications will also be sent to collaborators and neighboring communities for comment.

All future meetings will again be open to the public and it is the hope of the Planning Team that once the public education and outreach actions begin, public involvement in the Plan will increase and will be reflected in future revisions. The Planning Team will involve the public in the annual meeting by posting it on the CBJ website and to reach a broader audience to both the CBJ and Tlingit & Haida social media pages.

Figure 133 provides a visual of the HMP activities per year.

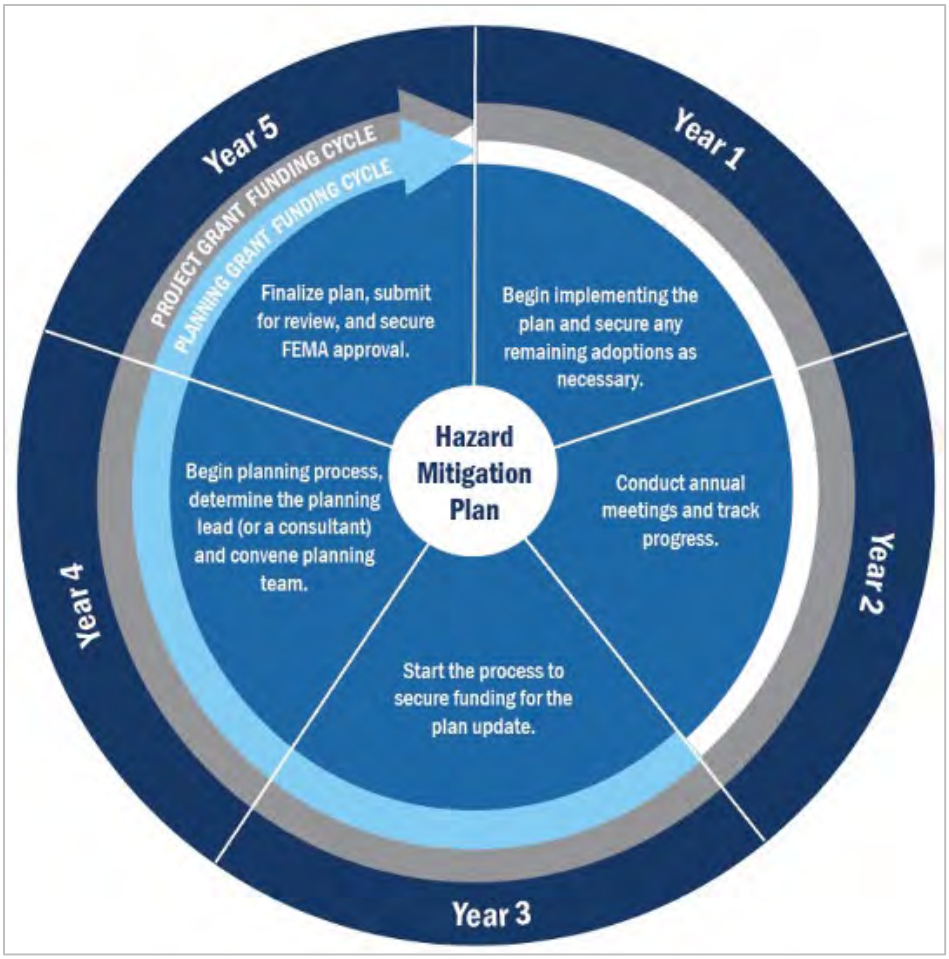


Figure 133 HMP Update Schedule

The Planning Team will schedule a review of the MJHMP Annual Review Checklist and status of mitigation actions in January of every year AND after elections or administration changes to bring new administration team members up to speed on the MJHMP. The Planning Team Leaders will be responsible for scheduling the annual review, and to transition responsibilities and information to new Planning Team Leaders and Members.

The Planning Team will review the Annual Checklist also for plan effectiveness. The team will evaluate if the review of the checklist is providing useful information for the update; progress on mitigation actions; identification of new "wish list" actions; and if the plan is working as intended.

Table 48 contains an annual review checklist to monitor successes and failures of the MJHMP.

Table 48 Annual Review Checklist

Monitoring	Evaluating	Updating	Action	2026	2027	2028	2029	2030
x		x	Disaster/significant hazard events					
x		x	• Injuries/fatalities					
x		x	Mitigation projects completed • Final project cost • Hazards mitigated • Lessons learned (success, benefits, outcomes)					
x		x	New infrastructure or critical facilities (and removed/replaced)					
x		x	New hazards, mapping, engineering, or planning documents to include in next update					
x			Community events where hazards or mitigation was discussed (identify upcoming events to discuss)					
x		x	New Planning Team/Collaborator members					
x		x	New land use development					
	x		Has the Plan increased public awareness/ education? If no, provide why, and ideas for improvement					
	x		Has the Plan resulted in a reduction in hazard damage? If no, provide why, and ideas for improvement					
	x		Are the identified mitigation actions being implemented in the designated time frames, and staying within the cost estimate? If no, provide why, and ideas for improvement					
	x		Has the jurisdiction applied for any grants to implement the mitigation strategy?					
	x		New mitigation projects "wishlist"					
		x	Apply for grant funding to update MJHMP (24 months from expiration)			**X**		
		x	Update MJHMP (start 12 months from expiration)				**X**	

5.4 PLAN INTEGRATION

This section describes the requirements for coordinating, implementing, or integrating the MJHMP into CBJ and Tlingit & Haida planning mechanisms.

After the MJHMP is adopted and implemented, members of the Planning Team will ensure that the MJHMP is integrated into updated CBJ and Tlingit & Haida planning mechanisms. These mechanisms may include their EOP/SCERP, Comprehensive Plan, Tribal Strategic Vision Plan, Capital Improvement Plan, etc., where appropriate. Integrating and implementing this philosophy and activities may require updating or amending specific planning mechanisms.

The Planning Team will achieve mitigation action and initiative integration by undertaking the following activities:

MJHMP Section	Existing Plan/ Policy/Program	Process for Integration
Section 3- Risk Assessment	Land Use Plan Tribal Environmental Plan	Incorporate hazard areas into an updated Land Use Plan and Tribal Environmental Plan to restrict future development in hazard areas as well as strategic community planning for relocation out of hazard areas.
	Emergency Response/Operations Plan (ER/OP)	Incorporate risk assessment findings into the creation/update of an Emergency Response/Operations Plan to help identify and ensure critical resources to maintain operations internally and externally during and after a hazard event.
	Climate Action Plan	Incorporate risk assessment findings in the creation/update of Climate Action Plans.
	Stormwater Plan	Incorporate risk assessment findings into stormwater plans for future development.
Section 4- Mitigation Strategy	CBJ Parking Management, Transit Development, Transportation Plan, and Coordinated Human Services Transportation Plans Tribal Transportation Plan	Incorporate the mitigation actions provided in the Mitigation Action Plan into each Jurisdiction's Transportation Plans by further studying and evaluating the underlying problems or if studies exist that outline potential solutions. Begin the design stage to develop a plan for each identified project, the actions to be taken, engineering and construction required, schedule, and estimated costs.
General	CBJ Comprehensive Plan Tlingit & Haida's Program Profiles	Integrate all aspects of the HMP into the CBJ Comprehensive Plan Update and Tribal Program Profiles to ensure continuity of community goals and objectives.

How the 2012 HMP was integrated into other planning mechanisms:

The 2012 CBJ HMP was integrated into the 2022 Tetra Tech Downtown Juneau Landslide and Avalanche Hazard Assessment to discuss hazards and historical events impacting Downtown Juneau.

CBJ is in the process of updating their Comprehensive Plan and anticipates that the 2012 and 2025 HMP will be integrated into the update.

6. PLAN UPDATE

This section provides an explanation of how the City and Borough of Juneau and the Central Council of Tlingit & Haida Planning Team intends to organize their efforts to ensure that improvements and revisions to the 2025 MJHMP occur in an efficient, well-managed, and coordinated manner.

This section addresses Element E of the Local Mitigation Plans regulation checklist and Element D of the Tribal Mitigation Plans regulation checklist.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT E. Plan Update
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))
E2-a. Does the plan describe how it was revised due to changes in community priorities?
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMENT D. Plan Updates
D1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.7(d)(3))
D2. Was the plan revised to reflect progress in tribal mitigation efforts? (Requirement 44 CFR § 201.7(d)(3) and 201.7(c)(4)(iii)))
D3. Was the plan revised to reflect changes in priorities? (Requirement 44 CFR § 201.7(d)(3))
Source: FEMA 2017 (Tribal)

6.1 2024 MJHMP UPDATE SUMMARY

The 2025 City and Borough of Juneau and Tlingit & Haida MJHMP Update included reviewing and revising the 2012 City and Borough of Juneau HMP.

In this MJHMP update, there were four new hazards identified by the Planning Team and no hazards identified in the 2012 HMP were removed. The Downtown Fire and the Wildland Fire hazard profiles were combined into the Wildland Fire and Urban (Community/Downtown) Fire hazard profile. The Air Transportation hazard profile was reorganized into relevant impacts to air transportation in each individual hazard profile.

New components to this MJHMP update include: shoreline/bank destabilization, primarily caused by glacial lake outburst flooding, is discussed in the Shoreline/Bank Destabilization hazard profile. Manmade dam failure of high and significant hazard dams, most notably Salmon Creek Dam and Douglas Island Dam, are discussed in the Dam Failure (High Hazard and Significant Hazard Dams) hazard profile. Hazardous material releases are discussed in the new Hazardous Materials Release hazard profile. Cyber threats, particularly to local and Tribal governments, are discussed in the Cybersecurity hazard profile.

The following table summarizes the updates to this plan. This is the first edition of a HMP for Tlingit & Haida's assets in Juneau.

Table 49 2025 Plan Update Summary

Section Updated	Information Updated
Section 1 – Plan Introduction and Background	Describes the purpose of the MJHMP and full layout description. Updates the section to reflect current population, economy, history, and demographics.

Table 49 2025 Plan Update Summary

Section Updated	Information Updated
Section 2 – Planning Process	Updates the current Planning Team, documents the planning process (meetings held, public participation), identifies collaborators, new information and documents reviewed as part of the plan update, and other ongoing tribal efforts.
Section 3 – Risk Assessment/Hazard Analysis	Reviews and updates the hazards to be profiled based on the previous plan and hazard events that have occurred since the 2012 HMP. • Glacial Lake Outburst Floods (GLOFs) are discussed in depth in this MJHMP Update for the first time. • Shoreline/bank destabilization hazard profile was created and is discussed in this MJHMP Update for the first time. • Dam failure, specifically the Salmon Creek Dam and the Douglas Island Dam, are discussed in the newly created Dam Failure (High Hazard Potential Dams) hazard profile. • Hazardous Materials Release hazard profile was created and discussed in this MJHMP for the first time. • Cybersecurity hazard profile was created and is discussed in this MJHMP Update for the first time. • The influence of future climate conditions was discussed within each hazard. Reviews and updates population, critical facilities and infrastructure since the last plan; development that has occurred since the last plan; damages from hazard events to evaluate changes in risk.
Section 4 – Mitigation Strategy	Reviews and updates mitigation actions completed since last plan; reviews and develops new mitigation actions based on current risk and goals.
Section 5- Plan Maintenance	Describes the Planning Team's commitment to review the plan annually. Describes the annual and five-year review process of the MJHMP. Outlines the timeline for review and annual review checklist.
Section 6- Plan Update	Describes changes in development and mitigation priorities.
Section 7- Plan Adoption	Describes CBJ and T&H's adoption.
Section 8- References	Updated references and supporting documentation.
Section 9- Appendices	Supporting documents.

6.2 CHANGES IN DEVELOPMENT IN HAZARD-PRONE AREAS

Since 2012, there has not been significant development in Juneau, however the community's risk to natural hazards has changed significantly. Due to Juneau's location, areas prime to development have mostly been developed in the 1970s and 1980s. Future development will be expensive due to steep slopes, the need for additional roadways, or poor soils for building. However, new hazards (most notably GLOFs) have impacted existing infrastructure. Much of the Mendenhall Valley was developed decades ago, well before GLOFs began to impact the area. To protect the planning area from future GLOFs, CBJ approved the current installation of HESCO barriers along certain flood-prone areas of the Mendenhall River to act as a temporary barrier to flooding in the Mendenhall Valley.

Due to the change in vulnerability to natural hazards in the planning area, numerous regulatory requirements concerning development in hazard areas have been adopted since 2012. In December 2023, CBJ adopted the 2022 Downtown Juneau Landslide and Avalanche Assessment avalanche maps for regulatory purposes, while choosing to decline the adoption of the landslide portion of the study. While CBJ did not adopt the landslide maps for regulatory purposes, they do recognize the study as the most recent available data and

they are available on the CBJ website for review. Floodplain mapping was also updated in 2020 with new FEMA FIRMS. CBJ is exploring options for another update due to the GLOF events in 2023 and 2024.

Tlingit and Haida recently renovated and opened AAN Hít (Village House), a cultural and economic hub in downtown Juneau. This renovated facility is housed in a historic three-story building on South Franklin St, an area prone to landslide events. This particular building is also located in the Urban Fire High Hazard Area of Downtown Juneau. An example of a CBJ development project in a hazard area is the Marine Park Deckover, a project that aims to increase access to the seawalk from downtown by installing an ADA-compliant ramp between timber wharf and Marine Park (CBJ 2022). This project was completed in May of 2023 and is located in an area that has experienced historic landslides.

This is the first edition HMP for Tlingit & Haida, therefore, there are no changes in development in hazard-prone areas to compare to.

6.3 CHANGES IN PRIORITIES AND MITIGATION EFFORTS

The 2012 HMP had a large emphasis on mitigation projects addressing avalanche, landslide, and downtown Juneau fire, which at the time were identified as the hazards of greatest concern. While this is still a priority to the Planning Team, they wished to focus their efforts on mitigation projects related to:

- Mitigate flooding, specifically glacial lake outburst flooding, in Juneau and resultant shoreline/bank destabilization and flood impacts.
- Public education for residents and visitors that pertain to hazard probability and emergency preparedness.
- Landslide and avalanche monitoring and mitigation (downtown Juneau).
- Identify affordable housing outside of hazard areas.
- Identify alternative routes to provide redundancy.
- Harden existing facilities in the community that are threatened by hazards.

This is the first edition HMP for Tlingit & Haida, therefore, there is no changes in priorities and mitigation efforts to compare to.

7. PLAN ADOPTION

This section fulfills the City and Borough of Juneau and Tlingit & Haida's formal MJHMP adoption requirements.

This section addresses Element F of the Local Mitigation Plans regulation checklist and Element E of the Tribal Mitigation Plans regulation checklist.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT F. Plan Adoption
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5)) F1-a. Does the participant include documentation of adoption? F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5)) F2-a. Did each participant adopt the plan and provide documentation of that adoption?
Source: FEMA 2025 (Local)

Regulation Checklist- 44 CFR § 201.7 Tribal Mitigation Plans
ELEMENT E. Assurances and Plan Adoption
E1. Does the plan include assurances that the tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend its plan whenever necessary to reflect changes in tribal or Federal laws and statutes? [44 CFR § 201.7(c)(6)] E2. Does the plan include documentation that it has been formally adopted by the governing body of the tribal government requesting approval? [44 CFR § 201.7(c)(5)]
Source: FEMA 2017 (Tribal)

7.1 TRIBAL ASSURANCES

Tlingit & Haida assures that the Tribal Planning Team and Tribal Council will comply with applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding (including 2 CFR Parts 200 and 3002) and will amend its plan whenever necessary to reflect changes in Tribal or Federal laws and statutes.

7.2 FORMAL ADOPTION

TBD

8. REFERENCES

This section provides a comprehensive reference list used to update the MJHMP.

ACCAP 2023. Alaska Center for Climate Assessment and Policy. https://uaf-accap.org/

ACRC 2022. Juneau's Changing Climate & Community Response. https://acrc.alaska.edu/docs/juneau-climate-report

ACRC 2025. Juneau Climate Report-Ocean. https://acrc.alaska.edu/juneau-climate-report/ocean.html

ADEC. 2010 Statewide Hazardous Material Commodity Flow Study. https://nukaresearch.com/download/projects/Hazmat-Commodity-Flow-Report.pdf

ADEC. 2017. Guidance on Developing Conceptual Site Models. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjzhbDNl9uNAxWKGTQIHQxSFGMQFnoECBIQAQ&url=https%3A%2F%2Fdec.alaska.gov%2Fmedia%2F11926%2Fadec-csm-guidance-222017.pdf&usg=AOvVaw2HzGJtkSw1XgiSKhF4DIKF&opi=89978449

ADEC. 2024. Alaska DEC Solid Waste Sites. https://adec.maps.arcgis.com/apps/webappviewer/index.html?id=43a9fdcd23a04b54aad1e753327ffd53

ADEC. 2025a. Contaminated Sites Search. https://dec.alaska.gov/Applications/SPAR/PublicMVC/CSP/Search/

ADEC. 2025a. PPR Spills Database Search. https://dec.alaska.gov/Applications/SPAR/PublicMVC/PERP/SpillSearch?SPage=0&PageSize=100&Spill_DateFrom=01%2F01%2F2005%2000%3A00%3A00&Spill_DateTo=02%2F12%2F2025%2000%3A00%3A00&Spill_Area=1&Spill_Region=5&Spill_Subarea=2&Spill_SearchButton=Search

ADFG 2025. Virtual Viewing. https://www.adfg.alaska.gov/index.cfm?adfg=viewing.podcastepisode&title=Routes:%20Gastineau%20Channel

ADN 2024. Juneau residents dig out after January snowfall hits near-record level for the city. https://www.adn.com/alaska-news/weather/2024/01/24/juneau-residents-dig-out-after-january-snowfall-hits-near-record-level-for-the-city/

ADSP 2022. Alaska Dam Safety Program, Douglas Island Dam Hazard Potential Classification. https://dnr.alaska.gov/mlw/cdn/pdf/forms/Hazard-Potential-Classification-Jurisdictional-Review.pdf

AEC 2020a. Landslides. https://earthquake.alaska.edu/nontectonic/landslides

AEC 2020b. What is a Landslide Tsunami Again? http://earthquake.alaska.edu/what-landslide-tsunami-again

AELP 2025. Salmon Creek Emergency Action Plan. https://www.aelp.com/Safety/Salmon-Creek-EAP

AFPC 2025. Explore Essential Resources for Alaska's Food System. https://www.akfoodpolicycouncil.org/resources/

AICC 2025. http://fire.ak.blm.gov/aicc.php

AK CASC 2020. New study highlights findings and predictions for Juneau glacial outburst flood. https://akcasc.org/2020/06/01/new-study-highlights-findings-and-predictions-for-juneau-glacial-outburst-flood/#:~:text=%E2%80%9CWe%20expect%20GLOFs%20from%20Suicide%20Basin%20to,to%20come%2C%E2%80%9D%20notes%20lead%20author%20Christian%20Kienholz.&text=If%20only%20taking%20into%20account%20the%20melt,a%20slightly%20smaller%20drainage%20event%20in%202020.

AK CASC 2025. Juneau Glacial Flood Dashboard. https://www.juneauflood.com/#/home

AKDOT 2022. Landslide/Embankment Failure of Max Italio Dr. https://www.arcgis.com/apps/mapviewer/index.html?layers=7d34a6dc51194296be7a38fd965c22c2

Alaska Beacon 2023. Alaska's Mount Edgecumbe volcano shows more signs of reawakening, scientists say. https://alaskabeacon.com/2023/02/27/alaskas-mount-edgecumbe-volcano-shows-more-signs-of-reawakening-scientists-say/

Alaska Beacon 2024. Postal inspectors stop suspicious envelope intended for Alaska elections officials. https://alaskabeacon.com/briefs/postal-inspectors-stop-suspicious-envelope-intended-for-alaska-elections-officials/

Alaska Department of Public Safety- Fire and Life Safety. 2025. Alaska State Fire Marshal's Office. Civilian Fire Fatality Statistics.

Alaska Fire Science Consortium 2025. Alaska's Changing Wildfire Environment. https://www.frames.gov/afsc/ACWE

Alaska Food Systems 2023. Alaska Food Security and Independence Task Force 2023. https://www.alaskafoodsystems.com/

Alaska's News Source 2019. UPDATE: Cyber attack on RavnAir forces cancellation of Alaska Dash 8 service. https://www.alaskasnewssource.com/content/news/Cyber-attack-on-RavnAir-forces-cancellation-of-Alaska-Dash-8-flight-service-566406781.html

Alaska's News Source 2022. Wasilla resident lost PFD after hackers redirected banking information. https://www.alaskasnewssource.com/2022/10/08/wasilla-resident-lost-pfd-after-hackers-redirected-banking-information/

Alaska's News Source 2023. Juneau couple loses home to Mendenhall River flood just days after moving in. https://www.alaskasnewssource.com/2023/08/11/juneau-couple-loses-home-mendenhall-river-flood-just-days-after-moving/

Alaska's News Source 2024. Delayed cargo ship halts delivery of grocery items to Alaska. https://www.alaskasnewssource.com/2024/06/04/delayed-cargo-ship-halts-delivery-grocery-items-alaska/

Alaska Public Media 2008. Governor's office locks down upon receiving white powder letter. https://alaskapublic.org/news/2008-12-10/governors-office-locks-down-upon-receiving-white-powder-letter-2

Alaska Public Media. 2013. Officials Say White Powder At State Office Building Non-Hazardous. https://alaskapublic.org/news/2013-10-12/officials-say-white-powder-at-state-office-building-non-hazardous

Alaska Public Media 2024. In Juneau, years can pass without a thunderstorm. Why are they so rare?. https://alaskapublic.org/news/2024-06-11/in-juneau-years-can-pass-without-a-thunderstorm-why-are-they-so-rare

Alaska Public Media 2024b. Roofs collapse, boats sink under the weight of Juneau's heavy snow. https://alaskapublic.org/news/2024-01-25/roofs-collapse-boats-sink-under-the-weight-of-juneaus-heavy-snow

Alhamid, A.K., M. Akiyama, H. Ishibashi, K. Aoki, S. Koshimura, and D.M. Frangopol. 2022. Framework for probabilistic tsunami hazard assessment considering the effects of sea-level rise due to climate change. Structural Safety- Volume 94(102152). https://doi.org/10.1016/j.strusafe.2021.102152

AMNH 2025. Łingít | Tlingit. https://www.amnh.org/exhibitions/permanent/northwest-coast/lingit-tlingit

Avalanche Canada 2023. Avalanche Path. https://www.avalanche.ca/glossary/terms/avalanche-path

AVO 2025a. Edgecumbe. https://avo.alaska.edu/volcano/edgecumbe

AVO 2025b. Gareloi. https://avo.alaska.edu/volcano/gareloi

AVO 2025c. Mount Edgecumbe volcanic field changes from "dormant" to "active" -- what does that mean?. https://avo.alaska.edu/news/view/mount-edgecumbe-volcanic-field-changes-from-dormant-to-active-what-does-that-mean

AVO 2025d. Volcanoes of Alaska. https://avo.alaska.edu/volcano/

Ballesteros–Cánovas J. A., Trappmann D., Madrigal–González J., Eckert, N., and Stoffel, M. 2018. Climate warming enhances snow avalanche risk in the Western Himalayas. Proceedings of the National Academy of Sciences 115(13): 3410–3415. https://doi.org/10.1073/pnas.1716913115

Bartlett, S. F., and Youd, T. L. 1995. Empirical prediction of liquefaction-induced lateral spread: Journal of Geotechnical Engineering: Vol 121, no 4. Journal of Geotechnical Engineering. https://ascelibrary.org/doi/10.1061/%28ASCE%2907339410%281995%29121%3A4%28316%9

BLM 2020. Fire Analysis in Alaska. https://fire.ak.blm.gov/content/fuelfire/Fire%20Analysis%20in%20Alaska.pdf

Buis, A. 2019. Can climate affect earthquakes or are the connections shaky?. NASA. https://climate.nasa.gov/news/2926/can-climate-affect-earthquakes-or-are-the-connections-shaky/

Cal Poly Humboldt-Redwood Coast Tsunami Work Group. The 1964 Great Alaska Earthquake and Tsunami. Accessed March, 2025. https://rctwg.humboldt.edu/1964-great-alaska-earthquake-tsunami

CBJ 2001. City and Borough of Juneau 2001 Area Wide Transportation Plan. https://juneau.org/index.php?gf-download=2020%2F01%2FPRINT-VERSION_Area-Wide-Transportation-Plan.FINAL.pdf&form-id=22&field-id=11&hash=540b91e22ac9efa21b48601fb9e0efd0de86fe7310a3a648bd4be25d31e903bb

CBJ 2015. Auke Bay Area Plan. https://aukebay.org/wp-content/uploads/2017/08/Auke_Bay_Plan_04172015_WEB_FINAL.pdf

CBJ 2006. City and Borough of Juneau 2006 Buildable Sites Criteria and Findings. https://juneau.org/index.php?gf-download=2019%2F12%2FCBJ-Lands-Buildable-Sites-Criteria-and-Findings.pdf&form-id=22&field-id=11&hash=ba2a8a4bc393dd75928a2eea0dd36d0d46a551c1dc55773933b4dd6b7d804e15

CBJ 2025. Capital City Fire/Rescue. https://juneau.org/fire/who-we-are

CBJ 2009. City and Borough of Juneau 2010 Capital Improvement Program. https://juneau.org/index.php?gf-download=2020%2F02%2FFinal-Book-2010-2015.pdf&form-id=22&field-id=11&hash=e6409495b1e56908d3d2bcf976f57c3ffd2c3b2253c18e4691c56acfdac47e00

CBJ 2011. City and Borough of Juneau 2011 Climate Action Implementation Plan. https://juneau.org/index.php?gf-download=2019%2F03%2F2011-Climate-Action-Plan.pdf&form-id=22&field-id=11&hash=32c8805f269ce4bd156cb5cd0bdfd2917fbac831e531c75d02d84a2e17e4405c

CBJ 2007. Climate Change: Predicted Impacts on Juneau. https://juneau.org/index.php?gf-download=2019%2F12%2FClimate-Change-Predicted-Impacts-on-Juneau.pdf&form-id=22&field-id=11&hash=87d34e937e2d2e3a935ad7a0d564cc6ba7c88bfa4fe6e71aa10b99d0a3213981

CBJ 1977. City and Borough of Juneau Coastal Management Program Phase-1.

CBJ 1964. City and Borough of Juneau 1964 Comprehensive Plan.

CBJ 2004. City and Borough of Juneau 2004 Comprehensive Plan.

CBJ 2008. City and Borough of Juneau 2008 Comprehensive Plan. https://juneau.org/index.php?gf-download=2025%2F02%2F2008-Comp-Plan_Adopted_Final.pdf&form-id=22&field-id=11&hash=a8af491479e782c045dd20bc6eef2a2a4701bd30a5c22b929440b22452895990

CBJ 2013. City and Borough of Juneau 2013 Comprehensive Plan. https://juneau.org/community-development/comp-plan-2013

CBJ 1983. City and Borough of Juneau 1983 Downtown Historic District Design Standards.

CBJ 2009. City and Borough of Juneau 2009 Downtown Historic District Design Standards & Guidelines. https://juneau.org/index.php?gf-download=2019%2F02%2FFINAL_DHDDSG_ASSEMBLYADOPTION_1072009.pdf&form-id=22&field-id=11&hash=2be2d9fac82f663851dbbca712bbb126a536a8df39bec96730f390c515850e30

CBJ 2015. City and Borough of Juneau 2015 Economic Development Plan. https://juneau.org/index.php?gf-download=2017%2F04%2F20150226040900.pdf&form-id=22&field-id=11&hash=31de1f216e74ac6949171748d44eb9657f2d2811197144ef3157fb54f64c4342

CBJ 2020. City and Borough of Juneau Flood Maps. https://fema.maps.arcgis.com/apps/StorytellingSwipe/index.html?appid=48beaefc7ca447f895978686b8e6bd1d

CBJ 2025. Food Security. https://juneau.org/community-development/food-security#:~:text=Juneau%27s%20food%20supply%20is%20vulnerable,extra%20food%20supplies%20in%20town.

CBJ 2004. City and Borough of Juneau 2004 Hazard Mitigation Plan.

CBJ 2012. City and Borough of Juneau 2012 Hazard Mitigation Plan. https://juneau.org/index.php?gf-download=2020%2F06%2FAll-Hazards-Mitigation-Plan-2012-Approved-Draft.pdf&form-id=22&field-id=11&hash=94ee23272eafe2c557b35ff5512217f3f18503437d325db92e2e07d5528c83bb

CBJ 2025. HESCO Barriers Phase 1. https://juneau.org/engineering-public-works/hesco-barrier-phase-1

CBJ 2020. City and Borough of Juneau 2020 Historical and Cultural Preservation Plan. https://juneau.org/index.php?gf-download=2020%2F08%2FHistoric-Preservation-and-Cultural-Plan-FINAL-VERSION-with-ordinance.pdf&form-id=22&field-id=11&hash=82c55b4e635147a307b5cb8171c187dc071461545380f160cb3228da1b1807aa

CBJ 2016. City and Borough of Juneau 2016 Housing Action Plan. https://juneau.org/index.php?gf-download=2017%2F04%2FHousingActionPlanFINAL-03.20.2017.pdf&form-id=22&field-id=11&hash=b8a2ac986be10d996a0577799b7e94299eb09f991e8b279dd13a7ee3451013c8

CBJ 2025. Juneau Hazards. https://juneau.org/emergency/juneau-hazards#:~:text=Earthquakes%20are%20of%20concern%20in,resulting%20from%20a%20significant%20earthquake.

CBJ 1978. City and Borough of Juneau 1978 Land Management Plan.

CBJ 2016. City and Borough of Juneau 2016 Land Management Plan. https://juneau.org/index.php?gf-download=2019%2F12%2FCBJ-Lands-Management-Plan-2016.pdf&form-id=22&field-id=11&hash=a1d2d9d55742b52f8632f694c6be3984ea14e1e2268b51a770a2d1770c0cc58a

CBJ 2018. Lemon Creek Area Plan. https://juneau.org/wp-content/uploads/2024/01/LC-Area-Plan-Final-05232018-update-Reduced-1.pdf

CBJ 2004. City and Borough of Juneau 2004 Long Range Waterfront Plan. https://juneau.org/index.php?gf-download=2018%2F01%2F2004-11-22-2003-Long-Range-Waterfront-Plan-CBJ.pdf&form-id=22&field-id=11&hash=8efb3f420b5c10b0a926edb0513dcd09316973838dd05b639b76e3d6d9a239c9

CBJ 2022. City and Borough of Juneau 2004 Long Range Waterfront Plan Amendment. https://juneau.org/index.php?gf-download=2023%2F06%2FAmendment-to-support-subport-development-February-7-2022.pdf&form-id=22&field-id=11&hash=bb0d00ac1abd73ebd67a77f5192081eef4a025dfd7ef773a4d4ae859b8479ed6

CBJ 2025. Marine Park Deckover. https://juneau.org/harbors/project-archive/entry/78826

CBJ 2023. Marine Park Deckover Project Ribbon Cutting Ceremony. https://juneau.org/index.php?gf-download=2023%2F06%2Fribbon-cutting-program_May23_Deckover.pdf&form-id=113&field-id=4&hash=da5bfede47c5697ac61645260bb8eafd129543e12a0c84cb140fffe5e2fc9375&gv-iframe=true

CBJ 2018. City and Borough of Juneau 2018 Renewable Energy Strategy. https://juneau.org/index.php?gf-download=2019%2F03%2FCBJ-Energy-Strategy-Approved.pdf&form-id=22&field-id=11&hash=5d2afc7b5817ab4382a69c747d8545f112c281e0d287116cbc352cd223501346

CBJ 2003. City and Borough of Juneau 2003 Subport Vicinity Revitalization Plan. https://juneau.org/index.php?gf-download=2017%2F12%2F2003-April_Subport_Area_Revitalization_Plan.pdf&form-id=22&field-id=11&hash=d130302f88b165e3630797c4053889fcb11dd00d984f6f37b9e0199c284d53e9&gv-iframe=true

CBJ 2024. Juneau Tourism Survey. https://juneau.org/wp-content/uploads/2025/02/Juneau-Tourism-Survey-Report-2024.pdf

CBJ 2023. City and Borough of Juneau 2023 Townsite Historic Building Survey. https://juneau.org/wp-content/uploads/2023/10/Juneau-Townsite-Historic-Building-Survey-2023-Final-w-Bib-and-Apps-A-C.pdf

CBJ 1993. City and Borough of Juneau 1993 Trails Plan. https://juneau.org/index.php?gf-download=2019%2F12%2FThe-Juneau-Trails-Final-Plan-1993.pdf&form-id=22&field-id=11&hash=771ae04de3539ca2c17d340c1d038cb79aa9846afdfeed193d8ef9f477a3ea03

CBJ 2008. City and Borough of Juneau 2008 Waterfront Design Guidelines. https://juneau.org/index.php?gf-download=2019%2F12%2FWaterfront-Design-Guidelines-2008.pdf&form-id=22&field-id=11&hash=eea554ab7d405beb101d94eeba5da5501dcc20e2ed10e520279ba62b94f7acd3

CBJ 1997. West Douglas Conceptual Plan. https://juneau.org/index.php?gf-download=2019%2F12%2FWest-Douglas-Conceptual-Plan-1997.pdf&form-id=22&field-id=11&hash=2f8cf6af9312d49dee597d80c7a3623c71cbc4a6992fde8f1c9afa74dfa93519

CBJ 2011. Willoughby District Land Use Plan. https://juneau.org/wp-content/uploads/2017/06/WilloughbyDistrictPlanJune2012.pdf

CBW 2020. City and Borough of Wrangell 2020 Multi-Jurisdictional Hazard Mitigation Plan. https://www.wrangell.com/sites/default/files/fileattachments/planning_and_zoning/page/10921/wrangell_mjhmp_revisedfinal_030220_version_approved_by_fema_3-10-2020.pdf

CCTH 2025. About Us. https://tlingitandhaida.gov/about-us/

Center for Strategic and International Studies 2025. Significant Cyber Incidents. https://www.csis.org/programs/strategic-technologies-program/significant-cyber-incidents

CIMSS 2022. Atmospheric River affecting Alaska. January 21, 2022. Written by: Scott Lindstrom. https://cimss.ssec.wisc.edu/satellite-blog/archives/44343

Coeur 2025. Kensington Mine. https://www.coeur.com/operations-projects/kensington-ak/default.aspx

Corewell Health 2025. Know the Difference Between Heat Stroke and Heat Exhaustion. https://corewellhealth.org/

Corringham, T.W., J. McCarthy, T. Shulgina, A. Gershunov, D.R. Cayan, and F.M Ralph. 2022. Climate change contributions to future atmospheric river flood damages in the western United States. Sci Rep 12, 13747. https://doi.org/10.1038/s41598-022-15474-2

CSI 2015. https://www.constructionspecifier.com/when-wetter-may-be-wiser-designing-for-resilience-in-areas-subject-to-flooding/flood_hydrostatic-illustration/

Dai, C. B. Higman, P.J. Lynett, M. Jacquemart, I.M. Howat, A.K. Liljedahl, A. Dufresne, J.T. Freymueller, M. Geertsema, M.W. Jones, and P.J. Haeussler. 2020. Detection and Assessment of a Large and Potentially Tsunamigenic Periglacial Landslide in Barry Arm, Alaska. Geophysical Research Letters 47(22). https://doi.org/10.1029/2020GL089800

Davies et al. 2022. Plateau Icefields: Glacial geomorphology of Juneau Icefield. https://www.antarcticglaciers.org/glaciers-and-climate/glacier-recession/changing-alaska/juneau-icefield-geomorphology/#:~:text=The%20%E2%80%9CLittle%20Ice%20Age%E2%80%9D%20of,continuously%20since%20this%20maximum5.

DCRA 2025. Community Database: Juneau, Alaska. https://dcced.maps.arcgis.com/apps/MapJournal/index.html?appid=3635942ba31c40f094e6249f9d07431c

Denali Commission 2019. Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities. Report Prepared for the Denali Commission By University of Alaska Fairbanks Institute of Northern Engineering U.S. Army Corps of Engineers Alaska District U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory. https://www.denali.gov/wp-content/uploads/2019/11/Statewide-Threat-Assessment-Final-Report-20-November-2019.pdf

DGGS 2013. Quaternary Fault and Folds Database. https://geoportal.dggs.dnr.alaska.gov/portal/apps/webappviewer/index.html?id=48d909b8b2f34e3b9fa12040a97f6e45

DGGS 2017. Tsunami Inundation Maps for Juneau, Alaska. By: E.N. Suleimani, D.J. Nicolsky, R.D. Koehler, and J.B. Salisbury. https://dggs.alaska.gov/webpubs/dggs/ri/text/ri2017_009.pdf

DGGS 2018. Suleimani, E.N., Nicolsky, D.J., and Koehler, R.D. Potential Maximum Permanent Flooding, Juneau, Alaska. https://doi.org/10.14509/30109

DGGS 2023a. Alaska Landslide Hazards Program. https://dggs.alaska.gov/pubs/project/1660

DGGS 2023b. Climate and Cryosphere Hazards. https://dggs.alaska.gov/hazards/climate/.

DGGS 2023c. Personal communication with Barrett Salisbury regarding tsunami potential and extent in Southeast Alaska.

DGGS 2023d. Glacier Change. https://dggs.alaska.gov/hazards/climate/glacier-change.html

DGGS 2023e. Snow Avalanches. https://dggs.alaska.gov/hazards/climate/snow-avalanches.html

DGGS 2025. Juneau Landslide Parcel Information. https://dggs.alaska.gov/webpubs/dggs/pir/text/pir2024_007.pdf

DHS&EM 2018. Alaska State Hazard Mitigation Plan, 2018.

DHS&EM 2022. Disaster Cost Index- October 2022.

DHS&EM 2023. Alaska State Hazard Mitigation Plan, 2023. https://ready.alaska.gov/Documents/Mitigation/SHMP/2023%20State%20of%20Alaska%20Hazard%20Mitigation%20Plan.pdf

DHS&EM 2024. 2024 Juneau Flood Incident Situation Report. https://www.commerce.alaska.gov/web/Portals/4/pub/CDBG-DR%E2%80%93Juneau_Flooding/08232024%20SITREP%202024%20Juneau%20Flooding.pdf

DHS&EM 2025. Cyber Security Vulnerability Assessment. https://ready.alaska.gov/Plans/CSVA

DIDEAP 2025. Douglas Island Dam Emergency Action Plan.

Dixon, G., O. Bullock, and D. Adams. 2018. Unintended Effects of Emphasizing the Role of Climate Change in Recent Natural Disasters. https://doi.org/10.1080/17524032.2018.1546202

Dong, L., Cao, J., and Liu, X. 2022. Recent developments in sea-level rise and its related geological disasters mitigation: A Review. J. Mar. Sci. Eng. 10(3), 355. https://doi.org/10.3390/jmse10030355.

Dura, T., Garner, A.J., Weiss, R., Kopp, R.E., Engelhart, S.E., Witter, R.C., Briggs, R.W., Mueller, C.S., Nelson, A.R., and Horton, B.P. 2021. Changing impacts of Alaska-Aleutian subduction zone tsunamis in California under future sea-level rise. Nat Commun 12, 7119.https://doi.org/10.1038/s41467-021-27445-8

EDS 2025. Downscaled Climate Model Output Juneau (Dzánti K'ihéeni), Alaska. https://arcticeds.org/report/community/AK172

EPA 2016. Adapting to Climate Change in Alaska. EPA Office of Policy EPA-230-F-16-019. https://www.epa.gov/sites/default/files/2016-07/documents/alaska_fact_sheet.pdf

EPA 2022. Climate Change Impacts: Climate Impacts in Alaska. https://climatechange.chicago.gov/climate-impacts/climate-impacts-alaska

EPA. 2024. Particulate Matter (PM) Basics. https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM

Er, M., H. Kars, and G. Jan van Wijngaarden. 2010. Long-term effect of seismic activities on archaeological remains. Special Paper of the Geological Society of America. 471:145-156. https://doi.org/10.1130/2010.2471(13)

Extreme Weather Watch 2025. Lowest Temperatures in Juneau History. https://www.extremeweatherwatch.com/cities/juneau/lowest-temperatures

FBI 2023. FBI Internet Crime Report 2023. https://www.ic3.gov/AnnualReport/Reports/2023_IC3Report.pdf

FEMA 2009. Erosion, Scour, and Foundational Design: Hurricane Ike Advisory. https://ia.eferrit.com/ea/968f0183a5841e32.pdf

FEMA 2017. FEMA, Tribal Mitigation Plan Review Guide. https://www.fema.gov/sites/default/files/2020-05/FEMA_Policy_Tribal_Mitigation_Plan_Review_Guide.pdf

FEMA 2025. FEMA, Tribal Mitigation Planning Handbook – Updated May 2025. https://www.fema.gov/sites/default/files/documents/fema_hmd-tribal-planning-handbook-2025_052125.pdf

FEMA 2020a. Flood Insurance Study Report City and Borough of Juneau, Alaska. https://map1.msc.fema.gov/data/02/S/PDF/02110CV000B.pdf?LOC=df932685e11355e127e5f4a17d3b711a

FEMA 2020b. Hydrodynamic Forces. https://www.fema.gov/about/glossary/hydrodynamic-forces#:~:text=Hydrodynamic%20forces%20are%20imposed%20on,pressure%20in%20the%20downstream%20side.

FEMA 2020c. Hydrostatic Forces. https://www.fema.gov/about/glossary/hydrostatic-forces#:~:text=Standing%20water%20or%20slowly%20moving,Last%20updated%20July%208%2C%202020

FEMA 2020d. Pre-disaster Conditions. https://www.fema.gov/appeal/pre-disaster-conditions

FEMA 2025. FEMA, Local Mitigation Planning Policy Guide- Effective April 11, 2025. https://www.fema.gov/sites/default/files/documents/fema_hmd_local-mitigation-planning-policy-guide_2025.pdf

FEMA 2023. National Risk Index- Tsunami. https://hazards.fema.gov/nri/tsunami

Firehouse 2004. Fire Burns Building in Downtown Juneau, Alaska. https://www.firehouse.com/home/news/10513945/fire-burns-building-in-downtown-juneau-alaska

FMCSA 2013. Nine Classes of Hazardous Materials. https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/Nine_Classes_of_Hazardous_Materials-4-2013_508CLN.pdf

Fox Weather 2024. Mendenhall River Flooding. https://www.foxweather.com/extreme-weather/alaska-couple-escape-mendenhall-river-flooding-2024

Fox Weather 2025. Alaska gustnado spins across busy road as severe thunderstorms slam Juneau. https://www.foxweather.com/weather-news/juneau-alaska-gustnado-severe-thunderstorms-heat-advisory

Gallagher 2025. Wildfires and Changing Land Use. https://www.ajg.com/news-and-insights/features/wildfires-and-changing-land-use/

Geertsema, M., Alcántara-Ayala, I. (2022). Mountain Landslides: An Overview of Common Types and Future Impacts. https://link.springer.com/chapter/10.1007/978-3-031-13298-8_11#citeas

Global Earthquake Archive. ArcGIS Online. Accessed April 2025.

Google Earth 2025. Erosion Locations of Interest. https://earth.google.com/web/search/Gold+Creek,+Juneau,+AK/@58.29326366,-134.34903857,876.90865418a,10183.35158897d,35y,0h,0t,0r/data=CiwiJgokCY6uEtwUKk1AESaVXyV-Ik1AGfLnrdBax2DAIXBGplOJzmDAQgIIAUICCABKDQj_____8BEAA

Govtech 2019. Justice Hacked: When Cyber Criminals Come for the Courts. https://www.govtech.com/security/justice-hacked-when-cyber-criminals-come-for-the-courts

Hecla 2025. Greens Creek. https://www.hecla.com/operations/greens-creek-alaska

Higman, B., D.H. Shugar, C.P. Stark, G. Ekström, M.N. Koppes, P. Lynett, A. Dufresne, P.J. Haeussler, M. Geertsema, S. Gulick, A. Mattox, J.G. Venditti, M. A. L. Walton, N. McCall, E. Mckittrick, B. MacInnes, E.L. Bilderback, H. Tang, M.J. Willis, B. Richmond, R.S. Reece, C. Larsen, B. Olson, J. Capra, A. Ayca, C. Bloom, H. Williams, D. Bonno, R. Weiss, A. Keen, V. Skanavis, and M. Loso. 2018. The 2015 landslide and tsunami in Taan Fiord, Alaska. Sci Rep 8, 12993. https://doi.org/10.1038/s41598-018-30475-w

HUD 2022. Total Development Costs (TDC) for Affordable Housing under the Native American Housing Assistance and Self-Determination Act of 1996 (NAHASDA). https://www.hud.gov/sites/dfiles/PIH/documents/PIH%202022-16%20TDC%20for%20NAHASDA.pdf

IPCC 2018. Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments. https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/

IPCC 2019a. Glacial retreat and increases in severe weather. https://www.ipcc.ch/2019/

IPCC. 2019b. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate Edited by: H.O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer. Cambridge University Press. 755 pp. https://www.ipcc.ch/srocc/

JEDC 2024. Juneau Economic Development Council Economic Indicators. https://www.jedc.org/wp-content/uploads/2024/11/2024-JEDC-Juneau-SEAK-Economic-Indicators-and-Outlook-Report.pdf

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

Juneau Empire 2023. Record heat wave hits Juneau. https://www.juneauempire.com/news/record-heat-wave-hits-juneau/?utm_source=chatgpt.com

Juneau Empire 2024. Neighbors taking action against Mendenhall River bank erosion. https://www.juneauempire.com/news/neighbors-taking-action-against-mendenhall-river-bank-erosion/

Kienholz, C., Pierce, J., Hood, E., Amundson, J.M., Wolken, G.J., Jacobs, A., Hart, S., Jones, K.W., Abdel-Fattah, D., Johnson, C., and Conaway, J.S. 2020. Deglacierization of a Marginal Basin and Implications for Outburst Floods. Frontiers in Earth Science. https://www.frontiersin.org/journals/earth-science/articles/10.3389/feart.2020.00137/full

Mendenhall Glacier, Alaska

KTOO 2012. Public health chief says powder is benign. https://www.ktoo.org/2012/03/08/public-health-chief-says-powder-is-benign/

KTOO 2018. 'Little slice of heaven' Juneau subdivision threatened by river erosion. https://www.ktoo.org/2018/06/04/little-slice-of-heaven-juneau-subdivision-threatened-by-river-erosion/

KTOO 2018. Tsunami warning downgraded or canceled across Gulf of Alaska after magnitude 7.9 earthquake. https://www.ktoo.org/2018/01/23/earthquake-triggers-tsunami-warning-for-gulf-of-alaska/

KTOO 2021. Icy roads, speed factored into weekend car wrecks in Juneau. https://www.ktoo.org/2021/11/29/winter-weather-slippery-roads-in-juneau/

KTOO 2022a. Juneau Landslide Damages Homes. https://www.ktoo.org/2022/09/26/landslide-damages-at-least-one-home-knocks-out-power-for-much-of-juneau/

KTOO 2022b. Scientists are studying what extreme drought looks like in Alaska's temperate rainforest. https://www.ktoo.org/2022/03/04/extreme-drought-southeast-alaska/

KTOO 2023. Meteorologists vs. microclimates: Forecasting the weather in Southeast Alaska. https://www.ktoo.org/2023/03/10/the-challenges-of-forecasting-in-southeast-alaska/

KTOO 2024a. Juneau's King Salmon Fishery Will Close Due to 2020 Landslide. https://www.ktoo.org/2024/06/21/much-of-juneaus-king-salmon-fishery-will-close-this-summer-because-of-a-2020-

landslide/#:~:text=Much%20of%20Juneau%27s%20king%20salmon,because%20of%20a%202020%20landslide

KTOO 2024b. Snowy weather expected across Southeast, but Juneau may be hit hardest. https://www.ktoo.org/2024/11/25/snowy-weather-expected-across-southeast-alaska-but-juneau-may-be-hit-hardest/

KTOO 2025a. Severe thunderstorm soaks Juneau, loosens cruise ship mooring. https://www.ktoo.org/2025/06/17/severe-thunderstorm-soaks-juneau-loosens-cruise-ship-mooring/

KTOO 2025b. Tlingit and Haida cancels food distribution due to federal funding cuts. https://www.ktoo.org/2025/05/02/tlingit-and-haida-cancels-food-distribution-due-to-federal-funding-cuts/

KTOO 2025c. Volcanic ash from possible Mount Spurr eruption could impact air travel in Juneau. https://www.ktoo.org/2025/04/01/volcanic-ash-from-possible-mount-spurr-eruption-could-impact-air-travel-in-juneau/

Lader, R., A. Bidlack, J.E. Walsh, U.S. Bhatt, and P.A. Bieniek, 2020. Dynamical downscaling for Southeast Alaska: Historical climate and future projections. J. Appl. Meteorol. Clim., 59, 1607-1623. https://journals.ametsoc.org/view/journals/apme/59/10/jamcD200076.xml

Larsen, P., S. Goldsmith, O. Smith, M.L. Wilson, K.M. Strzepek, P. Chinowsky, and B. Saylor. 2008. Estimating future costs for Alaska public infrastructure at risk from climate change. Global Environmental Change. 18(3). 442-457. https://doi.org/10.1016/j.gloenvcha.2008.03.005

Littell, J.S., S.A. McAfee, and G.D. Hayward. 2018. Alaska snowpack response to climate change: Statewide snowfall equivalent and snowpack water scenarios. Water (Switzerland), 10(5). https://doi.org/10.3390/w10050668

Martinez-Moreno, F. 2015. Detection and characterization of karstic caves: integration of geological and geophysical techniques. https://doi.org/10.13140/RG.2.2.23000.49927

Mears, Fesler, and Fredston. 1992. Juneau Area Mass-Wasting and Snow Avalanche Hazard Analysis.

Melvin, A.M., Larsen, P., Boehlert, B., Neumann, J.E., Chinowsky, P., Espinet, X., Martinich, J., Baumann, M.S., Rennels, L., Bothner, A., Nicolsky, D.J., and Marchenko, S.S. 2016. Climate change damages to Alaska public infrastructure and the economics of proactive adaptation. PNAS 114(2). pp E122-E131. https://doi.org/10.1073/pnas.1611056113

Michael Baker, International. 2025. Inundation Mapping and Draft Mendenhall River Preliminary 2d Surface Water Model Report.

MMI 2022. Modified Mercalli Intensity Scale. Michigan Technical University. http://www.geo.mtu.edu/UPSeis/Mercalli.html

Murakami, S., Yasuhara, K., Suzuki, N., Wei, N., and Komine, H. 2005. Vulnerability assessment to liquefaction hazard induced by rising sea-levels due to global warming. The Free Library. https://www.thefreelibrary.com/Vulnerability+assessment+to+liquefaction+hazard+induced+by+rising...-a0155784183

NASA-Earth Observatory 2020. Lituya Bay's Apocalyptic Wave. https://earthobservatory.nasa.gov/images/147557/lituya-bays-apocalyptic-wave

Nash et al. 2024. Atmospheric Rivers in Southeast Alaska: Meteorological Conditions Associated With Extreme Precipitation. https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2023JD039294

National Drought Mitigation Center, University of Nebraska, Drought Impact Reporter Dashboard 2025. https://unldroughtcenter.maps.arcgis.com/apps/dashboards/46afe627bb60422f85944d70069c09cf

National Geographic. Volcanic Ash. Accessed April 2025. https://education.nationalgeographic.org/resource/volcanic-ash/

Natural Resources Canada 2008. Volcanoes of Canada. https://web.archive.org/web/20080507152523/http:/gsc.nrcan.gc.ca/volcanoes/mon_e.php

NCEI 2023- U.S. Climate Normals Quick Access. Juneau Airport. https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&location=AK&station=USW00025309

NCEI/WDS 2025. National Geophysical Data Center / World Data Service: NCEI/WDS Global Historical Tsunami Database. NOAA National Centers for Environmental Information. doi:10.7289/V5PN93H7. https://www.ngdc.noaa.gov/hazel/view/hazards/tsunami/runup-search

NID 2025. National Inventory of Dams. https://nid.sec.usace.army.mil/#/

NIDIS 2025. Alaska Drought Maps. https://www.drought.gov/states/alaska/

NLC 2019. How One Alaskan Borough Survived A Cyber Attack. https://www.nlc.org/article/2019/10/01/how-one-alaskan-borough-stood-up-to-a-cyber-attack/#:~:text=But%20in%20mid%2D2018%2C%20several,and%20contain%20approach%20as%20well.

NOAA. Taku Winds. Accessed May 2025. https://www.weather.gov/media/ajk/brochures/Taku_Winds.pdf

NOAA 2019. High temperatures smash all-time records in Alaska in early July 2019. https://www.climate.gov/news-features/event-tracker/high-temperatures-smash-all-time-records-alaska-early-july-2019

NOAA 2020a. Alaska Atmospheric River. https://www.weather.gov/media/ajk/brochures/Alaska%20Atmospheric%20River.pdf

NOAA 2020b. SUMMER CLIMATE GUIDE TO SOUTHEAST ALASKA. Accessed May 2025. https://www.weather.gov/media/ajk/brochures/Summer%20Climate%20Guide%202016.pdf#:~:text=The%20moist%20and%20mild%20climate%20of%20Southeast,season%20during%20a%20%E2%80%9Ctypical%20summer%E2%80%9D%20in%20Southeast.

NOAA 2021. Interactive map: How has local sea level in the United States changed over time? https://www.climate.gov/news-features/features/interactive-map-how-has-local-sea-level-united-states-changed-over-time

NOAA 2023a. What are atmospheric rivers? https://www.noaa.gov/stories/what-are-atmospheric-rivers

NOAA 2023b. Atmospheric Rivers: what are they and how does NOAA study them? https://research.noaa.gov/2023/01/11/atmospheric-rivers-what-are-they-and-how-does-noaa-study-them/

NOAA 2023c. Melting Glaciers' Impact on Isostatic Rebound. https://storymaps.arcgis.com/stories/b27d9719f3644aeeb3ad53b2c24a33b6

NOAA 2025a. Atmospheric River Portal. https://psl.noaa.gov/arportal/

NOAA 2025b. Shoreline Data Explorer. https://www.ngs.noaa.gov/NSDE/

NOAA 2025c. Taku Winds. https://www.weather.gov/media/ajk/brochures/Taku_Winds.pdf

NPS 2019. The 2015 Taan Fiord Landslide and Tsunami. https://www.nps.gov/articles/aps-18-1-2.htm

NPS 2020. So Goes the Snow: Alaska Snowpack Changes and Impacts on Pacific Salmon in a Warming Climate. https://www.nps.gov/articles/aps-19-1-10.htm#:~:text=In%20Alaska's%20watersheds%2C%20climate%20change,32%C2%B0F)%20more%20frequently

NPS 2025. Kaasteen. https://www.nps.gov/articles/000/kaasteen.htm

NSF 2021. Alaska thunderstorms may triple with climate change. https://news.ucar.edu/132777/alaska-thunderstorms-may-triple-climate-change

NSF 2024. RAISE: Confronting glacier outburst flood hazards to improve glacial flood forecasts across northwest North America. https://www.nsf.gov/awardsearch/showAward?AWD_ID=2438778&HistoricalAwards=false

NWS 2023. Tsunami Propagation. https://www.noaa.gov/jetstream/tsunamis/tsunami-propagation

NWS 2025a. Glacial Dammed Lake Data. https://www.weather.gov/aprfc/gdlData?17

NWS 2025b. Juneau and Area Climate Information. https://www.weather.gov/ajk/localclimate

NWS 2025c. National Weather Service Issues First Heat Advisory Ever For Alaska This Weekend, But There's A Catch. https://weather.com/forecast/regional/news/2025-06-13-fairbanks-alaska-first-heat-advisory

NWS 2025d. PRELIMINARY REVIEW OF THE JUNE 16TH, 2025 THUNDERSTORM SQUALL LINE EVENT. https://partnerservices.nws.noaa.gov/products/9fc578dc6803645e2cf0fa304e679d2c

NWS 2025e. River Notes. https://www.weather.gov/aprfc/riverNotes

NWS 2025f. Storm Events Database and Storm Prediction Center Product. https://www.ncdc.noaa.gov/stormevents/

NWS 2025g. Suicide Basin Monitoring and Current Conditions. https://www.weather.gov/ajk/suicidebasin

NWS 2025h. WFO Juneau's Local Area Information. https://www.weather.gov/ajk/OurOffice-LocalArea#:~:text=Juneau%20averages%20around%2054%20inches,creeping%20above%2060%20degrees...

NWS. Southeastern Alaska Thunderstorm Climatology. Accessed April, 2025. https://www.weather.gov/media/ajk/articles/SEAKThunderstormClimatology.pdf

Peninsula Clarion 2018. In Juneau, residents take erosion into their own hands. https://www.peninsulaclarion.com/news/in-juneau-residents-take-erosion-into-their-own-hands/

Peninsula Clarion 2022. Gastineau Avenue Landslide. https://www.peninsulaclarion.com/news/city-of-juneau-wraps-up-landslide-cleanup/

Post and Mayo 1971. Glacier dammed lakes and outburst floods in Alaska. USGS publication. https://dggs.alaska.gov/webpubs/usgs/ha/text/ha-0455.pdf

PYB 2024. Record Snowfall in Juneau Alaska Sinks Eight Boats. https://www.poweryachtblog.com/2024/01/record-snowfall-in-juneau-alaska-sinks.html#google_vignette

Quilter, P., Ballegooy, S. V., & Reinen-Hamill, R. 2015. The effect of sea level rise on liquefaction vulnerability: A case study for consideration of development on coastal plains and reclamations: Semantic scholar. Semantic Scholar. https://www.semanticscholar.org/paper/The-effect-of-sea-level-rise-on-liquefaction-A-Case-Quilter-Ballegooy/706189686801fa09915baecd7044eed31da3d67b

Redilla, K., S.T. Pearl, P.A. Bieniek, and J.E. Walsh. 2019. Wind Climatology for Alaska: Historical and Future. Atmospheric and Climate Sciences, 9, 683-702. https://doi.org/10.4236/acs.2019.94042

SEAAK 2025. Alaska Snow Loads. https://seaak.net/alaska-snow-loads

Sea Gardens 2025. Herring egg gardens of the northwest coast. https://www.seagardens.net/herring-gardens

SEAGO 2025. SE ALASKA Sportfishing Economic Impacts. https://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/2024-2025/se/rcs/rc092_Southeast_Alaska_Guides_Organization_Economic_Impacts_of_Guided_Sportfishing_in_Southeast_Alaska_in_2024_.pdf

SI National Air and apace Museum 2024. How Active Volcanoes Can Put Airplanes in Danger. https://airandspace.si.edu/air-and-space-quarterly/issue-13/volcano-hazards#:~:text=Abrasive%20volcanic%20ash%20can%20cause,Mount%20Redoubt%20has%20many%20names.

Stover, C.W., Hake. C. 1979. United States Earthquakes 1979. USGS. https://pubs.usgs.gov/of/1984/0979/report.pdf

Tetra Tech 2022. Downtown Juneau Landslide and Avalanche Assessment. https://juneau.org/wp-content/uploads/2021/07/Downtown_Juneau_Landslide_and_Avalanche_Assessment_IFR_Report_Third%20Draft_Reduced.pdf

THTBC 2025. Our History. https://thtbc.com/our-history/

Tlingit & Haida 2019. Climate Change Action Plan. https://www.ccthita.org/wp-content/uploads/ClimateChangeActionPlan.pdf

Tlingit & Haida 2025a. Expanding Opportunities for Tribal Citizen Artisans and Advancing Economic Sovereignty. https://tlingitandhaida.gov/news/tlingit-haida-to-open-aan-hit-village-house/

Tlingit & Haida 2025b. Tribal Enterprises. https://tlingitandhaida.gov/about-us/tribal-enterprises/

Travel Juneau 2025. Downtown Juneau Alaska Street Tour. https://www.traveljuneau.com/things-to-do/top-attractions/downtown-street-tour/

UAA 2024. State of Alaska Division of Retirement and Benefits (DRB) Outage. https://www.alaska.edu/news/hr/2024.11.14AKDRBOutage.php

UAF AFPC 2023. Alaska Food Security and Independence Task Force 2023 Report. https://alaska-food-systems-soa-dnr.hub.arcgis.com/documents/6f7cda90d3df4e2e9c0300cbc30925a4/explore

UAF-Alaska Earthquake Center 2022. Significant Event. https://earthquake.alaska.edu/significant-event-page

UAF-Alaska Earthquake Center 2022. 2018 M7.1 Anchorage Earthquake. https://earthquake.alaska.edu/event/018fcnsk91/fault

UAF GI 2022. In the crosshairs of an atmospheric river. https://www.gi.alaska.edu/alaska-science-forum/crosshairs-atmospheric-river

UAF/SNAP 2025a. Northern Climate Reports. https://northernclimatereports.org/report/area/USFS21

UAF/SNAP 2025b. Airport Winds Tool. https://snap.uaf.edu/tools/airport-winds

UAF/SNAP 2025c. Community Climate Charts. https://snap.uaf.edu/tools/community-charts

UAF/SNAP 2025d. Alaska Garden Helper. https://snap.uaf.edu/tools/gardenhelper/

UAF-IARC 2022a. Southeast Alaska Drought History. https://uaf-iarc.org/wp-content/uploads/2022/02/Southeast-Alaska-drought-HISTORY.pdf

UAF-IARC 2022b. Southeast Alaska Drought Impacts. https://uaf-iarc.org/wp-content/uploads/2022/02/Southeast-Alaska-drought-IMPACTS.pdf

UAF-IARC 2022c. Southeast Alaska Drought Future. https://uaf-iarc.org/wp-content/uploads/2022/02/Southeast-Alaska-drought-FUTURE.pdf

UAF-IARC 2023. Southeast Alaska Drought. https://uaf-iarc.org/wp-content/uploads/2023/01/Southeast-Alaska-Drought-1.pdf

UCSD SIO 2022. Research at Scripps. https://scripps.ucsd.edu/

UNDRR 2017. Glacial Lake Outburst Flood. https://www.undrr.org/understanding-disaster-risk/terminology/hips/mh0013

UPI 1984. Mudslide Damages Dam, Veterinary Clinic. https://www.upi.com/Archives/1984/07/17/It-will-take-a-week-to-clean-up-from/3927458884800/#google_vignette

USACE 2007. Erosion Information Paper- Juneau-Douglas. https://www.poa.usace.army.mil/Portals/34/docs/civilworks/BEA/Juneau-Douglas_Final%20Report.pdf

US Census 2025a. Juneau City and Borough data. https://data.census.gov/table/ACSST5Y2021.S1101.?q=Juneau+census+subarea,+Juneau+City+and+Borough,+Alaska&t=Household+Size+and+Type

US Census 2025b. Juneau Population and Population Trends. https://data.census.gov/profile/Juneau_City_and_Borough,_Alaska?g=050XX00US02110

US Census 2025c. QuickFacts Juneau city and borough, Alaska. https://www.census.gov/quickfacts/fact/table/juneaucityandboroughalaska/PST045224

USDA 2023. Alaska and Changing Climate. https://www.climatehubs.usda.gov/hubs/northwest/topic/alaska-and-changing-climate

USDE 2011. Hydrodynamic loads on a building from coastal flooding. https://basc.pnnl.gov/images/hydrodynamic-loads-building-coastal-flooding

USDM 2025. Data. https://droughtmonitor.unl.edu/Data.aspx

USGCRP 2018. Fourth National Climate Assessment, Volume II. 1515 pp. https://doi.org/10.7930/NCA4.2018

USGCRP 2023. Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023

USGS. Measurements of Taku River, Alaska During Tulsequah Lake Outburst Floods. Accessed May 2025. https://pubs.usgs.gov/fs/1999/0131/report.pdf

USGS 1999. Hydrology, Geomorphology, and Flood Profiles of the Mendenhall River, Juneau, Alaska. https://pubs.usgs.gov/wri/1999/4150/1999_wrir99-4150.pdf

USGS 2004. Landslide Types and Processes. https://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html

USGS 2005. Historically Active Volcanoes in Alaska—A Quick Reference. https://pubs.usgs.gov/fs/2000/fs118-00/

USGS 2007. Hydrology and Glacier-Lake Outburst Floods (1987–2004) and Water Quality (1998–2003) of the Taku River near Juneau, Alaska. https://pubs.usgs.gov/publication/sir20075027

USGS 2010. Tsunami terms. https://www.usgs.gov/media/images/tsunami-terms#:~:text=Depths%20range%20from%200%2D2,(0%2D7%20feet).

USGS-Sound Waves Newsletter 2015. Study region along the Queen Charlotte-Fairweather fault. https://www.usgs.gov/media/images/study-region-along-queen-charlotte-fairweather-fault

USGS 2016. Volcanic Ash. https://volcanoes.usgs.gov/volcanic_ash/ash.html

USGS 2017. Changing Vulnerability of Coastal Communities to Tsunamis. https://www.usgs.gov/news/changing-vulnerability-coastal-communities-tsunamis

USGS 2018. Suicide Basin Map. https://www.usgs.gov/media/100990

USGS 2019. 20 Largest Earthquakes in the World Since 1900. https://www.usgs.gov/programs/earthquake-hazards/science/20-largest-earthquakes-world-1900

USGS-Pacific Coastal and Marine Science Center 2020. Earthquake Hazards in Southeastern Alaska. https://www.usgs.gov/centers/pcmsc/science/earthquake-hazards-southeastern-alaska

USGS 2024. Newest Volcano Notice Including Edgecumbe. https://volcanoes.usgs.gov/hans-public/volcano/ak90

USGS. Cool Earthquake Facts. Accessed April, 2025. https://www.usgs.gov/programs/earthquake-hazards/cool-earthquake-facts#:~:text=Alaska%20is%20the%20most%20earthquake,on%20average%20every%2014%20years.

USGS 2025a. Earthquake Catalog. https://earthquake.usgs.gov/earthquakes/search/

USGS 2025b. How often do Alaskan volcanoes erupt?. https://www.usgs.gov/faqs/how-often-do-alaskan-volcanoes-erupt#:~:text=Alaskan%20volcanoes%20have%20produced%20one,Preserve%20is%20the%20most%20recent.

USGS 2025c. What was the largest volcanic eruption in the 20th century?. https://www.usgs.gov/faqs/what-was-largest-volcanic-eruption-20th-century

USGS 2025d. Mendenhall R NR Auke Bay AK - 15052500. https://waterdata.usgs.gov/monitoring-location/15052500/#dataTypeId=continuous-00065--1654777834&period=P7D

UWSEAK 2025. Food Pantries and Prepared Meals. https://www.unitedwayseak.org/food-pantries-and-prepared-meals

Vincent Dunn, Deputy Chief FDNY (retired). Structural Fire Spread. Accessed April 2025. https://inspectapedia.com/roof/Structural-Fire-Spread-Dunn.pdf

Weather Channel 2020. Atmospheric River Smashes Alaskan Capital's 24-Hour Rain Record. https://weather.com/news/news/2020-12-02-juneau-alaska-all-time-rain-record

Weather Underground 2020. Atmospheric River Smashes Alaskan Capital's 24-Hour Rain Record. December 3, 2020. Written by: Jonathan Erdman. https://www.wunderground.com/article/news/news/2020-12-02-juneau-alaska-all-time-rain-record

Weather Underground 2020. Juneau, AK Weather History. https://www.wunderground.com/history/daily/PAJN/date/2020-12-1

Wever, N., C.V. Valero, and C. Fierz. 2016. Assessing wet snow avalanche activity using detailed physics based snowpack simulations. Geophysical Research Letters, 43(11). doi:10.1002/2016GL068428. https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1002/2016GL068428.

WHO 2025. Tsunamis. https://www.who.int/health-topics/tsunamis#tab=tab_2

Wilbur, K., Janes, M., and Mears, A. 2012. AVALANCHE IMPACT PERFORMANCE OF A LIGHT-WEIGHT DIVERSION STRUCTURE. International Snow Science Workshop Proceedings. https://arc.lib.montana.edu/snow-science/objects/issw-2012-294-299.pdf

SNETTISHAM TRANSMISSION LINE, SOUTHEAST ALASKA

WJTV 2023. Glacial dam outburst in Alaska's capital erodes riverbanks, destroys at least 2 buildings. https://www.wjtv.com/weather/severe-weather/ap-authorities-assess-damage-after-flooding-from-glacial-dam-outburst-in-alaskas-capital/

XMACIS2 2025a. Maximum 1-Day Total Precipitation for JUNEAU AIRPORT, AK. https://xmacis.rcc-acis.org/

XMACIS2 2025b. Maximum 1-Year Total Precipitation for JUNEAU AIRPORT, AK. https://xmacis.rcc-acis.org/

Your Alaska Link 2025. Tlingit & Haida pause traditional food program due to funding cuts. https://www.youralaskalink.com/news/local/tlingit-haida-pause-traditional-food-program-due-to-funding-cuts/article_dede1dbe-ffd8-4f9b-a097-2c201ea7d82b.html

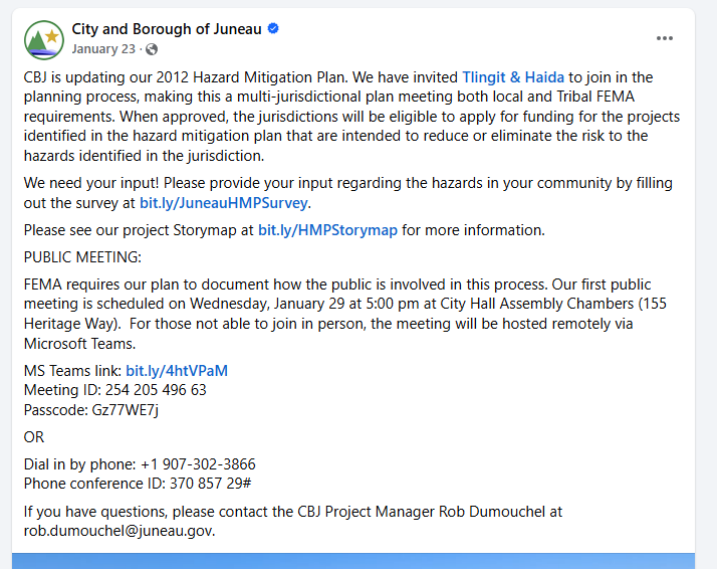
9. APPENDICES

APPENDIX A – ADOPTION RESOLUTIONS

APPENDIX B – FEMA PLAN REVIEW TOOLS

APPENDIX C – PUBLIC OUTREACH ACTIVITIES

Public Outreach for the City and Borough of Juneau and Tlingit & Haida's 2025 Hazard Mitigation Plan Update began in January 2025. A project announcement was published on the City & Borough of Juneau's website on January 22, 2025, and notifications were shared on social media pages. With the announcement, a request was made to the public to provide input to the project through a project survey. The Survey was active from January 23, 2025, through the completion of the project. Survey results are provided in this section that share the public's thoughts on the hazards that occur in the Planning area, impacts that have been experienced, and ideas for mitigation projects that have been incorporated into this HMP Update.



City and Borough of Juneau
January 23 ·

CBJ is updating our 2012 Hazard Mitigation Plan. We have invited Tlingit & Haida to join in the planning process, making this a multi-jurisdictional plan meeting both local and Tribal FEMA requirements. When approved, the jurisdictions will be eligible to apply for funding for the projects identified in the hazard mitigation plan that are intended to reduce or eliminate the risk to the hazards identified in the jurisdiction.

We need your input! Please provide your input regarding the hazards in your community by filling out the survey at bit.ly/JuneauHMPSurvey.

Please see our project Storymap at bit.ly/HMPStorymap for more information.

PUBLIC MEETING:

FEMA requires our plan to document how the public is involved in this process. Our first public meeting is scheduled on Wednesday, January 29 at 5:00 pm at City Hall Assembly Chambers (155 Heritage Way). For those not able to join in person, the meeting will be hosted remotely via Microsoft Teams.

MS Teams link: bit.ly/4htVPaM
Meeting ID: 254 205 496 63
Passcode: Gz77WE7j

OR

Dial in by phone: +1 907-302-3866
Phone conference ID: 370 857 29#

If you have questions, please contact the CBJ Project Manager Rob Dumouchel at rob.dumouchel@juneau.gov.

PUBLIC WORKSHOP #1

CITY AND BOROUGH OF JUNEAU AND TLINGIT & HAIDA MULTI–JURISDICITIONAL HAZARD MITIGATION PLAN UPDATE

Learn about natural hazard mitigation planning in your community! Join the CBJ and T&H for the first project workshop on January 29, 2025.

Natural hazards threaten our residents, homes, and infrastructure. We need your input on the hazards that occur in Juneau and how these events have impacted you in the past. Your input will be used to shape the Hazard Mitigation Plan and make the CBJ and T&H more resilient to natural hazards.

Please scan the QR code or the link below to visit our project StoryMap and complete our project survey.

At this meeting, we will discuss:

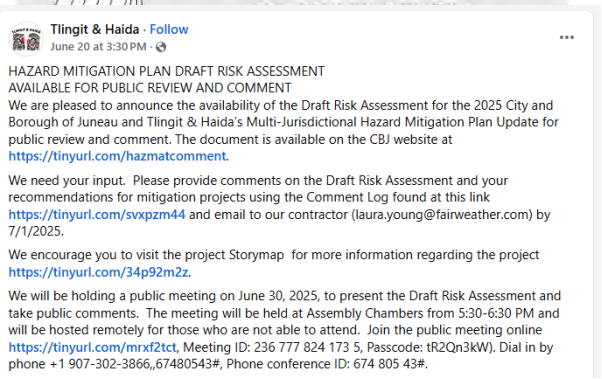
- Planning process
- Project schedule
- Natural hazards
- Critical facilities you rely upon
- Community lifelines
- Underserved/vulnerable populations

Project StoryMap and Survey

https://shorturl.at/1iEh4

WORKSHOP DETAILS **January 29, 2025**

5 pm- Public Workshop (in person and remote option)
Location: City Hall in the Assembly Chambers- 155 Heritage Way



Tlingit & Haida · Follow
June 20 at 3:30 PM ·

HAZARD MITIGATION PLAN DRAFT RISK ASSESSMENT
AVAILABLE FOR PUBLIC REVIEW AND COMMENT

We are pleased to announce the availability of the Draft Risk Assessment for the 2025 City and Borough of Juneau and Tlingit & Haida's Multi-Jurisdictional Hazard Mitigation Plan Update for public review and comment. The document is available on the CBJ website at https://tinyurl.com/hazmatcomment.

We need your input. Please provide comments on the Draft Risk Assessment and your recommendations for mitigation projects using the Comment Log found at this link https://tinyurl.com/svxpzm44 and email to our contractor (laura.young@fairweather.com) by 7/1/2025.

We encourage you to visit the project Storymap for more information regarding the project https://tinyurl.com/34p92m2z.

We will be holding a public meeting on June 30, 2025, to present the Draft Risk Assessment and take public comments. The meeting will be held at Assembly Chambers from 5:30-6:30 PM and will be hosted remotely for those who are not able to attend. Join the public meeting online https://tinyurl.com/mrxf2tct, Meeting ID: 236 777 824 173 5, Passcode: tR2Qn3kW). Dial in by phone +1 907-302-3866,,67480543#, Phone conference ID: 674 805 43#.

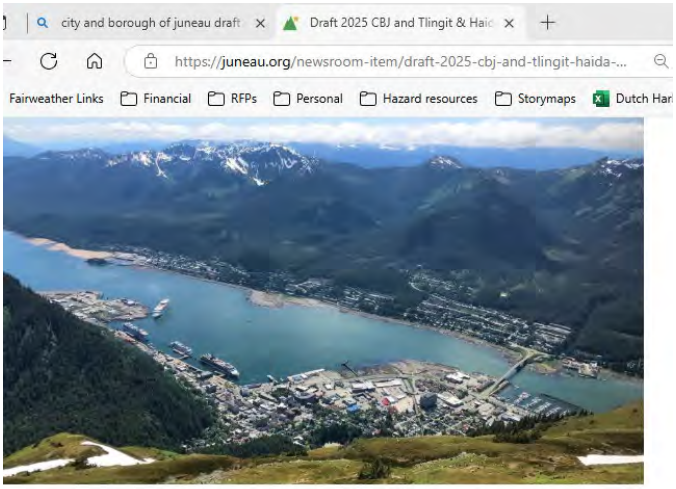
The public notice of the availability of the draft risk assessment was posted to the City and Borough of Juneau's website on June 16, 2025, and shared on social media pages as well as sent via email to project collaborators and the project email distribution list. KTOO published a news article on the availability of the draft risk assessment with links to the plan, project survey, and project StoryMap on 6/18/2025.

City and Borough of Juneau
June 20 at 11:37 AM ·

We are pleased to announce the availability of the Draft Risk Assessment for the 2025 City and Borough of Juneau and Tlingit & Haida's Multi-Jurisdictional Hazard Mitig... See more

You and 10 others 4 comments 6 shares

Like Comment Share



Draft 2025 CBJ and Tlingit & Haida multi-jurisdictional risk assessment open for comment

June 17, 2025 – Notices for Public Comment

We are pleased to announce the availability of the Draft 2025 City and Borough of Juneau and Tlingit & Haida's Multi-Jurisdictional Hazard Mitigation Plan Risk Assessment Update for Public Review and Comment.

This document represents the research and discussions with the planning teams; planning team input received during planning team and public meetings; and comments received from the public to identify the hazards that impact your jurisdiction; how they impact residents and infrastructure; as well as the number of people, residences, and critical facilities at risk.

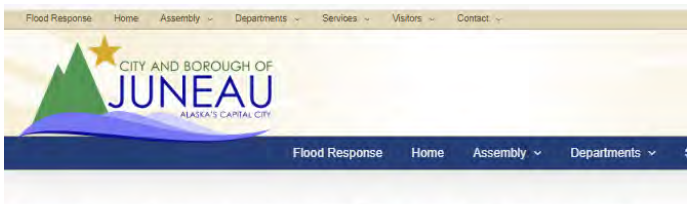
Download the Draft Risk Assessment here.

All in the community are invited to review the Draft Risk Assessment and provide comments to our contractor via email (laura.young@fairweather.com) by July 1, 2025 to enable the team to respond and incorporate any changes into the document to finalize the entire hazard mitigation plan for review and comment. For multiple comments, please fill out the comment log and send to our contractor to enable the team to track comments.

The entire draft HMP is anticipated to be released for public review in mid-July. Once the plan has been reviewed and finalized it will be adopted by the City and Borough of Juneau Assembly and Tlingit & Haida and then will be submitted to the State of Alaska and FEMA for formal review and approval.

We will be holding a public meeting on June 30, 2025, to present the Draft Risk Assessment and take public comments. The meeting will be held at the CBJ Assembly Chambers from 5:30-6:30 p.m. and will be hosted remotely for those that are not able to attend in person.

Link: Click to join via Microsoft Teams



Request for public comment: Hazard Mitigation Plan Update – Draft Mitigation Action Projects

July 10, 2025 – News, Notices for Public Comment

The CBJ and Tlingit & Haida are pleased to release the draft list of Mitigation Action Projects for public review and comment. These project ideas have been selected and prioritized by the Hazard Mitigation Plan (HMP) planning team and represent an important component of the 2025 Hazard Mitigation Plan Update.

The full draft HMP is expected to be released for public review early next week. While the next public review period for the HMP will be brief due to grant deadlines, the planning team is sharing the Mitigation Action Projects list in advance to give the public as much time as possible to review this key section of the plan. CBJ & T&H anticipate submitting the final, adopted HMP to the State and FEMA by the end of July.

Public input has played an essential role in developing this plan. The HMP draft incorporates feedback from community meetings, the public survey, social media, and comments on the draft risk assessment. If you have feedback on the Mitigation Action Projects, please send comments to laura.young@fairweather.com by July 25, 2025.

Due to the desire to expedite plan completion to meet grant deadlines, an additional opportunity for public involvement was added to the process by releasing the Mitigation Action Projects selected and prioritized by the planning team for review on 07/10/2025. This was done in advance of the draft HMP being released for public review and comment to provide additional time for public consideration of the projects. A notice of availability was published on the CBJ website and then shared on the CBJ's and T&H's social media pages as well as an email notification sent out to project stakeholders and members of the public that have requested to be informed through the HMP update process. KTOO published a news article regarding the mitigation projects for public review on 7/11/2025.

The public notice of availability of the draft hazard mitigation plan was posted to the City and Borough of Juneau's website on July 14, 2025, and shared on social media pages as well as sent via email to project collaborators and the project email distribution list.

Question 1: Residency Status

Residency Status	Number of Responses	Percentage (%)
Resident of CBJ (non-Tribal citizen)	86	74.78
Resident of CBJ (Tribal citizen)	24	20.87
Other (see below)	5	4.35
Total	115	100

Other Responses:

- Repeat visitor
- Former resident. Now visit monthly from Haines and rent apartment
- Resident of CBJ and parent of minor tribal members in CBJ
- Tribal citizen of another tribe not within CBJ area
- Both

Question 2: Which part of Juneau do you live in?

Area	Number of Responses	Percentage (%)
Downtown Juneau Area	20	17.39
Thane	2	1.74
West Juneau (Douglas Island)	5	4.35
Douglas	5	4.35
North Douglas Island	8	6.96
Twin Lakes	2	1.74
Lemon Creek	4	3.48
Mendenhall Valley	59	51.3
Auke Bay	5	4.35
Lena	0	0
Other (see below)	5	4.35
Total	115	100

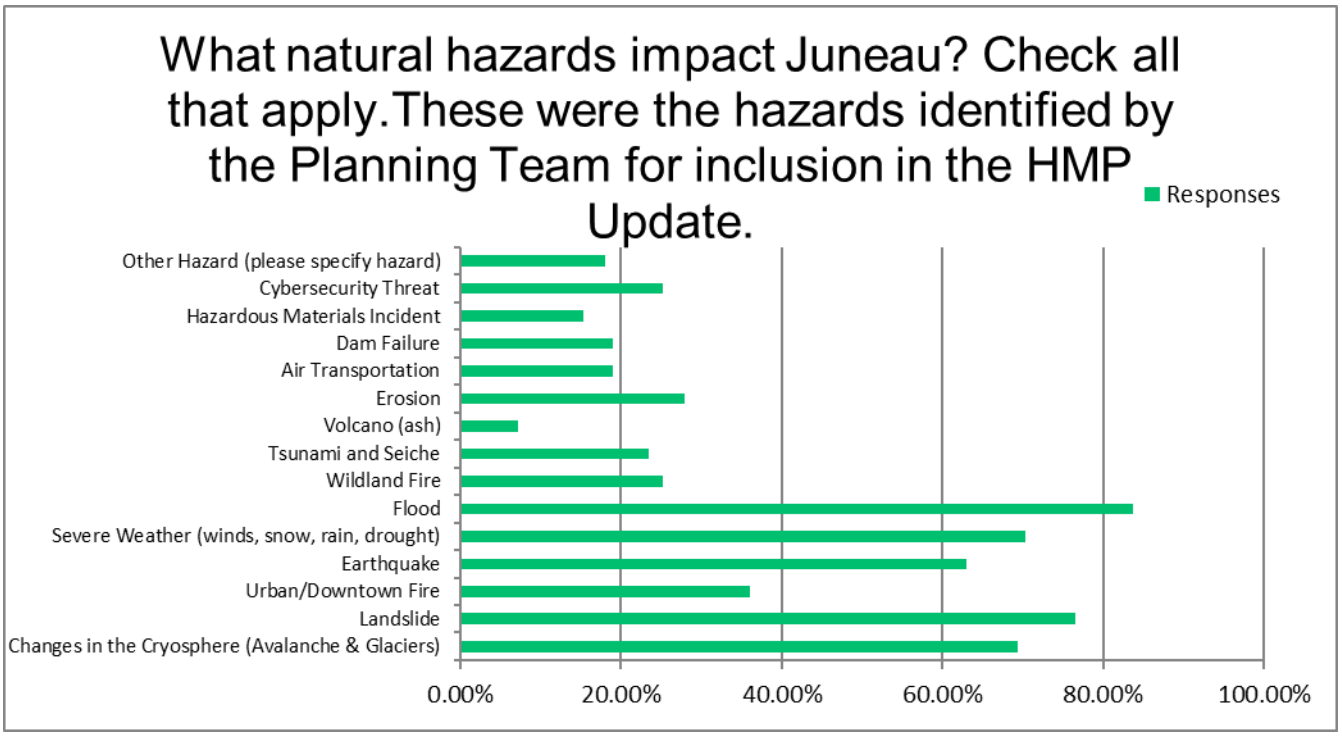
Other Responses:

- 27 mile Herbert River Rd
- Near airport/valley area
- Glacier Highway
- Sunny Point
- Airport area (Radcliffe Road)

Question 3: What natural hazards impact Juneau? Check all that apply. These were the hazards identified by the Planning Team for inclusion in the HMP Update.

Hazard	Number of Responses	Percentage (%)
Changes in the Cryosphere (Avalanche & Glaciers)	77	69.37
Landslide	85	76.58
Urban/Downtown Fire	40	36.04
Earthquake	70	63.06
Severe Weather (winds, snow, rain, drought)	78	70.27
Flood	93	83.78
Wildland Fire	28	25.23
Tsunami and Seiche	26	23.42
Volcano (ash)	8	7.21
Erosion	31	27.93
Air Transportation	21	18.92
Dam Failure	21	18.92
Hazardous Materials Incident	17	15.32
Cybersecurity Threat	28	25.23
Other Hazard (please specify hazard)	20	18.02

It's important to note that the percentage column represents the percentage of all survey respondents who identified the specific natural hazard.



Natural Hazards that Impact Juneau Residents

Other hazards identified by survey respondents:

Beyond the specific hazards listed in the survey, respondents provided a variety of additional concerns and observations regarding potential hazards that could impact the planning area. In order to maintain the integrity of the survey responses, no edits or revisions has been done on any of the responses. These concerns are listed below:

- Civil unrest. Food, supplies and medical shortages.
- Mass Wasting
- Air Transportation
- Barge
- Methane gas released from the Juneau landfill. All methane gas contributes to climate change.
- tour ship pollution and waste
- Increase population in summer (tourism industry)
- jokulhlaup
- Glacial outburst
- Glacial Outburst Flooding
- politicians
- Not sure how to respond to this section. Almost all of these issues impact parts of the Borough. For answers to this section and Item #4 below, I limited my response to only those areas that most likely would impact me personally.
- meteorites

- Heavy traffic on Mendenhall Back Loop Road
- Epidemics like Covid, marine transportation disruptions (barge and ferries)
- Not sure why you have this question. All hazards apply.
- Not a natural hazard, but during the cruise ship season Thane Road can be very hard to get to and get out of for emergency vehicles like fire trucks and ambulances.
- Health outbreak/pandemic; cyber attack on utilities
- port failure, ferry failure,
- pollution from mining (certainly Glory Hole up Gold Creek and Sandy Beach of Douglas)

Question 4: What is your level of concern for the hazards that impact Juneau?

Hazard	Not Concerned (%)	Somewhat Concerned (%)	Concerned (%)	Very Concerned (%)	This hazard does not impact my community (%)	Total Responses
Changes in the Cryosphere (Avalanche & Glaciers)	12.28%	21.05%	20.18%	43.86%	2.63%	114
Landslide	8.11%	18.02%	26.13%	44.14%	3.60%	111
Urban/Downtown Fire	20.72%	36.94%	26.13%	9.91%	6.31%	111
Earthquake	15.45%	49.09%	27.27%	7.27%	0.91%	110
Severe Weather (winds, snow, rain, drought)	11.82%	20.91%	37.27%	27.27%	2.73%	110
Flood	6.14%	12.28%	14.91%	65.79%	0.88%	114
Wildland Fire	38.18%	36.36%	15.45%	4.55%	5.45%	110
Tsunami and Seiche	43.24%	36.04%	12.61%	4.50%	3.60%	111
Volcano (ash)	55.96%	17.43%	3.67%	0.92%	22.02%	109
Erosion	11.54%	25.00%	38.46%	25.00%	0.00%	52
Dam Failure	26.92%	34.62%	26.92%	7.69%	3.85%	52
Hazardous Materials Incident	27.45%	35.29%	21.57%	11.76%	3.92%	51
Cybersecurity Threat	17.31%	32.69%	21.15%	26.92%	1.92%	52
Air Transportation	28.85%	34.62%	19.23%	15.38%	1.92%	52

Level of concern of other hazards identified by survey respondents:

- Civil unrest, food and other shortages if barges are impacted.
- NA
- O
- the traffic on our glacier is not good
- Increase population in the summer - very concerned on impact to environment and infrastructure.
- Food security
- jokulhlaup very concerned
- politician 9.9 out of 10
- Maritime disaster that would prevent freight and transportation, such as a wrecked cruise ship that prevented barges from reaching Juneau freight docks. Communication break, such as the fiber optic cable that was severed in Sitka this fall that stopped ALL communication for months.
- See note on Item 3, above
- meteorites: Not Concerned
- Ferry System; concerned. It's our lifeline to land
- Heavy traffic on Mendenhall back Loop Road very Concerned. Hospitals
- Disruption to marine transportation (ferries/barges carrying supplies), very concerned. We were very lucky during Covid; we might not be another time.
- concerned about any blockage of South Franklin and Thane Rd. -- including delays due to avalanche, landslides, accidents or tourism traffic
- Very Concerned about GLOFs
- Pandemic - somewhat; cyber attack on utilities - concerned
- marine port failure and ferry failure, both very concerned.
- Pollution Very Concerned (Glory Hole, Sandy Beach, Tulsequah Mine drainage into Taku R, lead from Hecla, whatever is killing fish downstream of Kensington)
- Power outages

Question 5: What critical facilities and infrastructure in Juneau do you rely on? (Example: hospital, bridges, roads, school, etc.)

Each survey response below is a direct quote from the respondent:

- Bridges, roads, barges
- Schools, medical facilities, roads.
- Bridge, hospital, airport
- Schools, Roads, Douglas Bridge, Hospital
- Bridges, roads hospital
- Roads, bridges, hospital, medical, barges, grocery stores, barges/ food supply security, fuel, electricity, communications including landline, wastewater utilities, NOAA/NWS, transportation (air/water) systems/ferry/airlift/airport, fire response, police, troopers,
- School, Hospital, SEARHC, roads
- emergency services, hospitals, airport, radios, phones
- Dont really know??
- Fire dept
- Roads, walking trails
- hospital, JAMHI, NAMI, road maintenance + plowing, airport, FERRY SYSTEM, university, harbor, recycling, cellular service, garbage pickup, supply freight, PO
- Stores, SEARHC Clinic, Hospital, bridges, roads, Schools
- The bridge road water electric
- Harbors, roads, bridges, water supply, hydroelectric power, wastewater treatment, medical care facilities and emergency response equipment and services.
- Bridges schools barge service docks roads grocery stores food distribution
- Hospital, Mendenhall River Bridge,
- Bus
- Roads Bridges and hidden underlying infrastructure.
- hospital, roads, school, etc.
- Local radio and TV news
- hospital, bridges, road, fire station, Etc.
- All critical infrastructure, All should be inspected and graded regarding natural hazard impacts.
- Roads, Hospital, bridges, water plant and sewer.
- Hospital, bridges, roads, grocery stores
- Hospital, bridges, roads, emergency responders.
- Hospital, airport, bridge, roads, schools
- Roads bridges medical facilities
- Bridges, roads, electrical, hospital, marine shipping for food, etc.
- Hospital, roads, garbage/waste disposal becoming hazardous and also unsightly.
- Hospital, bridges, roads.. I live and work here year-round. I rely on it all.
- Roads
- Roads, schools, medical
- Bridge, roads, airport, hospital, library
- water and wastewater treatment plants, hospital, Egan drive, foodland grocery store

- Roads, bridges, school, hospital and health-focused centers/buildings, work building, grocery stores, gas, churches.
- Roads, bridges, schools, libraries, ccfr, hospitals medical services,
- Bridges, hospital, highway, electrical grid, Internet
- All
- Roads, hospital, fire dept, water sewer, bridge, school, grocery stores, airport, Alaska marine highway (ferry), veterinarians, medical clinics
- Hospital, bridge, roads, school, fire/rescue, stores, office blogs, etc.
- Roads, bridges, airports, and hospitals.
- Bartlett Regional Hospital, brotherhood and back loop bridge, valley waste water treatment facility.
- All
- Hospital, airport, ferry terminal, and roads connecting them. Also grocery stores
- hospital, bridges, roads, docks, AML facilities, airport/runway
- CCFR, emergency response, hospital, bridges, roads, sewer/water, electricity, internet/phone system, NOAA radio
- hospital, bridges, roads,
- Roads, hospitals, airport, schools, grocery stores
- Hospital, Grocery Stores, Library, Police, Roads, local businesses
- Roads, hospitals, bridges…all infrastructure
- Hospital, schools, roads, bridges, harbors, airport, ferry
- Residential homes; Bartlett Hospital and EMS; DOT Building/Equipment (to maintain roads and move debris after a hazard event); Wastewater Treatment Plants; Electrical Power Infrastructure; large suppliers Home Depot and Costco (critical after disasters because they have volume and lower prices than other stores); AML/Shipping docks and infrastructure; schools; Lemon Creek Correctional; all Senior Centers; local businesses (as one group, not singling out just a few); Federal infrastructure (ex: Federal building, Mendenhall Visitor Center; USCG properties); all reservoirs; Fuel infrastructure (ex: Delta Western; Amerigas); cell phone towers and wifi communications infrastructure (ATT, ACS, GCI); airport; dock-based fish processing plants (AGS and Taku); ports and harbors; vessel haulout; Capital City Fire and Rescue infrastructure; tribal and tribal corporation-owned properties; hotels/rentals (as a group, not individual properties)
- Hospitals, roads, power, communications, gas/diesel/propane supplier, air traffic, maritime access. Associated infrastructure.
- hospital, fire/ambulance services, schools, bridges, roads, water and sewer services, airport/medivac services
- Roads, Costco
- Bridges, roads, emergency response (fire and medical)
- Douglas bridge, Egan intersection at Salmon Creek, Nugget intersection/Fred Meyers' intersection.
- Roads, water and sewer, electricity, hospitals, groceries, travel in and out of Juneau
- Brotherhood Bridge, Wastewater Treatment Plant, Airport, Hospital, Library, Schools, Grocery Store for medications.

- "SEARHC
- Roads
- Bridges
- Schools"
- Hospital, bridges, roads, airport, ferry terminal, radio towers
- Roads, Ferry, Airplanes, Hospital, Bridges, Police, JMR
- Hospital, bridges across rivers, airport, schools for emergency shelters.
- J-D Bridge, Harbors, Cruise Ship berths, internet
- "hospitals, bridges, roads, shipping ports, airport, pharmacies and grocery stores.
- Hospital, bridges, Roads, airport, schools, barge, marina, city docks
- What a silly question. Critical facilities implies that it is critical and thus I and the community rely on it.
- Roads, water and sewer, road drains and culverts
- hospital, airport, bridges, roads, schools, wastewater treatment, libraries, garbage pickup, recycling, city water & sewer, bus system
- All
- Bridges roads
- Everything.
- Housing, hospitals, grocery stores, road, bridges, airport.
- "Roads, Bridges, local hospital
- Short staffed, over worked Fire and Rescue teams"
- Roads, sidewalks, crossing walks
- There is only bridge between Douglas Island and Juneau. Additionally, there is only one port where we receive all of our goods (i.e. food).
- Roads, sewer, wastewater treatment plant, water treatment plant
- All of them. Our hospital capacity is not able to support a major disaster.
- I cannot stress enough the importance of S. Franklin and Thane Rd. access for Thane residents, and in addition to avalanche and landslide risks there are blockages and delays to access for fire/ambulance due to tourism related traffic, accidents, etc.
- Airport, ferries, hospital, schools, roads, grocery stores, bridges, trails.
- Cross-River Bridges, Roads, Public Services (Water, Sewer, Power)
- All
- Hospital, bridges, roads, schools.
- Mendenall valley infrastructure: roads, bridges, water/sewer, power, grocery stores
- Roads, freight & ferry terminals, water/sewer systems, electrical grid, health care facilities, schools, grocery stores, airport
- Bridges, roads, sewer, hospital
- Roads, hospitals, grocery stores
- Hospital, Mendenhall River bridge, grocery stores, roads
- roads, fire service access, ambulance access.
- Roads & bridges
- Water and sewer, roads and bridges, hospitals

- Bridges and roads.
- Bartlett hospital, Egan, brotherhood bridge (highway), water treatment facilities, AELP electricity, Juneau airport, Douglas bridge, barge service
- Douglas bridge
- the one and only bridge off the island, roads, hospital of questionable quality, airport, ferry terminal and vessels.
- AML port, Ferry terminal, docks and harbors, airport, Egan Drive, hospital, SEARHC facilities, Landfill, water treatment plant, wastewater treatment plant, Juneau-Douglas bridge.
- roads, hospital, bridges, schools
- airport, hospital, Douglas Bridge, Egan Drive, ferry terminal, Gold Creek flume (we live in the Flats), Harborview Elementary, Juneau Douglas High School. Grocery stores, barge dock.
- roads, bridges, trails, utilities,
- Airport, bridge, hospital, highways/roads, harbors
- N Douglas Hwy (state), bridge to town, hospital and clinics (CBJ SEARHC - even if not tribal citizen, schools and university, CBJ buses, CBJ Centennial Hall, grocery stores, hardware stores, CBJ water, airport, ferry terminal, barge docks
- Roads and bridges
- Hospital, bridge, road, school, museum, library, pool, trails, boat harbors, ramps, bank,
- Phone, internet, 9-1-1 service, police, fire, radio communications for emergency services, water/sewer, electricity, hospital, bridges, roads, air & barge service for food/necessities & fuel.
- Bridges, hospital, communications

Question 6: How do you receive warnings regarding hazard events? Please check all that apply.

Warning System	Responses	Percentage (%)
Social Media (Facebook, Twitter, etc.)	65	57.02
National Weather Service	86	75.44
Television	15	13.16
Radio	53	46.49
Community warning system	51	44.74
Word of mouth	69	60.53
None of the above	2	1.75
Other (see below)	23	20.18

Other hazard warning systems identified by respondents:

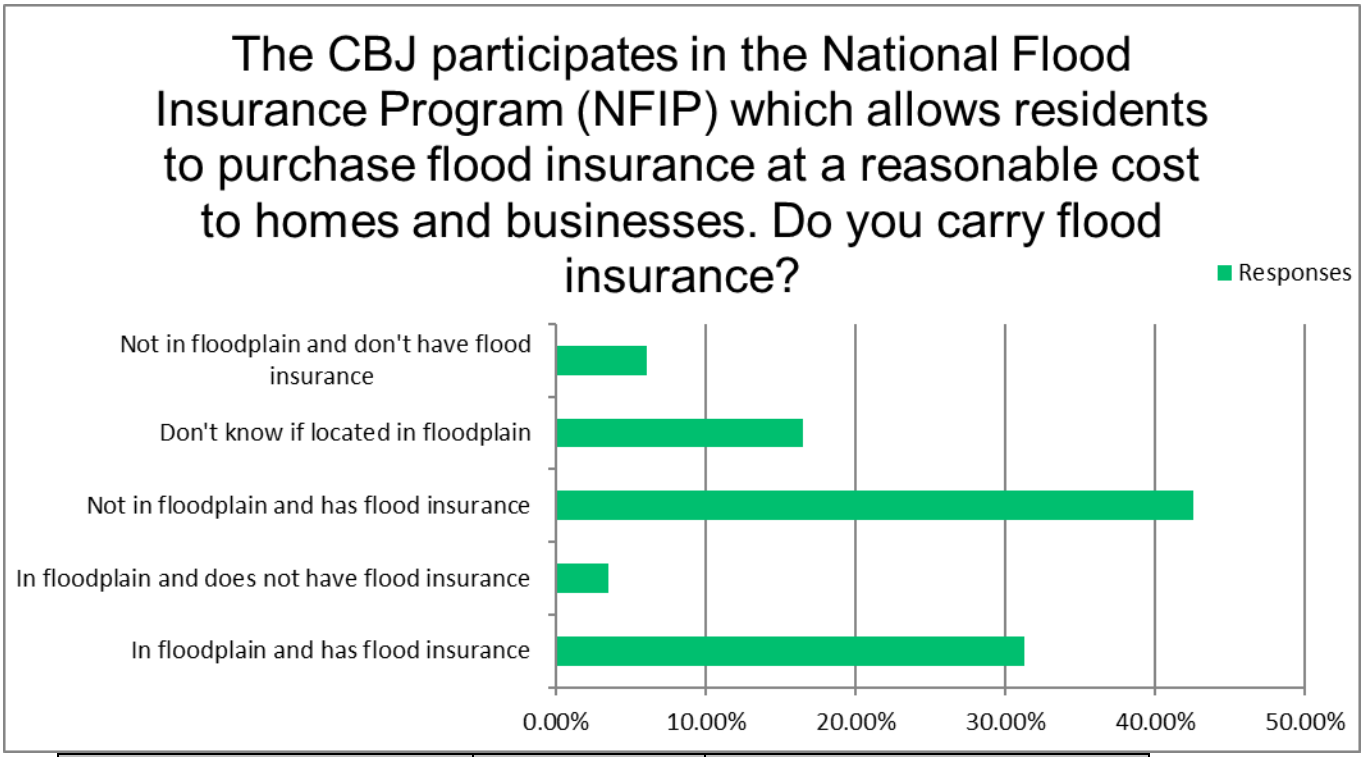
- CBJ emails and alerts
- CBJ website
- cell phone alerts work best
- phone alerts, nixel by text
- Cell phones
- Tlingit & Haida Public Safety
- Cell phone
- Red Cross emergency app
- I subscribe to CBJ emergency text alerts
- T&H employee texts, news articles
- Text
- CBJ text and email
- txt from friends
- I do not use any social media, but I do actively monitor any website providing timely and accurate information about disaster happenings.
- My daughter is tech savy and randomly monitors all of the above and relays vital issues to me.
- NWS updates on cell phone
- Cbj Text (hasn't been reliable)
- The Civic Plus alert system sucks. CBJ should invest in a much better emergency notification system. One that actually works would be good.
- email
- Internet websites
- My phone
- work
- Wish we had better warning notifications. The new civic plus is a low budget, imitation system. Get a real program.

Question 7: The CBJ participates in the National Flood Insurance Program (NFIP) which allows residents to purchase flood insurance at a reasonable cost to homes and businesses. Do you carry flood insurance?

Answer Choices	Responses	Percentage (%)
My home/business IS in the floodplain, and I DO carry flood insurance	36	31.30
My home/business IS in the floodplain, and I DO NOT carry flood insurance	4	3.48
My home or business IS NOT located in the floodplain, and I DO NOT carry flood insurance	49	42.6
I do not know if my home/business is located in the floodplain	19	16.52
My home/business IS NOT located in the floodplain, but I DO carry flood insurance	7	6.09
Total	115	100

Flood Insurance Coverage Among Juneau Residents

Question 8: What actions have you taken to prepare you and your household for future hazard events?



Actions Taken	Response	Percentage (%)
None of the above	16	14.16
Developed and practiced a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a household emergency	40	35.40
Prepared a "Disaster Supply Kit" (stored extra food, water, batteries, or other emergency supplies)	53	46.90
Attended meetings discussing disaster preparedness	50	44.25
Reinforced home with disaster-resistant materials (ex: installed non-structural seismic restraints for large furniture, secured roofing, etc.)	20	17.70

Purchased backup power supply (generator, solar panels, etc.)	31	27.43
Purchased specialty insurance (flood, earthquake, etc.)	40	35.40
Elevated home above floodplain	3	2.65
Other (please specify)	18	15.93

Additional actions identified by respondents:

- trying to get rock or items to prevent erosion from water flow for years
- can't afford to
- Made flood barriers
- Drainage improvements on property
- constructed retaining walls; monitor the watershed above my home by taking photos and inspecting conditions on a roughly quarterly basis, prepared a go-bag
- Lots of sand bags ready
- Purchased whole home flood barrier
- Organizing home differently, things on the floor in water proof bins and storing fewer items off the floor, raising, securing items, covered house vents, installed a sump pump, have sandbag material on hand, purchased materials to seal the house for flood
- Abandoned half of our home that gets wet every year. Cannot afford the $150k to raise the house.
- Installed water proof membrane at the lower 3' of garage walls. Raised water heaters, freezers, and other items in the garage at least 8" off floor. Raised back up generator by 30".
- Need a long term flood solution
- Plan to purchase flood barriers for flood protection.
- Have delayed repairs until flood hazard is mitigated.
- sandbags, other prep for possible flood
- Nothing as formal as a "Household/Family Emergency Plan" or "Disaster Supply Kit", but we are not unprepared. Nothing as formal as "Reinforcing the home..." (The question seems to be mostly about earthquakes, which is a bit shortsighted), but at various times, lots of Simpson anchors were installed.
- woodstove, in case of extended power outage; battery-operated lighting and radio
- have offsite storage of backups for computer data; have diversified money accounts; fight to limit extraction and use of fossil fuels (because some of these hazards are made worse by climate change)
- CERT training

Question 9: How prepared do you feel your household is for impacts of natural hazard events likely to occur in Juneau?

Prepared Level	Response	Percentage (%)
Not Prepared	19	16.67
Slightly Prepared	43	37.72
Somewhat Prepared	45	39.47
Very Prepared	7	6.14
Total	114	100

Question 10: If you were impacted by recent Mendenhall Glacier flooding events, please provide information on how you were impacted.

Impacted:

- My house on Meander Way was impacted by the 2024 Flood back in August. The lower level of our home was completely flooded, the garage, laundry room, lower family room, entry way, and crawl space was all damaged from the flood. The cost to repair was over $50,000.
- Flooded my street
- Flooded the garage and under house, three sheds. Ruined tons of property inside the garage which we put as much up as we could but not enough. The damage in the garage was not covered by fema. Thousands of dollars was spent for drywall, insulation, screws, cleaning supplies.
- Family friends
- I moved away from Mendenhall river/glacier area
- "We were in transition, camping out at the camp grounds waiting foe our housing to open up.
- We ended up staying with a friend "
- The previous year I attempted to get flood insurance because the flood had reached our street. I added on a flood insurance, but found out it was only for pipes and sewer because we were not considered to be in a flood zone. Due to this negligence of the city, we lost over 100,000 in equipment and belongings that we will not be reimbursed for. Our home and property got severely damaged and we are still fixing it.
- The water reached our yard
- Home devastated over $80k
- "Not directly; My brother's truck was flooded while he is out of town and parked at a friend's house. My coworkers and friends have been impacted directly.
- A friend didn't know of the flooding, or how far it had come into the valley and drove straight through the flooding on the roadway as she couldn't turn back around once she was in it. "
- Unable to get to work due to streets flooded. A little water in the garage is all. no damage.
- My neighbors were.
- Crawlspace filled, 1 - 1.5 foot water in garage, small amount through sliding glass doors. It was pretty scary how we quickly were surrounded by rushing water.
- Garage & crawl space flooded, lost primary vehicle
- Water in crawl space and yard.
- Had 18 inches of water in garage and a full crawlspace. Experienced $18,000 in damages to home and personal property. We moved vehicles out but nearly lost them to the water when the area we moved them to also flooded.
- Water flooded the house and garage destroyed flower gardens landscaping
- Lost sleep but house was not impacted. A foot higher and it would have.
- "Our home and Property flooded. We have slight elevation where our house sits on our property, with good drainage. So, we drained fairly quickly, except our crawl space.
- Our property had about 2-4 feet of water. Our house had about 3-4 inches of water, while our garage had about 3 feet of water.
- Our shed flooded as well, about 5-7inches of water.
- Damage was significant despite being ""minimal"" water.

- We are still identifying the full extent of the damage to our home and property.
- To date, our costs are in the excess of $200,000.
- We withdrew from retirement, liquidated our savings, maxed out our credit, and had to take additional loans. We received donations and applied for the funding supports offered.
- We are currently still holding excessive debt."
- We left the area for the night.
- Most of my driveway washed away.
- Flooded garage and crawl space. Damaged household goods.
- My house and property were majorly impacted by the 2023 flooding. I lost approximately a third of an acre of land and the river undermined my home
- My garage was flooded and just missed flooding the rest of my home by an inch.
- After purchasing a property NOT listed as in a flood risk area in 2017, my boyfriend purchased flood insurance out of a preponderance of caution. We were never affected by the floodwaters until the 2023 glacial flood. That event took place when we were out commercial fishing. It resulted in total loss of both of our trucks, damage to our driveway, skiff, and many items outside our home, 3 feet of water in our garage, and almost 2 feet of water in the first floor of our home. We were not expecting that flood, we were not in Juneau to respond to it, and therefore the losses were extreme. CBJ was completely unprepared to respond to the 2023 flood, resulting in nowhere for us to dispose of waste, no assistance in any of our stabilization efforts, and no access to any mitigation grants because of the expired Hazard Mitigation Plan. As a homeowner, my boyfriend received $0 of Individual Assistance from the State IA program because they delayed processing applications and then kicked us into the SBA loan program. He was told to take on debt as a 'relief' offering. There was no National Disaster declaration and no action at all from the City of Juneau. When we were again flooded in 2024, we had fewer losses because we were in town and took significant measures to prepare (ex: moving things out of our first floor). Again, the City has failed to take any actions to prepare for future flooding on our street (View Drive), and again the Hazard Mitigation Plan was expired, leaving us not able to access any mitigation grant programs that require this plan. To date, we have only had access to NFIP, State IA, and in 2024 the FEMA IA program. I hope that the completed plan will include specific items for how individual properties that are the primary residences of people in Juneau will be included as critical infrastructure, since we will need this in order to access grant programs for mitigation efforts like home raises or buyouts.
- "2023 Flood: I lost two trucks and massive amount of personal property.
- I had to cut a fishing season short to deal with all of it.
- Have spend hundreds of hours dealing with insurance and actively engaging with CBJ to try to convince them to act. CBJ negligently did almost nothing for future flood preparation, including not starting a HMP.
- 2024 Flood: Hundreds displaced, tens of millions in damages, no residents were warned. The weather service misreported the ""worst case scenario"" as only being as bad as the previous year, 15ft, stupidity incarnate.
- I had expected worse and did not rebuild. We spent a few weeks cleaning out debris, drying out and reinstalling insulation.

- We went from living in a 1400 sq, ft home taxed at around $500k, to living in a 800sq,ft apparent barely worth $250k.
- After repeated negligence and erroneous decision making by CBJ authorities we are actively looking to leave Juneau as soon as possible. I've been a resident for 25 year."
- In 2024 we received 11" of water in the garage and lower level of home. Lost many personal items that were stored in the garage.
- "Lost everything in our garage, in two homes. "
- We had glacial floodwater about 8” in both of our garages. We were just inches from water entering the living space of our home. We had to cut out 18” of drywall, remove wet insulation, replace with new insulation and replace the vapor barrier plastic. We have lived in this house for 42 years and this has never happened before. The glacial event has changed our lives.
- "33"" garage, 14"" home... all renewed under 4' down.
- Flood waters entered crawl space through soils, not crawl space vents. Particle board flooring, drywall and carpets were damaged by flooding. Front entry steps were moved by flood waters.
- We had to evacuate through floodwater in the middle of the night. I had flooding in my crawlspace, garage, and yard. Drainage at my home was impacted, causing water in crawlspace after heavy rains since the flood. My son's dad had extensive flood damage at his house and came to live with us for several months, continuing to use our washer/dryer, kitchen, and shower until his could be replaced.
- House and garage flooded
- I wasn't in the "flood" zone. But my house was surrounded by water. It was too deep to drive through. My sub-basement and garage flooded. I was not at all prepared. I had many repairs, not all are done. And lost a lot of items.
- House struck by trees coming down the river. Street flooded.
- In 2023, garage and crawlspace flooded. In 2024, we elevated the house 4 feet and only the crawlspace got wet. No damage.
- Entire residence (a 1-story structure) was flooded.
- I live in a duplex and myself and my neighbor are much lower than everyone around us and had about three feet of water in our homes. There was a big storm drain that blew out directly behind me and had tons of water surging up through it as the first streets began flooding causing basically my entire bottom floor to be ripped out including cabinets, appliances, bathrooms, entire living room and furniture. I had to replace a ton of electrical work and lost four cars. I had two freezers of native foods that had been harvested and a lot of dry good native foods that were also lost that took 100’s of hours to collect and process.
- First floor of house flooded 2024. Garage and crawlspace flooded 2023.
- Main level of home flooded
- Lower level of home, garage, and crawl space flooded in both 2023 & 2024. Had $80,000 in damage to home with 2024 flood.
- My entire first floor was inundated with up to 20 inches of floodwater. It is the end of January and we have still not recovered. It has decimated me financially as a single mother and I did not carry flood insurance as it is not a designated floodplain.
- Street became island, no water in home but water in shed at lower corner of property, loss of power for eight hours. Psychological impact following disaster.

- House was immersed in 4-5 inches of water, 5 feet of water in crawl space, cars floating in 5 feet of silted river water ....severe damage within structure.

Not Impacted:

- Do not live in flood area. I am a Red Cross volunteer and assisted in running the shelter.
- not really- just the repeated glacial breaks that floods the valley- but no real way to control been told
- None
- Na
- N/A
- N/A
- My home is in Mendenhaven, it may soon be in the flood zone if measures are not taken.
- N/A
- not impacted
- I am close to the impacted area. I believe CBJ and Tlingit Haida need to educate people in the Valley who were not impacted in 2023 or 2024 but could very well be impacted in the future how to prepare. People who are 1/2 block away from impacted areas still do not have flood insurance.
- N/A, our home wasn't impacted. We volunteered, but the volunteer structure wasn't well organized. CBJ doesn't seem to understand Incident Command or how Incident Command should work. No one really knew what to do or how to do it.
- No impact; I live downtown.
- I live near, but luckily not in, a low lying area that's been hit
- Everyone I know was affected, physically and emotionally. CBJ and their response has been anything but transparent so there is a lot of fear and misinformation among the community
- N/A
- Not impacted but near miss
- We were not, but I’m very worried that by altering the River channel, the water will need somewhere to go and it will start to effect our home.
- N/A

Question 11: Do you have any specific ideas for mitigation projects associated with the identified hazards that you would like the Planning Team to consider?

- Has the Planning Team considered the impact if barges are unable to arrive for whatever reason?
- Avalanche Fencing, Move Homes from under avalanche paths and rezone land under avalanche paths
- Most bridges need renovation.
- the list for items to have in an emergency kit, education, important papers, etc. how much water/foods
- ?
- Know where the elderly live so as to be responsive to that population segment
- NA
- None
- Limit new building projects in hazard zones.
- Pump for the suicide basin. Dams for houses to redirect flood waters away from houses.
- Make more public information how too and help out with informing
- setting an area community response team
- No
- Mass wasting (landslide) warning. I live in an extreme landslide zone).
- No
- N/A
- A Levy
- Replicate Tlingit & Haida's emergency text notification system.
- Please consider a long term mitigation such as a levee and/or dredging Mendenhall lake, and dredging the fish hooks by meander way and Killiwich Dr.
- Build a dam and a levee around lake. Reroute water to unpopulated area
- Regulate water flow at Mendenhall lake. Update dam safety, reinforce slide areas downtown.
- Reduce/limit cruise ship count to a manageable number so as to limit harm and effect on local infrastructure. / Suicide Basin needs attention, I feel that it needs to be addressed directly in a way that prevents water from pooling up and therefore reduces flooding.
- "Water gardens, landscaping for erosion and flood prevention. I do not support a second crossing, especially since it would affect wetlands which are nature's greatest flood and erosion defenses. "
- None
- I would like the planning team to offer residents in landslide areas tips and strategies for mitigating damage to properties from landslides, including diversion structures, retaining walls, and tips on how to monitor conditions to understand the early warning signs of a landslide. Juneau also should have a landslide warning tool like Sitka.
- "Staff shortages for respondents/nurses/doctors, especially during tour season. More travel nurses/respondents/doctors during summer. If we can't work with what we have, less tourism. Alarming sounding system alerts within the city/valley for flooding in the valley for evacuation notices, etc. A lot of people were sleeping during the last event. Alarming sounding system throughout whole city/Douglas for natural emergencies such as landslides. Flood Evacuation

route signs. Landslide Evacuation route signs specific to certain areas. Designated evacuation areas or signs leading there."

- Address Mendenhall river flooding as a complete system and not just pass the impact to down river neighbors
- Reroute Mendenhall river from Marion street west of original river to mouth of Montana Creek, Fortify bank down stream of Brotherhood Bridge. Other idea: Just like avalanche mitigation uses explosives, regular use of explosives at the glacial dam in the suicide basin to release water before it gets too full.
- Dredge river and remove the trees in the fishhook area. Dredge annually during the low water times in the river.
- A levee around Mendenhall Lake. A levee would contain flood water from any glacier basin outburst, not just suicide basin.
- Use resources already available for building a levee. The sand bags barriers will not work and more areas will flood. not investigating needs to be done, the NWS, UAS and many engineers have all the prior floods documented.
- CBJ has done a terrible job being proactive in general. My family was more prepared than most for this years glacial flooding(we moved out vehicles, sandbagged, had evacuation bags etc) and yet we were still unprepared for how bad it got. And most of the valley residents have zero clue how much danger glacial flooding creates. CBJ needs to better educate the public about how far this water could realistically reach. To get word out using any and all methods available, they need to push people to get flood insurance. They have done a terrible job keeping people safe, it is a miracle no one died during Aug 2024 event. They keep talking about this problem as if it only affects 400 or so homes, they have to start talking much bigger.
- mitigation and identification of hazards needs to be reasonable and realistic. The recent landslide and avelanch update was not specific enough to help land owners. There are no consultants to go to get reasonable services and the CBJ claimed their consultant had a conflict of interest - which is debatable. The plan in 198os did not have such restrictions
- The Mendenhall Lake levee for additional water storage and flood mitigation needs to be a top priority
- "Community alarm systems for disasters located in neighborhoods to ensure the sound reaches everyone. Identified locations for safe zones when disasters hit. Levy for the glacial releases. Grant funds that help release some of the financial burden on families and homeowners. "
- "Make suicide basin leak at a non impactful level! (this has been done in nepal and other locations. (It finds a way to leak out on its own, help it!) https://www.facebook.com/groups/518173094147483/posts/540609195237206/?__cft__[0]=AZVh8kV2TlwEuaU4XPgEsfuNt4lyWq6LdwBuihGnoE7KlxflbRL3QgJUzEdVXSWMYJOpJhb6w6TFhe13FUhnahdyzr5USjgGbKHKnX5wXGR4SVpOtobyl9kjj7s7nwoae07QC9fIUX_5MTSrqz5F5QI&__tn__=-UK-R https://www.facebook.com/share/p/19mbA83Scg/ Learn about glofs? https://eos.org/.../the-dangers-of-glacial-lake-floods... Vilca, INAIGEM In 1941, an ice avalanche triggered what is known as a glacial lake outburst flood (GLOF) from Lake Palcacocha. The lake is located at 4,562-meter altitude, below the Pucaranra and Palcaraju summits of the Cordillera Blanca mountain range of the Peruvian Andes. The flood killed an estimated 4,000 people in Huaraz, a third of its population at the time.

https://www.sciencedirect.com/.../abs/pii/S0277379113000383 https://energyeducation.ca/.../Glacial_lake_outburst_flood. https://www.climatehubs.usda.gov/.../glacial-lake... https://iee.psu.edu/.../glacier-lake-outburst-floods-loss... https://www.antarcticglaciers.org/.../increasing-risk-of.../ https://www.antarcticglaciers.org/.../glacial-lake.../ https://eos.org/.../the-dangers-of-glacial-lake-floods... Vilca, INAIGEM https://link.springer.com/article/10.1007/s13753-017-0152-7 The prerequisite for the prevention of glacial lake failure is to monitor glacial lake dynamics regularly, with a special focus on dangerous glacial lakes. But reasonable engineering measures (reinforcing or strengthening dangerous moraine dams, pumping, implementing siphon drainage measures, and excavating artificial drainage channels) that reduce lake capacity and reinforce moraine dams are the most effective to relieve or control the risk of GLOF disasters. ""s.rinzin2"" <s.rinzin2@newcastle.ac.uk>ashimsattar@iitbbs.ac.in https://old.iitbbs.ac.in/profile.php/ashimsattar/Hey Michael here is a few people i have reached out to.""Vincent"" <Vincent@lgge.obs.ujf-grenoble.fr> has implemented draining a outburst lake in france. GLOF-11 Pakistan https://www.greenclimate.fund/project/fp018 Email: walter@vaw.baug.ethz.ch Dr. Fabian Walter Swiss Federal Research Institute WSL Zürcherstrasse 111, 8903 Birmensdorf external pagehttps://www.wsl.ch/en/employees/walterfa.html I CIMD; Int center for Intregated Mountain Development. John Clague Emeritus Professor at Simon Fraser University, specializing in glaciology and natural hazards. https://www.antarcticglaciers.org/.../glacial-lake.../ https://www.undrr.org/understandi.../terminology/hips/mh0013 https://www.researchgate.net/.../229440867_Outburst... https://polarpedia.eu/en/jokulhlaup/ https://essd.copernicus.org/articles/15/2983/2023/A global database of historic glacier lake outburst floods Natalie Lützow, Georg Veh, and Oliver Korup Abstract Ongoing atmospheric warming has accelerated glacier mass loss in many mountain regions worldwide. Glacier lakes trap part of the glacial meltwater and have increased by about 50 % in number and area since the 1990s. Some of these glacier lakes may empty catastrophically and pose hazards to mountain communities, infrastructure, and habitats. Such glacier lake outburst floods (GLOFs) have caused millions of dollars of damages and fatalities and are one of many concerns about future changes in the magnitude, frequency, and impacts of processes of a shrinking mountain cryosphere. Consistently compiled inventories are thus vital to assess regional and local trends in GLOF occurrence, hazard, and risk. To this end, we studied 769 literature and internet sources and developed a standardized database with 57 attributes that describe and quantify the location, dam type, size, timing, and impacts of GLOFs in nine glaciated mountain regions. Our GLOF inventory also includes details about the lake area before and after the outburst for 391 cases that we manually mapped from optical satellite images since 1984. In total, we compiled 3151 reported GLOFs that occurred in 27 countries between 850 and 2022 CE. Most GLOFs have been reported in NW North America (26 %) and Iceland (19 %). However, the reporting density in our inventory varies. During the 20th century alone, the number of yearly documented GLOFs increased 6-fold. Less than one-quarter of all reported cases feature hydrodynamic characteristics such as flood peak discharge or volume or estimates of loss and damage. Our inventory more than doubles the number of reported GLOFs in a previous global inventory, though gaps in attributes remain. Our data collection process emphasizes the support of local experts in contributing previously undocumented cases, and we recommend applying protocols when reporting new

cases. The global database on historic GLOFs is archived at https://doi.org/10.5281/zenodo.7330344 (Lützow and Veh, 2023a) and regularly updated at http://glofs.geoecology.uni-potsdam.de/ (last access: 9 May 2023). How to cite. Lützow, N., Veh, G., and Korup, O.: A global database of historic glacier lake outburst floods, Earth Syst. Sci. Data, 15, 2983–3000, https://doi.org/10.5194/essd-15-2983-2023, 2023. https://www.usgs.gov/.../increased-understanding-alaskas... https://essd.copernicus.org/.../2023/essd-15-2983-2023.pdf https://www.icimod.org/mountain/glacial-lake-outburst-flood/ https://bioone.org/.../10.1659/MRD-JOURNAL-D-21-00045.1.fullhttps://www.usgs.gov/.../new-study-highlights-findings... https://en.vedur.is/.../volcanic-hazards/glacial-outburst/ https://cdac.in/index.aspx?id=st_ssdm_ssdm_glof Dear public servants I have posted articles about solutions at the bottom. A catastrophic sudden breach of the ice dam with a full basin has the potential of putting the Mendenhall valley and 10000 or so people in it on the east side of Admiralty Island in a very short period of time. Although currently this seems to be extremely unlikely, it would take a 40 foot high dike around Mendenhall lake to contain the 16 or so billion gallons of water that a full suicide basin can contain.) So imagine a release over half the time of this year's release and you start to see WHY WE NEED A REAL SENSE OF URGENCY. NOW! Need a air raid type siren that alerts everyone to evacuate in case of a flood like this year's or higher. (1-2 foot higher would have most certainly killed _____ number of people. Only one prevention method that I have found that has been done quickly is causing the dam to leak at a safe level. (Iam sure there are more articles and I will continue to look). There are lots of research from many agency's across the world. Very little thinking ""out of the box"". An interesting thought I had was how hard would it be to pipe the incoming water across/around the basin and directly out? Sounds crazy but... Use the water to cut through the dam and keep it open at a safe level.? Water is immensely powerful. (It's the part I do get and I believe if every person really knew the negative potential here they would all be demanding ACTION NOW.) Fear is our friend if we use it to take action. Humans have done way ""crazier things"". We need to create a leak (siphon over is probably safest) at the terminus of the north and south branches of the mendenhall glacier & suicide basin. The north branch terminus is mendenhall lake, south is suicide basin. There are ways this has been done, from shovels and pick axes in Bhutan to dynamite in France. Interventions on straightening the mendenhall river reinforcing the banks more ect, also need to continue and be stepped up in urgency. (We can mitigate better for the levels of water we have seen so far.) We can mitigate for the potential worst case scenario by keeping the water in suicide basin from filling beyond _____x. The basin over tops the south branch at times already.(See picture) Creating a deeper channel for this water to flow out of the basin earlier so that the basin leaks, alleviates the water level building to catastrophic levels. How many _____x feet distance and how many _____x feet depth is a question looking for a answer. Potential ways to do this: Siphoning. Diverting the in flowing water past the basin. Using this diverted water to keep a channel open. Use Heat Sources: Implement heat sources like heated cables or other devices that can warm the glacier surface. Introduce Warm Water/ heat water at site. . Drill into the glacier and inject warm water. This can create a channel as the warm water melts the ice. Attach a carriage type device attached to rock along south side branch highest point for _____x distance use water in suicide basin thru pump /heat / siphon tech to create a steady stream that cuts a channel in the ice for water to flow out. Certain chemicals can lower the melting point of ice.

Thermite could possibly be used to melt a ice channel. Specialty ice melters like those used on airport runways? Alter Surface Conditions: Apply materials that absorb more sunlight, like dark-colored substances, to increase melting through enhanced solar absorption. Explosives: Controlled detonations can also create channels. https://www.researchgate.net/.../48416691_Outburst_flood... Lasers? Directed energy weapons? plasma devices. Rocket engines? Other ideas? https://www.ctc-n.org/.../artificial_lowering_of_glacial... https://www.swissinfo.ch/.../floods-from-melting.../48431056 https://www.sciencedirect.com/.../pii/S2212420922001339 The glacial melt waters that sustain hydro power in Bhutan are also a potential source of destruction. Communities in Bhutan's Punakha-Wangdue and Chamkhar Valleys have been living with the threat of glacial lake outburst floods (GLOF) due to the rapid rate of glacial melting resulting from rising global temperatures. These areas - populated by emerging townships, hydropower plants, infrastructure projects, and farmland - could suffer extreme human and economic devastation should a glacial lake flood occur. In fact, a glacial outburst flood ripped through the village of Punakha in 1994, leaving 21 dead and destroying a year's worth of crops. ""Even today I don't like to go near the river because I'm very afraid of another flood happening,"" said Sonam, a horseman who survived the catastrophic glacial lake flood. UNDP is supporting the Government of Bhutan by bringing long-term glacial lake flood risk reduction plans into existing disaster prevention policies and practices. Among the achievements of this Global Environment Facility initiative is the construction and installation of a new automatic GLOF Early Warning System. The system includes sirens, automatic water level and weather stations. In addition, a flood warning control station, linked to Bhutan's flood warning system, is monitored 24 hours a day and shares water level data with neighboring Assam and West Bengal states in India. To complement the early warning system, awareness raising activities have been conducted to over 2,500 people from vulnerable communities, schools, government and religious institutions so they are better prepared for any impending disasters. The effort also provides employment. Every year from June to September, approximately 200-250 people trek to Thorthomi glacial lake to increase controlled water drainage from the lake using pickaxes and shovels. As a result, pressure from the melt water has been reduced on the thinning moraine dam. ""In the Himalayas, this is the first time this work is being done,"" says Yeshi Dorji, Director General, Bhutan Department of Geology and Mines. ""Quite a lot of countries like Nepal, Pakistan, India are observing us and how we are doing and how successful we will be."" The overall target of the project was reached when the lake water level was lowered by five metres. While initial surveys conducted before the beginning of the project have predicted a GLOF event from Thorthomi Lake as early as 2010, the project has successfully managed to avert this disaster. A recent survey of the project's impact on awareness and response capacities of the local population has revealed that 90% of GLOF-prone communities are already aware about the efforts of the project, and will be benefiting from the services provided by the early warning system even beyond the project lifetime. https://youtu.be/lbgv4ZMF5Zk?si=t3sCBY5kAsvMmJID Achieving the impossible: Preventing glacial lake outburst floods in the Third Pole, a look at action in Bhutan, Nepal, and Pakistan https://www.preventionweb.net/.../achieving-impossible... https://www.facebook.com/share/p/91c5MxG16rBUxdQi/... There are 15 million people in the world threatened by these GLOF events. Juneau Mendenhall valley is by far the biggest potential disaster from a GLOF event that I could find. We need action implementation now. If it were not

filling any more than it has, right now.... Thank you for making this your highest priority! https://www.facebook.com/photo/?fbid=10169161942740564&set=pcb.10169161947685564

- The city can mitigate flood damage and protect citizens by conducting risk assessments and mapping flood-prone areas, investing in improved infrastructure such as levees and stormwater systems, and implementing green infrastructure like rain gardens. Zoning regulations can restrict development in high-risk areas, while public awareness programs educate residents about preparedness. Establishing early warning systems and robust emergency response plans, along with regular maintenance of drainage systems, ensures effective management. Collaboration with agencies and community engagement further enhance these efforts, creating a comprehensive strategy for flood resilience. Work to inform the vulnerable citizens.
- Straighten out the Mendenhall River, taking out the bends in the river where they stack up.
- Levee around Mendenhall Lake.
- We need projects added to the plan for permanent mitigation of hazard risks for individual homes/residences, including: home raises; raised/reinforced fuel tanks throughout the Mendenhall Valley (moving all tanks above ground and up above the flood risk height); landslide and avalanche reinforcement for homes in the landslide/avalanche risk areas downtown; installing fences/barriers above portions of downtown to prevent landslides and avalanches; and buyouts/land swaps of properties that are not able to be otherwise mitigated (potentially adding a landswap component to a buyout program, to avoid reduction in the total # of properties for individual homes in Juneau). Updating/adding to building codes/zoning/planning can be a tool for mitigation, for example, by not allowing further development in avalanche and landslide risk areas, and not allowing any new structures to be built in the Valley below the 20ft flood inundation level. These projects necessitate focusing on individual homes as part of the critical infrastructure of Juneau, not just City properties.
- "How to build a ""temporary"" levy around Mendenhall Lake is the only viable long term solution. Have CBJ staff associated with emergency response actually monitor disasters real time instead of waiting for the aftermath. Individuals (Police/Fire etc.) stationed to monitor areas to provide warnings to residents and property owners would be invaluable. It's beyond negligent that this step has never been done. Flood alarms installed just before flood events (car battery, horn and a float switch secured to a sign post.....) would actually alert people to hazardous flooding nearby. During January 2024 a massive snow events caused several structural failures and at least 9 sunken vessels in harbors. This caused fuel pollution, damage to docks and a long expensive cleanup process. During such an event, members of the harbor department should at least attempt to monitor the harbors (like most harbor departments in Southeast) so that a compromised vessel owner could be contacted before completely sinking. CBJ currently has no harbor staff available let alone active after 5pm for any harbor."
- There are commercially available, flood prevention barriers that might help with flood fighting. We need to develop a means to purchase such items in mass or bulk amounts to bring down purchase prices and freight charges.
- Adopt the Hazard maps developed and returned in 2021 and 2022 instead of kowtowing to people putting money over human lives.

- Information Materials, micro-grants to help low-income households acquire the supplies to build their own disaster and emergency kits, develop unified command system with volunteer reserve list to respond to hazard events that have large impact.
- Regarding Question 7, you need one more answer. My house is not in the flood plain and I carry flood insurance. See my answer to Question 10. I believe that CBJ needs to provide sandbags and sandbagging instructions for most of the Valley before the 2025 flood.
- "Why cant we be a part of this team? Why are we only given this small space to list all that we have learned needs to be in place in a hazard mitigation plan to help us? CBJ has failed its community in not having this plan in place for years . Now they partner and don't include community groups except Tlingit Haida to be a part of this? I've heard that the language in this plan favors tribal members first. Im all for inclusiveness not special favors. Too little too late CBJ You care more about forming alliances than serving ALL of your community. Once more disappointed. "
- Trying to mitigate the glacier, causing flooding is pointless and a waste of money. I don't want any of my tax money going to pay for homeowner loss in the valley. The flood plain area should be once and for all evacuated of housing structures you can't control Mother Nature. Anyone of any intelligence would know not to buy a house in that area, people bought those houses of free well knowing there was a glacier in a lake that could overflow and flood their houses, it's so obvious. I don't wanna pay for other people's poor choices
- Better understanding of Incident Command. Seemed like the Command Post and EOC were blurred together. These two are NOT the same thing, shouldn't be housed together, it doesn't work. CBJ clearly proved its a bad idea. And it goes against national standards and best practices.
- SOMETHING QUICKLY AS POSSIBLE. I hope the HESCO barriers are in place for 2025. If not, we are leaving Juneau.
- Connection to Douglas Island, if JD Bridge was inoperative.
- Wider shoulders, lower speed limit, less truck and bus traffic on Mendenhall Back Loop Road. Barrier and dredge Mendenhall Lake
- By out for homes in the avalanche path. Then the homes could be used as a city owned air b and b for summer visitors or rentals during time of no avalanche risk.
- Obtain federal funding through the Corps of Engineers, FEMA, the State of Alaska, and the Alaska Congressional delegation to address the hazards. Please model your actions after the State of Iowa in addressing flood hazards.
- A short and long term plan for addressing glacier flooding to protect homes, businesses, and city services in the Mendenhall Valley
- Please fast tract and prioritize Suicide Basin long term solution. We can't survive financially and mentally to many more
- Diking system to regulated water to the river. Dredging the river and straightening the river path.
- Let's turn this mitigation stuff on it's head, and start by allowing private parties to voluntarily assume risks, without subsidies and without administrative interference. Competent adults can make decisions and live with the consequences. Let them.
- Landslide Warning System, alerts, and or a danger scale similar to North American avalanche danger scale.

- Zoning to reduce landslide and avalanche risk. Landslide hazard mapping outside of downtown.
- "Something needs to be done about the Mendenhall River. I don't know what but filling it for those along the banks is not helping. If anything, it seems like it caused more issues."
- Landslides downtown!
- Build a levy or dredge the river. Force CBJ to have a disaster fund and fine them for letting their hazard mitigation plan lapse.
- Build a levee around Mendenhall Lake in partnership with the Forest Service's plan for developing the area.
- I think structure elevation projects / grants could be very effective at preserving difficult to protect neighborhoods.
- Increase drainage at the top of Gastineau Ave. Install permanent reinforcement to the culvert above Gastineau Ave.
- Make available housing or property for development that is outside high risk areas.
- If I were king, I would simultaneously 1) initiate a study to determine a long-term resolution to Mendenhall GLOF; 2) initiate at least two short-term actions to protect the valley from Mendenhall GLOFs while we await implementation of a long-term solution (for example, install HESCO barriers AND clear potential overflow channels across river fish-hook bends AND consider dredging. I WOULD ALSO RENAME THE INACCURATELY NAMED "Mendenhall River flood gauge" to "Mendenhall LAKE flood gage" (in order to improve public comprehension of the hazard). I would also improve mapping of potential floodwater levels and better distribute that information the public.
- I would like cbj and t and h to work with jar to id where space for animals could be put in the event of a large scale disaster
- I hope for and immediate solution and HESCO barriers seem like the best quick choice before next summer. I also hope for a more permanent long term solution but leave that to the experts on what is realistic and the best option.
- Yes. Construct a dam at Mendenhall lake. It is well documented that glacial releases like this worsen exponentially. Research dating back to the 70’s or 80’s.
- Consider temporary short term mitigation in addition to he’s o barriers. Channel through oxbows in river, dredge river.
- Hesco barriers, levee around Mendenhall Lake with a flood control dam at the start of the river, cutting through the extreme curve along Meander Way to straighten the river.
- Escalation to build a levee or drill relief valves for SB before next August. Plenty of motivated and skilled people have come up with many great solutions other than the Hesco barriers.
- None
- Sometimes the Wetlands are very close to the Highway when the tides are high and it would impact people driving If the Wind ever decides to happen
- PSAs on how to prepare - what actions to take. what are the various hazards that could impact various parts of town?
- More granular landslide and avalanche maps for the whole of Juneau, not just downtown. Maps that can be used by homeowners to justify geoengineering projects to safeguard their homes from disasters. There is concern for the whole town given the recent landslides in Sitka, Haines, Wrangell, and Juneau. Consider starting in Lemon Creek and Mountain Side. Consider

engineering solutions for landslides and avalanches, mitigate catastrophic disaster to downtown Juneau. Mendenhall river course correction and bank stabilization for security for valley residents. Have a MOA between Allen Marine and Haines to support transporting people out of town in an event of a catastrophic failure of the airport, or ferry terminals. Consider other soft solutions to mitigate the impacts of hazards. Support an expanded foodbank to be able to respond to disaster events.

- Managed retreat of high hazard areas?
- If you're going to raise a levy on the river, it needs to be on the full length, not just the top half. Have a REAL city avalanche forecast. Develop a city wide landslide hazard map, not just downtown. Build in redundancies for our transportation.
- Move some housing and businesses out of the floodplains and landslide landing zones; provide financial assistance for more heat pumps, shared transportation, simple housing;
- Provide homeowners who live near storm drains the opportunity or funding to repair the portion of any drains on their property. Sometimes these tie in together but the state or city won't help homeowners whose portions have become damaged as long as the street level portion in the right of way is ok.
- Since glacial flooding has become worse as the years go by, PLEASE find a long-term solution to prevent severe flooding in valley residential areas. Why not try drilling through the mountain as was recommended early on by engineers, so that water can continually release/drain throughout the year and not build up in Suicide Basin to then release each fall and create havoc downstream?! Please do something long-term, not a temporary solution.
- Better emergency notification system (NOT Civic plus or whatever it is)

Question 12: Is there any information the CBJ or Tlingit & Haida can provide to you to help you better prepare for disasters occurring in your area?

- Specific information on disaster weather radios that work where I live and a cost effective way of obtaining one for each household.
- "Yes you can. Give just information on how we can get through any one of these disasters and how and where we can purchase such kits."
- None
- ?
- Keep up with the public news articles, social media, info about communications with the university research group. Public education by multiple avenues!
- Maybe how we can prepare for the next big flooding event and what we can do to protect our home from severe weather events.
- No
- Clear identification of Juneau's geophysical hazard and flood zones. This information requires a faceless and non-politicized presentation that is not influenced by area residents protecting their real estate values.
- "Have a written plan for flood emergency response. Such as, location where things could be stored. Cars can be parked, if there is a storage area for personal property like boxes or other things like that. How can you get help for evacuation. "
- Just more public announcements
- A=most effected B=somewhat effected C=not effected areas.
- I'd like to know if there is a warning system for possible landslide.
- Me? NO
- N/A
- We could remain on the rating system, because if we aren't then we won't be able to get future natural disaster assistance for floods
- Where and how to place sand bags around home
- Keep CBJ out of it and just keep on doing your good work T&H!
- Not necessarily, continue open conversation about mitigation measures.
- None
- I would like a workshop on how we should prepare for disasters in downtown Juneau.
- "If other areas in town don't have to evacuate during landslide watches, are those areas near close mountains still at risk/water and should they evacuate even if not their direct location. "
- Lid isn't fair or legal. How is it possible to more than double the property tax bill with this no fix lid assessment.
- CBJ needs to get their act together, the flooding has been occurring for 13 years and they have done absolutely nothing.
- How to safeguard our homes from future glacial outbursts.
- Updated flood mapping. Programs that provide $$ for lifting home, sandbags, and barriers.

- "Ongoing education on preparedness for variety of disasters. Better monitoring of suicide basin - blindness in the winter used to be okay. It feels important to start monitoring for potential winter releases. Our weather is warming so much. "
- We need an early warning system, we need assistance by maybe the national guard to help us prep our homes for the potential disaster. Elderly and disabled folks need assistance to prepare. When event occurs, CLOSE the streets from folks driving down the street. More than a few of our homes were damaged due to the wakes folks cause while driving down the street to look at the river. I live on Killewich Drive. A few of our elder had their home further damaged due to folks driving down our flooded streets. The city can hire a service to tell use how to prepare to protect our home, FEMA didn't provide helpful information that we didn't already know from a google search. Also, get that long term solution in place ASAP.
- We need a flood-dedicated full-time staff member housed in the Emergency Management department with CBJ. It would be great if this was a joint CBJ-T&H staff member, funded 50:50 by both entities. This would allow for a single person to be fully focused on all things related to the glacial outburst floods, including holding meetings with the public for 2 way communication. Right now, preparation for all disasters can often feel like a closed book to residents. Tapping into 2 way communication with residents would be a great resource for the City, but to take that on they likely need a dedicated staff member for this. Adding this staff member would also free up other staff time to focus on critical hazard preparation and response for landslides, avalanches, and other existential threats to downtown (and other neighborhoods). Currently, the City leadership (Manager office and Assembly) seem to focus a lot on not helping too much, trying not to spend any city money on any hazard preparation, and only applying for grants to protect/repair city buildings. This has resulted in a reactive process, where funds have to be cobbled together after an emergency, instead of carefully used in advance of disasters. It is time for us to come together as a community (one that has an ongoing housing crisis), and start supporting the properties that are the homes for Juneau residents, especially those properties in landslide and flood zones, since we know with certainty that those two hazards will destroy properties in the coming years (and likely during 2025). T&H and the city both have a space for leadership in helping their citizens prepare for disasters, including making sure all publicly/tribally owned buildings carry flood insurance and all other possible insurance, and working with private HOAs to require proper insurance and make plans for what to do in the event of disasters. No one should have to go through the financial hardship posed on the residents in the Riverside Condos after 2023. CBJ needs to update zoning and planning for new developments, to require proper hazard-ready building practices like building all new homes in the Valley above the 20ft flood inundation levels, reinforcing homes in landslide risk areas, etc. New properties built in the Valley between the 2023 flood and the 2024 flood were built on grade, not high enough to avoid inundation in future floods. The new senior center finished in 2023/2024 by Safeway was not built high enough to be out of risk from future floods either. We need to avoid that type of poor planning/zoning/building in the future, especially for areas affected by flood and landslide risk.
- "Any productive information from CBJ would be a first. They have consistently released as little information as possible and often that information is inaccurate for misinformation (aka a lie). The CBJ website is intentionally vague, convoluted and difficult to navigate such that many individuals give up on it as soon as they are directed to it. CBJ has yet to provide any flood plain

maps. No flood plain mapping was even initiated by the city for over a year after the 2023 flooding. Residents still do not know what they're flood risks are. CBJ has yet to enact any active warning system or implement any sort of evacuation plan. CBJ has yet to provide home owners with basic guidance on anything disaster related, even something as simple as purchasing NFIP."

- See discussion in item 11 above.
- Adopt the Hazard maps developed and returned in 2021 and 2022 instead of kowtowing to people putting money over human lives.
- It would be great to see a series of materials developed in collaboration between the CBJ and Tlingit & Haida that provides information on how to prepare for natural disasters.
- Again. Too much to list. This process and even this survey is not known to most people. Timing trap and poor exposure for meaningful results. It seems that CBJ misses the mark every time. Outdated (very) Mitigation Plan and then no reach out to the community to BE a Part of this Committees not just complete a survey. Exclusive club you are running.
- Disaster preparedness convention at Centennial Hall or ANB Hall, open to the community with free disaster, relief supplies, and information and assistance to people who cannot afford to purchase
- Don't use Civic notification system. Invest in a better product that works.
- No
- No
- Once we know the basin is released please get the National Guard on the way
- Listen and take action on a diking system
- Advance warning of foreseeable events. Real time information during events.
- Easily accessible flood inundation maps for various river gauge heights.
- For flooding. It would be great as the basin fills if CBJ or T&H could help deliver sandbags and materials. And help to prepare around the homes. As a single mother, this is not something I can easily do by myself.
- Continued and/or increased monitoring of soil saturation levels for the many homes that are under risk of landslides. Avalanche danger is well communicated but landslide danger feels particularly mysterious and therefore more ominous and unavoidable.
- Send mailers or go do to door for sending info. Facebook and the internet are not always accessible.
- Provide disaster preparedness kits and checklists.
- Yes. Update the flood-maps to show GLOF issues. Per the current map products, I'm not in a floodway. Yet all the signs point to that being the truth.
- CBJ should be more proactive in educating residents of risks to life and property, whether from flood, landslide, avalanche, etc. I know some property owners and some leaders are afraid that being open about such risk may negatively impact property values; however, leaders should not let financial cowardice compromise safety.
- "I don’t know that this comes from CBJ or T&H, but more accurate predictions of what could happen and level of flood possible from the current basin level would have been helpful. It was higher than expected and the storm drain blowing out behind my house also contributed to the amount of damage and that part is on the city (which I never actually asked about or addressed in the chaos of losing everything), but that storm drain needs to be lock tight from preventing a

geyser of water from coming up through it directly into my backyard. Actually I'd really like a follow up on this for peace of mind. There was a huge sink hole there when we were checking for damages the next morning. CBJ was in there right away and back filled, but I never actually knew what came of that and what was done for future prevention? 9226 Emily Way, Tesla Cox, tesla.cox1@gmail.com (Also note for below question, it asks to upload photos and provide info but it will only let me upload one and I have many and could provide context.)"

- Make clear maps of what areas were affected and potential areas affected. Clearly show elevations in a way normal people can understand their neighborhood could be underwater. Note river bank elevation so people understand at what point their house could truly flood.
- No, just put in the Hesco barriers no matter what. Don't let us flood again for a third time. Help us regain some value in our home, and help our mental health and stress to not be so bad.
- Continue to offer CERT training
- Help provide this people Need for where ever they are Located
- I think maps of the CBJ identifying what areas of town would be impacted by what hazards. I don't think a tsunami could impact Juneau since it is an inner island but I don't know that for sure. What is the hazard to my home from landslides, i.e. is the slope above my house a concern? Trees are always being uprooted on trails - how can I mitigate potential damage from falling trees on my property?
- Fridge magnet with who to call for what, where to turn for information during a disaster, how to volunteer to support. Website with similar information. Nixle or the like would be helpful.
- Identify or create shelters with sanitation set up. Store water, food, basic raingear, cleaning supplies for distribution when a disaster happens (and if we are lucky, then just share what's been stored every 18 months to rotate items). Provide simulations and training - folks from 16-24 are a great source of energy for volunteer responders (can be offered in Indigenous languages, home languages including English; could be for high school or college credit, or a certificate useful when applying for jobs)
- "No, just a better emergency communication system "

APPENDIX D –FUNDING RESOURCES FOR MITIGATION PROJECTS

Mitigation Resources

Identifying appropriate trainings, data, funding, and other resources is critical to the successful implementation of hazard mitigation efforts. This appendix provides information on federal, Tribal, state, and other resources and is organized as follows:

1) Past Funding Resources,

2) Mitigation Resources (non-monetary), and

3) Mitigation Funding Resources

Section 1: Past Funding Resources

It can be daunting for new staff to navigate funding cycles, meet grant requirements, and select appropriate funding sources for critical projects. Identifying resources that have been used successfully in the past can be a helpful way to begin.

Funding Resources	Yes/No	Has this source been used in the past? Could it be used in the future?
Capital Improvement Project Funding		
Authority to levy taxes for special purposes		
Borough-collected fees for water, sewer, gas, or electric services		
Borough-collected impact fees for new development		
Borough-incurred debt through general obligation bonds and/or special tax bonds		
FEMA Hazard Mitigation Grant Program	Yes	
U.S. Department of Housing and Urban Development Community Development Block Grants	Yes	
U.S. Department of Interior Grants	Yes	
U.S. Department of Transportation Grants	Yes	
U.S. Department of Agriculture Grants	Yes	
Other federal grants	Yes	
State funding programs	Yes	
Other funding programs	Yes	

Section 2: Mitigation Resources (non-monetary)

The table below includes information provided by federal, tribal, state, local, and nongovernment entities to support hazard mitigation efforts through training, helpful resources, data, and technical assistance programs. The following entities are a useful place to start.

- The Federal Emergency Management Agency (FEMA) is the federal one-stop-shop for hazard mitigation training and technical assistance.
- The State of Alaska Division of Homeland Security and Emergency Management (DHS&EM) is the State's hub for mitigation planning support and administers FEMA mitigation grants.
- The City and Borough of Juneau keep updated resources available on their website.

Please note that the table below is not exhaustive. It attempts to provide direction as local staff and stakeholders begin implementing this HMP.

Mitigation Resources (non-monetary)				
Entity	**Name**	**Category**	**Description**	
Federal				
Federal Emergency Management Agency (FEMA)	Emergency Management Institute (EMI)	Training	EMI offers free emergency management and hazard mitigation training to help state, local, and tribal government employees create and implement effective hazard mitigation plans.	
	FEMA Hazard Mitigation Planning Website / Distribution Warehouse	Helpful Resources	FEMA has developed many resources to support local hazard mitigation planning and implementation. Many of these documents are available online. They can also be ordered using the Distribution Warehouse's online order form or by calling 1-800-480-2520. Key resources include: • Mitigation Best Practices: These include stories, articles, and case studies that highlight successful efforts to reduce disaster risks. The *Mitigation Action Portfolio* is updated annually and provides documentation on mitigation activities that are eligible for funding. *Building Community Resilience with Nature-Based Solutions* provides guidance on designing and funding nature-based solutions to minimize hazard risk. • Mitigation Planning and Grants: FEMA's funding resources specify whether a hazard mitigation plan is required to be eligible. • Regulation and Guidance: This includes State, Tribal, Local, and Additional Mitigation Planning Policies which constitute FEMA's planning guidance for hazard mitigation.	
National Park Service	Rivers, Trails, and Conservation Assistance Program	Technical Assistance	NPS-RTCA provides technical assistance planning to support community-led outdoor recreation and conservation projects outside of National Park Units. There is no cost to apply.	*Local example: NPS-RTCA helped the City of Pelican develop a shovel-ready plan for improvements to a recreational trail that doubles as a tsunami evacuation route.*
Environmental Protection Agency	Equitable Resilience Technical Assistance	Technical Assistance	ERTA provides communities with no-cost design and project development assistance, community engagement, and partnership development support.	

Mitigation Resources (non-monetary)			
Entity	**Name**	**Category**	**Description**
U.S. Department of Housing and Urban Development (HUD)	Office of Native American Programs	Technical Assistance	HUD's Office of Native American Programs sponsors tuition free trainings and workshops for Tribal Leaders, Tribal housing staff, housing professionals, and nonprofit partners by request.
Cybersecurity & Infrastructure Security Agency (CISA)		Training and Helpful Resources	Provides resources, tools and training related to critical infrastructure security and resilience, for example the Dams Sector Crisis Management Handbook (2025).
Tribal			
Central Council Tlingit & Haida Indian Tribes of Alaska		Helpful Resources	CCTHITA's website includes information on regional coalitions and reference documents such as CCTHITA's Climate Change Adaptation Plan.
Tlingit Haida Regional Housing Authority		Helpful Resources	Education on financial literacy and home maintenance specific to Southeast Alaska.
Community Planning Assistance for Wildfire		Wildfire Planning	Working with communities across the country, Community Planning Assistance for Wildfire (CPAW) provides communities with land use planning solutions, communications assistance, and customized research to better understand and manage wildfire-prone areas and reduce risks. Established in 2015 by Headwaters Economics, CPAW is funded by the U.S. Forest Service and private foundations. Services and recommendations offered by CPAW's interdisciplinary team are provided at no cost to the community. Read more about CPAW.
State			
State of Alaska Division of Homeland Security and Emergency Management (DHS & EM)		Helpful Resources & Technical Assistance	DHS & EM supports planning, analysis, and mitigation in Alaska. Visit their website to access planning support and resources for Community Planning, Hazard Mitigation, and Community Resilience. Staff can help navigate hazard mitigation grant requirement questions.
UAF International Arctic Research Center	Alaska Climate Adaptation Science Center (AK CASC)	Helpful Resources & Data	AK CASC is a partnership between the University of Alaska and the U.S. Geological Survey which studies and provides research
Division of Senior Services			Provides special outreach services for seniors, including food, shelter, and clothing.
Division of Insurance			Provides assistance in obtaining copies of policies and provides information regarding filing claims.
Department of Transportation and Public Facilities (DOT/PF)			Provides technical assistance to the various emergency management programs, to include mitigation. This assistance is addressed in the DHS&EM-DOT/PF Memorandum of Agreement and includes, but is not limited to: environmental reviews, archaeological surveys, and historic preservation reviews. DOT/PF also coordinates buy-out projects to reduce right-of-way conflicts,

Mitigation Resources (non-monetary)			
Entity	**Name**	**Category**	**Description**
		Technical Assistance	collaborates on earthquake mitigation, and uses its Planning, Design and Engineering, Maintenance and Operations, and Intelligent Transportation Systems resources to identify hazards and initiate mitigation activities to meet the transportation needs of Alaskans. DOT/PF budgets for the temporary replacement bridges and materials necessary to make the multi-modal transportation system operational following a natural disaster.
Department of Nature Resources	Division of Forestry	Helpful Resources & Training	Participates in a statewide wildfire control program in cooperation with the forest industry, rural fire departments, and other agencies. Manages various wildland fire programs, including FireWise and the Community Forestry Program which provide helpful resources and trainings to support wildfire mitigation and sustainable forestry.
	Division of Geological and Geophysical Survey	Education & Data	Collects and distributes information about the State's geologic resources and hazards. Their geologists and support staff are leaders in researching Alaska's geology and implementing technological tools to most efficiently collect, interpret, publish, archive, and disseminate that information to the public
Local			
City and Borough of Juneau	Emergency Management & Flood Response	Helpful Resources	The CBJ website houses information related to disaster assistance, emergency declarations, local contractors, and resources for impacted residents.
Other			
The Center for Rural Development (RDPC)	Rural Domestic Preparedness Consortium	Training	RDPC is part of FEMA's National Training and Education System. It is focused on providing Department of Homeland Security-certified training and resources to support rural and tribal emergency management practitioners.
Alaska Tribal Resilience and Learning Network (AK TRLN)	Learning Network	Training & Helpful Resources	AK TRLN is a learning network hosted in partnership with the Native American Fish and Wildlife Society. It offers trainings, climate and weather tools, and
UAF International Arctic Research Center	Alaska Climate Adaptation Science Center (AK CASC)	Helpful Resources, Training & Data	AK CASC is a partnership between the University of Alaska and the U.S. Geological Survey which supports researchers, land managers, and Tribes through research, trainings, and dissemination of climate data.
American Planning Association	Hazard Mitigation and Disaster Recovery Planning Division	Planning	A non-profit professional association that serves as a resource for planners, elected officials, and citizens concerned with planning and growth initiatives.
University of Alaska Fairbanks	Scenarios Network for Alaska and Arctic Planning	Data	Climate tools and data to support planning, including downscaled climate model output data for Juneau.

Section 3: Mitigation Funding Resources

The table below includes federal, state, and nongovernmental funding sources that may be relevant for mitigation projects and related efforts. Funding sources that require a Hazard Mitigation Plans are indicated as such. *Local examples of successful grant awards are underlined and italicized.*

A note on project phasing: Phased projects differ from project scoping activities. Project scoping helps a community develop a concept or subapplication for a project that could be submitted in future grant cycles. Phasing is for projects that are further along in development, but for which funding is lacking to complete certain technical pieces.

Mitigation Resources (funding)			
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**
Federal			
Congressionally Directed Spending (CDS) Projects	The FY 2026 appropriations process includes opportunities to fund local projects through Congressionally Directed Spending, a reformed process which was resumed in FY22 which allows Alaskans to identify and receive federal assistance for needs in the state. Each year, the Senate Appropriations Committee issues guidance for CDS project proposals. This guidance describes which funding accounts are available and the eligibility requirements for each.		*In FY2024, Haines Borough was awarded $1 million for an emergency operations center. The Mat-Su Borough was awarded $2.5 million for critical at-risk flooding area protection.* *Flood and rockslide mitigation projects in the City of Seward and Skagway, respectively, were submitted for FY2025. These requests total $5,756,000.*
Federal Emergency Management Agency (FEMA) **Hazard Mitigation Assistance (HMA) Grants**	Hazard Mitigation Grant Program (HMGP)	Hazard Mitigation	HMGP is pass-through grant program that supports pre- and post-disaster mitigation plans and projects for state and local agencies and federally recognized Tribal governments. A Presidential Major Disaster Declaration **is required** to authorize HMGP funding. HMGP funding is not typically structured in strict phases. It begins with a presidential disaster declaration, followed by an application period (typically 12 months, extendable) where states and local governments can submit projects. Grant recipients have 36 months from the close of the application period to complete their projects, with quarterly progress reports required. All projects must meet the following five criteria to be considered for funding: • Conforms with State Hazard Mitigation Plan • Provides beneficial impact on the designated disaster area • Conforms with environmental laws and regulations • Solves a problem independently or constitutes a functional portion of a solution • Is cost-effective
	Hazard Mitigation Grant Program Post		HMGP–Post Fire is a pass-through grant program that provides funding for state and local agencies and federally recognized Tribal governments to reduce wildfire risks. Funded projects include (but are not limited to) defensible space initiatives, ignition-resistant construction, hazardous fuels reduction,

Mitigation Resources (funding)			
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**
	Fire (HMGP-Post Fire)	Hazard Mitigation	erosion control measures, slope failure prevention measures, and flash flooding prevention. HMGP–Post Fire grants are available to eligible states and territories that receive Fire Management Assistance declarations and to federally recognized Tribal governments that have land burned within a designated area. A Post Fire Presidential Disaster Declaration **is not required** to activate funding.
	Flood Mitigation Assistance (FMA)	Hazard Mitigation	FMA is a competitive program that provides funding to states, local communities, federally recognized tribes and territories. Funds can be used for projects that reduce or eliminate the risk of flood damage to structures insured by the National Flood Insurance Program (NFIP). FMA funding is available through the National Flood Insurance Fund for flood hazard mitigation activities and plan development to states, territories, and federally recognized tribes. NFIP participation is required to be eligible for funding. Local governments and non-federally recognized tribes are eligible as subapplicants and must be in "good standing" with the NFIP. All applicants and subapplicants must have a FEMA-approved and locally adopted HMP. For FMA, project scoping subapplications can be submitted for funding under the Capability- and Capacity-Building Activity type and phased projects are eligible for funding under the Localized Flood Risk Reduction Project type. Once FEMA awards the grant, funding is available for Phase I, which could include developing the complete body of technical data to finalize Phase I analysis and design, conduct applicable engineering studies, prepare a BCA, and provide documentation for an Environmental Planning and Historic Preservation (EHP) review. These Phase I deliverables provide FEMA with a technical body of information mutually concurred on by the recipients, the subrecipient, and FEMA to determine project eligibility based on technical feasibility and cost-effectiveness. If the results of the Phase I review indicate that the project meets FMA requirements, then the project becomes eligible for construction funding under Phase II. Phase I funding is part of the project's total estimated cost and is subject to FMA cost-share requirements. If a project is not shown to be cost-effective or technically feasible after Phase I completion, FEMA still funds the costs of Phase I. However, Phase II funding is not guaranteed and is instead contingent upon the outcomes of the evaluation of the Phase I deliverables.
FEMA (Other)	Assistance to Firefighters		FEMA's AFG Program is a direct annual competitive grant program that focuses on enhancing the safety of the public and firefighters with respect to fire and fire-related hazards. Funding can be used to purchase equipment, protective gear, and

Mitigation Resources (funding)				
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**	
	Grant (AFG) Program	Fire	emergency vehicles and provide training and other resources related to fire hazards. The AFG Program provides financial assistance directly to eligible fire departments, non-affiliated emergency medical service organizations, and state fire training academies.	
	Safeguarding Tomorrow Revolving Loan Fund Program (Safeguarding Tomorrow RLF)	Hazard Mitigation Projects	Funding will enable eligible state, local, and tribal jurisdictions to create a revolving loan fund for hazard mitigation projects, cost match, nature-based solutions, upfront project design costs, or for smaller projects that may not qualify for other Hazard Mitigation Assistance Grant Programs.	
Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy	Weatherization Assistance Program (WAP)	Weatherization	WAP reduces energy costs for low-income households through education and weatherization services. Qualifying households must be at or below 200% of the poverty income guidelines or receive Supplemental Security Income. Homeowners and renters are eligible.	
Environmental Protection Agency	Clean and Drinking Water State Revolving Loan Fund (SRF)	Water	Provides financial assistance for a range of water infrastructure projects, including stormwater management, estuary management, and nonpoint source pollution management. Financial assistance includes loans, purchase of debt, and insurance guarantees.	
	Water Infrastructure Finance and Innovation Act (WIFIA)	Water Infrastructure	Funds development and implementation activities for a wide variety of drinking water, wastewater, and stormwater infrastructure projects, including stormwater management and green infrastructure projects.	
Cybersecurity & Infrastructure Security Agency (CISA)	State and Local Cybersecurity Grant Program	Cybersecurity	Helps eligible entities address cybersecurity risks and threats to information systems owned or operated by (or on behalf of) state, local, and territorial governments. Administered by CISA and FEMA. FY 2024 SLCGP had a 30% cost share requirement, or a 20% cost share requirement for multi-entity projects.	
	Tribal Cybersecurity Grant Program	Cybersecurity	Assists Tribal governments with addressing cybersecurity risks and threats to information systems owned or operated by, or on behalf of, those Tribal governments.	
United States Department of Agriculture (USDA)	Natural Resources Conservation Service (NRCS) Emergency Watershed Protection (EWP) Program	Watershed Projects	The EWP Program offers technical and financial assistance to help relieve imminent threats to life and property caused by floods, fires, windstorms, and other natural disasters that impair a watershed. EWP grants are available to local agencies, conservation districts, federally recognized Tribal governments, and interested public and private landowners that have a sponsor. EWP **does not** require a disaster declaration by the federal or state government.	*Akiak Native Community was awarded funding to complete the relocation of six homes in danger from erosion in partnership with Kokarmiut Corporation and the City of Akiak (2020).*

Mitigation Resources (funding)			
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**
	NRCS Watershed Protection and Flood Prevention Operations (WFPO) Program	Watershed Projects	The WFPO Program provides technical and financial assistance to help plan and implement watershed programs, including flood prevention. It is available to state and local agencies and federally recognized Tribal governments and for watersheds that are 250,000 acres and smaller.
	NRCS Watershed Rehabilitation Program (REHAB)	Watershed Projects	The REHAB Program helps project sponsors rehabilitate aging dams that are reaching the end of their design life and/or no longer meet federal or state safety criteria or performance standards. Watershed Rehabilitation Programs receive funding from Congress through discretionary appropriations and additional funds provided by the Farm Bill.
	Farm Service Agency (FSA)	Agriculture	The FSA provides services related to loans and disaster assistance programs for agricultural producers, such as the Emergency Conservation Program, which offers financial and technical assistance to repair and restore farmland affected by natural disasters such as floods, hurricanes, wildfires, drought, and other calamities. The field office for the FSA in Alaska is located in Palmer.
	Rural Development (USDA-RD)	Rural Development	USDA-RD provides federal assistance resources throughout rural Alaska. Its state office is in Palmer. There are a few state programs of relevance to hazard mitigation, including: • Emergency Community Water Assistance Grants in Alaska: This program helps communities prepare, or recover from, an emergency that threatens the availability of safe, reliable drinking water. • Rural Utilities Service: Provides financing for rural infrastructure improvements including water and waste treatment, electric power, telecommunication, and broadband services. • Rural Housing Service: Offers programs to build or improve housing and essential community facilities in rural areas.
Department of Health and Human Services	Administration for Native Americans	Social and Economic Development	Provides social and economic development opportunities through financial assistance, training, and technical assistance to eligible tribes and Native American communities. FY2025 Notice of Funding Opportunities are in three areas: Native Language Preservation and Maintenance, Native Languages Esther Martinez Immersion, and Environmental Regulatory Enhancement.
	Hospital Preparedness Program	Hospital preparedness	Supports regional collaboration and health care preparedness and response to improve the capacity of the health care system to plan for and respond to large-scale emergencies and disasters. Provides funding for health care preparedness and response and offers guidance and technical assistance.
			Allocated to rebuild disaster-impacted areas and provide crucial seed money to start the long-term recovery process. Available to

Mitigation Resources (funding)				
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**	
Department of Housing and Urban Development (HUD)	Community Development Block Grant–Disaster Recovery (CDBG-DR)	Recovery from Presidentially declared disasters	state and local agencies and federally recognized Tribes to help recover from Presidentially declared disasters, especially in low-income areas. Grantees must ensure that their activities align with the mitigation strategy of their State Hazard Mitigation Plan (SHMP).	*CDBG-DR administered through the Division of Community and Regional Affairs for 2024 Juneau Flooding.*
	Community Development Block Grant–Mitigation (CDBG-MIT)	Hazard Mitigation	CDBG-MIT provides funding for mitigation activities that increase resilience to disasters and reduce or eliminate the long-term risk of loss of life, injury, damage to and loss of property, and suffering and hardship, by lessening the impact of future disasters.	*AWARE received $333,402 for retaining wall reconstruction (2021).*
	Indian Housing Block Grant Program (IHBG)	Housing	The IHGB is the primary means by which the Federal Government fulfills its trust responsibilities to provide adequate housing to Native Americans. It includes: • Formula grant: Distributed Annually and funds affordable housing activities including new housing construction, rehabilitation, and housing services. Tlingit Haida Regional Housing Authority (THRHA) receives on behalf of the tribes and have approval authority on the spending. • Competitive: NOFOs will announce the availability of this grant program to support affordable housing activities that primarily benefit low-income Indian families. Tribes can authorize THRHA to apply on their behalf for projects. The Section 108 Loan Guarantee Program provides CDBG recipients with the ability to leverage their annual grant allocation to access low-cost, flexible financing for economic development, housing, public facility, and infrastructure projects.	
	Indian Community Development Block Grant (ICDBG)	Housing, Community Facilities, Economic Development	Alaska Native villages and federally recognized tribes are eligible. Single-purposes grants are awarded on a competition basis pursuant to an annual NOFO. Imminent threat grants are noncompetitive, first come-first served funding of grants to eliminate or lessen problems that pose an imminent threat to public health or safety of tribal residents. This program is focused on providing support for low- and moderate-income persons.	
	Healthy Homes Programs	Housing	These programs include supporting safe homes during disasters and remediation efforts after disasters. Grant opportunities are posted as they are available.	
Department of Labor	Employment and Training Administration	Unemployment Assistance	Provides temporary benefits to individuals whose employment or self-employment has been lost or interrupted as a direct result of a major disaster declared by the President and who are not eligible	*$7,674 compensated across 10 claims made in Alaska in 2022.*

Mitigation Resources (funding)				
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**	
			for regular unemployment insurance benefits.	
Department of Transportation Federal Highway Administration	Recreational Trails Program	Transportation Infrastructure	Annual grant program that allocates funds to States to develop and maintain recreational trails and trail-related facilities. These are administered by the Alaska Department of Natural Resources.	
	Federal Lands Access Program	Transportation Infrastructure	Provides funding to improve transportation facilities that provide access to, are adjacent to, or are located within Federal lands. The FLAP supplements State and local resources for public roads, parking areas that serve as trail heads, trails, transit systems, and other transportation facilities, with an emphasis on high-use recreation sites and economic generators. Approximately $7.5 million is available annually for FLAP projects in Alaska.	*Forest Service project to re-route Treadwell Ditch Trail in Juneau.* *Forest Service project to develop a Master Plan for the Mendenhall Glacier Visitor Center area (2014).*
Small Business Administration	Disaster Loans	Mitigation Assistance	SBA Offers low-interest disaster loans to homeowners and small business impacted by declared natural and other disasters and to help mitigate against future disasters. Projects may include wind, flood, wildfire, and earthquake mitigation.	
U.S. Army Corps of Engineers (USACE)	Planning Assistance to States and Tribes	Water Resources	Allows the USACE to assist States, local governments, Tribes, and other non-Federal entities with comprehensive planning and technical assistance related to water resource needs. Cost-sharing varies across USACE programs. PAS programs are generally cost shared 50% with the study partner and may include waivers for federally recognized Tribes.	*USACE inspection of Gold Creek channel damage in 2022.*
	Tribal Partnership Program	Water Resources	Provides USACE to assist with water resource projects through studies including flood risk management, environmental restoration, and protection and preservation of natural and cultural resources. Cost-share waivers up to $482,000 may be applied to a TPP project that recommends project implementation.	
	Office of Wildland Fire (OWF)	Wildfire	OWF supports wildland fire management across to federally managed lands, which account for approximately 65% of land in Alaska. For example, the Burned Area Rehabilitation (BAR) Program supports efforts to repair or improve burned landscapes unlikely to recover without human assistance. The program, which must be implemented within the first 5 years after a fire, "jump-starts" the landscape recovery process by spreading native plant seeds or planting native seedlings, applying herbicides to kill invasive	

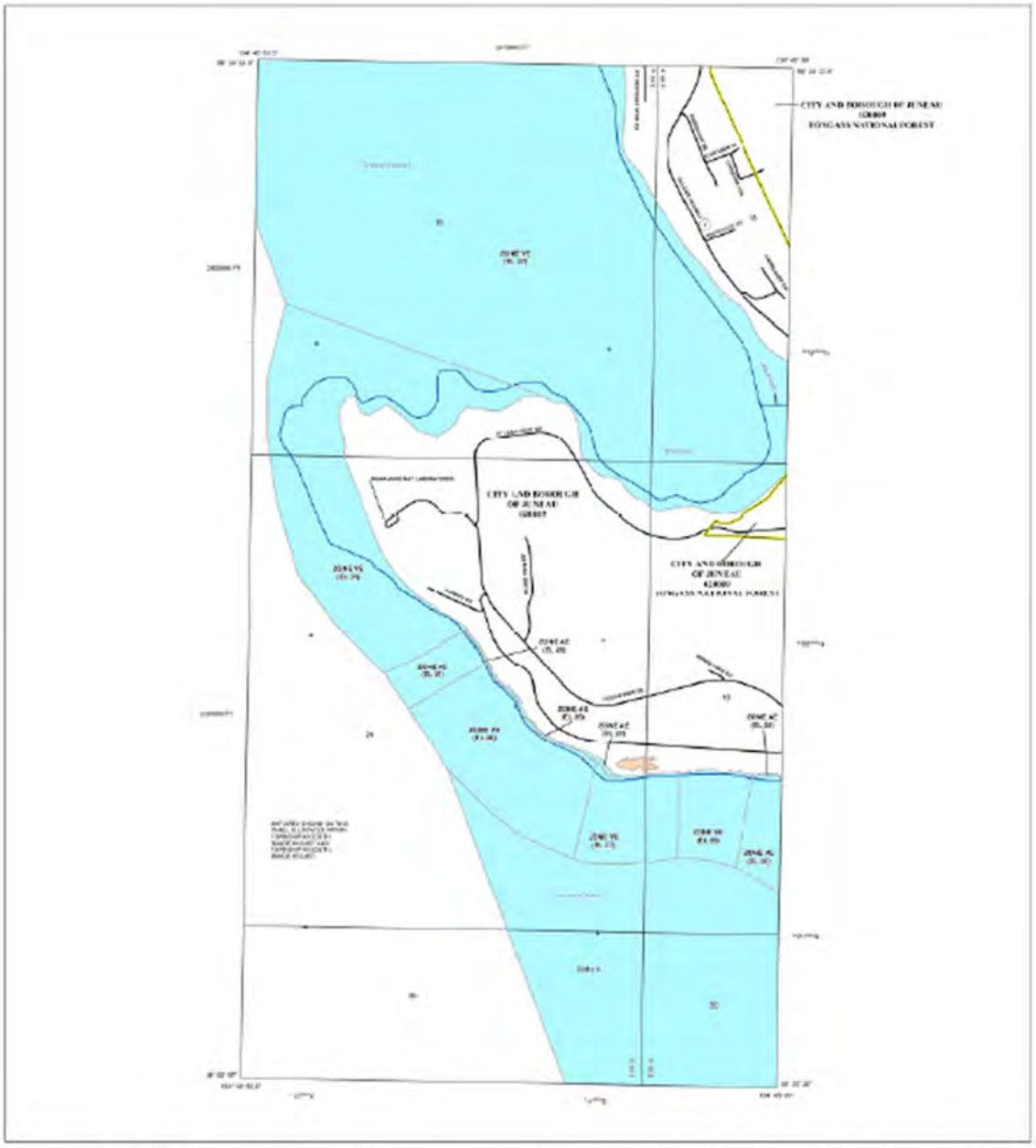
Mitigation Resources (funding)				
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**	
U.S. Department of the Interior			plants, removing them by hand, or introducing bacteria to control them, and using heavy equipment to disrupt the growth of targeted plant species or contour landscapes to control runoff. This program also funds the repair or replacement of minor infrastructure damaged by a wildfire, such as small trail bridges, handrails, campgrounds, boat ramps, stock tanks, or informational kiosks.	
	National Park Service (NPS) Historic Preservation Fund	Historic Preservation	Offers technical and financial assistance to communities related to historic preservation in partnership with State and Tribal Historic Preservation Offices (SHPO & THPO). These are administered through the State Office of History and Archaeology and are reviewed by the Alaska Historical Commission.	*$50,000 was awarded to the City and Borough of Sitka for support with siding, accessibility and insulation for the Japonski Island Boathouse.*
	NPS Tribal Heritage Grant	Cultural Heritage	Eligible to federally recognized Tribes, Alaska Native Villages and Alaska Native Corporations for a range of cultural resources surveys, inventories, planning, design, and repair work on historic sites.	
	NPS Land, Water, and Conservation Fund (LWCF)	Outdoor Recreation	The LWCF provides matching grants to states and local governments for the acquisition and development of public outdoor recreation areas and facilities. States must have a Statewide Comprehensive Outdoor Recreation Plan (SCORP) in place to be eligible. The State of Alaska Department of Natural Resources administers this grant.	*CBJ was awarded $197,000 for a hard court and covered ice arena at Savikko Park in 2002.*
	NPS Challenge Cost Share	Stewardship	Applications are submitted by NPS staff in partnership with educational institutions, private for-profit entities, or non-profit organizations. Projects should promote improved access and opportunities for outdoor recreation, environmental stewardship, and education in the National Parks, National Trails and / or Wild and Scenic Rivers.	
	US Fish and Wildlife Service (USFWS) Pittman-Robertson	Hunting Access	Allocates funds for hunting, wildlife viewing and management, and habitat conservation. Pittman-Robertson funds will reimburse 65% of the cost of an eligible Hunter Access proposal and requires a 25% non-federal match.	*Funding was secured to for the Treadwell Ditch Trail on Douglas Island to repair the trail, install bridges, and establish a durable surface trail.*
	USFWS Dingell-Johnson	Fishing Access	Allocates funding to improve recreational power boating and sport fishing access. This program is managed by the Alaska Department of Fish & Game who does not put out calls for proposals but instead received input through area management biologists for project proposals.	

Mitigation Resources (funding)				
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**	
Denali Commission		Economic and Infrastructure Development	Grants for tribal, local, state, and federal governments to improve the effectiveness and efficiency of government services, to develop a well-trained labor force employed in a diversified and sustainable economy, and to build and ensure the operation and maintenance of Alaska's basic infrastructure.	*$195,510 allocated to support permitting, engineering, and construction of intertie connecting Juneau, Greens Creek and Hoonah (2004).*
National Fish and Wildlife Foundation	America's Ecosystem Restoration Initiative (AERI)	Ecosystem Restoration	AERIA supports locally led projects that invest in fish and wildlife habitat restoration, ecosystem and community resilience, access to nature, habitat corridors and connectivity. Projects that address resilience to flooding, drought, and other threats may be eligible.	
	National Coastal Resilience Fund (NCRF)	Coastal Resilience	Supports the implementation of nature-based solutions to strengthen resilience of coastal communities and ecosystems to these threats.	
Tribal				
Tlingit-Haida Regional Housing Authority (THRHA	Home Repair Program	Home Repair	Funding to support home repair and similar projects for enrolled tribal members.	
	Mendenhall River Flood Recovery Loan Program	Home Repair	Designed to assist those who are affected by the Mendenhall River Flood and need assistance with renovating their home. Maximum loan amounts up to $50,000.	
	Low Income Housing Tax Credit (LIHTC)	Affordable Housing	The LIHTC program is a public program based on Section 42 of the IRS Code that is available to all income eligible applicants. This is a rent-to-own program designed to give very low- income families an opportunity for permanent affordable housing. This program is available only to rental developments in Juneau.	
	Down Payment Assistance Program	Affordable Housing	The THRHA Down Payment Assistance Program provides up to $20,000 in assistance funds to income-eligible applicants in the form of a 5 percent fixed rate second mortgage. This is a 10-year loan, where payment is deferred for the first five years. During this initial period, 10 percent of the loan will be forgiven each year, as long as the property remains owner-occupied. Any remaining balance will be amortized over the remaining term of the loan. The THRHA loan comes with a 1.5 percent loan origination fee and a $50 processing fee. The loan amount must be repaid if the home is sold prior to maturity.	
State				
Department of Commerce, Community, and	Alaska Climate Change Impact Mitigation Program	Natural Hazards	Provides technical assistance and funding to communities imminently threatened by climate-related natural hazards such as erosion, flooding, storm surge, and thawing permafrost. The intent of the program is to help impacted communities develop a planned approach to shoreline protection, building relocation and/or eventual relocation of the village.	

Mitigation Resources (funding)				
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**	
Economic Development	Division of Community and Regional Affairs		Administers the HUD Community Development Block Grant program, the Flood Mitigation Program, and the Climate Change Sub-Cabinet's Interagency Working Groups program funds. Also administers programs for State "distressed" and "targeted" communities.	
Alaska Energy Authority		Energy	Provides funding and technical assistance for energy-related upgrades and emissions reduction programs, which include the Bulk Fuel Upgrade Program, Diesel Emission Reduction Act Program, and Rural Power System Upgrade Program	
Department of Health	Division of Senior and Disabilities Services		Makes grants available to provide vital community-based supportive services.	
	Rural and Community Health Systems	Health and Medical Services	Includes a wide range of public health and medical programs that focus on public health preparedness, emergency medical services, trauma, and healthcare access.	
Division of Environmental Conservation	Response Account of the Oil and Hazardous Substance Release Prevention and Response Fund (Response Fund)	Pollution Prevention and Response	The DEC ensures safe food and safe water, and pollution prevention and response. DEC ensures water treatment plants, landfills, and bulk fuel storage tank farms are safely constructed and operate. Agency and facility response plans include hazards identification and pollution prevention and response strategies.	*DEC opened the Response Fund to provide supplies and free cleanup services to community members impacted by flood-related spills in Juneau (2024).*
Department of Transportation and Public Facilities (DOT/PF)	Statewide Transportation Improvement Program (STIP)	Transportation Infrastructure	The STIP is the state's four-year program for transportation system preservation and development, as required under 49 U.S.C. 5304(g). It covers all system improvements for which partial or full federal funding is approved.	*Five projects were selected for the STIP in CBJ for the period 2024-2027, including one Transportation Alternatives Program (TAP) project and one Community Transportation Program (CTP) project.*
Department of Natural Resources (DNR)	Division of Forestry	Wildfire	The Volunteer Fire Capacity (VFC) grant provides funding assistance for training, supplies, equipment purchases, and prevention activities on a cost share basis.	
Other				
Juneau Community Foundation	Community Support		Promotes philanthropy and effectively responds to the needs of Juneau to create a healthy, safe, and culturally rich environment. Administers programs such as the Juneau Hope Endowment/City & Borough of Juneau Social Service Grant program.	
Alaska Community Foundation	Community Support		Offers a range of grant programs ranging from community food security to nonprofit development.	*Yakutat Tlingit Tribe receipted $9,441 to purchase soil amendments and teach gardeners through the Community*

Mitigation Resources (funding)				
Entity	**Resource Name**	**Category**	**Accessible or Eligible to Use for Mitigation or Other Activities**	
				Food Security Through Gardening grant program.
Rasmuson Foundation	Community Support		With a mission to provide a better life for Alaskans, the Rasmuson Foundation offers a number of grant programs for Alaska-based nonprofits, individual artists, and nonprofit leaders.	*Juneau Housing First Collaborative received $500,000 in support of permanent supportive housing expansion at Forget-Me-Not Manor (2024).*
Juneau Arts & Humanities Council	Arts & Humanities		Invests in the community through financial support and assistance to students, individual artists, and arts organizations	
Sustainable Southeast Partnership (SSP)	Social, Environmental, Economic		Network of entities in Southeast Alaska addressing social, environmental, and economic challenges. SSP announces grant opportunities periodically, including Climate Adaptation and Resilience grants.	
Spruce Root	Community Development		Spruce Root is a 501c(3) nonprofit Community Development Financial Institution that offers programs, business resources, education, and small business lending to drive a regenerative economy in Southeast Alaska.	
Sealaska Corporation	Community Development		Sealaska serves 26,000 Alaska Native shareholders representing Tlingit, Haida, and Tsimshian peoples. It engages in corporate giving.	
Alaska Small Business Development Center	Business Development		Provides resources, advice, and assistance that help small for-profit businesses grow.	
American Red Cross	Recovery		Provides for the critical needs of individuals such as food, clothing, shelter, and supplemental medical needs. Provides recovery needs such as furniture, home repair, home purchasing, essential tools, and some bill payment may be provided.	
Crisis Counseling Program	Mental Health		Provides grants to State and Borough Mental Health Departments, which in turn provide training for screening, diagnosing, and counseling techniques. Also provides funds for counseling, outreach, and consultation for those affected by disaster.	
Institute for Business and Home Safety	Safety		An initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters. Offers free disaster guides for homes and businesses.	
Alaska Housing Finance Corporation	Weatherization		Individual who meets income limits may apply for the Weatherization program through the weatherization service provider in their area. Homeowners and renters may apply. (Income limits for CBJ as of April 2025 are $84,560 for single income and $96,640 dual income.)	

APPENDIX E – FEMA FIRMS AND SPECIAL FLOOD HAZARD EXPOSURE ASSESSMENT



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

N

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

0 175 350 700 Meters

PANEL LOCATOR

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

CITY AND BOROUGH OF JUNEAU, AK

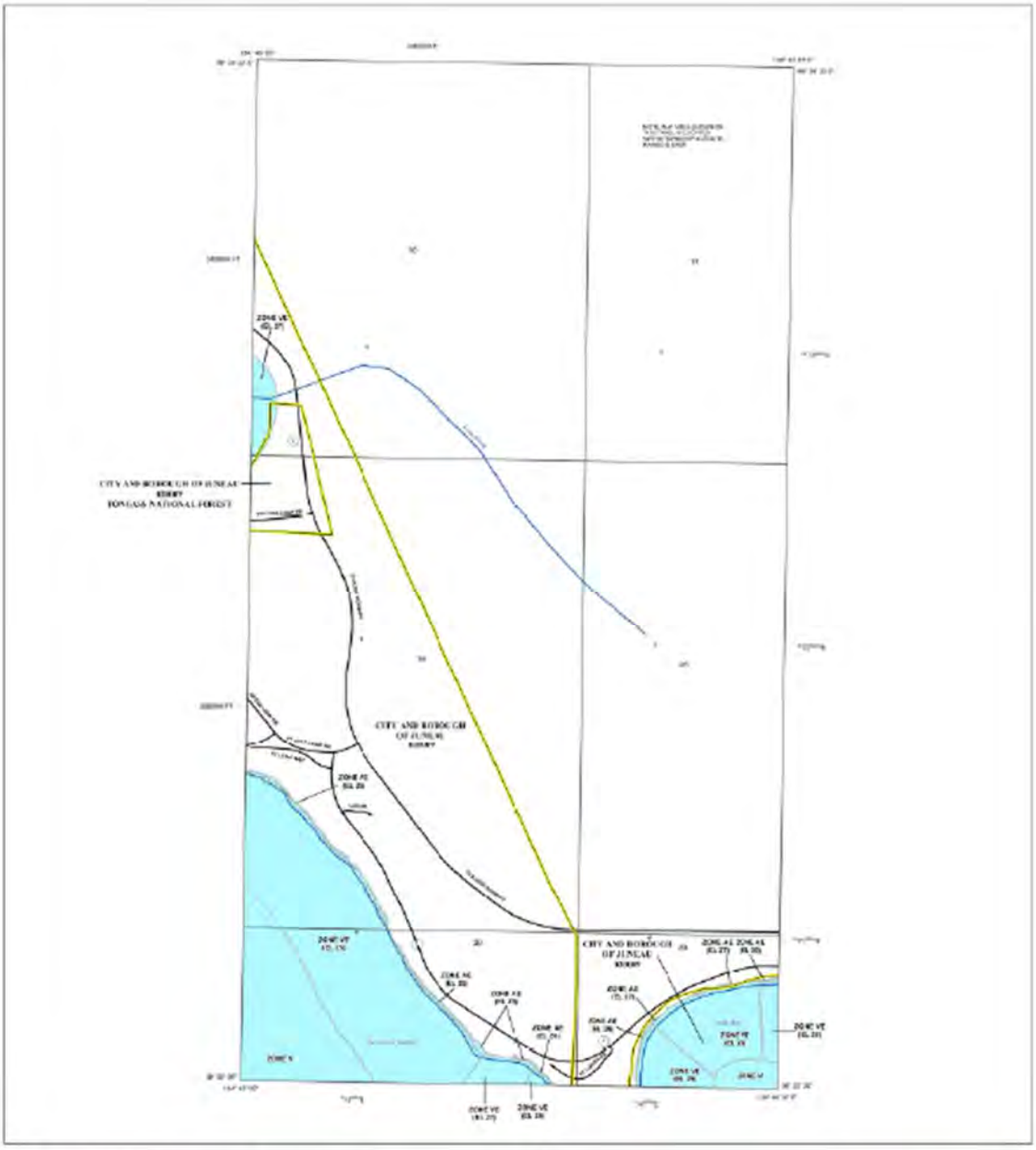
PANEL 3194 OF 2700

COMMUNITY	NUMBER	PANEL	SUFFIX
CITY AND BOROUGH OF JUNEAU	[illegible]	3194	G

VERSION NUMBER
2.3.3.4

MAP NUMBER
02110C3194G

MAP REVISED
SEPTEMBER 30, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

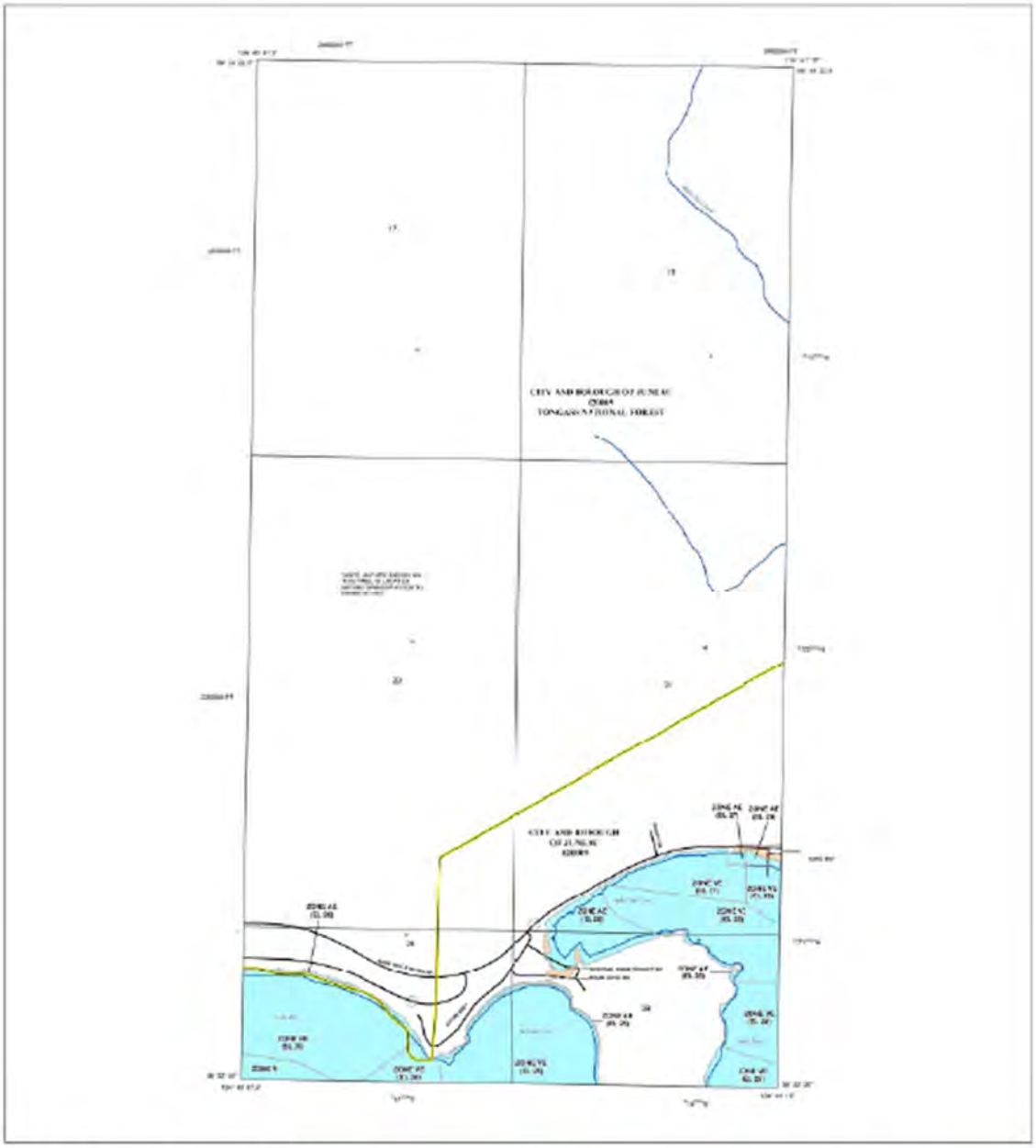
NATIONAL FLOOD INSURANCE PROGRAM

1 inch = 1,200 feet

PANEL

2334

SEPTEMBER 18, 2009



FLOOD HAZARD INFORMATION

NOTES TO USERS

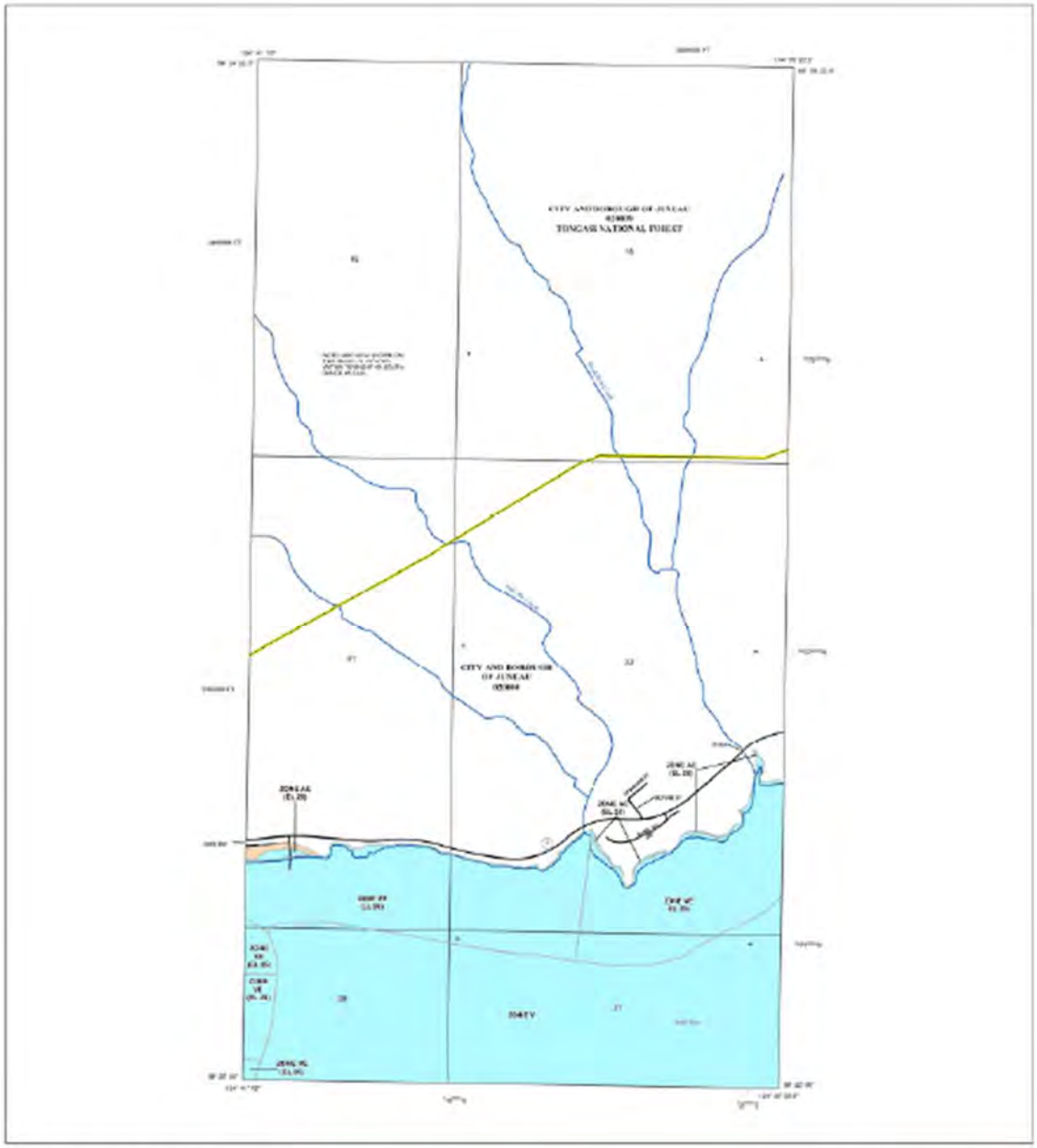
SCALE

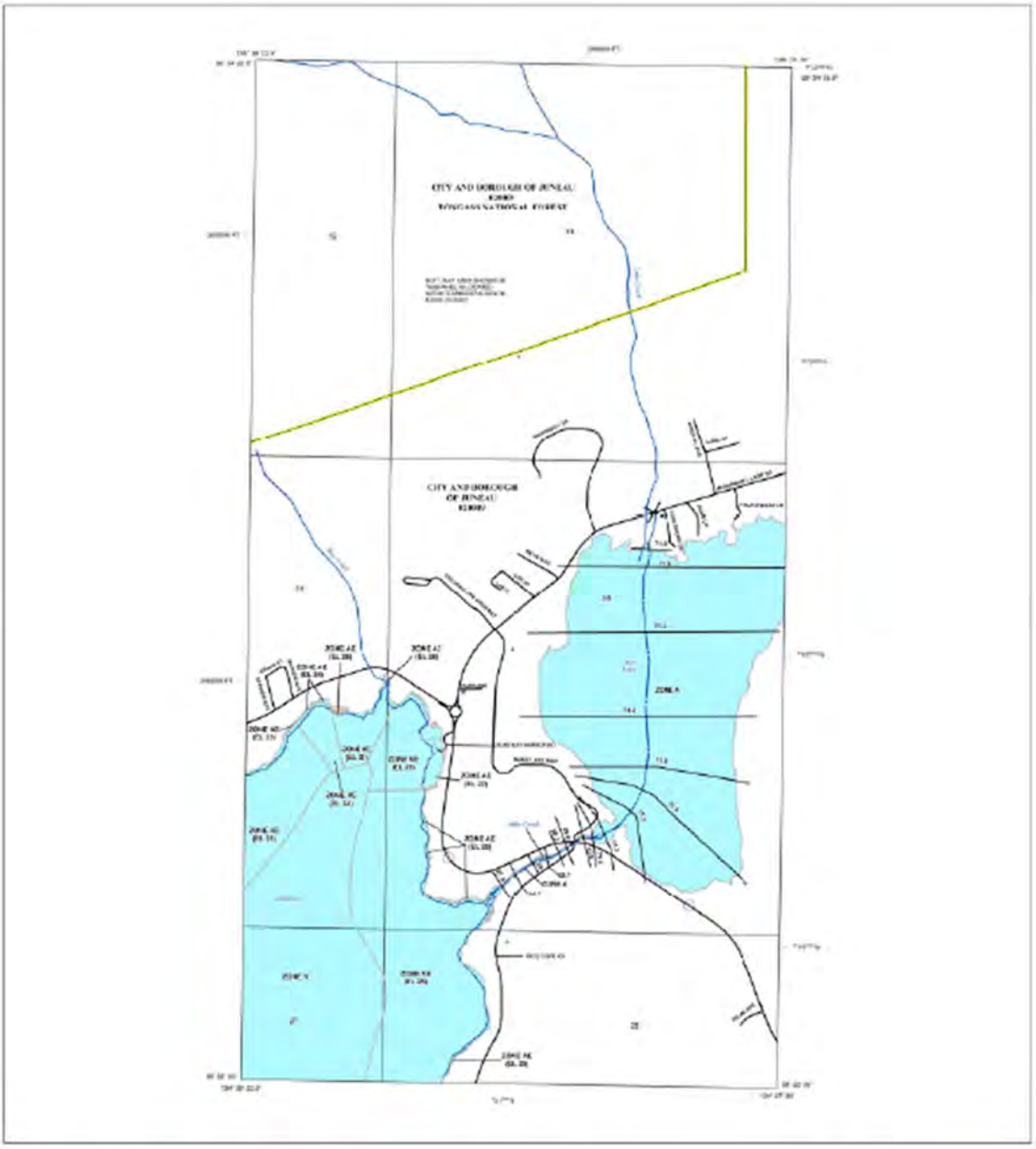
PANEL LOCATOR

FEMA

National Flood Insurance Program

SEPTEMBER 18, 2020


TONGASS NATIONAL FOREST
CITY AND BOROUGH OF JUNEAU
(CBJ)
CBJ
CITY AND BOROUGH OF JUNEAU
(CBJ)
CBJ
CBJ
CBJ



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

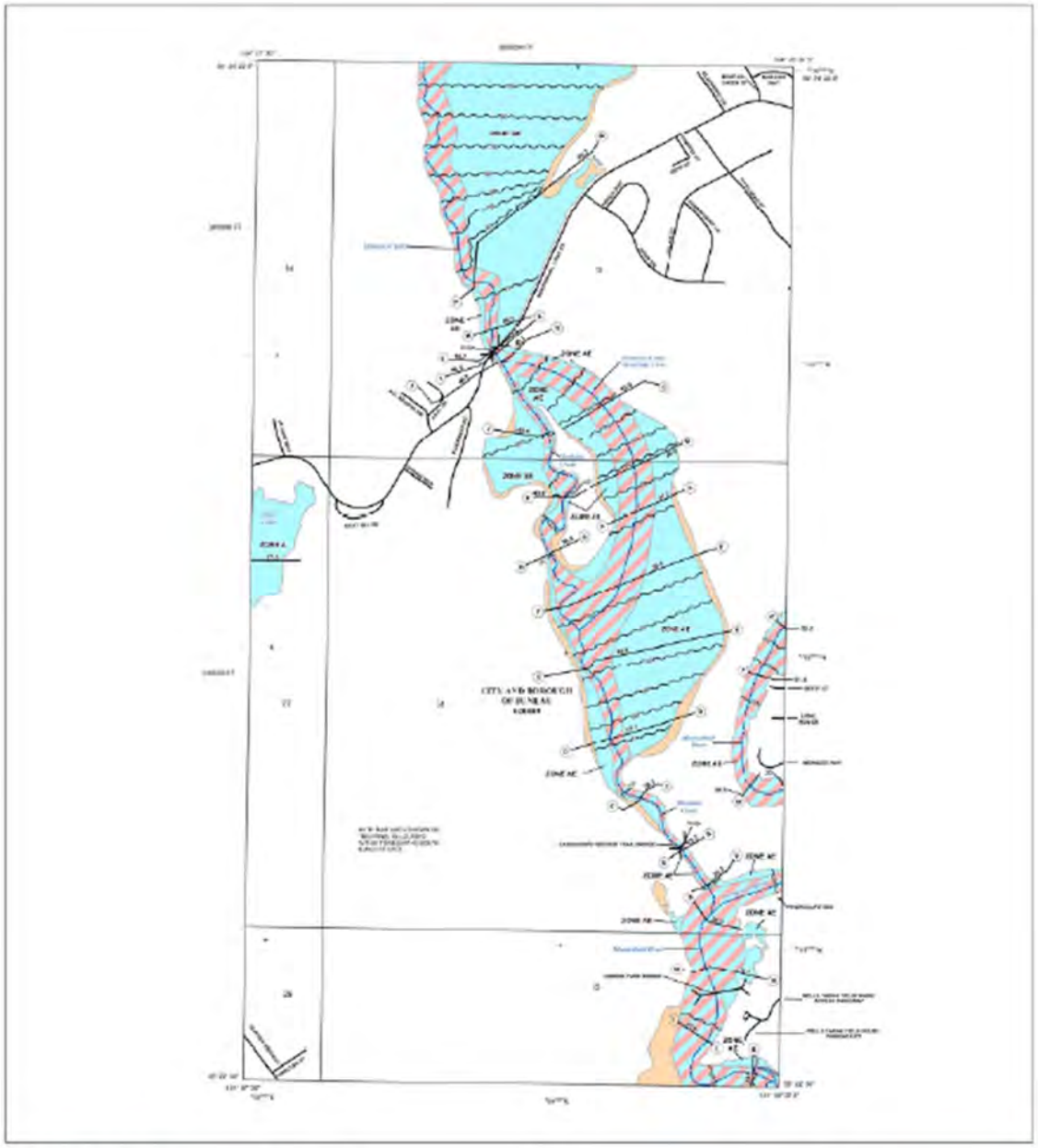
PANEL LOCATOR

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1219 OF 2700

SEPTEMBER 18, 2009



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

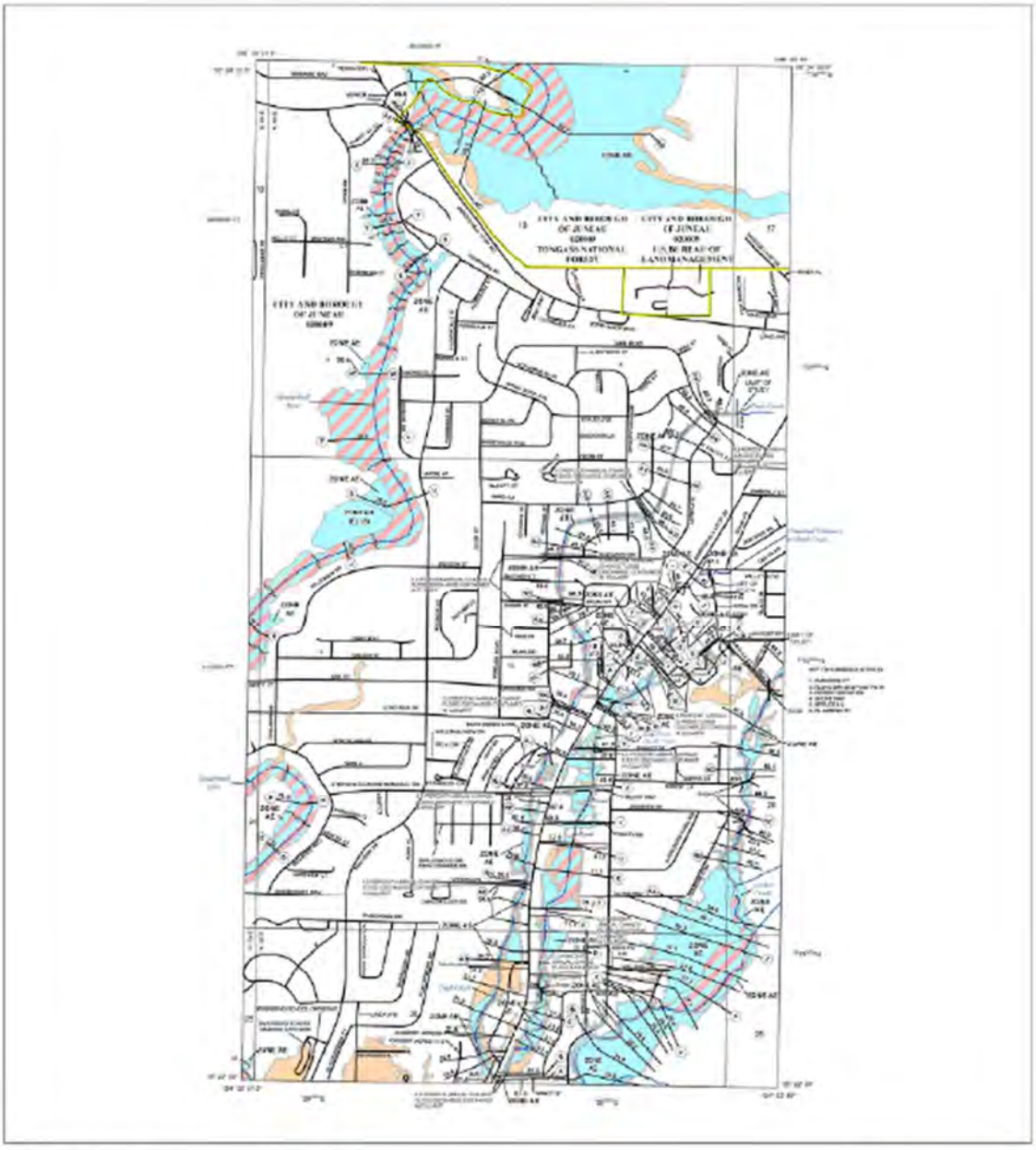
FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0238 OF 2700

SEPTEMBER 18, 2009



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED DESCRIPTION AND MAP
FOR FLOOD INSURANCE PURPOSES USE PANEL 0 OF FLOOD INSURANCE RATE MAP
HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Flood Risk due to Levee See Notes
- Area Determined to be Outside the 0.2% Annual Chance Floodplain
- Area of Undetermined Flood Hazard

OTHER AREAS

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)

OTHER FEATURES
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

SCALE

N

PANEL LOCATOR

FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

CITY AND BOROUGH OF JUNEAU, AK

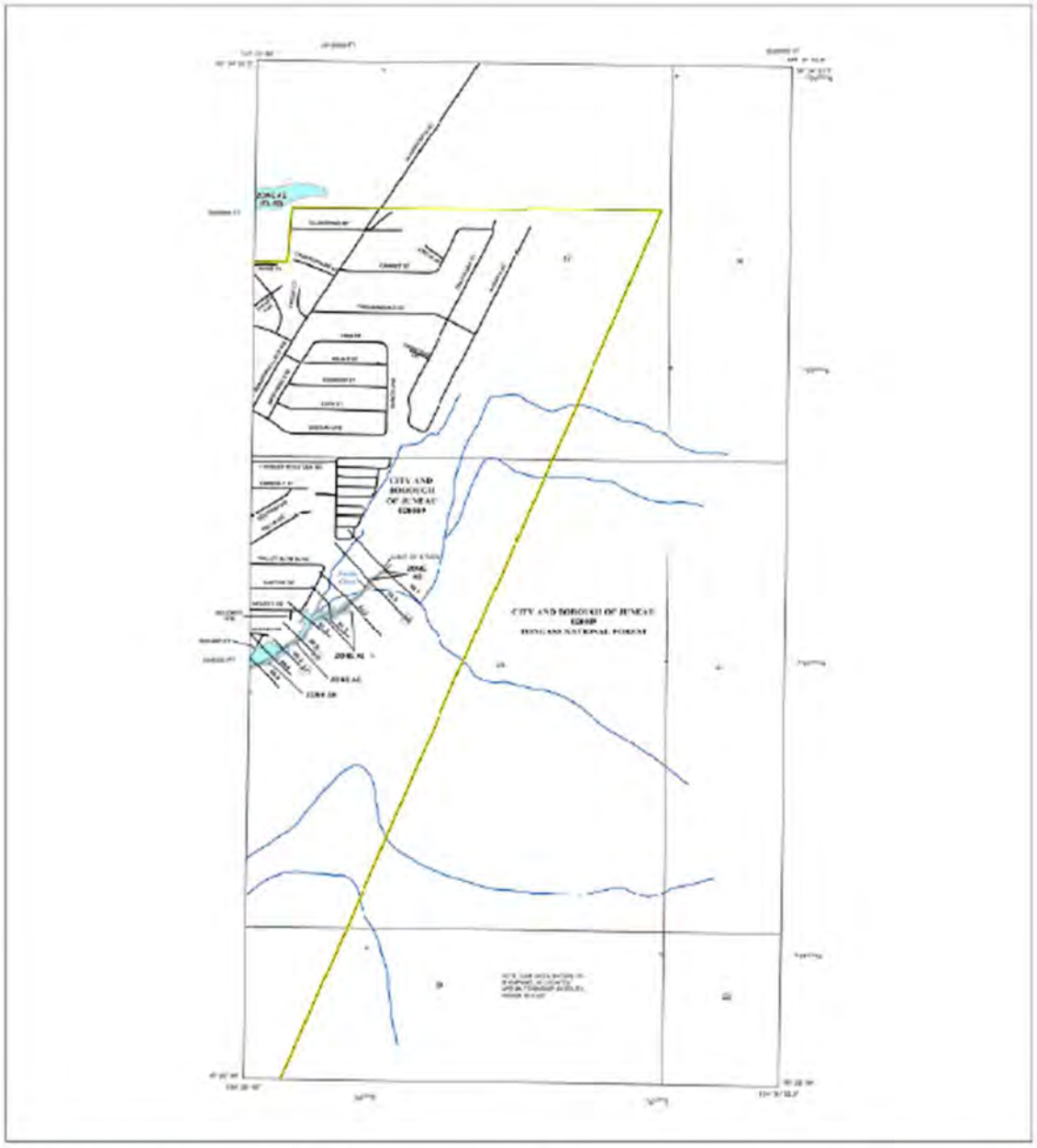
PANEL 1230 of 2700

COMMUNITY	NUMBER	PANEL	SUFFIX
CITY AND BOROUGH OF JUNEAU	[illegible]	1230	E

EFFECTIVE DATE
2.3.3.4

REVISED TO REFLECT
09/30/2020 FEMA

DATE REVISED
SEPTEMBER 18, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

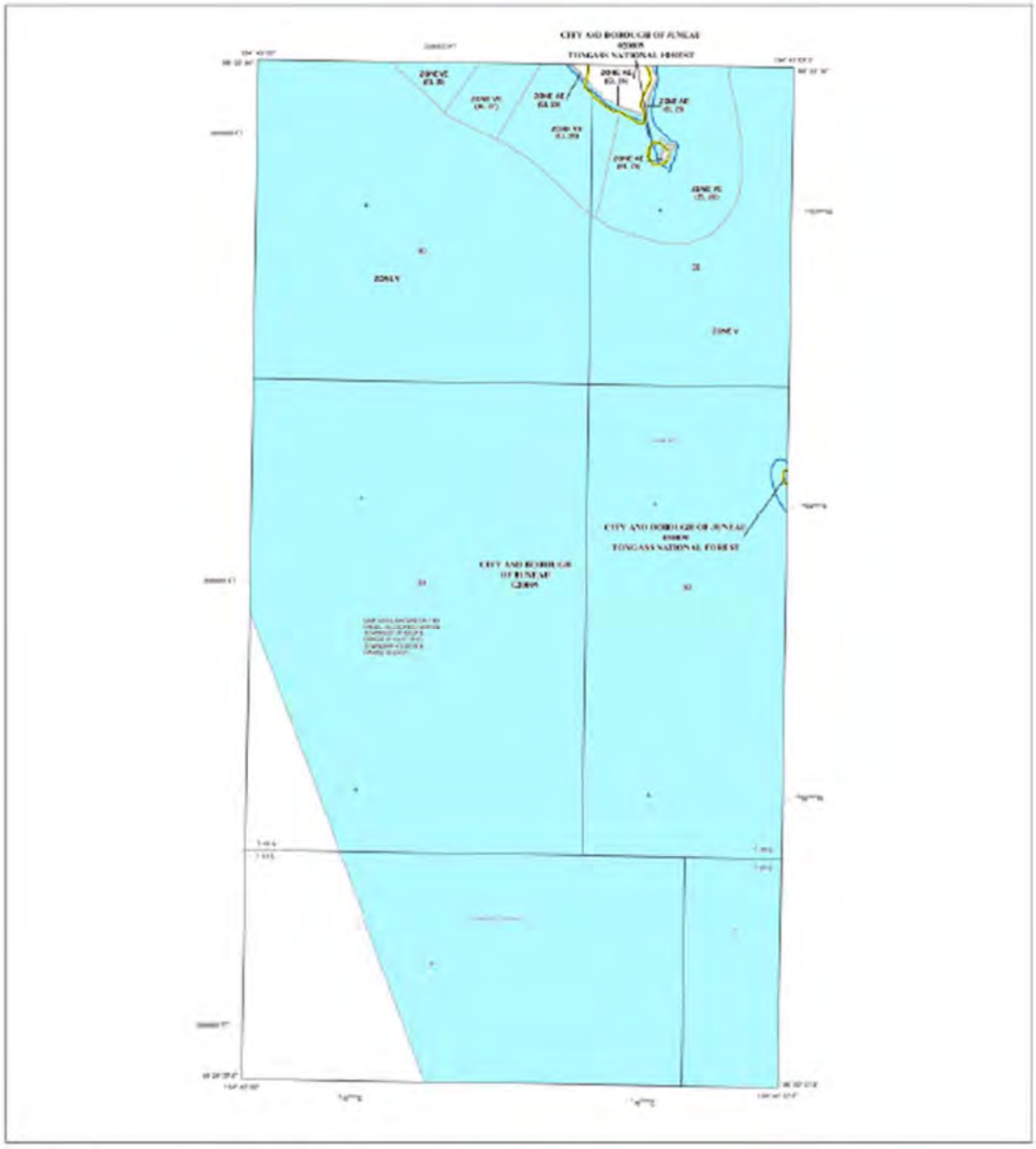
NATIONAL FLOOD INSURANCE PROGRAM

CITY AND BOROUGH OF JUNEAU, AK

PANELS 0203 - 0700

VERSION NUMBER
2.3.2.4

MAP REVISED
SEPTEMBER 18, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

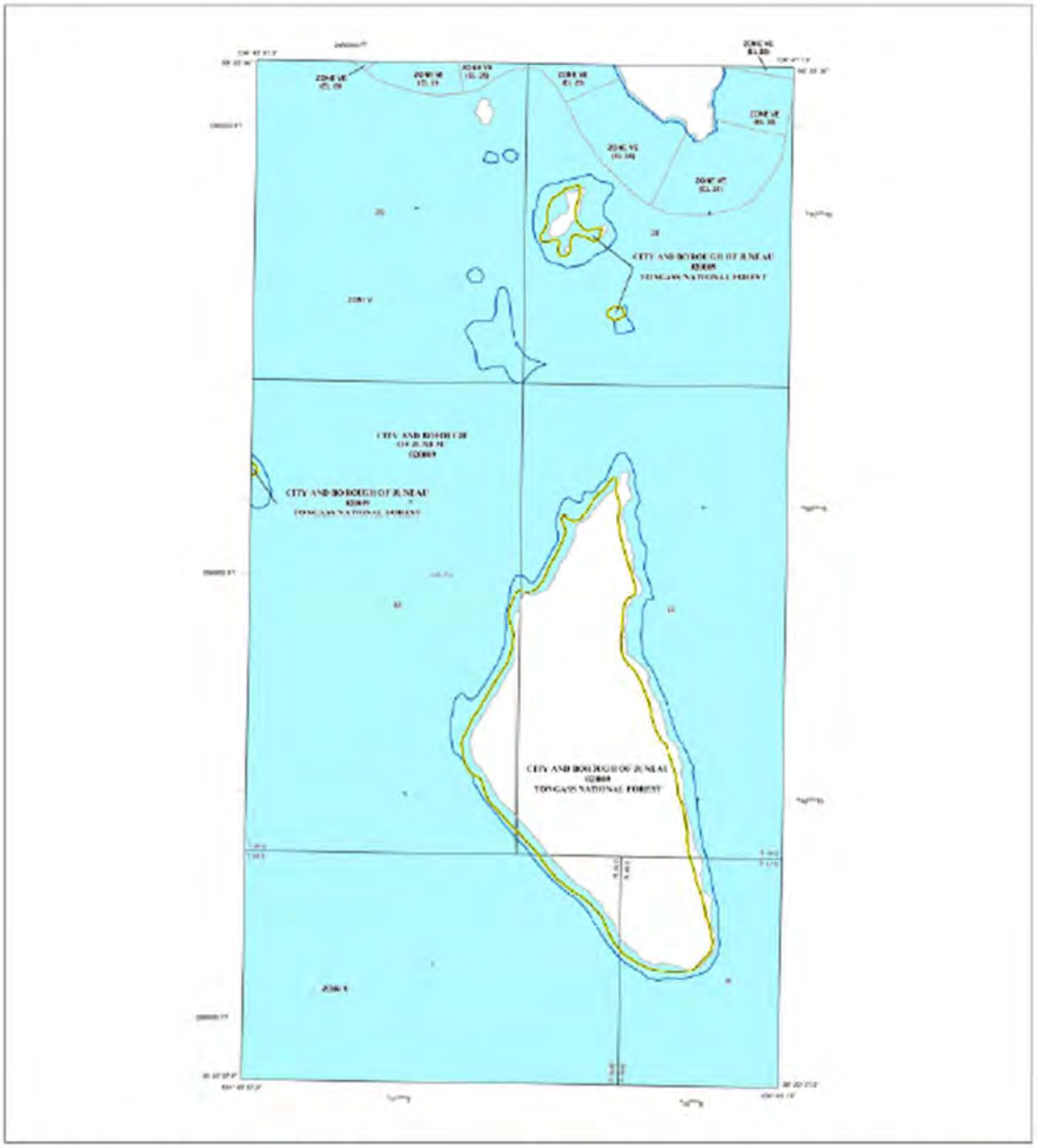
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1503 OF 2700

2334

SEPTEMBER 18, 2009



FLOOD HAZARD INFORMATION

NOTES TO USERS

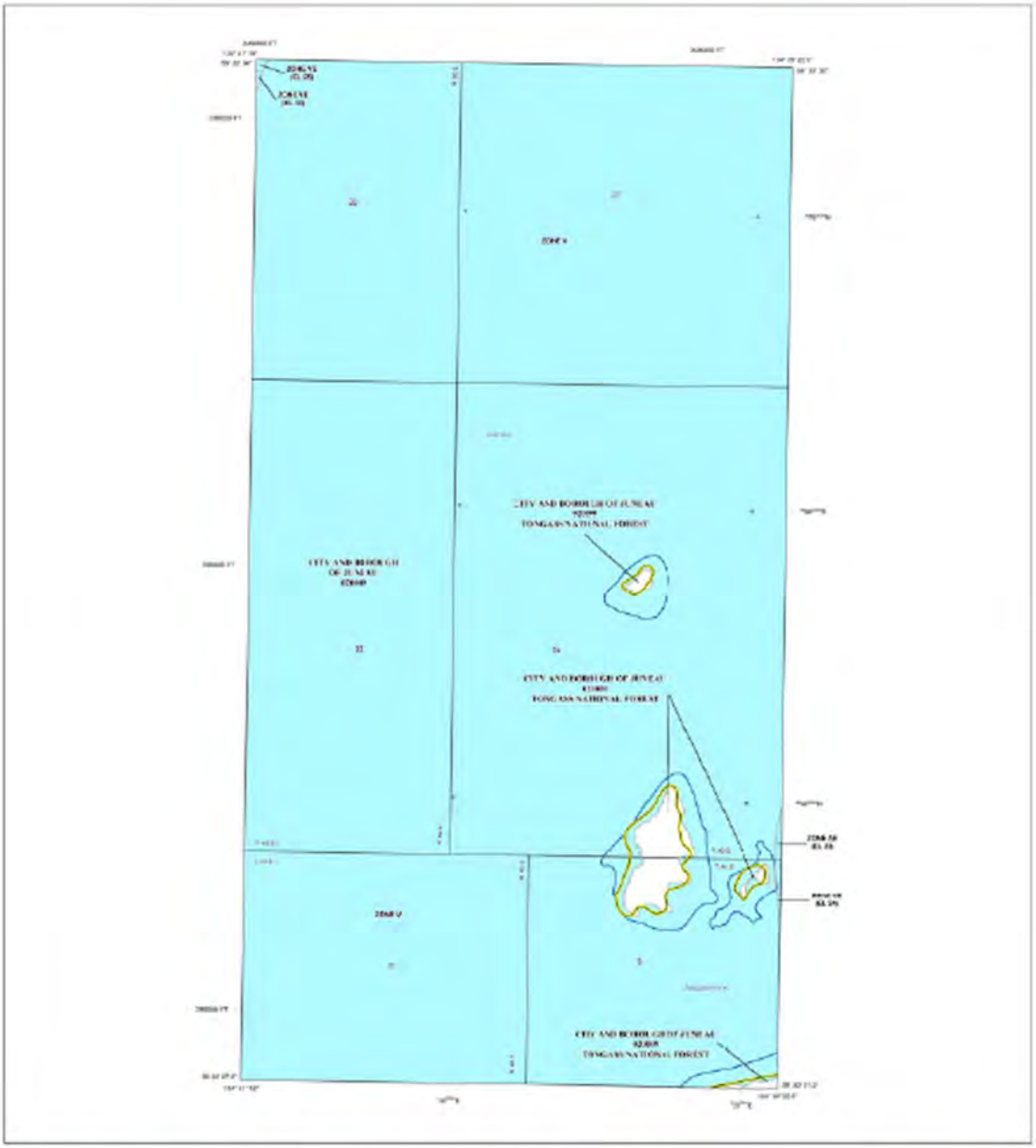
SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

SEPTEMBER 18, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

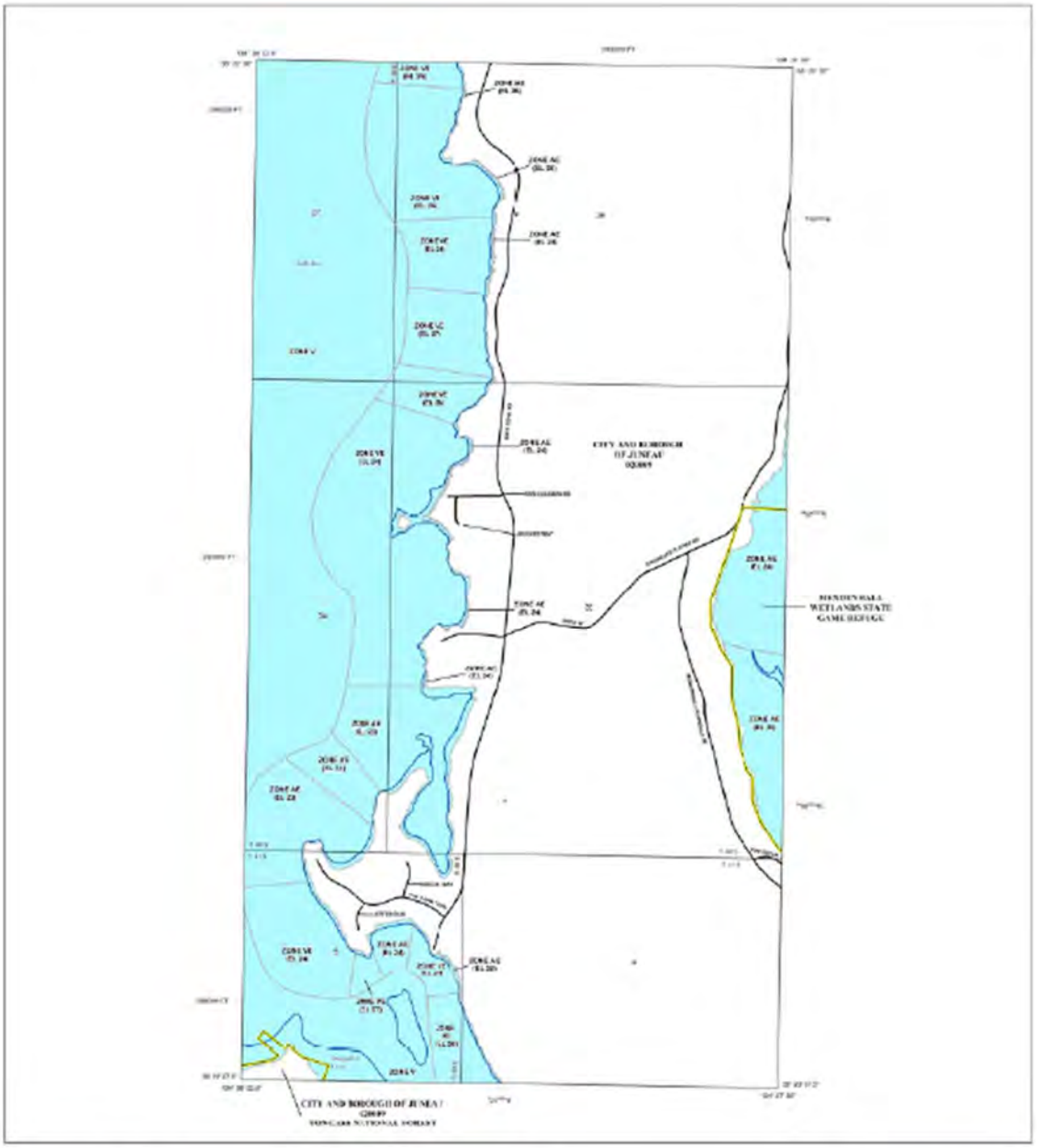
PANEL LOCATOR

FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2334

SEPTEMBER 16, 2009



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

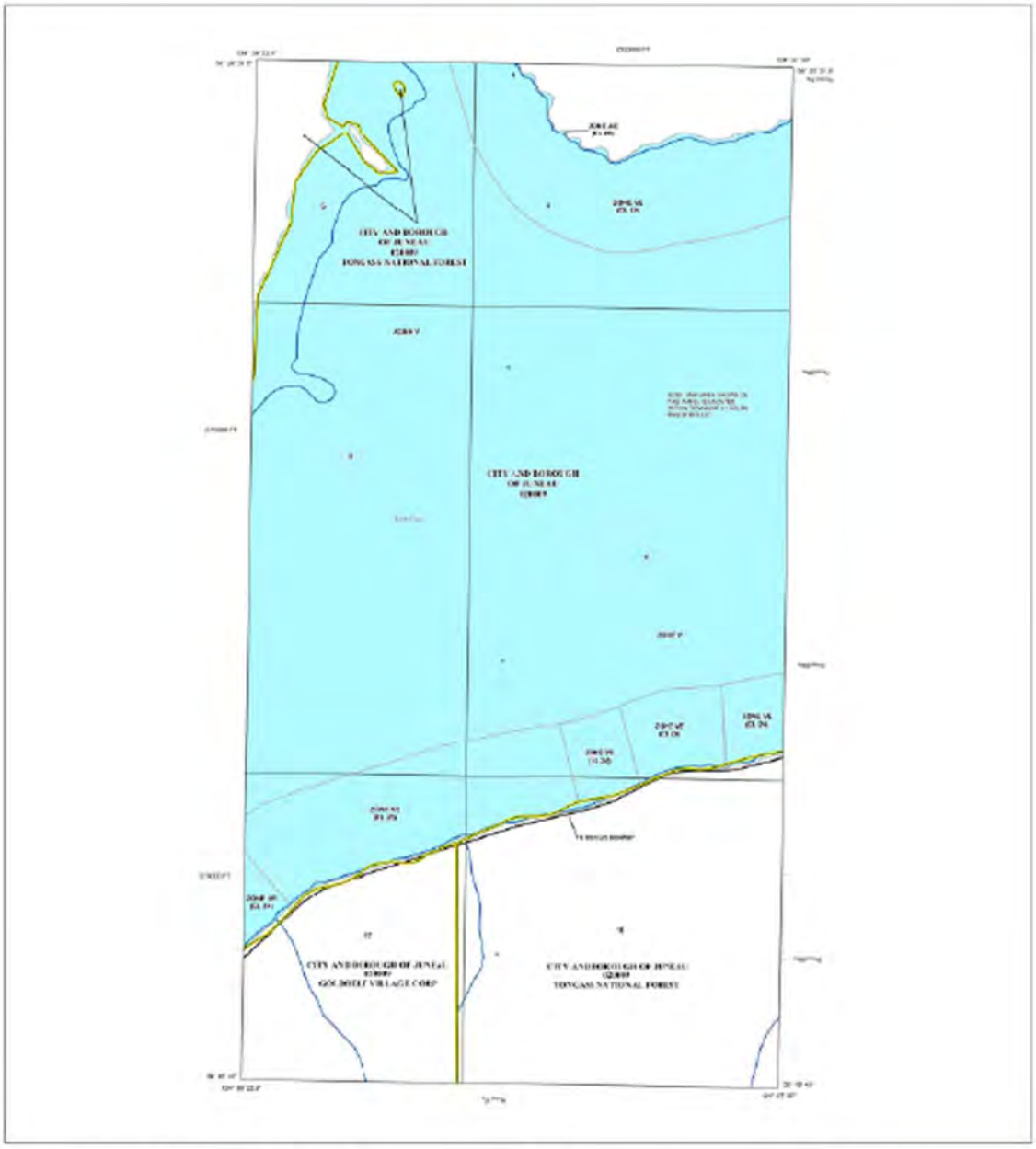
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1507 OF 2709

2334

SEPTEMBER 18, 2009



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

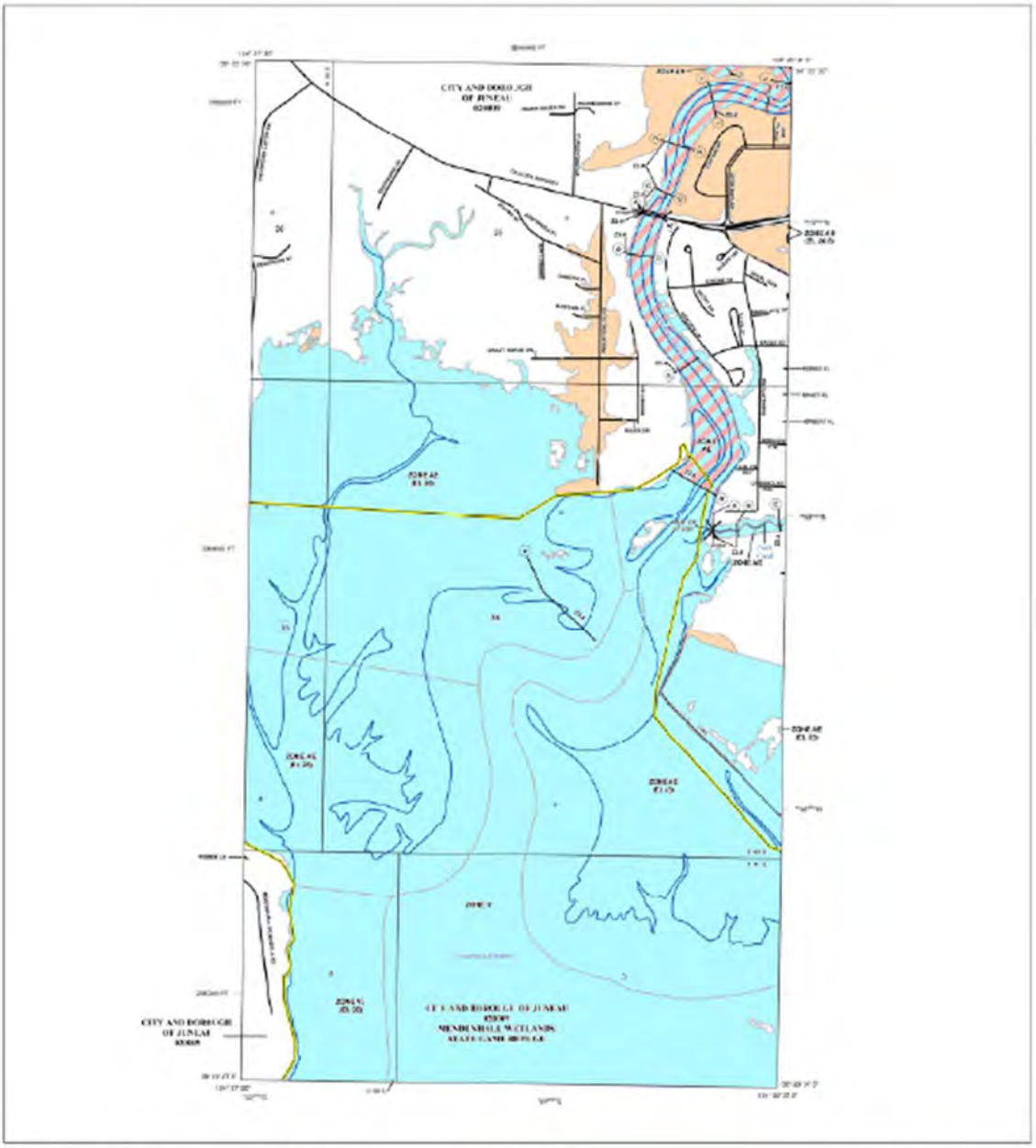
FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1509 of 2700

2334

SEPTEMBER 18, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

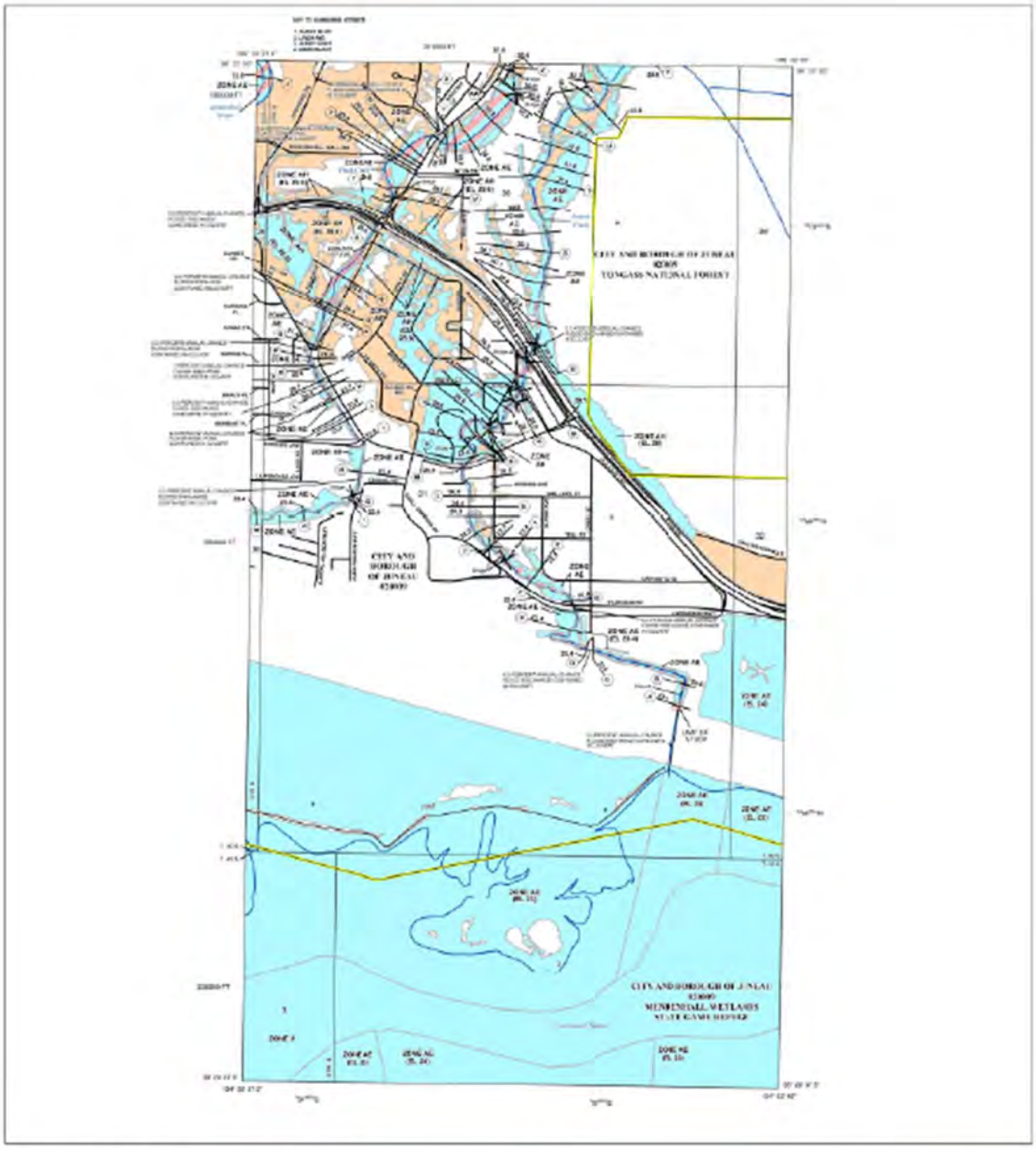
FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1524 OF 2700

SEPTEMBER 18, 2020



FLOOD HAZARD INFORMATION

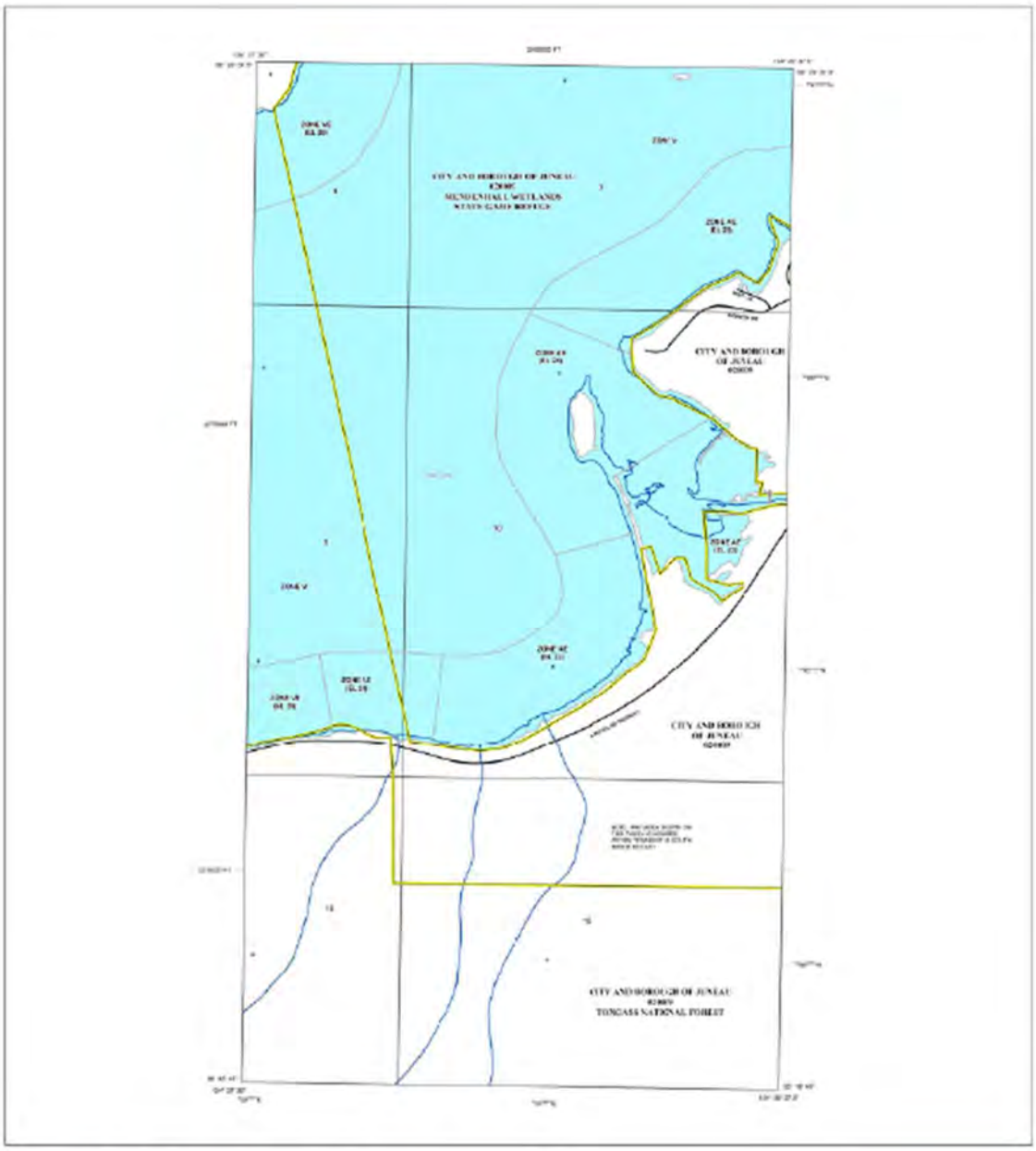
NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program



FLOOD HAZARD INFORMATION

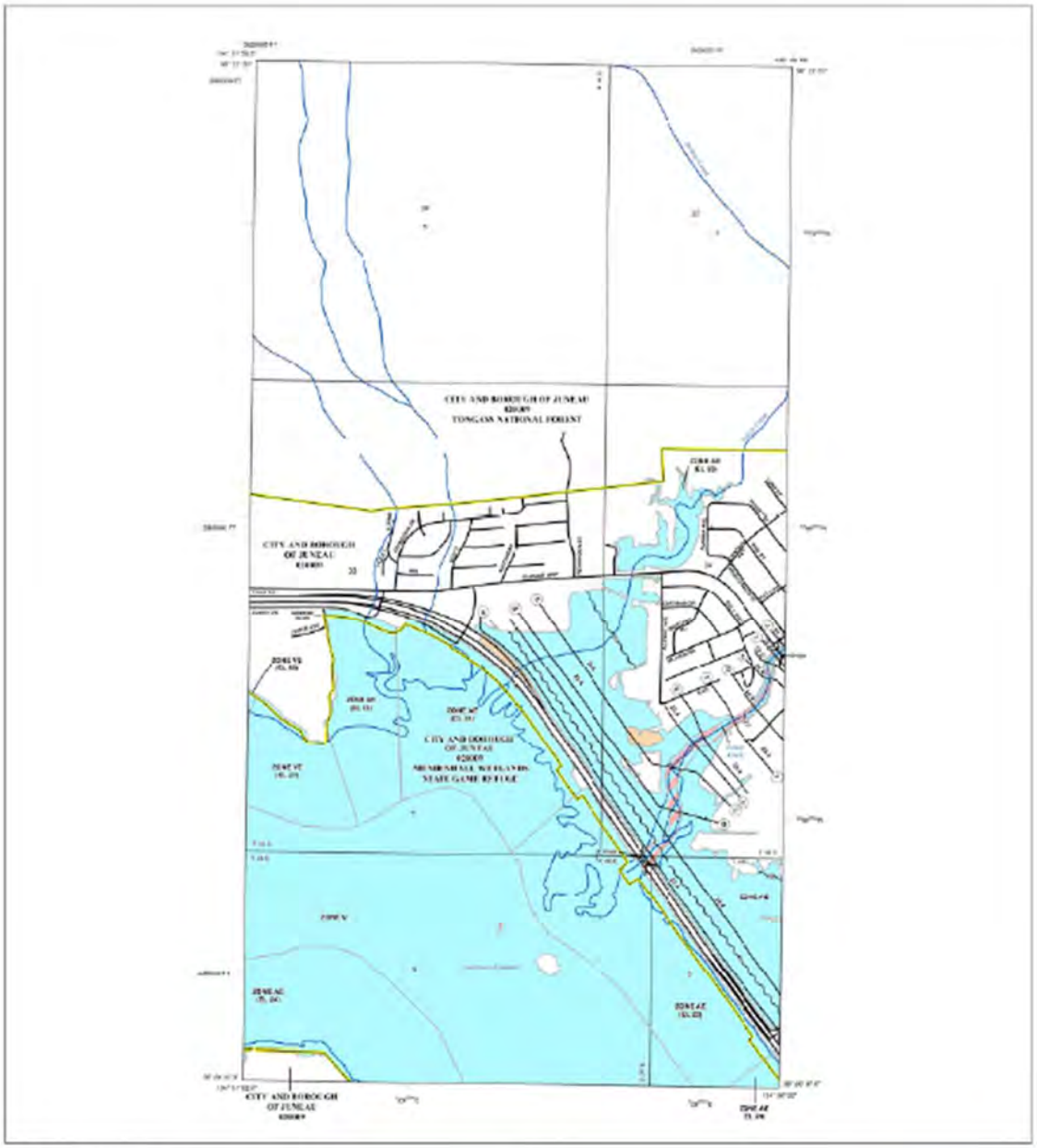
NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program



FLOOD HAZARD INFORMATION

THE INFORMATION DEPICTED ON THIS MAP AND IN FUTURE REVISIONS AND AMENDMENTS MAY BE VIEWED AND PLOTTED ONLINE AT: HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS

- Inundated by 1% Annual Chance Flood
- Regulatory Floodway

0.2% ANNUAL CHANCE FLOOD HAZARD

- Inundated by 0.2% Annual Chance Flood
- Area of Undetermined Flood Hazard

OTHER AREAS

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Cross Section with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)

MAP REPOSITORIES

- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

SCALE

N

1 inch = 400 feet 1:4,800

0 600 1,200 2,400 Feet

0 175 350 700 Meters

PANEL LOCATOR

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

CITY AND BOROUGH OF JUNEAU, AK

FEMA

COMMUNITY	NUMBER	PANEL	SUFFIX
CITY AND BOROUGH OF JUNEAU	[illegible]	[illegible]	E

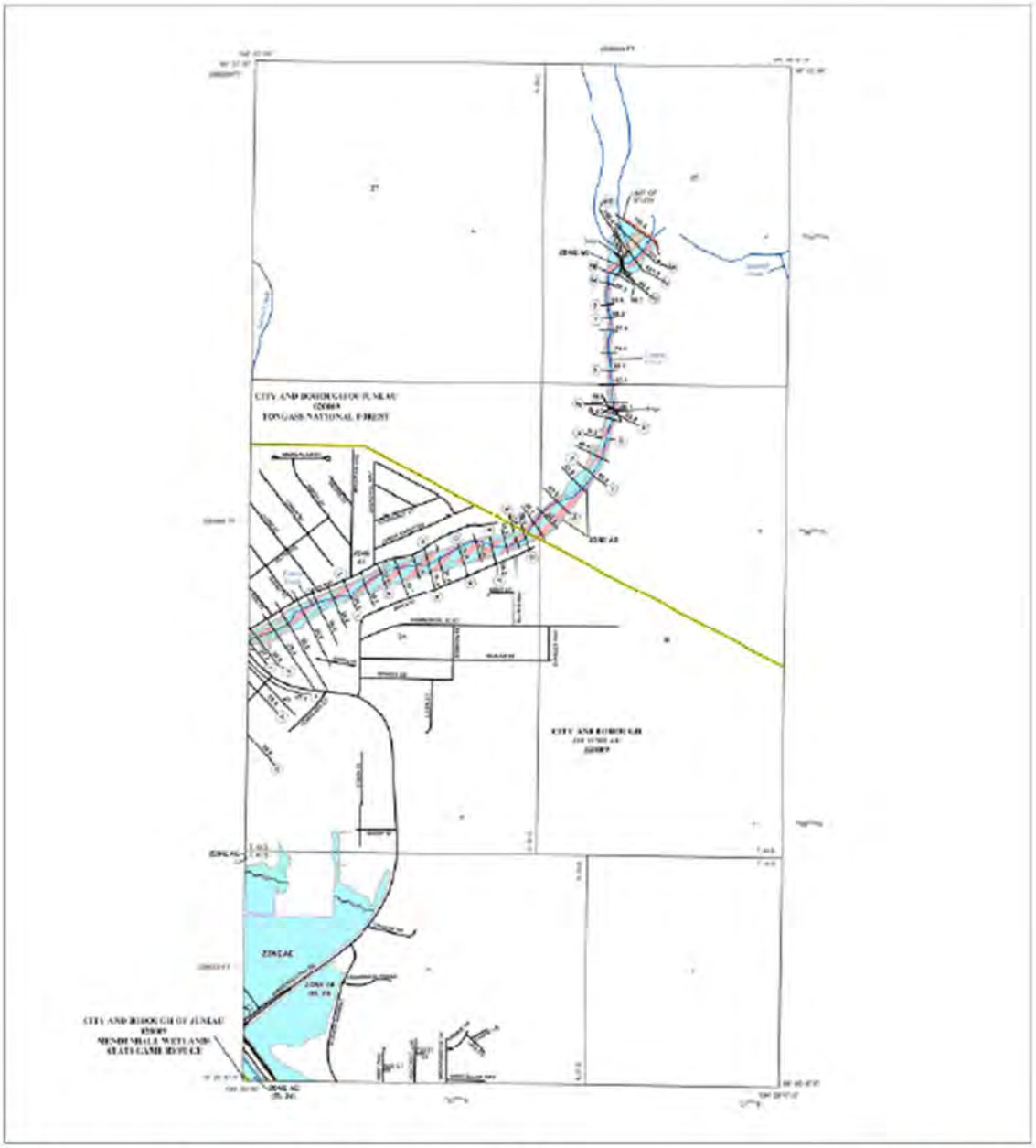
PANEL 1532 of 2700

FIRM

FLOOD INSURANCE RATE MAP

EFFECTIVE

SEPTEMBER 12, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

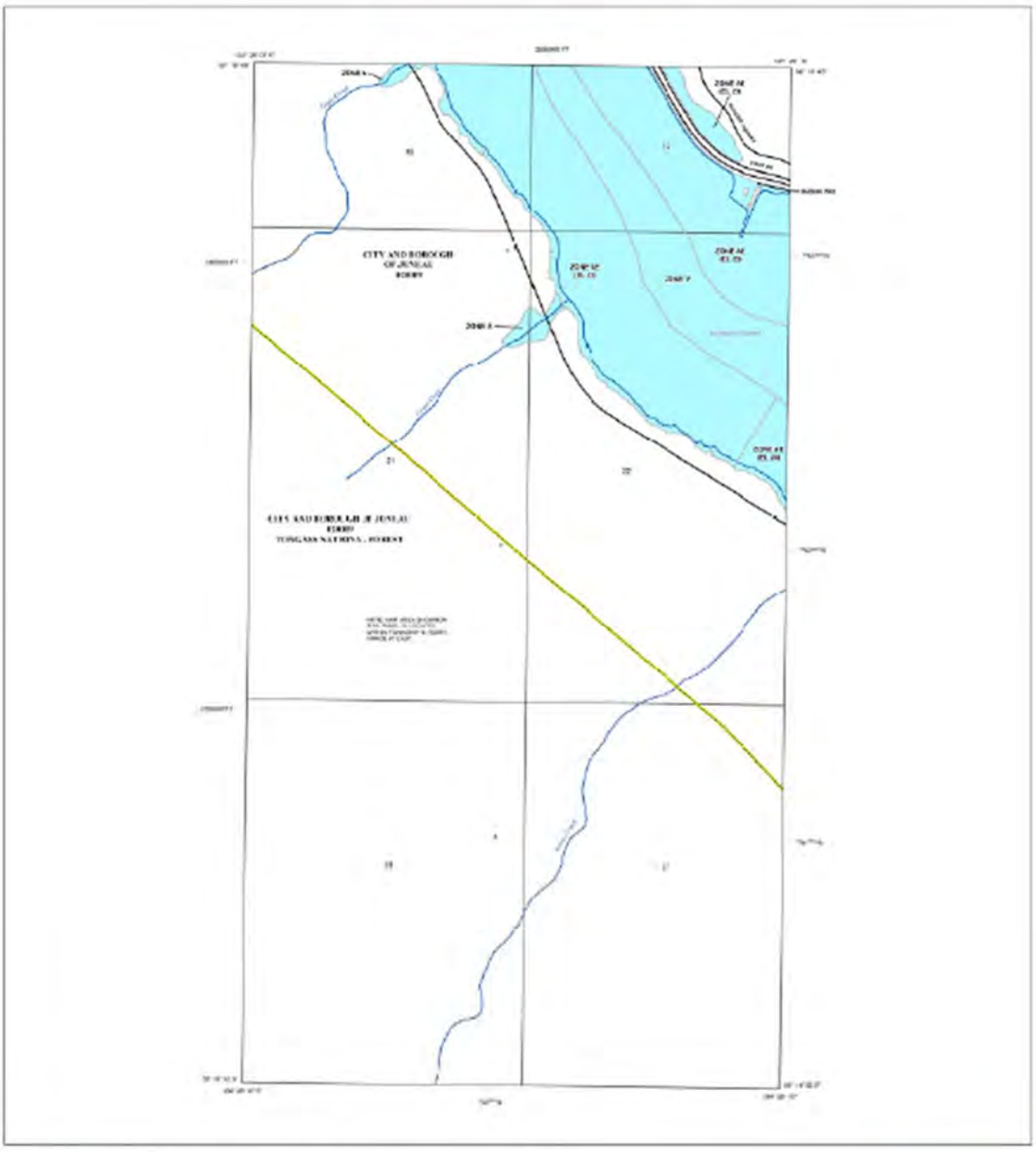
SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

SEPTEMBER 28, 2020



FLOOD HAZARD INFORMATION

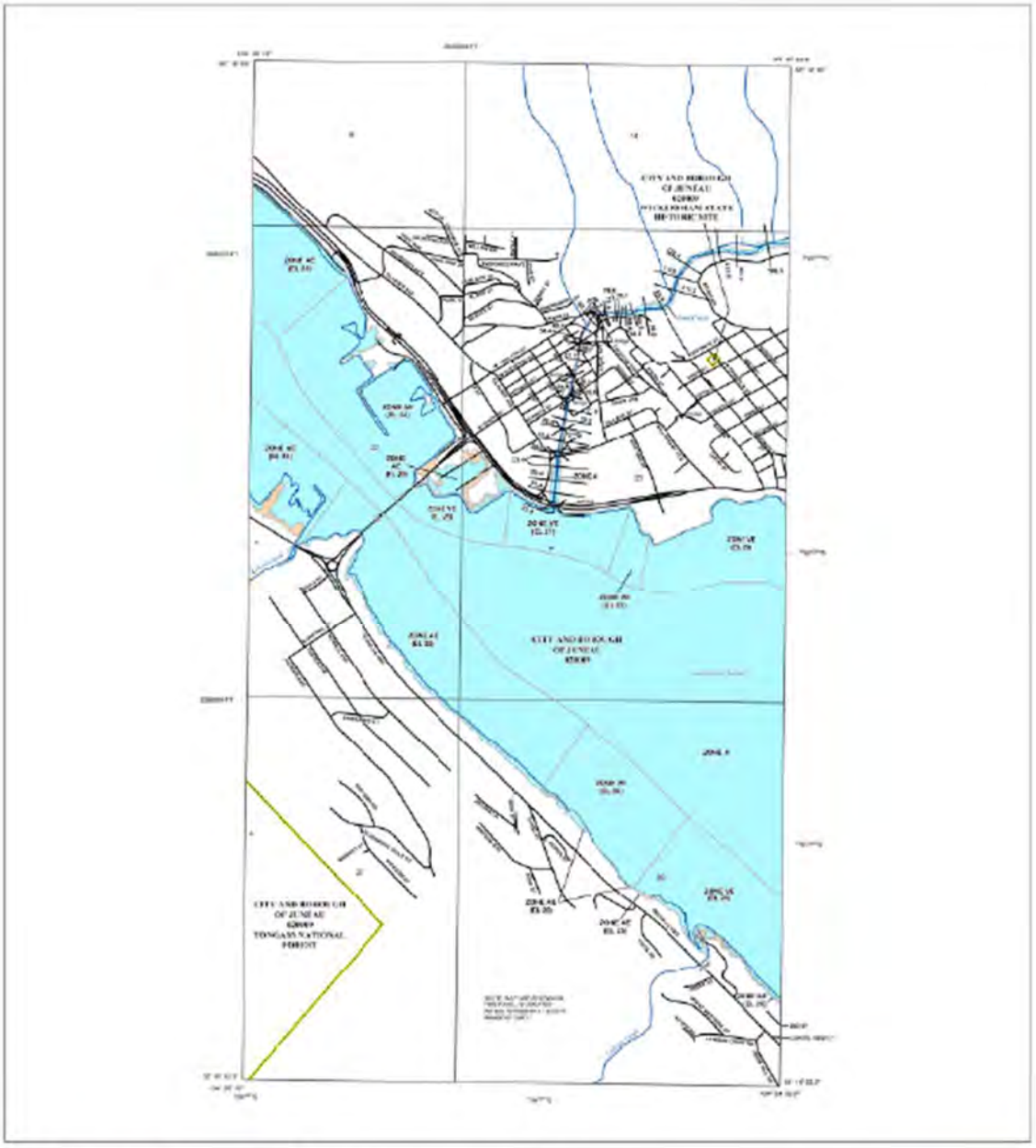
NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA
National Flood Insurance Program

SEPTEMBER 18, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

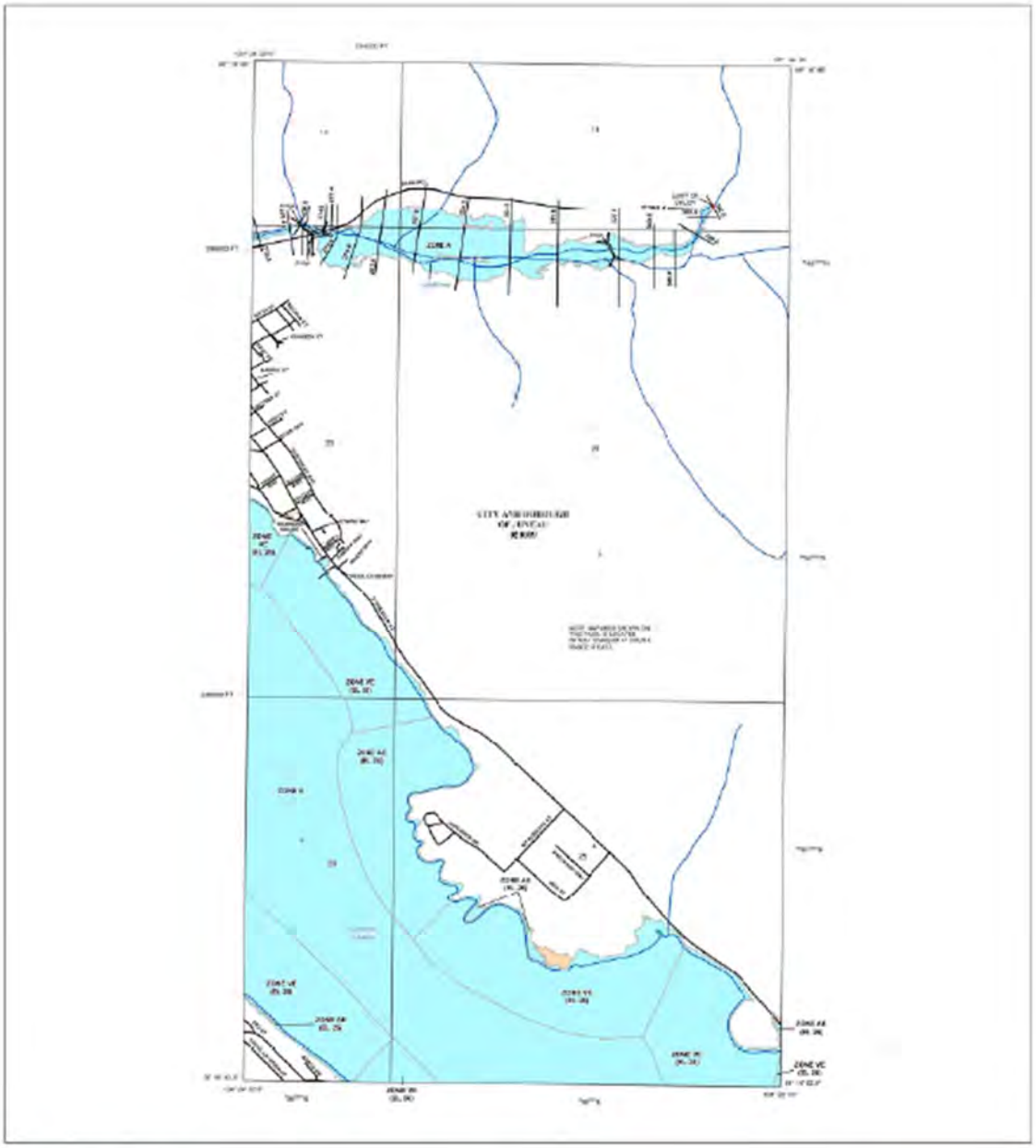
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

1506 2700

2334

SEPTEMBER 28, 2020



FLOOD HAZARD INFORMATION

NOTES TO USERS

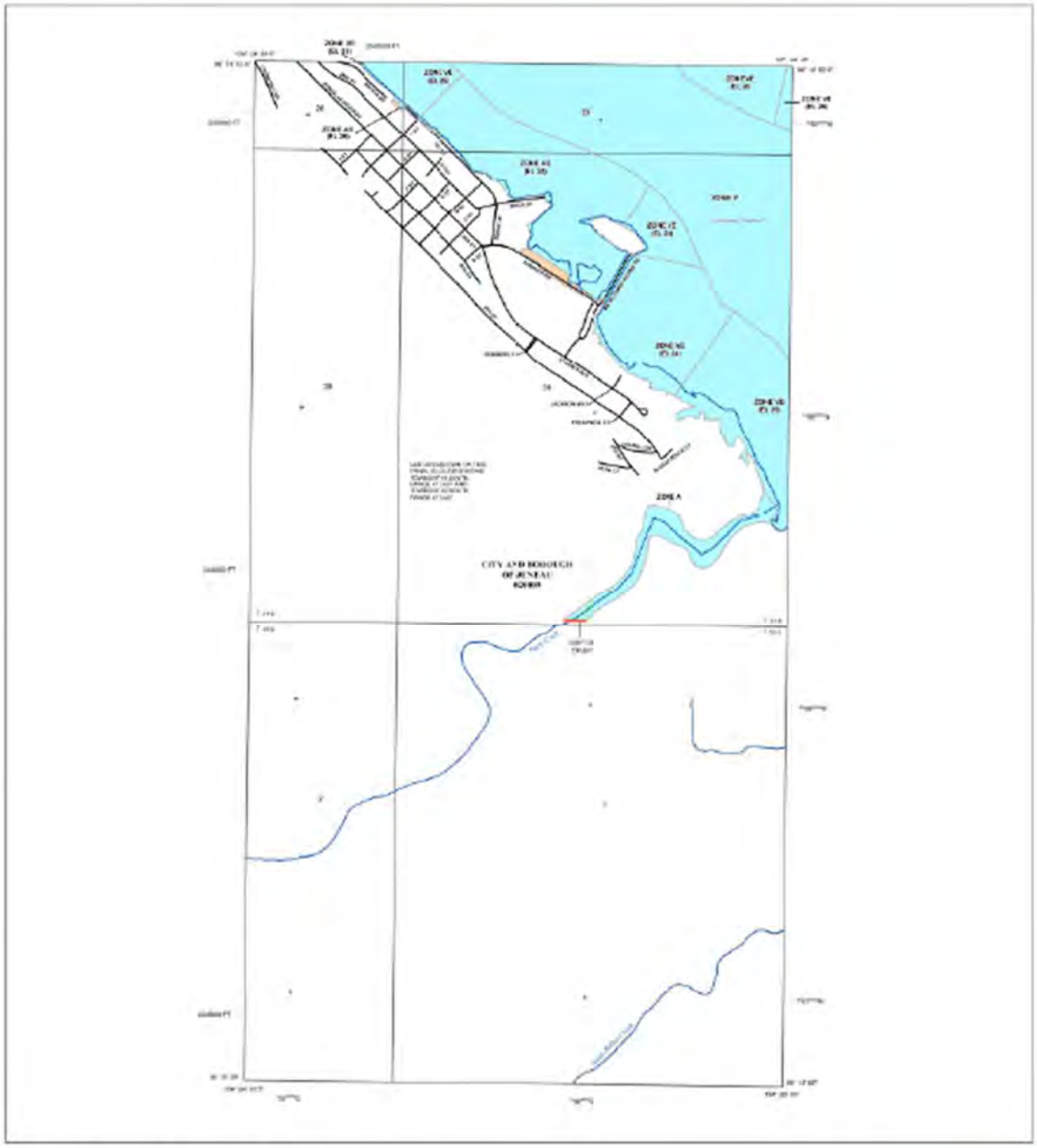
SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

SEPTEMBER 18, 2009



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

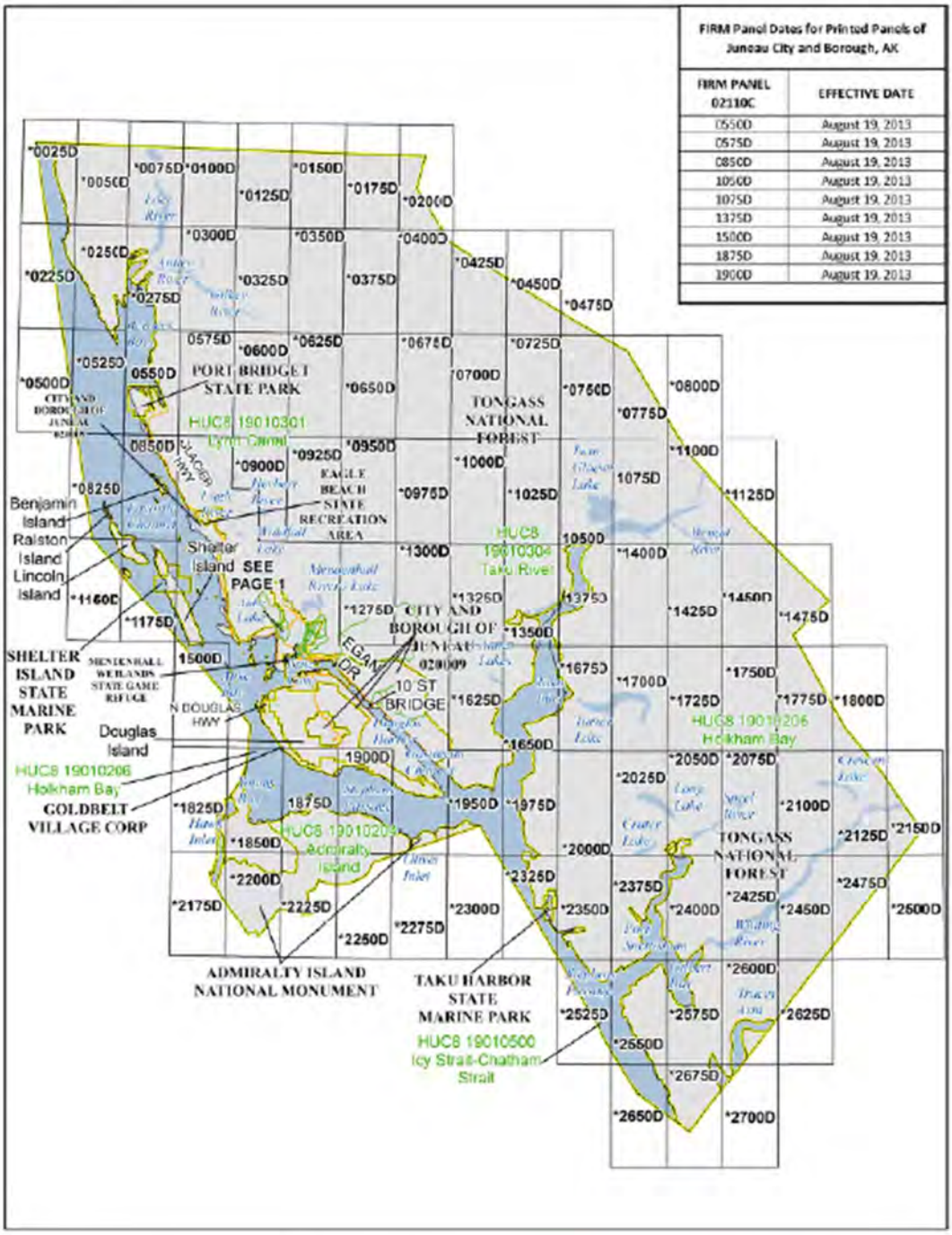
NATIONAL FLOOD INSURANCE PROGRAM

CITY AND BOROUGH OF JUNEAU, AK

PANEL 2704 OF 2709

SEPTEMBER 18, 2020

NATIONAL FLOOD INSURANCE PROGRAM
FEMA



1 inch = 8 miles

Map Projection:
NAD 1983 StatePlane Alaska 1 FIPS 5001 Feet
North American Datum of 1983

HTTP://MSC.FEMA.GOV

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

CITY AND BOROUGH OF JUNEAU, AK

FEMA

MAP NUMBER 02110C0000

MAP REVISED SEPTEMBER 28, 2020

BASE DATA			1-PCT-ANNUAL-CHANCE EXPOSURE			
CITY AND BOROUGH OF JUNEAU (AND GEOGRAPHIC AREAS)	TOTAL STRUCTURES	TOTAL VALUE	STRUCTURES EXPOSED IN A SPECIAL FLOOD HAZARD AREA	PERCENT OF STRUCTURES EXPOSED IN A SPECIAL FLOOD HAZARD AREA	EXPOSED VALUE (BUILDING AND CONTENTS)	PERCENT OF EXPOSED VALUE (BUILDING AND CONTENTS)
City and Borough of Juneau	**8,466**	**$4.4 B**	**208**	**2.46%**	**$115.5 M**	**2.65%**
Airport	39	$22.9 M	1	2.56%	$2.7 M	9.40%
Auke Bay	119	$618 M	1	<1%	$254 K	<1%
Douglas	431	$187.1 M	4	<1%	$1.7 M	<1%
East Valley	3,310	$1.4 B	72	2.18%	$32.5 M	2.32%
Glacier Hwy Past Cohen Dr	68	$21.3 M	17	25.00%	$5.3 M	25.08%
Glacier Hwy to Waydelich Creek	521	$226.9 M	23	4.41%	$18.8 M	8.30%
Juneau	894	$728 M	17	1.90%	$22.2 M	3.01%
Lemon Creek	459	$279.4 M	4	<1%	$798 K	<1%
Mendenhall Peninsula	313	$142.6 M	15	4.79%	$6.9 M	4.85%
North Douglas	561	$216.5 M	15	2.67%	$4.6 M	2.11%
Other Areas	84	$222.2 M	10	11.90%	$1.7 M	<1%
Remote Douglas	31	$3.3 M9	2	6.45%	$631 K	19.31%
Remote Mainland	2	$8.2 M	-	-	-	-
Salmon Creek to Vanderbilt Hill	360	$231 M	6	1.67%	$8.3 M	3.57%
Shelter Island	49	$5.7M	-	-	-	-
Switzer Creek	67	$50.7 M	1	1.49%	$252 K	<1%
Thane	68	$25.6 M	1	1.47%	$283 K	1.10%
West Juneau	362	$170.4 M	1	<1%	$2 M	1.18%
West Valley	728	$347.6 M	18	2.47%	$6.6 M	1.88%

"-" Indicates that no risk was identified.

Source: FEMA Flood Insurance Study 2020

APPENDIX F – HAZARD HISTORY DETAIL

APPENDIX F – HAZARD HISTORY DETAIL

Contents

1. EARTHQUAKE HISTORY 1
2. SEVERE WEATHER HISTORY 7
3. WILDLAND AND URBAN FIRE HISTORY 31
4. LANDSLIDE HISTORY 34
5. TSUNAMI HISTORY 39
6. FLOOD HISTORY 44
7. SHORELINE/BANK DESTABILIZATION HISTORY 61
8. CHANGES IN CRYOSPHERE HISTORY 63
9. VOLCANO HISTORY 68
10. DAM FAILURE (HIGH HAZARD AND SIGNIFICANT HAZARD DAMS) HISTORY 70
11. CYBERSECURITY HISTORY 71
12. HAZARDOUS MATERIALS RELEASE HISTORY 76

LIST OF FIGURES

Figure 1- Historical Alaska Earthquakes M5.0 and Greater, 1900 – March 15, 2025 4
Figure 2- Map of Alaska's Recorded Earthquakes in 2024 5
Figure 3- Historical Earthquakes M4.0 and Greater Within 100 miles of Juneau and Traditional Lands of Tlingit & Haida 6
Figure 4- Atmospheric River Affecting SE Alaska, December 1, 2020 7
Figure 5- Atmospheric River Affecting SE Alaska, January 21, 2022 8
Figure 6- Weather Warnings Issued Due to an Atmospheric River Event, January 21, 2022 8
Figure 7- Lightning Strike Overlooking Downtown Juneau, June 2013 10
Figure 8- Juneau and Traditional Lands of Tlingit & Haida Historical Drought Monitor Conditions (2000 – April 2025) 12
Figure 9- Prolonged Dry Periods in SE Alaska, 1950s, 70, 90s, 2000s 13
Figure 10- Historical SE Alaska Droughts Compared to the 2016-2019 Drought 14
Figure 11- Historical Wildfire Locations near Juneau and Traditional Lands of Tlingit & Haida (1950-2024) 32
Figure 12- Smoke Pouring out of the Roof of the 108-Year-Old Skinner Building (2004) 33
Figure 13- Historical Subaerial Landslides in Juneau and Traditional Lands of Tlingit & Haida 37
Figure 14- Historical Gully Landslides in and near Downtown Juneau 38
Figure 15- Historical Debris Landslides in and near Downtown Juneau 39
Figure 16- Map of Known Tsunamis in SE Alaska 40
Figure 17- Path of the 2016 Alpine Tsunami at Cowee Creek in Juneau 42
Figure 18- Tulsequah Glacier (2005) 44
Figure 19- Location of Suicide Basin and the Mendenhall Lake/River System 45
Figure 20- Mendenhall Glacier and Suicide Glacier retreat comparison: 1893 and 2018 46
Figure 21- GLOF Pours from underneath Mendenhall Glacier to overflow Mendenhall Lake 47
Figure 22- Water Level Before 2011 GLOF Drainage Event in Suicide Basin 47
Figure 23- USGS Suicide Basin USGS Monitoring 48
Figure 24- A flooded footpath near the Mendenhall Visitor Center due to GLOF, 2016 48
Figure 25- Streamflow at Mendenhall Lake during August 2023 GLOF 49
Figure 26- Flooding on Marian St. During the 2023 GLOF Event 50
Figure 27- Streamflow at Mendenhall Lake during August 2024 GLOF 51
Figure 28- Glacial Lake Outburst Flood, August 2024 51
Figure 29- Glacial Lake Outburst Flood in Mendenhall Valley, August 2024 52
Figure 30- Glacial Lake Outburst Flood in Mendenhall Valley, August 2024 52
Figure 31- Damages of Home on Meander Way from August 2024 GLOF 53
Figure 32- Cars Submerged in Flood Waters from August 2024 GLOF 54
Figure 33- Juneau Icefield Recession 63
Figure 34- Mendenhall Glacier Retreat and Formation of Suicide Basin Lake 64
Figure 35- Comparisons of Erupted Magma Volumes from Historical Volcanic Eruptions 68
Figure 36- Areas Impacted by Historical Alaska Volcanic Ashfall Events 69
Figure 37- Number of Global Cyber Events (2003-2022) 74

LIST OF TABLES

Table 1- Historical Earthquakes (M5.0 and greater within 100 miles of Juneau and Traditional Lands of Tlingit & Haida) 2

Table 2- Historical Severe Weather Events in Juneau and Traditional Lands of Tlingit & Haida (1996 – November 2024) 15

Table 3- Historical Wildfires (0.5 acres and Greater) within the Juneau and Traditional Lands of Tlingit & Haida Planning Area (1939-2024) 31

Table 4- Historical Subaerial Landslides in Juneau and Traditional Lands of Tlingit & Haida 34

Table 5- Historical Tsunami Events with Runup Recorded in Juneau and Traditional Lands of Tlingit & Haida (1800 – May 2025) 43

Table 6- Historical Flood Events in Juneau and Traditional Lands of Tlingit & Haida 54

Table 7- History of Shoreline/Bank Destabilization Events in Juneau and Traditional Lands of Tlingit & Haida 61

Table 8- Historical Avalanches in Juneau and Traditional Lands of Tlingit & Haida 65

Table 9- Global Historic Cyber Events with Losses Exceeding $1M USD (2003- June 2024) 71

Table 10- State of Alaska Historic Cyber Events 74

1. EARTHQUAKE HISTORY

Approximately 11% of the world's earthquakes occur in Alaska, making it one of the most seismically active regions in the world. Two of the ten largest earthquakes in the world since 1900 have occurred here (M9.2 1964 Good Friday Earthquake in Prince William Sound and M8.7 1965 Rat Islands Earthquake in the Aleutian Islands). Earthquakes of magnitude 7 or greater occur in Alaska on average of about once a year; magnitude 8 earthquakes average about 14 years between events (USGS, 2025).

Approximately 75% of Alaska's detected earthquakes occur in the Alaska Peninsula, Aleutian Islands, and the Anchorage area. About 15% occur in Southeast Alaska and the remaining 10% occur in the Interior. The largest earthquake in recent North American history occurred in the Alaska-Aleutian seismic zone. The M9.2 event now known as the 1964 Good Friday Earthquake lasted between four and five minutes and was felt over an 800,000 square mile area. It caused a significant amount of ground failure in Anchorage, as well as triggering landslides and tsunamis resulting in major damage throughout the region. Even though the earthquake was felt as far as Seattle, there was no reported damage in Juneau and Traditional Lands of Tlingit & Haida. The megathrust zone where the North Pacific Plate plunges beneath the North American Plate still has the potential to generate earthquakes up to magnitude 9.0.

Earthquakes in Southeast Alaska

Approximately 15% of Alaska's earthquakes occur in Southeast Alaska. Of particular interest are the large events that have occurred on the strike-slip faults associated with the Queen Charlotte- Fairweather fault system. This plate boundary between the North American plate and the Pacific plate is very analogous to the well-known San Andreas fault system in California and is essentially a northward extension of the right-lateral motion as the two plates slide past each other.

Although all the well recorded historic shocks larger than magnitude 7.0 have occurred on the main plate boundary, significant seismicity occurs eastward of the Queen Charlotte-Fairweather fault system. For example, seismicity follows the southern end of the Denali fault system and has produced historic earthquakes up to at least magnitude 6.5. The Denali fault appears to join to the Chatham Strait fault system and continue past the Juneau and Traditional Lands of Tlingit & Haida area. While little historic seismicity is associated directly with the Chatham Strait fault, there is sufficient geologic evidence of activity to consider this fault as a capable fault for a planning scenario earthquake due to its proximity to the population center in Juneau.

Historically large events include a magnitude 8.1 earthquake in 1949 and the magnitude 7.8 event in 1958 that triggered the giant tsunami wave in Lituya Bay. In recent years, Southeast Alaska has experienced several large earthquakes, recording a magnitude 7.5 earthquake in 2013, and a magnitude 6.0 earthquake in 2014.

1958 Lituya Bay Earthquake

On July 9, 1958, a 7.8-8.3 magnitude earthquake occurred in Lituya Bay, 116 miles northwest of Juneau and Traditional Lands of Tlingit & Haida. The earthquake was felt throughout Southeast Alaska, with prolonged ground shaking for about 3–4.5 minutes. The earthquake was caused by a strike-slip on the Fairweather fault and triggered a landslide of 30 million cubic meters and 90 million tons of rock/land was displaced in the narrow inlet of Lituya Bay. The sudden displacement triggered a megatsunami that was felt throughout the region.

Most impacts from this earthquake and resultant tsunami were felt in Yakutat and surrounding areas. No impacts to Juneau and Traditional Lands of Tlingit & Haida were reported.

More information on the megatsunami can be found in Section 3.3.5.

1964 Good Friday Earthquake

Alaska's strongest earthquake, and the second largest earthquake in the world, occurred on March 27, 1964, in Prince William Sound and was magnitude M9.2. Like most earthquakes in Alaska, this one occurred near the Alaska-Aleutian subduction zone and was felt by many residents throughout the State. This earthquake had its most devastating effect on Anchorage in Southcentral Alaska, and the effects were felt as far as California, resulting in tsunamis, landslides and 139 fatalities overall. The earthquake had little impact in Southeast Alaska, with no damages or injuries reported.

1979 M7.1 Saint Elias Earthquake

On February 28, 1979, a M7.1 earthquake occurred beneath the Chugach and St. Elias Mountains of southeastern Alaska approximately 400 miles from Juneau and Traditional Lands of Tlingit & Haida. A total of 308 aftershocks occurred between February 28 and March 31, 1979, which occurred in a broad zone that extends about 71 miles southeast from the epicenter, with the highest rate of activity centering about 31 miles southeast of the epicenter. Due to the remote location of the epicenter, there was minimal recorded damage, and no casualties reported, but the earthquake was felt as far south as Juneau and Traditional Lands of Tlingit & Haida. In the Mendenhall subdivision of Juneau, several instances of cracked plaster and shifted furniture were reported. The earthquake also had impacts to the Juneau Airport, with deplaning passengers having difficulty standing (USGS, 1979).

Reliable data in the seismology of Alaska has been recorded only since 1973 for most locations, and this makes the data relatively young compared to other areas. Obtained for the U.S. Geological Survey (USGS) and the archives of the UAF Geophysical Institute, State of Alaska, the information provided is based on the best-known data. Thorough research was conducted for all events since 1950 (1950-1972 data is less reliable than current data) and up to the present within the earthquake database of the USGS.

Table 1 lists the historical earthquakes M5.0 and greater that occurred within 100 miles of Juneau and Traditional Lands of Tlingit & Haida. The historical earthquake data was pulled from the USGS Earthquake Catalog from 1800, through the spring of 2025.

Since 1800, there have been 16 recorded earthquakes M5.0 and greater within 100 miles of Juneau and Traditional Lands of Tlingit & Haida. Since the 2012 HMP, there have been 4 earthquakes, M5.0 or greater, that occurred within 100 miles of Juneau and Traditional Lands of Tlingit & Haida.

Table 1- Historical Earthquakes (M5.0 and greater within 100 miles of Juneau and Traditional Lands of Tlingit & Haida)

Date	Latitude	Longitude	Magnitude
09/17/1899	59	-136	6.9
10/24/1927	57.711	-136.485	7.24
12/31/1927	57.371	-137.13	6.06
3/9/1952	58.902	-136.942	6.09
7/10/1958	58.23	-136.712	7.8
9/15/1985	59.102	-136.423	5.9
11/14/1987	58.961	-135.241	5
7/11/1990	59.325	-136.47	5.5
6/24/1991	58.345	-136.8588	5.6
1/6/2000	58.04	-136.87	6.1
1/9/2007	59.42	-137.118	5.7
6/7/2009	58.7695	-136.6582	5

Date	Latitude	Longitude	Magnitude
6/4/2014	58.9804	-136.7282	5.2
7/25/2014	58.3354	-136.9711	6
9/1/2019	59.1033	-136.9727	5
10/28/2023	59.0183	-136.4596	5.1

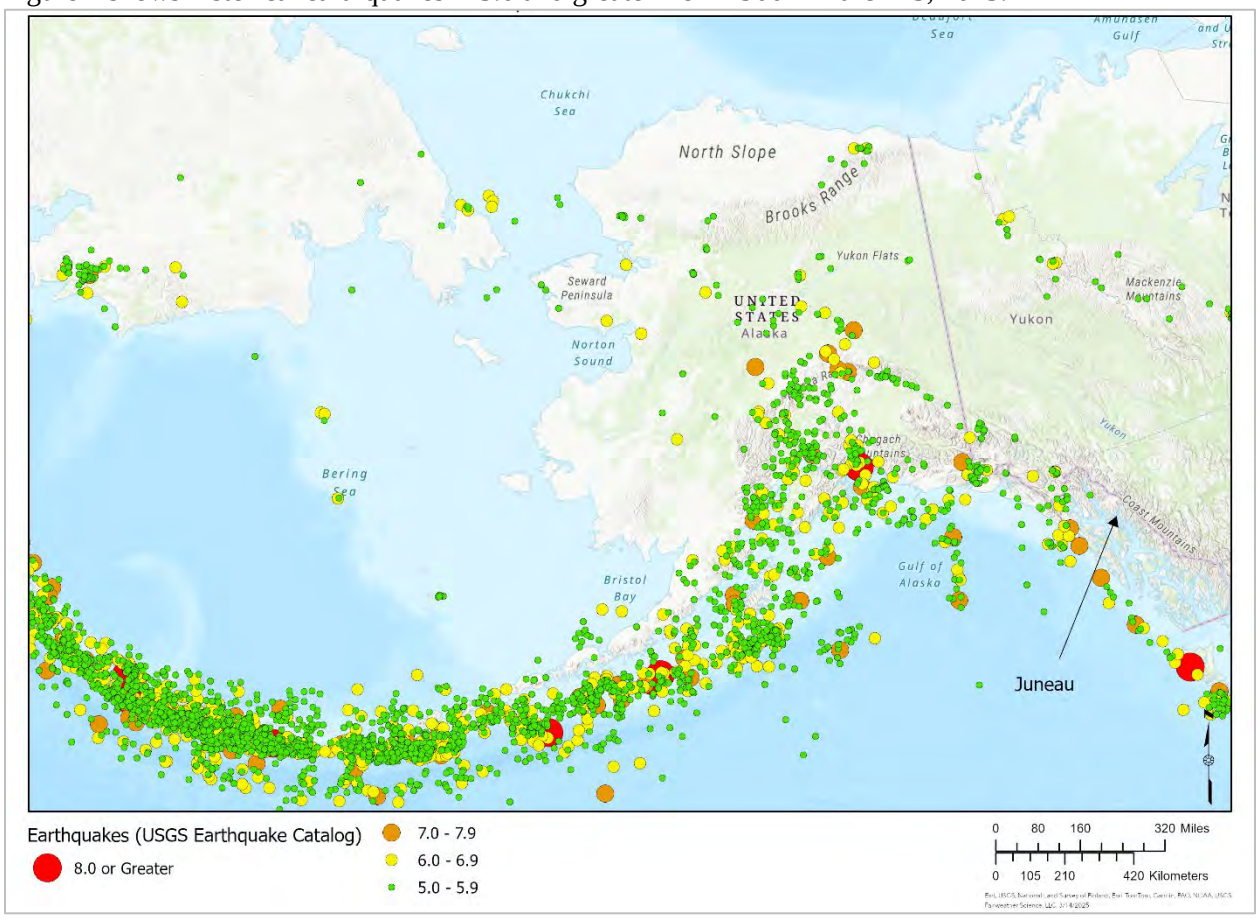
Source: USGS 2025a

Additionally, the January 2025 DHS&EM Disaster Cost Index (DCI) provides historical earthquake disaster declarations that may have impacted Juneau and Traditional Lands of Tlingit & Haida. The index lists the following events:

AK-18-265 2018 November Cook Inlet Earthquake declared by Governor Walker on December 2, 2018, then FEMA declared an Emergency Declaration on November 30, 2018 (EM-3410) then declared a Major Declaration on January 31, 2019 (DR-4413). On November 30, 2018, a major earthquake measured at magnitude 7.0 produced strong seismic shaking that caused widespread and severe damage primarily within the Municipality of Anchorage, Matanuska-Susitna Borough, and Kenai Peninsula Borough. The Municipality of Anchorage and Matanuska-Susitna Borough have each issued local declarations of disaster emergency in response to this event.

The disaster resulted in widespread and severe seismic shaking damage to major highways and critical community roads, bridges, and other transportation infrastructure; undermining of road embankments and railroad tracks, and loss of track base; widespread power, water, and communication disruption; structural collapse and resulting fires to several community buildings; and severe damage to private homes and personal property. These conditions have required local emergency protective measures to protect life and property, including activation and staffing of emergency operations centers; emergency debris clearance of roads and railroad tracks to protect critical infrastructure and maintain access; placement of road barricades to protect roads and bridges; operation of mass shelters for affected residents; school, business, and government office closures.

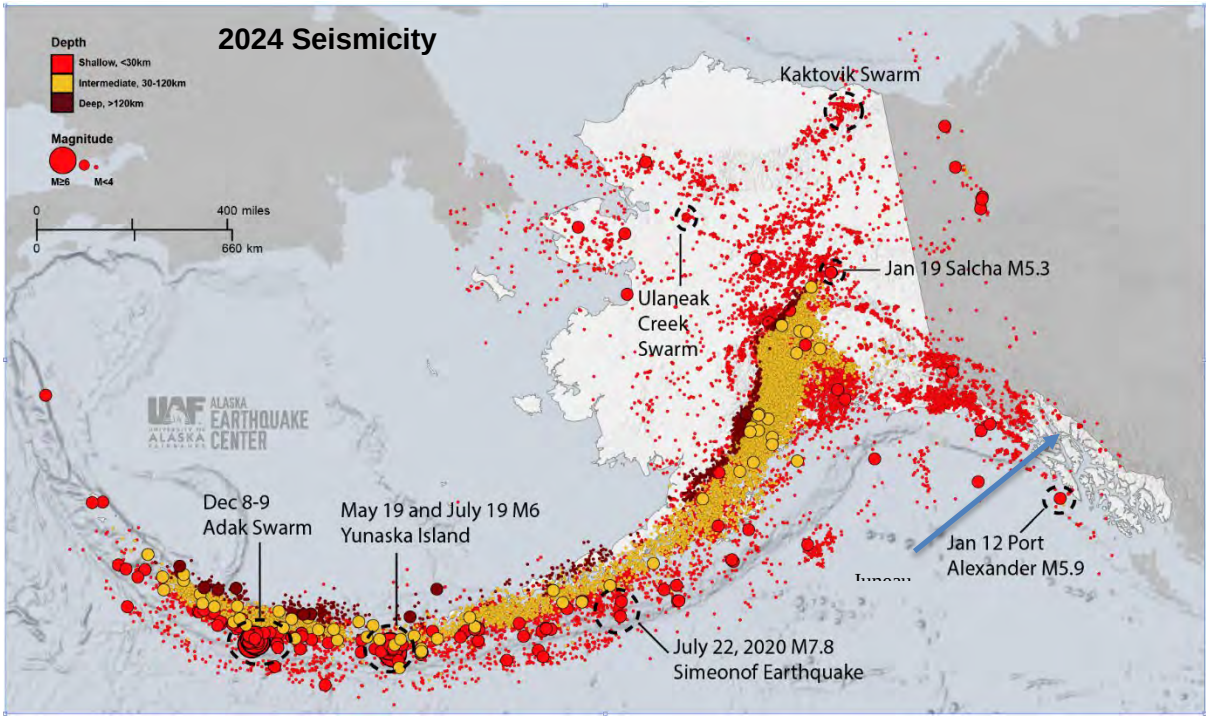
Figure 1 shows historical earthquakes M5.0 and greater from 1900 – March 15, 2025.



Source: USGS Earthquake Catalog

Figure 1- Historical Alaska Earthquakes M5.0 and Greater, 1900 – March 15, 2025

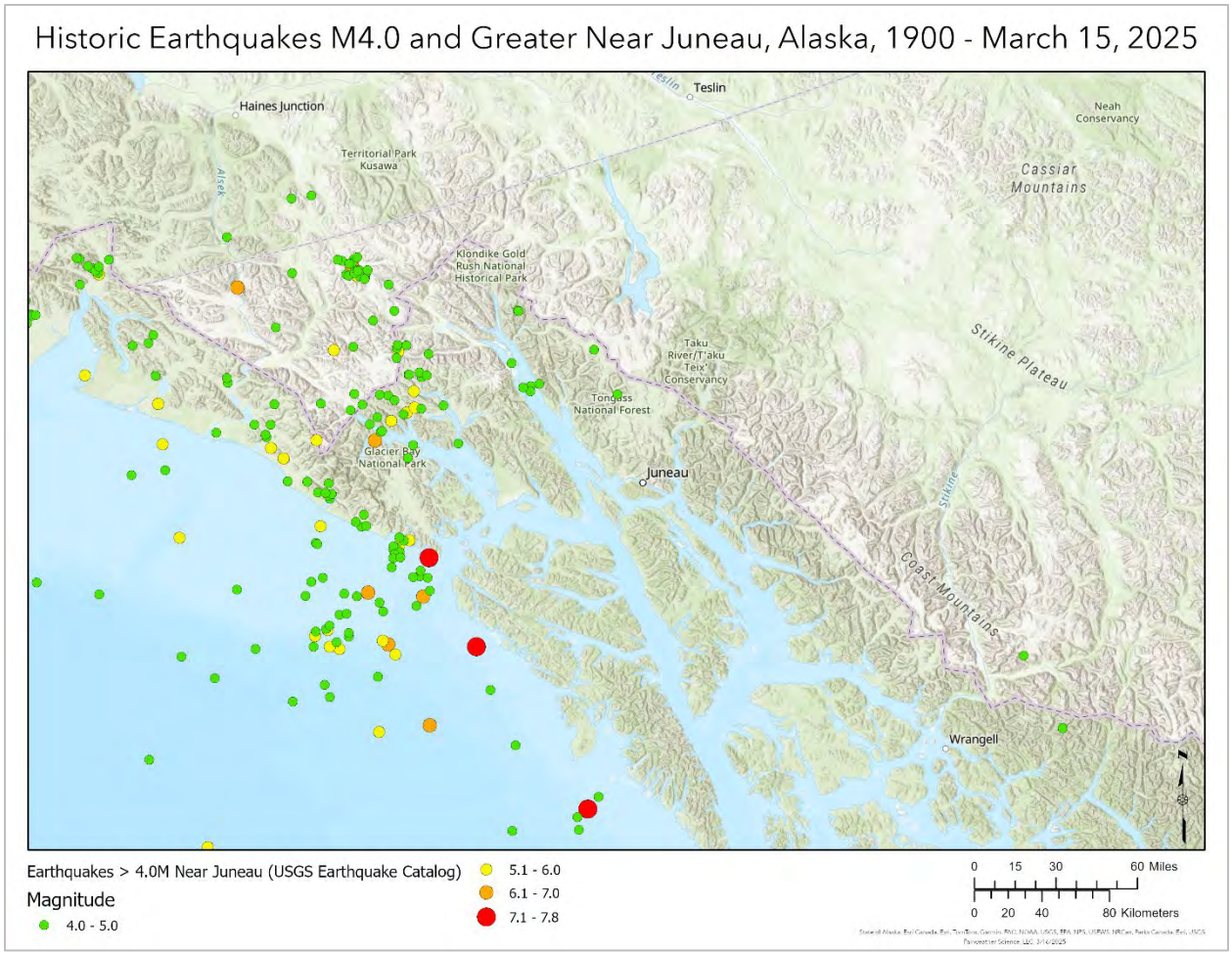
Figure 2 depicts one year of earthquake activity in Alaska during 2024. The Alaska Earthquake Center (AEC) states that "Alaska had a relatively quiet 2024 as far as numbers of seismic events, but several earthquake swarms kept things interesting." (AEC 2025). In 2024, there were a total of 39,836 earthquakes processed by AEC analysts, with an average of 762 reported earthquakes per week, mostly occurring in the Aleutians (AEC 2025). The 2024 total is about 5,700 less than the 2023 total and about 15,000 less than the record-breaking 2018, when AEC analysts processed about 55,000 seismic events (AEC 2025).



Source: AEC 2025

Figure 2- Map of Alaska's Recorded Earthquakes in 2024

Figure 3 depicts historical earthquakes M4.0 and greater within ~100 miles of Juneau and Traditional Lands of Tlingit & Haida.

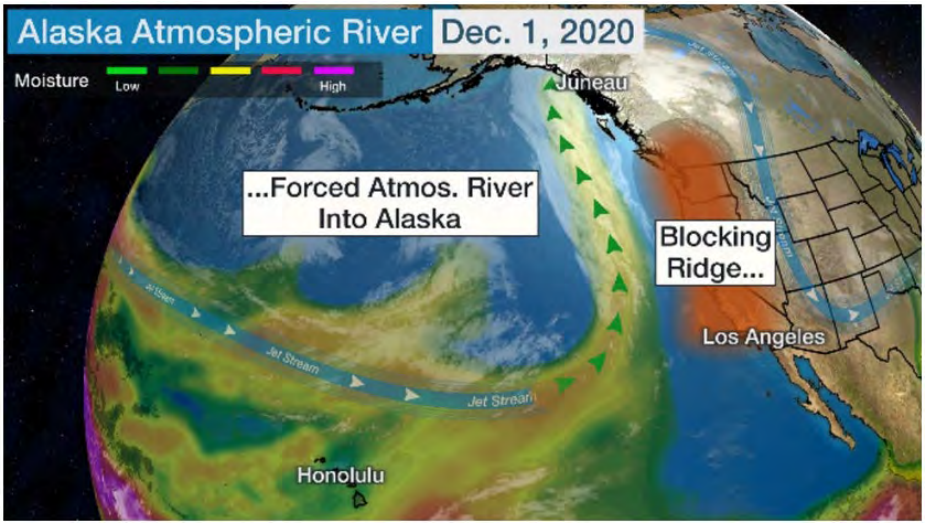


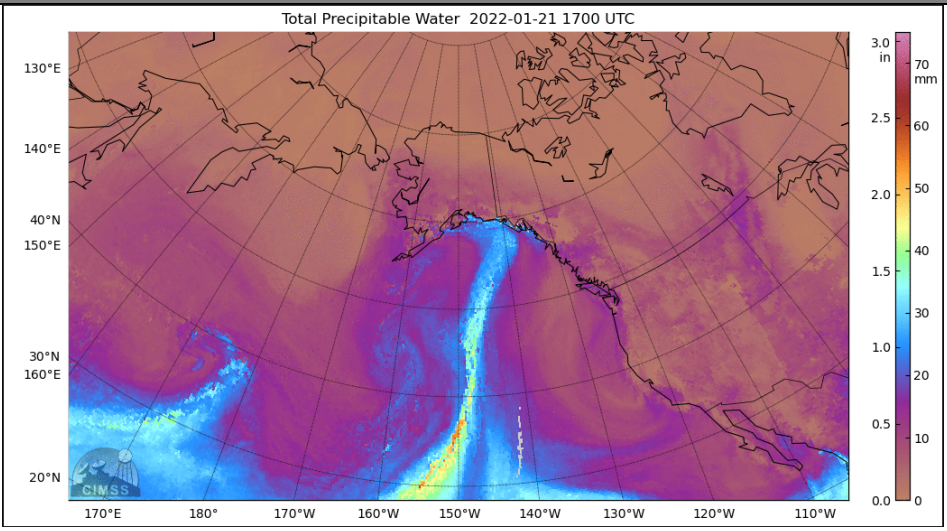
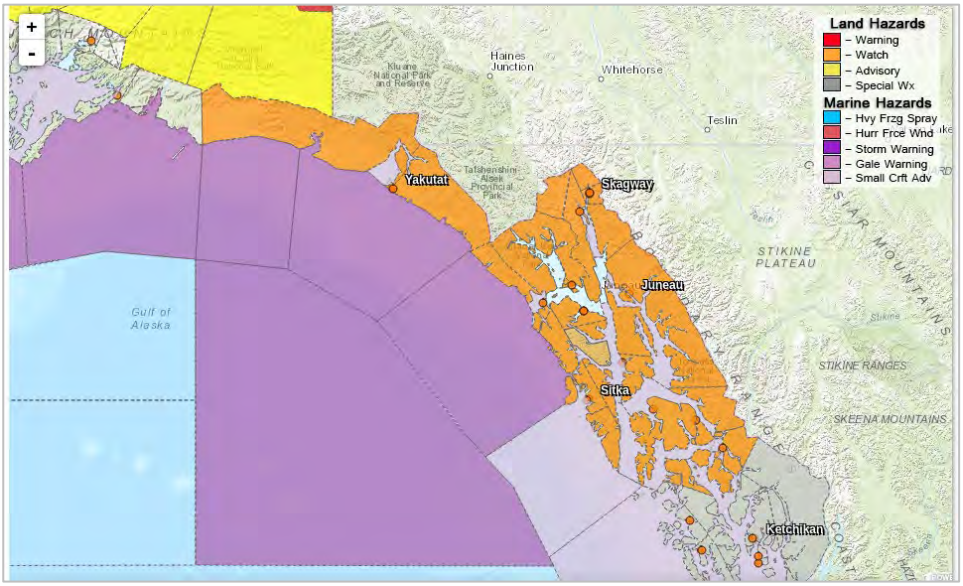
Source: USGS Earthquake Catalog

Figure 3- Historical Earthquakes M4.0 and Greater Within 100 miles of Juneau and Traditional Lands of Tlingit & Haida

Within ~100 miles of Juneau and Traditional Lands of Tlingit & Haida, the largest earthquake occurred on July 10, 1958, and measured 7.8 in magnitude, but there was no recorded damage to any infrastructure including critical, residential, and non-residential facilities.

2. SEVERE WEATHER HISTORY

Severe Weather Event	History of the Event
Heavy Rain	The Southeast Alaska archipelago is a part of the world's largest temperate rain forest and has the highest rainfall amounts in the state of Alaska. Many Southeast Alaska communities receive more than 100 inches of rain per year, while totals drop to 60 inches south of the Alaska Range, 12 inches in the Interior, and less than 6 inches on the North Slope. The ten wettest years in Juneau, based on total annual precipitation at JIA are 2022, 1991, 2015, 1992, 1999, 2020, 2023, 2021, 1997, 2006 (Xmacis, NWS 2025). In Juneau, fall rainfall is projected to increase by 16% by the end of the century (EDS 2025).
Atmospheric River	Atmospheric rivers impact SE Alaska regularly. On December 1, 2020, an atmospheric river event impacted SE Alaska and broke daily rainfall records in many communities. The Pacific jet stream, which typically guides storms from west to east across the Pacific Ocean during that time of year, ran into a roadblock in the form of a ridge of high pressure over the U.S. West Coast. That forced the jet stream to buckle northward, tapping a plume of deep moisture known as an atmospheric river and channeling it into southeastern Alaska (Figure 4) (Weather Underground 2020). While atmospheric rivers impact SE Alaska frequently, this event brought record-breaking rainfall to the panhandle.  Source: Weather Underground 2020 **Figure 4- Atmospheric River Affecting SE Alaska, December 1, 2020** Regarding the December 2020 event, Aaron Jacobs, NWS Juneau Meteorologist stated: “We are seeing more extreme-precipitation records being broken in the last 10 years. In Juneau and Traditional Lands of Tlingit & Haida, for example, in the last two years we have seen the wettest day and the third wettest ever, going back to the mid-1930s. Both events were associated with atmospheric rivers” (UAF GI 2022). Another atmospheric river event affected SE Alaska on January 21, 2022. Hourly satellite imagery showed a large cyclonic circulation to the south and west of Alaska that was helping to draw moisture towards the state (Figure 5). The legend represents the total estimated precipitation. Most of southeast Alaska was placed under a flood watch (Figure 6).

Severe Weather Event	History of the Event
	 Source: Cooperative Institute for Meteorological Satellite Studies (CIMSS) 2022 **Figure 5- Atmospheric River Affecting SE Alaska, January 21, 2022**  Source: Cooperative Institute for Meteorological Satellite Studies (CIMSS) 2022 **Figure 6- Weather Warnings Issued Due to an Atmospheric River Event, January 21, 2022**
High Winds	In the Downtown Juneau and Douglas areas the mountainous terrain induces what are known locally as Taku winds. These winds form countless times per year in all seasons but only reach high wind criteria in the fall and winter. Under certain conditions, strong offshore northeasterly winds are funneled down Taku Inlet and up over the northwest-southeast oriented mountains south of Downtown Juneau. These mountains impart a wave on the strong northeast ridgetop flow and on surface high winds at sea level. Hurricane force wind gusts (74 mph or greater) occur roughly once every two years during these Taku wind events. Taku winds produce strong wind shear and turbulence that can impact flights into and out of the JIA. Another result of these strong

Severe Weather Event	History of the Event
	offshore northeast winds is storm force winds and heavy freezing spray at the mouth of Taku Inlet. Some Taku Winds events Juneau has experienced are described below. These winds ranged in velocity from 67-80+ mph (NOAA 2025). - December 2-3, 2007: 74mph winds that produced freezing spray in Douglas Harbor. - January 11-17, 2011: 80+ mph winds that broke wind shields, overturned trailered boats, damaged infrastructure. - October 21, 2012: 67 mph winds that blew down trees and cut off power to over 2,000 Douglas and west Juneau residents. - May 2, 2014: 72 mph winds that caused minor damage to Douglas boat harbor. - January 2-4, 2015: 70 mph winds that damaged car windows, caused power outages, and tore off house siding in Mendenhall Valley. - January 31, 2015: 80 mph winds that overturned bleachers, broke windows, and moved 15,000-pound gangway in Douglas Harbor parking lot. Mariners in the region can be held up for several days until the dangerous marine weather conditions subside. High winds can also result in Juneau and Traditional Lands of Tlingit & Haida from strong low-pressure systems moving in from the Gulf of Alaska. These wind events are rarer (on average once every ten years), but the damage to property and trees is much more widespread. Generally, a low must be 970mb or lower to generate high winds as it tracks through the Northern Panhandle. This threat exists primarily during the fall and winter months. Localized downdrafts, downbursts and microbursts are also a significant hazard. Downbursts and microbursts can be generated by thunderstorms. Downburst winds are strong concentrated straight-line winds created by falling rain and sinking air that can reach speeds of 125 mph. The combination induces strong wind downdrafts due to aerodynamic drag forces or evaporation processes. Microburst winds are more concentrated than downbursts and can reach speeds up to 150 mph. They can cause significant damage as both can last 5-7 minutes. Because of wind shear and detection difficulties, they pose a big threat to aircraft landings and departures. **Tlingit Story: Wind Women** Tlingit believes the North Wind had its power given to it by spirits that reside in mountain cliffs. Therefore, they never speak against North Wind, no matter how hard it blows. A high caste man long ago married the daughter of East Wind. However, he heard North Wind also had a beautiful daughter. He married her as well and returned to his village, where his first wife lived. The daughter of East Wind grew jealous of how pretty the daughter of Northwind was. East Wind's daughter despised the sparkling clothing worn by the daughter of North Wind and how it made tinkling noises. She made the East Wind blow and it became warm and cloudy. Soon North Wind's daughter lost her sparkling clothing, and the icicles and frost melted. The story explains how different winds brought different weather conditions. When these winds intensified, severe weather could become more prevalent. To this day, wind direction is a key factor in predicting weather events and assessing potential hazards.
Thunderstorm (Lightning, Hail)	The Juneau and Traditional Lands of Tlingit & Haida area averages a thunderstorm every two years. Thunderstorms can occur any time of year but are most likely in the months of June and July.

<table>
<tr><th>Severe Weather Event</th><th>History of the Event</th></tr>
<tr><td></td><td>

Source: Alaska Public Media 2024, Photo Credit: Mikko Wilson, 2013
Figure 7- Lightning Strike Overlooking Downtown Juneau, June 2013</td></tr>
<tr><td>Dense Fog</td><td>Dense fog events are a relatively common occurrence in the Juneau and Traditional Lands of Tlingit & Haida area, especially at the JIA, due to the airport being located at the edge of the Mendenhall Wetlands (KTOO 2023).</td></tr>
<tr><td>Heavy Snow</td><td>JIA averages 87.6 inches of snowfall per year based on the new climate normals (1991-2000). 10+ inches of snow have fallen within several hours at Juneau and Traditional Lands of Tlingit & Haida. The record annual snowfall was 212.1 inches during the winter of 1994.
Winter storms are common in Juneau and Traditional Lands of Tlingit & Haida. Since 2011, 38 winter storms have been recorded in Juneau and Traditional Lands of Tlingit & Haida. These winter storms have resulted in over 18 inches of snow accumulation over the span of a day, snow and rain mix which caused the existing snow to become compacted and difficult to remove, and overall increased snow removal costs including machinery and labor.
While not common, drifting snow has occurred in Juneau and Traditional Lands of Tlingit & Haida during severe storm events with snowfall and accompanying high winds. In many cases, a winter storm or heavy snow event was accompanied by high winds, or winds followed shortly after the storm. This has historically led to snow drifts accumulating within the planning area.
<table>
<tr><th>Tlingit Story: Duration of Winter</th></tr>
<tr><td>Raven went into the groundhog’s house, who goes underground in September. After staying a while, Raven could not get out his hole. Groundhog had six toes, so he had to stay in the ground for six months, the duration of winter. To exit, Raven pulled off one of groundhog’s toes. This is why winter is five months and groundhogs have five toes.</td></tr>
</table></td></tr>
<tr><td>Extreme Cold</td><td>The lowest temperature in Juneau and Traditional Lands of Tlingit & Haida was recorded in January 1972, where temperatures reached as low as -22ºF. The coldest month of the year in Juneau and Traditional Lands of Tlingit & Haida is January, with an average low of 24°F and high of 33°F.</td></tr>
</table>

<table>
<tr><th>Severe Weather Event</th><th>History of the Event</th></tr>
<tr><td>Freezing Rain and Ice Storm</td><td>Freezing rain and ice storms are not commonly reported in Juneau and Traditional Lands of Tlingit & Haida.</td></tr>
<tr><td>Drought</td><td>The U.S. Drought Monitor (USDM) started in 2000 and is a is an interactive tool/map that is updated each Thursday to show the location and intensity of drought conditions across the country.

Since the creation of the USDM, the longest duration of drought conditions (D1–D4) recorded in Alaska lasted for 79 weeks. This drought began on July 17, 2018, and ended on January 14, 2020. This drought intensified to a D3 during the week of August 27, 2019, and affected 1.5% of Alaskan land (USDM 2025).

Even though Southeast Alaska was averaging over 100 inches of rain per year during this period of drought, the precipitation total was far below the typical yearly average (KTOO 2022).

Figure 8Figure 8- Juneau and Traditional Lands of Tlingit & Haida Historical Drought Monitor Conditions (2000 – April 2025) shows historical drought conditions for the Juneau and Traditional Lands of Tlingit & Haida Planning Area (2000 – April 2025).</td></tr>
<tr><td>Extreme Atmospheric Heat</td><td>Alaska issued its first heat advisory on June 13, 2025. The advisory was for Fairbanks, AK, where temperatures are expected to reach the mid to upper 80s. These forecast temperatures are 10 to 15 degrees above average for this time of year, which is 72F. The newly minted thresholds for issuing a heat advisory are 85F for the Interior, 75F for the North Slope, and 80F in Southeast (NOAA 2025). The hottest temperature recorded in Juneau was 90F on July 7, 1975 (ACRC 2022).

Below is the summer historical average and projected average temperatures for Juneau. All temperatures are measured in degrees Fahrenheit.

<table>
<tr><th>Month</th><th>Historical Average</th><th>2030</th><th>2060</th></tr>
<tr><td>June</td><td>54</td><td>57</td><td>59</td></tr>
<tr><td>July</td><td>56</td><td>60</td><td>61</td></tr>
<tr><td>August</td><td>55</td><td>58</td><td>60</td></tr>
</table>
Source: UAF/SNAP 2025

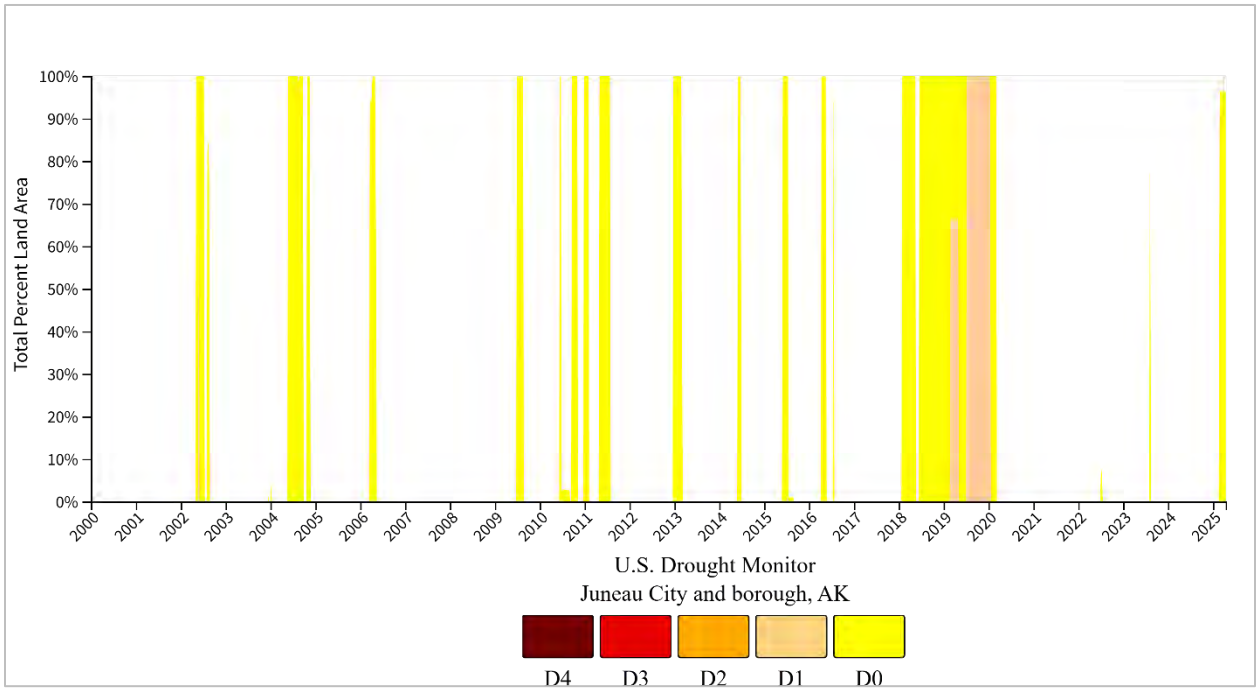
While Juneau has no history of heat advisories, there have been extreme heat events in the past.

In 2023, Juneau experienced several extreme heat events. On May 30th and 31st, high temperatures reached 78F and 79F. These were both record daily highs. July was 3.4F above the historical average, and July 7 had a high temperature of 85F (JE 2023).

Beginning in June and extending into July 2019, Juneau saw the high temperature reach at least 70F for a record 17 consecutive days (NOAA 2019).

Southeast Alaska experienced a drought accompanied by warmer than average temperatures for much of 2016-2019. Juneau recorded 4 consecutive daily high temperatures in 2016 (UAF-IARC 2022).</td></tr>
</table>

Severe Weather Event	History of the Event
	In 2004, another drought impacted Southeast Alaska, and Juneau set records for the warmest June and August on record. There was a combined 24 days where high temperatures reached higher than 75F.

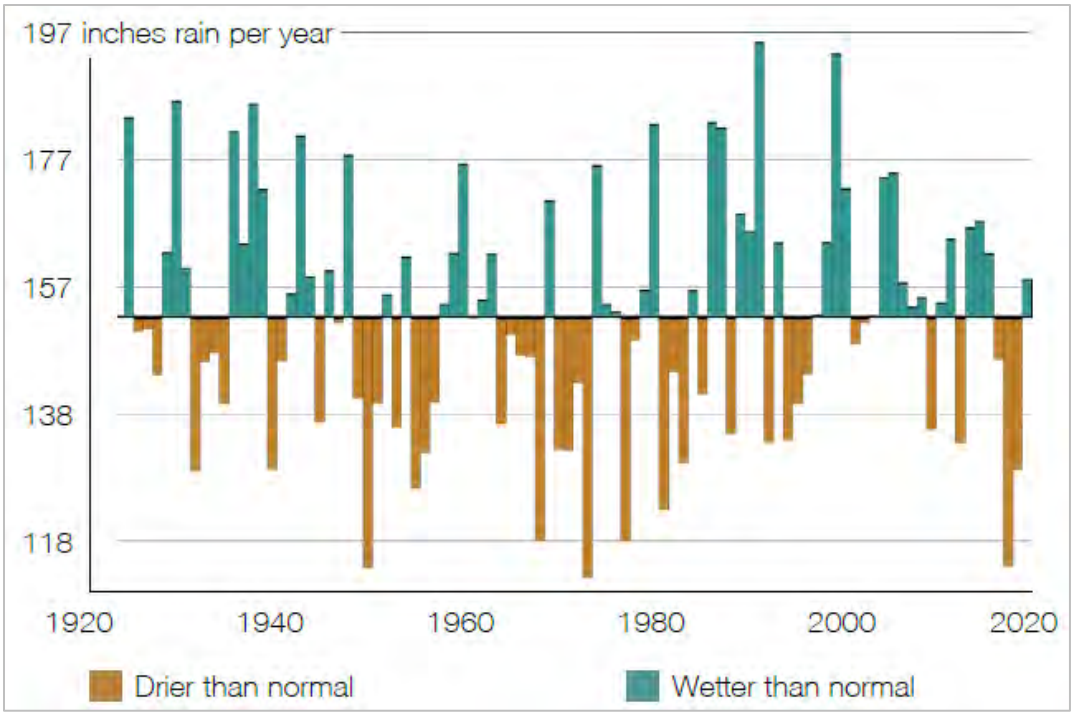


Source: NIDIS 2025

Figure 8- Juneau and Traditional Lands of Tlingit & Haida Historical Drought Monitor Conditions (2000 – April 2025)

From October 2016 to December 2019, southeast Alaska was plagued by a long-lived drought (Hoell et al. 2022). “Extreme drought” was declared by the U.S. Drought Monitor in summer 2019. Dry spells are not unusual in southeast Alaska.

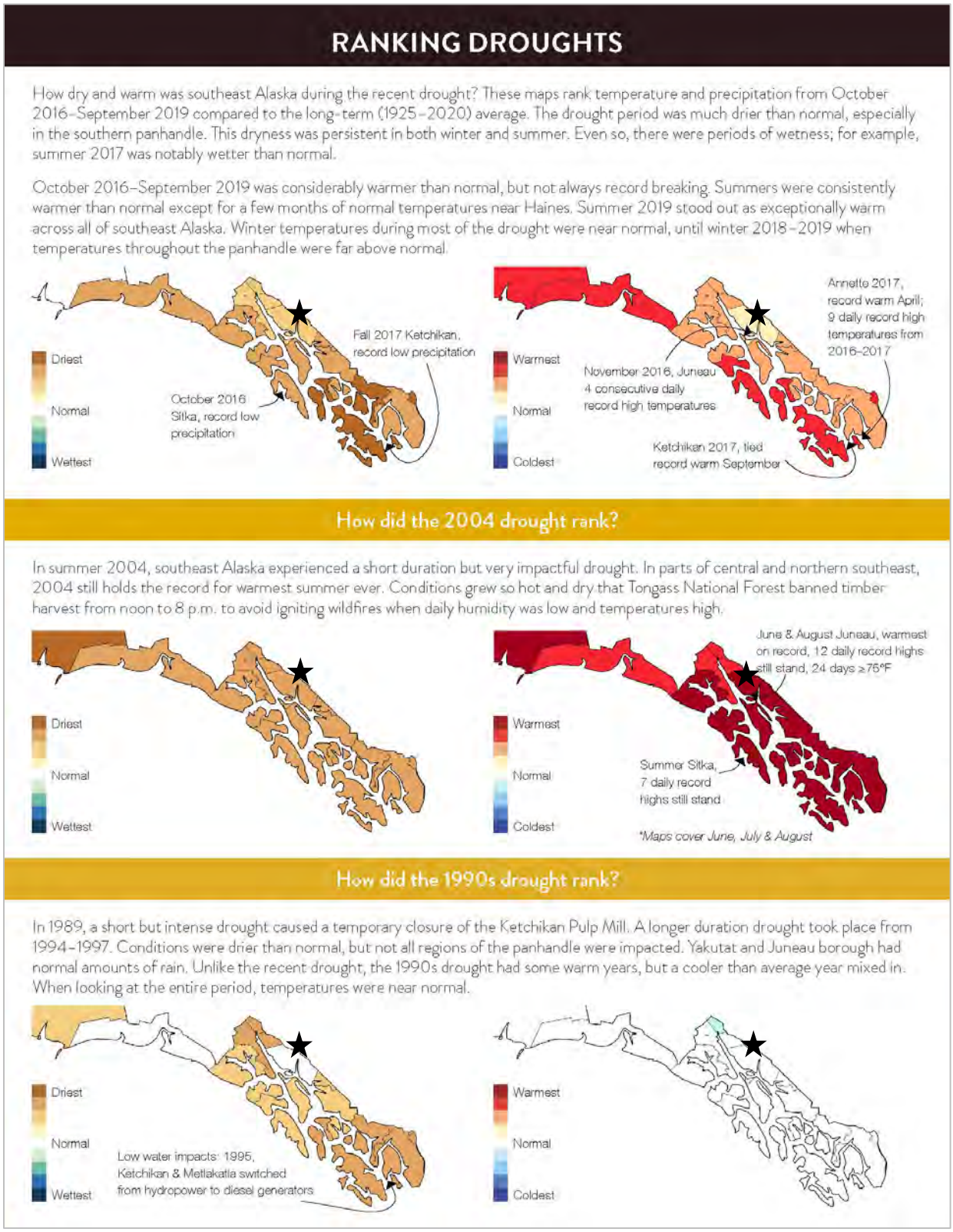
Figure 9 shows prolonged dry periods in the 1950s, 70s, and 90s. Some of these past droughts were longer and had years with even less rain, but the 2016–2019 drought was particularly jarring to those experiencing it because it followed a decade of much wetter conditions (UAF-IARC 2022a).



Source: UAF-IARC 2022a

Figure 9- Prolonged Dry Periods in SE Alaska, 1950s, 70, 90s, 2000s

The following figure compares historical droughts impacting southeast Alaska to the 2016-2019 drought.



Source: UAF-IARC 2022a

Figure 10- Historical SE Alaska Droughts Compared to the 2016-2019 Drought

Error! Reference source not found. lists Juneau and Traditional Lands of Tlingit & Haida's historical severe storm events from January 1996 – November 2024 that occurred in or impacted Juneau and Traditional Lands of Tlingit & Haida. The NWS Storm Events Database has data dating back to January 1950 for many states, but it began collecting data for Alaska in January 1996. Additionally, any events resulting in a flood are addressed in the flood hazard section (Section 3.3.6).

Since the 2012 HMP, there have been 122 severe weather events in Juneau and Traditional Lands of Tlingit & Haida (68 High Wind, 27 Winter Storm, 23 Heavy Snow, 2 Frost/Freeze, and 2 Blizzard).

Table 2- Historical Severe Weather Events in Juneau and Traditional Lands of Tlingit & Haida (1996 – November 2024)

Date	Event Type	Magnitude
9/21/99	High Wind	Peak winds at Juneau Federal Building: 60 mph.
1/3/01	High Wind	Dangerously strong winds occurred in Juneau the morning of the 3rd, with a peak wind of 89 mph recorded at the Juneau Ranger Station south of the airport.
2/12/01	Ice Storm	Two to five tenths of an inch of freezing rain occurred in the Juneau area.
2/26/01	High Wind	Southeast winds in excess of 60 mph occurred in the Juneau area, and a peak wind of 65 mph was recorded at the Juneau Ranger Station near the airport.
11/6/06	High Wind	South Douglas observed 73 mph at 0522 AKST on 11/6. Many gusts to 55 mph were also reported. Snow accumulations were 0.5 to 2.0 inches. There were instances of blowing and drifting snow especially off the mountains near Downtown. A boat was reported overturned on land in Downtown Juneau.
11/9/06	High Wind	A Taku wind event associated with a Gulf Storm occurred 11/9 -11/10. The strongest winds were focused on Downtown Juneau and South Douglas. The South Douglas profiler (SIDA2) recorded a Peak Wind of 61 mph.
11/13/06	Heavy Snow	Juneau had numerous observations of heavy snow ranging from 7.5 to 14.5 inches on 11/13. On 11/14 another 3 to 6 inches fell onto Juneau. Lighter amounts continued to fall on 11/17 and 11/18.
11/19/06	Heavy Snow	Juneau got hit with another November snowstorm on 11/18-11/19. Heavy snow began late at night on 11/18. The CO-OP observer at Lemon Creek near the Juneau airport measured 7 inches of new inches of new snow at 1600 AKST 11/19 with a storm total of 11.0 inches.
11/24/06	High Wind	A Taku Wind slammed South Douglas and Downtown Juneau on 11/24 and 11/25. South Douglas measured a 66-mph gust at 1300 AKST on 11/24, 60 mph gust 2122 AKST 11/24, and 63 mph gust 0302 AKST on 11/25. Gusts of 40 to 50 mph lasted throughout the Thanksgiving weekend.
11/29/06	Heavy Snow	Numerous reports of heavy snow in the first 12 hours of this storm came in with official totals ranging from 8 to 19 inches accumulation. The NWS Juneau Forecast Office had a measured storm total of 17.2 inches on 11/29 which was a record for that date. The Juneau airport augmented Automated Surface Observing System (ASOS) also set a record for 11/29 with 19.0 inches.
12/2/06	Heavy Snow	Juneau airport observed 9.5 inches in 12 hours with continued snow.
1/4/07	Heavy Snow	11.5 inches of new snow from 1600 AKST 1/4 to 0600 AKST 1/5. A CO-OP observer near Juneau had 9.8 inches overnight.

Date	Event Type	Magnitude
3/1/07	Heavy Snow	Downtown Juneau was struck by a rare SE Alaska Blizzard on 3/1. A peak wind of 51 mph was measured in Downtown Juneau with numerous reports of white out conditions. 4 to 6 inches of new snow fell during the first phase of this storm with 6 inches new snow measured by the Auke Bay CO-OP observer in the 12 hours prior to 1700 AKST 3/2 and another 6 inches into Friday night 3/2. Snow continued to fall on 3/3, but at advisory amounts. This storm affected every zone in the WFO Juneau area of responsibility for three days.
3/4/07	Heavy Snow	Auke Bay measured 7.5 inches new snow for 24 hours on 3/5- and 7.5-inches additional inches on 3/6. Storm total 15 inches, with additional unofficial reports of up to 2 feet in the local Juneau/Admiralty area.
3/16/07	Heavy Snow	An observation of 8.3 inches of new snowfall was taken at the Juneau office for the 12 hours before 0443 AKST on March seventeenth. Juneau airport measured a storm total of 7.2 inches for this event.
9/21/07	High Wind	A storm force low developed to 984 MB over Juneau at 984 MB at 3 AM AKST Friday 9/21.
1/13/08	High Wind	Strong arctic outflow immediately followed a snow event. Juneau airport had a measured gust of 66 mph at 1630 on the thirteenth. Sheep Mountain had 115 mph sustained and a measured gust of 154 mph at 1630. The Federal building downtown had a measured gust of 75 MPH at 2220. Mayflower Island observed a peak wind of 70 mph at 20:33.
2/3/08	Heavy Snow	During this snow event, Juneau airport received the heaviest snow with measurements of 5.3 inches of new snow for twenty-four hours ending at midnight 2/3.
2/4/08	Heavy Snow	During this snow event, Juneau airport received the heaviest snow with measurements of 7.3 inches of new snow for twenty-four hours ending at midnight on 2/4.
2/8/08	High Wind	Taku winds set up for Downtown Juneau and Douglas during this event. South Douglas had a peak wind of 61 mph at 0024 on 2/9. The Juneau Federal Building had measured gusts of 55 mph at 0838 on 2/9. No damage was recorded.
2/8/08	Winter Storm	South Douglas wind sensor recorded a peak wind of 61 mph at 0024 on 2/9. Auke Bay COOP measured a storm total of 9.3 inches of new snow from 2/9 through 2/11. Downtown Juneau had gusts around 30 mph during the storm. The Juneau airport was closed from 1353 to 2015 on 2/9 due to 1/4-mile visibility in snow also with low level wind shear.
4/17/08	Heavy Snow	Juneau had a late season snowfall with rapid accumulation on 4/17. Steady rain began on 4/16 and turned to snow around midnight 4/17. The airport storm total was 10.2 inches and the forecast office measured 7.8 inches, again, most of which fell before noon.
10/6/08	Frost/Freeze	Freezing temperatures into the mid 20s F were observed for Juneau and Traditional Lands of Tlingit & Haida. Juneau airport ASOS measured temperatures below freezing from 11 PM AKST on the night of 10/6 through 10 AM AKST 10/7. The minimum temperature recorded was 26F.
12/8/08	Heavy Snow	Juneau had one of the worst snowstorms of the season on 12/9. The cooperative observer at mile 17 measured 17.8 inches of new snowfall at 0700 AKST on 12/9. A peak wind of 30 mph was observed at the airport on 12/9 which had 10.7 inches of new snow.
12/21/08	High Wind	The Juneau South Douglas wind profiler measured peak surface winds of 60 to 71 mph on the morning of 12/21. No damage was reported.

Date	Event Type	Magnitude
1/8/09	Heavy Snow	The Juneau airport received 12.4 inches of snow between the 8th and 9th and a storm total of 19.3 inches.
1/25/09	Heavy Snow	An overrunning snow event occurred, with numerous cooperative observers around the Juneau area reported between 8 and nearly 11 inches of snow from the event.
1/31/09	Heavy Snow	Snow fall accumulations varied from near 5 inches to 8.5 inches of snow for a 12-hour period, with the Juneau airport reporting 6 inches of snow.
2/2/09	Heavy Snow	Numerous snow total reports in the Juneau area topped 8 inches: Canyon Island in Taku Inlet 15.4 inches and Annex Creek Power station 15.3 inches in 24 hours ending at 9 am, Juneau Forecast Office 10.4 inches overnight, Juneau airport 9.3 inches overnight, Snettisham Power station reported 8.5 inches overnight, Fritz Cove Road coop in Juneau 9.0 inches in 9 hours, and West Juneau Coop received 6.0 inches in 9 hours.
2/6/09	Heavy Snow	Heavy snowfall in Juneau area: Snettisham Power Station reported a total of 7 inches in the previous 12 hours. Canyon Island in Taku Inlet reported a total of 19.1 inches for a 24-hour total ending the morning of the 7th. An NWS employee estimated a 6 inches snowfall by 1 pm. The Juneau Forecast Office reported a snow fall of 7.0 inches in 12 hours by 3 pm.
2/8/09	Heavy Snow	An area of heavy snow spread across the Juneau area the afternoon of the 8th through the morning of the Feb 9th. By Midnight the Juneau airport had received 7.2 inches of snow and the Juneau forecast office 6.1 inches with nearly all of it from the start of the event.
3/6/09	Heavy Snow	A coop observer at Snettisham Power Plant recorded a total 8.0 inches the morning of the 7th. Several other sites around Juneau (Juneau airport, Annex Creek coop, Canyon Island coop) reported accumulations of 3 to 5 inches from the event but below warning levels.
3/12/09	Heavy Snow	Several coops in the Juneau area reported more than 10 inches of snow from the event. Annex Creek had received 15.6 inches snow by 6 pm on the 12th. Snettisham Power Plant received 11.0 inches by 7 am on the 13th and Canyon Island has 12.0 inches by 8 am on the 13th.
11/14/09	High Wind	Juneau ASOS reported a gust of 62 mph at the airport**.** Reports of tree damage in the Mendenhall Valley up to 2 ft diameter. The sensor on the Juneau Federal Building reported a gust of 63 mph. A wind sensor on top of Sheep Mountain reported a gust of 186 mph. Power outages occurred. This wind was a contributing factor to mudslides the next day due to soil disturbance of root systems.
1/10/10	Heavy Snow	The Juneau airport and the NWS Forecast Office picked up nearly 8 inches (7.7 and 8.0 respectively) by midnight the night of the 11th. Douglas reported 8 inches by 3pm AKST the 11th and a total of 13 inches by 10am the 12th.
3/12/10	Winter Storm	A moderate snowstorm hit Juneau on 3/12 into 3/13. A trained spotter observed 6.5 inches of new snowfall for 12 hours ending at 1900 AKST on 3/12.
10/12/10	High Wind	Juneau airport observed gusts to 63 mph at 1653 AKDT on 10/12 and a peak of 68 mph at 1353 AKDT. Trees were downed and power outages were frequent and sustained.
11/16/10	High Wind	Taku wind event in Juneau and Traditional Lands of Tlingit & Haida.

Date	Event Type	Magnitude
1/17/11	Winter Storm	Juneau got up to 6 inches overnight based on measurements on the morning of 1/18. Juneau airport had visibility as low as 2.5 SM overnight in snow. Not much wind with this event.
1/19/11	Winter Storm	Juneau got significant snowfall during this short-lived event. Storm totals in six hours ranged from 6.0 to 7.4 inches.
2/28/11	High Wind	Juneau had a prolonged period of Taku Winds starting on the evening of 2/28 and lasting into the early morning of 3/5. Damage to glass including windshields was common along with other miscellaneous property. A power outage due to wind was observed on 3/4 probably due to freezing spray on a transformer.
3/4/11	High Wind	Taku wind event in Juneau and Traditional Lands of Tlingit & Haida. Douglas Boat harbor wind sensors observed peak winds to 65 mph on four separate occasions on the night of 3/4. Most sustained winds were 40-50 mph. No damage was reported on this Taku wind event.
9/21/11	High Wind	Juneau airport ASOS had a measured gust of 71 mph around 1300 AKST on Wednesday 9/21.
11/13/11	Winter Storm	Numerous observations of heavy snow overnight through the morning of 11/14 occurred for Juneau and Traditional Lands of Tlingit & Haida. Amounts in 12 hours ranged from 6 to 12 inches.
11/23/11	Winter Storm	A spotter from North Douglas reported at 0900 AKST 11/23 for overnight (12 hours) 8.0 inches of new snowfall. The water plant measured 6.7. and Juneau airport had 9.4 inches midnight to midnight on 11/23.
11/23/11	Winter Storm	11/23 storm totals for Juneau and Traditional Lands of Tlingit & Haida: 8.0 inches at N. Douglas, 9.4 inches at the Airport, 6.7 inches at the Water Plant.
1/1/12	Winter Storm	Snow amounts were highly variable around Juneau 1/1 and 1/2. Lena point measured 8.9 and Auke Bay measured 7.6 inches of new snow for the evening of 1/1 while the airport only got 4.1 inches. Snow changed to rain later that evening at the airport.
1/21/12	Winter Storm	Strong north wind developed for Downtown Juneau, but no damage was reported on the night of 1/19/12. Juneau got highly variable amounts of snow with this storm. Storm totals ranged from 4 to 8 inches in town with northern sections getting the most snow.
1/23/12	Winter Storm	Highly variable snow amounts around Juneau for this storm. 4 to 6 inches on the afternoon of 1/23 then 4 to 11 inches new snow by the morning of 1/24.
1/29/12	Winter Storm	The arctic front was over Juneau on the evening of 1/29 as a maritime low-pressure system moved warm moist air over the area from the south. Locally heavy snow fell over Juneau during the night of 1/29. Juneau airport got 7.5 inches overnight. The water treatment plant measured 14.0 inches through 0900 on 1/30. There were several observations 6 to 9 inches of new snow into the morning of 1/30.
3/5/12	Blizzard	The official NWS observer at the Juneau airport measured 7.4 inches of new snow all during the evening on March 5th. The airport got an additional 4.3 inches of new snow by 0900 March 6th for a storm total of 11.7 inches. Other storm totals were 10 inches downtown and 6.3 inches at Auke Bay.
10/20/12	High Wind	The Douglas boat harbor wind sensor recorded numerous gusts over 60 mph during the night of Saturday October 20th and during the day on Sunday October 21st. On the 21st at 0445 a tree was blown into the power lines due to high wind. Approximately 2,000 customers in Douglas and West Juneau were without power for about an hour

Date	Event Type	Magnitude
		and a half. Also, a tree branch rubbed through the wire serving one house. One person was out of power for 2 hours.
11/22/12	High Wind	Gastineau Channel near Downtown had the salt spray lofted to the Douglas Bridge and the cruise ship dock area had frequent Williwaws. West Juneau had extreme gusts but were not measured. The Douglas Boat Harbor observation had peak wind to 70 mph measured. There were no power outages.
12/19/12	High Wind	High winds for Downtown Juneau and Douglas Island. Douglas Boat harbor measured many gusts over 60 mph for two days starting on 12/19. The peak gust was 68 mph on the evening of the 19th.
11/16/13	High Wind	Peak wind for several locations in Downtown Juneau ranged between 55 - 86 mph into the early morning hours on 11/18. No damage was reported. Strong wind to 45 mph persisted into 11/19. Douglas Boat Harbor and the Marine Exchange Office observations were around 64 mph peak wind during this time. Strong winds continued into 11/19.
11/21/13	Winter Storm	Storm total snowfall for the Juneau area ranged from 5 to 11 inches of new snow in the first 12 hours of the storm. Additional amounts of 2-3 inches were observed on 11/22 as the snow changed to rain and strong wind began. Traffic slowed, 4 accidents reported on the Juneau Police Report. All the flights into the Juneau airport were cancelled on Nov 21, one morning flight was able to get out of the Juneau airport. Some schools closed; minor events cancelled. Power for Auke Bay and Out the Road were gone for an hour in the morning of Nov 21.
12/1/13	High Wind	Arctic high pressure built over the Yukon, which setup a Taku type wind event in Downtown Juneau. The maximum wind observed was 89 mph. Maximum wind 12/1 0623L - Alaska Marine Exchange gust to 86 mph. Douglas Boat Harbor peak wind 64 mph at 0518 AKST. Juneau AML - 1550 AKST 24 – 72 mph. Juneau AML - 2140 AKST 39 – 79 mph.
2/10/14	High Wind	At 101738z 60 mph gust reported at Douglas Boat Harbor. Another 110418z 60 mph gust reported at SDIA2. Another 110558z 60 mph gust reported at SDIA2. A playhouse was picked up by the wind near Gastineau Elementary and went through the window into a house.
2/13/14	Winter Storm	6 inches at 4-mile North Douglas, 12 inches at JD wastewater treatment plant, 7.8 inches at Auke Bay COOP, 8.5 inches at Lena Point overnight, and 6.3 inches West Juneau. Storm total: 9.6 inches.
3/2/14	High Wind	Strong outflow winds occurred for Downtown Juneau. Wind was particularly strong during the evening of March 2 with multiple gusts in the mid 70s mph measured at the Alaska Marine Lines site and up to 62 mph at the Douglas Boat Harbor. The strongest winds were in the evening but lasted into the morning of March 3rd.
5/2/14	High Wind	Downtown Juneau observed a burst of very strong northerly winds to 70 mph that evening causing minor damage. Douglas Harbor measured a peak gust of 72 mph at 1930 AKDT. Several reports were over 60 mph Downtown. There was minor damage in the Douglas Boat Harbor.
11/5/14	High Wind	Downtown Juneau and Douglas observed gusts 60 to 70 mph on the evening of November 5th. No damage or power outages were reported.
11/26/14	High Wind	Juneau and Douglas Island experienced cross-barrier outflow winds. Numerous gusts in the 60 to 65 mph range were observed in Downtown Juneau and Douglas on the evening of November 26th through all day on the 27th. Peak observations occurred at

Date	Event Type	Magnitude
		the South Douglas wind profiler to 64 mph and to 66 mph at the AML site. No damage was reported.
11/30/14	Winter Storm	Numerous observations of heavy snow were reported for the Juneau area on Nov 30. Storm total amounts ranged from 6 to 12 inches for under 24 hours. The Juneau airport measured 9.5 inches from Saturday night to Sunday evening. Lena Loop had 10.4 inches. Outer Point had 11.5 inches. No damage or power outages were reported.
1/2/15	High Wind	Rare wind damage occurred in the Mendenhall Valley, along with numerous power outages. Frequent sustained winds were measured 60 to 70 mph for Downtown Juneau and Douglas. Peak wind to 114 mph was measured at Juneau AML in the Port near the Rock Dump. Car windows were damaged. A porta-potty was turned over. AEL&P reported a power outage early morning on the 4th. Rare wind damage on house siding was reported in the Valley.
1/5/15	High Wind	Douglas Boat Harbor had a measured gust of 64 mph at 05/1120 pm. Numerous gusts in the 40- 50mph range were observed for Downtown Juneau and Douglas. No damage or power outages were reported.
1/6/15	Winter Storm	4 to 10 inches of new snow fell over the Juneau area overnight on Jan 6th. Snow rapidly tapered off on the morning of the 7th. Plows easily kept up with snow removal. There were isolated reports of freezing rain or freezing drizzle. No damage was reported.
1/31/15	High Wind	Strong winds for Downtown Juneau and Douglas. A 15000-pound gangway at Douglas Boat Harbor was lifted at least 5 feet into the air and deposited into the boat launch - covered by water at high tide. Many broken windows occurred and grandstands in the park were thrown around. Numerous gusts 70-80 mph were observed in this Taku wind event. Damage for South Douglas: The gangway moved sometime on Sunday morning. 1) aluminum gangway about 15,000 pounds and had been sitting unsecured in the harbors parking lot for the last three years. It is now in the boat ramp and underwater at high tide. 2) Harbor Dept van busted window. 3) 7 windows or windshields broken in the parking lot. 4) Porta-potty knocked over and moved significantly. 5) Parks & Rec light pole knocked down 6) Ball field seating stands overturned and moved.
2/5/15	High Wind	Taku wind conditions persisted for Downtown Juneau and Douglas through Thursday night into Friday. There were many wind speed observations in excess of 100 mph, and damage was reported. There was significant damage to windows and windshields and power outages during this storm. Ferry service was canceled, and airline schedules were disrupted. Power Outages: Power outage occurred on thane road midday 2/5. Large falling tree took out two spans of lines. Power outage on Douglas and in Downtown Juneau evening of 2/5 affected Douglas, West Juneau, and the flats in Downtown Juneau. Broken power pole to blame for downtown Douglas outage. Back window of a vehicle blown out on Douglas. Fault reported on annex creek power line. Doors damaged at JD wastewater treatment plant. Tree limb fell in marine park. Window blown in at Baranof Hotel Thursday.
2/7/15	Winter Storm	Some areas of Juneau got 6 inches of new snow in 12 hours with this storm. No damage or outages were reported.
11/17/15	Winter Storm	Juneau received some significant snow as the warm air continued inland. Storm total for Juneau on November 17th ranged from 10 to 14 inches. No damage was reported.

Date	Event Type	Magnitude
12/25/15	Winter Storm	Storm totals for this event ranged from 7 to 9 inches around Juneau and Traditional Lands of Tlingit & Haida. No damage was reported but significant effort was made to remove snow.
1/26/16	High Wind	Juneau airport had gusts to 60 mph on the morning of 1/26. Minor damage was reported in Thane.
10/24/16	High Wind	Taku Winds for both Downtown Juneau and Douglas. Gusts to 65 mph occurred with some light damage including an overturned dumpster at the water treatment plant.
11/4/16	High Wind	Wind damage in the Juneau area with downed trees and power outages.
11/29/16	High Wind	Juneau Federal Building had 64 mph at 1230L. Spotter observed 56 mph gusts downtown. 6-inch diameter tree blown down near the Mendenhall River bridge.
12/2/16	High Wind	The Juneau Federal Building had gusts to 65 mph on 12/2. A few tree branches were downed. No damage reported.
12/6/16	Winter Storm	8 inches of snow at Cohen drive, 7 inches at Auke Bay, 11 inches on ground at Thane, 15 inches on ground at Fritz Cove, total 8.8 inches measured at Juneau airport. Intense snow removal operations for Juneau and Traditional Lands of Tlingit & Haida.
12/7/16	Heavy Snow	Windy conditions for Juneau into Saturday 12/10. WSO Yakutat measured 6.5 inches of new snow that fell between 2200 Wednesday 12/7 and 0700 12/8. No damage reported.
1/6/17	High Wind	Juneau AML peak wind 85 mph at 1330 Friday, South Douglas boat harbor (NWS employee estimated) wind gust around 80 mph at 1300 Friday, Point Bishop measured a wind gust to 66 mph at 1330 Friday, Juneau Federal Building measured a peak wind of 78mph at 1606 Friday, Juneau Library wind sensor measured a peak wind gust of 94 mph at 1645 Friday. There were numerous reports of damage. Vinyl siding blew off a hotel in Downtown Juneau and is flying around. A shack was blown into the center of a street in Downtown Juneau, reported at 0500 Saturday. A trampoline flipped over and hit a shed, causing minor damage. Glass door on State Office Building in JNU broken. Caller from Douglas heard several cars parked at boat harbor had windows knocked out. AEL&P reported power outage out the road Friday night due to tree down on 5200 block of Thane Road. Another tree down across Thane Road, no damage. JNU Empire reports a house on Telegraph Hill Downtown and two windows broken. Another house in Douglas had a skylight ripped off the roof.
1/21/17	High Wind	A moderate Taku wind occurred for Downtown Juneau and Douglas on the morning of 1/21. Marine Exchange observations at both the AJ Dock and AML both had peak gusts to 84 mph on the morning of 1/24. Both stations had frequent gusts greater than 60 mph during that morning. The very strong winds were confined to that part of town and along Thane Road. Williwaws were observed. No damage was reported.
2/11/17	High Wind	Downtown Juneau and Douglas had strong winds on 2/11. Three sites measured gusts in the 60 mph. No damage was reported.
3/1/17	Winter Storm	Juneau got at least 6 inches in 12 hours ending at 2/28 ending at 2100. West Juneau reported a heavy rate of snow: 6 inches in 6 hours on 3/1. The impact was snow removal.
3/7/17	High Wind	Mountain wave Taku winds in the downtown and Douglas area reached 60 - 70 mph in the early morning hours, then abated towards early morning while remaining gusty in the 45 -50 mph range. Minor mountain wave activity continued to persist beyond the afternoon. No damage was reported.

Date	Event Type	Magnitude
3/10/17	High Wind	Wind reaching 60 -70 mph began shortly after midnight for Downtown Juneau and Douglas and ended mid morning on 3/10 when the wind speed subsided into the 40-mph range. These winds were measured both on the South Douglas profiler and the Marine Exchange observations in the Rock Dump and docks area. No damage was reported although cargo loading operations were impeded.
3/12/17	Winter Storm	Storm total for Juneau by 1000 on 3/13 was 12.6 inches. NWS employee measured 16 inches storm total on Douglas Island. WFO got 14 inches. Impact was snow removal.
11/6/17	High Wind	High winds slammed Downtown Juneau and Douglas on the evening of 11/6 and the morning of 11/7. Gusts to 76 mph were observed at the South Douglas boat harbor. No damage or power outages were reported.
11/10/17	Winter Storm	The Juneau NWS Office measured 6.7 inches of new snow by midnight on the night of 11/10. Impact was snow removal of heavy wet snow.
11/16/17	Winter Storm	Record snowfall was recorded at the following locations: Lena Point near Juneau recorded 8.9 inches on November 17, breaking the previous record of 5.8 inches from 2015. The Juneau Forecast Office recorded 10.8 inches on November 17, breaking the previous record of 3.3 inches from 2003. Downtown Juneau recorded 3.0 inches on November 17, breaking the previous record of 2.5 inches from 1932. Impacts were snow removal, otherwise no damage was reported
11/24/17	Winter Storm	Juneau received 2.7 inches of snow early on the morning of 11/25. Impact was snow removal.
12/31/17	High Wind	Warming aloft changed snow to rain/freezing rain in the inner channels with ice accumulation on still cold roads and sidewalks in Juneau Monday 1/1 afternoon, then further warming changed it to rain. No significant damage was reported.
1/12/18	Winter Storm	Juneau Forecast Office measured 6 inches of new snow overnight by the morning of 1/13. Other amounts were less, but rain on top of snow made driving conditions poor. Impact was snow removal.
1/28/18	High Wind	On January 28, Downtown Juneau received very strong winds. No damage was reported.
2/12/18	Heavy Snow	On Monday 2/12 and Tuesday morning 2/13 Juneau was hit with a heavy snowstorm that was not well forecasted. By Tuesday morning Juneau received 6 to 15 inches of new snow plus some freezing drizzle. No damage was reported. Impact was intense snow removal.
2/28/18	High Wind	Taku wind gusts for Downtown and Douglas ranged from 65 to 92 mph during the night of 2/28 and daytime on 3/1. No damage was reported.
3/22/18	High Wind	This Taku wind event caused some shingle damage in West Juneau on 3/22 with fence damage, roof of chicken coop blown off, and back door damage reported at Douglas residence. Douglas Boat harbor 84 mph, Peak gust of 91 mph at 944 AKST. Lots of gusts in the 70s mph. Power outage Downtown Juneau at 0245 AKST.
3/26/18	Winter Storm	Juneau airport measured 9.2 inches and the WFO measured 8.6 inches storm total. Other areas around town got 6 to 8 inches of new snow. Impact was snow removal, but the snow melted off very quickly.
4/5/18	High Wind	Taku wind event for Downtown Juneau and Douglas on 4/5 into 4/6. Juneau AML dock observed gusts to 61 mph at 1322 on 4/5. The Juneau AJ Dock observed gusts to 83 mph at 1102 on 4/5 during this Taku wind event. Damage was limited to lawn

Date	Event Type	Magnitude
		furniture displaced and garbage cans blown over. Tree branches were broken on Douglas at 0930 AKST. No monetary value was assigned to this damage.
9/17/18	Frost/Freeze	The Juneau Forecast Office at PAJN measured prolonged temperatures below 32F between 0100 and 0800 on the morning of 09/17. No damage reported.
12/15/18	High Wind	A Taku wind hit Downtown Juneau and Douglas on the evening of 12/15 into the early morning hours of 12/16. AML measured gusts to 73 mph. Marine Exchange sensors maxed out at 78 mph. The library had gusts to 77 mph. No damage was reported.
12/19/18	Winter Storm	Snow showers in Juneau over a 24-hour period starting 12/19.
12/26/18	High Wind	Strong winds occurred during the afternoon hours on 12/26 with gusts above 60 to 70 mph as measured by the Marine Exchange dock sites. Gusts were confined to the Downtown area and not so much for Douglas. The only damage reported was that a chimney cap was blown off a home Downtown.
1/5/19	High Wind	Taku wind set up for Downtown Juneau and Douglas on 1/5 and 1/6. Peak gusts were to 70 mph, but no damage was reported.
1/9/19	High Wind	Numerous reports of sustained wind 40 to 50 mph with gusts up to 86 mph occurred after midnight for Downtown Juneau and Douglas on 1/9 through the evening of 1/9. No damage was reported, but the Alaska Marine Highway system canceled sailings in Lynn Canal due to storm force wind and heavy freezing spray.
1/10/19	Winter Storm	Storm total snow for the Juneau area, 1/10 to 1/12 was 11 to 17 inches. Outlying areas may have gotten up to 20 inches in this storm. Impact was intense snow removal. Driving conditions were impassable in some instances. Public schools were closed in Juneau on 1/11.
1/31/19	High Wind	Taku wind event for Downtown Juneau and Douglas on the evening of 1/31 into the morning of 2/1. One gust at the AJ Dock got to 90 mph. No damage was reported. LeConte of the AMHS canceled sailing for Lynn Canal on 1/31 and 2/1.
2/5/19	Winter Storm	Juneau WFO began observing snow at 2200 on 2/5 with a glaze beforehand. Storm total snowfall 4 to 5 inches plus freezing rain. The impacts were slippery conditions and snow removal.
2/14/19	High Wind	A Taku wind situation set up for Downtown Juneau and Douglas on the night of 2/14 and persisted during the daylight hours of 2/15. Measured wind gusts were 60 to 73 mph. No damage was reported.
2/18/19	Winter Storm	Storm totals were highly variable ranging from near 8 inches at the Juneau Forecast Office, 7 inches West Juneau, but only 1.5 inches at the airport. Impact was slick roads with some cars in the ditch and snow removal.
2/21/19	Winter Storm	West Juneau got a storm total of 6.2 inches. The Juneau WFO got 6.6 inches. Impact was delayed air travel and snow removal.
2/22/19	High Wind	Taku winds for Downtown Juneau and Douglas. One gust was 87 mph at the AJ Dock. No damage was reported.
3/10/19	High Wind	Very windy all-around Juneau including the Valley on 3/10. Gusts up to 67 mph at the AML dock at 0952. Gust up to 66 mph at the AJ dock at 0842. Juneau Federal Building 60 mph at 0450. Plenty of sustained winds 45 to 60 mph. No damage reported.

Date	Event Type	Magnitude
9/20/19	High Wind	Burst of wind in Juneau and Traditional Lands of Tlingit & Haida. There were several blowdowns of trees and power outages. One vehicle was damaged by a tree.
11/8/19	High Wind	Downtown Juneau and Douglas had prolonged wind gusts during the evening of 11/8 though midday on 11/09 ranging from 65 to 90 mph. Power outages were reported around town with a few blown down trees and a couple of broken windows.
12/25/19	High Wind	Peak gust of 63 mph measured at 812pm at the Juneau AJ Dock. Juneau AML Dock Marine Exchange sensor measured a peak gust of 64 mph at 1122 pm on the 25th, but gusts above 60 mph occurred since 852 pm. Juneau Marine Exchange Office sensor measured a peak gust of 74 mph at 122 am on the 26th, but gusts above 60 mph occurred between 752 pm on the 25th and 232 am on the 26th.
1/6/20	Heavy Snow	Various reports of snow around town in Juneau and Traditional Lands of Tlingit & Haida. Wastewater Co-op received 7.2 inches; West Juneau received 7.5 inches. The Juneau Forecast office received 7.5 inches. In a colder valley south of town, the Snettisham power plant recorded 13.6 inches of snow.
1/9/20	High Wind	Taku wind event for Juneau and Traditional Lands of Tlingit & Haida. The top wind gust recorded was 86 mph at the Juneau AML dock and 78 mph at the Juneau AJ Dock.
1/14/20	High Wind	Multiple locations around the Downtown Juneau area reported strong gusty winds from late afternoon to early evening. The strongest reported gust was 90 mph at the JMLA2 (Juneau Marine Lines) site. South Douglas Island across the channel reached 61 mph.
1/15/20	High Wind	Several mountain waves over 3 days pushed winds very high across Downtown, Douglas, West Juneau, and Thane. The worst of the winds occurred late Wednesday night into early Thursday morning. Top recorded wind gust was 90 mph at the AJ Docks Marine Exchange, numerous other observations between 60 an 80 mph. Many trees reported as being down, items blown around, window broken at the State Courthouse, and trailers overturned near the Coast Guard station. High winds and wind shear cancelled all flights at the Juneau airport on the 16th.
1/25/20	Heavy Snow	By about 8pm on the 25th 4-6 inches of snow fell in the Juneau area, then changed to rain. Snow lasted longer for areas out the road with reports of 6.5 inches measured at Tee Harbor and 8 inches estimated at Lena Point. Multiple car accidents were reported due to wet snow.
1/29/20	High Wind	AEL&P power company reported that wind caused a tree to blow down, partially blocking Glacier Highway and taking out a power line. Around that time the Juneau airport had gusts of up to 53 mph and another mesonet station had a peak gust of 56 mph.
1/30/20	Heavy Snow	The Juneau area saw 6 to 12 inches of snow in about 10 hours. The Juneau airport closed for a period of time due to very heavy rates and could not keep up with snow removal. The school district cancelled afternoon activities. AEL&P reported a power outage due to snow on tree branches and lines out the road.
2/3/20	Heavy Snow	Nearly 11 inches of new snow by 3 am, with a total of 12.8 for the 24-hour event. Several other locations around town reported event totals snowfalls of 5 to 9 inches, with the largest accumulations on Douglas Island. The Juneau School District cancelled school on the 4th, due to the snow that continued overnight.
2/20/20	High Wind	Marine Exchange sensors in Downtown Juneau and the Mendenhall Valley measured peak gusts of 69 -90 mph during the day on Feb 20th as a strong front moved through.

Date	Event Type	Magnitude
3/5/20	High Wind	Peak gusts of 66 mph were measured at Downtown Juneau early in the morning on the 5th. Numerous trees were then blown down on Shelter Island causing structural damage to a house and green house. Spotter there estimated 75 mph gusts. Trees blown down on Lena Point and Cohen Drive caused several power outages through the day.
3/29/20	High Wind	Juneau Downtown Docks measured consistent gusts over 60 mph during this two-and-a-half-day Taku wind event, including peak gusts of 90 mph at the AJ Dock throughout Monday March 30th.
4/8/20	High Wind	Strong southerly winds blew through the Juneau area Wednesday morning and changed the snow to rain in the afternoon for the northern areas. Peak gusts of 69 and 77 mph were measured at the Downtown Juneau docks in the morning. Near the Juneau airport one peak gust of 64 mph was measured. A tree took out a power pole near Tee Harbor causing a power outage.
11/17/20	High Wind	Numerous gusts more than 60 mph were measured around the Downtown Juneau docks during the day and early evening of November 17. A peak gust of 68 mph was measured at the Juneau Library at 224 pm.
11/28/20	High Wind	The Marine Exchange office measured a peak gust of 62 mph at 204 pm. Multiple trees were reported down around Juneau and Douglas causing power outages.
12/25/20	High Wind	Mesonet Station JLXA2 at the Juneau Library reported a peak gust of 67 mph. Power outages due to trees being blown down were also reported across the area throughout this event.
1/12/21	High Wind	Juneau airport automated surface weather observing station reported multiple gusts of 61 mph starting around 10:50 am AKST.
1/23/21	Heavy Snow	Snow began after 9 am, measured 1.4 inches at 3 pm and an additional 4.6 inches at 9 pm. Total snow for the day end up at 6.5 inches at midnight.
2/3/21	Winter Storm	A trained spotter in Downtown Juneau reported 7 inches of new snow at 8:30 am on February 3rd.
2/10/21	High Wind	Marine exchange observation at the Juneau AML dock reported a winds speed of 70 mph at 2:52 pm.
2/27/21	Winter Storm	Rain changed back to snow in the Juneau area with a very wet slush accumulating. Temperatures remained cold enough in the upper Lynn Canal area for snow and a second wrap continued the snow into Sunday, even behind the cold front.
3/15/21	Heavy Snow	An NWS employee reported 12.5 inches of new snow in West Juneau.
3/17/21	High Wind	Juneau airport ASOS reported a wind gust of 58 mph. Strong winds continued through 3:22 pm.
3/20/21	Heavy Snow	A trained spotter reported 8 inches of fresh snowfall in Tee Harbor.
10/1/21	High Wind	Utility Company reported outage in the Auke Bay area of Juneau due to strong winds.
11/18/21	Heavy Snow	A total of 8.0 inches of snow midnight to 9 pm at the Juneau National Weather Service Forecast Office.
11/20/21	Heavy Snow	A trained spotter reported 7 inches of fresh snow in Lena Point area of Juneau and Traditional Lands of Tlingit & Haida.

Date	Event Type	Magnitude
12/5/21	Heavy Snow	Cooperative Observer in Auke Bay of Juneau reported 7.4 inches of new snowfall.
12/20/21	Heavy Snow	A trained spotter in Juneau reported 6.5 inches of new snowfall. Storm total for the entire storm was 11 inches.
12/31/21	Heavy Snow	National Weather Service Employee reported 7.8 inches of snow in Juneau and Traditional Lands of Tlingit & Haida.
1/2/22	High Wind	The Mesonet station on the AML Dock in Juneau recorded and wind gust of 61 mph.
1/8/22	High Wind	Taku winds to Juneau and Traditional Lands of Tlingit & Haida. Heavy snow transitioned to rain across much of the area. This along with antecedent snowfall created roof load issues across the area with structural collapses in Juneau and Traditional Lands of Tlingit & Haida. Rain on snowpack and frozen ground created icy conditions across the area that impacted transportation for days following the event.
2/1/22	Winter Storm	A Trained spotter reported 8 inches of new snow in the Juneau at 7:30 am on February 2nd.
4/11/22	High Wind	Alaska Marine Lines dock weather station reported wind speeds up to 77 mph in this Taku Wind event. Widespread reports in the 60- 70 mph occurred across Downtown Juneau weather stations. Power outages and damage to an outdoor bar were reported.
11/5/22	High Wind	A mountain wave event resulted in frequent high wind gusts for parts of Juneau and Douglas that spanned just over 24 hours. Peak gusts of 64 - 71 mph were measured at the Marine Exchange station located at the AML Dock, the downtown Library, and at the Douglas Boat Harbor.
12/9/22	Heavy Snow	COOP Observer at Lena Point in Juneau reported 5 inches of snow had fallen by 11:15 am on the 9th and was up to 6 inches by 1pm with snow still falling. The Juneau airport reported snow ending shortly after. Another trained spotter in a nearby area also measured heavy rates over the morning hours of the 9th.
12/23/22	Heavy Snow	COOP observer at Lena Point, north of Juneau and Traditional Lands of Tlingit & Haida, measured 6.5 inches of snow had already fallen by 5pm while downtown had less than an inch by that time. In the end, reports were 10 to 14 inches.
12/29/22	Heavy Snow	A 5:15 in the morning of the 30th, a spotter NW of Juneau reported 5 inches of snow since it began around 9pm on the 29th. Another person further up the highway at Yankee Cove estimated that 7 inches had fallen by 7:24am and was still falling. A COOP observer at Lena Point confirmed a measurement of 6.8 inches at 9:20am and another inch of snow falling until mid afternoon. Snow was wet in consistency.
1/20/23	High Wind	Marine Exchange station at the AML Dock and at their office measured a peak gust of 65 and 62 mph respectively during the same hour. During this event the Juneau Eaglecrest Ski area recorded peak gusts of 60-92 mph between 12pm and 10pm.
2/1/23	Heavy Snow	Report from Tee Harbor, north of Juneau and Traditional Lands of Tlingit & Haida, said that snow began at 9pm on the 1st and measured 7.75 inches by 9am the next morning. Another 3 inches fell at their location by noon. Other locations around Juneau measured 3 to 6 inches but there were several cars off the road and a power outage in Mendenhall Valley.
2/14/23	Heavy Snow	Multiple spotters in the Mendenhall Valley and on Douglas Island reported heavy snow, including around 8 inches measured by 8 am on the 15th. Storm totals ranged from 6 to 14 inches.

Date	Event Type	Magnitude
2/24/23	Heavy Snow	The climate station at the Juneau airport measured a record-breaking snowfall of 14.3 inches on the 24th and a storm total of 20.6 inches through the next morning. Numerous other spotter reports came in from around Juneau with storm totals ranging from 6 to 12 inches.
3/1/23	Blizzard	The ASOS at the Juneau airport had continuous visibility of one quarter mile or less between 9am and 1pm with winds gusting between 36-56mph. Whiteout conditions were reported on Egan Drive, and the city closed multiple activities including a school early dismissal. Storm total snowfall from this event ranged from 6 to 12 inches before changing to rain in the afternoon.
3/10/23	High Wind	A Taku wind event resulted in numerous wind gusts in excess of 60 mph over nearly two days. These gusts were recorded by many stations across the Downtown Juneau docks. One station, AJXA2, recorded a peak wind gust of 76 mph at 702 pm AKST March 11.
4/9/23	High Wind	In addition to several mesonet stations around Downtown Juneau reporting wind gusts of around 60 mph, the Juneau airport ASOS measured a peak gust of 71 mph at 3:46 PM AKDT. AEL&P utility company reported a few small power outages around Juneau due to the winds and tree branches coming down.
5/4/23	Frost/Freeze	The COOP station at NWS Juneau recorded temperatures below 32 degrees for over 6 hours with a minimum of 28 degrees. The ASOS at the Juneau airport also recorded a low of 28 degrees. No impacts were shared.
10/9/23	High Wind	The Juneau airport ASOS measured a peak wind gust of 64mph. Another mesonet station at the docks downtown measured a peak gust of 60 mph. The power company reported 3 power outages and trees in the lines in the hour prior and following 2 hours.
11/20/23	Blizzard	Mesonet stations, webcams, and officials in Downtown Juneau confirmed high winds, alongside significantly reduced visibility in Downtown Juneau due to falling and blowing snow. A Taku Mountain wave event caused wind gusts over Downtown Juneau in excess of 60 mph for 16 hours including a peak gust of 90 mph on top of the downtown library at 6:23pm. A power outage was reported by an off-duty NWS Employee at 8:31am, and Juneau Harbors posted a picture of a sunken vessel in a downtown harbor on social media. The City of Juneau closed at 11am due to high winds and blizzard conditions, and the Juneau School District announced schools would have an early release. State offices were closed, as were the UAS campus buildings. Meanwhile, the north side of the community, between Auke Bay and Tee Harbor, saw 6-10 inches by 2pm and a storm total of 12 -14 inches. Snow began to mix with rain between 12-3am.
12/12/23	High Wind	Two separate waves resulted in two periods of windy conditions for Juneau and Traditional Lands of Tlingit & Haida, with the second, during the late afternoon and evening of December 12, being the strongest. The first wave in the morning saw high winds at elevation sites and caused multiple reports of downed trees and power outages out the road from Lena Point north. The Forest Service closed access to the Otter Way parking area due to fallen trees and unstable soil conditions. Peak wind at the Juneau airport of 66 mph was measured at 5:16pm local time. The AML dock downtown had a peak gust of 63mph in the same hour. Broken power poles and outages continued into the evening.
12/27/23	High Wind	Several mesonet stations across Downtown Juneau measured peak gusts in excess of 60 mph on the 27th. The highest wind gust was measured at the South Douglas Harbor profiler, topping out at 87 mph at 11:26am. The ANG dock saw a peak gust of 77 mph

Date	Event Type	Magnitude
		at 1:03pm. The following week a resident of the Mendenhall Valley reported that two trees came down on her property from this event.
1/12/24	Winter Storm	Light and very dry snow began to fall on the evening of Friday January 12th. After 9pm, rates increased and by 8am the Juneau Wastewater Treatment Plant COOP measured 7 inches of snow. Snow continued to fall through Saturday with several more inches accumulating then changed to freezing drizzle Sunday morning. This compacted the snow from the day before and created an icy crust. By late Sunday morning precipitation changed back to snow and began to add up again. Snowfall rates were very heavy throughout the Monday holiday and density of the snow was wet and difficult to move. Storm total snowfall at the NWS Office was 33.1 inches and an NWS employee on North Douglas measured a storm total of 38 inches. An avalanche occurred around 6pm Monday along Thane Road in a known avalanche area and another avalanche occurred the following day in the Behrends slide area. No damage occurred from either avalanche. Snow diminished late on the 15th, but schools were closed for Tuesday to allow for continued snow removal. USCG and Juneau Docks & Harbors department confirmed that 3 vessels sank in the harbors due to the weight of the snow with a rough estimated loss of $100k. In all they had 8 vessels that were at risk of sinking.
1/17/24	High Wind	A long duration Taku wind event in Juneau and Traditional Lands of Tlingit & Haida. All the Downtown Juneau docks and the Douglas Boat Harbor measured gusts more than 60 mph during this period with peaks of over 70 mph and a max of 81 mph at 12:52am on the 18th at the AML dock. The weather station at the top of Eaglecrest measured a peak gust of 73 mph at 9:03pm on the 17th.
1/21/24	Winter Storm	Dry snow began to add up quickly on Sunday the 21st with the NWS office in the Mendenhall Valley measuring over 6 inches by 3pm in the afternoon. The storm total at the Juneau NWS office was 30.9 inches, the Juneau airport had 34.5 inches, and a COOP observer at Lena Point measured 40.9 inches. Alaska Electric Light and Power reported a downed tree which took out a power line on the Mendenhall Peninsula. Juneau Harbors reported vessels sinking due to snow load followed by a change to rain, culminating in at least 5 boats sunk. A partial collapse of a warehouse on Channel Drive occurred due to snow load, and two residential porches collapsed in the Mendenhall Valley, with one family temporarily trapped in their home. Basin Road and Thane Road were both closed due to high avalanche danger, and two avalanches were observed on January 24 down the Behrend's Ave path and Basin Road.
1/29/24	High Wind	AEL&P reported a power outage in Downtown Juneau due to a downed tree at 7:36am on the 29th. At 8:50am NWS forecasters observed a dead tree come down outside the NWS Office. Downtown Juneau Marine Exchange stations measured a peak gust of 62 mph at 942am. A peak gust of 93 mph was measured at the Eaglecrest Ski area at 9:40am.
1/31/24	Heavy Snow	Snow began to fall in Juneau in the afternoon of January 31st and reached 7.2 inches measured at the forecast office and 6.8 inches measured at the airport by midnight. Snow continued to fall until 1pm on the 1st with another 7.7 inches measured for the day at the NWS office and 7 inches at the Juneau airport. This gave a total of approximately 14 inches of snow in less than 24hrs.
2/9/24	Winter Storm	An estimated 5 inches of snow was reported in Douglas by late afternoon, then another report estimated 10 to 12 inches in the same area by 5:50pm.
10/17/24	Heavy Snow	Snow began to accumulate out the road in Juneau at around 9pm on the 17th with 6 inches measured in the daybreak morning. A vehicle accident caused a large power outage for out the road and Auke Bay. Total accumulations of 8 inches were later

Date	Event Type	Magnitude
		reported near Tee Harbor. DOT later reported over 100 trees came down along the highway north of mile marker 30 from this event due to heavy wet snow and the ground not yet being frozen.
10/25/24	High Wind	Marine Exchange observation at the AML Dock measured a peak gust of 61 mph at 8:32pm AKDT on October 25th. Other peak winds around downtown ranged from 45 to 57 mph during this event.
11/19/24	High Wind	Several Marine Exchange of Alaska mesonet stations across Downtown Juneau measured gusts in excess of 60 mph from the evening of November 19th through the morning of the 21st. A peak gust of 84 mph was measured at the top of the Juneau Library at 2:33pm on the 20th. Other peak gusts were over 70 mph.
11/22/24	High Wind	Mesonet station at the top of the Juneau Library recorded a peak wind gust of 74 mph at 4:42am on the 22nd. Multiple other stations recorded high winds during the time frame, with frequent gusts over the high wind criteria of 60mph.
11/26/24	Heavy Snow	Light snow fell across the Juneau area throughout the daytime on Nov. 26th with 3 to 5 inches reported. Snowfall rates then increased through the night with an average of 3 inches measured in each 6-hour period between 3pm to 9am the following morning, reaching 9 inches in that 18-hour period.
12/1/24	Winter Storm	Snow began just before midnight on December 1st at the Juneau airport and quickly became heavy. 6 inches of snow had already fallen by 6am near the airport and another report of up to 10 inches on Douglas Island by 12:45pm. Snow continued through Sunday evening, then saw several hours of sleet and several hours of freezing rain through the following morning. Rain continued to fall on the snowpack, causing localized flooding and icy conditions. Schools were closed on Monday the 2nd and city offices had a delay. Storm totals from the event ranged from 10 to 17.5 inches of snow with an eighth inch glaze of ice.
Source: NWS 2025b- Storm Events Database and Storm Prediction Center Product		

Additionally, the DHS&EM January 2025 DCI lists the following severe weather disaster events which may have affected the area:

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

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

98-190 Southeastern Storm: On October 27, 1998, the Governor declared a disaster to exist in the communities of Haines and the City and Borough of Juneau for the purposes of accessing federal highway administration funds after the worst two-day rainfall in fifty years occurred in Southeast Alaska on October 19-20, 1998. Over 6 inches of rain fell within a 48-hour period. As a result, extensive damage to many road systems, public, private and non-profits properties was caused from mudslides and water shoreline/bank destabilization. On November 24, 1998, under the authority granted by Alaska Statute 26.23.020, the governor amended his declaration of disaster in the City and Borough of Juneau, the City and Borough of Haines, to include the Chilkat Indian Village (Community of Klukwan) in order for public (infrastructure) assistance to public property and individual and family grant assistance. The Governor also requested that the Small Business Administration declare an administrative declaration

for physical disaster damages to provide low interest loans to businesses and private property owners. Individual Assistance totaled $167K for 65 applicants. Public Assistance totaled $828K for 10 applicants with 30 PW's. The total for this disaster is $1.12 million.

06-216 2005 Southeast Storm (AK-06-216) declared December 23, 2005 by Governor Murkowski: Beginning on November 18, 2005 and continuing through November 26, 2005, a strong winter storm with high winds and record rainfall occurred in the City/Borough of Juneau, the City/Borough of Haines, the City/Borough of Sitka, the City of Pelican, the City of Hoonah, and the City of Skagway, which resulted in widespread coastal flooding, landslides, and severs damage and threat to life and property, with the potential for further damage. The following conditions exist as a result of this disaster: severe damage to personal residences requiring evacuation and relocation of residents; to individuals personal and real property; to businesses; and to a marine highway system dock, the road systems eroded and blocked by heavy debris that prohibited access to communities and residents, and other public infrastructures, necessitating emergency protective measures and temporary and permanent repairs. The total estimated amount of assistance is approximately $1.87 million. This includes the following: Individual Assistance totaling $500K for 52 applicants and Public Assistance totaling $1.1 million for 14 applicants and 31 PW's. There was no hazard mitigation. Nov 21,08 update—Closeout later to DAS total cost of $1,684,311 (included $183,088 for IA, plus IA Admin of $35,748, PA Grantee admin of $133,779, and subgrantee admin allowance of $30,290.) Lapse to DRF was $183,586. RBS-11/28/08.

AK-20-272 2020 December Southeast Storm declared by Governor Dunleavy on December 5, 2020 then FEMA declared on 2/17/2021 DR-4585-AK. A very strong atmospheric river impacted Southeast Alaska from December 1-2 with a series of other strong and moist weather fronts through December 8th. The atmospheric river produced historic extreme precipitation in particular over the far northern inner channels including Haines Alaska. The rainfall and snowmelt caused massive road infrastructure damage from runoff coming from Ripinsky Ridge that overwhelmed culverts and flooded areas away from steep terrain including portions of the Haines airport. There were also multiple debris flows along the Haines Highway, Lutak Rd, Mud Bay Rd, Mosquito Lake area and a deadly landslide along Beach Rd where 2 people lost their lives. A large avalanche came down into Chilkat Lake that damaged a few homes. Residents were evacuated from numerous locations across the Haines area. Eight homes were destroyed, and at least 21 will be inaccessible in the long term.

On December 1, precipitation moved into the region with snow level slowly rising through the day with some minor accumulations at sea level but much more at higher elevations (34-59") and along the Haines Highway (17.8"). The 24hr precipitation amount of 5.49" on December 1 from the Haines Airport broke the all-time daily record from 1946 and was a 25 to 50-year return period for rainfall frequency. Looking at a rolling 24hr rainfall total from December 1 through the 2 at 12pm the max was 7.12" with a 100-150-year return interval (RI). The downtown Haines COOP station reported 6.62" which broke it's all time daily precipitation record from 2005 on December 2 (taken at 8am). The Haines 40NW COOP reported 5.23" and broke it's all time daily precipitation record from 1999 and was a 25-year RI.

Under the authority granted by Alaska Statute 26.23.020(c), Governor Dunleavy declared that a condition of disaster emergency exists in the entire Southeast Region of Alaska to include Haines Borough, Municipality of Skagway Borough, City and Borough of Juneau, City and Borough of Wrangell, Petersburg Borough, City and Borough of Sitka, Ketchikan Gateway Borough and the Annette Island, Chatham, and Southeast Island Regional Education Attendance Areas (REAAs), and this condition is of sufficient severity and magnitude to warrant a disaster declaration in order to provide assistance. In addition, as an appropriate life safety decision, the Governor suspended compliance with all state environmental permitting requirements and other specific State requirements pertaining to the Department of Transportation and Public Facilities in accordance with the authority granted by AS 26.23.220 (g)(1), for the duration of the effective date of this proclamation.

AK-22-279 2022 January Southeast Storm declared by Governor Dunleavy on January 11, 2022: Beginning January 8 and continuing through January 11, 2022, a strong winter storm brought extraordinary heavy snow and rainfall over the northern portions of the Alaska Panhandle. This recent cold weather pattern produced over five feet of snow in some areas, followed by heavy rain and additional snow that significantly added to the structural loads on public facilities and infrastructure, residential homes, personal property, and commercial structures. The heavy snow loading on two commercial buildings in the City and Borough of Juneau caused them to collapse, and similar heavy snow loading on the Yakutat Health Center damaged the roof structure resulting in water leakage into the facility. The heavy snow and rain, ice accumulation, and cold temperatures caused similar roof damage and/or frozen water and wastewater pipelines in other public buildings and private property in the City and Borough of

Yakutat, Haines Borough, and Municipality of Skagway Borough requiring emergency response. Community efforts to remove snow, while ongoing since the start of the storm, are challenged by continuing extreme weather and limited local or regional resources. Local officials were concerned about additional damages that may occur if emergency snow removal is not completed rapidly, have requested immediate state support, including the Alaska National Guard, for labor, equipment, and supplies for snow removal from community structures and critical facilities. The City and Borough of Yakutat, City and Borough of Juneau, Haines Borough, and Municipality of Skagway Borough are each political subdivisions of the State of Alaska, and the City and Borough of Yakutat has declared a local disaster emergency and requested state disaster assistance for this event. The severity and magnitude of this emergency are beyond the timely and effective response and recovery capability of local resources, immediate and emergency assistance is needed, and there are insufficient regularly appropriated local funds to cover these requirements.

3. WILDLAND AND URBAN FIRE HISTORY

Wildland fires occur in every state in the country, including all regions of Alaska. Each year, between 600 and 800 wildland fires, mostly between March and October, burn across Alaska causing extensive damage.

According to the Alaska Interagency Coordination Center (AICC), 276 fires have occurred within the Juneau and Traditional Lands of Tlingit & Haida Planning Area in an 85-year period (1939-2024). The largest fire burned 56 acres near Berners Bay in 2018. This fire was caused by a campfire.

Since the 2012 HMP, there have been 7 wildland fire events in the Juneau and Traditional Lands of Tlingit & Haida Planning Area.

The following table shows historical wildfires greater than 0.5 acres in the Juneau and Traditional Lands of Tlingit & Haida Planning Area.

Table 2- Historical Wildfires (0.5 acres and Greater) within the Juneau and Traditional Lands of Tlingit & Haida Planning Area (1939-2024)

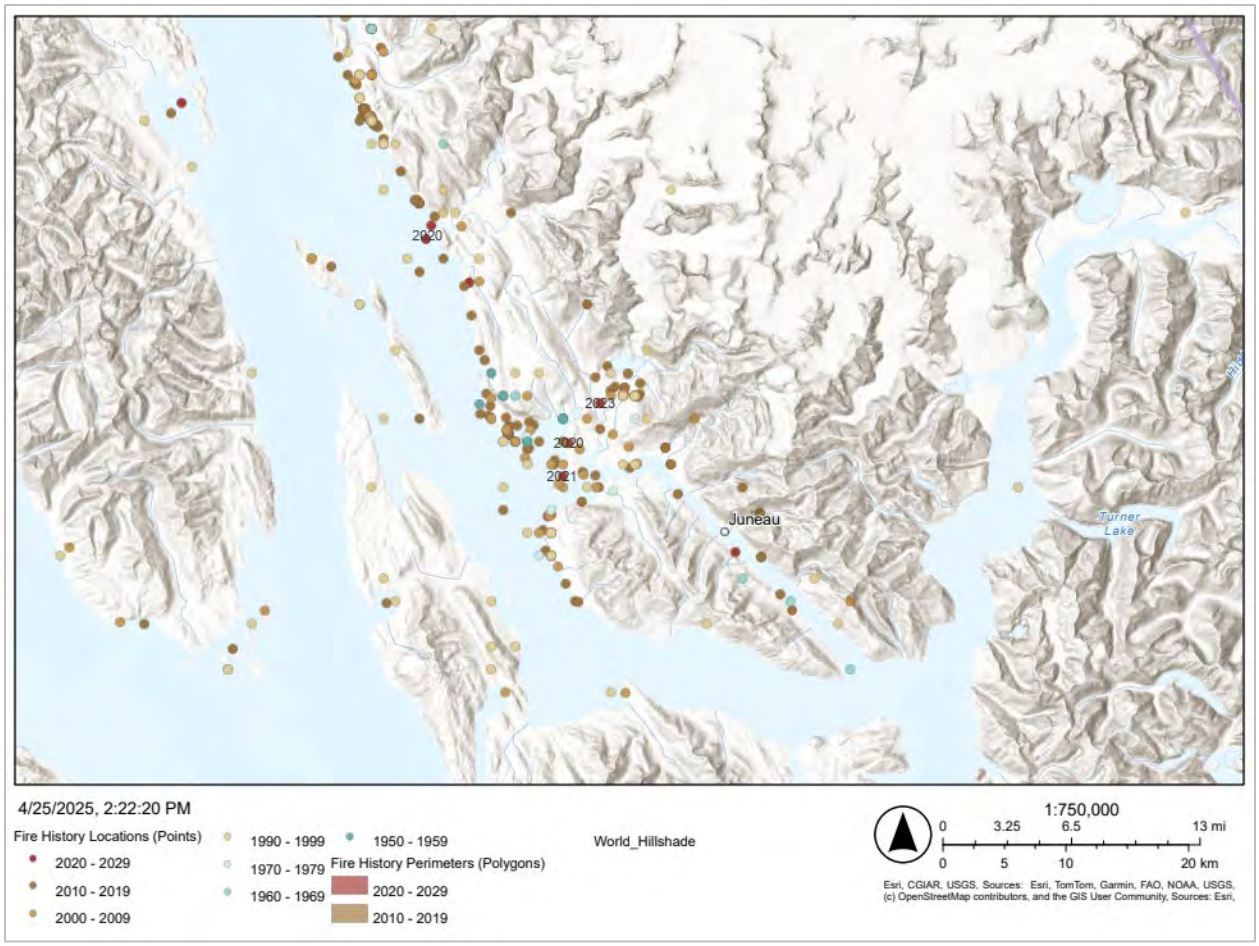
Fire Year	Fire Name	Latitude	Longitude	Total Acres Burned	Cause
1952	Mile 17	58.4	-134.733	0.5	Debris Burning
1953	Mile 17	58.4	-134.733	0.5	Debris Burning
1965	Aspen	58.66667	-134.917	2	Children
1995	Sunshine Cove #2	58.61667	-134.933	0.8	Arson
1996	Back Loop	58.4	-134.567	1	Children
1997	26 Mile	58.5	-134.767	2	Human- Cooking Fire
1997	Berner’s Bay	58.83333	-134.967	20	Human- Cooking Fire
1998	Freddy	58.35	-134.55	0.5	Human- Power saw
2000	Little Sheep Creek	58.25	-134.25	2	Human- Campfire
2002	Davie’s Creek	58.66667	-134.917	2	Human
2002	Moose Lake	58.4	-134.583	2	Human
2005	Engineers Cutoff Road	58.36111	-134.627	1	Human
2005	Refuge Wetlands	58.35056	-134.547	2.5	Human
2005	Middle Point	58.27528	-134.657	0.5	Human
2009	Suedla	58.35	-134.65	5	Human- Campfire
2010	Gun Range Fire	58.46667	-134.617	0.5	Human
2011	Fir Road	58.4	-134.55	0.5	Children

Table 2- Historical Wildfires (0.5 acres and Greater) within the Juneau and Traditional Lands of Tlingit & Haida Planning Area (1939-2024)

Fire Year	Fire Name	Latitude	Longitude	Total Acres Burned	Cause
2015	Crow	58.5	-134.817	0.6	Human- Campfire
2017	Mendenhall Wetlands	58.34194	-134.605	0.9	Miscellaneous
2018	Lucky Me	58.24333	-134.331	1.1	Debris Burning- Open Trash Burn
2018	Antler	58.78556	-134.94	56	Campfire
2020	Crow Point	58.51419	-134.841	15.5	Unknown
2021	Spuhn Island	58.34128	-134.651	1.2	Unknown
2023	Wren	58.39467	-134.599	9.5	Unknown

Source: AICC 2025

The below figure depicts the locations of historic fires near Juneau and Traditional Lands of Tlingit & Haida.



Source: AICC 2025

Figure 11- Historical Wildfire Locations near Juneau and Traditional Lands of Tlingit & Haida (1950-2024)

Urban (Community/Downtown) Fire

Urban fires are a constant threat to the Juneau and Traditional Lands of Tlingit & Haida area. Juneau and Traditional Lands of Tlingit & Haida itself has avoided a mass conflagration in the community's recorded history, but neighboring island, Douglas, has been severely damaged by fire on three separate occasions:

- March 9, 1911 - a large fire destroyed sixteen buildings in the Douglas business district.
- October 10, 1926 - the eastern side of town, the Indian village, and the small mining town of Treadwell were leveled by fire.
- February 23, 1937 - another fire destroyed most of Douglas.

Juneau's Downtown Historic District is known for its streets filled with historic buildings, but the district also poses a significant fire hazard. Many of the buildings in this district are wood-framed structures, which increases the risk of a conflagration event. Historically, fires did occur in Downtown Juneau, but they were all confined to the building of origin and did not spread.

In 2004, a fire was called in at a Downtown Juneau building with smoke billowing from the roof. The 108-year-old Skinner Building was reported to have caught fire from a roof tarring job at the top of the historic building. Due to the building's age and multiple layers of wood on the walls and roof, local firefighting crews had difficulty locating the source of the burn, so all crews were removed from the building. To prevent the fire from spreading to nearby buildings, an excavator peeled down the walls of the structure. In the aftermath of the fire, the building was destroyed, and luckily there were no serious injuries. This event provides an illustration of the potential of a mass conflagration event throughout Downtown Juneau, due to the congestion of historic wooden structures in the area.

The Alaska State Fire Marshal's office records fatalities due to urban fires, and there have been 6 fatalities in Juneau and Traditional Lands of Tlingit & Haida from structure fires between 2012-2025. The majority of these fires causes were undetermined, with one fire starting from a cooking mishap (Alaska DPS 2025).

Source: KTOO 2015, Photo Credit: Brian Wallace

Figure 12- Smoke Pouring out of the Roof of the 108-Year-Old Skinner Building (2004)

4. LANDSLIDE HISTORY

Subaerial (above the water) and submarine (underwater) and landslides are a serious hazard for coastal Alaska communities, particularly in Southeast and Southcentral Alaska (AEC 2020). This region has a long history submarine and subaerial landslides, avalanches, and rockfalls.

Subaerial Landslide

Juneau and Traditional Lands of Tlingit & Haida has experienced numerous subaerial landslides in recent history. These landslides have induced damages to critical facilities, private residences, and the natural environment within the Planning Area. The most damaging landslides occurred in 1920, 1936, and 2020.

Table 3- Historical Subaerial Landslides in Juneau and Traditional Lands of Tlingit & Haida

Date	Description of Event
1/2/1920	A series of debris avalanches occurred in the area between Gastineau Avenue and South Franklin Street. Damage was caused by the impact of the debris slides as well as the relocation of several buildings, which slid into other buildings. Four people were killed, and up to eight were injured.
11/15/1929	Gastineau Avenue landslide destroyed one home.
10/16/1936	A debris avalanche between Gastineau Avenue and South Franklin Street destroyed several buildings and buries one resident. The slide debris crossed Gastineau Avenue and damaged/entered the backside of the Alaskan Hotel.
11/22/1936	One of Juneau and Traditional Lands of Tlingit & Haida's most destructive landslides occurred on November 22, 1936. Prolonged heavy rainfall triggered a debris flow that struck a residential area causing numerous injuries and deaths. The slide completely covered South Franklin Street to a depth of approximately ten feet. Fifteen people were killed. A second, much more damaging slide quickly followed the first one. The second slide cut a swath 100 feet wide and ranged from 10 to 40 feet deep. The slides tore through Gastineau Avenue and Ewing Street, and terminated near the Juneau Cold Storage Company's warehouse, and ran up the side of the building approximately 3 feet. Two apartment buildings, a lodge, and a store were engulfed, and powerlines and lights were disrupted.
7/16/1984	Heavy rain fell on already waterlogged soils and triggered a debris avalanche/flow that destroyed a small hydroelectric dam, Juneau Veterinary Clinic, and damaged two houses and left debris on the Glacier Highway and inside several local businesses.
10/20/1998	Over the 19th and 20th of October, over six inches of rain fell in the Juneau and Traditional Lands of Tlingit & Haida area, saturating the soil and causing several ground failures, closing several sections of highway and damaging homes, roads, and state trails. Slides occurred along North Douglas Highway, on Thane Road, downtown near Cope Park, and along Glacier Highway in several locations just north of the high school, in the Twin Lakes area, and near the ferry terminal. At least 5 homes were damaged on North Douglas due to mass wasting and flooding between Cordova Street and the Bonnie Brae subdivision. After the slides occurred along Glacier Highway, the AWARE women's shelter was flooded with muddy water. Another mud slide completely collapsed a section of Fritz Cove Road (just north of the airport) and removed a beachfront home from its foundation. The home was destroyed. Several state trails were also destroyed.
10/6/2019	Localized flooding on small creeks and debris flows occurred around the Downtown Juneau area, Douglas and along Thane Road during the overnight hours. John Street, on Douglas Island, saw massive shoreline/bank destabilization when culverts were overwhelmed or blocked by debris from the rainfall runoff. This event produced highly variable 24-hour precipitation totals ranging from just over one inch at the JIA to more than seven inches in Douglas with most rainfall falling in 6 to

Date	Description of Event
	12 hours. This was a very anomalous event with return periods ranging from a 200–500-year event in Douglas to a 10–25-year event in Downtown Juneau for 12- and 24-hours time frame. Most of the damage from the shoreline/bank destabilization when culverts were overwhelmed or blocked, and debris flows that blocked roadways in Douglas were reported by trained weather spotters or emergency management right after midnight on October 6th. There were multiple calls from the public located on St. Anns Ave about minor street flooding in Douglas along with a debris flow on David and John Street washing out portions of the street. Police started to evacuate people out of harms way with the Red Cross helping people displaced from the damage. Just before sunrise more reports came in that Thane Road was blocked by a debris flow just before Mt. Roberts Street. There were also other reports on the morning of the 6th that there was a debris flow in Cope Park in Downtown Juneau along with major damage to the Alaska Electric Light and Power's flume system as a debris took out a section of the flume. One report came in that a person's oil tank became dislodged from shoreline/bank destabilization and was spilling heating fuel onto the ground and street.
12/2/2020	Between the 2nd and 4th of December, Juneau and Traditional Lands of Tlingit & Haida experienced over 6.5 inches of rainfall in 48 hours accompanied by winds gusting over 60 miles per hour. A debris flow affected the AWARE shelter, with saturated debris and water running across Glacier Highway and flowing into the parking lot and the first floor of the building. The top of Mary Ellen Way also experienced blockage by a debris flow and several outbuildings and one home were damaged. It was reported that employees of the shelter heard rumblings preceding the debris flow and were able to move their vehicles before they were inundated with mud. Another slide from this rainfall occurred in the Highlands neighborhood, with debris flowing down both directions of Behrends Avenue, extending to Egan Drive. Debris also covered several homes on Ross Way. The landslide also damaged Salmon Creek Road and cutoff the freshwater supply to Macaulay Salmon Hatchery, resulting in premature release of Chinook Salmon, Chum Salmon, and Rainbow Trout. The fish were essentially destroyed since they were not yet able to use saltwater. This caused the 2024 emergency closure of near shore sport fishing for Chinook Salmon around Juneau and Traditional Lands of Tlingit & Haida, a detriment to the culture, economy, and recreational options of Juneau residents.
4/4/2022	A sizeable rockslide occurred at Milepost 10.1 of the North Douglas Highway. An estimated 150-foot cliff band was exposed during the rockslide, which left significant overhanging blocks. Approximately 500 cubic yards of rock, tree trunks, and minor colluvium soils hit the highway. The debris filled the ditch, shoulder, and inbound lane while blocking the outbound lane with massive boulders, the largest measuring 11 feet across.
4/7/2022	Another rockslide occurred on the same cliff face as the April 4, 2022, rockslide, again covering the North Douglas Highway. The massive overhanging rocks exposed during the previous rockslide were dislodged from the cliff face during this event. One of the boulders, 16 feet across, bounced over the road and landed in the water. The road was closed to all but emergency vehicles until April 22, 2022.
9/6/2022	1-4 inches of rainfall preceded a landslide occurring in Downtown Juneau. The slide pushed one home across Gastineau Avenue into another home, and downed power lines. Power was out in Douglas, North Douglas, Downtown Juneau, and the majority of Thane for several hours. Community residents were evacuated to a downtown fire station. Gastineau Avenue was closed for three days.
9/26/2022	Around 1700AKST on September 26th, there was a strong wind shift to the west after hours of strong southeast winds and heavy rain leading up to the event. The ground was saturated, and the wind shift triggered a large tree to fall from steep terrain in Downtown Juneau to produce a shallow landslide Rain amounts from this event ranged from 3 to 5 inches in 36 hours. The heavy rain

Date	Description of Event
	coupled with warm temperatures produced significant amounts of runoff to cause moderate flooding around the Jordan Creek area near Juneau and Traditional Lands of Tlingit & Haida from mid morning on September 26th through the morning of September 27th. As the front moved through the area there was a wind shift in the afternoon hours of September 26th and with the ground very wet from the heavy rain caused a tree to fall which triggered a shallow landslide in Downtown Juneau that damaged 3 homes. The heavy rain also triggered 2 landslides near mile marker 31 along Glacier Highway one around 1700AKST and then again in the early morning of September 27th.
8/13/2023	Heavy rains induced a small landslide on Starr Hill. No damages were reported, but several homes were evacuated. There was a small amount debris that ran up onto one residence but no notable damage was incurred. The heavy rains also caused the City and Borough of Juneau to issue a warning to residences to avoid “already unstable riverbanks”
7/14/2024	A landslide, triggered by heavy rains, affected the Strasbaugh Apartments on Gastineau Avenue. The slide displaced 7 people, but no injuries or major damage was reported. Trees, mud, and large debris was deposited into the road. The heavy rains triggered at least two more (smaller) landslides that day. There were no damages reported in those slides. The National Weather Service issued a flood watch On July 14th until July 15th.

Source: Tetra Tech 2022, KTOO 2023, KTOO 2024

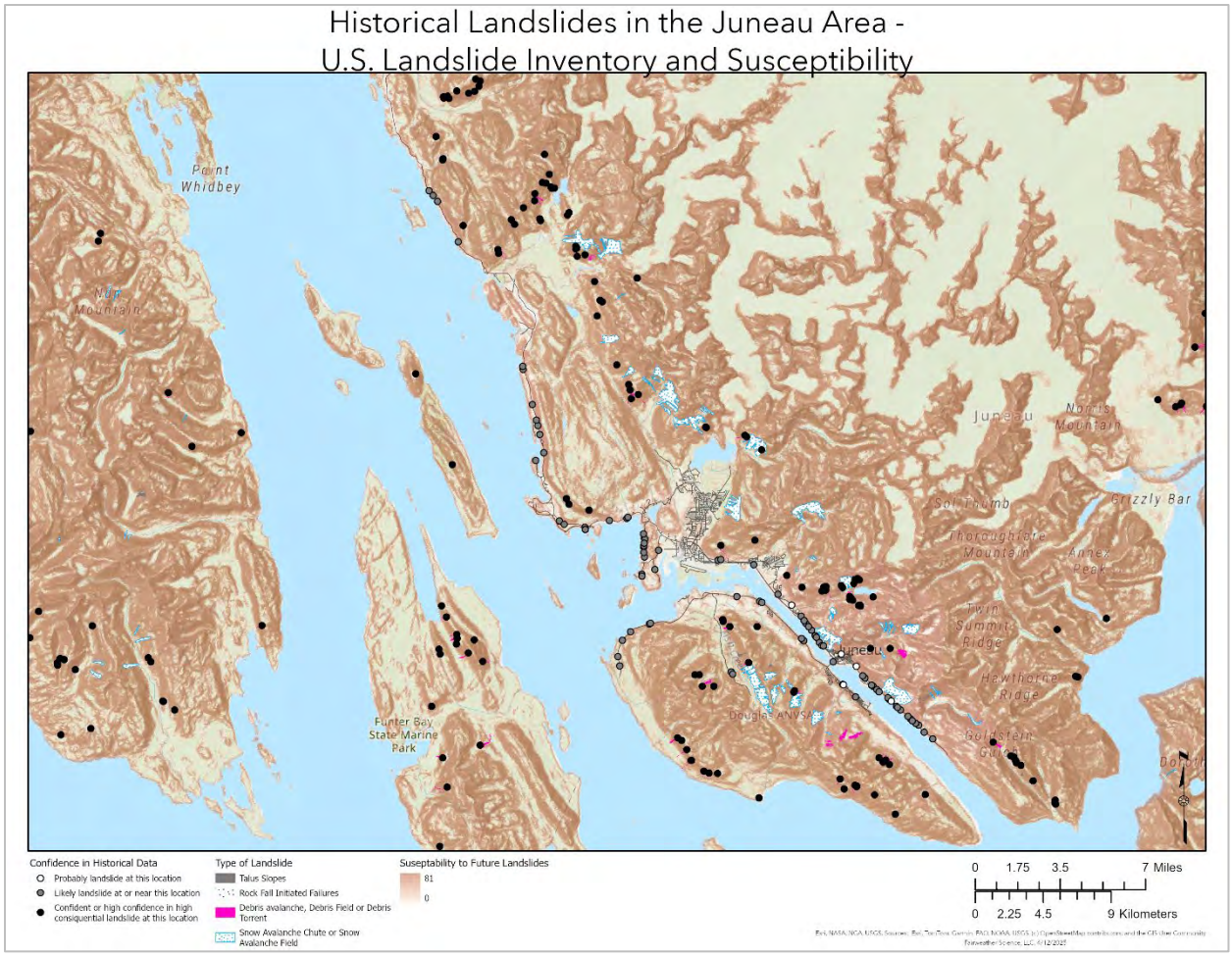


Figure 13- Historical Subaerial Landslides in Juneau and Traditional Lands of Tlingit & Haida

Figure 14 shows historical gully landslides in and near Downtown Juneau Gully landslides are defined as a landslide that occurs within a channel formed by shoreline/bank destabilization.

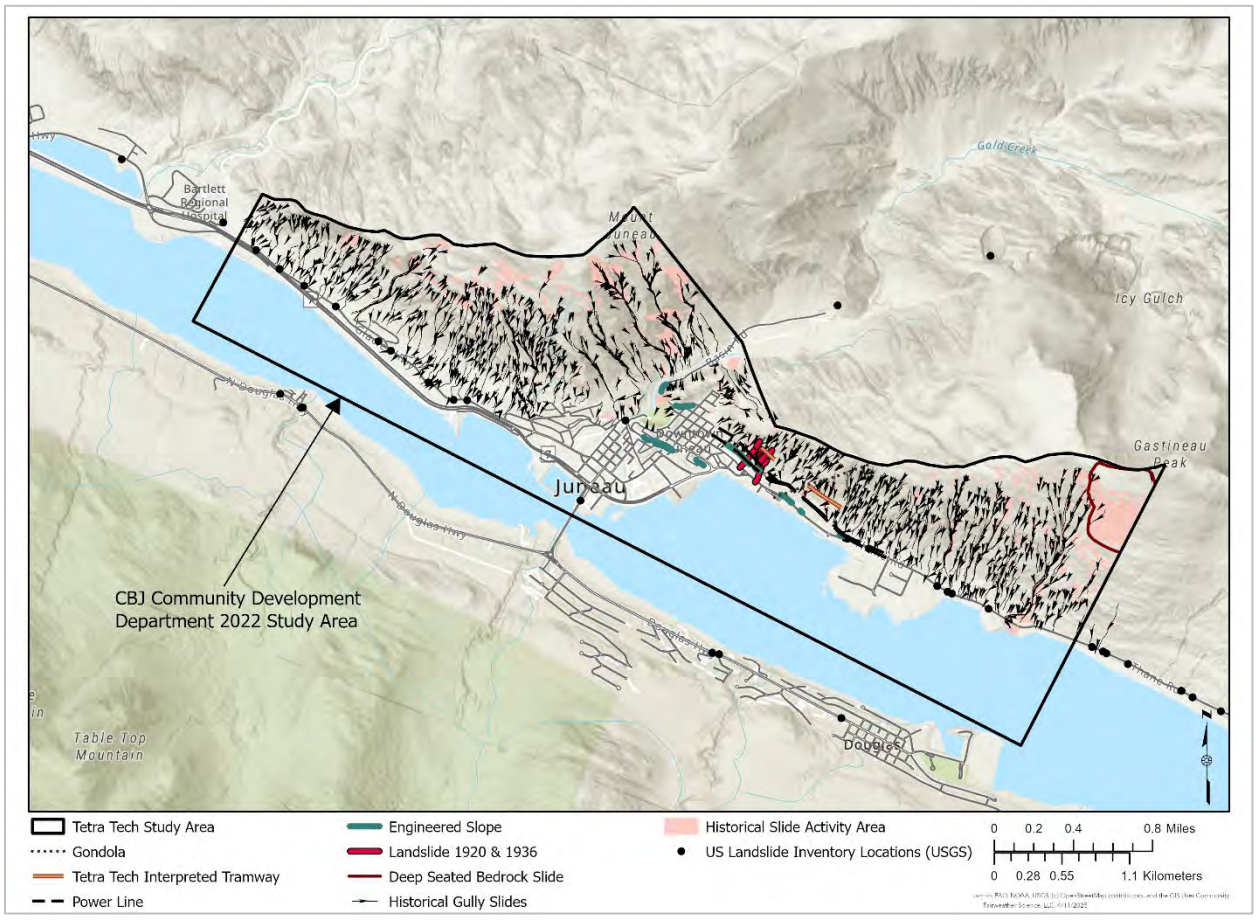


Figure 14- Historical Gully Landslides in and near Downtown Juneau

Figure 15 shows historical debris landslides in Downtown Juneau. Debris flows are fast-moving landslides that are particularly dangerous to life and property because they move quickly, destroy objects in their paths, and often strike without warning.

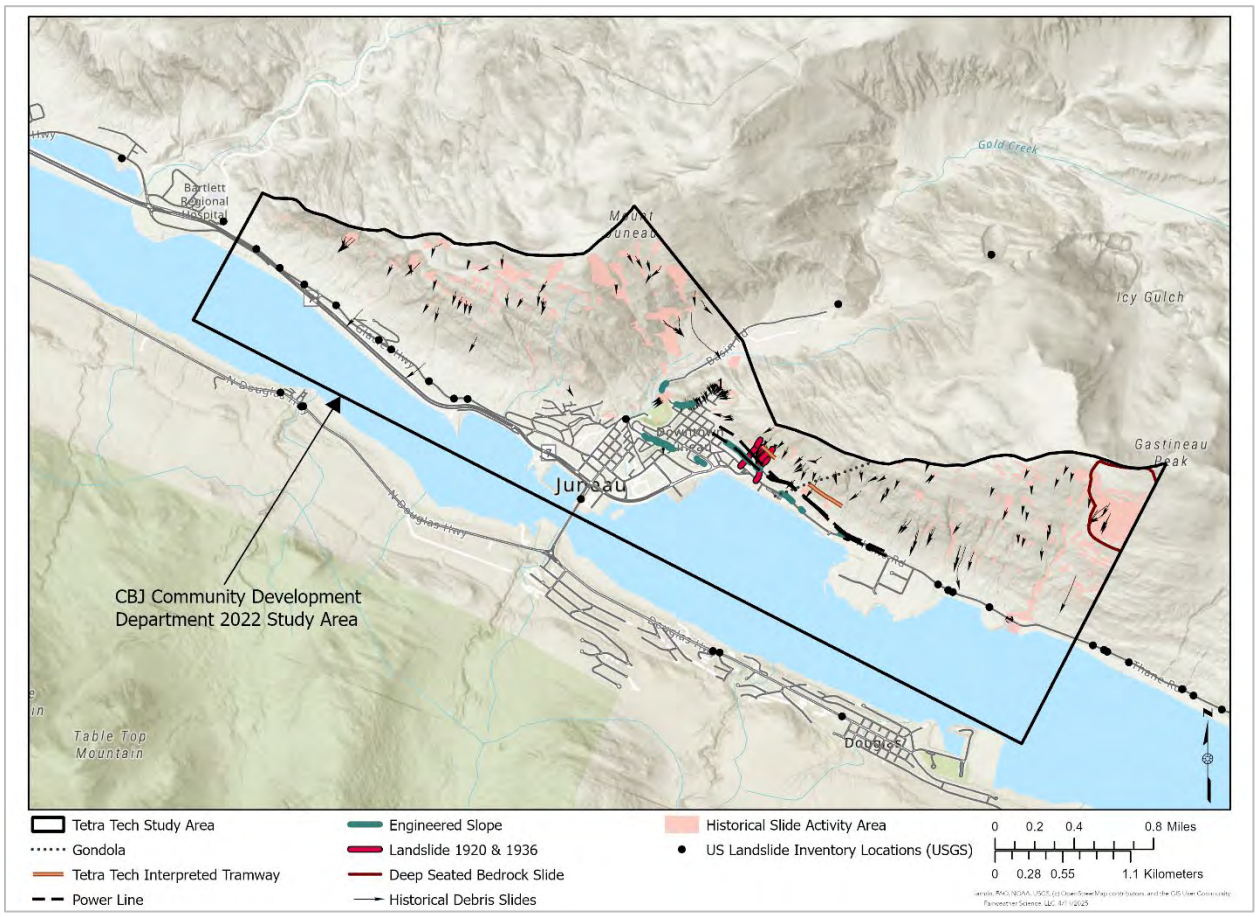


Figure 15- Historical Debris Landslides in and near Downtown Juneau

Submarine Landslide

There is little documentation regarding submarine landslides in Juneau and Traditional Lands of Tlingit & Haida. Juneau and Traditional Lands of Tlingit & Haida may have experienced underwater/submarine landslides following earthquakes in 1958 and 1964 that caused minor wave activity and minimal impacts (CBJ 2020).

During the 1958 Lituya Bay Earthquake and mega tsunami near Yakutat, it was reported that underwater cables in Lynn Canal, between Juneau and Traditional Lands of Tlingit & Haida and Skagway, were broken by submarine landslides (DGGS 2022).

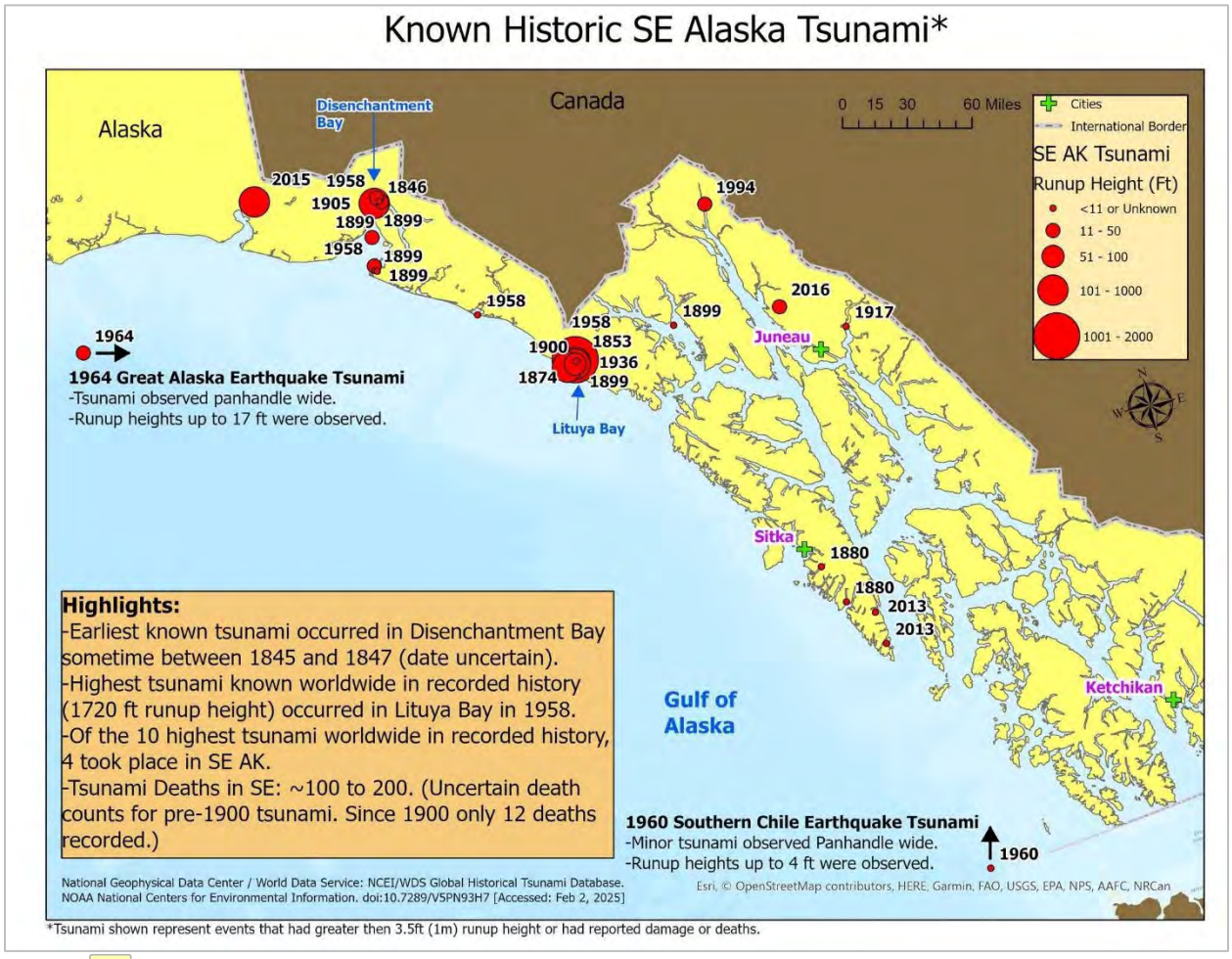
5. TSUNAMI HISTORY

The protected communities of southeast Alaska such as Juneau and Traditional Lands of Tlingit & Haida are at low risk for damage from a distant-source tsunami; however, landslide-generated tsunamis are a significant hazard, especially when combined with the risk of earthquake in the region. Earthquakes can trigger landslides, which can in turn create a tsunami.

Alaska is the site of 35 of the Pacific coast's 63 historical tsunamis. The tsunamis of 1964 were among the most damaging historical tsunami events worldwide. Southeast Alaska has been struck by ten of Alaska's

historical tsunamis, about half of which were damaging. The tsunami with the highest wave height ever recorded occurred in Southeast Alaska, at Lituya Bay in 1958. Tsunamis in Alaska have destroyed settlements such as Kodiak and Valdez, and structures such as Scotch Cap lighthouse, and have caused many deaths and extensive property damage.

Juneau and Traditional Lands of Tlingit & Haida have not been impacted by a damaging tsunami in recent history. However, tsunamis are unpredictable and can occur with little warning.



Source: NWS Juneau 2025

Figure 16- Map of Known Tsunamis in SE Alaska

1958 Lituya Bay (Yakutat) Landslide and Megatsunami

On July 9, 1958, a 7.8-8.3 magnitude earthquake occurred in Lituya Bay, 115 miles northwest of Juneau and Traditional Lands of Tlingit & Haida. The earthquake was caused by a strike-slip on the Fairweather fault and triggered a landslide of 30 million cubic meters and 90 million tons of rock/land was displaced in the narrow inlet of Lituya Bay. The sudden displacement triggered a megatsunami that was felt throughout the region and at least eight separate local tsunamis.

This tsunami was so powerful that water marks and cleared trees were recorded at over 1,700 feet in elevation in the fjord (a height taller than the Empire State Building). A total of 5 people were killed from this tsunami and many others injured and displaced from their homes. In Yakutat, the only permanent outpost close to the epicenter at the time, infrastructure such as bridges, docks, and oil lines all sustained damage. A water tower collapsed, and a cabin was damaged beyond repair. Sand boils and fissures occurred

near the coast southeast of Yakutat, and underwater cables that supported the Alaska Communication System were cut. Lituya Bay is a known tsunami prone area and there have been three other fatal landslide-generated tsunamis.

Juneau and Traditional Lands of Tlingit & Haida were not directly impacted by this tsunami, but it was reported that underwater cables in Lynn Canal, between Juneau and Skagway, were broken by submarine landslides.

1994 Skagway Tsunami

The 1994 Skagway tsunami was a landslide-generated tsunami that caused one fatality and over $25 million in damage. This event was predicted somewhat by a 1972 U.S. Geological Survey study that addressed Skagway's vulnerability to landslide-generated tsunamis. The study concluded that a large landslide-generated tsunami was likely in Skagway and would cause a significant hazard to the city. The study recommended that the area be studied in detail to better understand the threat and possible mitigation activities. The recommended assessments and studies were not performed. Studies conducted after the event indicate that several factors led to the landslide, tsunami, and seiche. An extremely low tide initiated the submarine landslide at the mouth of the Skagway River. The submarine landslide, combined with increased river volume from recent flood events, triggered a second submarine landslide underneath the PARN docks, which were undergoing major repairs and storing 9,000 cubic yards of riprap material on the pier foundation.

There were no reported impacts in Juneau and Traditional Lands of Tlingit & Haida from this tsunami event.

2011 Tohoku (Great East Japanese Earthquake)

On March 11, 2011, the M9.1 Tohoku earthquake produced a small wave in Juneau and Traditional Lands of Tlingit & Haida. The maximum wave amplitude recorded by the tide gauge was 8.3 in (DGGS 2017). The far-field Tohoku tsunami did not result in a significant wave at Juneau and Traditional Lands of Tlingit & Haida due to its distance from the tsunami source and directivity patterns of the energy propagation away from Southeast Alaska (DGGS 2017). The waves were directed primarily to the northwest, toward the coast of Japan, and to the southeast, in the Pacific Ocean. There are no observations of this tsunami at Juneau and Traditional Lands of Tlingit & Haida, likely because of the relatively small size of the wave and an arrival time of 5:35 a.m. (DGGS 2017). The Tohoku tsunami arrived during a falling tide, and the highest wave arrived at low tide. The tidal range in Juneau and Traditional Lands of Tlingit & Haida on March 11th, 2011, was 12 ft (DGGS 2017).

2015 Taan Fjord Landslide and Tsunami

On October 17, 2015, 180 million tons of rock slid into Taan Fiord, an arm of Icy Bay, 272 miles northwest of Juneau and Traditional Lands of Tlingit & Haida, generating a tsunami that stripped forest from 8 square miles of Wrangell St.-Elias National Park and Preserve and reached as high as 633 feet (193 m) above the fjord, the fourth-highest tsunami ever recorded. It had almost no human impact. No one was close enough to be harmed, and the only damage to infrastructure was rocks scattered on a beach used for landing bush planes (not within CBJ boundary) (NPS 2019). The slope failure occurred from rapid ice loss from a tidewater glacier in a tectonically active setting (Higman et al. 2018).

Figure 17- Path of the 2016 Alpine Tsunami at Cowee Creek in Juneau

2016 Cowee Creek Juneau Alpine Tsunami

On December 30, 2016, a M3.4 seismic event was recorded at the head of Cowee Creek, north of Juneau near the end of the road (KTOO 2018). A gigantic piece of rock broke away from a cliff and plunged into a small lake at the terminus of an unnamed glacier. An estimated 600,000 cubic yards of water was blown out of the lake. A 30-foot-high wave rolled down Cowee Creek, downing trees and scouring the shoreline in a 300-foot-wide swath down the valley (KTOO 2018). LIDAR, or light detection and ranging surveys, before and after the tsunami show that 1,500 trees were washed away by the wave (KTOO 2018).

2018 Kodiak Earthquake

On January 23, 2018, a 7.9 magnitude earthquake occurred near Kodiak, and a tsunami warning was issued. However, a tsunami did not occur in Juneau and Traditional Lands of Tlingit & Haida. Just 92 miles away, Sitka registered a 4.8-inch wave at 3:18 a.m. (KTOO News Department 2018).

2021 Chignik Earthquake

On July 29, 2021, a powerful 8.2 magnitude earthquake occurred 60 miles southeast of Chignik. As a result of this earthquake, a tsunami advisory was issued for southeast Alaska, including the area from the inner/outer coast from Cape Decision (85 miles southeast of Sitka) to Cape Fairweather, which is 132 miles northwest of Juneau and Traditional Lands of Tlingit & Haida. Juneau and Traditional Lands of Tlingit & Haida were on alert for orders to evacuate, but the advisory was cancelled shortly after with no impact on the community.

Table 4 describes historical tsunami events that impacted Juneau and Traditional Lands of Tlingit & Haida. Since the 2012 HMP, there was 1 tsunami event that caused runup in Juneau and Traditional Lands of Tlingit & Haida, but it did not impact the community.

Table 4- Historical Tsunami Events with Runup Recorded in Juneau and Traditional Lands of Tlingit & Haida (1800 – May 2025)

Date	Cause*	M	Origin	Location of Effects	Max. Water Height (m)	Comments
10/24/1927	EQ+L	7.1	Southeast Alaska	Juneau	Observed	Heavy seas broke towline, water muddy and churned. The Juneau-Skagway-Haines cable broke in two places. Cable breaks were ascribed to a submarine landslide.
11/4/1952	EQ	8.2	Kamchatka Peninsula	Juneau	0.13	
3/9/1952	EQ	8.2	Central Aleutian Islands	Juneau	0.20	
3/9/1957	EQ	8.6	Andreanof Islands	Juneau	0.20	
7/10/1958	EQ	7.9	Southeast Alaska	Juneau	Observed	Six underwater cables broke.
5/22/1960	EQ	8.6	Chile	Juneau	0.05	Trace recorded.
3/28/1964	EQ	8.5	Gulf of Alaska	Juneau	1.10	The tide was 4 to 6 feet higher than normal.
7/30/1972	EQ	7.6	Southeast Alaska	Juneau	0.10	Coast Guard reported “confused white cap throughout Alaskan waters.”
2/27/2010	EQ	8.5	Chile	Juneau	0.11	
3/11/2011	EQ	8.3	Japan: Honshu	Juneau	0.21	
7/29/2021	EQ	8.2	Gulf of Alaska	Juneau	0.05	

*Cause of tsunami: EQ= earthquake only, L=landslide only, EQ+L: earthquake and resultant landslide
Source: DGGS 2017, NCEI/WDS 2025

6. FLOOD HISTORY

The Juneau and Traditional Lands of Tlingit & Haida Planning Area is subject to voluminous rainfall, snow and glacier melt, coastal, and glacier-dammed lake release flooding. Details of the historic incidents of the flooding events are detailed here.

Glacial Lake Outburst Flood (GLOF)

Tulsequah Glacier: The Taku River, which drains into Taku Inlet approximately ten miles south of Juneau and Traditional Lands of Tlingit & Haida, experiences glacial outburst floods. These floods originate from Lake No Lake along the Tulsequah Glacier in British Columbia, located approximately 40 miles northeast of Juneau and Traditional Lands of Tlingit & Haida. As flood waters from the draining of Lake No Lake flow into the Taku River, flooding can happen with damages to remote cabins along the river. A flooding event occurred in 2021, with a record high water level of 45.54 feet and record discharge of 137,000 cubic feet per second. USGS has record of outbursts from Tulsequah Lake dating back to 1910 (USGS, 1999). Most recently, release from Lake No Lake began on the night of 6/29/2025. Residents and recreationists were advised to remain vigilant for potential hazardous debris in the Taku River. According to the NWS, the River crested at 40.9 feet early on the morning of 7/1/2025 without reaching flood stage or causing damages.

Figure 18- Tulsequah Glacier (2005)

Mendenhall Glacier: There had been no previously known glacial outburst flood problems that immediately threatened the more densely inhabited areas of Juneau and Traditional Lands of Tlingit &

Haida until the summer of 2011. Since 2011, Juneau and Traditional Lands of Tlingit & Haida has experienced annual glacial lake outburst floods released from Suicide Basin. Suicide Basin is a side basin of the Mendenhall Glacier above Juneau and Traditional Lands of Tlingit & Haida. Beneath Mendenhall Glacier is Mendenhall Lake, which drains into Mendenhall River. The low-lying area along Mendenhall River is the most populated residential area in Juneau and Traditional Lands of Tlingit & Haida. Suicide Basin has released glacial lake outburst floods that cause inundation along Mendenhall Lake and River annually since 2011. Some years have seen multiple smaller floods while some years have seen one large flood.

Source: NOAA 2019

Figure 19- Location of Suicide Basin and the Mendenhall Lake/River System

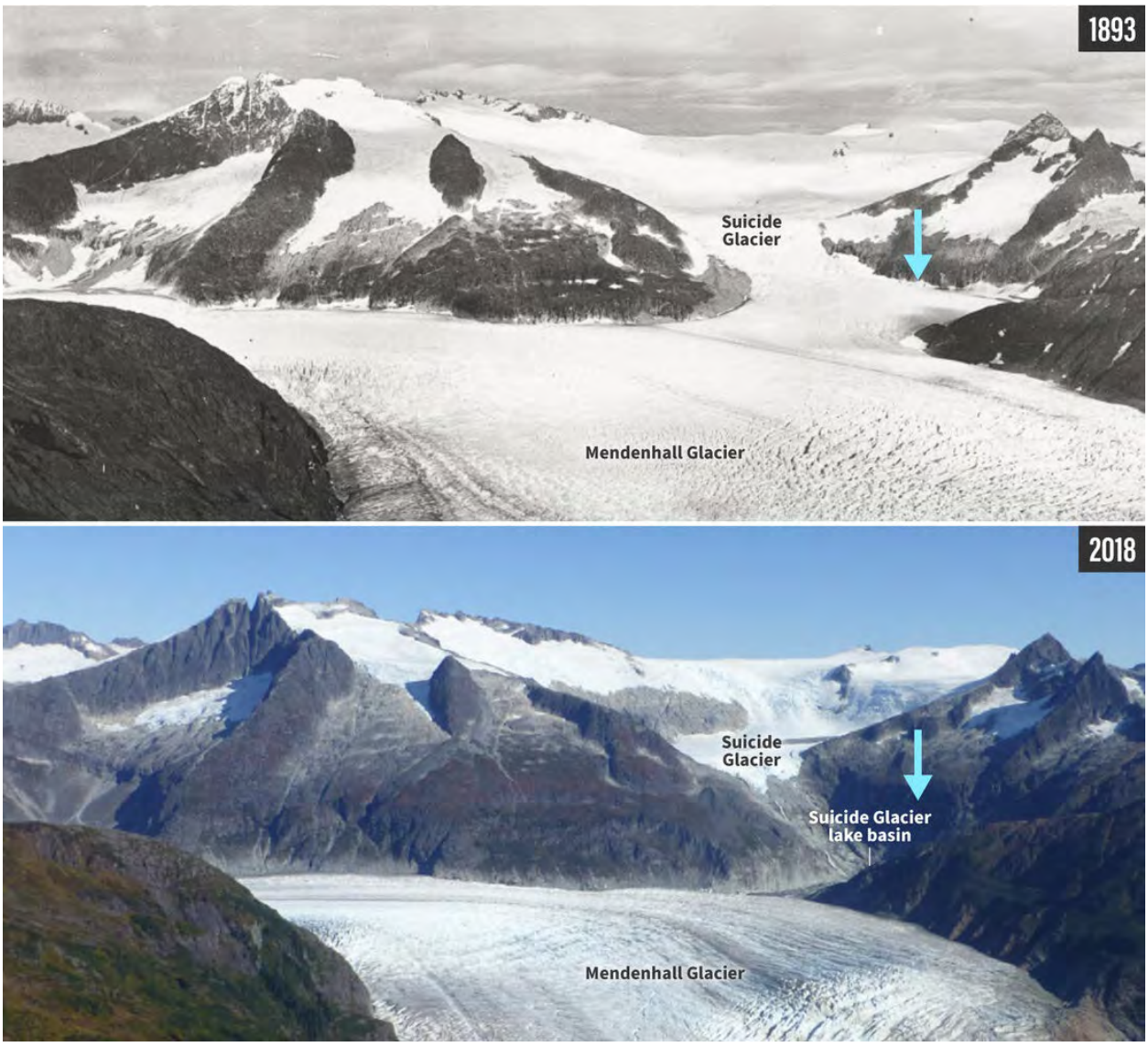


Figure 20- Mendenhall Glacier and Suicide Glacier retreat comparison: 1893 and 2018

Source: USGS 2011

Figure 21- GLOF Pours from underneath Mendenhall Glacier to overflow Mendenhall Lake

Even after full release, meltwater can continue to refill Suicide Basin, posing a risk for secondary and tertiary releases. The figure below shows water levels before and after an outburst flood from Suicide Basin.

Source: Alaska Climate Adaptation Science Center StoryMap "Hidden Water: The Suicide Basin Outburst Flood 2020

Figure 22- Water Level Before 2011 GLOF Drainage Event in Suicide Basin

The USGS monitors Suicide Basin using imaging and laser sensor data. Two cameras take one image each per day and laser sensor data detects changes in the basin's water levels (National Weather Service, 2025).

Source: National Weather Service Suicide Basin Image Scale Viewer 5/19/2025

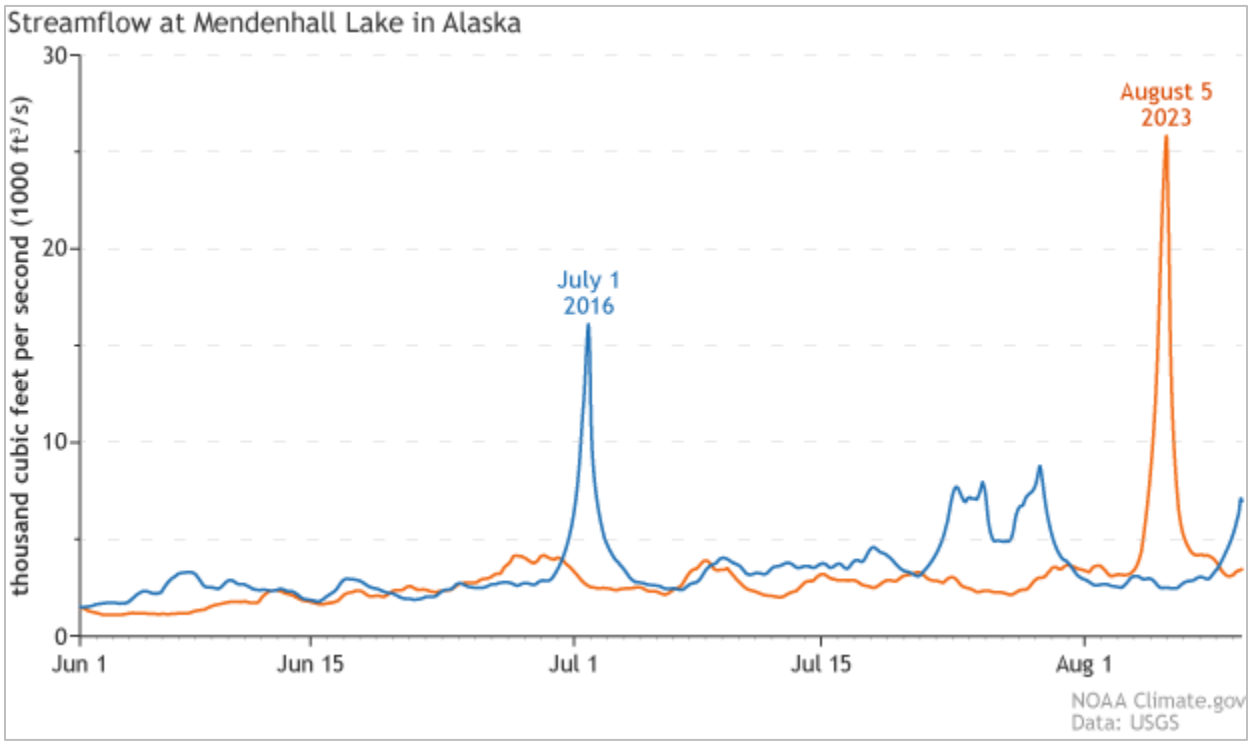
Figure 23- USGS Suicide Basin USGS Monitoring

In 2016, an outburst flood from Suicide Basin caused the water level of Mendenhall Lake to gain nearly 12 feet over the baseline and resulted in significant damage to riverside properties. Streamflow reached 16,300 cubic feet per second, more than ten times greater than the average flow (1,000 cubic feet per second) of the Mendenhall River in summer.

Source: Climate Adaptation Science Center

Figure 24- A flooded footpath near the Mendenhall Visitor Center due to GLOF, 2016

In August 2023, a glacial outburst flood from Suicide Basin sent a then-record amount of water rushing at nearly 26,000 cubic feet per second into Mendenhall Lake and River, with a Mendenhall Lake gauge recording 14.97 feet above baseline of 55.99 feet. Flood waters caused significant shoreline/bank destabilization and swept trees and buildings downstream.



*Blue line depicts previous record-high GLOF in 2016. Orange line depicts 2023 streamflow.
Source: NOAA and USGS, 2023

Figure 25- Streamflow at Mendenhall Lake during August 2023 GLOF

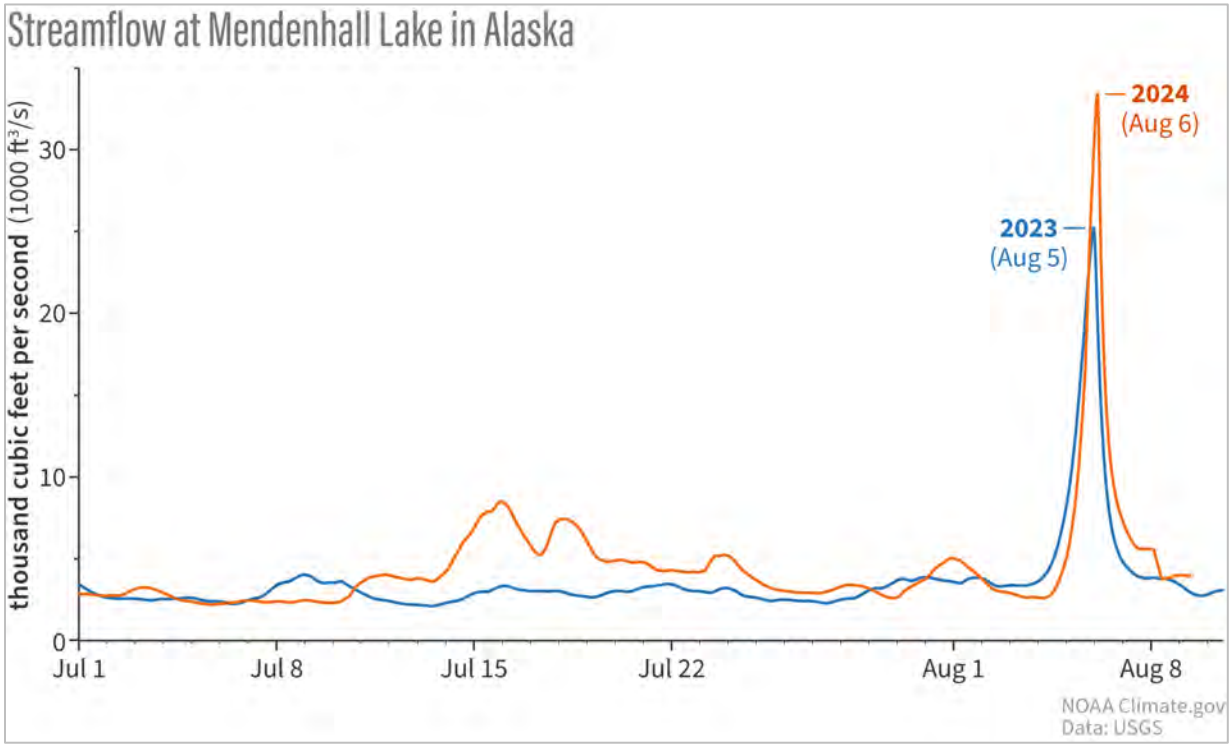
Photo Credit: Rod Wilson, Juneau Resident

Figure 26- Flooding on Marian St. During the 2023 GLOF Event

The 2024 glacial outburst flood, which took place on August 5th and 6th due to a major release from Suicide Basin, resulted in peak water levels of 15.99 feet at 3 a.m. on August 6th. This exceeded the level of the August 2023 outburst (14.97 feet) by over a foot. Streamflow exceeded 33,000 cubic feet per second and remains the largest flow that has occurred along the Mendenhall River system in recorded history. These events are instances of glacial outburst floods in which water was released all at once during a single flooding event. Previously, flooding occurred in smaller partial releases throughout the summer and fall.

Floodwaters inundated homes and roads in the Mendenhall River Valley. Preliminary damage assessments of neighborhoods estimate that approximately 290 residences (including apartments and condos) were damaged by floodwaters. No casualties or injuries were reported. Governor Dunleavy made an emergency declaration on August 6th, 2024, which activated a state disaster response including Public and Individual

Assistance disaster programs. The State Emergency Operations Center (SEOC) deployed multiple incident management personnel to coordinate the state disaster response.



*Blue line depicts previous record-high GLOF in 2023. Orange line depicts 2024 streamflow.
Source: NOAA and USGS 2024

Figure 27- Streamflow at Mendenhall Lake during August 2024 GLOF

Source: Alaska National Guard 2024

Figure 28- Glacial Lake Outburst Flood, August 2024

Source: Alaska Department of Transportation and Public Facilities 2024

Figure 29- Glacial Lake Outburst Flood in Mendenhall Valley, August 2024

Photo Credit: Locke Brown, Juneau Resident

Figure 30- Glacial Lake Outburst Flood in Mendenhall Valley, August 2024

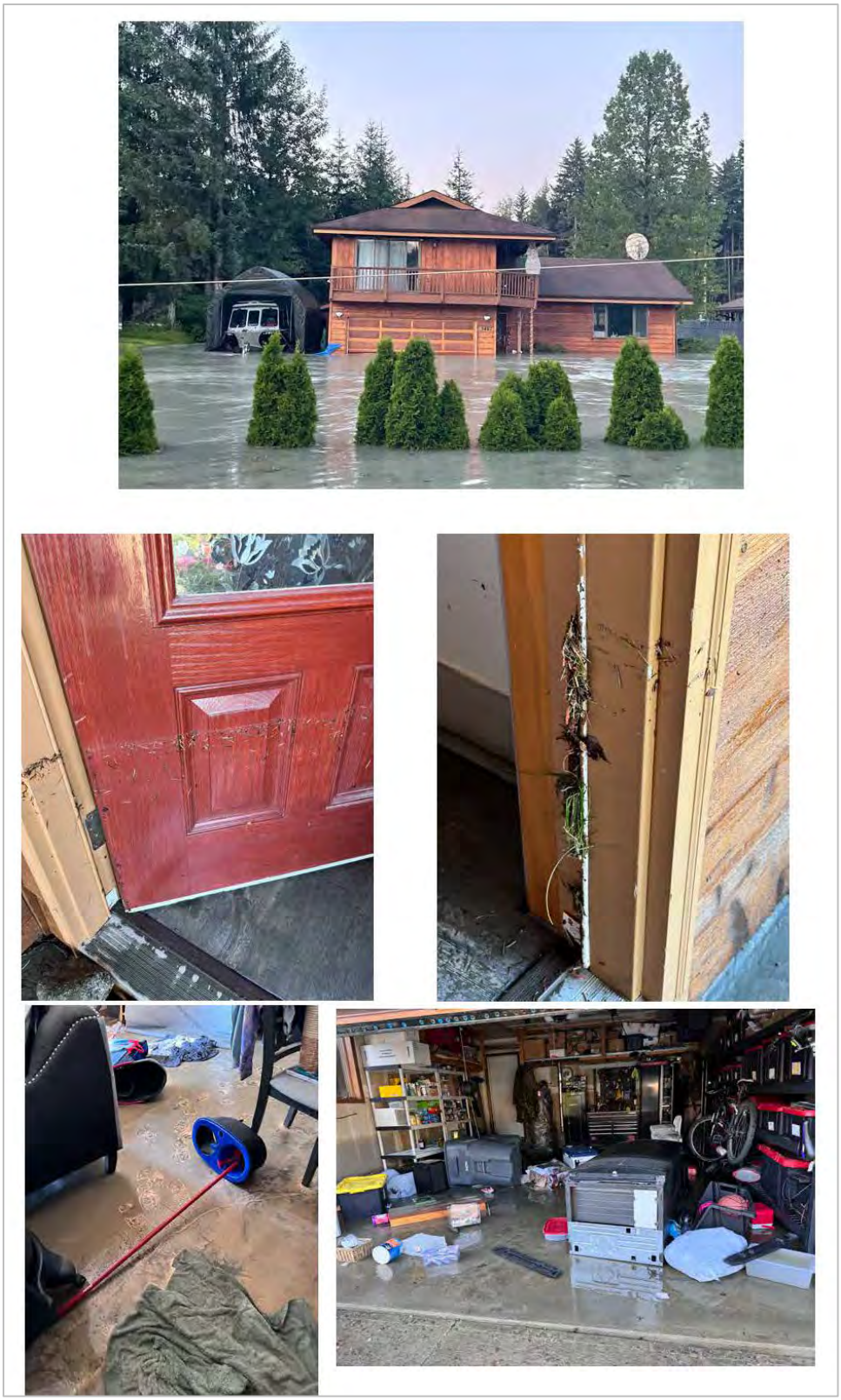


Photo Credit: Kamal Lindoff, Juneau Resident
Note: The homeowner reported that damages were upwards of $50,000

Figure 31- Damages of Home on Meander Way from August 2024 GLOF

Photo Credit: Tesla Cox, Juneau Resident

Figure 32- Cars Submerged in Flood Waters from August 2024 GLOF

Lemon Creek Glacier: Two glacial lakes, Lakes Linda and Lynn, were discovered recently on the Lemon Creek Glacier. These lakes do generate glacial outburst floods, but the magnitude is such that flooding does not occur downstream on Lemon Creek. These lakes will need to be monitored in the coming decades in case they grow large enough to generate a significant jökulhlaup on Lemon Creek.

Other Flooding

In the Juneau and Traditional Lands of Tlingit & Haida area, as well as most coastal areas of Southcentral and Southeast Alaska, floods due to snowmelt are typically lower in magnitude than those due to rainstorms in late summer or fall. Glacier melt is typically largest in late summer, increasing the potential magnitude of late summer rainfall floods in glacial streams.

In addition to glacial outburst floods, high tides, and coastal storms, the principal flood problems in the area are inadequate culverts and bridges which become blocked by debris and ice, developments that encroach onto and obstruct the natural floodplains, high velocity flow, and siltation of culverts. Along some of the creeks, there are large stockpiles of logs which will increase flooding if carried downstream to a constriction.

A heavy precipitation event occurred in November of 1984. This rainfall event coincided with one of the highest tides of the year. In Juneau and Traditional Lands of Tlingit & Haida, the “normal” tide was expected to reach 12.5 feet; the combination of low pressure and strong winds caused a surge ranging from 2-3 feet above predicted values. Waves of 4 – 10 feet contributed to damage along the coastline. Storm surge is not historically a frequent occurrence in Juneau and Traditional Lands of Tlingit & Haida.

Table 5- Historical Flood Events in Juneau and Traditional Lands of Tlingit & Haida

Date	Description/Magnitude of Event
11/26/1984	The worst two-day rainfall in fifty years occurred in Southeast Alaska on October 19-20, 1998. This rainfall event coincided with one of the highest tides of 1984. In Juneau and Traditional Lands of Tlingit & Haida, the “normal”

Date	Description/Magnitude of Event
	tide was expected to reach 12.5 feet; the combination of low pressure and strong winds caused a surge ranging from 2-3 feet above predicted values. Waves of 4 – 10 feet contributed to damage along the coastline. Over 6 inches of rain fell within a 48-hour period, with most flooding occurring on the second day of heavy rain. Small streams swelled out of their banks in the Juneau and Traditional Lands of Tlingit & Haida area. Water pooled over streets and parking lots. At 11am, Montana Creek rose to a stage of 17.3 feet (flood stage is 17.0 feet). At this time, flood waters over two feet deep covered several residential lots. An unknown number of homes sustained water damage. Extensive damage to many road systems, public, private and non-profits properties was caused from mudslides and water shoreline/bank destabilization. Numerous mudslides occurred throughout the Juneau and Traditional Lands of Tlingit & Haida area. The worst slide completely collapsed a portion of Fritz Cove Road and removed a beachfront home from its foundation. The water receded quickly during the afternoon as the rain lightened. At the JIA, 6.28 inches of rain fell in 48 hours – a record for a 2- day period. The 3-day storm total at the JIA was 6.41 inches. The Governor declared a disaster to assist Haines and the City and Borough of Juneau.
10/20/1998	After over 24 hours of steady moderate-heavy rain, widespread flooding occurred along small streams and in urban areas in Juneau and Traditional Lands of Tlingit & Haida. Montana Creek rose above flood stage and approximately 2 feet of water inundated a residential area in the Mendenhall Valley. Several damaging mudslides occurred around the Juneau and Traditional Lands of Tlingit & Haida area causing minor damage to an unknown number of homes, roads, and state trails. The most devastating slide removed a portion of Fritz Cove Road and destroyed a nearby home. Juneau and Traditional Lands of Tlingit & Haida received 6 to 10 inches of rain in less than 48 hours between October 19th and 20th.
12/27/1999	A slow-moving tropical connection frontal boundary spread 3 to 5 inches of rain over the Northern Panhandle. Minor small stream flooding of Jordan Creek in the JIA area flooded two homes and one business.
6/28/2000	A band of heavy showers and thundershowers dumped 1.86 inches of rain over the Mendenhall Valley in less than 12 hours, causing considerable ponding in low lying areas and city streets and minor flooding along Montana Creek.
7/26/2000	The annual release of a glacial lake encompassed by the Tulsequah Glacier created unusually high flows and minor flooding conditions along the Taku River. There was no known damage to any of the cabins or other structures along its shores.
8/8/2001	A glacial lake encompassed by the Tulsequah Glacier released causing minor flooding along the Taku River. Logs and debris were carried downstream. A small airstrip was also briefly flooded. The river stage rose approximately 6 feet through the period, peaking at 41.9 ft (NOAA Storm Events Database).
6/25/2004	The Taku River, northeast of Juneau and Traditional Lands of Tlingit & Haida, flooded during this time. Minor flood stage is at 43 feet and moderate flood stage is at 44 feet on the USGS Taku River gauge. The river crested at 44.96' around 1530 on 6/25. This exceeded the flood of record of 44.1' set in August of 1989. This flood was the result of the annual Jökulhlaup on the upstream Tulsequah River in British Columbia. Due to record warmth, this year's release was the earliest on record. Many seasonal cabins are located on the remote shores of this river. The flood also creates extreme currents hazardous to navigation. Folks prepare for their cabins and property for the potential flood each year. Despite these efforts, flood damage occurred to several cabins including one being swept away.
12/23/2005	Beginning on November 18, 2005 and continuing through November 26, 2005, a strong winter storm with high winds and record rainfall occurred in the City/Borough of Juneau, the City/Borough of Haines, the City/Borough of Sitka, the City of Pelican, the City of Hoonah, and the City of Skagway, which resulted in widespread coastal flooding, landslides, and severs damage and threat to life and property, with the potential for further damage. The following conditions existed as a result of this disaster: severe damage to personal residences requiring evacuation and relocation of residents; to individuals personal and real property; to businesses; and to a marine highway system dock, the road systems eroded and blocked by heavy debris that prohibited access to communities and residents, and other public infrastructures, necessitating emergency protective measures and temporary and permanent repairs.

Date	Description/Magnitude of Event
	During this rain event, the culvert underneath Wickersham Avenue was plugged with debris and there was subsequent flooding of Wickersham Avenue and Glacier Highway. Costs were estimated to be $15,000, including work on Behrends Avenue.
9/2/2006	3 to 4 inches of water over the road to the Mendenhall Lake Campground parking lot, but the lot itself was not flooding. Flood stage approximately 9.6 feet which crested at 12.03 feet.
8/22/2007	One of the glacier dammed lakes on the Taku River began a release on 8/22/2007 which completed by late in the day on 8/24/2007. Discharges increased from 26,000 cfs to 41,600 cfs while water temperatures dropped from 47 to 39 degrees F. The river crested 5 ft below flood stage.
7/19/2011 – 7/22/2011	High water level of 10.92 feet in the Mendenhall River with a total discharge reaching 14,220 cfs. There was significant flooding around Mendenhall Lake Campground, which was evacuated. View Drive was cut off due to the amount of water on the road and a subdivision was evacuated. One home reported 2-3 feet of water inside. The road leading to the sub-division was flooded and impassable. The Skaters Cabin Spur Road near Mendenhall Lake flooded as well with about 2.5 feet of water. Residents below the Back Loop Bridge along the Mendenhall River saw flood water inundate their back yards. First glacier dam outburst flood on the Mendenhall Lake/River system that produced significant flooding. The source of the flood waters was from Suicide Basin and side basin on the Mendenhall Glacier, about a mile up from the glacier terminus. The Mendenhall Glacier was holding back water in Suicide Basin like a dam. The source of the flood waters was unknown for most of the event along with how much water was being impounded.
8/19/2011-8/22/2011	High water level of 10.26 feet in the Mendenhall River with a total discharge reaching 14,220 cfs. The Suicide Basin glacier-dammed lake refilled and produced a second release during a heavy rain event. There was minor flooding in Mendenhall Lake Campground, on Skaters Cabin/West Glacier Spur Road and on View Drive. Heavy rain fall from an atmospheric river moving over the Central Panhandle produced moderate flooding on the Mendenhall River/Lake system on August 22. Rain rates were greater than 0.1 inches per hour and these rain rates produced significant runoff. There was also indication that some of the flood waters was from a second release of the glacier dam in Suicide Basin that help raise the river and lake stages to be in the top 5 in history. It was verified that glacier dammed lake in Suicide Basin drained for a second time that summer (NOAA Storm Events Database).
7/9/2014 – 7/11/2014	High water level of 11.82 feet in the Mendenhall River with a total discharge reaching 19,900 cfs. This was a record flood at the time, with widespread flooding in Mendenhall Lake Campground. There was significant flooding within the campground with 3-4 feet of water in places and 150 feet of road within the campground was damaged. View Drive experienced serious flooding with an entire subdivision cut off due to water on the road. Some homes sustained over 3 feet of flood water. There was also minor flooding downstream of the Mendenhall River bridge on Back Loop Road (NOAA Storm Events Database).
7/16/2014	A weather front moved across the north central inner channels on July 14 and produced about one half to three quarters of an inch of rainfall. The Taku River began to rise from the rain runoff but instead of dropping off once the rain let up the river rose significantly. At the same time the water temperature started to drop significantly. All of these variables pointed towards a release from Lake No Lake glacier dammed lake along the Tulsequah Glacier. For the next thirty hours the Taku River rose significantly as the water from Lake No Lake drained into the river system. The Taku River crested at forty-four point zero two feet which was just above moderate flood stage at 1:30pm on July 16 (NOAA Storm Events Database).
8/11/2014	High water level of 10.88 feet in the Mendenhall River with a total discharge reaching 16,350 cfs. There were two days leading up to this event that had record rainfall values - .139” and 2.33” of rainfall measured at the Juneau forecast office on August 9th and 10th, respectively. Moderate flooding occurred in Mendenhall Lake Campground, which was evacuated by the U.S. Forest Service. One home on View Drive reported approximately 2 feet of water in their garage and crawl space. There was about 3 feet of water across West Glacier Spur Road along Mendenhall Lake (NOAA Storm Events Database).
7/6/2016	High water level of 11.99 feet in the Mendenhall River with a total discharge reaching 16,300 cfs. There was minor to moderate flooding along View Drive and other riverside roads, as well as to Mendenhall Lake Campground which closed. Water was not reported to have entered any homes.

Date	Description/Magnitude of Event
8/26/2016	Another mini release in the Mendenhall Basin with no flooding reported.
7/11/2017	Taku River likely rose from a glacier dammed lake release between 7/11 and 7/12. No damages reported.
10/27/2017	As moderate rain fell through the day on the 26th, Jordan Creek began to slowly rise from about one inch of rainfall in 12 hours. The creek's rate of rise started to sharpen overnight on the 26th as the snowpack in the headwaters became primed to produce more runoff to go along with the runoff from the rainfall. Jordan Creek went above minor flood stage in the early morning hours of the 27th as the rain increased to be heavy. Within 3 hours around 9 am AKDT the water levels rose above the old record stage for that site of 10.07 feet and above moderate flood stage of 10.50 feet. Jordan Creek crested at 10.97 feet, a new record, in the afternoon of the 27th and began to recede through the early evening as the rain rates began to tapper off. There was significant flooding in the Jordan Creek area with multiple home's and business's' flooded, with some water in their crawl space and/or homes. Roads around the area were flooded but still passable. Estimated flood damage costs were around $100,000. The heavy rain also produced a debris flow along the Gold Creek flume and cause damage which cost about $80,000 to fix (NOAA Storm Events Database).
6/7/2018	Report from Tundra Helicopters confirmed that Lake No Lake was emptied in a GLOF event affecting the Taku River. Reports from a couple of days prior stated that Lake No Lake was full and likely to release imminently.
7/19/2018	Throughout spring and the first part of the summer Suicide Basin, a side valley that is dammed by the Mendenhall Glacier, filled with water from snow melt and rainfall. In the afternoon hours of July 17th visual reports showed signs of the basin beginning to drain as the glacier dam was starting to fail. The river gauge in the Mendenhall Lake started to show this inflow of water from the basin through the evening hours and by the morning of the 18th the event was well on its way. For the next 2 days the Mendenhall Lake and River rose five in a half feet and crested at 10.92ft in the afternoon of the 19th. There was minor to moderate flooding around Mendenhall Lake and the upper portions of the river above Back Loop Road. The Mendenhall campground was evacuated due flooding of up to three feet at the entrance and within the campground with some damage done to the road system. The West Glacier spur road and the area around Skaters Cabin was flooded with three feet water. View Drive was flooded with two feet of water and the road cut off. There was minor flood damage to some homes that border the river along the road.
8/8/2018	Two to three inches of rain fell in a 48 – 72-hour period near sea level with four to five inches at higher elevations. The very warm temperatures created very high freezing levels that increase runoff from snow or ice melt. There was also a release of water from the glacier dammed lake in Suicide Basin that added runoff into the Mendenhall River system, but less water than the first release earlier in the summer. The Mendenhall Lake crested at ten point forty-two feet by the afternoon on August 9th. There was minor to moderate flooding around Mendenhall Lake and the upper portions of the river above Back Loop Road. The Mendenhall campground was evacuated due flooding of up to two feet at the entrance and within the campground, also the Skaters Cabin Road was flooded. View Drive was flooded with one foot of water and the road cut off. Reports indicate that a few days later, on 8/13/2018, Oxbow on the Mendenhall River broke through creating a new channel.
7/4/2020	Lake No Lake, part of the Tulsequah Glacier drainage system, released and crested on 7/5. Aerial flight and Sentinel imagery confirmed the release. Flow increased from approximately 40,000 cfs to 80,000 cfs over 24 hours. Flood stage increased from approximately 38 feet to 42 feet in the same period.
8/1/2020	High water level of 11.53 feet in the Mendenhall River with a total discharge reaching 14,500 cfs. Webcam images showed Suicide Basin dropping and USGS gauges showed a rise consistent with a GLOF release. The U.S. Forest Service evacuated Mendenhall Lake Campground and closed the Nugget Falls trail system. Skaters Cabin Road and View Drive closed due to flooding of the roadways. Roads and low-lying yards along the Mendenhall River were flooded. The Juneau Weather Forecast Office Storm Survey reported that no property damage occurred during this event. Water was above the garage slab elevation for one home. Sand bagging resulted in only minimal water entering the garage.
8/11/2020	July and the beginning of August was very wet and the soils were primed. As moderate to heavy rains moved over the area on the morning of August 9th Mendenhall Lake continued to rise from the previous rains but at a steeper rate. Rainfall totals ranged from one to three inches near sea level with higher amounts in the headwaters at higher elevations. The river crested around ten point two feet which is above moderate flood stage of ten feet

Date	Description/Magnitude of Event
	in the afternoon hours of August 10th. There was minor to moderate flooding around Mendenhall Lake and the upper portions of the river above Back Loop Road. The Mendenhall campground was evacuated due the potential of moderate flooding the night before impacts took place. There was up to two feet of water at the entrance and within the campground. The West Glacier Spur Road and the area around Skaters Cabin was also flooded. View Drive was flooded with less than one foot of water.
12/2/2020	A very strong atmospheric river impacted Southeast Alaska from December 1-2 with a series of other strong and moist weather fronts through December 8th. The atmospheric river produced historic extreme precipitation in particular over the far northern inner channels Governor Dunleavy declared that a condition of disaster emergency exists in the entire Southeast Region of Alaska to include Haines Borough, Municipality of Skagway Borough, City and Borough of Juneau, City and Borough of Wrangell, Petersburg Borough, City and Borough of Sitka, Ketchikan Gateway Borough and the Annette Island, Chatham, and Southeast Island Regional Education Attendance Areas (REAAs). Over 2 days, precipitation amounts in the Juneau and Traditional Lands of Tlingit & Haida area ranged from 5 to 7 inches. The JIA 48-hour total of 6.39 inches which was a 100-year event. Multiple homes around Jordan Creek and business in Jordan Square were flooded. Roads near the creek from Jordan Ave, Cascade St, Trout St and the main road of Glacier Highway all were significantly flooded with 1 to 3 feet of water. Due to the intense long duration heavy precipitation, additional snowmelt runoff, and high soil saturation there were multiple debris flows reported across the Juneau and Traditional Lands of Tlingit & Haida area near steep terrain which damaged homes, blocked a number of roads and overwhelmed culverts that damaged roads from shoreline/bank destabilization. Renninger Street, at the base of Heintzleman Ridge, accesses a city water reservoir along with a middle school was washed out from shoreline/bank destabilization on both sides of the road. Residences along Mary Ellen Way on Vanderbilt Hill had multiple debris flows that damaged homes and deposited debris into yard that blocked drainages to divert water into homes. Multiple large debris flows occurred along the lower and upper Salmon Creek Rd and damaged the penstock that brings water from the reservoir to the ALE&P power plant and CBJ water treatment facility. A big debris flow was reported along Wire St which damages homes and blocked the Glacier Hwy. Another big debris flow was reported near the AWARE shelter along Glacier Hwy which deposited lots of mud around the shelter and surrounding homes. A home was damaged by a debris flow on Cohen Dr near Tee Harbor as the debris smashed into the side of the home removing a significant portion of the structural support.
6/30/2021	In June 2021, a combination of above-normal snowmelt, significant antecedent precipitation, an atmospheric river on June 24-26, and finally a glacial lake outburst from Lake No Lake (adding approximately 49,300 cfs to the discharge) resulted in a total record discharge of 137,000 cfs and record high water level of 45.54 feet in the Taku River. Dwellings ranging from small cabins to houses flooded in the Taku Valley area. A flood warning was issued warning residents in the area of flood crest levels to exceed the previous record event from the 2004 GLOF event on the Taku River.
8/10/2021 – 8/13/2021	A strong atmospheric river with sub-tropical moisture moved out of the north Pacific and over Southeast Alaska. Mendenhall Lake rose over moderate flood stage of 10 feet on 8/13/2021. The Mendenhall Lake campground was evacuated from significant flooding along with road closures of View Drive and Skaters Cabin Road. West Glacier Spur Road was also closed. Dredge Lakes Trails were flooded. Some locations along the Mendenhall River below the back loop bridge had a significant amount of water in their yards.
7/1/2022	A glacier-dammed lake outburst caused the Taku River to rise rapidly before reaching a crest of 43.4 feet. Minor flooding occurred along the Taku River. No damages reported.
7/8/2022	A small release was reported from Suicide Basin with very minor flooding of nearby trails including Nugget Galls Trail near Mendenhall Glacier Visitor Center, flooding of the kayak and commercial raft launches near West Glacier Trailhead. Flooding was also reported of various Dredge Lake Trails but no trails were closed. No roads were flooded or closed. The supplemental river reading at Back Loops Bridge was 9.20 feet. The lake crested at approximately 8.1 feet in the evening of 7/8/2022.
8/30/2022	Bands of showers were rotating around a low in the eastern Gulf of Alaska. A very strong shower remained in place over the JIA area including the drainage basin of Jordan Creek for 2 hours. The very heavy rainfall was a 50-year return period and produced significant amount of runoff to cause Jordan Creek to rapidly rise out of its

Date	Description/Magnitude of Event
	banks to produce moderate flooding. There was flooding of roads, yards along with some water getting into homes near Jordan Creek.
9/26/2022	Jordan Creek started to rise in response to the heavy rain through September 26th with it going over minor flood stage of 9.7 feet in the late evening hours. Water levels continued to rise at a fast pace from 12-hour rain of amounts of over 1.50 inches. The runoff from the heavy rain pushed Jordan Creek just above moderate flood stage and crested at 10.58 feet before receding below flood stage by the morning hours of September 27th. There was significant flooding of roads and parking lots around the Jordan Creek area and along Jordan Avenue.
10/1/2022	Moderate precipitation fell over the Jordan Creek area from the afternoon of September 29th to daybreak on September 30th. This precipitation of 1 to 1.5 inches of rain in 12 to 18 hours rose Jordan Creek to be just below bankful. Jordan Creek crested at 10.98 feet in the late morning which was the second highest crest on record from the 2 to 3 inches of rain that fell over the previous 24 hours. There was significant flooding of roads, yards, parking lots around the Jordan Creek area and along Jordan Avenue.
10/27/2022	High water level of 10.25 feet in the Mendenhall River with a total discharge reaching 12,200 cfs. There was minor flooding of Nugget Falls Trail and around the Mendenhall Glacier Visitors Center. There was flooding of the kayak and commercial raft launches near West Glacier Trailhead and on the Dredge Lake Trails. No trails closed. No roads were flooded or closed. It was estimated that as much as half of Suicide Basin discharged during this event (similar to 2016 and 2020).
8/6/2023	High water level of 14.82 feet in the Mendenhall River with a total discharge reaching 25,200 cfs. The Mendenhall River remained in the flood stage for almost 10 hours. The river rose 0.4 feet per hour, and there was 20 – 150 feet of riverbank shoreline/bank destabilization in many places which added to overbank flooding. There was significant shoreline/bank destabilization downstream of Mendenhall Back Loop Bridge. There was significant flooding on View Drive, with the road blocked by several feet of water, as well as on Skaters Cabin Road. Meander Way flooded and homes were inundated with water. Mendenhall Lake Campground was completely underwater. The Riverside area of town near Riverside Condos had homes undercut and collapse into the river. The road system surrounding Mendenhall River Elementary School flooded. The Mendenhall Back Loop Bridge and pedestrian footbridge at Diamond Park were closed. Flood waters reached as high as six feet in some neighborhoods. In total, there was significant damage on four different streets, including the condemnation of residential structures and multi-story condos, two structures lost to the Mendenhall River, inundation of three sewage lift stations, and multiple fuel tanks swept downstream. Hazardous material spills were assumed after the smell of petroleum was reported in the flood zone. There were reports of several large trees and some decking seen floating down Mendenhall River. In the end there were about 48 homes affected with 13 destroyed, 8 with major damage and 7 with minor. This historic event saw the largest amount of water released from Suicide Basin in a single event and approximately 14 billion gallons of water came out of the basin and into the Mendenhall Lake and River system. Governor Dunleavy made a disaster declaration to support recovery on 8/8/2023.
9/22/2023	Heavy rain moved into the Juneau and Traditional Lands of Tlingit & Haida area in the late afternoon of September 20th and continued to increase through the overnight hours with 1.5 to 2 inches of rainfall. A second pulse of heavy rain moved over the area in the evening and overnight hours of the 21st and this additional 1 to 1.5 inches of rain pushed Jordan Creek above moderate flood stage. The creek crested at 10.77 feet in the early morning hours of Friday September 22nd. There was moderate flooding around Jordan Creek which impacted roads, business and a few homes. The severity of the impacts was water getting into a few homes and crawlspaces, over driveways and around entrances to businesses.
1/30/2024	Rain and rising freezing levels moved over the Juneau and Traditional Lands of Tlingit & Haida area through the evening hours of January 28th. Jordan Creek crested at 10.78 feet. The rain continued to increase in intensity and with the rising freezing level, a significant amount of runoff was going into local rivers and streams. There was some damage to a few homes and business along the creek and roadways near Jordan Creek were impassable at times.
8/6/2024	High water level of 15.99 feet in the Mendenhall River with a total discharge exceeding 35,000 cfs. During this event, an estimated 14.6 billion gallons of water were released from Suicide Basin. The river remained in a flood stage for 28 hours. The river rose 0.4 feet per hour from the time of the glacial outburst to peak crest.

Date	Description/Magnitude of Event
	Hundreds of homes were impacted by this flooding event. 290 homes were impacted by 4 – 6 feet of water. Several homes fell into the Mendenhall River, including homes outside of anticipated flood areas. Hundreds of vehicles were flooded. There were numerous hazardous material spills, causing portions of the Mendenhall River and its floodwaters to smell like petroleum. Many people evacuated with 43 people seeking refuge in an emergency shelter. Public utilities, infrastructure, and roadways were sustained severe damages. There were power outages throughout the flooded area. The north side of View Drive experienced more flooding than in 2023, causing damages to road and homes. Killewich Drive also experienced greater water flows than in 2023 as water moved with strength down Riverside and Killewish Drives into Emily Way. Sharon and Gee Street, Long Run, and Northland experienced flooding unlike they had experienced before. Water approached from both the north and the west and inundated homes with 1-4ft of water. Storm drains were overwhelmed, and pressure led to flooding through manholes around Mendenhall Valley Library, behind the Safeway by Mendenhall River, and Brotherhood Bridge. Governor Dunleavy issued a disaster declaration on 8/6/2024 and FEMA issued a disaster declaration on 10/16/2024.
10/20/2024	Suicide Basin refilled with rain through the fall and a second release from the basin occurred. The Mendenhall Lake Gauge rose above the moderate flood stage of 10 feet at 715pm AKST on Sunday October 20th, crested at 10.8 feet at 1130pm, and fell below moderate flood stage at 1am AKDT on the 21st. There were reports of trees and debris floating down the river and water in the backyards of three homes along View Drive. Skaters Cabin Road was closed and impassable along with some damage to a road within the USFS Mendenhall Campground.
6/29/2025	A release from Lake No Lake began on the night of 6/29/2025. Residents and recreationists were advised to remain vigilant for potential hazardous debris in the Taku River. According to the NWS, the River crested at 40.9 feet early on the morning of 7/1/2025 without reaching flood stage or causing damages.

Source: NWS Storm Events Database- Storm Prediction Center Product (NWS 2025a), NWS 2025

7. SHORELINE/BANK DESTABILIZATION HISTORY

The USACE completed an erosion assessment for Juneau and Traditional Lands of Tlingit & Haida during their 2007 Alaska Baseline Erosion Assessment. The Erosion Information Paper dated October 26, 2007, states that

> *"Erosion in the Juneau area is due primarily to riverine processes associated with the Mendenhall River. High summer base flows from the melting Mendenhall Glacier, and heavy rainfall events in summer and fall can cause major flooding and erosion."*

Since 2007, there have been several new shoreline/bank destabilization developments in Juneau and Traditional Lands of Tlingit & Haida. GLOFs that caused severe riverine shoreline/bank destabilization in the Mendenhall River. Some of the most notable events were in 2011, 2014, 2020, 2023, and 2024. There have been other major events in the Juneau and Traditional Lands of Tlingit & Haida that caused shoreline/bank destabilization beyond the Mendenhall Valley. At least two severe storms have created shoreline/bank destabilization events in Juneau and Traditional Lands of Tlingit & Haida. These occurred in 1984 and 2005.

Table 6- History of Shoreline/Bank Destabilization Events in Juneau and Traditional Lands of Tlingit & Haida

Date	Description of Flood/Storm Event	Description of Shoreline/Bank Destabilization Event
11/26/1984	The "Thanksgiving Day Storm" brought hurricane force winds that coincided with the "King Tide", the highest astronomical tide of the year.	There was intense coastal flooding that eroded sections of Egan Drive and Thane Road. Gold Creek experienced the most extreme shoreline/bank destabilization of the Juneau and Traditional Lands of Tlingit & Haida area during the storm.
11/23/2005	A severe winter storm paired with high winds and preluded by heavy rainfall caused widespread flooding, landslides, and storm surge.	The marine highway dock system experienced coastal scour, and roadways extended along the coast suffered shoreline/bank destabilization damage.
07/19/2011	This GLOF produced a Mendenhall River crest of 10.92'. There was significant flooding around Mendenhall Lake campground, and View Drive was cut off due to amount of flood water	The riverbank of the Mendenhall River destabilized during this event in the oxbow near View Drive.
07/09/2014	Glacial release caused what was at the time a record flood for the Mendenhall River. It crested at 11.82'. The entire subdivision encompassing View Drive flooded, with minor flooding downstream of the Back Loop Road	Riverine shoreline/bank destabilization occurred in the same oxbow as the 2011 flood, and riverine scour occurred around the foundation of Mendenhall River bridge.
08/01/2020	The Mendenhall River crested at 11.53' during the 2020 GLOF.	Skaters Creek Cabin and View Drive were closed due flood waters, and the shoulders were eroded. The Nugget Falls trail system was closed and required repairs due to shoreline/bank destabilization and debris blocking trails.

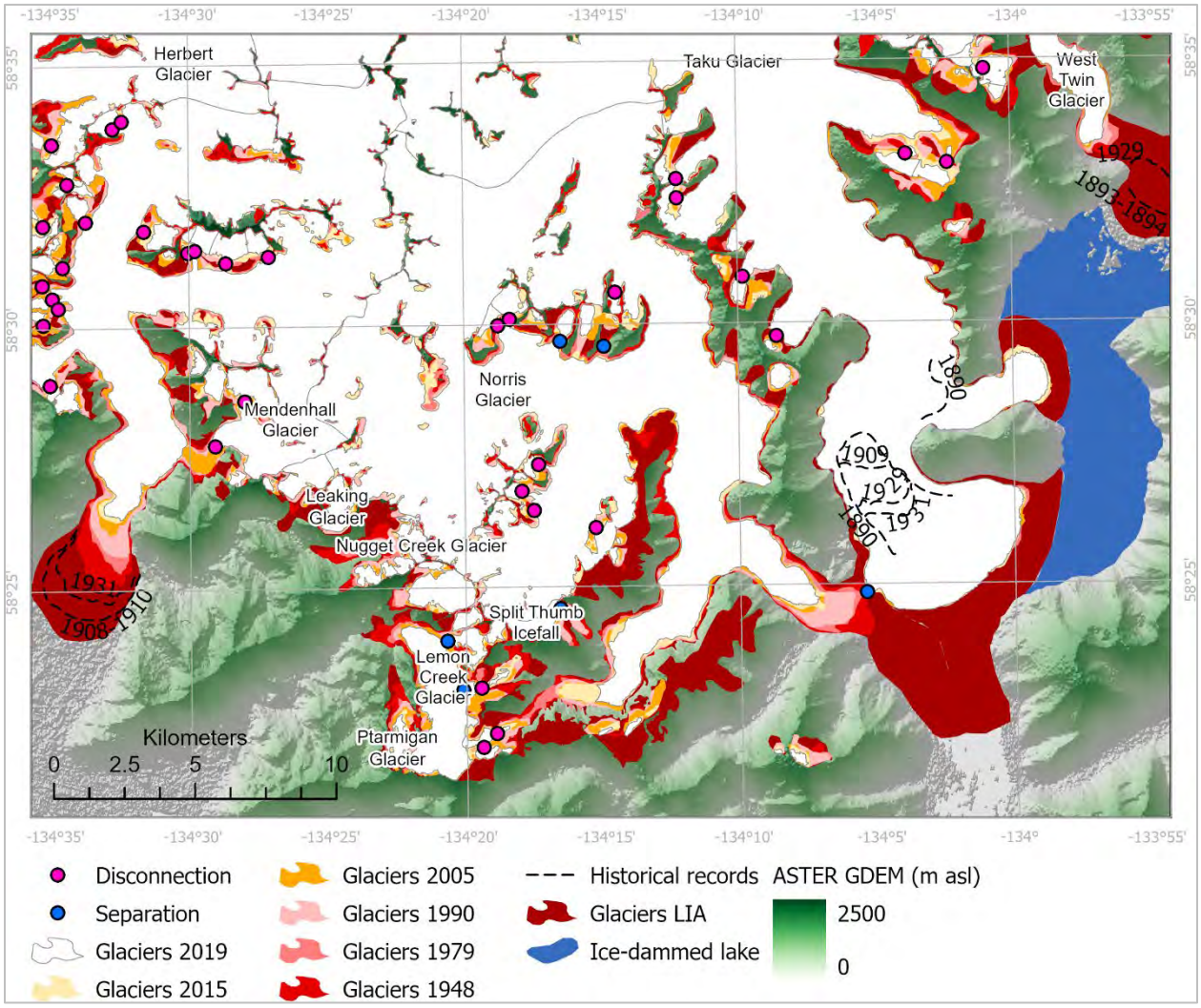
Date	Description of Flood/Storm Event	Description of Shoreline/Bank Destabilization Event
08/08/2023	This GLOF, at the time, was the worst flood on record for the Mendenhall River. The river crested at 14.82'.	20-150 feet of riverbank was eroded in several areas. The Riverside neighborhood was eroded significantly, with several homes and apartments having their foundations undercut, with one home sluffing into the river and destroyed. There was also significant riverine scour around the Back Loop Bridge, and shoreline/bank destabilization downstream of the bridge
08/06/2024	This GLOF resulted in a Mendenhall River crest of 15.99'	View Drive experienced shoreline/bank destabilization due to flood waters "flowing like a river" down the street and Riverside Drive and Killewich Drive experienced similar affects.

Source: NWS 2025a

8. CHANGES IN CRYOSPHERE HISTORY

History (Glacier)

Most of the glaciers in the Coast Mountains around Juneau and Traditional Lands of Tlingit & Haida advanced to their current locations in the middle 1700s till the late 1800s and have been receding continuously since then (Davies et al. 2022). The exception of this is Taku Glacier, which advanced since the late 19th century. It did not begin receding until recently.



Source: Davies et al. 2022

Figure 33- Juneau Icefield Recession

Before 2011, there had been no previously known glacial outburst flood problems that immediately threatened Juneau and Traditional Lands of Tlingit & Haida until the summer of 2011. Since 2011, Juneau and Traditional Lands of Tlingit & Haida has experienced annual glacial lake outburst floods released from Suicide Basin. Suicide Basin is a side basin of the Mendenhall Glacier. Beneath Mendenhall Glacier is Mendenhall Lake, which drains into Mendenhall River. The low-lying area along Mendenhall River is the most populated residential area in Juneau and Traditional Lands of Tlingit & Haida. Suicide Basin has released glacial lake outburst floods that cause inundation along Mendenhall Lake and River annually since 2011. Some years have seen multiple smaller floods while some years have seen one large flood.

Source: NOAA Climate 2025

Figure 34- Mendenhall Glacier Retreat and Formation of Suicide Basin Lake

Tlingit Story: The Story of *Kasteen*
The Tlingit and Haida have been living in what is now the Juneau area for time immemorial. They have a rich history of how their lives have evolved with the landscape. During the little ice age (1303-1850), the Grand Pacific Glacier churned into the ocean, creating deep fjords and displaced the *Xunaa* Tlingit for a time. One of the greatest examples of this is the story *Kasteen*, a member of the *Chookanedí* clan. She lived in *S'e Shuyee* (End of the Glacial Silt), in modern day Glacier Bay during the 1700s. Per custom, *Kaasteen* was confined to her home in the backroom while entering womanhood. Out of boredom, she began calling to the glacier like a dog, throwing bones to it out her back window. The story describes how powerful a "woman in transition" can be, and the glacier responded to her calls. The *Chookanedí* people knew they had to flee, but someone had to stay behind to appease the glacier spirit. *Kaasteen* was engulfed in glacial silt and ice (some accounts state her grandmother took her place). Before they left, her clan left her sea otter furs and food, so she would be warm and not hungry after

Tlingit Story: The Story of *Kasteen*

death. When the glacier receded, *Chookanedí* clan returned and renamed the place *Sít' Eeti Geiyí* (Bay in place of the Glacier).

Today, the story of *Kaasteen* is still very much in the minds and hearts of the Tlingit people. Her spirit aids travelers navigating ice choked water and she is still supplied and fed. The National Park Service partners with the Hoonah Indian Association, Huna Heritage Fund, and Hoonah City Schools to bring clan members to Margerie Glacier. Here, salmon, seaweed, and tobacco are lowered into the water so members can commune with the Glacier Girl, *Kaasteen*. This story symbolizes the power Tlingit women have in their communities and lands. It also shows the resilience of these clans to adapt to their world repeatedly, and how glaciers have impacted human inhabitants in Southeast Alaska for centuries (NPS 2025).

History (Snow Avalanche)

In the past 100 years, more than 70 buildings within 10 miles of Downtown Juneau have been hit, damaged or destroyed by avalanches. At present, Juneau and Traditional Lands of Tlingit & Haida have 60 buildings, including one hotel, in high avalanche hazard zones: plus an expressway and a boat harbor (CBJ AHMP 2017).

The Behrends Avenue and White avalanche paths have the most recorded historical avalanche events in the Planning Area. Table 7 lists historical avalanches of the Behrends Avenue Path and White Path.

The information contained in this table was originally researched and compiled by Doug Fesler, Jill Fredston, and Art Mears of the Alaska Mountain Safety Center, Inc. Although not a complete history of the Behrends Avenue and White Subdivision avalanche paths, this inventory represents the most complete history ever compiled and is based upon the best information available at the time the report was written (1991). Numerous other local avalanche paths produce dozens of avalanches each year. Since this table was created there have been numerous close calls, but no other severe damage has been recorded (AMSC 1991). The table has been expanded to include more current events.

Table 7- Historical Avalanches in Juneau and Traditional Lands of Tlingit & Haida

Date	Details
1890	A large avalanche reportedly reached tidewater in the vicinity of present-day Aurora Basin Small Boat Harbor
March or April, 1917	A large slide with significant powder blast reportedly blocked the road (the predecessor of Glacier Highway) and destroyed a considerable number of trees, but did not reach the beach.
1926	A large slide reportedly stopped 300' above Glacier Highway, although one finger blocked the road and reached tidewater.
1935	A large wet slab avalanche reportedly crossed Glacier Highway, blocking the road below the present-day subdivision.
March 22, 1962	A large slide extended into the trees above Glacier Highway extending nearly to the edge of the highway.
Winter 1965-66	40 small slides recorded.
February 10, 1966, 11am	Debris stopped approximately 1000' above the subdivision.
February 17, 1966, 12:30pm	Debris stopped approximately 350'-450' above the subdivision on the east side. 17 other small slides were also recorded from same storm in the same path.

Date	Details
February 22, 1966, 2pm	A large wet slab avalanche fell along the eastern side of the path, terminating approximately 400' up slope from the subdivision. A second long running slide descended the central portion of the path, stopping 500'-600' above the subdivision. Four other small slides were recorded during this storm in this path.
February 28, 1966	22 small avalanches were recorded on this date.
March 14, 1966	Numerous small loose snow and wet slab releases were observed on this date.
April 3, 1966, 3pm	A moderate size wet slab avalanche terminated approximately 800' above the subdivision.
April 9, 1966	A large wet slab release was reported.
January 10, 1971, 1:30pm	The only avalanche fatality known to have occurred in the Behrends Avenue path resulted on this date when a mountain climber descended into the upper part of the path, triggering a slide. Four slides reportedly fell during the day, causing powder blast to extend into the subdivision and nearly to tidewater.
February 16, 1971	A large wet slide extended into the trees above homes in the White Avalanche Path.
February 21, 1971, 10:30am	A moderate size avalanche with debris 8'-10' deep and 200' wide stopped 400'-450' above houses.
March 3, 1971, 5:30pm	A moderate avalanche reportedly dusted the subdivision and deposited some snow (from powder blast) in the yards of houses in Behrends before terminating in the vicinity of Glacier Ave. The debris flow stopped short of the subdivision.
April 3, 1971, 8am	A moderate sized avalanche stopped approximately 800' above 232 Behrends Avenue.
January 19, 1972, 10:37 am	A soft slab avalanche triggered by strong NE winds terminated in the trees, at the base of the White Path gully.
March 11, 1972	A small-moderate sized avalanche reportedly terminated approximately 1000' above nearest houses on Glacier Ave.
March 1972, prior to 8am	Two moderate sized slides descended the eastern and western sides of the path, stopping approximately 800' above the houses on Behrends Avenue. A third slide stopped in the gully.
January 1974	An avalanche in the Garbage Dump Path blocked Glacier Highway with a snow load approximately 15 feet deep and 75 feet wide. The slide damaged one DOT bulldozer and destroyed trees.
December 16, 1975, 12:15pm	An avalanche of unknown dimensions descended Behrends path on this date.
January 1980	A moderate sized avalanche "dusted" the subdivision with powder blast that continued to tidewater. Debris stopped short of reaching the subdivision.
Winter/Spring 1981	A large avalanche hit the gray condominium on Glacier Avenue while it was under construction. Debris came through the 2 X 4 frame walls and into the basement.
March 7, 1982	A large avalanche stopped in the trees just above the subdivision.
January 2, 1985	An avalanche 12' deep and 60' wide stopped approximately 30' above homes.

Date	Details
January 14, 1985	An avalanche of unknown size reportedly stopped short of reaching the subdivision.
February 20, 1985, 9:50pm	A large avalanche hit and damaged one residential structure and partly buried one vehicle and a cache of building materials.
February 26, 1985, 4-5pm	Four or five small slides were reported during the day with one larger slide terminating at the base of the mountain above the subdivision.
February 26, 1985, 8:10pm	Debris from a large slide, the largest in recent years, hit and damaged one residential structure and stopped short of hitting several others.
March 18, 1985, 5:30am	A large avalanche hit and damaged one residential structure and stopped short of several others.
January 25, 1989	A large avalanche with debris measuring 8'-12' deep and 200' wide stopped 30' above homes in the White Avalanche Path.
February 22, 1990	A large avalanche hit one house and missed another house by 20' in the White Avalanche Path.
1990-91 winter	Two avalanches occurred during this winter, one extending from the base of the transverse gully on the eastern side and one from the drainage of the western creek, terminating approximately 500' up slope from the houses on Behrends Avenue.
March 1991	A large slide reached Wickersham Avenue.
April 16, 2008	A massive avalanche approximately three miles from the Snettisham powerhouse destroyed over one mile of transmission lines, taking down at least two towers and damaging others. The avalanche impacts cut all hydroelectric power, forcing the city to rely on diesel generators for months.
February 7, 2009	Avalanche Crosses Thane Road at Snowslide Creek burying the road 20-30' deep for 800'.
March 31, 2017	During a period of high avalanche danger, the Behrends path slid taking out the gate at the end of Coleman Road and hitting a van stopping 32' short of structures.
February 2021	The Behrends neighborhood, near Juneau-Douglas High School, was evacuated due to unprecedented avalanche danger. It was the first time the city's urban avalanche forecaster warned residents of "extreme" avalanche danger. No avalanche ever occurred, but the city set up an emergency shelter at Centennial Hall.
December 2021	An avalanche descended Mt. Juneau above the Gold Creek Flume trail. The snowpack level on the mountains surrounding Downtown Juneau was not high, so the overall avalanche danger at the time was considered low.
January 15, 2024	An avalanche buried Thane Road under 1-2 feet of snow. The road was closed until the next day once DOT crews plowed the slide area.

Source: AMSC 1991, Tetra Tech 2022, KTOO 2024

9. VOLCANO HISTORY

On June 6, 1912, the largest volcanic eruption of the 20th century exploded from the volcano, Novarupta, which is located on the Alaska Peninsula on a slope of Trident Volcano in Katmai National Park and Preserve, about 750 miles due west of Juneau and Traditional Lands of Tlingit & Haida. The eruption lasted 3 days and created the Katmai caldera and the Valley of Ten Thousand Smokes in the process (NPS 2021). This event fueled early USGS and National Geographic Society scientific investigations and helped shape thinking and research about volcanoes and magmas and future eruptions (NPS 2021).

There were no reported deaths from this event and increased seismic activity days before the eruption led Natives in the Katmai region to completely abandon their villages and seek shelter in Cold Bay and along the Bristol Bay coast (NPS 2017).

Figure 35 shows a comparison of erupted magma volumes from historical volcanic eruptions. The magnitude and volume of the eruption at Novarupta in 1912 were exceptional, spewing about 30 times the volume of the 1980 eruption of Mount St. Helens (USGS 2025).

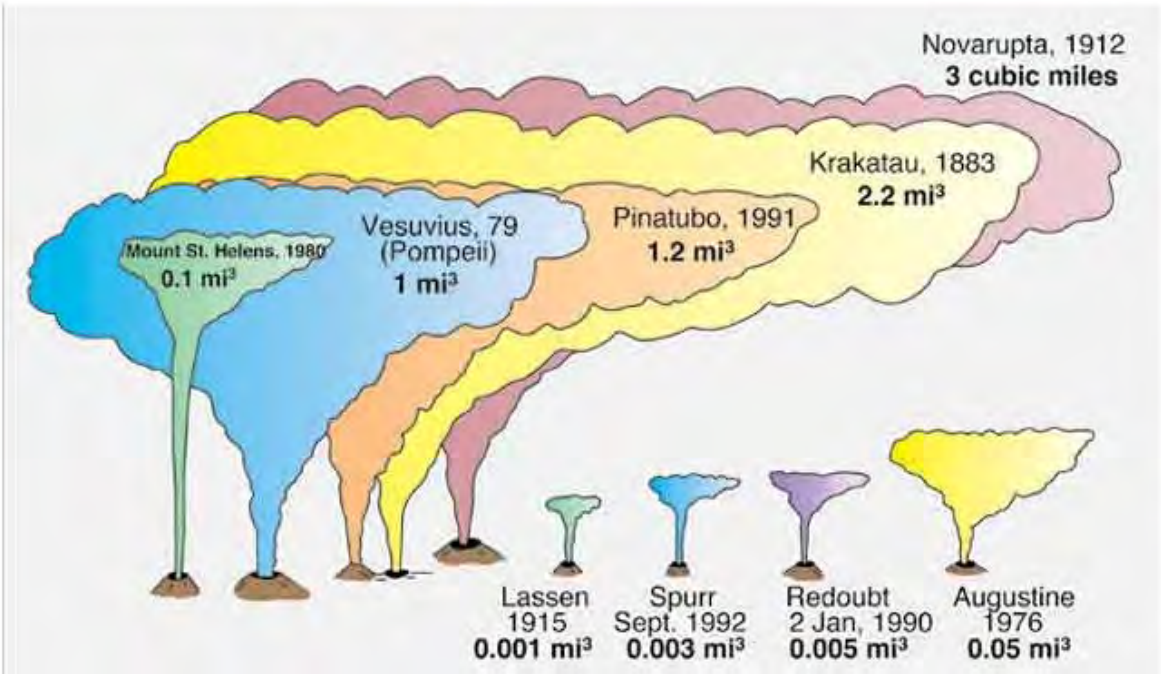


Figure 35- Comparisons of Erupted Magma Volumes from Historical Volcanic Eruptions

The January 2025 DCI lists the following volcanic eruption disaster events that have occurred in Alaska:

103. Mt. Redoubt Volcano, December 20, 1989: When Mt. Redoubt erupted in December 1989, posing a threat to the Kenai Peninsula Borough, Mat-Su Borough, and the Municipality of Anchorage, and interrupting air travel, the Governor declared a Disaster Emergency. The Declaration provided funding to upgrade and operate a 24-hr. monitoring and warning capability.

104. KPB-Mt. Redoubt, January 11, 1990: The Kenai Peninsula Borough, most directly affected by Mt. Redoubt, experienced extraordinary costs in upgrading air quality in schools and other public facilities throughout successive volcanic eruptions. The Borough also sustained costs of maintaining 24-hr. operations during critical periods. The Governor's declaration of Disaster Emergency supported these activities.

161. Mt. Spurr, September 21, 1992: Frequent eruptions and the possibility of further eruptions has caused health hazards and property damage within the local governments of the Municipality of Anchorage, Kenai Peninsula Borough, and Mat-Su Borough. These eruptions caused physical damage to observation and warning equipment. Funds to replace equipment for AVO.

Juneau and Traditional Lands of Tlingit & Haida reportedly experienced volcanic ashfall in 1992 from the eruption of Mt. Spurr. This eruption disrupted travel at JIA, with Alaska Airlines and Delta Airlines temporarily stopping flights in and out of the JIA after the eruption. The following figure shows the ashfall comparison from multiple eruption events.

Source: NPS 2016

Figure 36- Areas Impacted by Historical Alaska Volcanic Ashfall Events

10. DAM FAILURE (HIGH HAZARD AND SIGNIFICANT HAZARD DAMS) HISTORY

Based on available records, there has never been a significant failure of a High Hazard or Significant Hazard dam in Juneau and Traditional Lands of Tlingit & Haida.

11.CYBERSECURITY HISTORY

The Center for Strategic and International Studies has compiled a list of cyber incidents between 2006 and the beginning of 2023. The following table shows the number of events, and the entities involved in events where the losses were in excess of a million dollars.

Table 8- Global Historic Cyber Events with Losses Exceeding $1M USD (2003- June 2024)

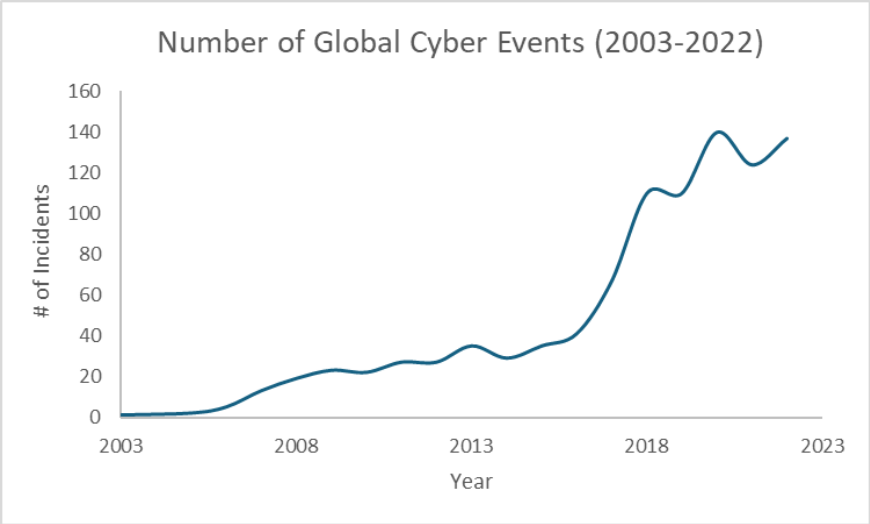
Year	# of Incidents	Countries/Entities Involved
2003	1	China, US
2005	2	China, US
2006	5	China, US, Russia, UK
2007	13	China, US, unknown, Russia, Estonia, UK, Israel, Syria, France, Tiawan
2008	19	UK, China, US, TJX, CENTCOM, Scotland, Pakistan, Georgia, Russia, Marathon, Exxon, Conoco, RNC, DNC, Tibet, India, Belgium, Germany, Afghanistan, Wikileaks, Japan, Korea
2009	23	Iraq, US, WSJ, UN, Russia, DOD, Ukraine, Korea, Germany, China, John Hopkins, NASA, HSIN, Merrick, Tiawan, USMC, Iran, Canada, Coca-Cola, France, FAA, Pakistan, Israel, Hamas, Hezbollah
2010	22	India, Pakistan, UK, US, Australia, WSJ, Siemens, ANSDAQ, Russia, Canada, China, France, Latvian, Rio Tinto, Google, Vietnam, NATO, EU, Intel, Google, Adobe, Iran, Twitter, Morgan Stanley, MI5, PLA
2011	27	US, China, Norway, NASA, USGS, Apple, Azerbaijan, China, Australia, Japan, Mitsubishi, Korea, German, Citibank, IMF, Sony, Oak Ridge, Google, RSA, Lockheed Martin, EU, Canada, France, South Africa
2012	27	Al-Qaida, US, Russia, Central Asia, Eastern Europe, Iran, BOA, NYSE, Chase, Capital One, Sun Trust, Telvent Canada, Aramco, Lebanon, India, NSA, China, UK, PLA, Canada, Israel, Syria, Sudan, Japan, NASA, Qatar
2013	35	Finland, Vietnam, Germany, NSA, US Navy, Iran, China, DOD, US Civil Aviation, North Korea, Syria, Russia, PLA, US Transportation Command, Ukraine, Australian Security Intelligence Organization, Israel, US Electrical Grid, Iran, India, Pakistan, Saudia Arabian Ministry of Defense, Saudi Government, UAE, Oman, USACOE National Inventory of Dams, DHS, Big Oil, ThyssenKrupp, NYT, WSJ, WP, Bloomberg, Japan, US Banks, US Weapons Systems Designs
2014	29	Tehran, Syria, Target, OPM, China, India, Indian Government, Iran, US, Alcoa, US Satellite Corporations, Canada, US Office of Personnel Management, Poland, Turkey, Germany, Italy, France, Spain, DHS, Community Health Systems, Home Depot, Austria, Switzerland, Hong Kong, Pharma, Australian Mining, Russia, NATO, EU, Ukraine, Dairy Queen, iCloud, Department of State, NOAA, NWS, USPS, North Korea, Sony, Asia, Middle East, Europe, Canada
2015	35	German Steel Mill, France, Canada, Anthem, China, Iran, Europe, Middle East, US State Department, ISIS, DOD, Yemen, Saudi Arabia, IRS, Russia, United Airlines, Pacnet, North Korea, Germany, Office of Personnel Management, Japan Pension Service, Hacking Team, Sudan, Ethiopia, Morocco, UAE, Joint Chiefs of Staff, The Hague, Central Asia, Pakistan, Dutch Safety Board, Fox-IT, Australia Submarine Contractor, Tehran, CIA, ROK National Intelligence Service, Australian Bureau of Meteorology
2016	41	Czech Republic, Armenia, Azerbaijan, Sri Lanka, Israel, US, Britain, Austrian, FAAC, SWIFT, Bangladesh, US Department of Justice, DHS, FBI, IRS, Russia, Finland, 21st Century Oncology, North Korea, South Korea, MedStar Health, Microsoft, Philippine Commission on Elections, German Christian Democratic Union, Russia, China, US Steel, Saudi Arabia, Iran, Germany, Iran, Turkey, Belarus, Mongolia, Eastern Europe, DDOS, DNC, India, DCNS, Hong Kong, Oracle, Brazil, NSA, Pastebin, Yahoo, Japanese Defense Ministry, National Intelligence, DHS, Liberia, Saudi Aramco, Saudi General Authority of Civil aviation, AdultFriendFinder, San Francisco Municipal Transportation Agency, Ukrenergo, Kiev
2017	67	Sweden, Russia, Ukraine, Singapore, Ministry of Defense, India, Pakistan, HUD, NOAA, Cornell, University, NYU, Iran, Saudi Arabia, US, Wikileaks, China, Twitter, DOD, South Korea, NSA, Danish Defense Intelligence Service, Japan, Lazarus Group, North Korea, US Defense Contractors, Irland, Israel, Iran, France, Lebanon, WhatsApp, NSA, Boyusec, UK, Maersk, Montenegro, NYT, Mexico, Qatari, UAE, UniCredit, Italy, US Energy Facilities, Wolf Creek Nuclear Operating Corporation, Turkey, Jordan, Germany, Saudi Arabia, Israel, UK Energy, Southeast Asian Military and Government Organization, Swedish Transport Agency, Scottish Parliament, British Parliament, India, Pakistan Security and Military Organizations, South Korean Bitcount Exchange, Estonia, Cambodia, Equifax, SEC, US Cyber Command, NATO, Poland, Baltic States, Saudi Arabia, Australian Government, Poland, CyCon, Yahoo, NotPetya, Vietnam, ASEAN Organization, Uber, Siemens, Moody's Analytics, Trimble, CASIC, Taiwan, Schneider Electric
2018	110	India, Lebanon, Norway, Japan, NEM, China, African Union, US Navy Contractor, DHS, Russia, Pyeongchang Olympic Games, US, UK, Germany, North Korea, UN, SWIFT, Turkey, Under Armor, Columbia, FBI, US

Year	# of Incidents	Countries/Entities Involved
		Department of Justic, US Department of Treasury, Iran, Baltimore Maryland 911, City of Atlanta, US DOD, Central America, Sint. Maarten, Netherlands, Hamas, Fatah, US Allie Foreign Affairs ministries, Mexican Banks, Pakistan, Afghanistan, Facebook, Google Play market, Android, US Navy Contractor, France, Germany, Switzerland, Ukraine, Exactis, DDoS, Cambodian National Election Commission, Cambodian Senate, Cambodian Parliament, DNC, Hillary Clinton campaign, Singapore, Finland, Italian Navy, Senate election campaign, US Electric utilities, Middle East Electric Utility companies, US Senators, 76 Universities in 14 countries, Cosmos Bank, Starwood Hotel Chain, Vietnamese Defense, Energy, and Government, Ukraine Orthodox church, ISIS, Kurds, Netherlands, US State Department, 45 countries governments including US, Canada, France, UK, Balkans, FIFA, Westinghouse Electric, Organization for the Prohibition of Chemical Weapons, Anti-Doping Agencies, Ukraine Security Service, Medicare, Medicaid, Trump, Saudi Arabia Petrochemical Plant, US Aerospace, Austal, Telegram, Instagram, Pakastani Air Force, US State Department, ATMs across Asia and Africa, Atlanta GA, Lebanon, German parliament, German military, American hotel chain, Siapem (Italian oil company), Scotland, Russian oil company, NATO, US Navy contractors, New Zealand, EU Communications system, Chile
2019	110	Germany, Iran, US, Russia, Ukraine, SEC, South Korea, US DNC, Former US Intelligence Personnel, UAE, France, North Korea, Center for Strategic and International Studies, Visma, China Ministry of State Security, Airbus, Australian Federal Parliament, Election Security groups, Internet Research Agency, US International Civil Aviation Organization, 27 US Universities, India Government websites, Pakistan, 200 oil and gas and heavy machinery global companies, Egyptian human rights activists, Indonesia's National Election Commission, EU Elections, Israeli security firm, Vietnam, Israel elections, ISIS, US DOE, Los Angeles County, Salt Lake County, Israeli defense firms, Bayer, UK banks/government, Finland elections, Lithuania Defense Minister, General Electric, Ukraine Military/Government, Amnesty International, Hamas, Iran, Philippines, Australian University, Telecom in Iraq Pakistan and Tajikistan, Telegram, NERC, Internation Cell Phone Providers, Yandex, US Cybercommand, Croatian Government Agencies, Libya, African elections, Microsoft, LinkedIn, USCG, Merchant Vessel Networks, East Asia Government Agencies, BASF, Siemens, Henkel, ProtonMail, Capital One, US Utility Companies, Venezuela, Bahraini government agencies, India, Czech Republic Foreign Ministry, Huawei/African Countries, US Cancer Institutes, Uyghur, 60 universities in US Australia UK Canada Hong Kong and Switzerland, Tibet, Dalai Lama, Eastern Europe, Central Asia, US Utility Companies, Airbus, Egyptian government, Myanmar, Taiwan, Vietnam, Indonesia, Mongolia, Tibet, Xinjiang, Trump campaign, Morocco, Georgia, WhatsApp, UK Labor Party, Microsoft, Kazakh, BMW, Hyundai, 22 nations government agencies across North America Europe and Asia, Cambodia, Bapco
2020	140	Austrian foreign ministry, Israeli NSO, Pakistani Government officials, Russia, Ukrainian Energy, 2 US Municipalities, Mitsubishi, China, Turkish Government, UN, Iran, Wesat, Iran, Malaysian government, US Defense Information Systems Agency, Mexico Economy Ministry, CIA, Uzbekistan, Iran Industrial Companies, Saudi mobile operators, South Korea, North Korea, Iran, WHO, Estonia, Republic of Georgia, Azerbaijan SCADA Systems of wind turbines, Vietnam, Wuhan, Chinese Ministry of Emergency Management, USDHHS, Israel utility systems, Poland War Studies University, Google Play app, Taiwanese petrochemical companies, PLA, Foreign science and tech ministries in Australia Indonesia Philippines Vietnam Thailand Myanmar Brunei, Iranian Port, Mitsubishi Electric, Pakistan telecom, Taiwan, EasyJet, Air transportation in Kuwait and Saudi Arabia, Norway's State Investment Fund, FSB, GRU, Japan Italy Germany and UK businesses, US Defense contractors, Indian government agencies and banks, Australia, Morocco, Turkey, Syria, Uyghur, Tibet, CIA, UK Elections, Canada, UK, US, Vatican, Israel, NATO, Taiwan semiconductor vendors, Tiawan government agencies, Ukraine elections, Afghanistan, Pakistan, ATMs, New Zealand Stock Exchange, US Security Council, Norway, Tbilisi Georgia, North Africa and Middle East countries, Chinese Ministry of State Security, US IT Government Healthcare Finance and Media, German hospital, Iran's Islamic Revolutionary Guard Corps, Android, Spanish research centers, Government agencies in NATO countries, CMA CGM SA, Universal Health Systems, Pharmaceutical Company, International Maritime Organization, Azerbaijani government, Windows, Diplomatic entities and NGOs in Africa Asia and Europe, US Census Bureau, US Cyber Command, Microsoft, Iran Ports and Maritime Organization, Tokyo Olympics, US Defense Industrial Base, Government and Telecom in Iraq Kuwait Turkey and UAE, Universities in Australia Canada UK US Netherlands Singapore Denmark Sweden, Aerospace and Defense Companies in Russia, US State and Local Government networks and aviation networks, Greece, Munich Security Conference, State Election Websites, Indian Pharmaceutical company, Hamas, COVID vaccine research facilities, AstraZeneca, Foxconn, Google Play Store, Shirbit, SolarWinds, Pfizer, European Medicines Agency, National Data Center of Mongolia, Facebook, 40 Israeli companies, Al Jazeera, African Union, Finnish parliament, Scottish Environmental Protection Agency, Johnson & Johnson, Novavax
2021	124	New Zealand Central Bank, China, Major gaming and gambling countries, North Korea, Hezbollah, Iran, Oldsmar Florida Water Supply, India, Pakistan, Kazakhstan, Pakistan Atomic Energy Commission, Pakistan Air Force, Kashmir Elections, French IT providers, UAE, Pfizer, Amsterdam, Netherlands, Germany, Sweden, Ukraine, Security Service of Ukraine, Vietnam, Russia, Tibet, Oxford University, Microsoft, Azerbaijan, Bahrain Israel, Saudi Arabia, UAE, Lithuania State Security Department, European Medicines Agency, Polish Security Services,

Year	# of Incidents	Countries/Entities Involved
		Poland National Atomic Energy Agency and Health Ministry, Indian Transportation Sector, Facebook, Uyghur, US Cyber Command, Columbia Elections, German National Elections, Nine Entertainment, US State Department, Israel, Times of India, Vietnam, European Commission, EU, French Security, NYC Metropolitan Transportation Authority, Swedish Sports Confederation, MI5, LinkedIn, US and European Defense Contractors via VPN, Palestinian Intelligence, 20 low-cost global airlines, NATO, Bundestag, German parliament, Russian Navy contractor, Belgium, Volue, Colonial Pipeline, (academia, airlines, construction, energy, equipment, financial, freight, government, health, IT, law enforcement, manufacturing, marketing, retail, pharma in Australia, Belgium, Brazil, Canada, China, Costa Rica, Czech Republic, France, Germany, India, Indonesia, Italy, Jordan, Peru, Poland, Portugal, Spain, UAE, UK, US), Health Service Executive, South Korea Government, Korea Internet and Security Agency, ROK Ministry of Foreign Affairs, International Atomic Energy Agency Nuclear Security Officer, Seoul National University, Daishin Securities, Fijitsu, JBS, Korea Atomic Energy Research Institute, LineStar Integrity Services, Colonial Pipeline, Netherlands Polic Internal Network, iConstituent, WhatsApp, Sol Oriens, DOE, US Naval Institute, MS Office 365 Cloud Services, Russia Foreign Intelligence Service, Verizon, Metropolitan Water District, Telegram, Afghan government, Afghan National Security Council, Ukrainian Ministry of Defense, Kaseya, Iran, Norway, Facebook, Oil and Natural Gas Pipeline Companies in the US, iPhone, Android, South Africa Transnet Port Terminals, Microsoft Exchange, Myanmar, Philippines, Saudi Arabian Oil Company, Estonia, Tallinn, Southeast Asian Telecommunication providers (5), Lazio Italy, Slovak government, Iranian prison, Belarus Police and Interior Ministry, Kurds, Norwegian Government, Norway National Defense and Security Intelligence, UN, Hungary Election, Lithuanian Defense Ministry, Voicenter, Roshan, Israeli Defense Ministry, Brazil, Indonesia State Cyber and Password Agency, Persian Gulf ports of entry, Iranian Fuel Cards, Telecommunications Networks, Robinhood, FBI Law Enforcement Enterprise Portal, UK Labor Party, China airlines, US Defense Contractor, Android, Windows Devices, CS Energy, US Defense and Technology firms, Huawei, Twitter, Belgium Ministry of Defense
2022	137	DRPK, Russia, Maariv, Jerusalem Post, Israel, Ukraine, International Committee of the Red Cross, Iran, WeChat, Australian Prime Minister, Greek Parliament, Minecraft Tournament, Andorra Telecom, Canadian Foreign Ministry, North Korea, China, German Pharma and Tech firms, UK Foreign office, Wall Street Journal, Palestine, Hamas, Belgium and German Oil Terminals, US Defense contractors, Pakistan, India, US NSA, Ukrainian Defense Ministry Ukraine Banks, UK, Ukrainian Cabinet of Ministers and Ministries of Foreign Affairs Infrastructure and Education, Google Chrome, Israeli Government websites, 6 US State Government Agencies, National Research Council Canada, Russian Emergency Situations Ministry, Tass, European Banking Authority, Microsoft, CNCERT/CC, Greenland Parliamentary Authority, Russian Energy Ministry, State Statistics Service, Federal Penitentiary Service and Bailiff Service, Viasat, Pakistani government, Indian Government, Marshall Islands National Telecommunications Authority, Ukraine National Post Office, Ukrainian Energy Facility, Ukraine Power Grid, Ukrainian Media, Energy semiconductor and telecom in US Israel Russia Canada, Indian State Load Dispatch Centers, Telegram, WhatsApp, Hamas, Facebook, Twitter, Finnish Ministries of Defense and Foreign Affairs, Ronin Network, Catalonians, European Commission, iPhones, Costa Rican Ministry of Finance, France Poland Portugal Embassy Officials, Romanian National Directorate Ministry of Defense Border Police National Railway Company and OTP Bank, Italian Senate Ministry of Defense and National Health Institute, RuTube, Greenland Healthcare system, Grand Ethiopian Renaissance Dam, Jordan Ministry of Foreign Affairs, Port of London Authority, Norwegian public institution, Germany's Greens Party, Outlook, MS Office 365, Harmony's Horizon, Lynas Rare Earths, Jerusalem and Eliat public address systems, Media Today, Hyghur, Iranian Steel Companies, US Major Telecom Networks, Lithuania state railway airport media companies and government ministries, NSA TAO, Ukrainian media company, Albanian Prime Minister and Parliament, Lithuania state-owned energy provider, YouTube Twitter, British Army, Belgium Ministries of Interior and Defense, Shanghai Police, ICCO, Pakistan Air Force, Eastern Europe Government and Defense Firms, Estonia, Montenegro, South Staffordshire Water, DESFA, Latvian Parliament, Ukraine nuclear power plants, Finnish Parliament, Taiwan government, Italy energy agency (GSE), UK MI5, Mexican Defense Ministry, Anonymous, Iranian government, China Northwestern Polytechnical University, NSA, Bosnia, Herzegovina, Telecom internet and universities in Middle East and Africa, Albanian Government networks, US State government Colorado Kentucky and Mississippi, US airports, Bulgarian Defense Ministry Interior Ministry Justice Ministry and Constitutional Court, Australian Department of Defense, Southeast Asia, USB Drives, Pakistani government military and companies, Guadeloupe government, Vanuatu government, Danish State Railways, US Merit Systems Protection Board, Bahraini government elections, energy and logistics in Ukraine and Poland, UAE, former US intelligence, Indian hospital, VTB, Amnesty International of Canada, SBA COVID funds, French hospital, Danish defense ministry, Vatican City, Saudi Arabia government, US UK France healthcare organizations, Italy Ministry of Agriculture, Jalisco, FBI InfraGard
2023	126	Moldovan, Asia Pacific government military and civilian networks, Malaysian National Defense, Albanian government, Costa Rica's Ministry of Public Works, Iran, Australian and US public infrastructure, Nepalese government, Russia, UK Postal Service, Serbian government, US Federal Civilian Executive Branch, Litvian Ministry of Defense, Hospitals in Netherlands and other countries in Europe, China, EU Commission, Italy

Year	# of Incidents	Countries/Entities Involved
		Revenue Agency, Technion University, Bahrain international airport and news agency, Iranian intelligence services, Acea, Polish public, NATO, Turkish airbase, Polish Tax Service, Slovakian cybersecurity researchers, Taiwanese politicians, US politicians and celebrities, Thailand, Indonesia, Vietnam, North Korea, US-based cybersecurity research firms, Estonian voting system, Chinese nuclear energy industry, Pakistan, Bangladesh, Saudi Arabia, CISA, FBI, French National Assembly, Russian military leaders, Israel, Bitcoin mining operations, Canada, African telecom service providers, Mandiant, South Korean academic institutions, Iran, NSA, Sudan, India's Insurance Information Bureau, Kenyan government, Guam, Belgium, Apple, Russian public, Russian telecom provider, Swiss Government, Geneva Airport, US Department of Energy, Illinois Hospital, Italian banking institutions, Pakistan, Wagner Military Corporation, BMW, US Department of Commerce, NATO, South Korean government, Norway, New Zealand Parliament, Trinidad and Tobago, Chinese seismic monitors, UK Electoral Commission, Germany, Nebraska Congress, Belarus, Ecuador, Tiawan, Polish rail systems, Chinese public, X (Twitter), Czech Stock Exchange, South Africa, Sri Lanka, Australian Federal Police, International Criminal Courts, Crimean internet providers, Kuwait Ministry of Finance, Bermuda Department of Planning, Japan, Guyana, Hamas, Cambodia, Denmark, Philippines, Uzbekistan, Kyivstar, Russian largest water utility plant, Iranian gas stations, Kyiv, Medibank.
2024 (Up to Most Recent Update)	68	Medibank, 65 Australian government agencies, Microsoft, Swedish government digital service provider, Global Affairs Canada, Dutch Military, French health insurance companies, United States, Iranian military, Houthi rebels, Royal Canadian Mounted Police, Chinese cybersecurity companies, United Kingdom, India, Indonesia, Taiwan, Russia, Georgia Embassy, Poland Embassy, Ukraine Embassy, Iran Embassy, Swiss National Cyber Security Centre, German military officials, Canadian Financial Intelligence Agency, China, members of the EU, India government and energy sectors, African Union, El Salvador's national cryptocurrency wallet, Belarus, Ukraine, Poland, Czech Republic, UK Ministry of Defense, Pakistan, Canadian Communications Security Establishment, Palau, Japan Space Agency, South Korea, New Zealand, Germany's Federal Office for Cartography and Geodesy, Crowdstrike, UN, Mongolia, Thailand, Amazon, Microsoft, Canadian Center for Cyber Security, United Arab Emirates, North Korea, Turkey, Albania, LinkedIn, US telecom providers, Chinese tech firms, Romania, US Treasury Department, Rome, Palermo, Kazakhstan.

Source: Center for Strategic and International Studies 2025



Source: Center for Strategic and International Studies 2023

Figure 37- Number of Global Cyber Events (2003-2022)

Alaska regularly has the highest rate of cyberattacks per capita in the country, 319 per 100,000 residents (FBI 2023). The State of Alaska has experienced the following cyber events:

Table 9- State of Alaska Historic Cyber Events

Year	Location/Entity	Event Type
2018	Matanuska-Susitna Borough	Ransomware
2018	City of Valdez	Ransomware
2019	RavnAir Group	Hacking

Year	Location/Entity	Event Type
2021	Alaska Court System	Ransomware
2021	Alaska Department of Health and Social Services	Hacking
2022	State of Alaska MyAlaska System, PFD Department	Phishing
2024	University of Alaska	Hacking
2025	Juneau School District	Hacking

Source: UAA 2024, DHS&EM 2025, KTOO 2025

Since 2018, at least two Alaska municipalities and boroughs and at least three Alaska government departments have fallen victim to a cyberattack. Matanuska-Susitna Borough spent $2.5 million to unlock its data (NLC 2019), and the City of Valdez chose to pay the ransom.

The Alaska State Court Administrator, Stacey Marz states: “Courts should decide in advance how much they’re willing to share with the public, given that threat actors may be listening. The courts are choosing not to disclose details to the public about the threat actor’s identity and motives, the malware used and the costs of the attack” (Govtech 2019).

Since these events, Alaska has increased its IT security measures to prevent future attacks. The City and Borough of Juneau has experienced at least two cyber attacks. According to available reporting, Tlingit & Haida has not been impacted by a cybersecurity attack. The first recorded cyber attack to affect the Jurisdictions involved the Alaska Court System, in 2021. Headquartered in Downtown Juneau, the Court System detected malware on several of their computers. While no confidential data was compromised, the attack disrupted court operations for nearly two weeks (KTOO 2021). The second cyber attack occurred in January 2025, when hackers targeted the Juneau School District’s information service provider, PowerSchool. The nationwide data breach occurred through a customer support portal, compromising personal information of students and staff who had been part of the district since the 2008-2009 school year. PowerSchool offered two years of complimentary identity protection and credit monitoring services to those affected (KTOO 2025).

12.HAZARDOUS MATERIALS RELEASE HISTORY

Between January 1st, 2012, and April 1st, 2025, the Juneau and Traditional Lands of Tlingit & Haida Planning Area experienced 3,113 recorded releases or spills. The Division of Spill Prevention and Response (DSPR) within ADEC categorizes these releases by the type of material released: extremely hazardous substance, hazardous substance, non-crude oil, process water, and unknown substances. Based on the historical data, Juneau and Traditional Lands of Tlingit & Haida experiences upwards of 10 hazardous materials releases per month (ADEC 2025). These events vary widely in extent, source, and cause.

Mining operations make up about half of all releases in Juneau and Traditional Lands of Tlingit & Haida. About one third of the releases came from transportation by air, land, and sea. Residential releases make up less than 10% of all releases, and commercial activities make up about 5%. Utility provision makes up less than 1%.

- 1,543 of 3,113 releases originated from mining operations.
- 356 of 3,113 releases originated from air transportation or harbors/ports/marinas.
- 292 of 3,113 releases originated from marine vessels
- 234 of 3,113 releases originated from residences.
- 175 of 3,113 releases originated from vehicles on land.
- 84 of 3,113 release originated from commercial activities such as: cannery/seafood processing, commercial/retail/office, maintenance yard/shop, chemical manufacturing/storage, sand/gravel /borrow pits, or salvage/recycling/wrecking yards.
- 75 of 3,113 releases originated from bulk fuel terminals or gas stations.
- 17 of 3,113 releases originated from utility provision, such as: power generation, telecommunications, waste disposal, or water/wastewater facilities.

With regards to the cause of release, many events are caused by structural issues with equipment, transportation, or storage of hazardous materials. However, human error and intentional releases happen occasionally.

- 693 of 3,113 releases were caused by equipment failure.
- 597 of 3,113 releases were caused by line failure.
- 250 of 3,113 releases were caused by human error.
- 29 of 3,113 releases were caused by intentional release or sabotage/vandalism.

It is important to note that these events are self-reported by the responsible parties or discovered and reported, meaning that there is the possibility of missing data that would change this analysis.

In addition to these releases listed above, there have been several incidents involving white powder mailed to government offices within the City and Borough of Juneau. In 2008, then Alaska Governor Sarah Palin's office received a package containing a suspicious white powder, along with 7 other state houses across the country, all marked with Dallas postmarks. These packages did not contain any toxic material, and some were simply bleached flour (Alaska Public Media 2008). In 2012, 4 Alaskan school districts received letters containing suspicious white powder, including the Juneau School District Central Office. Other school districts in the lower 48 received similar letters. Luckily, the powder was found to be non-infectious and non-toxic (KTOO News Department 2012). In 2013, a package containing a suspicious white powder was delivered to the State Office Building. The substance turned out to be a packaging material and was non-toxic (Kelly 2013). As recently as 2024, USPS workers intercepted a package containing a suspicious white powder sent to the Alaska Division of Elections. As in other cases, Alaska was not the only state targeted by these packages; and at least one of these packages across the country contained bleached flour. The package mailed to Nebraska election office was sent by the "United States Traitor Elimination Army" (Brooks 2024).