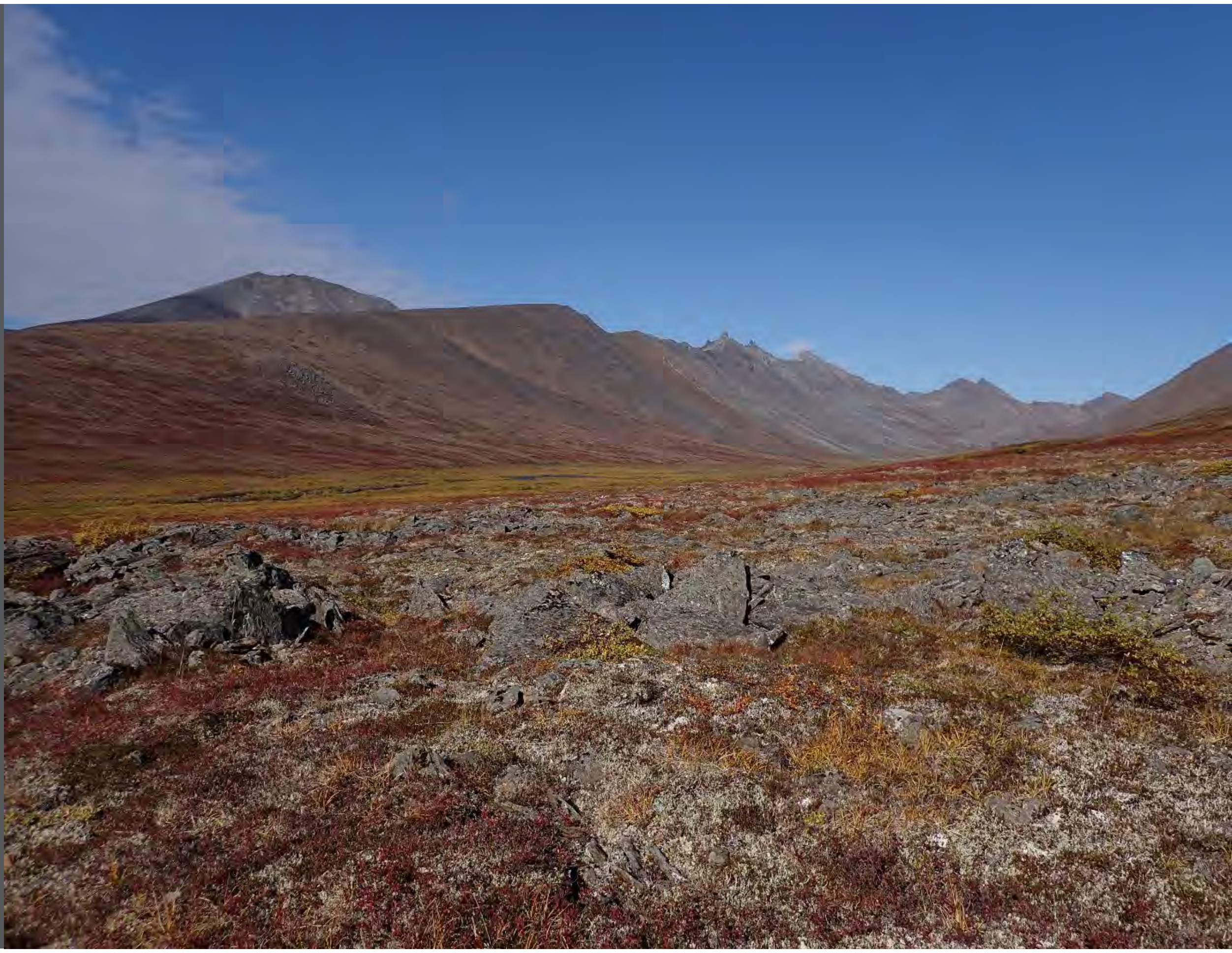

Graphite Creek Project

Environmental Evaluation Document

Graphite One

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Contents

1 Introduction 1
1.1 Project Overview 1
1.2 Project Location 4
1.3 Project Background and History 6
1.4 Project Purpose and Need 6
1.5 Permits and Approvals 7
2 Proposed Project and Alternatives 10
2.1 Design Development Process 10
2.1.1 Preliminary Feasibility Study 10
2.1.2 Feasibility Study 13
2.1.3 Transportation Corridor 15
2.2 Proposed Action 20
2.2.1 Mine Site 20
2.2.2 Mosquito Pass Access Road 26
2.2.3 Temporary Barge Facilities 29
2.2.4 Mine Closure and Reclamation 32
2.3 No Action Alternative 33
2.4 Support Facilities 33
2.4.1 Bulk Fuel Storage 34
2.4.2 Concentrate Storage 34
2.4.3 Employee Housing 34
2.4.4 Existing Road Upgrades 35
3 Affected Environment 36
3.1 Physical Environment 36
3.1.1 Paleontology 36
3.1.2 Geology and Mineral Resources 39
3.1.3 Geomorphology, Permafrost, and Soils 43
3.1.4 Air Quality 53
3.1.5 Noise and Vibration 58
3.1.6 Hydrology and Floodplains 60
3.1.7 Water Quality 72
3.2 Biological Environment 88
3.2.1 Vegetation, Wetlands, and Other Waters of the United States 89
3.2.2 Fish, Essential Fish Habitat, and Invertebrates 99
3.2.3 Birds 109
3.2.4 Terrestrial Mammals 122
3.2.5 Marine Mammals 128
3.2.6 Threatened and Endangered Species, and Critical Habitat 131
3.3 Human Environment 141
3.3.1 Visual and Aesthetic Resources 142

3.3.2 Landownership, Management, and Use ... 143
3.3.3 Recreation ... 147
3.3.4 Cultural Resources ... 150
3.3.5 Subsistence and Traditional Use ... 159
3.3.6 Socioeconomics ... 176
3.3.7 Human Health and Safety ... 185

4 Environmental Consequences ... 192

4.1 Physical Environment ... 193

4.1.1 Paleontology ... 193
4.1.2 Geology and Mineral Resources ... 195
4.1.3 Geomorphology, Permafrost, and Soils ... 196
4.1.4 Air Quality ... 201
4.1.5 Noise and Vibration ... 206
4.1.6 Hydrology and Floodplains ... 208
4.1.7 Water Quality ... 218

4.2 Biological Environment ... 225

4.2.1 Vegetation, Wetlands, and Other Waters of the United States ... 225
4.2.2 Fish, Essential Fish Habitat, and Invertebrates ... 230
4.2.3 Birds ... 233
4.2.4 Terrestrial Mammals ... 236
4.2.5 Marine Mammals ... 238
4.2.6 Threatened and Endangered Species, and Critical Habitat ... 240

4.3 Human Environment ... 244

4.3.1 Visual and Aesthetic Resources ... 244
4.3.2 Landownership, Management, and Use ... 252
4.3.3 Recreation ... 254
4.3.4 Cultural Resources ... 256
4.3.5 Subsistence and Traditional Use ... 259
4.3.6 Socioeconomics ... 264
4.3.7 Human Health and Safety ... 267

5 Avoidance, Minimization, and Mitigation Measures ... 271

5.1 Preconstruction and Construction Phase General and Project-Wide Best Management Plans and Avoidance/Minimization Measures ... 272

5.1.1 Paleontology ... 272
5.1.2 Geomorphology, Permafrost, and Soils ... 272
5.1.3 Air Quality ... 274
5.1.4 Noise and Vibration ... 274
5.1.5 Hydrology, Floodplains, and Water Quality ... 275
5.1.6 Vegetation, Wetlands, and Other Waters of the United States ... 276
5.1.7 Fish, Essential Fish Habitat, and Invertebrates ... 278
5.1.8 Birds, and Terrestrial and Marine Mammals ... 278
5.1.9 Threatened and Endangered Species ... 279
5.1.10 Visual and Aesthetic Resources ... 279
5.1.11 Recreation ... 279

5.1.12 Cultural Resources 280
5.1.13 Subsistence and Traditional Use 280
5.1.14 Socioeconomics 280
5.1.15 Human Health and Safety 281

5.2 Operation Phase Best Management Practices, and Avoidance and Minimization Measures 281

5.2.1 Paleontology 281
5.2.2 Geomorphology, Permafrost, and Soils 281
5.2.3 Air Quality 281
5.2.4 Hydrology, Floodplains, and Water Quality 282
5.2.5 Vegetation, Wetlands, and Other Waters of the United States 283
5.2.6 Cultural Resources 283
5.2.7 Subsistence and Traditional Use 283
5.2.8 Socioeconomics 283
5.2.9 Human Health and Safety 284

5.3 Closure/Post-Closure Phase Best Management Plans, and Avoidance and Minimization Measures 285

5.3.1 Geomorphology, Permafrost, and Soils 285
5.3.2 Hydrology, Floodplains, and Water Quality 285

6 References 287

Tables

Table 1-1. Townships, ranges, and sections for the Project 4
Table 1-2. Required permits, approvals, and plans 7
Table 2-1. Mosquito Pass corridor and Teller Road corridor reconnaissance study comparison 18
Table 2-2. Bridge crossings 28
Table 3-1. Description of PFYC class values 37
Table 3-2. PFYC class values within the Project study area 39
Table 3-3. Mineral resource terms and definitions 42
Table 3-4. Description of soil deposits within the Project vicinity 44
Table 3-5. Soils, hydric rating, and farmland status within the Project area 45
Table 3-6. Description of permafrost distribution type 47
Table 3-7. Permafrost distribution within the Project area 48
Table 3-8. Estimated frequency of avalanches originating from identified paths expected to impact the Mosquito Pass access road 52
Table 3-9. Estimated frequency of avalanches originating from identified paths expected to impact mine site facilities 52
Table 3-10. National and Alaska Ambient Air Quality Standards 54
Table 3-11. Typical source noise levels 59
Table 3-12. Runoff characteristics of measured streams within the Project area and at nearby USGS gauges 64
Table 3-13. Major drainages crossed by the proposed Mosquito Pass access road 65
Table 3-14. Major streams along the Mosquito Pass access road with drainage area, channel, and floodplain characteristics 67

Table 3-15. Acreages of mapped vegetation community types ... 89
Table 3-16. Rare plants found within the Project vicinity ... 94
Table 3-17. Mapped and jurisdictional wetland and waterbody types within the Project study area ... 96
Table 3-18. Freshwater EFH in the mine site and access road study areas ... 101
Table 3-19. Fish without EFH designation ... 107
Table 3-20. Birds with special status that may occur within the Project area ... 110
Table 3-21. Birds of Conservation Concern within the Project area ... 113
Table 3-22. Terrestrial mammals with potential to occur within the Project area ... 122
Table 3-23. ESA-listed species within the Project area ... 132
Table 3-24. Probability of encountering humpback whales from DPSs that feed seasonally in marine waters of the Project area ... 133
Table 3-25. Land ownership within the Project study area ... 143
Table 3-26. State Land Unit designation descriptions and management intent ... 146
Table 3-27. Typical recreational activities within the Project study area by season ... 149
Table 3-28. Cultural resources within the Project study area ... 153
Table 3-29. Iñupiaq placenames within the Project vicinity. ... 158
Table 3-30. Subsistence resource areas identified at SAC meetings. ... 163
Table 3-31. Subsistence resources within the study area ... 165
Table 3-32. Brevig Mission select subsistence harvests ... 167
Table 3-33. Teller select subsistence harvests ... 168
Table 3-34. Brevig Mission and Teller large land mammal harvests, 2015 ... 170
Table 3-35. Nome select subsistence harvests ... 170
Table 3-36. Demographics, population and race, 2023 ... 178
Table 3-37. Population projections, 2023 to 2050 (select years) ... 178
Table 3-38. Economic and workforce characteristics, 2023 ... 179
Table 3-39. Employment by select industries, 2023 ... 180
Table 3-40. Housing characteristics, 2023 ... 181
Table 3-41. AADT for the Nome-Taylor and Nome-Teller Highway ... 182
Table 3-42. Disability and health insurance coverage, 2023 ... 186
Table 3-43. Nome Census Area health rankings, 2025 ... 187
Table 3-44. Incident rates of nonfatal occupational injuries and illnesses, Alaska, 2023 ... 188
Table 3-45. Fatal occupational injuries by industry, Alaska, 2023 ... 188
Table 3-46. Monthly Return of Offenses, Nome Police Department, 2022 ... 190
Table 4-1. Quantity of bedrock material and mineral resources to be removed ... 195
Table 4-2. Soil disturbance impacts from the Proposed Action ... 197
Table 4-3. Proposed Action impacts to vegetation community types within Project footprint. ... 227
Table 4-4. Direct impacts on wetlands and waterbodies under the Proposed Action ... 229
Table 4-5. Species habitat preference by vegetation type and impact ... 234
Table 4-6. Potential for ESA-listed species to be present in the Project Area by month ... 241
Table 4-7. Key observation points for Proposed Action features ... 245
Table 4-8. Proposed Action impacts on visual resources and aesthetics when viewed from the key observation points ... 251
Table 4-9. Documented cultural resources that could be affected by the Proposed Action ... 257
Table 5-1. Definition of avoidance, minimization, and mitigation terms ... 271

Figures

Figure 1-1. Project location ... 3
Figure 1-2. Land use and mining claims ... 5
Figure 2-1. Preliminary Feasibility Study mine site layout ... 12
Figure 2-2. Feasibility Study mine site layout ... 14
Figure 2-3. New access road alternatives ... 17
Figure 2-4. Proposed Action mine site layout ... 22
Figure 2-5. Mosquito Pass access road layout ... 27
Figure 2-6. Temporary barge facilities layout ... 30
Figure 3-1. PFYC geological formations within the Project study area ... 38
Figure 3-2. Detailed geologic units within the Project area ... 41
Figure 3-3. Soils within the Project area ... 46
Figure 3-4. Permafrost distribution within the Project area ... 49
Figure 3-5. Overview of avalanche hazards within the Project area ... 51
Figure 3-6. Mine site streams mapped in 2019 and in the current USGS hydrography layer ... 62
Figure 3-7. Comparison of mean daily stream flows measured by USGS near the Project area and Upper Graphite Creek year-round hydrograph ... 63
Figure 3-8. Preliminary watersheds for mine site and Mosquito Pass access road streams and rivers ... 66
Figure 3-9. Digital Elevation Model hillshade of Glacier Canyon Creek as it transitions from a narrow, incised channel to a low-gradient alluvial channel ... 68
Figure 3-10. Cobblestone River alluvial channel with active gravel bars ... 69
Figure 3-11. Sinuk River rocky channel ... 70
Figure 3-12. North Star Creek alluvial fan channel form ... 71
Figure 3-13. Surface and groundwater sample locations ... 76
Figure 3-14 Imuruk Basin water monitoring locations ... 87
Figure 3-15. Vegetation overview map ... 91
Figure 3-16. Invasive plant species found within the Project vicinity ... 93
Figure 3-17. Wetlands and waterbodies overview map ... 98
Figure 3-18. Anadromous streams listed in the AWC within the Project vicinity ... 100
Figure 3-19. Survey locations with fish presence ... 105
Figure 3-20. Raptor nest survey results (2022–2024) ... 121
Figure 3-21. Western Arctic Caribou Herd seasonal ranges (2002–2017) ... 125
Figure 3-22. Critical habitat and species range overlap for polar bears, spectacled eiders, Steller's eiders, bearded seals, and ringed seals ... 136
Figure 3-23. Land ownership and mining claims within the Project study area ... 144
Figure 3-24. Land use designations for the Project area ... 148
Figure 3-25. Game Management Unit 22, Seward Peninsula-Southern Norton Sound ... 162
Figure 3-26. Caribou, moose, and bird subsistence resources near the Project area ... 173
Figure 3-27. Fish and marine mammal subsistence resources near the Project area ... 175
Figure 3-28. Kougarok road crash data, 2020–2024 ... 190
Figure 4-1. Mine site stream impacts ... 210
Figure 4-2. Key observation point locations and viewing directions ... 246

Appendices

Appendix A: *2024 Hydrogeology Report*, Graphite Creek Project
Appendix B: *Snow Avalanche Hazard Assessment for the Graphite Creek Project*
Appendix C: *Graphite Creek Project Aquatic Baseline Studies: 2024 Report*
Appendix D: *Visual Resources and Aesthetics Technical Report*
Appendix E: *Graphite One Community and Tribal Engagement Summary*

Abbreviations

°F	degrees Fahrenheit
AAAQS	Alaska Ambient Air Quality Standards
AAC	Alaska Administrative Code
AADT	annual average daily traffic
ACCS	Alaska Center for Conservation Science
ACHP	Advisory Council on Historic Preservation
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADL&WD	Alaska Department of Labor and Workforce Development
ADNR	Alaska Department of Natural Resources
AHPA	Alaska Historic Preservation Act
AHRS	Alaska Heritage Resources Survey
AKEPIC	Alaska Exotic Plants Information Clearinghouse
AKVWC	Alaska Vegetation and Wetland Composite
ANCSA	Alaska Native Claims Settlement Act
APDES	Alaska Pollutant Discharge Elimination System
APE	Area of Potential Effects
AR	Access Road
ARD	acid rock drainage
AS	Alaska Statute
AST	Alaska State Troopers
asl	above sea level
avg	average
AWC	Anadromous Waters Catalog
AWQS	Alaska Water Quality Standards
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BLM	Bureau of Land Management
BMP	best management practice
BSNC	Bering Straits Native Corporation
BSSD	Bering Strait School District
CFR	Code of Federal Regulations
Cg	graphitic carbon
CGP	Construction General Permit
CO	carbon monoxide
CSG	coated spherical graphite
CWA	Clean Water Act

dB	decibel(s)
dBA	A-weighted decibel(s)
DMLW	Division of Mining, Land, and Water
DOE	Determination of Eligibility
DOI	U.S. Department of the Interior
DOnx	marble, graphitic rocks, and schist
DOT&PF	Alaska Department of Transportation and Public Facilities
DPS	Distinct Population Segment
EED	Environmental Evaluation Document
EFH	Essential Fish Habitat
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
ESCP	Erosion and Sediment Control Plan
FR	*Federal Register*
FS	Feasibility Study
ft	foot/feet
ft^3/mi^2	cubic foot/feet per square mile(s)
Graphite One	Graphite One (Alaska) Inc.
HAP	Hazardous Air Pollutant
HDPE	high-density polyethylene
HDR	HDR Engineering, Inc.
H:V	horizontal:vertical
Hwy	Highway
ID	Identifier
Klgr	intermediate granitic rocks
Kmgr	granitic rocks of central and southeast Alaska
KOP	key observation point
LEDPA	Least Environmentally Damaging Practicable Alternative
max	maximum
MBTA	Migratory Bird Treaty Act
Mcy	million cubic yards
MGD	million gallons per day
mg/L	milligram(s) per liter
mg/m^3	milligrams per cubic meter(s)
$\mu g/m^3$	micrograms per cubic meter(s)
mi	mile(s)
mi^2	square mile(s)
MMPA	Marine Mammal Protection Act

MP	Milepost
mph	miles per hour
MS	Mine Site
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSHA	Mine Safety and Health Administration
Mt	million tons
MW	megawatt
N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
No.	Number
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NRHP	National Register of Historic Places
NSHC	Norton Sound Health Corporation
NTU	nephelometric turbidity unit
NWI	National Wetland Inventory
O_3	ozone
Ocs	Casadepaga schist
OHW	ordinary high water
OSHA	Occupational Safety and Health Administration
Owl Ridge	Owl Ridge Natural Resource Consultants, Inc.
PAG	potentially acid generating
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PFS	Preliminary Feasibility Study
PFYC	Potential Fossil Yield Classification
PM	particulate matter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns
PM_{10}	particulate matter with aerodynamic diameters less than or equal to 10 microns
PP	process pond
ppb	parts per billion
ppm	parts per million
Project	Graphite Creek Project
PSD	Prevention of Significant Deterioration
Pzncs	Younger schist
PzPxkg	high-grade metamorphic rocks of the Seward Peninsula
Q&A	Question and Answer

Qs	unconsolidated surficial deposits, undivided
Rd	Road
ROW	right-of-way
RS	Revised Statute
SAC	Subsistence Advisory Committee
SGCN	species of greatest conservation need
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SPL	sound pressure level
SWPPP	Stormwater Pollution Prevention Plan
T&E	Threatened and Endangered
TDS	total dissolved solids
TMF	tailings management facility
TSS	total suspended solids
Unit	Game Management Unit
USACE	U.S. Army Corps of Engineers
USAMS	Uncle Sam Alaska Mining Syndicate
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VBC	village-based counselor
VOC	volatile organic compound
VSPO	Village Public Safety Officer
WACH	Western Arctic Caribou Herd
WAD	weak acid dissociable
WMF	waste management facility
WMP	water management pond
WOTUS	Waters of the United States
WTP	water treatment plant
yr	year(s)
Zgns	Orthogneiss of the Seward Peninsula
Zngn	metagranitic rocks

1 Introduction

Graphite One (Alaska) Inc. (Graphite One) has prepared this Environmental Evaluation Document (EED) to assist the U.S. Army Corps of Engineers (USACE) in evaluating the proposed Project. The EED provides information about the natural and human resources potentially affected by the proposed Project to support the USACE analysis under the National Environmental Policy Act (NEPA), the Clean Water Act (CWA) Section 404(b)(1) Guidelines, and overall public interest.

Chapter 1 (Introduction) provides an overview of the proposed action, relevant Project background and history, provides Graphite One's stated purpose and need for the Project, and identifies other environmental permits and authorizations that would be required prior to construction. Chapter 2 (Proposed Project and Alternatives) describes alternatives to the proposed Project as well as describes Project components, summarizes proposed construction methods, and identifies design criteria requirements and considerations. Chapter 3 (Affected Environment) describes baseline environmental conditions (i.e., affected environment) for the resources that could potentially be affected by the Project and Chapter 4 (Environmental Consequences) describes reasonably foreseeable impacts to those resources. The analyses in Chapter 4 include impacts that may extend beyond the USACE scope of analysis under NEPA. Chapter 5 (Avoidance, Minimization, and Mitigation Measures) provides a summary of the mitigation measures and best management practices (BMPs) incorporated into the Project planning and design.

1.1 Project Overview

Graphite One proposes to develop an open-pit, graphite mine near the Imuruk Basin on the Seward Peninsula, approximately 37 miles north of Nome, and 16 miles west of the community of Mary's Igloo (Figure 1-1). The Graphite Creek Project (Project) would comprise the construction, operation, and reclamation of the mine site and a new access road connecting the mine site to an existing public road system on the Seward Peninsula.

The Project components would consist of:

- Mine site
    - Open-pit graphite mine
    - Mine site roads
    - Ore processing facilities
    - Waste management facilities (WMFs)

  - Water treatment facilities
  - Operations and maintenance facilities
- New gravel access road between the mine site and existing road network

Overall, the Project would require approximately 30 months of construction, with a projected mine life expectancy of approximately 21 years. Graphite One would carry out the Project in three phases:

1. Construction (Construction Phase);
2. Operations and maintenance (Operations Phase); and
3. Closure, reclamation, and monitoring (Reclamation and Closure Phase).

In addition to the Project components listed above, existing public road infrastructure improvements and support facilities for fuel and concentrate storage and employee housing would be needed in Nome.

These additional components would be located on existing gravel pads and roads and may require minor upgrades to existing multiuse facilities. There would be no new construction solely as a result of the proposed project. Any potentially necessary permitting or construction activities would be conducted by other entities. These facilities are not part of the proposed action and are outside of the scope of analysis.

Figure 1-1. Project location

1.2 Project Location

The Project is located on the Seward Peninsula, approximately 37 miles north of Nome, Alaska, in the northern foothills of the Kigluaik Mountains and south of Imuruk Basin (Figure 1-1). The proposed access road would connect the mine site to the existing Nome-Taylor Highway (also known as Beam Road or Kougarok Road) through Mosquito Pass. The entire permanent Project footprint is located on State of Alaska land (Figure 1-2).

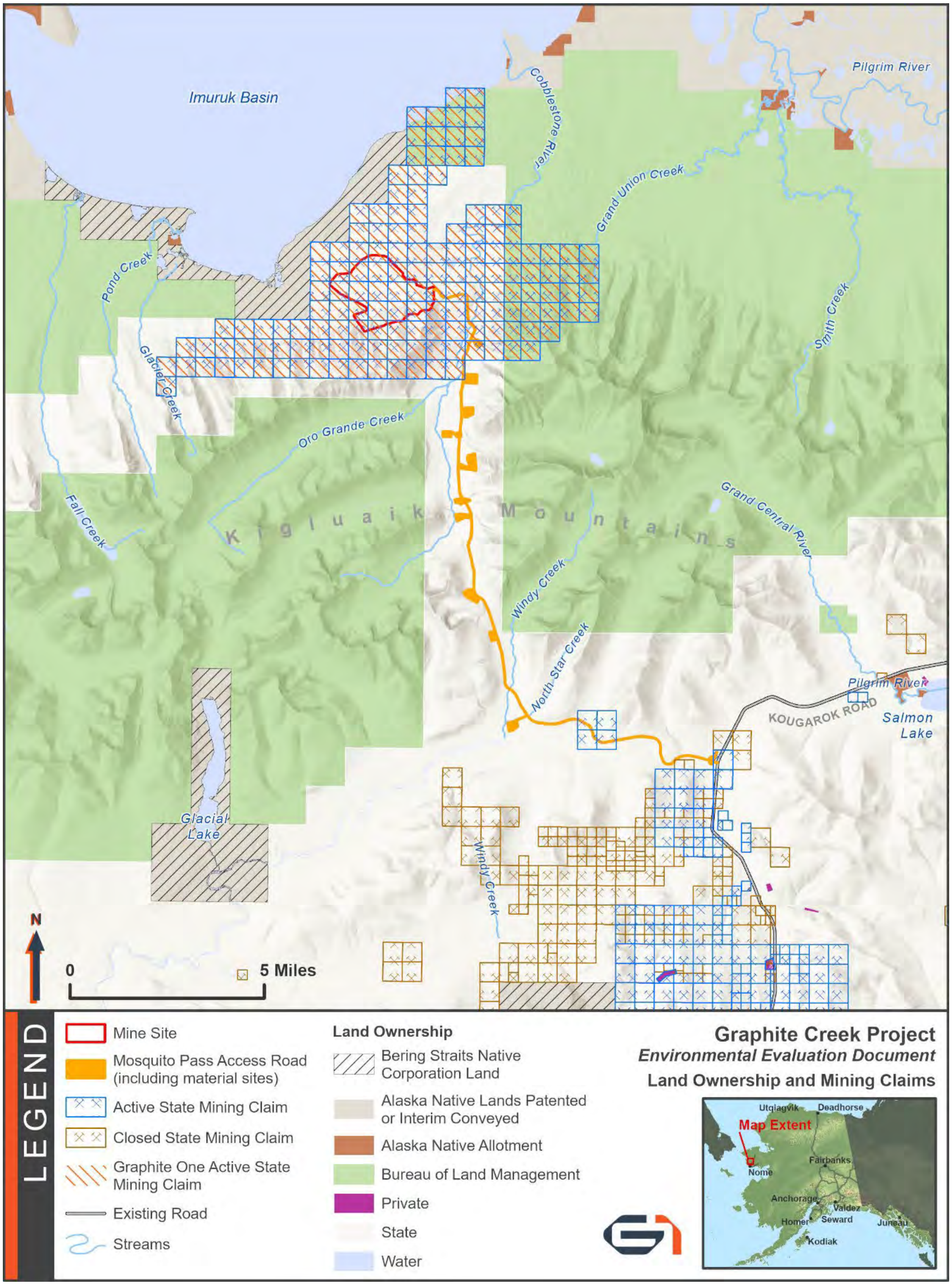
The Graphite Creek property, which would contain the mine site, comprises 176 active mining claims totaling 23,680 acres (Figure 1-2). The mine site (area of disturbance), located at 65.038424° North and 165.540990° West, would be approximately 1,870 acres. The Project is within the Kateel River Meridian (see Table 1-1 for townships, ranges, and sections) and U.S. Geological Survey (USGS) Quadrangle Maps Teller A-2 SE, Teller A-1 SW, Nome D-2 NE, and Nome D-1 NW.

Table 1-1. Townships, ranges, and sections for the Project

Township	Range	Section(s)[a]
5 South	34 West	15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28, 35, 36
6 South	34 West	1, 2, 11, 12, 13, 14, 23, 24, 25, 36
7 South	33 West	6, 7, 14, 15, 16, 17, 18, 23, 24
	34 West	1

[a] Kateel River Meridian

Figure 1-2. Land use and mining claims



1.3 Project Background and History

Graphite mining within the Project area began during the early 1900s. The first known claims were staked in 1900 by Uncle Sam Alaska Mining Syndicate (USAMS) near the bay on the southern side of Imuruk Basin (Harrington 1919). In 1912, USAMS shipped 132 tons of graphite to Seattle and the San Francisco Bay area, and by 1916 had stockpiled another 303 tons (Mertie 1918). The Alaska Graphite Mining Co. staked its original claim in 1905, adding claims in 1915 and 1916 (Mertie 1918; Harrington 1919). A total of 35 tons of graphite was mined from talus in 1907 (Coats 1944). In 1916, 99 tons of graphite was mined (Mertie 1918). This production was hauled a short distance overland to Windy Cove, from there to Teller by boat, and then shipped to Seattle and San Francisco (Harrington 1919).

After initial early 1900s production, the Graphite Creek deposits lay undisturbed until 1943, when a USGS field crew sampled material from several sorted piles of previously mined graphite and several high-grade graphitic lenses on the Graphite Creek Property (Coats 1944). The USGS crew observed exposed, high-grade lenses varying from a few inches to a few feet in thickness, with lengths 10 to 15 times their width and containing up to 60 percent graphite.

The last-known exploration interest within the area was in 1981, when Anaconda Copper Company collected several samples for analysis during a one-day visit (Hudson 1981; Wolgemuth 1982). The Alaska Division of Geological and Geophysical Surveys and researchers at Stanford University completed mapping within the area in 1992. Minor data collection, sample analysis, and report writing were completed at the request of the claim-holding Tweet family in 1994 and 1998. Exploration work conducted for Graphite One began in 2011 and has continued through 2025.

1.4 Project Purpose and Need

Graphite One's purpose for the proposed Project is to mine graphite from their mineral leases on State of Alaska land, to process the graphite into commercially viable ore concentrate, and to transport the concentrate to a processing facility to manufacture high grade, coated spherical graphite (CSG) and other products in demand. The CSG would supply the electric-vehicle, lithium-ion battery, and energy storage markets as well as other high-grade graphite products.

To accomplish the purpose and need of the project, Graphite One proposes to mine graphite from the Graphite Creek deposit, process and containerize ore concentrate at the mine site, and transport the concentrate by truck to the Port of Nome by constructing a new gravel access road from existing public roads. The sealed ore containers would be barged to a processing/recycling/production facility outside of Alaska. The graphite concentrate would be produced from the Graphite Creek deposit using mining processes, infrastructure, logistics, and energy supplies that are economical and feasible for application at a remote location on the Seward Peninsula.

The need for the Project is to provide essential, domestic, supply-chain infrastructure for the United States' renewable energy sector and energy storage systems as well as advanced graphite materials for industrial and Defense Industrial Base applications. The Project would also provide workforce and business development opportunities in local, state, and national markets.

1.5 Permits and Approvals

Table 1-2 lists permits and regulatory approvals required by federal and state agencies to construct and operate the Project. While this list is intended to be comprehensive for Project initiation, other permitting and regulatory approval needs may arise throughout the Project's duration.

Table 1-2. Required permits, approvals, and plans

Agency	Permit/Authorization/Plan	Scope and Jurisdiction
Federal		
USACE	CWA Section 404 Department of the Army Permit	Required for discharge of fill material into WOTUS, including wetlands. Requires completion of the following consultations and certification: • NHPA Section 106 • ESA Section 7 • MSA EFH • CWA Section 401 Water Quality Certification
SHPO	NHPA Section 106 Consultation	Requires review for impacts on significant historic properties. USACE is the lead agency but must allow the SHPO and ACHP to comment.
NMFS and/or USFWS	ESA Section 7 Consultation	Requires protections for fish, wildlife, marine mammals, and plants listed as threatened or endangered. Requires concurrence to determine if "taking" of a listed species or adverse habit impacts would occur.
NMFS	MSA EFH Consultation	Purpose is to protect, conserve, and enhance EFH. Requires consultation to determine if the Proposed Action would adversely impact EFH.
USFWS	BGEPA	Requires identification of eagle nests, roosts, and perches. Requires a permit to "take" bald eagles, including their parts, nests, or eggs.
USFWS	MBTA	Prohibits the intentional and unintentional take (i.e., killing, capturing, selling, trading, transporting) of protected migratory bird species without prior authorization by USFWS (16 USC 703–712).

Agency	Permit/Authorization/Plan	Scope and Jurisdiction
State		
ADEC	Air Quality Construction Permit	Demonstrates compliance with Alaska Ambient Air Quality Control requirements (18 AAC 50).
ADEC	CWA Section 401	Water Quality Certification
ADEC	Air Quality Control Operating Permit	Demonstrates compliance with Alaska Ambient Air Quality Control requirements (18 AAC 50, and 40 CFR 60 and 63).
ADEC	APDES Permit	Authorizes effluent discharge into water and requires characterization of the discharge and receiving water.
ADEC	CWA Section 402	Authorizes discharge of wastewater into state waters and land surfaces. APDES CGP is required with the development and implementation of a SWPPP.
ADEC	Solid Waste Management Permit	Authorizes tailings and waste rock disposal.
ADEC	Stormwater Plan	Authorizes controlled discharge of stormwater and runoff.
ADF&G	Fish Habitat Permit	Authorizes activities in fish bearing waters, including withdrawal structures for water (Title 16).
ADNR	Land Use Permit	Authorizes hard rock exploration and winter cross-country travel
ADNR	Tidelands Lease	Authorizes lease of state tidelands for the barge landing.
ADNR	Plan of Operations Approval	Documents balancing mineral extraction with effects on public resources.
ADNR	Reclamation Plan Approval	Documents reclamation of the mine to prevent degradation of land and water resources (AS 27.19.20). Includes a reclamation bond (AS 27.19.040).
ADNR	Millsite Lease	Authorizes mine facilities not located on the upland mining lease or claim.
ADNR	Mining Lease	Consolidates mining claims into a single lease.
ADNR	Land Use Permit	Authorizes staging areas, placement of communications repeater and meteorological station, and geotechnical drilling on state land to support the Project.
ADNR	ROW	Required for ROW acquisition; required on state-owned and selected lands.
ADNR	Temporary Water Use Application	Authorizes water withdrawal to support construction and operation of the mine.

Agency	Permit/Authorization/Plan	Scope and Jurisdiction
ADNR	Permits to Mine in Alaska Application	Authorizes hard rock exploration and mining activities on the Project site.
ADNR	Easement Application	Required for construction of the access road.
ADNR	Material Sales	Required for material use outside the ROW and mining claims.
ADNR	Dam Safety Certification	Required for the tailings storage dam and stream diversion structures.

Source: Barr 2025

Notes: AAC = Alaska Administrative Code; ACHP = Advisory Council on Historic Preservation; ADEC = Alaska Department of Environmental Conservation; ADF&G = Alaska Department of Fish and Game; ADNR = Alaska Department of Natural Resources; APDES = Alaska Pollutant Discharge Elimination System; AS = Alaska Statute; BGEPA = Bald and Golden Eagle Protection Act; CFR = Code of Federal Regulations; CGP = Construction General Permit; EFH = Essential Fish Habitat; ESA = Endangered Species Act; MBTA = Migratory Bird Treaty Act; MSA = Magnuson-Stevens Fishery Conservation and Management Act; NHPA = National Historic Preservation Act; NMFS = National Marine Fisheries Service; ROW = right-of-way SHPO = State Historic Preservation Office; SWPPP = Stormwater Pollution Prevention Plan; USC = United States Code; USFWS = U.S. Fish and Wildlife Service; WOTUS = Waters of the United States

2 Proposed Project and Alternatives

This EED provides a design development process and alternatives evaluation to assist USACE in their NEPA environmental review, public interest considerations, and CWA Section 404(b)(1) evaluation processes.

Graphite One evaluated a range of alternatives to identify a set of reasonable and practicable alternatives for the proposed Project that could meet the overall Project purpose, be constructable, address community concerns, and ultimately result in the identification of a Least Environmentally Damaging Practicable Alternative (LEDPA) by the USACE. For the proposed Project, Graphite One evaluated the feasibility of several access road alternatives, facility siting configurations, and barge transportation routes to avoid and minimize impacts to Waters of the United States (WOTUS) and other environmental considerations.

The following framework was used for the evaluation of alternatives:

- **Reasonable** is based on consideration of the Project's purpose as well as technology, economics, and common sense.
- **Practicable** means the alternative is available and capable of being constructed after considering cost, existing technology, and/or logistics in light of the overall Project purpose(s) (40 CFR 230.3(l).

It is critical that the alternatives considered, and ultimately implemented, meet the needs of the Project as defined in Chapter 1 Introduction. Alternatives that do not address those needs or are not technically feasible were not carried forward for the environmental impacts analysis.

2.1 Design Development Process

Design and development of the mine have progressed from a Preliminary Feasibility Study (PFS; JDS 2022) to the recent release of the Feasibility Study (FS; Barr 2025). The FS used current geologic, economic, and environmental data collected for the mine to refine the design and operation of the mine from what was originally proposed in the PFS. Through the design development process, Graphite One has designed a mine that is economically viable, minimizes environmental impacts, and accommodates stakeholder input.

2.1.1 Preliminary Feasibility Study

The first step in the design development process was the development of a PFS by Graphite One and JDS Energy & Mining, Inc., based on the results from the 2011 to 2018 exploration drilling programs. The PFS described the graphite resource, mining method, onsite primary processing facilities and infrastructure, secondary processing (offsite), environmental permitting, reclamation needs, and economic viability of the Project. Figure 2-1 shows the general layout of the mine, processing facilities, roads, tailings management, and water treatment based on the PFS.

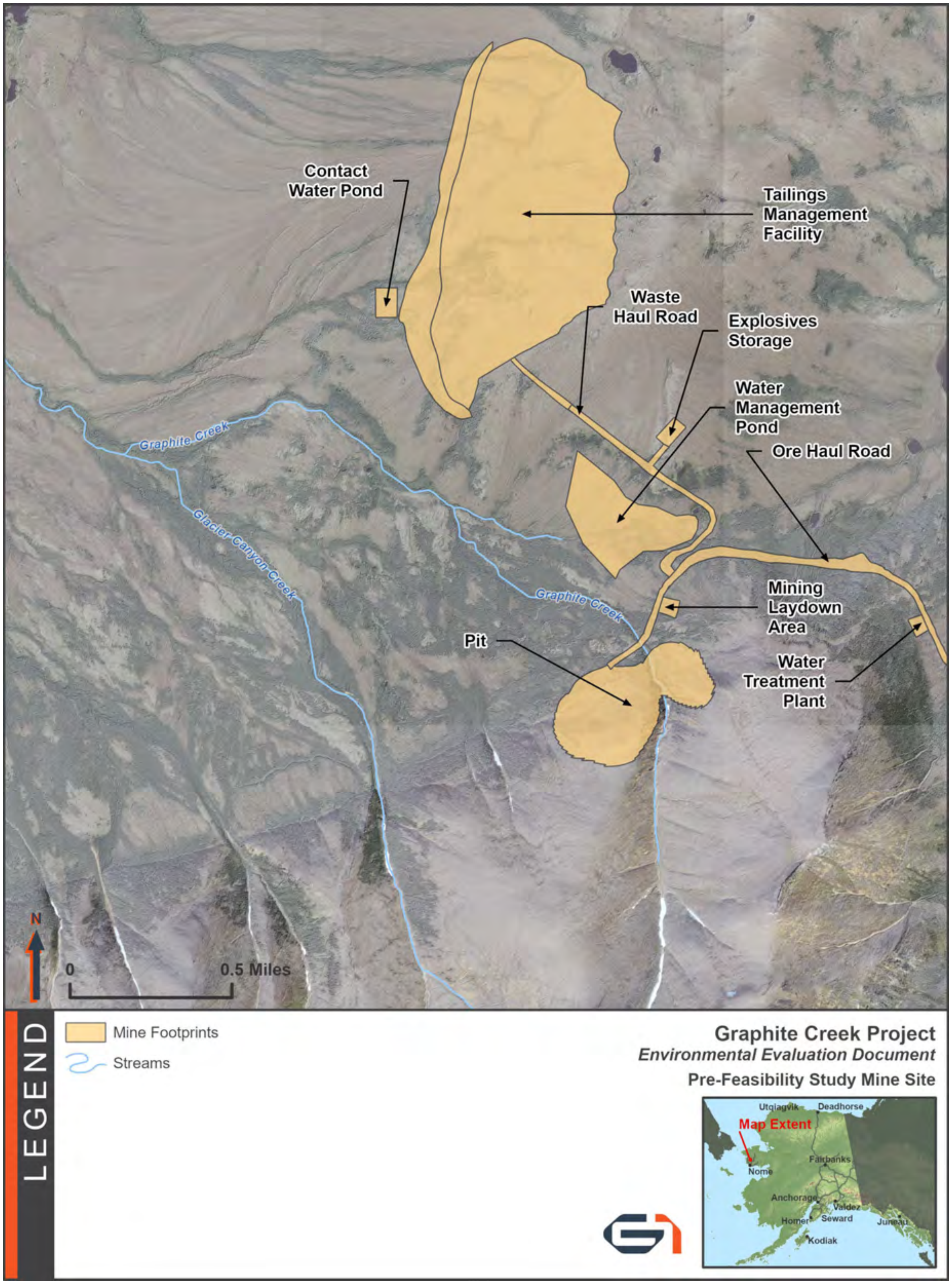
The site layout shown in Figure 2-1 was designed with available data to minimize the footprint of mine facilities by using existing topography while reducing impacts to the nearest communities and the areas they use for subsistence harvest. In this layout, the camp and helipad, primary mine processing plant, and water treatment plant (WTP) were in the Cobblestone River drainage and not visible from Teller, Imuruk Basin, and the surrounding tundra. The mine pit was centered on Graphite Creek and was approximately 0.5-mile across and approximately 71 acres in area.

The PFS recommended an open pit mine as the mining method due to its relatively low cost and the near-surface nature of the deposit. The pit design was phased to optimize construction activities and smooth production rates during mining operation. The pit design parameters consisted of a ramp width of 100 feet, road grades of 10 percent, bench heights of 26 feet, variable slope angles by rock type, and a minimum mining width of 100 feet. Final walls were benched to a height of 105 feet to satisfy an overall slope angle of 42.4 degrees or flatter.

Over the life of the mine in the PFS design, the mine would produce 24.8 million tons (Mt) of ore at an average graphite grade of 5.6 percent graphitic carbon (Cg), along with 55 Mt of waste. Ore material would be sent directly to the primary crusher or a temporary stockpile near the pit prior to processing. Waste material would be co-mingled with mine tailings in the tailings management facility (TMF), located on the west-facing slope above Imuruk Basin, north of the mine pit. The TMF was designed to store approximately 69 Mt of filtered tailings and waste rock, equivalent to a volume of 43 million cubic yards (Mcy) and cover approximately 466 acres in surface area. The tailings and waste rock would be co-mingled in a single facility due to the assumed presence of potential acid-generating material in the mine pit. The TMF would be developed and reclaimed in three stages, progressing from south to north.

During mine closure, a second WTP would be constructed. This WTP would be needed to manage the pit water levels and treat the contact water that fills the pit. The WTP would operate two months per year, likely during July and August. Operation of the WTP during closure would require continued logistical support and planning for a remote seasonal camp at the mine site. In the PFS, water treatment in perpetuity was expected because of the exposed pit high wall. The PFS also recommends construction of a discharge pipeline with a diffuser into Imuruk Basin.

Figure 2-1. Preliminary Feasibility Study mine site layout



2.1.2 Feasibility Study

The design and operations of the mine were further refined in the 2025 FS. The FS included information collected by Graphite One during exploration and geotechnical drilling programs at Graphite Creek during 2022, 2023, and 2024, and were used to further understand the economically recoverable resource as well as refine the mine and access road design. Based on the 2023 and 2024 exploration drilling program results, Graphite One determined that the economically recoverable graphite resource at the site is 300 percent greater than estimated in the PFS results (JDS 2022; Barr 2025).

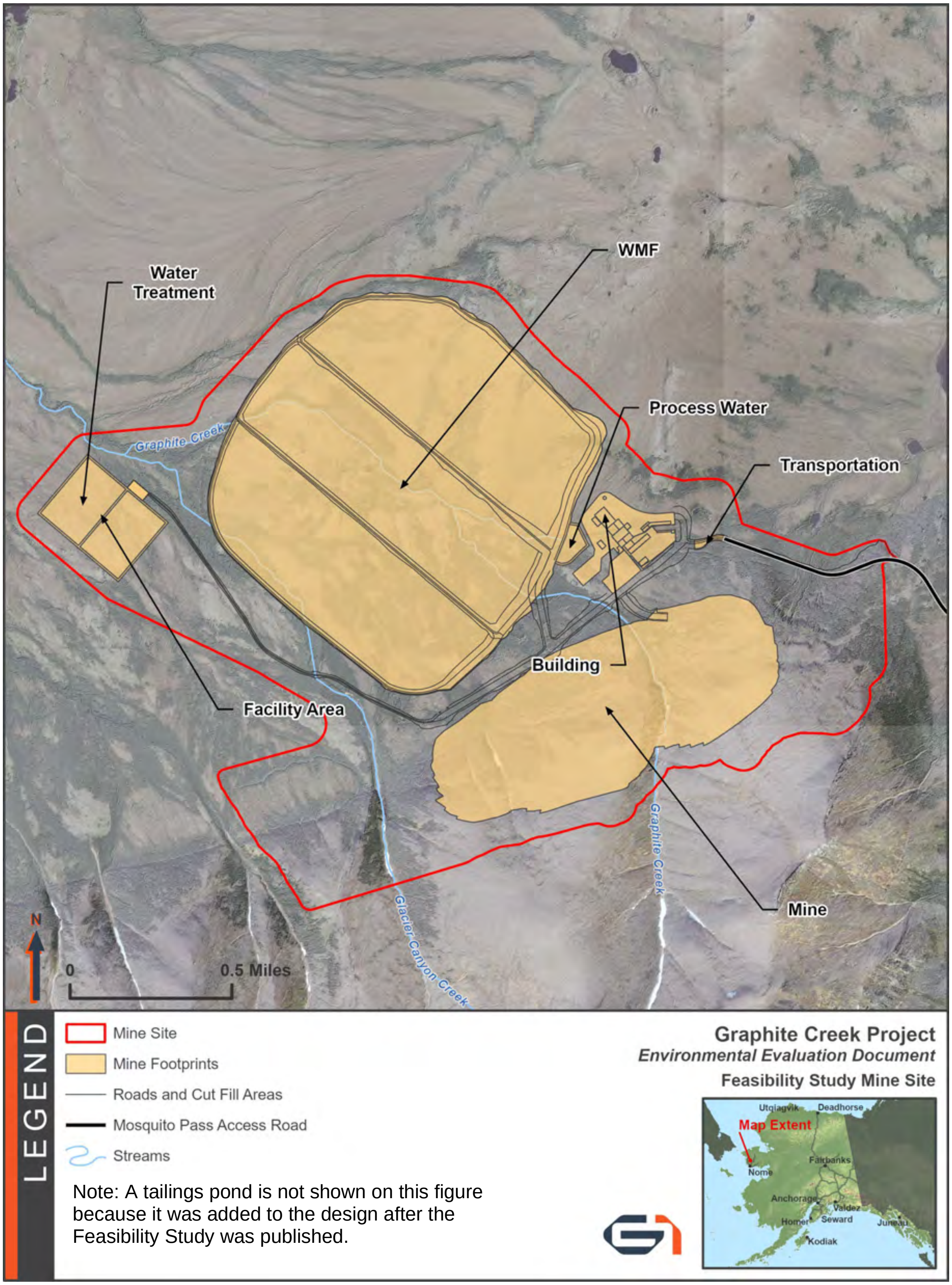
The following describes how the mine pit, ore processing, waste and tailings storage, and water treatment design have changed in response to these findings to support an economically viable Project. Stakeholder input also led to significant changes in the layout of mine facilities (Figure 2-2).

For the same reasons detailed in the PFS, the FS recommended an open pit mining method. The pit would be developed in five stages, and the overall shape was determined through a resource optimization process using standard mining software and geotechnical data. The ramp widths, road grades, and mining bench heights are consistent with the PFS design. Graphite One's current estimate is that over its life, the mine would produce 78.5 Mt of ore at an average graphite grade of 5.2 percent Cg, along with 253.3 Mt of waste rock. Consequently, the pit increased in size from the PFS design to approximately 1.1 miles in length and 337 acres in area.

Compared to the PFS layout (Figure 2-1), the proposed FS mine layout (Figure 2-2) is more condensed around the mine pit; neither the ore processing nor water treatment facilities are sited in the Cobblestone River drainage. This change in layout is in direct response to input from nearby community members who expressed concerns about potential impacts on subsistence fish resources in the Cobblestone River and asked Graphite One to minimize the overall footprint of the mine facilities in the Cobblestone River drainage.

The WMF would be larger and designed to store approximately 338 Mt of filtered tailings and waste rock, equivalent to a volume of 181.8 Mcy and approximately 660 acres in surface area. Graphite One's proposed WMF is located just north of the mine pit, and a diversion channel would be required to divert Graphite and Glacier Canyon Creeks around the WMF. Further geotechnical investigations since the PFS have revealed the potential for acid generation and metal leaching, so filtered tailings and waste rock would be co-mingled in the WMF. As with the PFS design, the proposed WMF would be developed and reclaimed in phases during mine operation.

Figure 2-2. Feasibility Study mine site layout



Note: A tailings pond is not shown on this figure because it was added to the design after the Feasibility Study was published.

The modified WMF location has been designed to limit the visual impact of the mine during operations and after closure by blocking the view of the pit and process facilities from Imuruk Basin. Once the WMF has been reclaimed, visibility of the pit should be significantly reduced. Also, if additional reserves are found, the WMF location would allow for more complete backfilling of the pit with future waste and tailings material, potentially reducing the footprint of future operations.

After mining operations conclude, the site would transition into final reclamation and closure activities. All reclamation activities would be self-performed using the equipment fleet that supported the mining operation. Demolition and most reclamation activities would be completed in approximately one year. The WMF would be progressively covered and reclaimed throughout the life of the mine. Seepage collected from the WMF would be captured and either used in the process plant or treated during operation. Treatment would continue after mine closure in accordance with Alaska Pollutant Discharge Elimination System (APDES) permit requirements.

The FS design included a diversion structure for Graphite Creek upstream of the mine pit that would need to remain following mine closure to limit the amount of water entering the pit.

2.1.3 Transportation Corridor

Dried graphite concentrate would need to be transported from the mine site to the Port of Nome for shipping to a west coast port, where the graphite concentrate would then be transported via rail and/or truck to a secondary treatment plant (currently anticipated to be in Ohio). The Port of Nome is the only practicable alternative to transport the concentrate to the west coast of mainland U.S. due to the lack of road connections and nearby ports. Graphite One considered two options for transporting the graphite concentrate to the Port of Nome: hauling by truck on gravel roads or barging through Imuruk Basin. Ultimately it was determined that truck transportation was more practicable and environmentally less damaging than barging through Imuruk Basin as described in this section. Trucks would operate multiple times per day year-round, and barging would only occur during ice-free months.

2.1.3.1 Truck Transportation

The mine site is currently inaccessible by road from Nome, so the Project must include construction of a new access road to tie into existing gravel roads. Graphite One considered various alternatives for the new access road route.

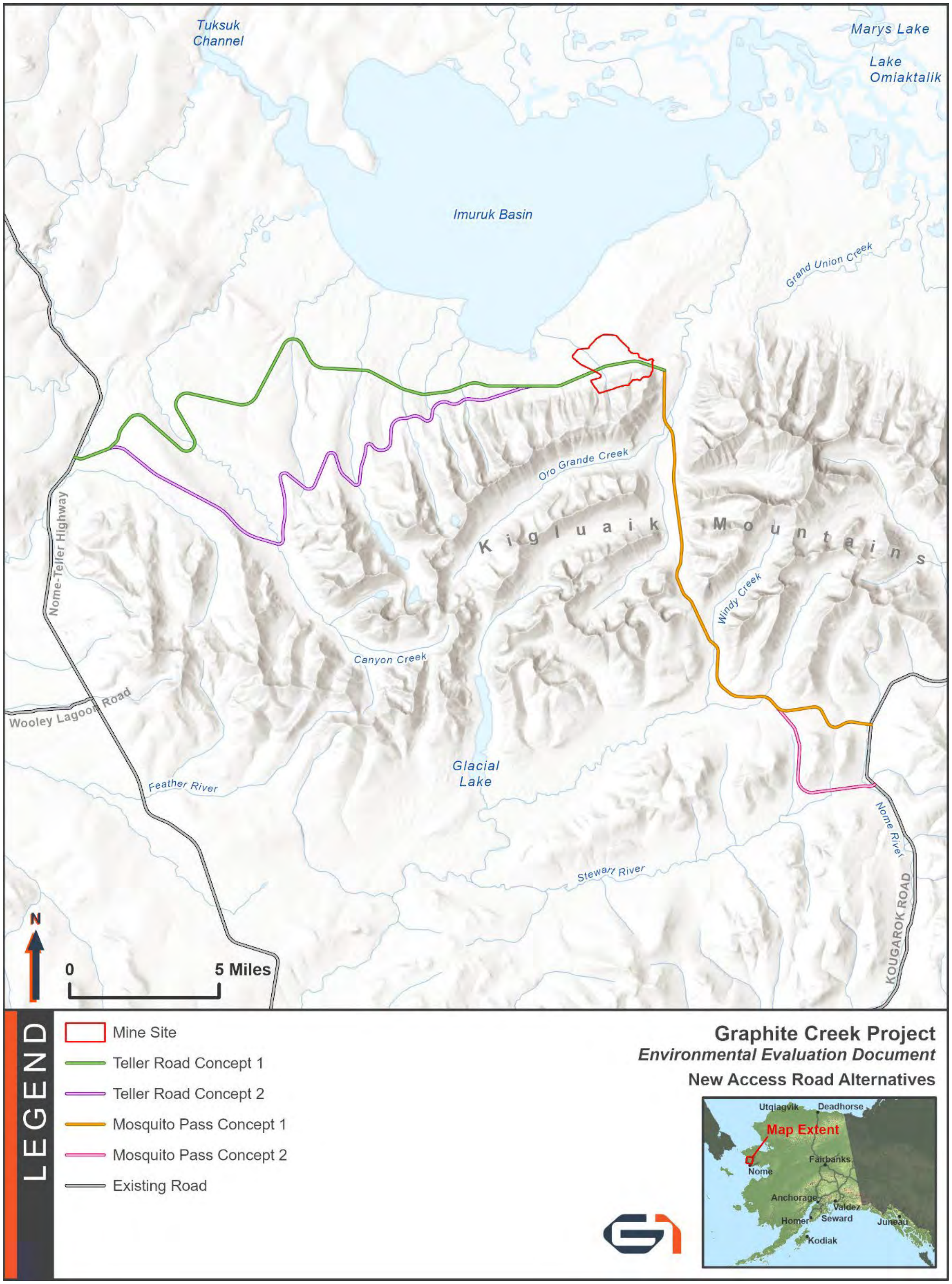
New Access Road Alternatives

Two alternative routes were studied for a new access road to connect the mine to the existing road system with access to Nome: Mosquito Pass Corridor (MPC), which would access the mine site from the south-southeast; and Teller Road Corridor (TRC), which would access the mine site from the west. The mine’s location between Imuruk Basin and the Kigluaik Mountains limits the potential access points due to the geography. Accessing the mine from the northeast would require an additional 50 miles of travel and construction of over 20 miles of new road to get around the Kigluaik Mountains. In addition, construction of the access road on the north side of the Kigluaik Mountains would be predominantly in wetlands. Due to constructability, high cost, and wetland impacts, this alternative was determined to not be reasonable and was not included in the reconnaissance study.

For the Mosquito Pass Corridor and Teller Road corridor, Graphite One considered two variations, or concepts (Figure 2-3) for a total of four alternatives. Recon LLC conducted a reconnaissance study of the two corridors in 2018 (Recon 2018). The reconnaissance study considered the following factors:

- Road design criteria and purpose
- Terrain characteristics and their effect on constructability and road geometry
- Construction material availability (material sites along the corridor)
- Permafrost and how it may affect embankment integrity and stability
- Number of stream crossings and their characteristics
- Geohazards and their potential to impact development and operations
- Wetland extent and impacts to wetlands and constructability
- Impacts on viewsheds
- Wind exposure and snowdrift potential
- Road geometry and impacts on serviceability and safety
- Constructability and impacts on Project schedule and cost
- Elevation gain and loss
- Vegetation type and extent
- Distance to point of departure from existing road infrastructure and limits of maintenance
- Mine to port haul distance
- Conditions of existing infrastructure, including roads and bridges
- Land status and ownership

Figure 2-3. New access road alternatives



The reconnaissance study found the Mosquito Pass Corridor would require fewer miles of new road, traverse terrain and ground conditions more amenable to road construction and long-term operation (including available construction material), and cost half as much when compared to the Teller Road Corridor alternatives. Based on wetland mapping for the Project area, Teller Road Corridor Alternatives 1 and 2 would impact approximately twice as many acres of wetlands as the Mosquito Pass Corridor alternatives. In addition to the factors considered in the reconnaissance study, the Mosquito Pass Corridor would avoid impacting the Canyon Creek area that is used by a large reindeer herd for winter/spring grazing and calving. The Mosquito Pass Corridor does include an area used by a small local reindeer herd; however, most of their range is south of the proposed access road. The Mosquito Pass Corridor Alternative 1 would be more practicable based on cost and logistics and would result in less environmental damage than Mosquito Pass Corridor Alternative 2 or the Teller Road Corridor alternatives. Based on these factors, the Mosquito Pass Corridor Alternative 1 is the preferred access route and the anticipated LEDPA. Table 2-1 provides a comparison summary of the access routes.

Table 2-1. Mosquito Pass corridor and Teller Road corridor reconnaissance study comparison

Parameter	Teller Road Corridor 1	Teller Road Corridor 2	Mosquito Pass Corridor 1	Mosquito Pass Corridor 2
Mine to Port total distance (mi)	76	78	50	50
New Construction distance (mi)	26	25	17	19
Average Elevation (ft)	450	790	750	750
Maximum Elevation (ft)	800	1,500	1,170	1,170
Minimum Elevation (ft)	140	210	320	320
Beginning Elevation (ft)	640	640	640	640
Ending Elevation (ft)	250	250	620	523
Elevation Gain (ft)	2,618	3,700	2,020	2,080
Elevation Loss (ft)	2,993	4,060	2,050	2,200
Average Road Grade (%)	3.6	4.8	4.2	4.0
Horizontal Curves	19	34	17	16
Major Stream Crossings	13	12	8	7
Total Stream Crossings	37[(a)]	38[(a)]	41[(b)]	43[(b)]
Material Site Availability	Very limited	Limited	Excellent	Excellent
Road Constructability	Very Poor	Poor	Good	Good
Permafrost Occurrence (%)	65	30	5	5
Wetland Occurrence (%)	63[(a)]	52[(a)]	15[(b)]	18[(b)]
Existing Bridges to Repair	3	3	0	0

Parameter	Teller Road Corridor 1	Teller Road Corridor 2	Mosquito Pass Corridor 1	Mosquito Pass Corridor 2
Length of Existing Highway Not Maintained in Winter (mi)	41	41	16	14

Source: Recon LLC 2018

Notes: mi = mile(s); ft = foot/feet

[a] Wetland and waterbody mapping of the Teller Road Corridor was completed in September 2025 and was used to supplement findings from the Recon 2018 reconnaissance study.

[b] Wetland and waterbody mapping of the Mosquito Pass Corridor from the *Graphite Creek Project Jurisdictional Determination Report* (HDR 2025) was used to supplement findings from the Recon (2018) reconnaissance study.

2.1.3.2 Barge Transportation

During the mine concept development phase, Graphite One considered barging the processed graphite through Imuruk Basin to Nome instead of constructing a gravel access road and trucking the graphite concentrate to Nome. This alternative would require construction of a permanent barge loading facility in Imuruk Basin and a permanent access road from the loading facility to the mine site. Barges transporting graphite would have to travel across Imuruk Basin, through the 10-mile-long Tuksuk Channel to Grantley Harbor, and then to the Port of Nome.

The shallow depths of Imuruk Basin restrict vessel navigation to shallow-draft barges and landing crafts, meaning the processed graphite would have to be loaded onto a smaller vessel for transportation across the basin, then transferred to a larger vessel in Grantley Harbor. Additionally, barging is not possible during the ice season, which would require the processed graphite to be stockpiled at the mine before being barged to Nome during the short, open-water season (approximately June to October). Imuruk Basin is also important for local subsistence use because nearby residents rely on it for food, recreation, and hunting access..

This alternative was dismissed from further consideration due to logistical challenges of barging graphite concentrate and subsistence use concerns. Since Imuruk Basin stays frozen longer than the Bering Sea, there would be a limited ice-free window to barge processed graphite from the mine site. This would require storing large quantities of graphite at the mine site or near Imuruk Basin during winter months. During the open water season, barging activity would be continuous in Imuruk Basin and through Tuksuk Channel to move all the graphite concentrate out of the Port of Nome. This amount of vessel traffic over the life of the mine is not preferable because it would adversely affect subsistence fishing and hunting within the basin. While the long-term use of barging for transporting processed graphite has been dismissed, the short-term use of barging for transporting construction equipment, modular mine facilities, and a bulk ore sample for the Project are proposed see Sections 2.2 Proposed Action and 2.2.3 Temporary Barge Facilities.

2.2 Proposed Action

The proposed Project would consist of an open pit mine, mine site roads, ore processing facilities, a tailings pond and waste rock management facility (WMF), a WTP, and a 17.3-mile-long gravel access road to connect to the existing Seward Peninsula public road system to transport processed graphite concentrate to the Port of Nome. The proposed new access road also includes rock and gravel borrow sites, also referred to as material sites, along its corridor. Other mine infrastructure would include onsite electrical power generation and distribution, fuel storage and dispensing, explosives and emulsion storage, and a helipad. Enclosed buildings would be provided for administration offices, warehousing, a metallurgical laboratory, a crusher, mills, tailings filtration and thickening, concentrate loading, a truck shop, parts storage, and emergency response. Crushed ore feeding the mill would be stored in a covered stockpile. Accommodation facilities during Project construction would be developed at the mine site. The permanent workforce during Project operation would be housed in Nome on existing developed land (see Section 2.4.3 Employee Housing).

The proposed new two-lane gravel access road would have culverts and bridges at waterbody crossings as well as material sites. Sections 2.2.1 Mine Site and 2.2.2 Mosquito Pass access road provide a summary of the major Project components to be included in the construction of the mine site and new access road, respectively.

Temporary construction components for the Project would include temporary river/stream crossings, temporary stream diversions, and cofferdams for bridge construction. Additionally, a temporary gravel staging pad near Imuruk Basin and seasonal winter road from the gravel staging pad to the mine site would be constructed to support barging of equipment and materials through the basin during access road construction.

The permanent mine site and Mosquito Pass access road would be located entirely on State of Alaska-owned land managed by the Alaska Department of Natural Resources (ADNR). The temporary gravel staging pad would be constructed on Bering Straits Native Corporation (BSNC) land and leased to Graphite One.

All proposed project components have been, and will continue to be, designed to minimize adverse direct and indirect impacts to the environment, most notably aquatic resources (including wetlands, streams, and marine waters).

2.2.1 Mine Site

The mine site would include roads, electrical power generation and distribution, fuel storage and dispensing, explosive and emulsion storage, a WMF, a WTP, and a helipad. Additionally, there would be administration offices, warehousing, a metallurgical laboratory, a crusher, a mill, tailing filtration and thickening, concentrate loading, a truck shop, parts storage, a wastewater (sewage) treatment plant, drinking water well, emergency accommodations for employees, concentrate container storage, and emergency response (Figure 2-4). The mine would operate 365 days per year, 24 hours per day.

2.2.1.1 Mine Pit

The mining method is open pit mining using conventional drill, blast, load, and haul to deliver ore to a crusher where the ore process begins. The mine is designed to deliver up to 11,000 tons of ore daily. With a life of the mine strip ratio of 3.2:1, on average, an additional 35,400 tons of waste would be handled daily. The strip ratio is the amount of overburden (economically non-valuable soil and rock) that must be removed to release a given ore quantity. Waste rock would be co-mingled with drystack coarse tailings for disposal to create compacted and low-permeability material to stabilize the buttress to the tailings dam. The lowest pit bench would be approximately 100 feet above sea level (asl). The north pit rim would be approximately 575 feet asl, and the south pit wall, which is on the mountain side, would extend up to approximately 1,445 feet asl. The approximate area would be 6,000 by 2,300 feet. Currently, the mine is expected to be operational for 21 years.

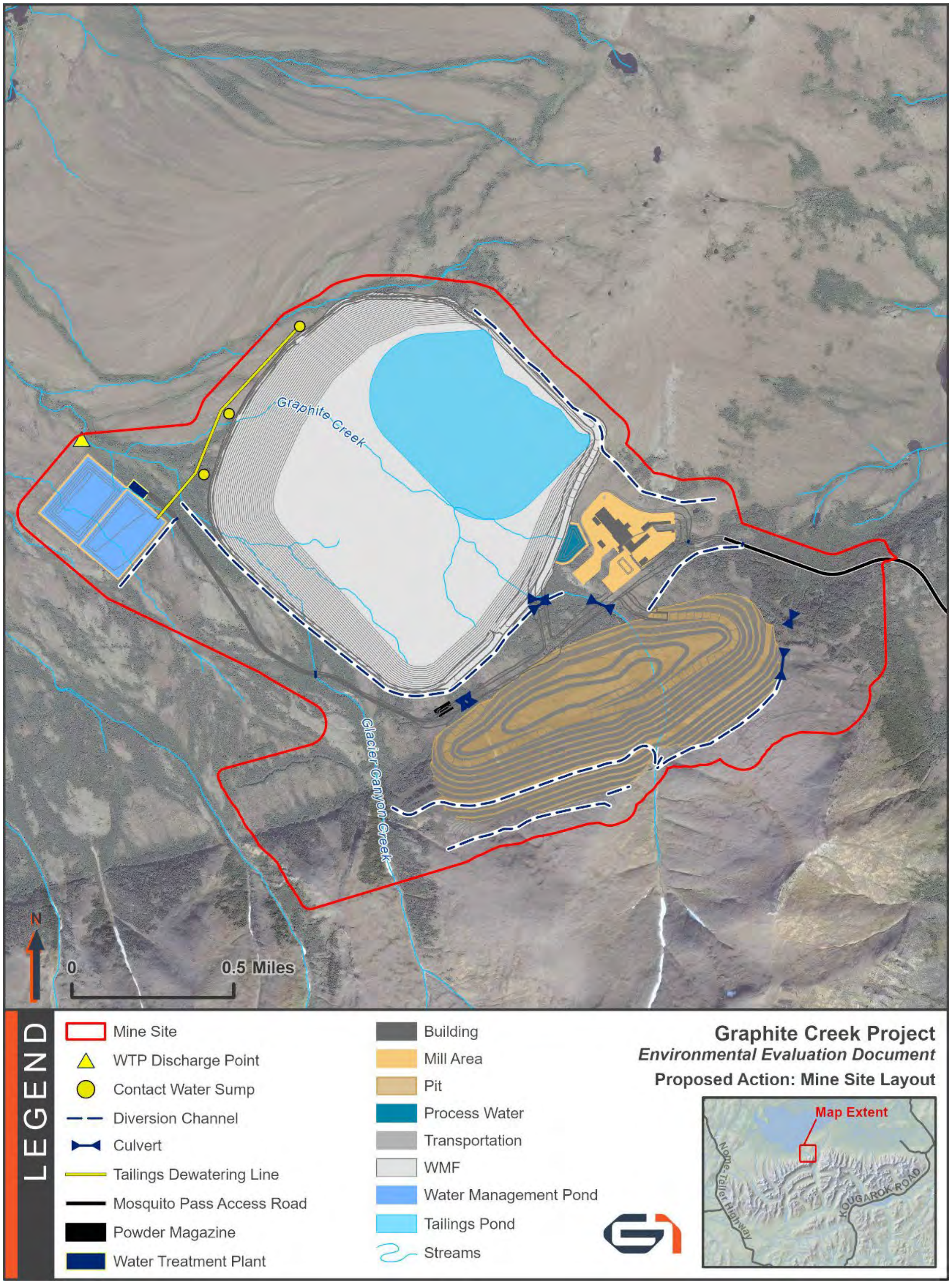
The overall size and design of the pit was based on open pit economic optimization and geotechnical considerations. The design criteria can be found in Section 16 of the FS (Barr 2025).

Current water balance modeling and regional geologic groundwater modeling performed by Graphite One indicate that the pit would fill with seepage and direct precipitation for approximately 58 years until the pit lake reaches an elevation of 400 feet asl and would start to discharge to the surface (SRK 2026a). In order to prevent surface discharge of the pit water, pit water would be piped to the WTP and treated to meet Alaska Water Quality Standards (AWQS) before being discharged.

2.2.1.2 Processing Facilities

Processing of mined ore would occur on the processing pad. The processing pad contains the processing plant, ore stockpiles, a process water pond, a truck shop, an administrative office, a power station, fuel storage, and a helicopter pad. The processing plant would use crushing, grinding, and flotation processes. A jaw crusher would reduce ore, which would then be conveyed to a covered stockpile. The crushed ore would then be conveyed to the mill. Ground ore would pass through seven stages of flotation and three stages of regrinding, producing a 95 percent pure graphite concentrate. The concentrate would be dewatered and dried before being placed in fully enclosed shipping containers for truck transport to the Port of Nome.

Figure 2-4. Proposed Action mine site layout



A process water pond would support operational needs at the mill and capture runoff from the mill area. Sediment basins would be constructed to settle out sediments in the runoff from the mill area before it enters the process water pond. The process water pond would be hydraulically linked with the water treatment ponds to maintain the balance between reuse and treatment.

2.2.1.3 Waste Management Facility

The WMF for Graphite Creek would store both waste rock material (non-ore) from the pit and tailings (coarse and fine) produced from the milling operation. The fine, wet tailings would be stored in a conventional tailings pond that would be constructed in the northeastern portion of the WMF. The dam for the tailings pond would be built in stages using compacted waste rock material.

The dewatered, coarse tailings would be co-mingled with waste rock and placed into the WMF. The waste material and coarse tailings would be hauled in and placed by large, end-dump, mining trucks. Co-mingling and compaction would occur in the WMF using heavy equipment, such as dozers and graders. The objective of the co-mingling strategy is to create blended, compacted, low-permeability material. Placement of co-mingled material over the life of the operation would result in a very large stabilizing buttress adjacent to the tailings dam. The WMF would be constructed in multiple stages, and contemporaneous closure activities would be used wherever practical. The filtered coarse tails may potentially be used as protective liner cover for the WMF if geotechnical studies show they meet the stability and drainage criteria.

The tailings pond would be constructed during the initial stage of WMF development. The elevation of the dam would be raised over time, as operations progress and more tailings storage is required. Wet tailings would be pumped from the processing pad to the wet tailings pond by a pipeline. Approximately 25 to 30 percent of the milled material is expected to be diverted to the wet tailings pond for disposal.

A high-density polyethylene (HDPE) or clay basin liner would be installed under the WMF prior to material placement. Additionally, the inside slope of the tailings dam would be lined. An underdrain system would be installed within the WMF. This system would assist in transporting water that drains through the comingled material to collection pond sumps, where it would be sent to the water management ponds (WMPs). Water from the collection pond would either be recycled for use at the mill or treated for discharge to Glacier Canyon Creek.

The overall design geometry for the WMF, including the tailings dam (e.g., height, slopes) was developed from a two-dimensional slope stability analysis to evaluate long-term stability conditions under the ultimate WMF geometry. The geometry uses an exterior slope of 3H:1V and an average height of 280 feet, with a maximum height of approximately 345 feet. The WMF design uses a waste rock perimeter embankment surrounding the co-mingled tailings and waste material.

2.2.1.4 Water Management Facilities

Water management at the mine would be designed to manage water resources throughout the life of the mine, ensuring maximum reuse and minimal environmental impact. Water management would segregate contact water from non-contact water and divert upstream sources around the mine to limit the volume of water needing treatment. Water resource management throughout the life of the mine would be described in a *Water Management Plan*.

Water management facilities would include WMPs, a WTP, diversion ditches, contact water ditches, stormwater settling structures, a diversion structure for Graphite Creek around the mine pit, and collection and treatment of mine pit water after closure.

Diversions would be built to channel water from Graphite Creek, Lower Graphite Creek, Ruby Creek, and Glacier Canyon Creek around the mine facilities to limit the volume of contract water produced. As the mine pit extends to Graphite Creek, a diversion would be constructed to route surface runoff away from site facilities, to mitigate pit infiltration, and to reduce dewatering and water treatment needs. The diversion would redirect creek flows around the pit and all operational areas into Glacier Canyon Creek to the west of the pit footprint. Intercept berms and channels would prevent other non-contact water from running on, and route it around, operational areas. Graphite Creek would require diversion once the pit footprint encroaches on this non-fish bearing stream. Glacier Canyon Creek is also non-fish bearing and is the natural ultimate discharge point of Graphite Creek.

North of the pit, Lower Graphite and Ruby Creeks would be conveyed in a diversion that would flow south and west around the WMF. Glacier Canyon Creek would flow into this diversion with Lower Graphite and Ruby Creeks, then northward into the original Glacier Canyon Creek channel north of the mine facilities. Additional diversion channels would be constructed as needed to route upstream water sources around mine operations.

WMPs would be used to store contact water and to settle sediments prior to recycling or treatment. The WTP would treat all contact water to State of Alaska standards prior to discharging to Glacier Canyon Creek. The WTP would use chemical precipitation, flocculation, settling, filtration, and reverse osmosis processes to treat the water prior to discharge. The WTP would remain in place to treat water from the pit lake following mine closure.

2.2.1.5 Power Generation Facilities

Due to a lack of other power sources within the region, diesel powered generators would be used to provide electrical power at the mine site. Two 7.5-megawatt (MW) generators would operate to supply the 12.5 MW of nominal electrical operating load. A third 7.4-MW generator would be installed as a standby spare for a total of 22.5 MW of generating power. These generators would be located on the same pad as the processing plant.

Diesel fuel for power generation, concentrate drying, and mobile equipment would be trucked from a bulk fuel tank farm in Nome. Two weeks of fuel would be stored at the mine site in a double-walled, 850,000-gallon aboveground steel tank. The fuel tank would be within a containment structure adjacent to the power generation facility. A fueling station and 4,000-gallon gasoline tank for light vehicles would be co-located in the containment area.

2.2.1.6 Powder Magazine Pads

High- and low-explosive materials would be stored on a gravel pad along the main mine haul road connecting the pit with the WMF on pads built specifically for this purpose. The magazines would be situated a sufficient distance from occupied facilities to meet regulatory safety requirements. The two magazines would be adequately barricaded by berms, isolated from mine traffic, and separated from one another by the required distance.

2.2.1.7 Site Roads

The main site roads would serve the mill, truck shop, and remaining support buildings within these areas. The site roads would continue westward beyond the mill toward the pit, WMPs, WTPs, and WMF. The site would also have designated haul roads to facilitate material movement (i.e., ore, waste) from the open pit to the primary crusher at the mill and WMF. Where required, various temporary construction roads would be made or modified from existing roads for temporary construction laydown facilities, staged WMF construction, and general construction access.

2.2.1.8 Other Mine Site Facilities

Other minor infrastructure facilities would be located on gravel pads developed for the main facilities described above, including:

- Drinking water well
- Potable WTP
- Mine mobile equipment shop
- Construction camp facilities
- Wastewater (sewage) treatment plant
- Offices
- Warehouses
- Emergency response equipment and facilities
- Metallurgical/assay laboratory

- Explosives storage facility
- Concentrate container storage
- Emergency accommodations for employees when weather conditions prohibit safe travel
- Mosquito Pass access road guard gate

2.2.2 Mosquito Pass Access Road

The proposed Project would involve constructing a new gravel access road to the Graphite Creek mine site (Figure 2-5). The proposed Mosquito Pass access road, Corridor 1, would be 17.3 miles long, beginning at Milepost (MP) 30 Kougarok Road, north of Nome, and traverse through Mosquito Pass to the mine site. The access road would be 28 feet wide to accommodate two-way traffic, with side slopes that range from 2 horizontal (H):1 vertical (V) to 3H:1V. The road would be a private industrial mining road and would not be open for public use. A security gate would be located near the junction with Kougarok Road to prevent unauthorized use. The access road would be used to transport graphite concentrate to the existing road system in custom polymer-lined, 20-foot shipping containers with a net capacity of 23 tons.

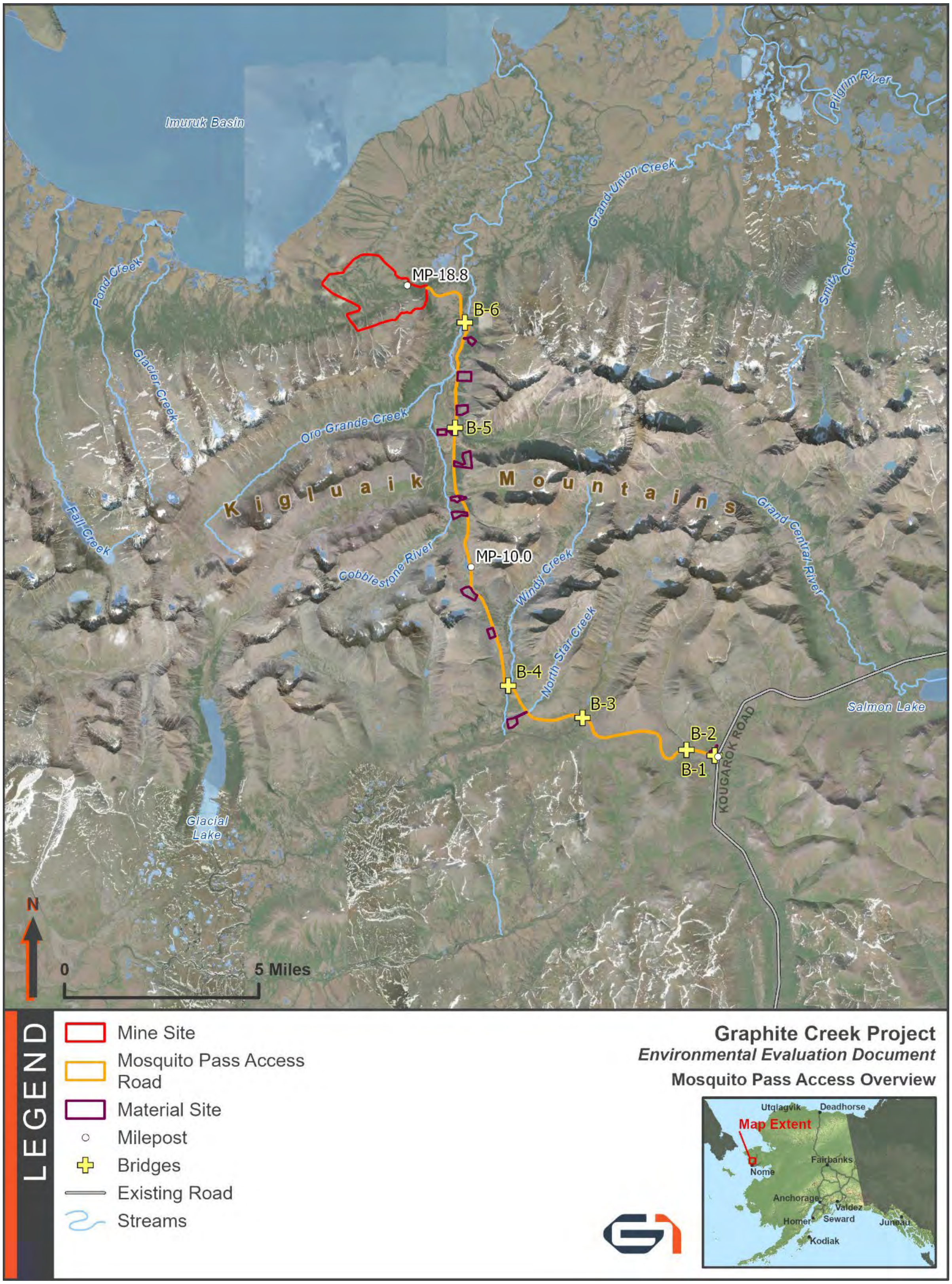
The Mosquito Pass access road would be constructed entirely of locally sourced material extracted from material sites along the route. The road would typically use fill construction over native soils with side cut-to-fill construction limited to a few on-side slope sections where subgrade conditions allow. Design criteria for the road can be found in the FS (Barr 2025).

In locations with soft spots or poor underlying material, additional road prism borrow or geotextile fabric may be required. A dust palliative such as calcium chloride may be mixed in with the crushed aggregate surface course material to control dust.

2.2.2.1 Stream Crossings

The proposed Mosquito Pass access route crosses numerous creeks, streams, and rivers, collectively referred to as “stream(s)” in this document. Crossings would be accomplished with culverts or bridges, depending upon ordinary high water (OHW), stream widths, stream characteristics, constructability, and various topographic considerations. All crossings are designed to minimize environmental impacts and crossings over fish-bearing waters would require authorization from the Alaska Department of Fish and Game (ADF&G).

Figure 2-5. Mosquito Pass access road layout



2.2.2.2 Bridges

Bridges would be constructed at six stream crossings (Table 2-2). The bridges would be designed for 80-ton capacity and have an overall width of 16 feet. The minimum vertical clearance below bridges (OHW elevation to the lowest bridge superstructure member) is 10.6 feet. Vertical clearance requirements would be refined based on site-specific hydrology and hydraulics during final design.

Table 2-2. Bridge crossings

Stream Name	Milepost	Approximate Length (feet)	Number of Spans
Nome River	0.1	80	1
Buffalo Creek	0.8	95	1
Sinuk River	4.3	80	1
Windy Creek	6.7	131	1
Osborn Creek	13.7	90	1
Cobblestone River	16.5	160	2

2.2.2.3 Culverts

The Project would involve constructing culverts from 3 to 55 feet wide at stream crossing locations along the route. Culverts would be designed to minimize environmental impacts and would be based on the location of the culvert, characteristics of each stream crossing, and fish presence. Fish passage culverts would be designed in general accordance with the U.S. Fish and Wildlife Service (USFWS) *Culvert Design Guidelines for Ecological Function, Alaska Fish Passage Program* (USFWS 2025a). Additional small cross-drainage culverts that are not associated with stream channels would be installed as needed during access road construction to maintain surface hydrology drainage patterns and prevent ponding against the road embankment. The total quantity of drainage and fish passage culverts will be determined during final design.

2.2.2.4 Material Sites

Eleven material sites have been identified along the Mosquito Pass access road to provide the sand, gravel, aggregates, and riprap needed for road construction and maintenance (Figure 2-5). Material sites are divided into two types: borrow sites, which provide gravel and sand; and quarry sites, which provide rock that can be processed into riprap or smaller aggregates. Material would be transported from the material sites and along the Mosquito Pass access road corridor by truck. Two of the material sites would require short spur access roads off the Mosquito Pass access road. Material sites would be reclaimed consistent with State approved, site-specific reclamation plans.

Excavated material at the mine site would be used to build mine site infrastructure. If additional material is needed, material sites along the Mosquito Pass access road would be used.

2.2.2.5 Access Road Gate Facilities

The access road gate would be constructed near the intersection of the Mosquito Pass access road and the Kougarok Road. In addition to the security gate, facilities included at this location would include:

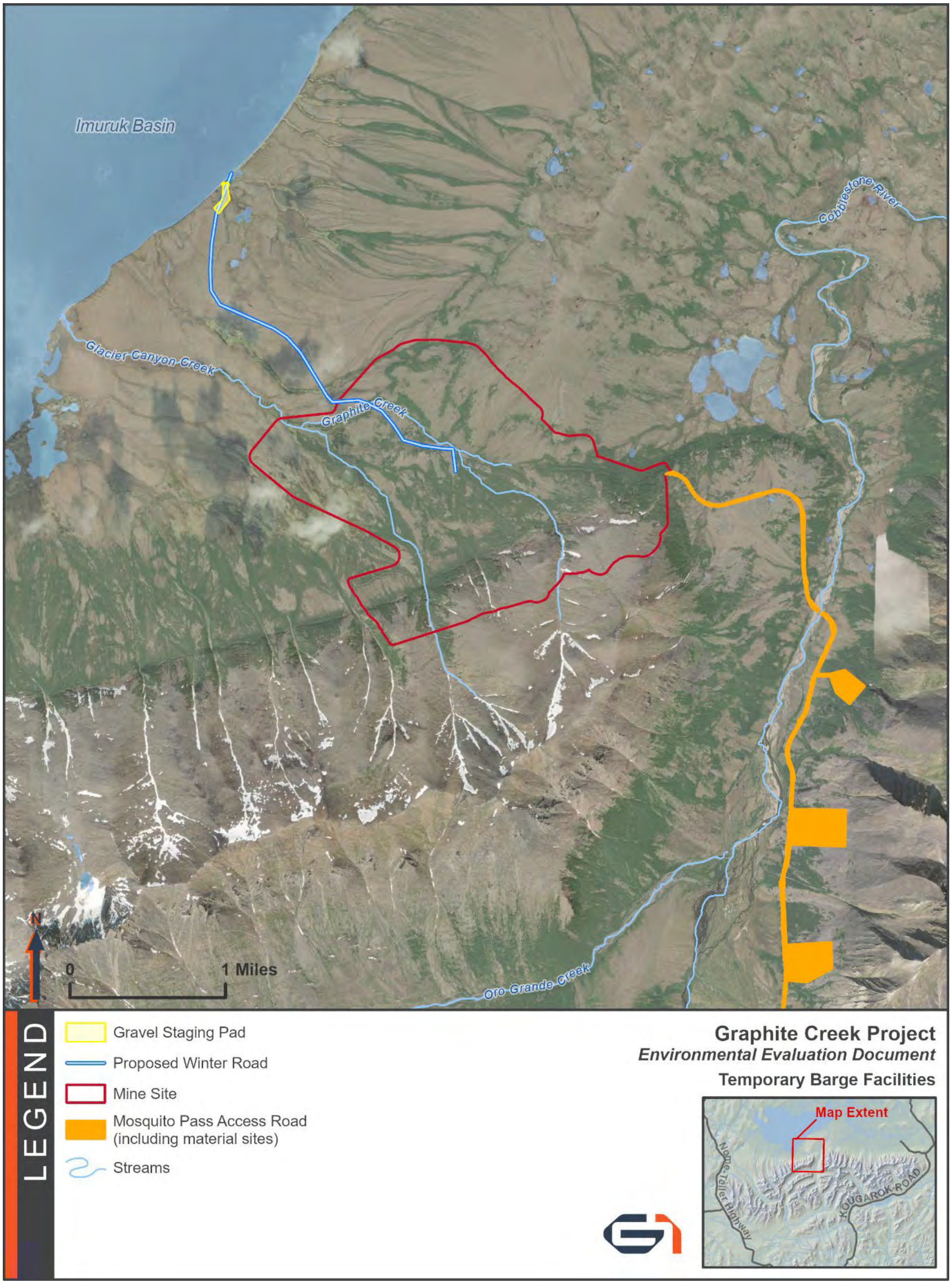
- Guard House – constructed from modular components
- Diesel generator and fuel tank with secondary containment
- Parking and turnaround area for tractor trailers
- Emergency sleeping accommodations for up to 12 personnel – constructed of modular components
- Fueling station for road maintenance equipment

2.2.3 Temporary Barge Facilities

During construction of the Mosquito Pass access road, construction and mining equipment and materials would be barged between Nome and the mine site through Imuruk Basin. A temporary gravel staging pad near Imuruk Basin and seasonal winter road to the mine site would be constructed to support barging operations (Figure 2-6). No permanent structures would be installed in Imuruk Basin to support the barge landing, and the temporary staging pad would be restored to pre-construction conditions.

Graphite One would use a shallow-draft barge or landing craft, which could be moored on the shoreline of Imuruk Basin, to transport construction equipment and modularized mine facilities during the open water season. Equipment and facility modules would be staged on the nearby temporary gravel staging pad until winter when an ice and snow road could be constructed to transport these materials to the mine. This would allow Graphite One to start constructing the mine prior to the completion of the Mosquito Pass access road.

Figure 2-6. Temporary barge facilities layout



The temporary gravel staging pad would also be used to store a bulk ore sample from the deposit until the following open water season for barging to the Port of Nome. A bulk graphite ore sample of 10,000 tons is required to develop graphite concentrate that can be used for the qualification process in order to facilitate commercial arrangements. The graphite qualification process typically takes two years and must be completed prior to mining. The temporary gravel staging pad would be constructed on BSNC land leased to Graphite One. This pad would be used to land equipment for excavating the bulk ore sample in late summer. Once there is sufficient snow cover and ground freeze, a winter trail would be established to mobilize the equipment to the Graphite Creek Camp. Approximately 10,000 tons of graphite ore would then be drilled, blasted, and hauled back to the gravel staging pad for haulage to Nome the following summer. This work would be weather dependent and may occur over 2 to 3 years. The gravel staging pad would be removed and the area restored following its use.

2.2.3.1 Barge Landing

During the open water season (approximately June to October), Graphite One would use a shallow-draft barge or landing craft to lighter equipment and material across Imuruk Basin between the gravel staging pad and a larger barge in Grantley Harbor. This would require approximately 44 round trips per season between Imuruk Basin and Grantley Harbor. Lightering is required due to the shallow bathymetry of Imuruk Basin. The larger barge would then transport equipment and material to and from the Port of Nome. A barge landing site near the gravel pad has been identified based on Imuruk Basin bathymetry. The barge landing site would not require mooring facilities or dredging. To get from the barge landing site to the gravel pad, low-ground-pressure transport vehicles would drive approximately 100 yards along the beach to a temporary ramp that would allow access to the higher ground on which the pad is located. The temporary ramp would be constructed using mats and clean gravel and would be removed once usage is complete and the area would be recontoured to pre-construction conditions.

2.2.3.2 Gravel Staging Pad

The 5-acre temporary gravel staging pad would consist of approximately 3 to 5 feet of fill material over a geotextile fabric overlay on existing ground. The vegetative mat would be left undisturbed to limit impacts on the permafrost located at the site. Fill material would be sourced from Brevig Mission or Nome.

The gravel staging pad would be used to store construction equipment and modularized mine facilities, which would be brought in during the open water season, until a winter road could be constructed to the mine. The staging pad would also be used to store the bulk ore sample until it can be transported across Imuruk Basin during the following open water season. Once the access road is complete and the staging pad is no longer needed, the site would be restored by removing the gravel and geotextile fabric and seeding as necessary.

2.2.3.3 Winter Access Road

A seasonal winter road would be constructed when the ground is frozen to transport construction equipment and materials between the gravel staging pad and mine site. During winter, the area between the gravel staging pad and mine is typically characterized as wind-blown tundra. The winter road would be constructed of snow and ice, depending on the conditions, to minimize ground disturbance, and would be approximately 3.3 miles long. This work will be completed using conventional winter trail equipment such as tracked dozers, tractors, and excavators. Once a winter trail is established and frozen in, rubber-tired equipment such as articulated haul trucks will be used to haul the sample and other supplies between the basin and project site.

2.2.4 Mine Closure and Reclamation

After mining operations conclude, the site would transition into final reclamation and closure activities. Due to the site's remote location, all reclamation activities would be self-performed using the equipment fleet that supported the mining operation. Given the relatively small size of the operation and concurrent reclamation activities of the WMF throughout the life of the mine, it is assumed that most demolition and reclamation activities at the mine site would be completed in approximately one year.

The mill and most facilities and foundations would be demolished and removed. The debris would be disposed in the final pit and covered in accordance with Alaska mining regulations. The haul roads and facility pads would be dismantled and regraded to approximate original contours. Topsoil material and other suitable oxide material that was salvaged during operations would be spread on the regraded areas where suitable and reseeded according to the reclamation and closure plan approved by ADNR. The last phase of the WMF would also be regraded and closed at this time.

At mine closure, several facilities would remain in use and would not be demolished or reclaimed until a later date. The water management infrastructure, power generation, and the access road would remain in place until the water collected from the site meets State water quality standards. Post-closure water from the open pit would be pumped and treated to maintain the pit lake level at or below its maximum management level. Reclamation and closure plan and financial assurance mechanisms required by the State of Alaska would include financial provisions for operating water treatment facilities and conducting ongoing monitoring indefinitely in the post-closure period.

When water treatment is complete, the access road including bridges and culverts, WTP, and power generation facilities would be removed and the area reclaimed. The Graphite Creek diversion structure would remain in place and require intermittent maintenance. Access to the site for maintenance would be via helicopter after the access road is removed. Through the

State of Alaska permitting process, Graphite One would be required to provide funding through the bonding process to maintain the diversion dam.

The Project has been designed to avoid and minimize impacts on WOTUS, non-jurisdictional wetlands, fish, Essential Fish Habitat (EFH), and other resources, wherever practicable, through avoidance and minimization measures such as route refinement, construction methods, selective siting of Project components, and appropriately sized conveyance structures.

2.3 No Action Alternative

NEPA requires consideration of a No Action Alternative. The No Action Alternative means no permits would be issued, and the proposed Project would not be constructed. There would be no mine, and no access roads would be constructed. The existing camp used for exploration and associated equipment would be removed from the site, and the area would be reclaimed. The No Action Alternative would result in no loss of wetlands or other aquatic resources. The No Action Alternative is used as a baseline to analyze impacts of the Proposed Action.

The No Action Alternative would result in economic losses such as jobs, tax revenue, and local spending on businesses related to mine construction, operation, and reclamation and closure. The No Action would also result a continuing dependence on a foreign supply of graphite and a loss of essential supply chain infrastructure for U.S. energy storage systems and the renewable energy sector.

2.4 Support Facilities

The facilities described below are considered support facilities and are not part of the proposed Project being analyzed in this EED. These facilities have either already been permitted and constructed or would not require USACE authorization. The facilities are described here to show how they would support overall mine construction and operations.

New support facilities and multi-use infrastructure improvements in Nome would include a concentrate storage pad (approximately 26 acres), additional fuel storage capacity, employee housing, and upgrades to existing roads. The concentrate storage pad and fuel storage pad have already been constructed, and the employee housing component would be constructed on a previous upland mining tailings area by a third party and would not require USACE authorization.

Improvements to the existing roads would include widening, curve straightening, and capping of roads to accommodate the transport trucks; the Alaska Department of Transportation and Public Facilities (DOT&PF) would complete the improvements, which have independent utility from the proposed project.

2.4.1 Bulk Fuel Storage

Due to sea ice formation on the Bering Sea and Norton Sound, shipping of fuel, concentrates, and other bulk commodities can only occur between approximately June and October. In order to support year-round mine operations, the Project would require 8 million gallons of fuel to be stockpiled in Nome by October 1 each year. Graphite One has assumed it would use excess capacity in existing bulk storage owned by Sitnasuak Native Corporation, but an additional 4 million gallons of diesel fuel storage would be required. Graphite One intends to negotiate the construction and operation of that storage with local businesses, who would also deliver the fuel to Graphite Creek. Two 14,000-gallon truck/trailer loads would be required daily. The bulk fuel storage area is a multi-use area that has already been permitted and constructed and is not dependent on the project.

2.4.2 Concentrate Storage

Graphite concentrate would only ship during the ice-free season; therefore, Graphite One would need to stage the 20-foot shipping containers at a facility near the Port of Nome. The containers would be stacked three to four high in rows until container ships are able to access the port during ice-free months. Graphite One has assumed that the Port of Nome expansion project would have progressed sufficiently to allow self-loading container ships with 37-foot drafts to load containers dockside. If the Port of Nome expansion does not proceed, Graphite One would examine options to lighter concentrate containers to a vessel anchored in deeper water.

It is assumed that the concentrate container storage area would be on land owned and already developed by BSNC, and no further disturbance would be required.

2.4.3 Employee Housing

Employee housing during construction would be provided in Nome or at the mine site. Graphite One is anticipating that the Project’s construction housing requirements would be fulfilled by a construction camp installed to support the Port of Nome expansion and/or a new camp constructed in Nome, and no new facilities would be required. If the Port of Nome expansion is further delayed, a construction camp would be built on existing prepared land in Nome.

It is Graphite One’s intention to maximize a local work force in Nome through a combination of local hire and relocation. Graphite One recognizes Nome’s housing shortage and intends to provide long-term housing by constructing a subdivision with single and multi-family housing as well as apartments for Nome-based employees. Graphite One would construct camp style accommodations for residents of outlying villages for their use while on rotation. The location of these facilities requires planning with the City of Nome and private landowners, but it is expected that all construction would occur on previously developed land that is uplands and would not require USACE authorization.

2.4.4 Existing Road Upgrades

The existing Kougarok Road between Nome and the site access road junction consists of 30 miles of gravel road. The first 13 miles between Nome and the Nome River Bridge is kept open year-round and is used by residents to access the small community at Dexter. The remainder of the road north of the Nome River is not maintained during winter months. DOT&PF owns the right-of-way (ROW) and has provided preliminary recommendations on road modifications that would be required to support year-round operations by Graphite One. It is expected that DOT&PF would permit and construct the required road upgrades, which have independent utility from the Project. The modifications include widening, curve straightening, and capping. No modifications to the Nome River and Snake River Bridges, the only bridges on the route, are expected.

3 Affected Environment

This chapter of the EED describes the affected environment of the Project study area for each resource associated with the Proposed Action and No Action alternative. The Affected Environment consists of areas and their resources that may experience environmental effects resulting from implementing the Proposed Action or No Action alternative (as described in Chapter 2 Proposed Project and Alternatives).

The Project study area for the Proposed Action is generally defined as the area within which Project impacts would occur during mine construction, operation, and reclamation. The study area may be refined for certain resources, for example cultural resources may consider a more focused study area than the economic analysis, which may require a broader study area.

3.1 Physical Environment

This section provides supporting information to describe the affected environment of the Proposed Action and the No Action alternative on physical resources within the Project area, including the mine site and Mosquito Pass access road and material sites. The temporary barge facilities area is discussed under physical resources where potential impacts to those resources may occur.

3.1.1 Paleontology

Paleontology is the study of the history of life on Earth through the examination of the fossil record. Evidence of ancient life, including remains, imprints, and traces of once-living organisms, were preserved in sediments and rocks as fossils.

Paleontological resources are protected on public lands through state and federal laws; however, no protections for paleontological resources exist on private land. The State of Alaska protects fossils and paleontological materials, such as the associated sedimentary matrix of fossils, through the Alaska Historic Preservation Act (AHPA; Alaska Statute [AS] 41.35). The AHPA requires ADNR to locate, identify, and preserve paleontological resources; however, the exact locations of these resources are not publicly available and are exempt from state and federal Freedom of Information laws.

3.1.1.1 Potential Fossil Yield Classification of Project Area

The potential for paleontological resources within the Project area was assessed using the Bureau of Land Management's (BLM's) Potential Fossil Yield Classification (PFYC) system. The PFYC system is an accepted and standard method for predicting, assessing, and mitigating paleontological resources on federal and non-federal lands. Paleontological resources are known to be correlated with certain mapped geologic units. The PFYC system was developed from available geologic maps. A class value (Table 3-1) is assigned to each geologic unit based on the potential abundance and/or significance of paleontological resources, and the class value is applied to the geologic formation, member, or other mapped unit.

Table 3-1. Description of PFYC class values

Class	Fossil Potential	Description of PFYC class
U	Unknown	• Units may exhibit features or preservation conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is known • Geological units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail • Scientific literature does not exist or reveal the nature of paleontological resources • Reports of paleontological resources are anecdotal or have not been verified • Area or geologic unit is poorly or under studied
1	Very Low	• Units are not likely to contain recognizable paleontological resources • Units are Precambrian in age or older • Units contain igneous or metamorphic units, excluding air-fall and reworked volcanic ash units
3	Moderate	• Sedimentary geological units have fossil content that varies in significance, abundance, and predictable occurrence • Units may be marine in origin with sporadic known occurrences of paleontological resources • Units may contain resources that occur intermittently, in low abundance • Units may contain widely dispersed significant resources

Source: BLM 2016

3.1.1.2 Paleontological Resources

The Project study area for paleontological resources (Figure 3-1), which consists of the footprints for the mine site and Mosquito Pass access road, including material sites, was assessed using BLM's (2016) PFYC system. More than 1,800 acres of the Project footprint (approximately 78 percent of the total footprint) falls within the BLM's Unknown class for potential fossil yield (Table 3-2). The Unknown area coincides with an area geologically composed of unconsolidated surficial deposits containing Pleistocene- and Holocene-age glacial and periglacial deposits as well as small sections of Tertiary-age deposits. Overall, the unit is considered less than 2.6 million years in age. There is potential for encountering fossil-bearing substrates below these surficial deposits. The remaining 487 acres of the Project footprint contains Class 1 fossil potential due to the igneous and metamorphic category of rock found in the area (Table 3-2). Class 1 resources are unlikely to contain any recognizable paleontological resources (BLM 2016).

Figure 3-1. PFYC geological formations within the Project study area

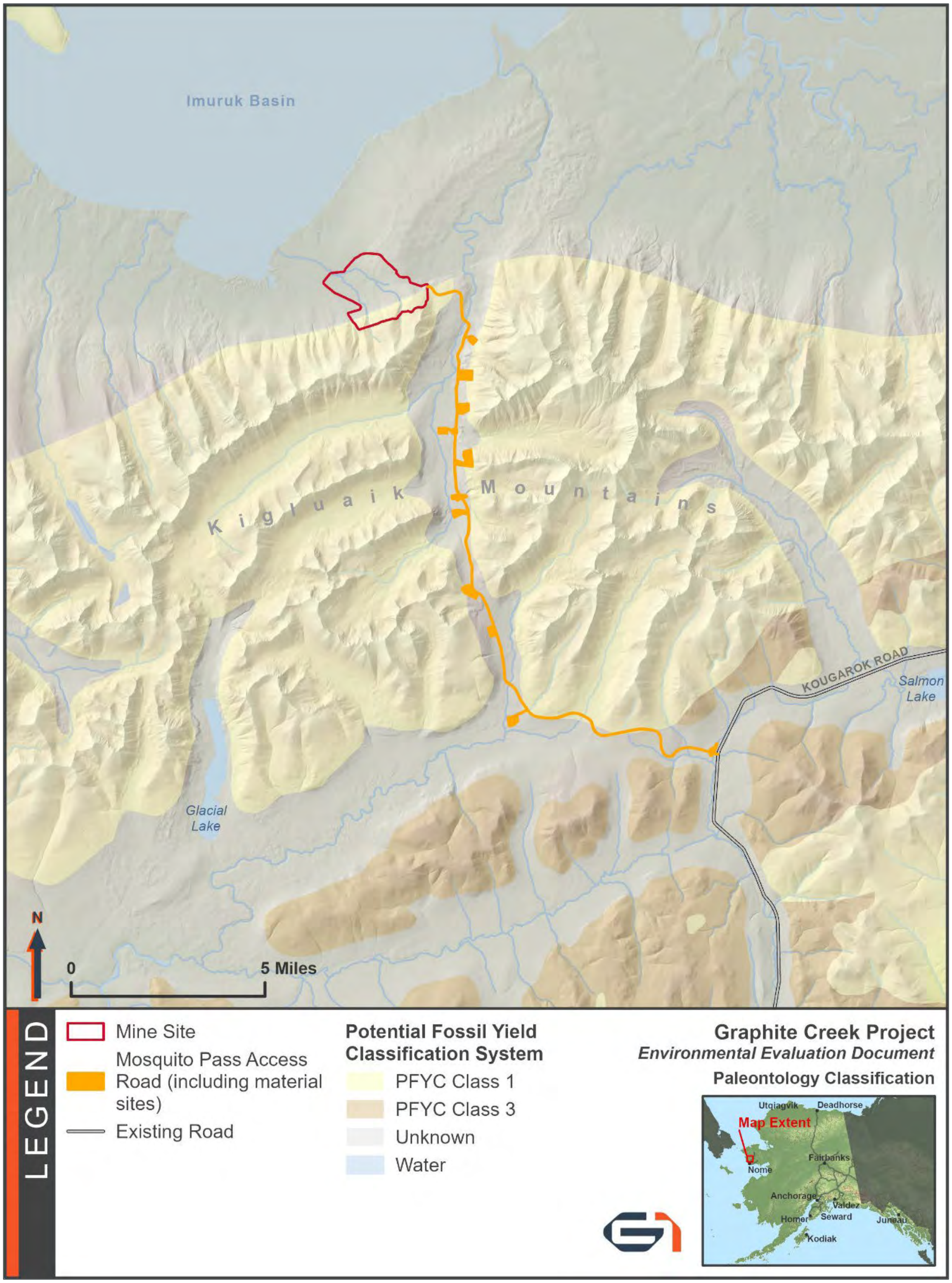


Table 3-2. PFYC class values within the Project study area

PFYC Class	PFYC Justification	Geologic Unit	Age of Geologic Unit	Acres
U	Unknown	Unconsolidated surficial deposits, undivided	Quaternary (Up to 2.58 million years)	1,804.2
1	Igneous Rock	Intermediate granitic rocks	Late Cretaceous (252 million – 2.5 billion years)	4.4
1	Metamorphic Rock	High-grade metamorphic rocks of the Seward Peninsula	Early Paleozoic to Proterozoic (252 million – 2.5 billion years)	476.7
1	Metamorphic Rock	Orthogneiss of the Seward Peninsula	Neoproterozoic (252 million – 2.5 billion years)	6.0

In addition to BLM's PFYC system, the Arctos Database (2025) and Paleobiology Database (2025) were consulted for potential paleontological resources. No paleontological resources were identified within the Project area; however, these resources were identified within the region. The locations of the closest paleontological resources recognized by the Alaska Paleontological Database were coarse and only identified by their USGS quadrangle identifier. Paleontological resources are recorded 9 miles or more away from the Project area in the Teller A-3, B-4, Nome C-1, and Nome C-3 USGS quadrangles. The closest resource identified by the Arctos Database (2025) was a mammoth tooth fragment found along the Agiapuk River in 2022. The mouth of the Agiapuk River is approximately 8 miles north of the Project area, across Imuruk Basin. The exact locality of the specimen was not disclosed; however, the Agiapuk River is in a geologic unit classified as unconsolidated surficial deposits and therefore geologically similar to most of the Project area. The Paleobiology Database (2025) identified fossilized corals in the same Unknown PFYC unit as the Project. These fossilized corals were in unconsolidated surficial deposits approximately 10 to 12 miles southwest of the Project area.

3.1.2 Geology and Mineral Resources

Geological and mineral resources have the capacity to be affected by and to affect the Project area. As such, the study area of geology and mineral resources includes the extent of the Project area; however, regional geology is discussed for context. Geomorphology, permafrost and soils, and avalanche and seismic hazards are discussed in Section 3.1.3.

3.1.2.1 Regional Geology

The Graphite Creek deposit lies within the Kigluaik Mountains on the Seward Peninsula along the Kigluaik Fault. Tectonically, this area lies within the Arctic Alaska-Chukotka microplate, which extends to Chukotka in Russia and the Brooks Range in northern Alaska. The Seward Peninsula, composed of approximately 25,000 square miles, extends west from the Alaska mainland to the Bering Sea. The Seward Peninsula is geographically and topographically diverse, with geologic units composed of complex assemblages of igneous, sedimentary, and metamorphic rocks ranging in age from approximately 2.6 to 2.66 million, to 541 million to 4.6 billion years old (Sainsbury 1975). The rocks of the Seward Peninsula are divided into two map units, or groups of rocks, containing similar features that consist of a blueschist-greenschist facies unit and a greenschist-amphibolite-granulite facies unit (Case et al. 2023).

3.1.2.2 Geology within the Project Area

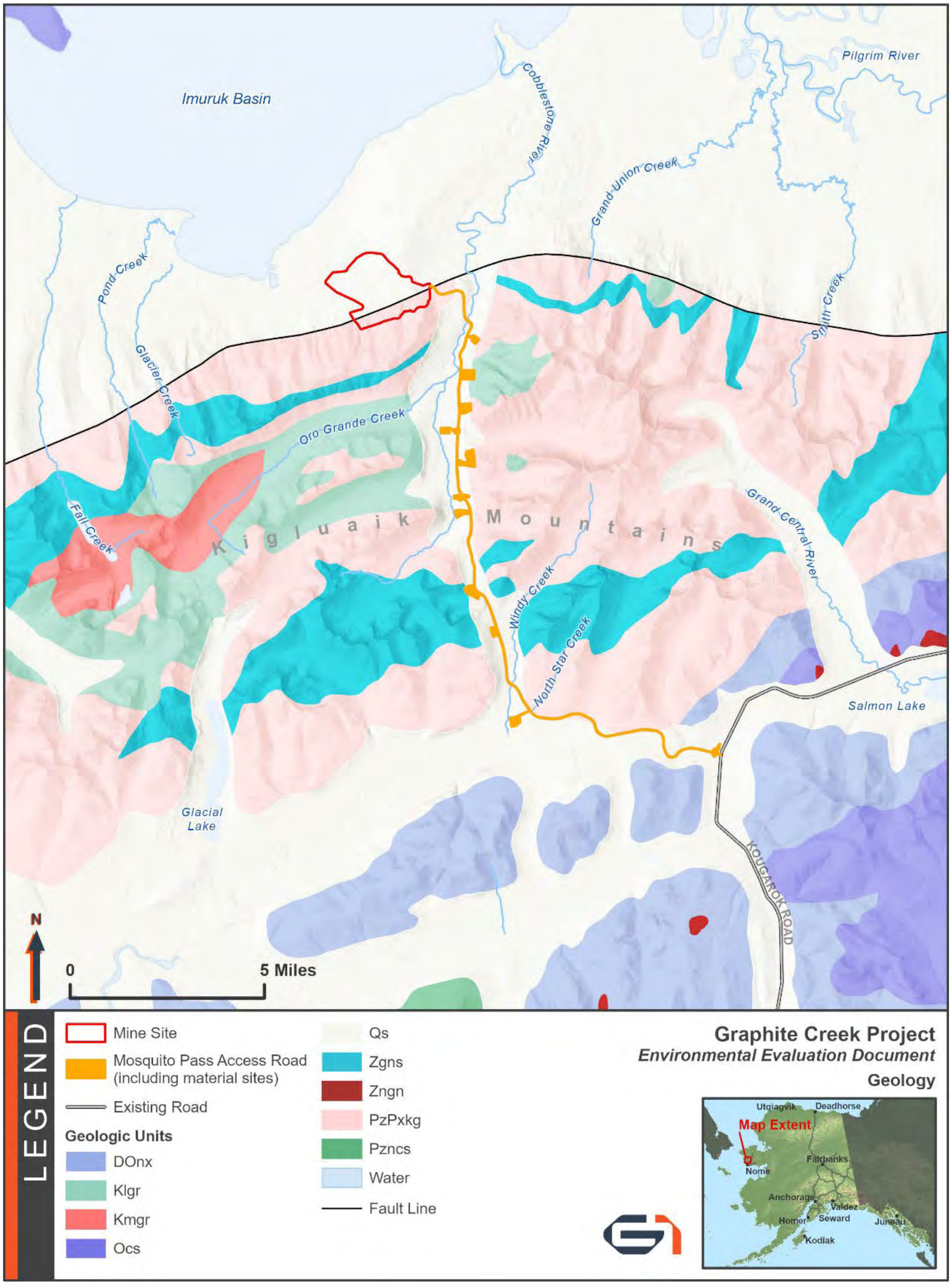
USGS began mineral exploration of the Seward Peninsula in 1899. For the next five years, nearly the entire peninsula was surveyed geologically and topographically (Moffitt 1913). It was during these USGS surveys that the graphite deposits in the Kigluaik Mountains were identified and found to be widespread. Two mining companies first staked claims for graphite in the vicinity around 1900 (Coats 1944; Harrington 1919). Recent mapping of the pit and facility areas was conducted in 2024 and resulted in updates to the interpreted surficial geology and bedrock map. The Graphite Creek graphite deposit, measuring approximately 3 miles long and 0.12 mile wide, is among the largest graphite deposits in the world and is the largest in North America (Case et al. 2023).

The Graphite Creek graphite deposit is on the northern side of the Kigluaik Mountains along the Kigluaik Fault (at 755-foot elevation; Figure 3-2). The Kigluaik Mountains formed 100.5 to 66 million years ago. The Kigluaik Fault is a normal fault that is uplifted between the Kigluaik Mountains to the south and the sediment-filled Imuruk Basin to the north. This fault is the most important structure within the study area as it forms a hard boundary between economically non-valuable soil and rock in the hanging wall; the block of rock that lies above the fault; and the graphite-containing bedrock in the footwall, the lower wall of the fault. The Kigluaik Fault also exists as a distinct zone that carries some graphite ore, with an average thickness of roughly 10 feet (Barr 2025).

BEDROCK

The Project's mine site area is underlain by high-grade granulite facies metamorphic rocks of the Kigluaik metamorphic complex. Bedrock is either exposed or covered minimally by surficial overburden material throughout most of the Project area, particularly in the incised creek valleys and/or relatively steep slopes adjacent to the Kigluaik Fault. The bedrock is composed of quartz-biotite schist, quartz-biotite-garnet schist, quartz-biotite-garnet-sillimanite schist, quartz-biotite-sillimanite schist, quartz diorite, and felsic intrusive (Barr 2025).

Figure 3-2. Detailed geologic units within the Project area



Notes: DOnx = marble, graphitic rocks, and schist; Klgr = intermediate granitic rocks; Kmgr = granitic rocks of central and southeast Alaska; Ocs = Casadepaga schist; Pzncs = Younger schist; PzPxkg = high-grade metamorphic rocks of the Seward Peninsula; Qs = unconsolidated surficial deposits, undivided; Zgns = Orthogneiss of the Seward Peninsula; Zngn = metagranitic rocks

MINERAL RESOURCES

Over the life of the mine, approximately 300 million tons (Mt) of material will be mined, including roughly 230 Mt of waste rock and overburden as well as approximately 71 Mt of graphite-containing mineral reserves. The 71 Mt of graphite-containing mineral reserves consists of Proven and Probable mineral reserves at an average diluted grade of 5.22 percent graphite concentration. See Table 3-3 for definitions of terms used in this section.

Table 3-3. Mineral resource terms and definitions

Terms	Definitions
Mineral Resource	A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade, or quality and quantity that there are reasonable prospects for eventual economic extraction
Mineral Reserve	The economically mineable part of a measured and/or Indicated Mineral Resource
Inferred Mineral Resource	Inferred Mineral Resources are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves, and no certainty exists that any part of the inferred resources could be converted into mineral reserves
Indicated Mineral Resource	An Indicated Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, density, shape, and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit
Probable Mineral Reserve	The economically mineable part of an indicated mineral resource; implies a lower degree of confidence in Modifying Factors than the Proven Mineral Reserve
Proven Mineral Reserve	The economically mineable part of a measured mineral resource; implies a high degree of confidence in Modifying Factors
Modifying Factors	Considerations used to convert Mineral Resources to Mineral Reserves, including mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social, and governmental factors

Source: CIM 2014

Of the 230 Mt of waste rock and overburden, approximately 17.4 Mt contain Measured and Indicated Mineral Resources at an average grade of 2.4 percent graphite concentration. An additional 40.4 Mt of Inferred Mineral Resources occur at an average grade of 3.9 percent graphite concentration; however, there is no certainty that any part of the Inferred Mineral Resources are economically viable.

At present, the United States is 100 percent import-dependent for natural graphite. Natural graphite appears on the Department of Energy's Critical Materials List as both a critical mineral and a critical material for energy (88 *Federal Register* [FR] 51792 [August 4, 2023]). High-grade graphite in its advanced CSG form is essential to electric vehicle batteries as well as energy storage systems. The U.S. Department of the Interior (DOI) found that graphite is one of nine critical minerals that meets all six of the industrial/defense sector criticality indicators identified by DOI (87 FR 10381 [February 24, 2022]). The World Bank's Climate-Smart Mining Initiative includes graphite among its clean-tech, green-tech materials, and projects global graphite demand to rise 383 percent between 2020 and 2050 (Arrobas et al. 2017). According to USGS (Fortier et al. 2018):

> *"Graphite's use in rechargeable batteries, as well as technologies under development (such as large-scale fuel-cell applications), could consume as much graphite as all other uses combined."*

3.1.3 Geomorphology, Permafrost, and Soils

The following section describes the geomorphology of the Project area, or the processes that shaped the area landforms. The section also describes the soil types within the Project area, including instances of permafrost, and avalanche and seismic hazards. The study area consists of the land directly adjacent to, and intersecting, the Project footprint, including the mine site, Mosquito Pass access road, and temporary barge facilities.

3.1.3.1 Geomorphology

The Project mine site is located on the southern side of Imuruk Basin, where a gently sloping alluvial plain runs from the cove to the base of the Kigluaik Mountains (Eccles et al. 2015). The Project footprint elevation ranges from sea level at Imuruk Basin, to 328 to 1,640 feet asl at the mine site located within the alluvial plains, to 3,904 feet asl as the access road travels through the mountains (Barr 2025). The Kigluaik Mountains form an east-west belt that runs approximately 47 miles long and 12 miles wide with the highest peak, Mount Osborn, which reaches 4,715-foot elevation and hosts the only active glacier in the range (Kaufman et al. 1989; Barr 2025).

The advance and retreat of glaciers are responsible for the landforms present within the Project area today. During the oldest glacial episodes on the Seward Peninsula, which precede the 800,000-year-old lava flow identified covering Nome River sediment drift, ice in the Kigluaik Mountains filled valleys and stretched southward beyond Nome's present-day coastline (Kaufman et al. 1989). Within the Kigluaik Mountains, sediment deposits can be attributed to extensive Nome River glaciation. Glacial deposits within the Project area include sand, gravel, and boulders; fluvial gravel and sand; marine and fluvial terrace deposits; and wetlands (Till et al. 2011). Although smaller in scale, the Stewart River glacial interval and Salmon Lake glaciation were responsible for more localized impacts in the Kigluaik Range, while Mount Osborn glaciation occurred in the higher alpine valleys.

The steep northern flank of the mountain range is fault-bounded and contains straight, narrow, U-shaped valleys with streams that carve through large moraines, or deposits of glacial material left by receding glaciers, that extend beyond the front of the northern range toward Imuruk Basin (Kaufman et al. 1989). Imuruk Basin consists of glacial outwash and alluvial sediments that overtop a graben (i.e., a portion of Earth's crust shifted downward); the lack of emergent marine deposits suggests the basin sunk more than 23 feet within the late Quaternary period, the current geologic time period (Kaufman et al. 1989).

The northern range's peaks run along an asymmetrically folded antiform axial plane composed of Precambrian and early Paleozoic rock (Kaufman et al. 1989). The surface features of the northern range's front fault, such as well-defined scarp, suggest Holocene displacement, or the activity that occurred during climactic warming and retreat of continental glaciers during the Holocene epoch (NPS 2023).

The southern slopes of the Kigluaik Range are gentler, with lower-elevation summits (Kaufman et al. 1989). The formation of deep, U-shaped valleys and well-developed moraines, as well as the presence of numerous boulders, again suggests extensive and repeated glacial activity in the past. The southern part of the range consists of deep and wide glacial troughs that have created extensive drainage networks, which include streams that flow toward the Seward Peninsula's southern coast. The age and activity of the fault bounding the southeastern portion of the range is uncertain.

3.1.3.2 Permafrost and Soils

Project facilities—the WMF, WMP, and mill facility—would be located at the mine site north of the Kigluaik Mountains. Early mapping indicates soil deposits in the mill area vicinity consist of glacial (till), colluvial (landslide, solifluction debris), alluvial (alluvium and old alluvial fan), and lacustrine (glaciofluvial) deposits (Barr 2025; Kaufman and Hopkins 1989). Table 3-4 summarizes characteristics of the soil deposits and typical locations where the soils are found.

Table 3-4. Description of soil deposits within the Project vicinity

Deposit	Description
Till deposits	• Poorly sorted, non-stratified, debris-forming end moraines • Display broader crests, less microrelief, and more reworking by solifluction
Solifluction debris	• Thin deposits of weakly stratified, poorly sorted, pebbly silt • Have platy rock clasts that form well-developed lobes and smooth, sweeping terraces
Landslide deposits	• Bouldery, non-stratified, blocky debris • Located in glaciated mountain valleys
Alluvium	• Stratified deposits of moderate to well-sorted gravel and sand • Restricted to floodplains and active rivers
Old alluvial fan	• Stratified gravels with some cobbles and boulders, forming inactive fans along the Kigluaik Mountains' northern flank
Glaciofluvial deposits	• Found as lake terrace deposits (well-sorted and stratified sand, silt, and minor fine gravel), stratified silt and peat (weakly stratified, well-sorted lacustrine and eolian silt; lenses rich in organic material and detrital peat); and silty cover deposits (weakly stratified mantles consisting mainly of loess and secondary periglacially fractured materials)

Source: Barr 2025

Soils present across the Project area, including at the temporary barge facilities, mine site, and Mosquito Pass access road, are presented with their hydric rating in Table 3-5. No data was provided for soil status as prime or other important farmland. Figure 3-3 maps these soils within the study area.

Table 3-5. Soils, hydric rating, and farmland status within the Project area

Map Unit Symbol	Soil Map Unit	Hydric Rating	Prime and other Important Farmlands Status
E40W	Nulato Hills, Seward Peninsula Highlands-Maritime Water, Saline	Predominantly Nonhydric	No data
E41P1	Seward Peninsula Highlands-Arctic Upland and Lowland-Glaciated Valleys	Partially Hydric	No data
E41P2	Seward Peninsula Highlands-Arctic Upland-Loess Plain	Partially Hydric	No data
E41LM3	Seward Peninsula Highlands-Arctic Upland-Rounded Mountains, Calcareous	Partially Hydric	No data

Source: USDA-NRCS n.d.-a, n.d.-b, n.d.-c

Subsurface geotechnical and hydrogeologic investigations of the mill area consisted of six drillholes in 2024 (Barr 2025). The investigation classified approximately 70 percent of the soils as sands and approximately 25 percent as gravels. Clays and silts represented less than 3 percent of the logged soils. Additionally, the length of frozen soils logged was approximately 328 feet, while the depth range was 36 to 417 feet below ground surface (bgs).

Permafrost has been identified across the Project area (Barr 2025). Permafrost occurs when the ground's thermal condition is at or below 32 degrees Fahrenheit (°F) for at least two years in a row; permafrost is considered an impermeable zone (Tundra Consulting 2024). Table 3-6 describes the permafrost distribution types mapped for the Project area.

Figure 3-3. Soils within the Project area

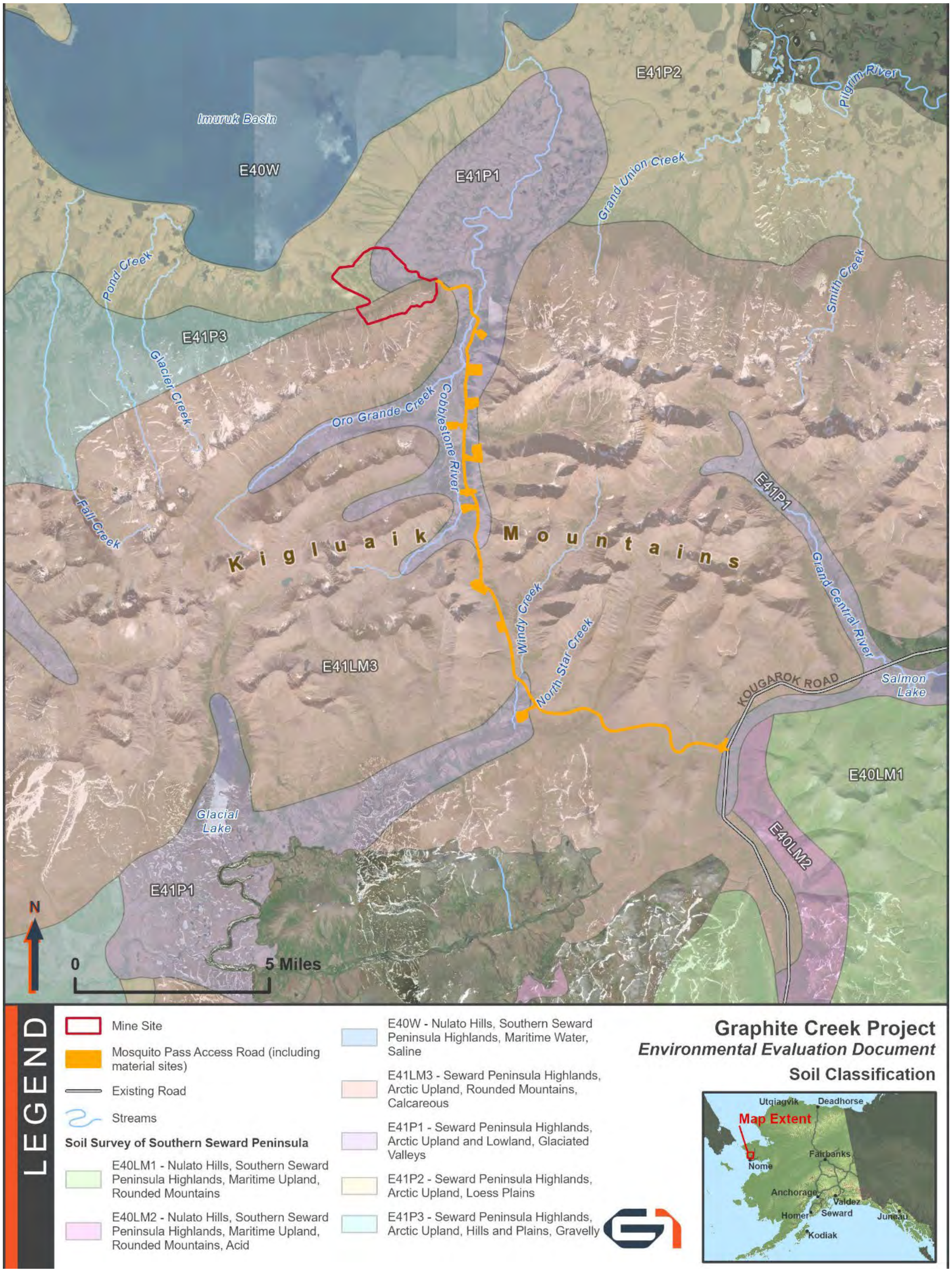


Table 3-6. Description of permafrost distribution type

Permafrost Distribution Type	Description
Absent	Indicates where permafrost is anticipated to be locally absent
Warm Discontinuous, Hydrogeology Recharge Zone	Indicates where permafrost is anticipated to be locally discontinuous to the degree that surface water can recharge the groundwater system
Warm Discontinuous, Suprapermafrost Talik	Indicates where permafrost is anticipated to be locally discontinuous and relatively warm, with suprapermafrost talik (i.e., perennially unfrozen zones located on top of permafrost) often present above the top of permafrost; top of permafrost describes the uppermost position of the ground that does not exceed 32°F on an annual basis
Cold Continuous	Indicates where permafrost is anticipated to be locally continuous and relatively cold; The ground thermal regime has an active layer that seasonally develops above the top of permafrost
Old Alluvial Fan	Indicates stratified gravels with some cobbles and boulders, forming inactive fans along the Kigluaik Mountains' northern flank

Source: Tundra Consulting 2024 (included in Appendix A)

Table 3-7 describes permafrost distribution at the Project mine site based on field studies conducted in 2024, while Figure 3-4 maps the distribution. Field studies included ground temperature measurements from 20 digital temperature cables, which are described in detail in Appendix A (*2024 Hydrogeology Report*; Tundra Consulting 2024). Three borings were additionally drilled in the temporary barge facility vicinity (Recon 2023). Each boring encountered permafrost. While ice content was variable at the site, it was considered ice-rich overall. The WMF footprint would extend across lowlands and the Cobblestone Moraine, which have different surficial material, ground thermal regime, and permafrost properties. The Cobblestone Moraine is observed to have locally continuous permafrost with evidence of ice-rich soil and massive ground ice. Thaw features such as thermokarst ponds (active and inactive), retrogressive thaw slumps (inactive), active layer detachments (inactive), thermal erosion channels and gullies (active and inactive) have been observed in the Cobblestone Moraine. Permafrost observed in the lowlands is commonly a few tenths of a degree Celius below zero and overlain by perennially unfrozen ground below the active layer. The rate of permafrost thaw likely varies across the project area, with the lowest rates expected in the ice-rich overburden soil of the Cobblestone Moraine (NPC 2024).

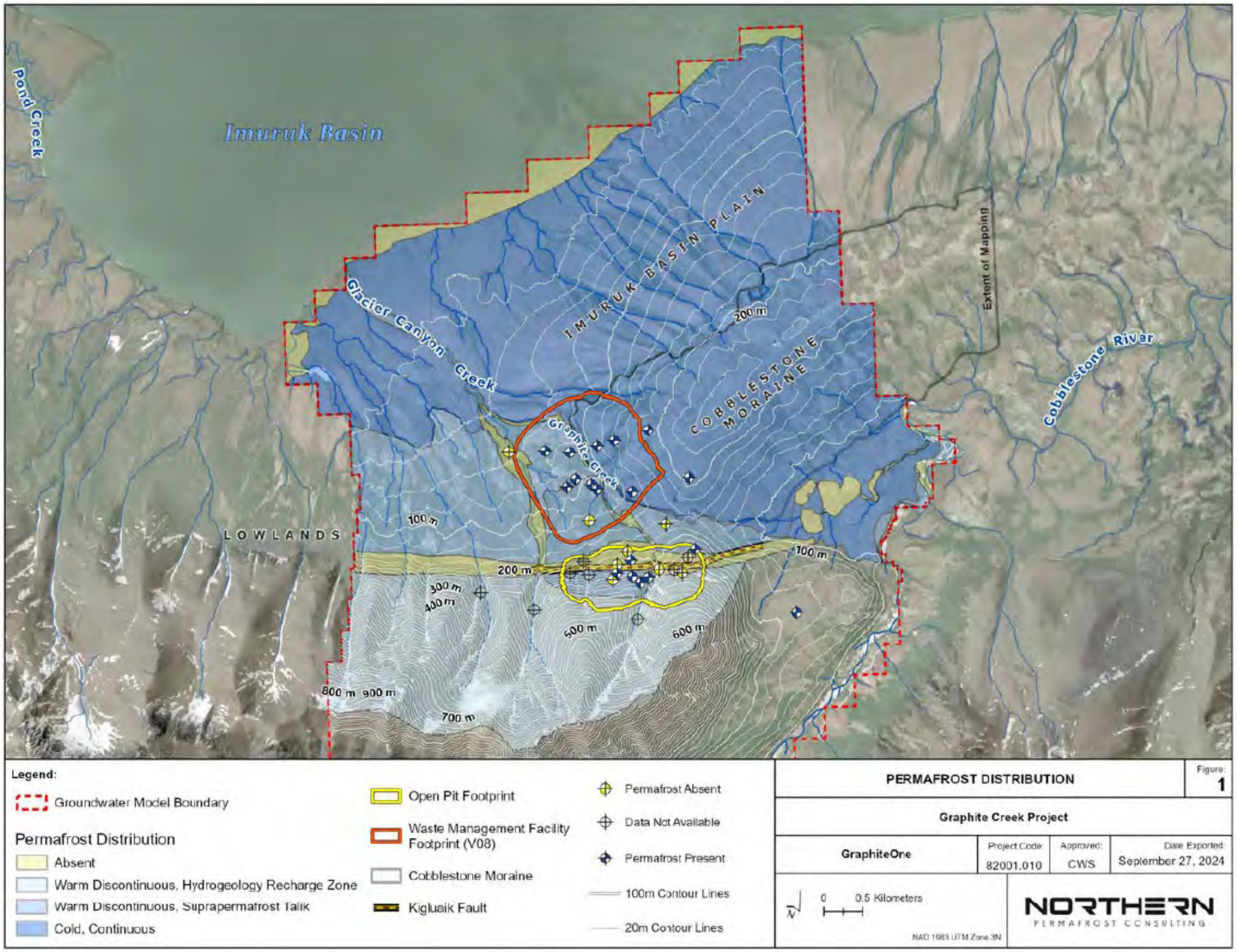
Table 3-7. Permafrost distribution within the Project area

Project Area[(a)]	Location	Permafrost Distribution
Uplands (open pit area)	Kigluaik Fault	Permafrost is locally absent
Uplands (open pit area)	Open Pit	Permafrost is discontinuous with a thick, unfrozen, suprapermafrost talik approximately 115 to 131 feet thick; where permafrost is present, the permafrost base is approximately 328 feet bgs
Uplands (open pit area)	Pit (south zone)	Permafrost is locally absent
Uplands (open pit area)	Pit (north zone)	Permafrost is locally discontinuous with a suprapermafrost talik where present; area is likely a groundwater recharge zone
Lowlands	Southern portion of lowlands	Permafrost is locally discontinuous (temperature is greater than 31.57°F) and may be absent in areas with alder and willow; permafrost base is approximately 197 feet bgs or less, and suprapermafrost taliks are found above the top of permafrost
Lowlands	Northern portion of lowlands	Permafrost is locally discontinuous (temperature is greater than 31.57°F); permafrost base is approximately 328 to 492 feet bgs, and suprapermafrost taliks are found above the top of permafrost
Graphite Creek and Canyon Creek	Graphite Creek and Canyon Creek	Permafrost is believed to be absent along the mid and upper stretches of Graphite and Canyon Creeks
Cobblestone Moraine	Cobblestone Moraine	Permafrost is considered locally continuous based on limited measurements recording temperatures of 30.2 to 29.3°F; active layer depth is approximately 3 to 7 feet, while the permafrost base is approximately 492 to 591 feet bgs
Imuruk Basin Plain	Imuruk Basin Plain	Permafrost is locally continuous based on temperatures of 30.2 to 29.3°F, as well as ice-rich with massive ground ice; active layer depth is approximately 3.3 feet, while the permafrost base is approximately 492 to 591 feet bgs

Source: Tundra Consulting 2024 (included in Appendix A)
Notes: Original metric units have been converted to imperial units.
Definitions: “Active layer” describes the uppermost zone located on top of permafrost that seasonally thaws and refreezes. “Base of permafrost” describes the lowermost position of the 32°F isotherm.
[a] Corresponds to broader geographic extents shown in Figure 3-4

Tundra Consulting (2024) did not take ground temperature measurements in the Mosquito Pass access road vicinity; however, mapping of permafrost characteristics of Alaska indicates that the Project area, including the Mosquito Pass access road, is just south of the continuous permafrost zone in a majority discontinuous permafrost zone (Jorgenson et al. 2008). Discontinuous permafrost on the Seward Peninsula is generally very close to the freeze-thaw point, with permafrost temperatures ranging from 23 to 30.2°F (Recon 2023). These temperatures make the permafrost more susceptible to thawing from ground disturbance of the vegetative mat, which would otherwise insulate the ground.

Figure 3-4. Permafrost distribution within the Project area



Source: Tundra Consulting 2024 (included in Appendix A)

Permafrost is anticipated to continue warming over the life of the Project due to climate trends and land disturbance from development (Barr 2025).

3.1.3.3 Avalanche and Seismic Hazards

Debris-flow, avalanches, landslide deposits, and talus occur on the steep valley walls created by retreating Pleistocene glaciers, causing the valley walls to be vulnerable to seasonal freeze-thaw cycles and mass wasting (Kaufman et al. 1989).

The Project area straddles the Kigluaik Fault, a Holocene-active fault that is described in additional detail in Section 3.1.3.1 Geomorphology. Results of a seismic hazard evaluation note that that the fault is the largest contributor to strong ground shaking at the Project site, and the frequency and magnitude of the earthquakes originating from the fault warrant appropriate design considerations to minimize potential impacts (Lettis 2024). The Kigluaik Fault additionally poses surface fault rupture risks to the mine pit (primary displacement) and the WMF (secondary displacement).

Alpine Solutions (2024) conducted a snow avalanche hazard assessment for the Project (Appendix B *Snow Avalanche Hazard Assessment for the Graphite Creek Project*). Avalanche terrain within the Project area consists of expansive alpine bowls that funnel into channeled tracks as well as open slopes that are broad and short (Alpine Solutions 2024). All avalanche terrain within the study area is in the alpine, where there is a lack of vegetation to shelter the area from wind and snow. Since starting zones for area avalanches exist on all aspects, these zones are exposed to a variety of prevailing wind directions and sun. Large, dry slab avalanches typically start on 30- to 40-degree slopes, while steeper slopes often experience more frequent and smaller loose-snow avalanches (or sluffs) and lower-angle terrain experiences wet avalanches. The avalanche season runs from approximately September to May, potentially extending into June or later at elevations higher than 1,640 feet.

Twenty-four avalanche paths were identified within the study area that could affect the proposed Project's infrastructure, including the access road, crossing structures, material sites, mine pit, and pit diversion channel (Alpine Solutions 2024). Figure 3-5 provides an overview of avalanche risk locations. Infrastructure not exposed to avalanche hazards includes the WMF, mill, WMP, and existing camp.

Avalanches' destructive potential is classified on a scale ranging from D1 (generally not harmful to people) to D5 (could gouge the landscape; Alpine Solutions 2024). The destructive potential of the identified avalanche pathways within the Project area includes D2 (potential to bury, injure, or kill a person) and D3 (potential to bury/destroy a car, damage a truck, destroy a wooden-framed house, or break trees). No identified avalanche pathways that would impact the Project infrastructure had the potential to create D4- or D5-sized avalanches.

Figure 3-5. Overview of avalanche hazards within the Project area

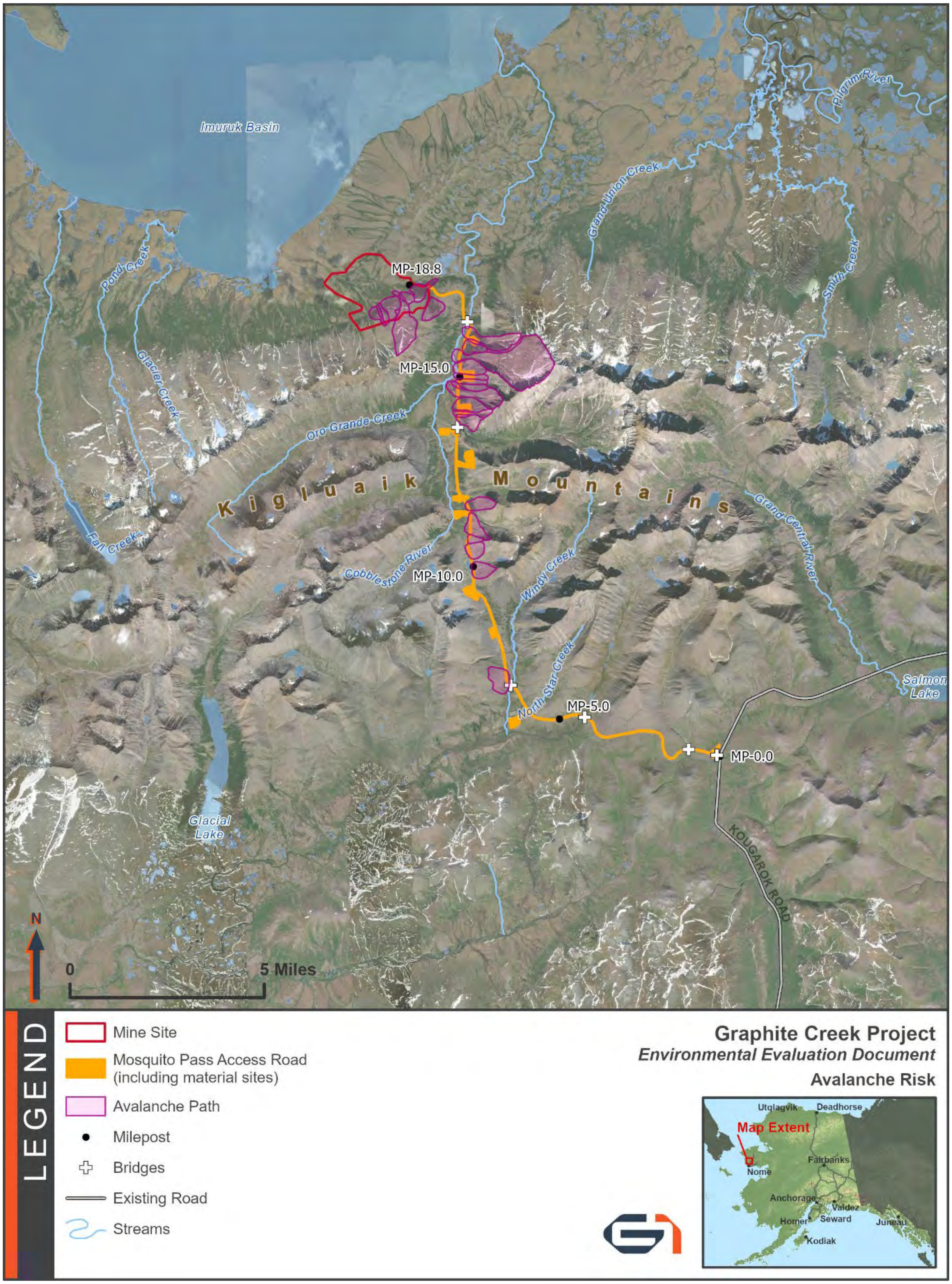


Table 3-8 and Table 3-9 provide the estimated maximum dense flow extent for the identified avalanche pathways affecting the Mosquito Pass access road and mine site, which correspond to a frequency of 1:100 (events:years).

Table 3-8. Estimated frequency of avalanches originating from identified paths expected to impact the Mosquito Pass access road

Avalanche Path	Approximate Length Affected (feet)	Estimated Frequency (events:years)	
		Size D2	Size D3
AR 1.0	2,133	1:3	1:10
AR 2.0	1,640	1:3	1:10
AR 3.0	1,804	1:3	1:10
AR 4.0	1,312	1:3	Undetermined
AR 5.0	3,281	1:3	1:10
AR 6.0	1,148	1:3	1:10
AR 7.0	886	1:3	1:10
AR 8.0	886	1:3	1:10
AR 9.0	1,640	1:1	1:10
AR 10.0	1,640	1:1	1:10
AR 11.0	656	1:1	1:10
AR 12.0	820	1:1	1:10
AR 13.0	722	1:1	1:10
AR 14.0	1,804	1:1	1:10
AR 15.0	1,870	Undetermined	1:10
AR 16.0	2,067	1:3	1:10
AR 17.0	1,969	1:3	1:10

Source: Alpine Solutions 2024 (included in Appendix B)
Notes: Original metric units have been converted to imperial units; AR = Access Road

Table 3-9. Estimated frequency of avalanches originating from identified paths expected to impact mine site facilities

Infrastructure Affected	Avalanche Path	Estimated Frequency		Comments
		Size D2	Size D3	
Graphite One Plant	MS 1.0	1:1	Undetermined	
	MS 2.0	1:1	Undetermined	
	MS 3.0	1:1	1:10	

Infrastructure Affected	Avalanche Path	Estimated Frequency		Comments
		Size D2	Size D3	
Existing Drill Trails	MS 1.0	1:1	Undetermined	Only 100-165 feet of eastern spurs exposed
	MS 2.0	1:1	Undetermined	
	MS 3.0	1:1	1:10	
	MS 4.0	1:1	1:10	
	MS 5.0	1:1	1:10	
	MS 6.0	1:1	1:10	
	MS 7.0	1:1	Undetermined	
Proposed Pit	MS 1.0	1:1	Undetermined	Small section of proposed pit in avalanche starting zone; modified with pit development
	MS 2.0	1:1	Undetermined	Avalanche starting zone and track modified with pit development
	MS 3.0	1:1	1:10	Avalanche track modified with pit development
	MS 4.0	1:1	1:10	Avalanche starting zone and track modified with pit development
	MS 5.0	1:1	1:10	Avalanche track modified with pit development
	MS 6.0	1:1	1:10	Avalanche track modified with pit development
	MS 7.0	1:1	Undetermined	Avalanche starting zone and track with proposed pit development

Source: Alpine Solutions 2024 (included in Appendix B)
Notes: Alpine Solution (2024) notes that the original Graphite One Plant infrastructure studied is from the PFS. Site layout has changed since the PFS, and avalanche paths that no longer affect proposed infrastructure have been removed; MS = Mine Site

Additionally, there is the potential for slush flows (i.e., rapid mass wasting of water-saturated snow) to occur within the study area and affect proposed infrastructure (Alpine Solutions 2024). Slush flows can occur on gentler angles and are often triggered by heavy rainfall, temperatures that are above freezing, and intense solar radiation.

3.1.4 Air Quality

This section characterizes existing ambient air quality conditions in the Project vicinity and provides a summary of applicable ambient air quality standards. The information presented herein serves as a baseline for comparison with potential future conditions under the Proposed Action and No Action alternative.

3.1.4.1 Regulatory Framework

Air quality conditions are typically assessed by measuring concentrations of pollutants in the ambient environment and comparing those values to federal and state standards. The U.S. Environmental Protection Agency (EPA), under the authority of the Clean Air Act, has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), particulate matter with aerodynamic diameters less than or equal to 10 microns (PM_{10}), particulate matter less than or equal to 2.5 microns ($PM_{2.5}$), and lead (Pb). These standards are intended to protect public health and welfare.

The Alaska Department of Environmental Conservation (ADEC) administers the air quality program within Alaska and has adopted the NAAQS as the Alaska Ambient Air Quality Standards (AAAQS) under 18 Alaska Administrative Code (AAC) 50 (ADEC 2025a). These standards apply statewide and serve as benchmarks for evaluating existing air quality conditions in both regulated and remote areas. Table 3-10 provides an overview of national and Alaska ambient air quality standards.

Table 3-10. National and Alaska Ambient Air Quality Standards

Pollutant[a]	Primary/ Secondary	Averaging Time	NAAQS	AAAQS	Form
Carbon Monoxide (CO)	Primary	8 hours	9 ppm	10 mg/m^3	Not to be exceeded more than once per year
CO	Primary	1 hour	35 ppm	40 mg/m^3	Not to be exceeded more than once per year
Lead (Pb)	Primary and Secondary	Rolling 3-month avg	0.15 µg/m^3	0.15 µg/m^3	Maximum concentration, 3-month rolling average
Nitrogen Dioxide (NO_2)	Primary	1 hour	100 ppb	188 µg/m^3	98th percentile of 1-hour daily max, avg over 3 years
NO_2	Primary and Secondary	1 year	53 ppb	100 µg/m^3	Annual mean
Ozone (O_3)	Primary and Secondary	8 hours	0.070 ppm	0.070 ppm	4th-highest daily max, avg over 3 years
$PM_{2.5}$	Primary	Annual	9.0 µg/m^3	12.0 µg/m^3	Annual mean, avg over 3 years
$PM_{2.5}$	Secondary	Annual	15.0 µg/m^3	—	Annual mean, avg over 3 years
$PM_{2.5}$	Primary and Secondary	24 hours	35 µg/m^3	35 µg/m^3	98th percentile, avg over 3 years
PM_{10}	Primary and Secondary	24 hours	150 µg/m^3	150 µg/m^3	Not to be exceeded more than once/year on 3-yr avg

Pollutant[a]	Primary/ Secondary	Averaging Time	NAAQS	AAAQS	Form
Sulfur Dioxide (SO_2)	Primary	1 hour	75 ppb	196 µg/m^3	99th percentile of 1-hour daily max, avg over 3 years
SO_2	Primary	3 hour	0.5 ppm	1,300ug/m^3	Not to be exceeded more than once/year
SO_2	Primary	24 hour	—	365 ug/m^3	Not to be exceeded more than once/year
SO_2	Primary	Annual	—	80 ug/m^3	—

Source: ADEC 2025a; EPA 2025a

Notes: avg = average; max = maximum; µg/m^3 = micrograms per cubic meter(s); mg/m^3 = milligrams per cubic meter(s); ppb = parts per billion; ppm = parts per million; yr = year(s)

[a] Hazardous Air Pollutants (HAPs) are also regulated under the Clean Air Act Section 112 and include pollutants such as benzene, formaldehyde, polycyclic aromatic hydrocarbons (PAHs), and metals such as mercury and arsenic. Monitoring and control of HAP emissions will follow EPA and ADEC guidelines (40 Code of Federal Regulations Part 63, 18 AAC 50.502).

At the time of this writing, the Project area is designated as in attainment or unclassifiable for all criteria pollutants. According to 18 AAC 50.015, an area is designated “attainment” for a particular air pollutant if air quality meets the ambient air quality standard for that pollutant. If air quality does not meet the ambient standard, the area is designated “nonattainment” for that pollutant. If there is insufficient information to classify an area as attainment or nonattainment, it is designated “unclassifiable” for that pollutant (18 AAC 50.015). No designated nonattainment areas exist on the Seward Peninsula or within the Nome Census Area (ADEC 2025b).

No permanent ADEC or EPA ambient air monitoring stations are within or near the Project area. The closest ambient monitoring station is operated by Graphite One in Nome, located approximately 25 miles from the nearest point of the Project footprint. This station lies within the same Air Quality Control Region (Region 10) and Nome Census Area as the Project (EPA 2025b), and ADEC has found that the site is representative of background conditions at the mine site. Data collection, reporting, and approval by the ADEC is still in progress. Project-specific meteorological data (Section 3.1.4.3 Meteorological Monitoring Summary) provide insight into local dispersion conditions.

3.1.4.2 Regional Setting

The proposed Project is in a remote region of western Alaska on the northern portion of the Seward Peninsula, approximately 35 miles northeast of Nome. The Project area lies within the Bering Sea coastal climate zone, characterized by cold winters, cool summers, and frequent wind events. The local terrain consists of rugged metamorphic ridgelines, glacially sculpted uplands, tundra plains, alluvial valleys, and widespread wetlands. Elevations range from sea level near Imuruk Basin to more than 4,700 feet in the Kigluaik Range. The Project infrastructure spans multiple physiographic units, including alpine ridges, colluvial slopes, glaciofluvial terraces, and permafrost-affected tundra lowlands.

This region lies in the transition zone between continental and maritime climatic systems. The Bering Sea influences the weather year-round, contributing to relatively mild winter temperatures compared to Interior Alaska, high humidity, persistent cloud cover, and frequent fog, particularly over the Imuruk Basin and adjacent wetlands. During summer, marine layers often retreat inland, allowing stronger insolation, but wind reversals and coastal surges can transport cool, moist air upslope. Winter conditions are characterized by shallow boundary layers, persistent inversions, and reduced vertical mixing, especially in the basin and valley bottoms. These factors result in seasonally limited dispersion potential, particularly under snow-covered or frozen surface conditions.

Wind exposure and turbulence also vary sharply across the Project area. The ridge crests and upper slopes of the Kigluaik Mountains experience persistent wind flow from the northeast and east due to funneling of synoptic systems along the Arctic-Pacific air mass boundary. However, lower elevation sites near Imuruk Basin exhibit calmer and more stagnant conditions, particularly at night or during high-pressure episodes. These calm zones are prone to cold air drainage and radiative inversions, which can trap local emissions near the ground.

The Seward Peninsula supports relatively sparse vegetation dominated by tundra shrublands, sedge wetlands, lichen heath, and scattered dwarf conifers at lower elevations. Vegetative cover affects both dust generation and atmospheric chemistry. During spring, when snowmelt exposes unvegetated soil and riverbeds, aeolian dust transport becomes a significant short-term contributor to local particulate levels. Studies have noted that wind-blown silt from glacial and marine terraces can increase PM_{10} concentrations across the Seward lowlands, particularly under dry, windy conditions (Hopkins 1963; Höfle et al. 2000; ADEC 1998).

Air quality across the Seward Peninsula and western Alaska is generally considered to be pristine due to the region’s low population density, minimal industrial activity, and prevailing meteorological conditions that promote dispersion. In its annual monitoring network assessments, ADEC consistently characterizes rural areas in western Alaska as being in attainment or unclassifiable for all NAAQS (ADEC 2025b). Preliminary review of the data collected by Graphite One in Nome indicate that ambient concentrations of CO, SO_2, NO_2, O_3, and particulate matter (PM) are well below applicable federal and state standards.

Natural sources of air pollutants in this region include windblown dust, sea spray, biogenic volatile organic compounds (VOCs) from vegetation, and smoke from seasonal wildfires. During summer months, episodic wildfire smoke can contribute to temporary increases in fine PM ($PM_{2.5}$), although such events are typically brief and regional in scale. Studies conducted in Arctic and Subarctic regions of Alaska have also documented the seasonal transport of aerosols from lower latitudes, particularly during late winter and early spring, contributing to elevated background levels of fine particulates during “Arctic haze” episodes (ADEC 2011; Shaw 1995).

These events are infrequent and not expected to substantially influence long-term ambient air quality within the Project area.

No known industrial facilities, significant point sources, or population centers are within the immediate Project site vicinity. The nearest community, Nome, has a population of under 4,000 and is the only nearby source of localized emissions, such as power generation, residential heating, vehicle traffic, and other fuel combustion. The limited extent of development and human activity in the surrounding region suggests that existing ambient air quality is primarily influenced by natural processes. No Class I areas (such as national parks or designated wilderness areas with enhanced air quality protections under the Clean Air Act) are located within 62 miles of the Project area.

3.1.4.3 Meteorological Summary

To support air quality impact analysis for the Proposed Action, a year-long meteorological monitoring program was conducted from May 1, 2024, through April 30, 2025 (Boreal 2025). The monitoring station was located within 0.5 mile of the proposed mill site and sited at approximately 492 feet asl, within the western flank of the Kigluaik Mountains. The station was installed and operated by Boreal Environmental Services on behalf of Graphite One in accordance with EPA's (2000) *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA-454/R-99-005) and ADEC's (2018) *Prevention of Significant Deterioration (PSD) Annual Data Report Format*.

The meteorological tower was instrumented at 32.8 and 6.6 feet above ground level, respectively, and collected data on the following parameters: wind speed and direction, vertical wind speed, ambient air temperature, relative humidity, barometric pressure, solar radiation, and precipitation. Hourly data were logged continuously and reviewed under a Quality Assurance Project Plan designed to meet data quality objectives for regulatory modeling.

Across the full monitoring year, mean wind speed at 32.8 feet was 6.8 miles per hour (mph), with maximum hourly wind speeds reaching 52.5 mph. The wind rose indicated a strong prevailing flow from the east-northeast and east, which together accounted for nearly 24 percent of total wind observations. Wind patterns reflected synoptic-scale flow channeled through the Kigluaik topography and local thermally driven circulation influenced by Imuruk Basin to the north. Calm conditions, defined as wind speeds below 1.1 mph, occurred 15.8 percent of the time, with calm episodes most frequent during winter nights and high-pressure systems.

Vertical wind speeds, which affect vertical plume dispersion and dilution, were modest. Mean hourly vertical speed was 0.11 mph, with peak hourly values up to 2.7 mph. These values are consistent with weak convective mixing, especially under stable atmospheric conditions common during winter and nighttime temperature inversions. The presence of snow cover and low solar input during much of the year further suppresses surface turbulence and enhances stratification.

Ambient temperatures ranged from –34 to 77.4°F, with monthly means below freezing from October through April. Temperature inversions are expected to form frequently, particularly during shoulder seasons when radiative cooling outpaces daytime warming. Solar radiation peaked at 913 watts per square meter during late June, with 24-hour daylight in midsummer and near-complete darkness from late November through mid-January. These seasonal light regimes contribute to sharp transitions in atmospheric stability and dispersion capacity.

Precipitation, including both rain and snow, totaled 21.8 inches over the monitoring period, with highest accumulation between August and October. Snow cover typically persisted from October into late May, consistent with other climatological records for the western Seward Peninsula. Frozen ground conditions are relevant for dispersion modeling because they limit dust suppression and influence surface energy budgets. Relative humidity averaged 70.8 percent, with hourly values ranging from 9.1 to 100 percent.

All monitored parameters exceeded 90 percent quarterly data completeness, satisfying regulatory thresholds for use in dispersion modeling under Appendix W of 40 CFR 51 and 18 AAC 50.215. The dataset captures representative worst-case meteorological conditions for the site, including calm wind periods, cold air pooling potential, and periods of enhanced vertical mixing during summer.

The observed meteorological conditions reflect a mixed dispersion regime. During winter and transitional seasons, atmospheric dispersion is generally limited due to temperature inversions, low wind speeds, and shallow boundary layers. In contrast, summer months bring increased solar heating, moderate winds, and elevated convective mixing heights, which support more effective dilution and transport of pollutants. However, the combination of frequent calm conditions and complex terrain, especially slope-basin transitions, warrants careful modeling of near-field pollutant concentrations and fugitive dust behavior.

These conditions are broadly consistent with other Subarctic mountain-front settings studied in western Alaska, though the influence of the Bering Sea, lowland inversion zones, and orographic wind channeling make the Project site meteorologically distinct from more inland or Arctic Slope environments. The site-specific data set generated through 2024-2025 monitoring program provides a robust basis for future dispersion modeling required to assess compliance with NAAQS and AAAQS, as well as for planning emission controls and dust suppression strategies under construction and operations scenarios.

3.1.5 Noise and Vibration

The Project area is located in a remote area in the northern foothills of the Kigluaik Mountains and through Mosquito Pass, far from any regular source of human-generated noise and vibration. The settlements of Teller and Brevig Mission (combined population approximately 600) are located approximately 30 miles northwest, and the city of Nome (population approximately 3,700) is located approximately 35 miles south of the Project mine site. Mary's

Igloo, located approximately 15 miles east of the Project mine site, is primarily used as a seasonal fishing camp.

3.1.5.1 Noise Concepts

Noise can be defined as unwanted sound. The terms “noise” and “sound” are used interchangeably herein.

Sound is composed of tiny fluctuations in air pressure and characterized by its amplitude (i.e., how loud it is), frequency (or pitch), and duration. Within the range of human hearing, sound can vary in pressure amplitude by a factor of over 1 million. Therefore, a logarithmic, or decibel (dB), scale is used to quantify sound intensity and compress the scale to a more manageable range.

The human ear does not hear all frequencies equally; low and very high frequencies are de-emphasized. The A-weighting scale, or A-weighted decibels (dBA), is the most common weighting scale used to reflect this selective sensitivity of human hearing. It puts more emphasis or “weight” on the frequencies humans hear well, and less weight on frequencies humans do not hear well. It is also thought to provide a rating of noise that predicts the injurious effects the noise has on human hearing (OSHA 2022). Excessive or unwanted sound is typically characterized as noise. Problems related to noise can include general annoyance, stress-related illnesses, high blood pressure, sleep disruption, and hearing loss (EPA 1981).
Table 3-11 lists typical noise levels for some common noise sources.

Table 3-11. Typical source noise levels

Sound Pressure Level, dBA	Typical Sources
100	Jet flyover at 1,000 feet
90	Gas lawn mower at 3 feet
85	Food blender at 5 feet
75	Shouting at 3 feet
70	Vacuum cleaner at 10 feet
60	Conversational speech
50	Quiet urban daytime
40	Quiet urban nighttime
35	Quiet suburban nighttime
30	Quiet bedroom at night
20	Quiet rural nighttime
0	Approximate threshold of hearing

Source: MPCA 2015

Because of the logarithmic scale, sound levels cannot be simply added or subtracted. If sound energy is doubled, the sound level only increases by 3 dB. However, a doubling of sound energy is not perceived by humans as a doubling of loudness. A 3-dB change is considered a barely noticeable difference, a 5-dB change is considered a noticeable difference, and a 10-dB change is considered a doubling or halving of loudness.

3.1.5.2 Vibration Concepts

Ground vibration is the oscillation of the ground and can be caused by various sources, such as construction activities, heavy traffic, or natural seismic events. These vibrations travel through the ground and soil and can affect the stability and integrity of buildings and structures above them.

3.1.5.3 Noise and Vibration within the Project Area

In the Project area, Imuruk Basin is used for activities such as berry picking, seal hunting, and fishing. Such activities may involve temporary noise from boats, snowmachines, or aircraft used to access those sites. The nearest existing roadway is Kougarok Road, where the Mosquito Pass access road would tie in. Aircraft may occasionally fly over the Project area, including large jet aircraft at high altitudes on international flights and small piston aircraft at lower altitudes accessing backcountry locations nearby. Natural sounds within the Project area may include noise from wildlife, wind and rain, flowing water, and ice thawing and moving during winter and spring, including avalanches.

Given the undeveloped character of the Project vicinity and distance to areas of human activity, existing sound levels are likely to be very low, particularly at night and during periods of calm weather. Anthropogenic noise within the area is expected to be minimal and of short duration, when it occurs. Existing daytime noise levels are estimated to be 30 to 35 dBA, though they may be as low as 20 dBA (HDR 2024). Noise during nighttime may be anywhere from 3 to 10 dB quieter than daytime levels in a given area depending on what sort of noise sources are present. Noise during winter may be quieter still, particularly in areas where water-related noise sources prevail during summer. Currently, there are no construction activities or heavy traffic that would generate ground vibrations in the Project area.

3.1.6 Hydrology and Floodplains

The following section describes available information regarding the existing streamflow and floodplain characteristics within the Proposed Action area. The study area consists of the Project footprints, including the mine site and access road.

3.1.6.1 Mine Site Area Streams

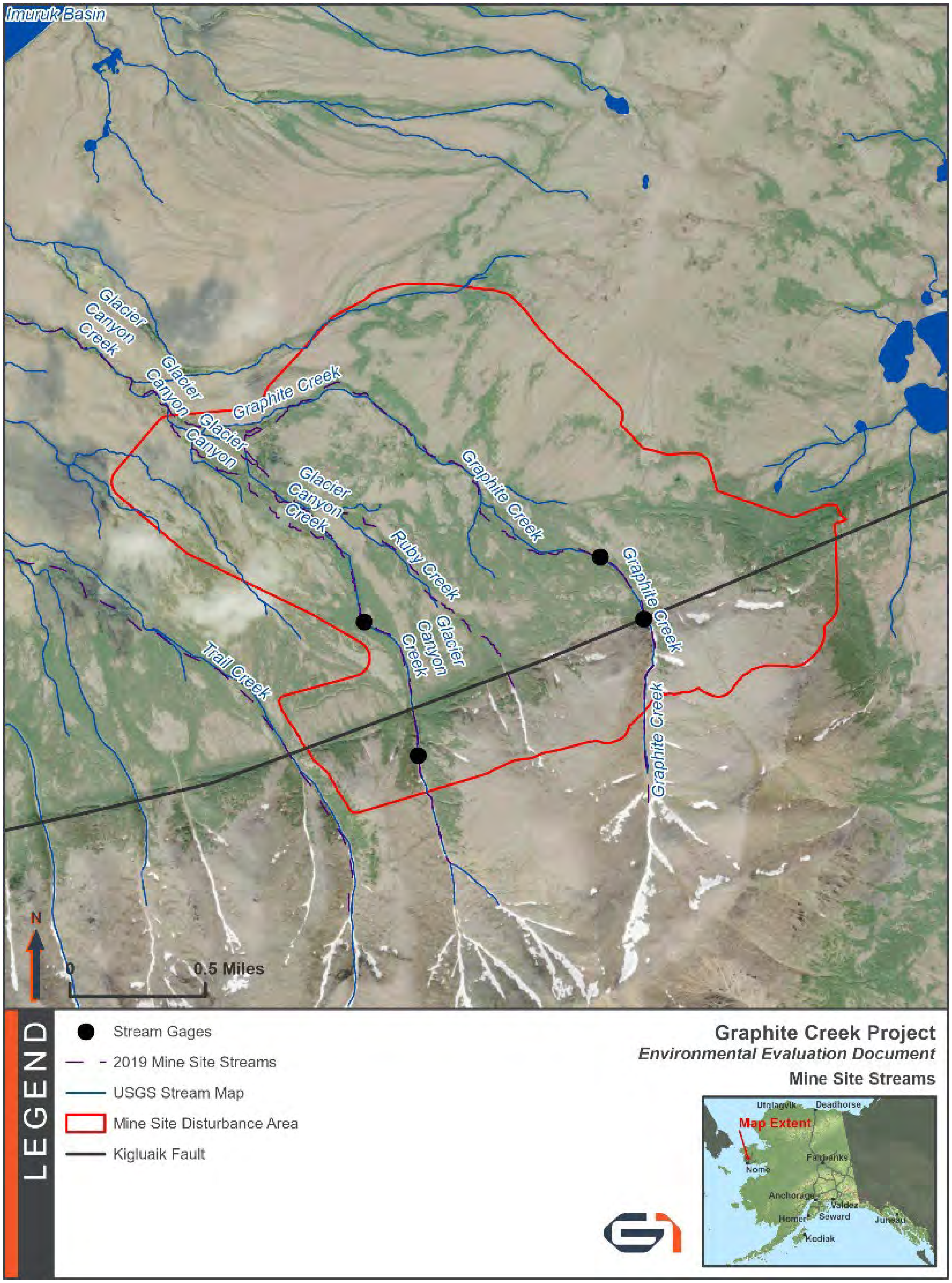
The mine site area, including the proposed pit and waste facilities, is located on a north-facing slope above Imuruk Basin. Two small streams, Graphite Creek and Glacier Canyon Creek, drain the slope; the drainage areas are less than 1 square mile. There are minor discrepancies in stream mapping and nomenclature between 2019 investigations for the *Final Surface Water*

Hydrology Environmental Baseline Studies Report (ERM 2020) and 2024 mapping (based on USGS 2023) adopted by the Project for the small tributaries for Graphite and Glacier Canyon Creeks. In ERM's (2020) report, Ruby Creek is a tributary to Graphite Creek, while the 2024 mapping based on the USGS (2023) hydrography layer shows the tributary meeting Glacier Canyon Creek above the confluence with Graphite Creek. Ptarmigan Creek appears in pre-2019 studies and refers to Glacier Canyon Creek above the confluence with Graphite Creek. From 2019 onward this is known as Glacier Canyon Creek (Figure 3-6). While the discrepancies can cause confusion, the total surface drainage that would be impacted by the mine does not change.

The upper watershed contributing to these creeks is bedrock-dominated, and the creeks flow through deep gullies or small canyons on steep slopes. Upon crossing the Kigluaik Fault, the hillslope grade decreases and is underlain by unconsolidated sediments. With the change in material, stream incision decreases and loss to groundwater increases.

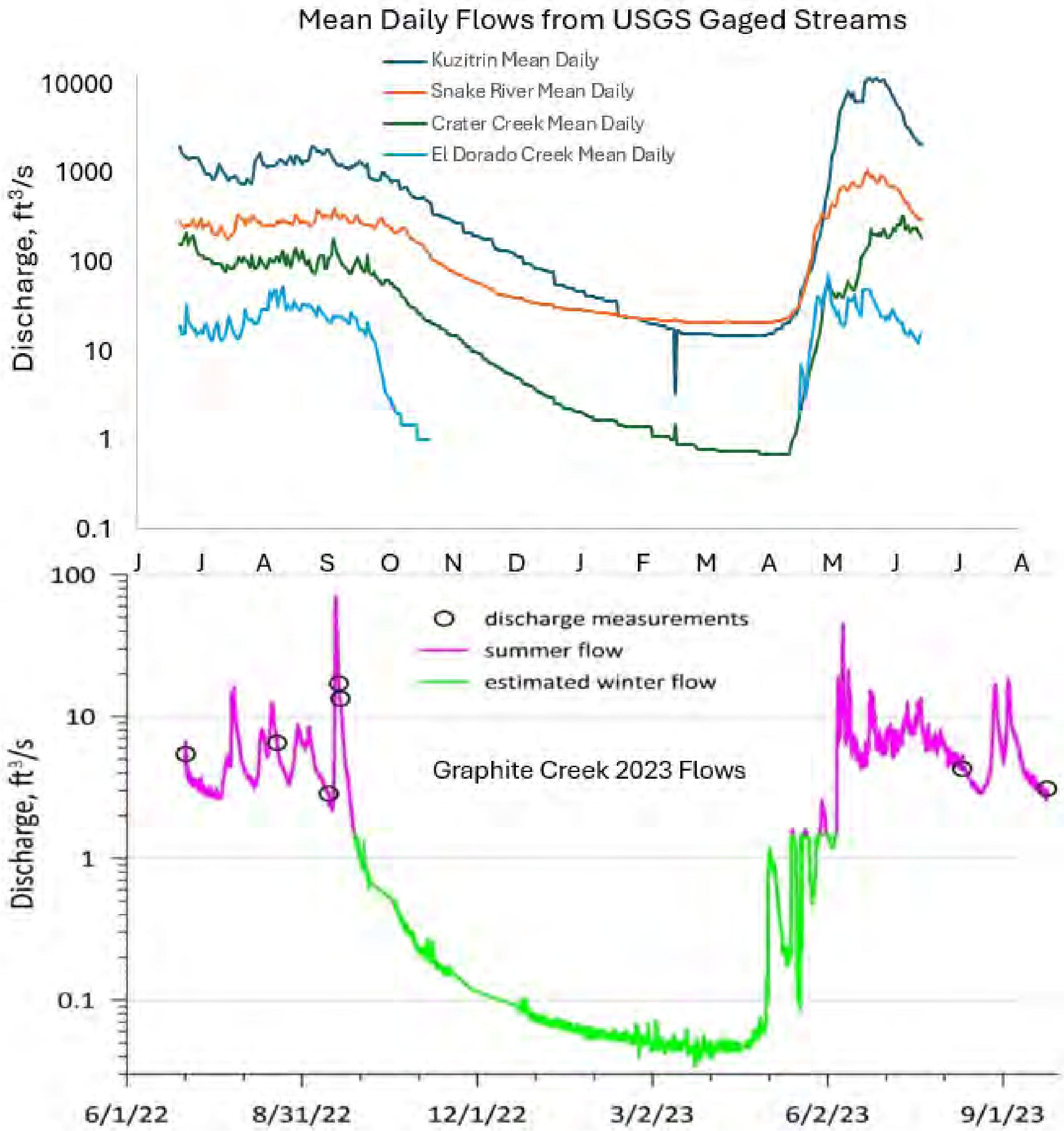
To quantify streamflow throughout the year, Brailey Hydrologic Consultants installed stream gauges on Graphite and Glacier Canyon Creeks both upstream and downstream of the Kigluaik Fault and on the Cobblestone River near the proposed road crossing. Streamflow for 2022through 2025 is available as of this writing. Field measurements began in late June or early July each year, and usable transducer data started in June for most sites. Only one station (Upper Graphite Creek) recorded continuously throughout winter 2023; therefore, snowmelt timing and winter flow magnitude are estimated from Upper Graphite Creek and nearby USGS gauges at Kuzitrin River, Snake River, Crater Creek, and El Dorado Creek (Figure 3-7).

Figure 3-6. Mine site streams mapped in 2019 and in the current USGS hydrography layer



Source: ERM 2020; USGS 2023

Figure 3-7. Comparison of mean daily stream flows measured by USGS near the Project area and Upper Graphite Creek year-round hydrograph



Source: USGS Water Data for Alaska (Upper Graph), Tundra Consulting 2024 (Lower Graph)
Note: Please note different scale and axes.

Snowmelt begins in late April or early May, and peaks between mid-May and mid-June. Rainfall peaks are often the high flow of the year and can occur from July to October. The highest flow recorded by most Project area gauges is the September 2022 flood caused by Typhoon Merbok, though it was not significantly higher than a peak during early August 2024. Mean annual runoff (in cubic feet per second per square mile of drainage area) ranges from 0.7 to 2.7, increasing in small, high-elevation drainages, while runoff during the highest flows measured at each gauge can be greater than 100 (Table 3-12).

Table 3-12. Runoff characteristics of measured streams within the Project area and at nearby USGS gauges

Stream Name	Drainage Area (mi^2)	Mean Annual Runoff (ft^3/mi^2)	Maximum Flood Runoff (ft^3/mi^2)
Upper Graphite Creek	0.82	2.7	87.5
Upper Glacier Canyon Creek	0.8	—	32.5
Cobblestone River	64.2	—	93.5
Kuzitrin River Gauge 15712000	1740	0.7	23.0
Snake River Gauge 15621000	86	2.3	48.8
Crater Creek 15668200	22	2.5	115.5
Eldorado Creek 15635000	6	—	100.0

Notes: "—" = not measured; ft^3/mi^2 = cubic foot/feet per square mile(s); mi^2 = square mile(s)

Streamflow decreases in October as freezing temperatures become more common and rain falls as snow. Winter streamflow is minimal or unmeasurable at most gauges, though discontinuous thawed areas called taliks discharge groundwater in some locations. In 2023, upper Graphite Creek remained flowing, possibly because the gauge pool was insulated by avalanche deposits (Tundra Consulting 2024).

Brailey Hydrologic Consultants took multiple same-day measurements above and below the Kigluaik Fault at Graphite and Glacier Canyon Creeks, and estimated that approximately 3 and 6 percent, respectively, of streamflow is lost to groundwater across the upper part of the alluvial apron (Tundra Consulting 2024). An additional gauge installed in 2025 showed significantly more loss to groundwater downstream of the Graphite Creek/Glacier Canyon Creek confluence. This is consistent with 2025 field observations of Ruby Creek going underground within the proposed mine site area and reappearing several hundred feet downstream.

3.1.6.2 Streams along the Road Alignment

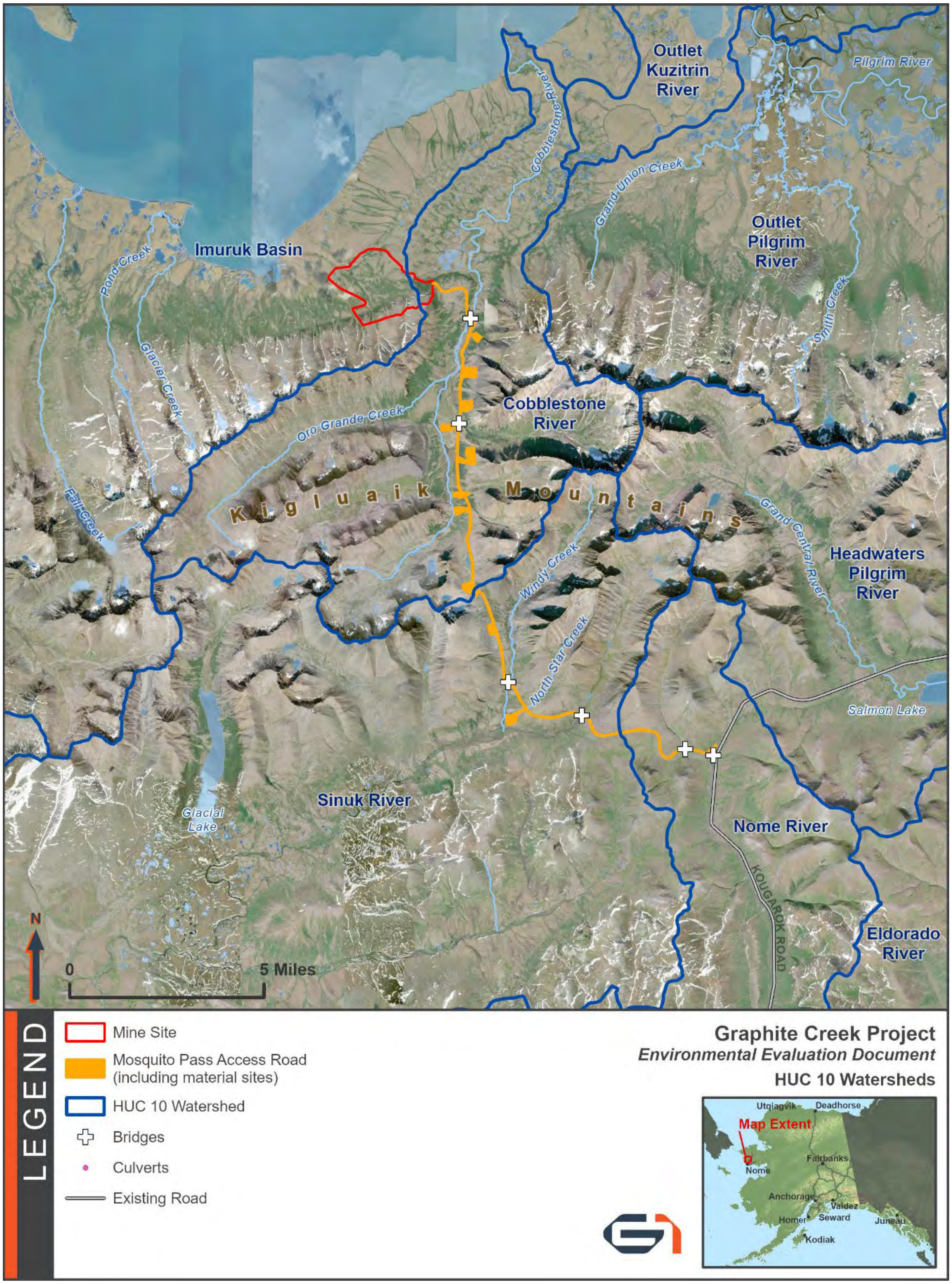
The proposed Mosquito Pass access road crosses approximately 41 streams and ephemeral drainages, the largest of which is the Cobblestone River. From north to south (mine site to Nome-Kougarok Road), the major crossings are the Cobblestone River, Osborn Creek, Windy Creek, Sinuk River, North Star Creek, Buffalo Creek, and Nome River. Of these, the Cobblestone River is the largest. All drainages north of Mosquito Pass flow into the Cobblestone River, while southern drainages flow into the Sinuk River, then the Nome River. Drainage areas for the major crossings range from approximately 2.5 to 57 square miles (Table 3-13; Figure 3-8).

Table 3-13. Major drainages crossed by the proposed Mosquito Pass access road

Basin Name	Drainage Area (mi^2)[a]
Cobblestone River	58.7
Osborn Creek	8.6
Windy Creek	11.7
North Star Creek	2.7
Sinuk River	8.7
Buffalo Creek	5.0
Nome River	5.4

Note: mi^2 = square mile(s)
[a] Drainage area at the crossing location.

Figure 3-8. Preliminary watersheds for mine site and Mosquito Pass access road streams and rivers



Floodplains within the Project area vary in width and complexity. In the mine site upstream of the fault, streams are narrow and incised, with the active channel and floodplain of Ruby, Graphite, and Glacier Canyon Creeks each 10 to 20 feet wide. As these streams reach lower-gradient slopes, incision decreases, and the channel may split or meander in brushy floodplains or, in the case of Ruby Creek, disappear underground and reappear downslope. Floodplain width on the alluvial plain is difficult to define using traditional riverine terms. The channel and floodplain morphology are influenced heavily by discontinuous permafrost and relict glaciofluvial landforms. Iron precipitate cements the streambed of Graphite Creek and reduces sediment transport and stream incision in the upper reaches (Figure 3-9).

Along the proposed access road alignment, there is a greater range of channels and floodplains (Table 3-14). Alluvial channels are those where the streambed is formed of mobile sediment and there are commonly gravel bars and islands, such as along the Cobblestone River (Figure 3-10). Rocky channels have a streambed that appears to be coarser than is regularly transported by the stream, and the channel is shallow (Figure 3-11). Alluvial fans are broad, wedge-shaped deposits of sediment, usually between a steep mountain front or canyon and a gentler valley bottom. Alluvial fans are characterized by multiple channels that spread apart from each other (Figure 3-12). The floodplain is much wider than the active channel, and only a small part of the fan is usually active. However, flow can easily move from one side of the fan to another.

Table 3-14. Major streams along the Mosquito Pass access road with drainage area, channel, and floodplain characteristics

Basin Name	Drainage Area (mi^2)[(a)]	Floodplain Width (ft)	Channel Width (ft)	Channel Form at Crossing
Cobblestone River	58.7	500	100	Single Braid Alluvial Channel
Osborn Creek	8.6	480	44	Alluvial Fan
Windy Creek	11.7	115	100	Single Thread Rocky Channel
North Star Creek	2.7	300	19	Alluvial Fan
Sinuk River	8.7	250	50	Multiple Thread Rocky Channel
Buffalo Creek	5.0	320	60	Single Thread Semi-Alluvial Channel
Nome River	5.4	380	50	Multiple Thread Alluvial Channel

Notes: ft = foot/feet; mi^2 = square mile(s)
[a] Drainage area at the crossing location.

Figure 3-9. Digital Elevation Model hillshade of Glacier Canyon Creek as it transitions from a narrow, incised channel to a low-gradient alluvial channel

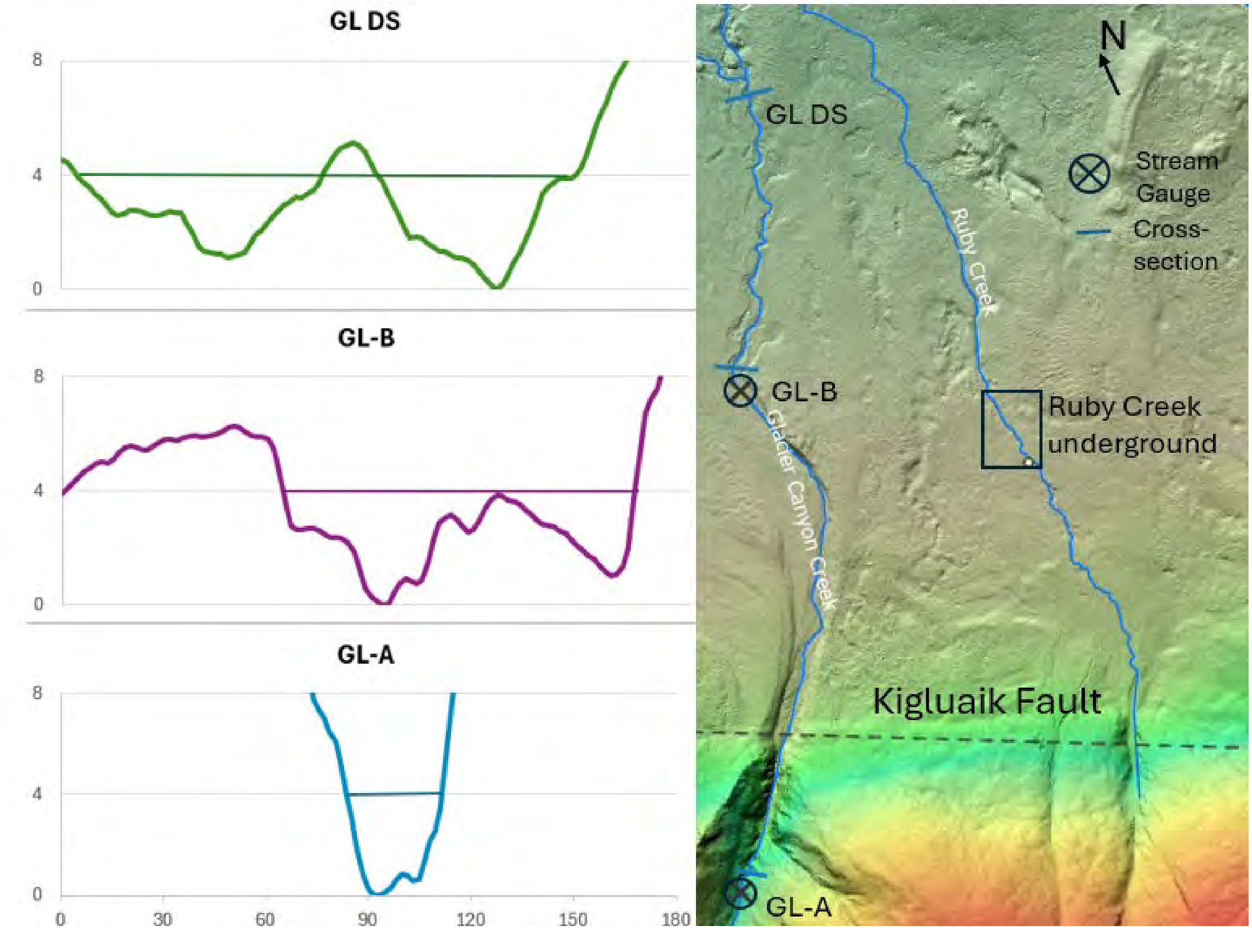


Figure 3-10. Cobblestone River alluvial channel with active gravel bars

Figure 3-11. Sinuk River rocky channel

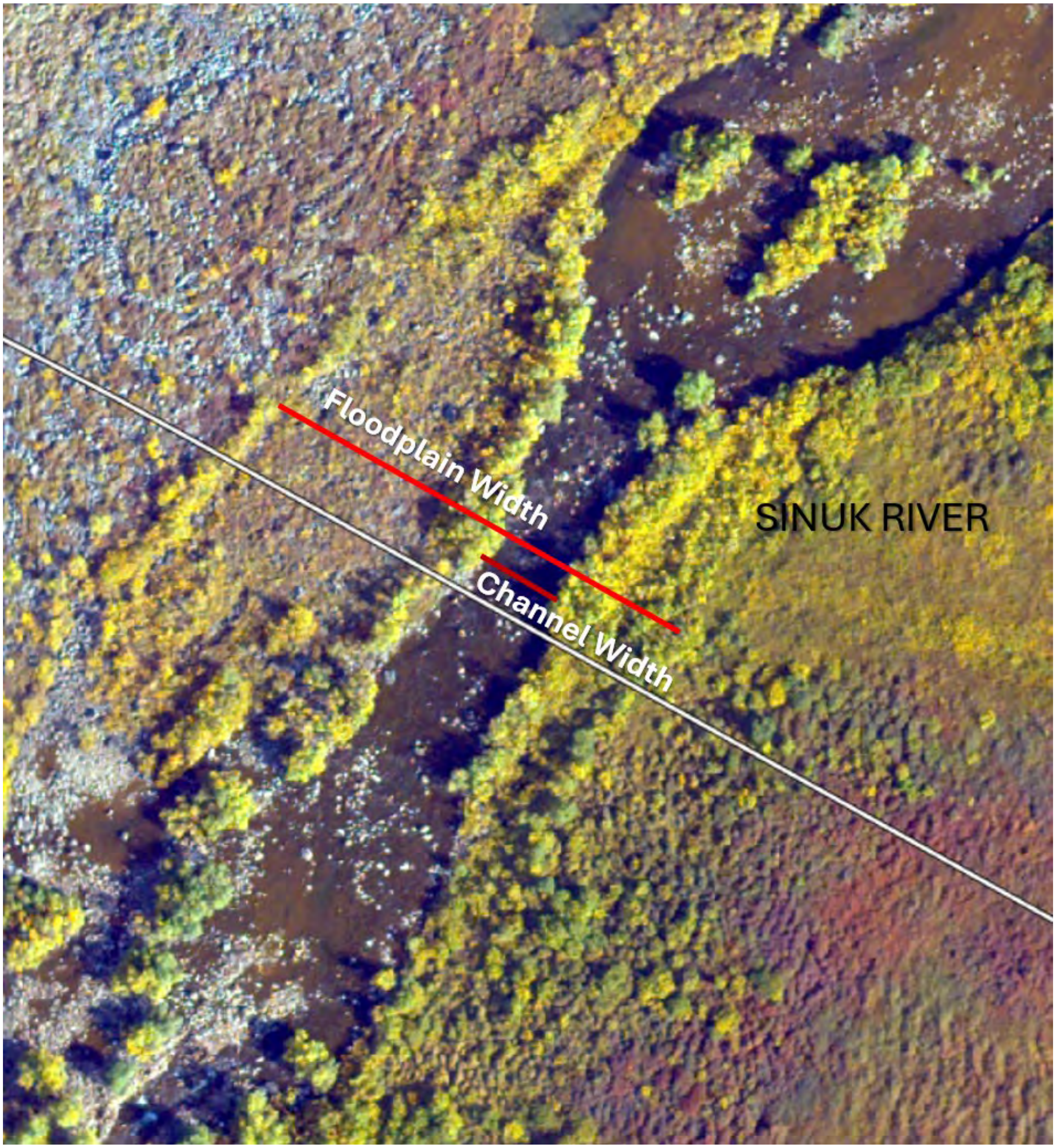
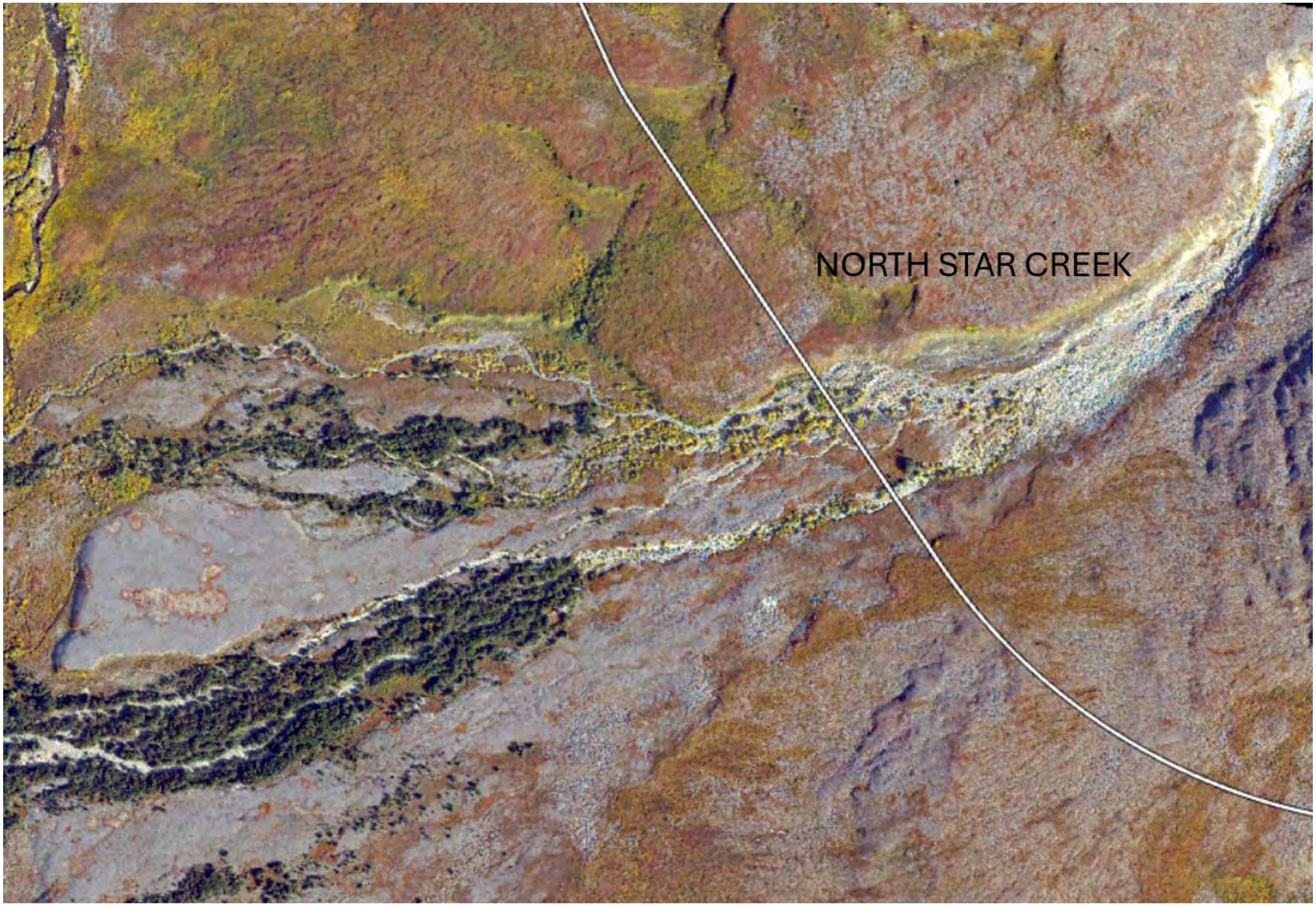


Figure 3-12. North Star Creek alluvial fan channel form



3.1.7 Water Quality

This following section describes existing conditions related to surface water and groundwater quality within the Project area.

3.1.7.1 Water Quality Overview

The Project area includes a range of water resources, including upland headwater streams, shallow and deeper groundwater systems, and Imuruk Basin. These systems exhibit variable chemical conditions that reflect differences in geology, hydrology, elevation, and landscape position. Surface water and groundwater are chemically and hydraulically distinct across much of the site, and each stream and aquifer unit presents different water quality characteristics.

Water quality conditions across the Project area are influenced by seasonal hydrology. Snowmelt dominates streamflow during early summer, while baseflow sustained by shallow groundwater and residual summer precipitation is the primary source of discharge during late summer and early fall (ERM 2020; ABR 2024a, 2024b). This seasonal transition affects pH, conductivity, dissolved solids, and other parameters throughout the year. Groundwater chemistry shows differences between shallow and deep aquifers, and varies depending on location, depth, and subsurface material. Imuruk Basin, located at the lower end of the watershed, receives inflow from both surface and groundwater sources and transitions from freshwater to brackish conditions with depth and tidal influence (Tundra/ABR 2026). Imuruk Basin salinity is also influenced by season (snow melt and later summer precipitation) resulting in significant freshwater input. During the winter, runoff is drastically decreased; however, the tidal input of saltwater is constant throughout the year resulting in higher salinity levels in the winter (Brailey and Tundra 2026).

Surface waterbodies within the Project footprint include tundra streams and tributaries such as Glacier Canyon Creek (historically “Ptarmigan Creek” above the confluence with Graphite Creek), Graphite Creek, Trail Creek, Ruby Creek, and other unnamed tributaries that originate near the mineralized deposit. Additional waterbodies within the Project area include the Cobblestone River, Oro Grande Creek, and their tributaries. Streams that ultimately flow into Imuruk Basin include Fall Creek, the Cobblestone River, and several unnamed tundra tributaries west of the Project footprint. Imuruk Basin is a broad intertidal lake that is hydrologically and ecologically significant to the region (ERM 2020; Tundra/ABR 2026).

The information presented in this section is based on the comprehensive water quality sampling report prepared by Tundra Consulting and ABR (2026). Surface water sampling was typically conducted multiple times a year between June and October. Groundwater data was collected from wells screened in both bedrock and unconsolidated material (Tundra/ABR 2026).

3.1.7.2 Regulatory Overview

Water quality conditions in the Graphite Creek region are evaluated against AWQS established under 18 AAC 70 (ADEC 2025c). These standards are designed to protect designated and existing uses of all waters of the state, including surface waters and, in limited cases, groundwater. Where applicable, specific parameters (e.g., pH, sulfate, total dissolved solids [TDS], aluminum, iron, zinc, manganese) are compared directly to AWQS for freshwater aquatic life or drinking water use (Tundra/ABR 2026; SRK 2026a). AWQS include both narrative and numeric criteria. Narrative criteria prohibit visible oil, sludge, or objectionable turbidity, as well as any toxic or deleterious substances in concentrations that may impair water uses. Numeric criteria establish specific concentration limits for a wide range of analytes, including metals, nutrients, major ions, and other substances that may pose risks to aquatic life, human health, or water supply.

Under Section 303(d) of the CWA, states are required to identify surface waters that do not meet water quality standards for one or more designated uses. These waters are listed as impaired and may require the development of total maximum daily loads to address pollutants of concern. The ADEC maintains the state's list of impaired water bodies and updates it regularly in coordination with the EPA.

As of the most recent ADEC Integrated Report (2025d), no impaired water bodies are located within or adjacent to the Project area.

3.1.7.3 Geochemistry

The geochemistry of waste rock and tailings material is a critical component of water quality characterization in mining projects. While baseline water chemistry reflects current conditions, the mineralogical and chemical properties of mined material determine the potential for future changes in surface water quality if exposed to air and water. The composition of rock types, their acid-generating potential, and leachability of trace metals inform the selection of constituents of interest and provide a foundation for monitoring and water management planning. For these reasons, baseline geochemical data are included in this section to establish the current profiles of site materials and their relevance to future water-rock interactions.

Baseline geochemical characterization of waste rock and tailings was conducted to assess the potential for acid generation, elemental leaching, and mobilization of naturally occurring compounds or constituents that could influence water quality if exposed to surface water or precipitation. Characterization was performed by SRK Consulting using static and kinetic test methods on representative drill core samples and metallurgical tailings composites (SRK 2026a). These data establish the geochemical baseline conditions of the Project area and support the identification of potential constituents of interest for future monitoring and permitting.

The geology of the Project area consists primarily of high-grade metamorphic rocks from the lower Kigluaik Group, including quartz-biotite schist, quartz-biotite-garnet schist, and quartz-biotite-sillimanite schist, which contain variable amounts of sulfide minerals and have limited carbonate buffering capacity (SRK 2026a). These rock types are the most geochemically reactive, with acid-base accounting results showing that 75 percent of quartz-biotite schist, 88 percent of quartz-biotite-garnet schist, and 100 percent of quartz-biotite-sillimanite schist samples are potentially acid generating (PAG; SRK 2026a). The principal graphite-hosting unit, quartz-biotite-garnet-sillimanite schist, exhibited a mixture of PAG and non-PAG classifications that attributed to lower sulfide concentrations. The presence of carbonate minerals was minimal across all rock types, resulting in low neutralization potential and limited buffering against acid generation.

Solid-phase elemental analysis showed that there are elevated concentrations of several trace metals relative to upper crustal abundance benchmarks (SRK 2026a), including arsenic, cadmium, molybdenum, and selenium. These concentrations do not represent current water quality levels but highlight elements with metal-leaching, acid rock drainage (ARD) potential. Kinetic testing using humidity cells confirmed that acid generation can occur rapidly in PAG rock types. Three of six cells reached pH values below 4.5 within 22 weeks, and as pH declined (became more acidic), leachate concentrations of sulfate, aluminum, cadmium, cobalt, copper, lithium, manganese, nickel, selenium, uranium, and zinc increased (SRK 2026a). These data demonstrate that the rocks tested have the potential to develop low pH (acidic) conditions, and low-buffering rocks at the site could leach trace metals under acidic conditions.

Geochemical testing of rougher tailings composite also demonstrated variable acid generation potential. Among six tailings samples, the static results were four classified as non-PAG and two as PAG, with sulfide concentrations ranging from 0.02 to 0.18 percent. A humidity cell test on the rougher tailings composite showed a gradual decline from an initial neutral pH buffered at 7 to a stable range of 5.3 to 5.6 after 16 weeks, which suggests that buffering occurred through aluminosilicate minerals rather than through carbonates (SRK 2026a). Although no water quality standards were exceeded in the solid-phase extraction static tests, process water samples produced with the rougher tailings composite contained elevated concentrations of manganese and zinc (dissolved), and aluminum, copper, iron, Pb, selenium, and silver (total) compared to Alaska Water Quality Criteria (SRK 2026a). These comparisons were to determine potential constituents of interest and do not indicate existing exceedances in the environment.

The mineralogical setting of the deposit, including graphite-bearing schists and amphibolite-facies metamorphic units, is conducive to sulfide oxidation when exposed to air and water. Overburden is generally thin and discontinuous, consisting of glacial and fluvial deposits overlying bedrock exposures (Till et al. 2011; Tundra Consulting 2024). This limited cover and the presence of reactive rock types reinforce the importance of managing water-rock interactions.

3.1.7.4 Groundwater Quality

Groundwater in the project area occurs in two distinct hydrogeologic systems: a fractured bedrock aquifer in the uplands south of the Kigluaik Fault and an unconsolidated sediment aquifer in the lowlands north of the fault (Figure 3-13). These systems differ in permeability, hydraulic behavior, and geochemical character. The Kigluaik Fault has very low permeability and restricts flow from the upland aquifer to the lowland aquifer.

Water quality data for both systems was first collected during the 2021 field program and has continued each year with additional wells added annually through 2025. The laboratory results include major ions, metals, pH, conductivity, alkalinity, and TDS. Temperature, turbidity, dissolved oxygen, pH, and conductivity are measured in the field at the time of sampling. Where applicable, results are compared to water quality criteria in AWQS (18 AAC 70), including hardness-adjusted criteria for cadmium, copper, Pb, nickel, silver, and zinc (Tundra/ABR 2026; ADEC 2024).

UPLANDS

Groundwater data within the uplands area was collected from wells located in bedrock in the proposed pit. Two of the wells (24GCT019 and 21GC068) are collared (surface drilling location) north of the fault, but the groundwater sample locations were located in bedrock due to the angle of the drill hole and the angle of the fault. The aquifer was sampled from shallow depths (98 to 131 feet) down to below the depth of the planned pit (approximately 984 feet). There is a discontinuous permafrost interval from approximately 115- to 328-foot depth that has a perched aquifer above. Two of the shallow samples were collected in the perched aquifer.

The water chemistry presented below (acidic, low alkalinity, high TDS, high sulfate, high aluminum, and high iron) are indicative of natural ARD conditions. ARD indicators are also seen in the rock geochemistry (Section 3.1.7 Water Quality) and in surface water quality (Section 3.1.7.5).

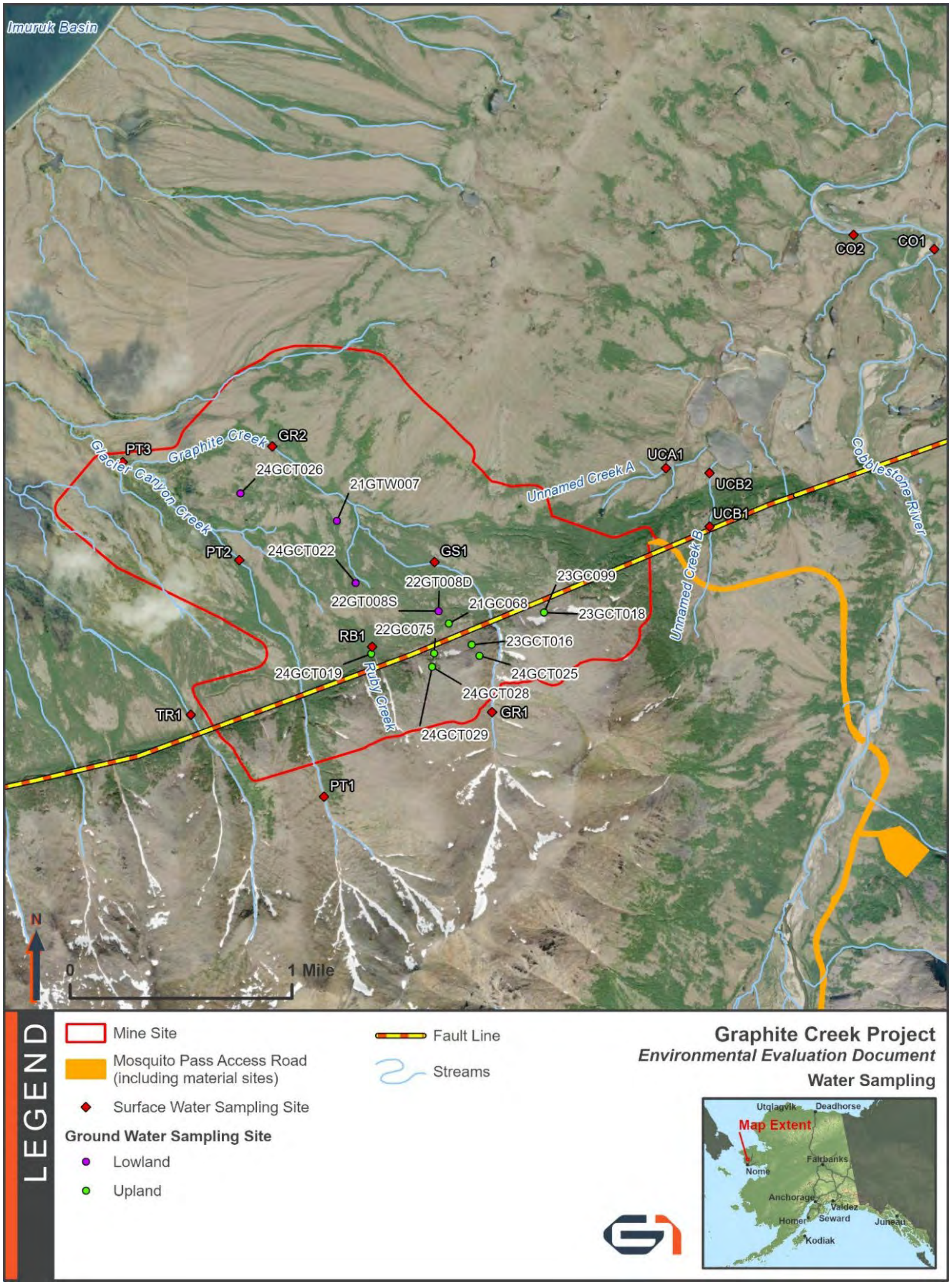
WATER TYPE

The upland groundwater is generally a calcium-magnesium sulfate water type, which drives the pH of the water. This water type is due to the parent bedrock material in contact with the groundwater.

TEMPERATURE

Groundwater temperatures in the uplands area consistently range from 35.6 to 39.2^{o}F with August samples tending to have the highest temperature readings. Deep groundwater samples show similar readings. The perched aquifer is more variable with low temperatures near 33.8^{o}F.

Figure 3-13. Surface and groundwater sample locations



pH and Alkalinity

The groundwater pH is variable with no apparent pattern relative to depth or location. Groundwater at most sample locations range from mildly acidic to very basic (typical range of 6.2 to 10).

The AWQS for alkalinity is 20 milligrams per liter (mg/L) calcium carbonate. Alkalinity measures the ability of the rocks and water to neutralize acids. Low alkalinity levels in groundwater indicate that there is little or no buffering capacity in the water to resist rapid drops in pH. The upland aquifer has a wide alkalinity range, and similar to pH, there is no apparent pattern relative to depth or location. The aquifer generally has low alkalinity, but is above the regulatory criteria, ranging from 18 to 100 mg/L. Based on the groundwater sampling done to date, 31 percent of the groundwater well samples collected in the uplands area do not meet AWQS.

Total Dissolved Solids and Sulfate

Naturally occurring ARD systems often have high sulfate concentrations in water due to the oxidation of sulfide minerals, which is part of the acid generating process. The dissolved sulfate, iron, and other metals often result in high TDS. TDS and sulfate exceed AWQS in 84 percent and 88 percent of the samples collected to date, respectively.

In the uplands area, groundwater TDS concentrations range from 700 to 1,500 mg/L, which exceed the AWQS 500 mg/L. Groundwater samples from the central part of the pit have distinctly high TDS concentrations, ranging from 4,000 to 10,000 mg/L.

The sulfate concentration is correlated with TDS and exceeds the AWQS of 250 mg/L at all sampling locations except one (23GCT018). The typical sulfate range within the uplands area is 500 to 1,000 mg/L. Similar to TDS, measurements from the center of the pit area are much higher, with sulfate concentrations ranging from 2,500 to 9,000 mg/L. Both the high TDS and sulfate concentrations measured from groundwater sampling are consistent with a naturally occurring ARD system.

Metals

The two metals most commonly mobilized into water under ARD conditions are aluminum and iron. The AWQS for aluminum is 0.087 mg/L. Aluminum concentrations in the upland aquifer are highly variable, typically ranging from 0.009 to 10 mg/L. A majority of the samples (67 percent) collected from the aquifer in the uplands area exceed the AWQS for aluminum. Similarly, sampling to date from the aquifer in the upland area shows iron content exceeding the AWQS of 1 mg/L. The highest iron concentrations are found within the proposed pit and far exceed AWQS, range from 700 to 2,000 mg/L.

Other metals that are typically associated with naturally occurring ARD environments are seen in the upland aquifer at levels exceeding the regulatory standards including nickel (55 percent of samples), cobalt (51 percent), and zinc (31 percent). Other metals with fewer exceedances include cadmium (8 percent), copper (8 percent), and uranium (6 percent).

Non-metals that may be mobile in natural acidic environments have also been recorded, including fluoride (37 percent of samples) and beryllium (6 percent of samples), while selenium concentrations exceeding AWQS have been recorded in a single sample. Barium, which is not generally associated with leaching in acidic environments, exceeds the regulatory criteria in 6 percent of samples.

Lowlands

The Kigluaik Fault is at the mountain front and separates the upland aquifer to the south from the lowland aquifer to then north (Figure 3-13). Downgradient from the proposed pit, the lowlands are dominantly comprised of glacio-fluvial and fluvial sediment with glacial till located on the eastern side of the project area. All of the monitoring wells are located downgradient of the proposed pit in the glacio-fluvial and fluvial sediment and were installed to varying depths. Sample locations are shown on Figure 3-13. The wells range in distance from 656 to 5,249 feet from the Kigluaik Fault

Water Type

The lowland groundwater is generally similar to the upland water and is a calcium-magnesium sulfate type. In the lowland sampling locations farthest from the Kigluaik Fault (24GCT026) the water is a mixed type, with a chloride component not recorded at any other sampling locations in the Project area.

Temperature

Lowland groundwater temperatures range from 35.6 to 39.2ºF. The shallow proximal location shows a wider range of temperatures, reaching as high as 46.4ºF, presumably due to meteoric water influence.

pH and Alkalinity

The lowland groundwater is slightly acidic to slightly basic with a typical pH range of 6.1 to 8.0. The most distal well from the pit (24GCT026) is distinctive with a basic pH range of 10.8 to 11.8.

Alkalinity varies between the wells but is consistently above AWQS. The majority of locations have an alkalinity range of 40 to 190 mg/L The most upgradient of the distal wells (24GCT022) is distinctive with an alkalinity of 24 mg/L. The most distal well (24GCT026) (very high pH) is at the upper end of typically observed alkalinity range.

The proximal water samples have a pH and alkalinity close to neutral, in contrast to the water on the other side of the fault.

Total Dissolved Solids and Sulfate

The lowland groundwater has moderately high TDS levels that exceed regulatory criteria of 500 mg/L in 30 percent of samples. The TDS concentration is generally between 250 and 500 mg/L. The exception is well 22GT008 which was sampled at two depths, one shallow and one deep. The shallow sample initially had high TDS levels which have steadily dropped and are now below regulatory limits. The deep sample location is distinctive and exceeds the regulatory limit with the TDS level ranging from 850 to 1,100 mg/L. This is considerably lower than the TDS seen immediately on the other side of the Kigluaik Fault.

Sulfate levels are poorly correlated with TDS. The majority of locations have moderate sulfate concentrations ranging from 100 to 250 mg/L. Similar to TDS, the sulfate content in the deep sample at well 22GT008 is high compared to other samples, ranging from 45 to 850 mg/L. All samples that exceed the sulfate criteria (24 percent) were seen at the proximal location. The most distal has shown relatively low sulfate levels ranging from 40 to 60 mg/L.

Metals

The metal concentrations of the lowland groundwater are generally low. Aluminum has the highest number of samples that exceed regulatory criteria (36 percent exceed the criteria of 0.087 mg/L). The aluminum content of groundwater in the lowland aquifer is highly variable with a range of 0.002 to 1.0 mg/L. The deep proximal location and the most distal location have the highest concentrations.

Iron content is somewhat elevated with 18 percent of the samples exceeding the regulatory criteria of 1.0 mg/L. As with aluminum, the iron content of the lowland aquifer is highly variable, ranging from 0.005 to 1.1 mg/L. As with aluminum, the highest levels are seen in the deep proximal location and the most distal location.

Other metal exceedances are rare in the lowland groundwater. Six percent of the samples had copper, and 6 percent of the samples had molybdenum concentrations that exceed regulatory criteria (two samples each).

3.1.7.5 Surface Water Quality

Surface water sampling has been conducted intermittently since 2014 to provide pre-development baseline water quality monitoring. The baseline data provides information about existing conditions and helps guide development of the mine and required water treatment systems.

Water quality is currently monitored in seven streams: Cobblestone River, Graphite Creek, Glacier Canyon Creek, Ruby Creek, Trail Creek, Unnamed Creek A, and Unnamed Creek B (Figure 3-13). The Cobblestone River, east of the mine site, is the largest stream in the project area and drains a substantial portion of the interior of the Kigluaik Mountains. Graphite Creek, Glacier Canyon Creek, and Ruby Creek drain the proposed mine area or terrain to the west with similar mineralization. Unnamed Streams A and B drain into the Cobblestone Drainage and drain areas with glacial till deposits, but they may be influenced by the mineralized rocks. Baseline data collected to date shows that mineralization is naturally occurring in Unnamed Streams A and B. Unnamed Stream B drains from the proposed mine area.

Information in the following surface water quality sections is from data collected in 2014-2016, 2018-2019, and 2021-2025 (Tundra/ABR 2026).

Cobblestone River Water Quality

The Cobblestone River is sampled at two locations (CO1 and CO2) that are approximately 0.5 mile and 1 mile north, respectively, of the mountain front.

Water Type

Surface water sampling included identification of the major ions and cations, which is important to help understand the surface water chemistry and the waters' ability to dissolve substances it comes in contact with. Surface water in the project area is dominated by calcium and magnesium major cations, and sulfate and carbonate/bicarbonate major anions.

Temperature and Dissolved Oxygen

The Cobblestone is a subarctic stream with a thick ice cover in the winter. Larger pools do not completely freeze to the substrate. Summer temperatures are around 42.8ºF, reaching a typical high of 50 to 53.6ºF in late July or early August. The dissolved oxygen concentration varies between 12 and 14 mg/L.

Turbidity and Total Suspended Solids

The Cobblestone is a clear river with a turbidity ranging from 0.6 to 1.6 nephelometric turbidity units (NTU), but it can reach 10 NTU or higher during storm events. Total suspended solids (TSS) are also low, typically ranging from 1 to 2.5 mg/L.

pH and Alkalinity

The pH of the Cobblestone is close to neutral and the alkalinity is low, typically in the range of 25 to 38 mg/L (AWQS is a minimum of 20 mg/L).

Total Dissolved Solids and Sulfate

Dissolved solid concentrations are typically low ranging from 60 to 130 mg/L. Sulfate is also low, typically in the range of 17 to 40 mg/L.

METALS

Metals were tested for total and dissolved concentrations; however, only the results for total metals were provided in the summary reports. Aluminum concentrations are elevated, but usually below AWQS (typical range of .016 to 0.08 mg/L, AWQS of 0.087 mg/L). The aluminum concentration in the Cobblestone slightly exceeds the AWQS approximately 5 percent of the time. Iron concentrations are slightly elevated as well, typically ranging from 0.03 to 0.2 mg/L (AWQS of 1 mg/L). Other metal concentrations are low.

The elevated aluminum and iron are likely related to streams in the Kigluaik Mountains that have iron and aluminum precipitating environments.

NUTRIENTS AND VOLATILE ORGANIC COMPOUNDS

Nutrient concentrations in the Cobblestone are low. Nitrate, nitrite, and total phosphorus are typically below detection limits (>0.1 mg/L). Ammonia concentrations are also low. These concentrations indicate a lack of nutrient enrichment and are consistent with cold, oligotrophic (relatively low in plant nutrients) headwater systems in undisturbed arctic environments.

VOCs were analyzed in 2019 to determine if there were any anthropogenic sources. No VOCs were detected in Cobblestone River samples.

MINE AREA STREAMS

The four principal streams—Graphite, Ruby, Glacier Canyon (formerly Ptarmigan), and Trail Creeks—originate in upland catchments and flow over bedrock before crossing into the lowlands and eventually draining into Imuruk Basin (Figure 3-13). Surface water quality within the mine area reflects the combined influence of steep terrain, shallow soils, naturally mineralized bedrock, and strong seasonal shifts in hydrology. Graphite Creek and Ruby Creek are tributaries to Glacier Canyon Creek; Glacier Canyon Creek and Trail Creek discharge directly into Imuruk Basin. These streams have similar geochemical traits with some variation that is described in the following sections. Water quality conditions in these streams are dynamic and driven by transitions between snowmelt-dominated runoff during early summer and baseflow during mid-summer and storm runoff in the late summer. Winter streamflow is minimal or is unmeasurable at most gauging locations being monitored for the Project.

These streams are characterized by precipitate that is indicative of naturally occurring ARD conditions. The upper reaches in the uplands have a white aluminum sulfate precipitate. Near the mountain front, the precipitate transitions to rust colored iron oxide.

Water Type

The deposit drainages are dominated by calcium sulfate and are strongly influenced by the high sulfate content. In this type of water, strong acids exceed weak acids, which is a typical water type in ARD environments.

Temperature and Dissolved Oxygen

These are typical subarctic streams in that they are frozen in the winter, break-up in late May or June, and start freezing again in October. Streams likely have base flow that finds their ways both above and below the stream bed (Brailey 2025).

Summer water temperatures typically range between 33.8 and 42.8°F, rarely reaching 50°F. The dissolved oxygen levels are slightly higher than the Cobblestone River, typically ranging from 13 to 15 mg/L and occasionally reaching 18 mg/L. The dissolved oxygen in Glacier Canyon Creek, below the Graphite Creek confluence, is lower (12 to 13 mg/L).

Turbidity and Total Suspended Solids

The turbidity of the deposit area streams is higher than the Cobblestone River but still low with a range of 0.3 to 15 NTU. Graphite and Glacier Canyon Creeks show a slight increase in turbidity from the upstream to the downstream direction.

Suspended solids have a similar pattern as turbidity does, though the lower Glacier Canyon location does not show an increase in suspended solids. The TSS for these streams typically ranges from 2 to 20 mg/L.

pH and Alkalinity

The mine area streams are acidic and have very low alkalinity. The pH of these streams typically ranges from 4 to 7 with the pH of each reach of a stream typically varying over a range of one to two pH units. Ruby Creek is distinct from the other streams with a typical pH range of 4.5 to 5. Upper Graphite Creek (in the uplands) is less acidic with a typical pH between 6 and 7.

All deposit area streams have alkalinity levels that do not meet the AWQS of 20 mg/L (AWQS is a minimum concentration). With the exception of upper Graphite Creek and Trail Creek, the alkalinity typically ranges from 0.5 to 3 mg/L. Upper Graphite Creek and Trail Creek are distinctly higher with typical ranges of 10 to 20 mg/L and 3 to 10 mg/L, respectively, but still below the State criteria. The low pH and low alkalinity indicate that there is insufficient buffering capacity to buffer the acid generated by the oxidation of sulfide minerals, a situation often seen in ARD systems.

Total Dissolved Solids and Sulfate

High TDS and sulfate levels are also typical of ARD systems. The deposit area streams have TDS levels that fall into three groups. Glacier Canyon and Trail Creeks typically range between 300 and 800 mg/L. Ruby Creek is higher, typically ranging between 450 mg/L and 1,500 mg/L. The TDS levels in Graphite Creek typically range from 100 to 550 mg/L. The deposit area streams have TDS levels exceeding the AWQS of 500 mg/L in 28 percent of the samples.

The sulfate content has a pattern similar to that of TDS. Sulfate is above the AWQS of 250 mg/L in approximately 34 percent of the samples. Concentrations range from 60 to 800 mg/L.

Metals

Streams draining ARD systems often have high aluminum and iron content as well as other metals. This is the case with the deposit area streams. Aluminum exceeds AQWS (0.087 mg/L) in approximately 76 percent of samples. Iron concentrations are more variable than aluminum and to date approximately 30 percent of samples exceed AQWS. Nickel and cadmium exceed AWQS in approximately 55 percent and 53 percent of samples from deposit area streams, respectively. Leaching of these metals is also typically associated with naturally occurring ARD.

Other metals that exceed AWQS are cobalt (26 percent), copper (16 percent), and zinc (14 percent). Pb exceeds AWQS in three samples (1.4 percent). These metals are often leached in ARD systems.

Non-metals that may be mobile in acidic environments are also detected, including fluoride (7 percent of samples) and beryllium (1.4 percent). Selenium exceeds AWQS in two samples (0.9 percent).

Weak acid dissociable (WAD) cyanide exceeded AWQS in four samples (2 percent). There has been no known human use of cyanide in the area. The WAD cyanide detected during water quality sampling is likely from biological sources.

Nutrients and Volatile Organic Compounds

Nutrient concentrations are low throughout the proposed mine area. Nitrate, nitrite, and ammonia are consistently below AWQS thresholds and do not vary significantly by season or location. Low concentrations of total phosphorous have been observed, typically below 0.05 mg/L. These low nutrient concentrations are consistent with cold, oligotrophic headwaters systems and suggest that primary productivity is naturally limited. No signs of nutrient enrichment or eutrophication have been observed in the water column or periphyton.

VOCs were sampled during the 2019 baseline study with no target compounds detected (ERM 2020). The absence of VOCs in these samples confirms that hydrocarbon contamination is not present under baseline conditions, as expected for an undeveloped and roadless watershed.

UNNAMED CREEKS A AND B

Two unnamed creeks located between the proposed mine area and the Cobblestone River have been monitored for water quality since 2014 (Unnamed Creek A) and 2024 (Unnamed Creek B). Both drain into the Cobblestone River. Creek A drains a low saddle through which the road would pass; the access road would cross Creek B. Most of the Creek A drainage is composed of glacial till, but a small part of the drainage includes potentially mineralized upland. The majority of the Creek B drainage is the uplands and includes a potential extension of the mineralized rock. A substantial part of the surface in the Creek B drainage is covered by glacial till.

These drainages have characteristics that are generally intermediate between Cobblestone River characteristics and deposit area stream characteristics: they show characteristics of both mineralized rock and glacial till. They are not consistent, however, with each creek sometimes showing characteristics of one or the other.

WATER TYPE

Creek A has a calcium bi-carbonate water type which none of the other creeks in the project area had. Creek A water type indicates it has buffering capacity unlike other streams that were tested. Creek B has the same type of water as the streams in the deposit area – calcium sulfate.

TEMPERATURE AND DISSOLVED OXYGEN

The temperature of these creeks is in the 39.2 to 42.8ºF range during the summer, similar to the Cobblestone River. The dissolved oxygen of Creek B is similar to the other streams. However, Creek A has the lowest dissolved oxygen in the study area, typically ranging from 10 to 12 mg/L.

TURBIDITY AND TOTAL SUSPENDED SOLIDS

The two drainages have similar turbidity, but different TSS concentrations. Turbidity is typically between 4 to 20 NTU. TSS of Creek A is typically low (4 to 6 mg/L), lowest in the study area. TSS of Creek B is similar to the deposit area streams.

PH AND ALKALINITY

Both creeks have pH values in the neutral range with low alkalinity, but meet AWQS, similar to the Cobblestone River. The alkalinity levels suggest that there is sufficient alkalinity to buffer acid generation that may be happening in the drainages.

TOTAL DISSOLVED SOLIDS AND SULFATE

TDS and sulfate concentrations in both drainages meet AWQS. TDS and sulfate in Creek A are low, similar to waters in the Cobblestone River. Creek B is similar to the deposit area streams with moderate TDS and sulfate concentrations (but without the higher concentrations that are sometimes seen in the deposit area streams). This suggests that there may be some ARD influence in the Creek B drainage.

METALS

Aluminum concentrations in both creeks exceed AWQS but fall between the concentrations seen in the Cobblestone River and the deposit area creeks. Iron concentrations in both creeks are similar to the deposit area creeks (though deposit area creeks show a much larger range of concentrations). The median iron concentrations are very close to the AWQS with over half of the samples exceeding the limit. The elevated aluminum and iron concentrations also suggest ARD influence in the drainages.

Cadmium concentrations in these creeks do not exceed AWQS. Cadmium in Creek A is low, similar to the Cobblestone River. Cadmium concentrations in Creek B are also low but fall between concentrations found the Cobblestone River and the deposit area streams. Nickel concentrations did not exceed AWQS in these creeks with similar patterns relative to the other streams.

Concentrations of other minerals are below AWQS in both creeks. The concentrations tend to fall between those of the Cobblestone and those of the deposit area creeks.

3.1.7.6 Imuruk Basin

The Imuruk Basin is a large tidal lake. It has a mean tidal range of 0.35 feet (NOAA 2024). Water that discharges from the Imuruk Basin flows through the Tuksuk Channel to Grantley Harbor and then to Port Clarence on the Bering Sea. The Tuksuk Channel has large flow rates that are strongly tidally influenced and may reverse flow direction during certain tidal conditions (Brailey and Tundra 2026. The Imuruk Basin receives inflow from rivers that drain much of the interior of the Seward Peninsula, including the Agiapuk, Kaviruk, Kuzitrin, and Cobblestone Rivers. The deposit area streams (Graphite, Glacier Canyon, and Trail Creeks) discharge into the south side of the basin.

The basin has an area of approximately 90 square miles, a length of 17 miles, and a depth of 10 to 15 feet. The Tuksuk Channel is at least 60 feet deep. The channel bottom extends a short distance into the basin at a depth of 20 to 25 feet. Basin waters are thought to be well mixed by wind and waves related to the large surface area and shallow nature of the basin.

The basin has been monitored by performing depth profiles at 12 sites distributed throughout the basin (Figure 3-14). Water samples have been collected at a site near the basin outlet and near where deposit area streams enter the basin. The depth profiles have been measured at 1.6- or 3-foot intervals. Measurements have included turbidity, temperature, pH, conductivity/salinity, dissolved oxygen, and oxygen reduction potential. Water samples were also collected and analyzed in the laboratory for the same characteristics as surface and groundwater sampling, described in Sections 3.1.7.4 Groundwater Quality and 3.1.7.5 Surface Water Quality.

Information in the following sections is from Forester and Seigle 2024a; Forester and Seigle 2024b; and Forester et al. (in preparation) unless otherwise referenced.

SALINITY

The water of Imuruk Basin varies from slightly brackish to freshwater. The salinity of the basin varies over the year. Brackish conditions are dominant during winter while the basin is continuously covered in ice. Freshwater inputs then greatly increase in response to snow melt runoff in the early summer and during fall when rain storms are frequent

Saline water enters the basin during high tides. Saline water is denser than fresh water, therefore it typically enters as a layer at the bottom of the water column. Higher salinity is often seen near the outlet at depths of 12 to 13 feet, below which the salinity often reaches 8 to 10 ppt.

The largest quantities of fresh water enter the basin from the north, east, and southeast. Some weak stratification of freshwater over brackish water is seen in samples collected in the eastern end of the basin in September.

TEMPERATURE AND DISSOLVED OXYGEN

The temperature of the Imuruk Basin water typically ranges from 50 to 55ºF in the summer with the warmest water temperatures occurring in August. Dissolved oxygen levels range from 10.9 to 12.4 mg/L.

TURBIDITY AND TOTAL SUSPENDED SOLIDS

The Imuruk Basin is a clear water body with turbidity typically ranging from 2.8 to 4.4 NTU. TSS are also low, typically ranging from below method detection limits to 4.6 mg/L.

pH AND ALKALINITY

Imuruk Basin water is typically slightly basic with a pH in the 7.5 to 8 range. Typical seawater has a pH of a little over 8, so this range is reasonable for brackish water. The alkalinity is in the range of 50 to 80 mg/L which is low for seawater, but higher than seen in the Cobblestone or deposit area streams. The alkalinity suggests that the Imuruk Basin waters have good buffering capacity.

Figure 3-14 Imuruk Basin water monitoring locations

TOTAL DISSOLVED SOLIDS AND SULFATE

Salinity, TDS, and sulfate are directly correlated in Imuruk Basin. TDS and sulfate were measured at two depths at two sample locations. TDS levels in the Imuruk Basin range from 450 to 1,140 mg/L, generally above the freshwater standard of 500 mg/L. The sulfate content ranges from 35 to 90 mg/L, well below the freshwater standard. The high TDS is likely due to the brackish conditions as suggested by the correlation with salinity and that the major anion ratios are similar to those of seawater.

METALS

Alaska does not have marine or brackish water criteria for most metals. The freshwater criteria are used for comparison purposes.

Available samples suggest that the aluminum concentration of Imuruk Basin is typically in the range of 0.10 to 0.16 mg/L, which is above typical levels for marine and freshwaters. The freshwater standard is 0.087 mg/L. Aluminum concentrations at both depths at the location relatively near the inlet of the deposit area streams is greater than 0.4 mg/L in late-July/early-August of both 2023 and 2024.

The iron content is typically in the range of 0.3 to 0.6 mg/L, which is below the freshwater standard of 1 mg/L for iron. In both 2023 and 2024, the highest concentrations were seen in late-July/early-August at both depths at the sample location nearest the deposit area stream inlets, exceeding the freshwater criteria.

Other metals in Imuruk Basin do not exceed freshwater standards.

NUTRIENTS AND VOLATILE ORGANIC COMPOUNDS

Water in the Imuruk Basin has not been analyzed for VOCs.

Nitrate and nitrite concentrations were below 0.01 mg/L in most samples, and total phosphorus was typically below 0.02 mg/L. These values are consistent with undeveloped freshwater systems and indicate that Imuruk Basin is not subject to nutrient loading from upstream sources.

3.2 Biological Environment

This section provides data and background necessary to support the conclusions presented in Chapter 4 (Environmental Consequences) of this EED. Biological Resources include vegetation, wetlands, and other WOTUS; fish; birds; terrestrial mammals; marine mammals; and threatened and endangered (T&E) species.

3.2.1 Vegetation, Wetlands, and Other Waters of the United States

The Project study area for vegetation, wetlands, and other WOTUS encompasses approximately 15,688 acres. The study area covers an approximately 2,000-foot-wide corridor along the proposed Mosquito Pass access road (1,000 feet on either side of centerline), an approximately 1,000-foot buffer of material sites, and a large area surrounding the mine site that encompasses all proposed infrastructure.

3.2.1.1 Vegetation

The Project study area is located within the Seward Peninsula ecoregion (Nowacki et al. 2001). The Seward Peninsula ecoregion consists of a landscape mosaic of coastal lowlands; expansive convex hills with scattered broad valleys; and small, isolated groups of rugged mountains. Vegetation is principally tundra, with alpine Dryas-lichen tundra and barrens at high elevations as well as moist sedge-tussock tundra at lower elevations. Patches of low-growing ericaceous and willow-birch shrubs occur on better-drained areas (Nowacki et al. 2001).

Vegetation Mapping

The Alaska Vegetation and Wetland Composite (AKVWC), provided by the Alaska Center for Conservation Science (ACCS), was used for Project study area vegetation mapping (ACCS 2023). The AKVWC combines data derived from 28 regional land cover maps that have been developed within the last 31 years. This dataset contains hierarchical levels of land cover classes that are represented by both coarse- and fine-scale classes. Coarse-scale classes are analogous to Level III of the Alaska Vegetation Classification; fine-scale classes, which nest within the coarse-scale classes, are analogous to Level IV (Viereck et al. 1992). The AKVWC vegetation mapping shows alder, dwarf shrubs (including *Dryas* species) and some low shrub communities within Project study area uplands (ACCS 2023; see Figure 3-15 and Table 3-15). Wetter areas consist of sedges, tall willow, and low shrub communities.

Table 3-15. Acreages of mapped vegetation community types

Mapped Vegetation Community Type	Vegetation Mapped (acres)[(a)]
Shrub	—
Alder	2,979.7
Dwarf Shrub	4,796.9
Low Shrub	4,072.9
Tall Willow	490.8
Total Shrub	**12,340.4**
Herbaceous	—
Sedge	144.7
Tussock Tundra/Lichen	2,965.9

Mapped Vegetation Community Type	Vegetation Mapped (acres)[a]
Total Herbaceous	**3,110.6**
Total Vegetated Cover	**15,451.0**
Unvegetated Cover[b]	237.0
Total Mapped Project Study Area	15,688.0

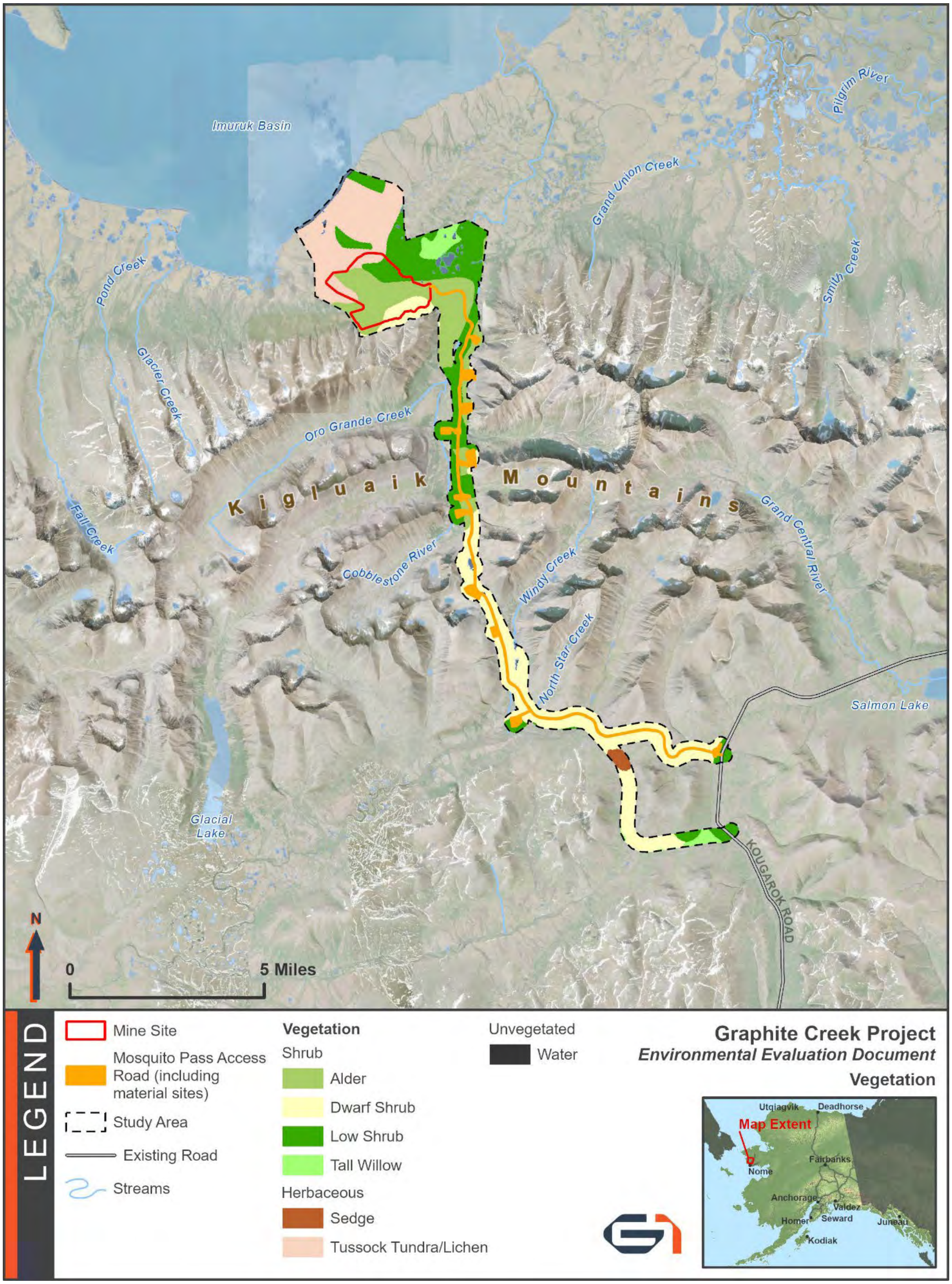
Source: ACCS 2023

a The mapped area includes approximately 1,000 feet from each side of the Mosquito Pass access road centerline (2,000 feet total corridor width), a 1,000-foot buffer of material sites, and a large area surrounding the mine site that encompasses all proposed infrastructure. Total acreage presented may not reflect the sum of the individual cells due to rounding.

b Unvegetated cover type includes freshwater and saltwater.

Field data collected during wetland surveys in the Project study area found that low shrub communities primarily consist of birch (*Betula* spp.), alpine blueberry (*Vaccinium uliginosum*), willow (*Salix* spp.*),* and marsh labrador tea (*Rhododendron tomentosum*). Dominant dwarf shrub species found during field surveys include mountain-avens (*Dryas* spp.*),* and white Arctic mountain-heather (*Cassiope tetragona*) in dryer locations as well as black crowberry (*Empetrum nigrum*), northern mountain cranberry (*Vaccinium vitis-idaea*), and bog rosemary (*Andromeda polifolia*) in wetter areas (HDR 2025). Vegetative communities within the Project study area are primarily undisturbed.

Figure 3-15. Vegetation overview map



INVASIVE PLANTS

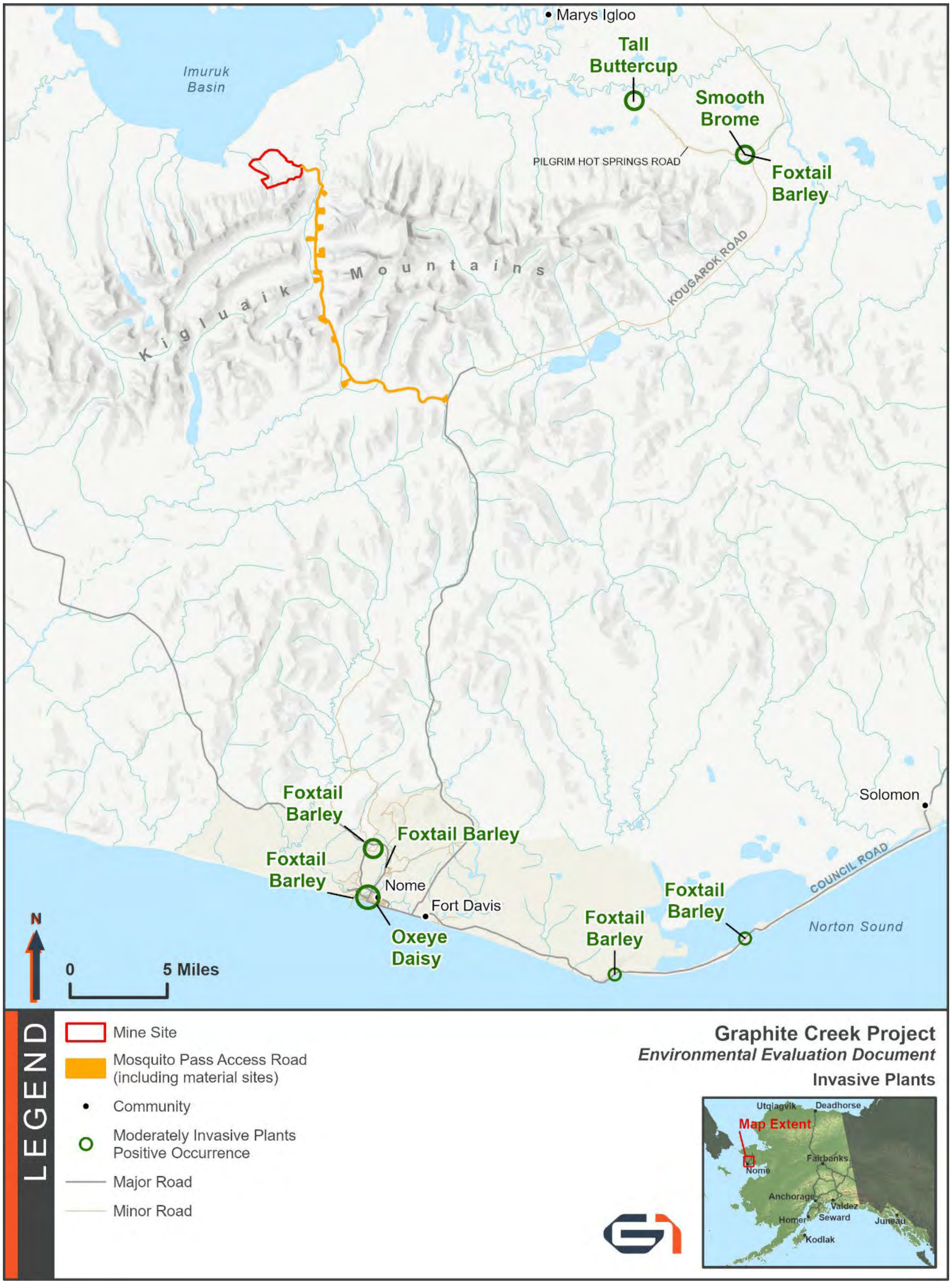
Invasive species are those species introduced from another region that become established and often overcome native species. Once established, invasive species can permanently change the structure and function of ecosystems by competing or hybridizing with native species, altering soil and water composition, and degrading water quality. Invasive species can change ecosystems by altering habitat composition, increasing wildfire risk, competing with native species for food and territory, changing existing predator/prey relationships, reducing productivity, or otherwise disrupting natural habitat functions (ADF&G 2025a). Reversing an infestation of invasive species can be difficult and costly, or impossible, despite large efforts. Executive Order (EO) 13112 *Invasive Species* and 64 CFR 6183 require federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts attributed to them.

The State of Alaska regulates and manages the spread of invasive and noxious weed species. Several state and federal organizations as well as regional community groups are working to identify, control, and prevent the spread of invasive and noxious weeds in Alaska. The ACCS maintains the Alaska Exotic Plants Information Clearinghouse (AKEPIC) database, which contains information on more than 400 non-native plant species tracked in the state (AKEPIC 2025a). The majority of invasive plant species have been identified near populated areas.

A review of the AKEPIC Invasive Plants Mapper indicates that there are currently no documented invasive species within the Project study area (AKEPIC 2025a). Invasive species have been identified at nearby locations in Nome as well as along the Nome-Taylor Highway and connected Pilgrim Hot Springs Road. Documented invasive species within these areas range from very weakly invasive to moderately invasive. Moderately invasive species were found in Nome and along Pilgrim Hot Springs Road, and include smooth brome (*Bromus inermis*), foxtail barley (*Hordeum jubatum*), oxeye daisy (*Leucanthemum vulgare*), and tall buttercup (*Ranunculus acris*) (Figure 3-16; ACCS 2025a). Invasive species located in nearby areas have the potential to spread into the Project area.

No surveys for Elodea (*Elodea canadensis*) have been documented within the Project study area vicinity (AKEPIC 2025b). Elodea is considered highly invasive and is a serious threat to the ecology of freshwater systems (ACCS 2025a; Carlson et al. 2016). Surveys to assess the extent of known infestations of Elodea have been challenging due to the difficulties of reaching most lakes and rivers in remote Alaska (Carey et al. 2016).

Figure 3-16. Invasive plant species found within the Project vicinity



Source: ACCS 2025a

RARE PLANTS

There are no plants listed as threatened or endangered under the Endangered Species Act (ESA) of 1973, as amended, within the Project area. However, on February 1, 2024, the Center for Biological Diversity petitioned USFWS to list the Alaskan glacier buttercup (*Ranunculus glacialis* ssp. *alaskensis*) as a threatened or endangered species under the ESA with the concurrent designation of critical habitat (Center for Biological Diversity 2024). The Alaskan glacier buttercup is a rare Arctic plant found only in the Kigluaik Mountains. According to the petition, this subspecies is considered imperiled globally and in the United States due to its extreme rarity, very restricted range, small population, and other factors, which makes it at high risk of extinction (NatureServe Explorer 2025; Center for Biological Diversity 2024).

On August 25, 2025, USFWS found that the petition to list the Alaskan glacier buttercup did not present substantial scientific or commercial information that would warrant listing the plant as threatened or endangered (90 FR 41359).

The Alaskan glacier buttercup has been found in the western and southeastern areas of the Kigluaik Mountains near the Teller Highway, along the western edge of the mountains and Kougarok Road, and along the southeastern edge of the mountains (Center for Biological Diversity 2024). However, access to the Kigluaik Mountains is difficult, and widespread plant surveys have not occurred. The Alaskan glacier buttercup is known to occur in sparsely vegetated areas from approximately 722- to 3,281-foot elevation on slopes, ridges, and summits in unstable scree or mineral soil that is not calcareous. This buttercup has been found to be associated with Alpine tundra sage (*Carex michrochaeta*), milky draba (*Draba lacteal*), Arctic stitchwort (*Minuartia arctica*), blackish oxytrope (*Oxytropis bryophila*), and McConnell's poppy (*Papaver mcconnellii*) (Center for Biological Diversity 2024). Pedestrian surveys for the Alaskan glacier buttercup were conducted in this habitat located within the upper limits of the mine site area in 2024 and 2025, but none were found.

The ACCS maintains a rare plant list for Alaska; however, no statewide protections pertain to species on the list. Table 3-16 contains a list of rare plants that have been found within the Project vicinity. Alaska moonwort (*Botrychium alaskense*) and nakedstem saxifrage (*Festuca viviparoidea* ssp. *viviparoidea)* have been previously identified in Mosquito Pass near the proposed access road and material sites (ACCS 2025b).

Table 3-16. Rare plants found within the Project vicinity

Common Name	Scientific Name	State Rank	Global Rank	BLM List
Alaska moonwort	*Botrychium alaskense*	S3	G4	Watch List
Arctic wormwood	*Artemisia senjavinensis*	S3	G3	Sensitive
Nakedstem saxifrage	*Micranthes nudicaulis* ssp. *nudicaulis*	S3	G3/G4Q	Watch List

Common Name	Scientific Name	State Rank	Global Rank	BLM List
Northern fescue	*Festuca viviparoidea* ssp. *viviparoidea*	S3/S4	G4/G5, T4/T5	N/A
Small-leaf bittercress	*Cardamine blaisdellii*	S3	G3/G4	Watch List

Source: ACCS 2025b
Notes: N/A = Not Applicable

3.2.1.2 Wetlands and Other Waters of the United States

USACE has jurisdiction over WOTUS, of which wetlands are a subset, under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act of 1899. Under EO 11990, *Protection of Wetlands*, federal agencies must avoid impacts on wetlands wherever practicable; minimize impacts that cannot be avoided; and, in some cases, compensate for unavoidable impacts. Wetlands are defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (33 CFR 328.3). Wetlands must possess the following three indicators: (1) a vegetation community dominated by plant species, typically adapted for life in saturated soils; (2) inundation or saturation of the soil during the growing season; and (3) soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions (USACE 1987, 2007).

A *Jurisdictional Determination Report* (HDR 2025) and an accompanying wetland and waterbody mapping dataset, completed for Graphite One, identified wetlands and waterbodies potentially subject to USACE jurisdiction within the proposed Project study area. Wetlands were delineated using the USACE wetland delineation manual’s three-parameter method of determining an area’s wetland status and methods described in the 1987 Corps of Engineers *Wetland Delineation Manual* (USACE 1987) and the 2007 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual, Alaska Region* (USACE 2007). Mapped wetlands were attributed with National Wetland Inventory (NWI) mapping codes based on the *USFWS Classification of Wetlands and Waterbodies* (FGDC 2013). The *Jurisdictional Determination Report* (HDR 2025) included wetland mapping for the 15,688-acre Project study area, including the proposed mine site and Mosquito Pass access road areas. The report provides descriptions of wetland types and data based on 2019, 2021, 2023, and 2024 Project area field investigations conducted by HDR Engineering, Inc. (HDR) wetland scientists. The *Jurisdictional Determination Report* (HDR 2025) provides an analysis of jurisdiction for all mapped wetlands and waterbodies using the pre-2015 regulatory regime in light of the *Sackett* decision. Of the 6,513 acres of mapped wetlands and waterbodies identified in the *Jurisdictional Determination Report* (HDR 2025), 582 acres of wetlands and waterbodies were potentially determined to be WOTUS and under jurisdiction of the USACE.

WETLANDS AND WATERBODIES MAPPING

Within the Project study area (15,688 acres), approximately 5,987 acres (38 percent of study area) were determined to be wetlands, and an additional 527 acres (3 percent of study area) were mapped as waterbodies. The remaining approximately 9,175 acres (59 percent of study area) were determined to be upland. Additionally, approximately 429,681 linear feet of tidal, perennial, and intermittent streams were mapped as line features. Approximately 582 acres (4 percent of study area) of wetlands and waterbodies and 323,101 linear feet of streams are preliminarily determined jurisdictional (HDR 2025). Table 3-17 provides details regarding the total mapped area of wetlands, waterbodies, and uplands, along with the area of proposed jurisdictional wetlands and waterbodies.

Wetlands within the Project study area are located along broad slopes, valley bottoms, near and within the floodplains of streams, in the lowlands adjacent to Imuruk Basin, and in the high alpine where snowmelt collects. The most abundant wetland types mapped within the study area are Palustrine Emergent and Palustrine Scrub-shrub wetlands. Palustrine wetlands generally include nontidal freshwater wetlands dominated by trees, shrubs, or persistent emergent vegetation (e.g., grasses, sedges), but can also include waterbodies less than 8.2 feet deep (FGDC 2013). Figure 3-17 shows the wetlands and waterbodies that have been mapped for the Project study area.

Table 3-17. Mapped and jurisdictional wetland and waterbody types within the Project study area

Wetland Type[(a)]	Mapped Area (acres)	Percent of Study Area	Jurisdictional Area (acres) [(b)]
Estuarine Wetlands (E2EM1P, E2SS1P, E2SS3P)	7.5	< 1	7.5
Scrub-Shrub Wetlands (PSS1/3B, PSS1/3C, PSS1/EM1B, PSS1/EM1C, PSS1/EM1E, PSS1/EM1F, PSS1B, PSS1C, PSS1E, PSS1F, PSS3B, PSS3C, PSS3/1B, PSS3/1C, PSS3/EM1B, PSS3/EM1C)	3,142.8	20.0	10.7
Emergent Wetlands (PEM1/SS1B, PEM1/SS1C, PEM1/SS1E, PEM1/SS1F, PEM1/SS3B, PEM1/SS3C, PEM1B, PEM1C, PEM1E, PEM1F, PEM1Fx, PEM1H)	2,802.3	17.9	68.8
Mosaics (PSS1/EM1B:U, U:PEM1/SS1B, U:PSS1/EM1B)	34.2	< 1	—
Total Wetlands	**5,986.8**	**38.2**	**87.0**
Estuarine Waters (E1UBL, E2USN, E2ABV)	82.5	< 1	82.5
Freshwater Lakes (L1UBH, L2USC)	44.9	< 1	44.9
Freshwater Ponds (PABH, PUB/ABH, PUBF, PUBFx, PUBH, PUBHx, PUSC, PUSCx)	112.1	< 1	91.5
Streams (R1UBV, R2UBF, R2UBH, R2USC, R2USF, R3UBF, R3UBH, R3USC, R3USF, R4SBA, R4SBC)	287.0[(c)]	1.8	275.9[(d)]
Total Waterbodies	**526.5**	**3.4**	**494.9**

Wetland Type[(a)]	Mapped Area (acres)	Percent of Study Area	Jurisdictional Area (acres) [(b)]
Total Wetlands and Waterbodies	6,513.4	41.5	581.9
Total Uplands	9,174.6	58.5	—
Total Project Area Corridor Mapped	15,688.0	100	—

Source: HDR 2025

Note: Total acreages may not reflect the sum of the individual cells due to rounding.

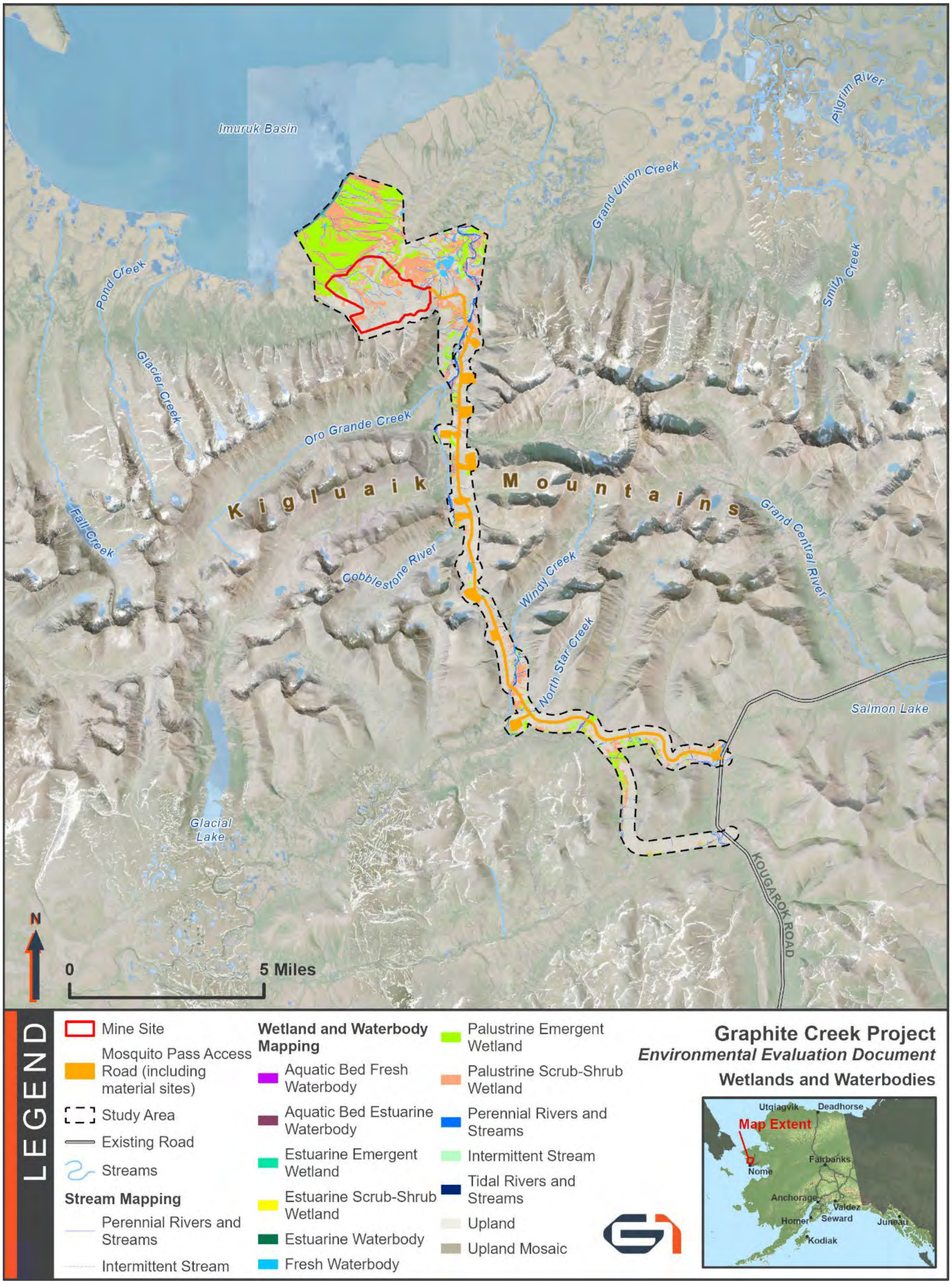
[a] Additional information and descriptions of the NWI Codes listed in the table are available in the *Jurisdictional Determination Report* (HDR 2025).

[b] Detailed information on the criteria used to determine proposed jurisdictional wetlands and waters is provided in the *Jurisdictional Determination Report* (HDR 2025).

[c] An additional 429,680.5 linear feet of streams were mapped within Project study area.

[d] An additional 323,100.9 linear feet of streams are preliminarily jurisdictional.

Figure 3-17. Wetlands and waterbodies overview map



3.2.2 Fish, Essential Fish Habitat, and Invertebrates

Three Project study areas are considered for fish, EFH, and aquatic invertebrates. The mine site study area includes all fresh, anadromous, and marine waters including Imuruk Basin within 1 mile of the mine site and landing vessel operations (Figure 3-18). The marine study area includes all marine waters that are proposed to be crossed by barging operations during the Mosquito Pass access road construction. The access road study area includes all waters intersected by the Mosquito Pass access road footprint and its associated facilities.

The Project area has varied aquatic habitats, including freshwater streams and the saltwater-influenced Imuruk Basin, which generally supports the expected biodiversity of an Arctic ecosystem (Owl Ridge 2025). Imuruk Basin is a 17-mile-long intertidal lake in the southwestern portion of the Seward Peninsula (NSBSRPT 2015; Hudson 2024). Imuruk Basin has a maximum depth of 20 feet (NSBSRPT 1996). The Bering Strait provides saltwater input to Imuruk Basin first by way of Grantley Harbor, then Tuksuk Channel. Salinity is low in Imuruk Basin. Alt (1973) recorded salinity levels at 1 to 4 percent, while Barton (1978) recorded levels at 1.3 to 5.4 percent. Imuruk Basin drains much of the surrounding terrestrial landscape, including several Anadromous Waters Catalog (AWC) designated waterbodies. It provides habitat for freshwater resident, anadromous, and marine fish species. Aquatic ecology in the region is generally considered to be of high quality and relatively unaffected by adverse anthropogenic influence (BLM 2012).

3.2.2.1 Essential Fish Habitat and Fishery Management Plan-Managed Species

The Magnuson-Stevens Fishery Conservation Act (MSA) governs marine fisheries management in U.S. Federal Waters. The MSA was established to prevent overfishing; rebuild overfished stocks; increase long-term economic and social benefits; ensure a safe and sustainable supply of seafood; and protect habitat that fish need to spawn, breed, feed, and grow to maturity. The MSA establishes provisions on EFH, defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (50 CFR 600.10). EFH is only identified for those species managed under a federal fishery management plan. Amendment seven to the MSA includes waters defined in the State of Alaska’s *Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes* (or AWC) as EFH.

Salmon off the coast of Alaska are managed under the *Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska* (NPFMC 2018). Table 3-18 lists salmon with AWC waterbodies within the study area. Marine EFH is located along the barging route that would be used to move construction and mining equipment and materials. Marine EFH species found along the barge route can be found in the *Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area* (NPFMC 2024).

Figure 3-18. Anadromous streams listed in the AWC within the Project vicinity

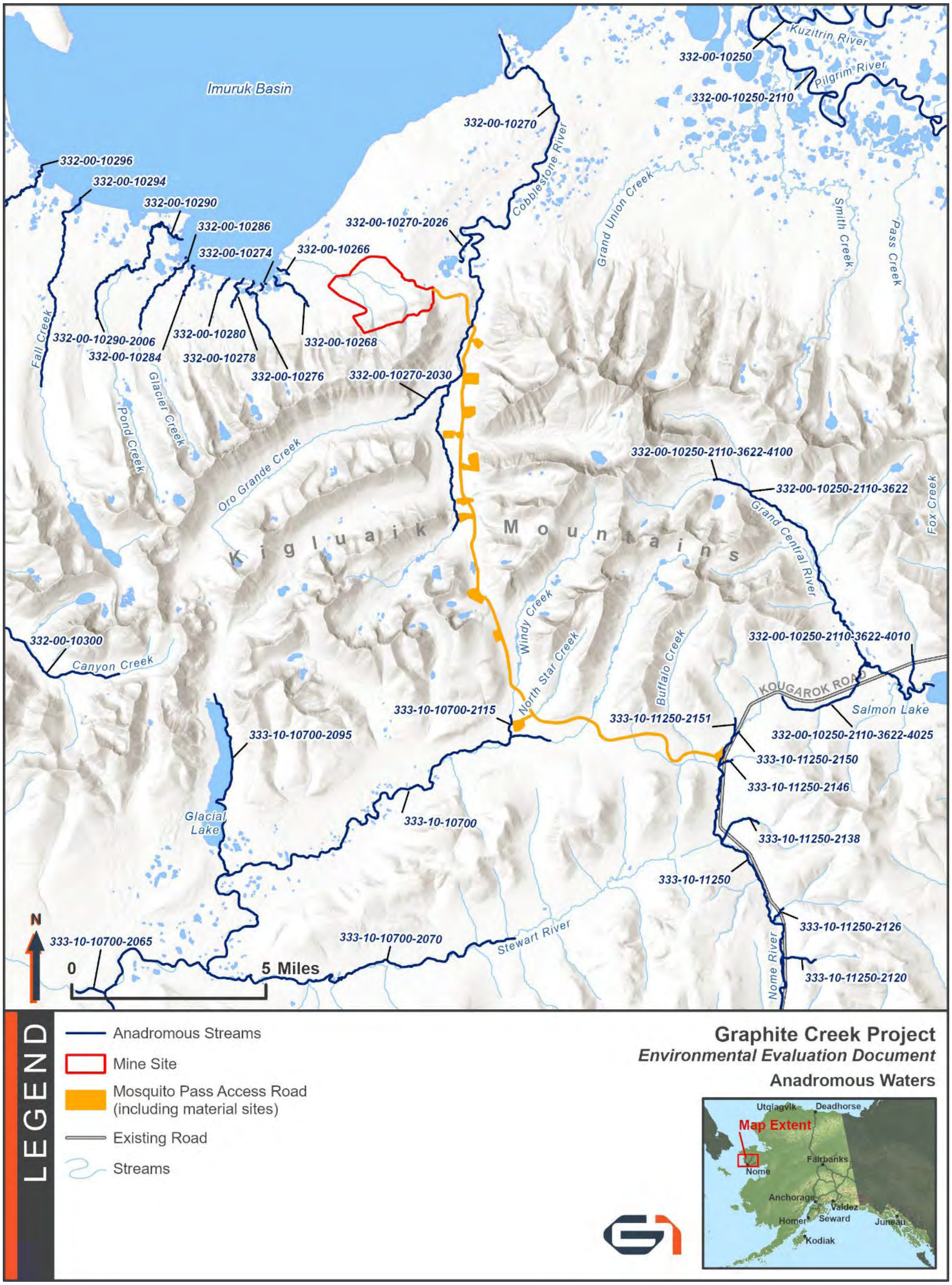


Table 3-18. Freshwater EFH in the mine site and access road study areas

Species	Habitat Preference	Seasonality in Study Area	EFH (Waterbody and AWC number)
Chinook (*Oncorhynchus tshawytscha*)	• Egg and Alevin: Rear where deposited • Juvenile: May move to saltwater after emergence or rear for 2 years in freshwater • Mature Adult: Spawn in waters from an inch to a few feet deep in both small and large rivers; water may have low to high velocity; spawn in gravels with sub gravel flow	• Egg and Alevin: Late summer to early spring • Juvenile: Year-round • Mature Adult: July to September	Presence: • Cobblestone River[(a)] (332-00-10270) • Imuruk Basin[(b)] (332-00-10230-0010) • Sinuk River[(b)] (333-10-10700) Spawning: • Nome River[(a)] (333-10-11250)
Coho (*O. kisutch*)	• Egg and Alevin: Rear where deposited • Juvenile: Generally, spend 1 to 2 years in freshwater but may rear longer • Mature Adult: Spawn in porous gravel substrates that are generally silt free	• Egg and Alevin: Fall to spring • Juvenile Year-round • Mature Adult: July to September	Presence: • Cobblestone River[(a)] • Imuruk Basin[(b)] • Oro Grande Creek[(a)] (332-00-10270-2030) • Sinuk River[(a)] • Windy Creek[(a)] (333-10-10700-2115) Rearing: • Cobblestone River[(a)] • Oro Grande Creek • Unnamed Stream[(a)] (332-00-10268) [(b)] and (332-00-10270-2026) [(b)] • Windy Creek[(a)] Spawning: • Nome River[(a)]
Chum (*O. keta*)	• Egg and Alevin: Rear where deposited • Juvenile: Quickly migrate to estuaries • Mature Adult: Spawn on gravel in streams with upwelling ground water in waters 3 to 20 inches deep	• Egg and Alevin: Early summer to early spring • Juvenile: February to June • Mature Adult: June to September	Presence: • Cobblestone River[(a)] • Imuruk Basin[(b)] • Sinuk River[a] Spawning: • Cobblestone River[(a)] • Nome River[(a)] • Windy Creek[(a)]

Species	Habitat Preference	Seasonality in Study Area	EFH (Waterbody and AWC number)
Pink (*O. gorbuscha*)	• Eggs and Alevin: Rear where deposited • Juvenile: Quickly migrate to saltwater • Mature Adult: Spawn in riffles with clean gravels or along borders between pools and riffles with moderate to fast current	• Eggs and Alevin: Late summer to early spring • Juvenile: Spring • Mature Adult: June to August	Presence: • Cobblestone River[(a)] • Imuruk Basin[(b)] • Sinuk River[(a)] • Unnamed Stream (332-00-10266)[(b)] and (332-00-10268)[(b)] Spawning: • Nome River[(a)]
Sockeye (*O. nerka*)	• Egg and Alevin: Rear where deposited • Juvenile: Likely spend most of their rearing (1 to 3 years) in lakes; may rear in streams or estuaries • Mature Adult: Highly variable; spawning may occur in lakes or streams; may occur in large or small gravels in depths up to 100 feet of lakes, where they prefer areas of upwelling; in streams, riffles are preferred	• Egg and Alevin: Summer to mid-April or early June • Juvenile: Year-round • Mature Adult: May to September	Presence: • Cobblestone River[(a)] • Imuruk Basin[(b)] • Sinuk River[(a)] Spawning: • Cobblestone River[(a)] • Nome River[(a)]

Source: NMFMC 2018; ADF&G 2025b; Owl Ridge 2025 (included in Appendix C)
[a] Waterbody within the access road study area
[b] Waterbody within the mine site study area

3.2.2.2 Fish

PREVIOUS SAMPLING EFFORTS

In 1977, the most frequently captured fish during fish sampling conducted by ADF&G in Imuruk Basin were pond smelt (*Hypomesus olidus*), ninespine stickleback (*Pungitius pungitius*), least cisco (*Coregonus sardinella*), Pacific herring (*Clupea pallasii*), saffron cod (*Eleginus gracilis*), and Bering cisco (*Coregonus laurettae*). Sampling efforts included the use of both beach seines and gill nets. Sampling efforts were also successful in capturing, northern pike (*Esox lucius*), northern sucker (longnose sucker; *Catostomus catostomus*), and chum salmon (*Oncorhynchus keta*) (Barton 1978).

The presence of species, such as Pacific herring, burbot (*Lota lota*), northern pike, smelt, and whitefish (*Coregonus* sp.) have been confirmed by subsistence users of the Imuruk Basin (Raymond-Yakoubian 2013). Imuruk Basin is said to be susceptible to significant summer algae blooms that may be responsible for fish die-offs to some extent (NSBSRPT 2015). In 1971 and 1977, ADF&G reported blooms that were so thick they obscured water visibility and interfered with fish sampling attempts (Barton 1978). ADF&G's Norton Sound/Bering Strait Regional Planning Team have also noted that native fish stocks are predated on by seals in the Imuruk Basin (NSBSRPT 2015).

Between 1987 and 1997, the BLM conducted fish sampling efforts of lakes in the Kigluaik Mountains, where Char (*Salvelinus sp.*) were the only species found (Webb 2000). Specimens were collected for genetic testing and identified a unique subpopulation of Arctic char (*Salvelinus alpinus*) in the Kigluaik Mountains (Webb 2000).

PROJECT SAMPLING EFFORTS

Baseline aquatic sampling in the Project area has occurred annually (except for in 2020 due to COVID-19-related precautions) between 2019 and 2024, following initial Pacific salmon surveys in 2018 (Owl Ridge 2025). The 2024 sampling season was the fifth year of aquatic baseline data collection, the third year of Imuruk Basin sampling, and the fourth year of efforts to determine Dolly Varden (*Salvelinus malma*) spawning areas. Additionally, aerial Pacific salmon (*Oncorhynchus* spp.) surveys and sampling of new proposed road crossing sites and potential resident Dolly Varden populations in Mosquito Pass lakes were also conducted in 2024. See Appendix C for the *Graphite Creek Project Aquatic Baseline Studies: 2024 Report* and further details on baseline conditions in the Project area (Owl Ridge 2025). The studies were used to establish baseline conditions for water quality and fishery information.

The following information about the baseline studies is summarized from Owl Ridge Natural Resource Consultants, Inc.'s (Owl Ridge 2025) report (Appendix C).

BIOMONITORING

Seven long-term biomonitoring sites were established in 2019, with two sites added in 2021 for a total of nine sites. Biomonitoring included monitoring water quality and flow, periphyton standing crop, aquatic macroinvertebrates, fish abundance and distribution, and juvenile Dolly Varden whole body trace element concentrations. Seven sites lie within areas potentially impacted by project-related activities and two were control sites located outside of likely project influence. All sites were sampled for water quality, periphyton standing crop, aquatic macroinvertebrates, and juvenile fish abundance and whole-body metal burdens. The results of the biomonitoring found that most sites in the study area have adequate habitat conditions to support invertebrate populations with some natural variability over time. Two sites on Graphite Creek have low invertebrate density and taxa diversity and are unable to support healthy macroinvertebrate assemblages.

Fish abundance and distribution sampling in 2024 resulted in 178 fish from seven species being captured across nine biomonitoring sites. The most abundant fish captured was Dolly Varden

(38.2 percent of total catch) followed by slimy sculpin (33.1 percent of total catch). Slimy sculpin, Dolly Varden, coho, and pink salmon have been caught in all sampling years. Additional species caught in recent years include Arctic grayling, Alaska Blackfish, ninespine stickleback, and chum salmon. Between the two sites on Graphite Creek, one slimy sculpin has been captured during all years of sampling.

Periphyton are a microalgae which support stream biological communities as primary producers and were assessed in the project area drainages by determining concentrations of chlorophyll-a, -b and -c on underwater substrates. The chlorophyll-a concentrations at the biomonitoring sites on Graphite Creek were too low to be detected, which generally indicates the stream is less productive. The remaining sites had variable results depending on the year, but levels of primary production generally appear to be adequate to support stream biological communities. Appendix C provides the full results of the biomonitoring.

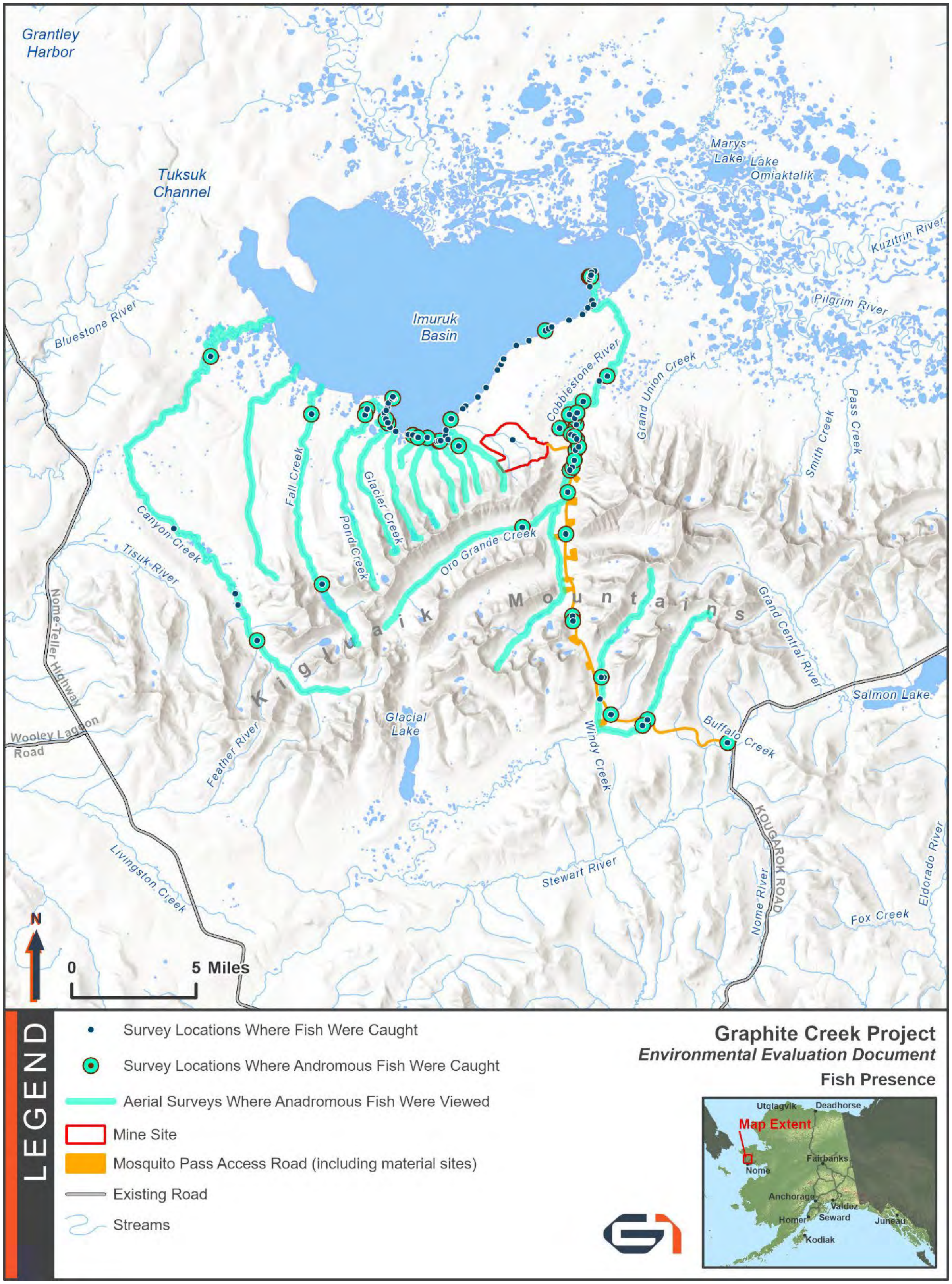
Imuruk Basin Fish Sampling

Imuruk Basin is mostly freshwater with a saltwater influence which supports a diverse and abundant fish population of both freshwater and brackish water species. Baseline water quality data was collected to monitor basin conditions for potential changes due to upstream mining activities that could affect water pH and turbidity which could in turn impact fish populations. Sampling efforts were focused in Windy Cove, the southern shore of Imuruk basin, and around the mouth of the Cobblestone River where project-related impacts downstream from mining activities would be anticipated (Figure 3-19). Fish sampling in 2024 identified 18 species in the spring and 18 species in the fall.

Aerial Pacific Salmon Surveys

Aerial surveys were conducted to describe the extent and distribution of Pacific salmon species within and near the project area. Surveys were timed to occur close to the peak run time of adult Pacific salmon species to most accurately determine salmon upstream extent in streams. Figure 3-19 shows the streams surveyed and the locations fish were caught. The Cobblestone River had the most fish counted in aerial surveys, with its middle reaches supporting the highest counts for multiple species suggesting importance for spawning.

Figure 3-19. Survey locations with fish presence



Dolly Varden Spawning Surveys

Dolly Varden spawn during the fall in the Cobblestone River and likely several other streams within and near the project area. Sites along the Cobblestone, its tributaries, and Canyon Creek were surveyed from the air and then on the ground using rod-and-reel techniques. These data were used to identify Dolly Varden spawning condition and activity and identify consistent spawning locations in the Project area. Dolly Varden are an important subsistence food and sport fishing resource and are known to occupy habitat in the Cobblestone River, Oro Grande Creek and an unnamed tributary of the Cobblestone River.

Road Stream Crossing Surveys

Road stream surveys were conducted to determine fish presence to guide road design and fish passage structures (Figure 3-19). Surveys used visual and backpack electrofisher methods. Streams already identified in the AWC were not surveyed further. Based on the AWC and sampling conducted for the Project, 15 sites were identified as requiring fish passage during design.

Mosquito Pass Lakes Sampling

Two lakes, Mosquito Pass Lake and Shadow Lake, were sampled to assess the presence of possible resident Dolly Varden. Sampling consisted of placing Fyke nets near the outlets for a minimum of 24 hours. Sampling conducted in 2024 confirmed the presence of probable resident Dolly Varden in Mosquito Pass Lake.

Summary of Results

Based on the aquatic baseline studies, the Cobblestone River is the most productive river in the Project area in terms of numbers of adult Pacific salmon and Dolly Varden spawner returns. The middle reaches of the Cobblestone River are important spawning habitat for Pacific salmon and Dolly Varden. Graphite Creek, located at the mine site, was consistently found to have low water quality and sparse aquatic life. Over the course of the baseline studies described above, Owl Ridge has only captured a single slimy sculpin in Graphite Creek. Imuruk Basin fish sampling shows fish species are diverse throughout the basin, indicating the basin provides important habitat for a variety of fish species during the open water season (Owl Ridge 2025).

Table 3-19 lists non-salmonid fish identified in these and other sampling efforts.

Table 3-19. Fish without EFH designation

Species	Habitat Preference	Waterbodies Documented In
Arctic grayling (*Thymallus arcticus*)	• Eggs are deposited in lower reaches of river systems and hatch 3 weeks after spawning • Juveniles and adults may winter in lakes or deep pools of large rivers; in spring, adults migrate upstream to spawning grounds and feeding areas; grayling migrate back to wintering areas in early fall	• Cobblestone River • Imuruk Basin
Bering cisco (*Coregonus laurettae*)	• Juveniles rear in nearshore estuarine environments • Adults and juveniles may overwinter in nearshore environments (Padilla et al. 2016)	Imuruk Basin
Broad whitefish (*Coregonus nasus*)	Adults may forage or transit nearshore, estuarine, and freshwater environments (Leppi et al. 2022)	Imuruk Basin
Burbot (*Lota lota*)	Burbot occupy freshwater rivers and lake environments at all life stages.	Imuruk Basin
Dolly Varden (*Salvelinus malma*)	• Eggs hatch in spring • Juveniles rear for 2 to 5 years near hatch site • Adults enter spawning areas from saltwater in fall through spring; adults spawn in mainstems of rivers in fall and winter; some populations are resident, spend their lives in freshwater, and may be genetically isolated	• Cobblestone River • Imuruk Basin • North Star Creek • Osborn Creek • Upper Sinuk River • Windy Creek
Fourhorn sculpin (*Myoxocephalus quadricornis*)	Fourhorn sculpins occupy moderately saline, estuarine, and freshwater environments (Robins et al. 1991).	Imuruk Basin
Humpback whitefish (*Coregonus pidschian*)	• Eggs are negatively buoyant, non-adhesive, and therefore subject to currents • Once hatched, juveniles rear in ponds, sloughs, estuaries, and marine environment • Some adults are anadromous and spawn in freshwater drainages with loosely compacted gravel beds in turbid and swift-moving water	Imuruk Basin
Least cisco (*Coregonus sardinella*)	• Eggs hatch where they are laid • Juveniles swim downstream to forage in river deltas, estuaries, and near coast environments • Adults may be anadromous or resident; they spawn in lakes and rivers (USFWS 2012)	Imuruk Basin
Longnose sucker (*Catostomus catostomus*)	• Eggs laid and hatch in spring to early summer • Juveniles rear in similar environments where they were laid as eggs • Adults spawn in streams, lakes, and ponds in spring and early summer; leave spawning grounds by October to overwinter in lakes (Mansfield 2004)	Imuruk Basin

Species	Habitat Preference	Waterbodies Documented In
Ninespine stickleback (*Pungitius pungitius*)	Adults may occur in brackish or freshwater, and spawn in spring and summer	Imuruk Basin
Northern pike (*Esox lucius*)	• Spawning occurs in spring in the margins of lakes or slow-moving streams; eggs hatch within 30 days • Northern pike overwinter in lakes and deep rivers	Imuruk Basin
Pacific herring (*Clupea pallasii*)	• Juveniles rear in sheltered bays and inlets (Funk 2007; Wespestad and Barton 1979) • Adults have been documented spawning along the coastline in Imuruk Basin (Barton 1978)	Imuruk Basin
Pond smelt (*Hypomesus olidus*)	• Egg and juveniles rear in Imuruk Basin • Adults spawn in shallow rivers or lakes on sand and gravel (Barton 1978)	Imuruk Basin
Rainbow smelt (*Osmerus mordax*)	Adults spawn in coastal freshwater streams (Johnson and Winters 2018)	Imuruk Basin
Saffron cod (*Eleginus gracilis*)	Juveniles and adults may live in brackish waters for extended periods (Wolorita 1985)	Imuruk Basin
Starry flounder (*Platichthys stellatus*)	• Juveniles may rear in estuarine waters • Starry flounder are reported to move into Imuruk Basin to overwinter (Raymond-Yakoubian 2013); they were also caught during Project sampling during summer	Imuruk Basin
Threespine stickleback (*Gasterosteus aculeatus*)	• Eggs are usually deposited in shallow, freshwater environments • Threespine stickleback can be found in marine, brackish, and freshwater	Imuruk Basin
Sheefish (*Stenodus leucichthys*)	• Eggs hatch in spring; spring floods carry fry downstream where they rear year-round (ADF&G 1978) • Adults spawn in swift mainstems of rivers with substrates with varied gravel size, and absence of silt and sand; spawning occurs in late September and early October; wintering occurs in lower segments of rivers, brackish inlets, and delta; in summer, adults migrate upstream to spawning grounds (ADF&G 1978)	Not captured in Project surveys; sheefish have been captured in Imuruk Basin by local residents (Raymond-Yakoubian 2013)
Tomcod (*Microgadus tomcod*)	Information is limited on tomcod habitat preferences; tend to be found along shorelines during fall and winter (Cobb 1927).	Not captured in Project surveys; tomcod have been captured in Imuruk Basin by local residents (Raymond-Yakoubian 2013)

3.2.2.3 Invertebrates

Macroinvertebrate populations can serve as bio-indicators of short- and long-term change in aquatic ecosystems. Macroinvertebrate sampling for the Project occurred at Fall Creek, Glacier Canyon Creek (two sites), an unnamed stream flowing into Imuruk Basin, mainstem Cobblestone River, an unnamed tributary of Cobblestone River, Oro Grande Creek, Windy Creek, and the Upper Sinuk River. Sampling between 2019 and 2024 found Insecta (61.5 to 86.7 percent) to be the most abundant class each survey year, followed by Annelida (10.2 to 23.0 percent) and Mollusca (0.4 to 6.82 percent). Community biodiversity and evenness have remained consistent throughout the sampling period. Species diversity is indicative of a population somewhat tolerant of organic pollutants. Sabellid worms (*Manayunkia* spp.) have been observed in the unnamed Cobblestone River tributary. One Sabellid worm species, *Manayunkia speciosa*, can be an intermediate host to a parasite that affects salmonid species. Where this parasite has been detected in salmonids in Alaska, there were no outward signs of infection in the host fish (Owl Ridge 2025).

3.2.3 Birds

The Migratory Bird Treaty Act (MBTA) prohibits the intentional take (i.e., killing, capturing, selling, trading, transporting) of protected migratory bird species without prior authorization by USFWS (16 United States Code [USC] 703–712). Historically, incidental take was included, however, in April 2025, DOI revised the MBTA to clarify that the incidental take of migratory birds is not prohibited under the MBTA, pursuant to the authority established by EO 14154, *Unleashing American Energy*. All birds that are year-round residents in Alaska, or occupy summer or wintering ranges in the state, except designated waterfowl, grouse, and ptarmigan, are protected under the MBTA (USFWS 2017). In addition to protections under the MBTA, bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act (BGEPA; 16 USC 668–668d). The BGEPA prohibits the “take” of bald or golden eagles, including their parts, nests, or eggs without an appliable permit. The BGEPA defines “take” as to “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” The ESA aims to protect at-risk fish, wildlife, and plant species. The ESA includes provisions for listing or delisting a species, creating recovery plans, promoting interagency cooperation to prevent takes and issuing permits for prohibited activities. Take, as defined under the ESA, means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

Long-term datasets indicate that more than 90 local and migratory birds exist within the Project area. Citizen science data and research from proximal areas (Schick 2005) identify the bird species most likely to occur within the Project area. Eighty-six species are listed as game species or under the ADF&G (2015) *Wildlife Action Plan* (Table 3-20).

Table 3-20. Birds with special status that may occur within the Project area

Common Name	Scientific Name	Game Species	ADF&G
Aleutian tern	*Onychoprion aleuticus*	—	X
American golden plover	*Pluvialis dominica*	—	X
American pipit	*Anthus rubescens*	—	X
Arctic loon	*Gavia arctica*	—	X
Arctic tern	*Sterna paradisaea*	—	X
Arctic warbler	*Phylloscopus borealis*	—	X
Bald eagle	*Haliaeetus leucocephalus*	—	X
Bank swallow	*Riparia riparia*	—	X
Bar-tailed godwit	*Limosa lapponica*	—	X
Black brant	*Branta bernicula*	X	X
Black scoter	*Melanitta americana*	X	X
Black turnstone	*Arenaria melanocephala*	—	X
Black-bellied plover	*Pluvialis squatarola*	—	X
Black-legged kittiwake	*Rissa tridactyla*	—	X
Bluethroat	*Cyanecula svecica*	—	X
Bristle-thighed curlew	*Numenius tahitiensis*	—	X
Cackling goose	*Branta hutchinsii*	X	—
Canada goose	*Branta canadensis*	X	—
Common eider	*Somateria mollissima*	X	X
Common murre	*Uria aalge*	—	X
Common raven	*Corvus corax*	—	X
Common redpoll	*Acanthis flammea*	—	X
Dunlin	*Calidris alpina*	—	X
Emperor goose	*Anser canagicus*	X	X
Fox sparrow	*Passerella iliaca*	—	X
Glaucous gull	*Larus glaucescens*	—	X
Golden eagle	*Aquila chrysaetos*	—	X
Golden-crowned sparrow	*Zonotrichia atricapilla*	—	X
Gray-crowned rosy finch	*Leucosticte tephrocotis*	—	X
Greater scaup	*Aythya marila*	X	—
Gyrfalcon	*Falco rusticolus*	—	X
Harlequin duck	*Histrionicus histrionicus*	X	—
Hermit thrush	*Catharus guttatus*	—	X
Hoary redpoll	*Acanthis hornemanni*	—	X
Horned lark	*Eremophila alpestris*	—	X

Common Name	Scientific Name	Game Species	ADF&G
Horned puffin	*Fratercula corniculata*	—	X
King eider	*Somateria spectablis*	X	X
Kittlitz's murrelet	*Brachyramphus brevirostris*	—	X
Lapland longspur	*Calcarius lapponicus*	—	X
Long-billed dowitcher	*Limnodromus scolopaceus*	—	X
Long-tailed duck	*Clangula hyemalis*	X	X
Long-tailed jaeger	*Stercarius longicaudus*	—	X
Mallard	*Anas platyrhynchos*	X	—
McKay's bunting	*Plectrophenax hyperboreus*	—	X
Northern harrier	*Circus cyaneus*	—	X
Northern pintail	*Anas acuta*	X	—
Northern shoveler	*Spatula clypeata*	X	—
Northern wheatear	*Oenathe oenanthe*	—	X
Pacific golden plover	*Pluvialis fulva*	—	X
Parakeet auklet	*Aethia psittacula*	—	X
Pectoral sandpiper	*Calidris melanotos*	—	X
Pelagic cormorant	*Urile pelagicus*	—	X
Peregrine falcon	*Falco perigrinus*	—	X
Pigeon guillemot	*Cepphus columba*	—	X
Red knot	*Calidris canutus*	—	X
Red phalarope	*Phalaropus fulicarius*	—	X
Red-throated loon	*Gavia stellata*	—	X
Rock ptarmigan	*Lagopus muta*	X	—
Rock sandpiper	*Calidris ptilocnemis*	—	X
Rough-legged hawk	*Buteo lagopus*	—	X
Rusty blackbird	*Euphagus carolinus*	—	X
Sabine's gull	*Xema sabini*	—	X
Sanderling	*Calidris alba*	—	X
Sandhill crane	*Grus canadensis*	X	X
Savannah sparrow	*Passerculus sandwichensis*	—	X
Semipalmated sandpiper	*Calidris pusilla*	—	X
Short-eared owl	*Asio flammeus*	—	X
Snow bunting	*Plectrophenax nivalis*	—	X
Snow goose	*Anser caerulescens*	X	—
Snowy owl	*Bubo scandiacus*	—	X
Spectacled eider	*Somateria fischeri*	—	X

Common Name	Scientific Name	Game Species	ADF&G
Spotted sandpiper	*Actitus macularius*	—	X
Steller's eider	*Polysticta stelleri*	—	X
Surf scoter	*Melanitta perspicillata*	X	—
Thick-billed murre	*Uria lomvia*	—	—
Tundra swan	*Cygnus columbianus*	X	—
Wandering tattler	*Tringa incana*	—	X
Western sandpiper	*Calidris mauri*	—	X
Whimbrel	*Numenius phaeopus*	—	X
White-crowned sparrow	*Zonotrichia leucophrys*	—	X
White-winged scoter	*Melanitta deglandi*	X	X
Willow ptarmigan	*Lagopus lagopus*	X	—
Wilson's snipe	*Gallinago delicata*	X	—
Wilson's warbler	*Cardellina pusilla*	—	X
Yellow warbler	*Setophaga petechia*	—	X
Yellow-billed loon	*Gavia adamsii*	—	X

Source: ACCS 2025c; ADF&G 2015, 2025c; Audubon 2025; Cornell Lab of Ornithology 2025

The following datasets were used to gain information on the life history and range of avian species. The ACCS collects, synthesizes, and validates information on Alaska's animal and plant species of conservation concern and their habitats. ACCS (2025c) was used for information on avian ranges. ADF&G Species Profiles were used to gather life history, ranges, and habitat use information. The ADF&G (2015) *Wildlife Action Plan* was used to identify species of greatest conservation need (SGCN) and distribution of each species in Alaska. The Audubon (2025) *Guide to North American Birds* and the Cornell Lab of Ornithology (2025) were used to gather life history and conservation status.

Most birds found within the Project area are migratory and are only present for their breeding season. Migratory birds are generally found within the Project area as early as April and as late as October. For most species, the breeding season is between May and August. Open and shrub breeding habitats on the Seward Peninsula are typically used for breeding between May 10 and July 20. Geese and swans may begin nesting as early as April 20, seabirds nest from May 20 to September 15, and raptors generally nest March 1 through August 31 (USFWS 2017). Relatively few resident birds (e.g., common ravens [*Corvus corax*], willow ptarmigan [*Lagopus lagopus*], snow buntings [*Plectrophenax nivalis*], snowy owls [*Bubo scandiacus*], American dippers [*Cinclus mexicanus*]) are found within the Project area.

The USFWS identifies bird species that are of the highest conservation concern but are not ESA-listed and includes them in the Birds of Conservation Concern (BCC) list. To determine eligibility for the BCC list, USFWS evaluates a species population abundance, trends, threats to breeding and non-breeding grounds, and size of the breeding and non-breeding range. New versions of the BCC list are published periodically. Thirteen bird species known to occur within the Project area are on the BCC list (USFWS 2021a; Table 3-21). Table 3-21 presents the BCC species that may occur within the Project area, their preferred habitat, probability of presence, and months they may be present, and each species is discussed in detail in Sections 3.2.3.1 Passerines through 3.2.3.4 Raptors.

Table 3-21. Birds of Conservation Concern within the Project area

Species	Presence within Project Area	Habitat Preference/Vegetation Community	Months Present
Aleutian tern	Uncommon	Shrub-tundra, grass or sedge meadows, and freshwater marshes/ tussock tundra and herbaceous sedge	May to August
American golden plover	Common	Dwarf-shrub meadows near wetlands for breeding/dwarf shrub	Mid-May to August
Bar-tailed godwit	Common	Dwarf-shrub meadows near wetlands/ dwarf shrub	June to September
Black turnstone	Rare	Low-lying, salt grass meadows and sparsely vegetated habitats/ herbaceous sedge	May to July
Bristle-thighed curlew	Uncommon	Hummock-ridge tundra and tussock-shrub tundra/tussock tundra and dwarf shrub	Late-May to August
Dunlin	Common	Wet meadow mixed with drier dwarf shrubs/dwarf shrub and herbaceous sedge	Mid-May to late-September
Kittlitz's murrelet	Rare	Unvegetated mountain slopes/ unvegetated cover	April to October
Red knot	Uncommon	Dry, stony ground close to wetlands/ tussock tundra and unvegetated cover	June to August
Rock sandpiper	Common	Shorelines and tundra habitat near freshwater/herbaceous sedge and low shrub	Year-round
Short-eared owl	Common	Grassland, dwarf shrub, marshes, ridges, and mounds/low shrub and tussock tundra	April to June
Snowy owl	Common	Ridges, mounds, hummocks, and rocky outcrops with sparse vegetation / tussock tundra and unvegetated cover	Year-round
Wandering tattler	Common	Subalpine areas of mountain landscapes/tussock tundra and unvegetated cover	June to July
Yellow-billed loon	Uncommon	Low-lying areas on the shoreline of large, deep, freshwater lakes/ herbaceous sedge	June to September

Source: USFWS 2021a

3.2.3.1 Passerines

Passerines arrive on the Seward Peninsula in May and depart in August. They nest on the ground in low shrubs or occasionally tall shrubs, where available. Passerines are generally insectivorous or omnivorous. Few are year-round residents, although common ravens, snow buntings, and American dipper persist year-round. The rusty blackbird (*Euphagus carolinus*) and McKay's bunting (*Plectrophenax hyperboreus*) are discussed below. The rusty blackbird is included due to long-term population declines in the Lower 48 States due to wintering habitat loss. The McKay's bunting is the only bird species endemic to Alaska and winters in western Alaska and the Seward Peninsula before returning to breed exclusively on St. Matthew and Hall Islands. Commonly sighted migratory passerines within the area include common redpolls (*Acanthis flammea)*, fox sparrows (*Passerella iliaca)*, gray-cheeked thrushes (*Catharus minimus*), and golden-crowned sparrows (*Zonotrichia atricapilla*) (eBird 2019).

RUSTY BLACKBIRD

Rusty blackbirds have undergone drastic population declines for the last century. The North American population decline is estimated at 12.5 percent per year for the past 40 years. Population decline may be the result of degradation of boreal forest habitat, primarily in their wintering range in the eastern United States. Habitat loss has likely resulted from logging and agricultural development, mercury contamination, and wetland loss from climate change. Additionally, aspects of the rusty blackbird life history, such as the distribution and the migratory nature of the bird, may contribute to the population decline. Patchy distribution and the migratory nature of the species means that settling to breed may not result in viable breeding populations due to the difficulty of locating mates or forming loose nesting colonies, as observed in Alaska. (Greenberg et al. 2011). Adult rusty blackbirds generally nest in evergreen vegetation within extensive bogs and muskegs. Within the Project area, they are likely to be found in tall scrub-shrub wetlands. Their diet is composed primarily of aquatic insect larvae and crustaceans. Rusty blackbirds have large home ranges because adults use multiple wetlands for foraging (Powell et al. 2010).

MCKAY'S BUNTING

McKay's bunting is the only bird that is recognized to be strictly endemic to Alaska, meaning it is found nowhere else in the world. The entire population breeds exclusively on St. Matthew and Hall Islands in the Bering Sea and migrates to the western coast of Alaska during fall (Audubon 2025). Due to its small population size and restricted range, it is a species of high conservation concern for many resource management agencies (Richardson et al. 2024). Within the Project area, this species prefers tussock tundra and scree slopes with little vegetation. McKay's buntings forage primarily on the ground for seeds and insects, and nests in protected cavities on the ground or cliffs (Audubon 2025). Recent studies of its breeding population have shown a population decrease of 38 percent from 2003 to 2018 (Richardson et al. 2024). This decline has yet to be attributed to any cause, and little information is present on the non-breeding ecology of McKay's bunting. The population risks for a small, isolated species population are a cause for conservation concern (Richardson et al. 2024).

3.2.3.2 Shorebirds

Shorebirds within the region are migratory and arrive on the Seward Peninsula to breed in May (eBird 2019). Shorebirds almost exclusively are ground nesters, typically making nests on tundra with dwarf vegetation or rocky tundra not far from wetlands, streams, or shorelines (Cornell Lab of Ornithology 2025). The Imuruk Basin and the surrounding area provide habitat for many shorebirds to be able to nest, molt, and feed within a single area (Zimmerman 1982). Shorebirds begin to migrate south in August, with the majority having left the area by the end of the month (eBird 2019). Many of the shorebirds within the area are listed as BCC by USFWS due to widespread population declines (USFWS 2021a). Shorebird populations are sensitive to a variety of factors, including habitat loss, pollution, and overharvesting. Common shorebird species within the area include American golden plover (*Pluvialis dominica*), wandering tattler (*Tringa incana*), and bar-tailed godwit (*Limosa lapponica*) (Table 3-21). Shorebirds primarily feed on aquatic invertebrates, including insects, crustaceans, and mollusks (USFWS 2021a).

Aleutian Tern

Aleutian terns (*Onychoprion aleuticus*) breed across the Bering Sea region and winters in Southeast Asia. Aleutian terns breed both in colonies and individually from the Chukchi Sea, south along the Alaska coast to Glacier Bay National Park, including the Seward Peninsula (Renner et al. 2015). This species breeds within the Project area between May and August. Aleutian tern nesting occurs in a variety of habitats including shrub-tundra, grass or sedge meadows, and freshwater marshes. Their diet is composed of small fish and insects (USFWS 2006). Aleutian terns are a BCC due to knowledge gaps in their life history and recorded declines across their nesting range (Renner et al. 2015). Population declines are attributed to predation, harsh rearing conditions, and human disturbance (USFWS 2006).

American Golden Plover

American golden plovers breed in Arctic and Subarctic regions of Alaska and Canada, and winters in southern South America. They arrive on breeding grounds as early as mid-May and depart in August. When breeding, they prefer dry areas with substrate consisting of rocks, lichen, and sparse shrubs. American golden plovers commonly prey on earthworms and insects (Johnson 2003). Global population estimates for the species are around 200,000 individuals, and population trends are unclear. The largest threat to American golden plovers is from habitat loss and exposure to agrochemicals. Habitat loss is primarily associated with agricultural and other land conversions such as residential development and mining. Climate change effects that alter their breeding areas in the Arctic are the most impactful to American golden plovers (Clay et al. 2010).

Bar-tailed Godwit

The bar-tailed godwit is a near-threatened species. It migrates annually from its South Pacific winter range to western Alaska to breed (McCaffery and Gill 2020). Bar-tailed godwits are often found on their breeding grounds between June and September (Gill Jr. and McCaffery 1999). Their diet is primarily composed of insects, crustaceans, and mollusks. On the Seward Peninsula, bar-tailed godwits prefer dwarf-shrub meadows near wetlands for breeding. Bar-tailed godwits tend to feed in the vegetation near their nest sites, or if nonbreeding, almost exclusively on the coast, probing for food (Cornell Lab of Ornithology 2025). Global populations are recognized to be declining, largely due to the reduction of stop-over migratory habitat along the Yellow Sea coast (McCaffery and Gill 2020).

Black Turnstone

Approximately 85 percent of the black turnstone (*Arenaria melanocephala*) population breeds on the Yukon-Kuskokwim Delta within 1.2 miles of the coast, outside the Project area. Preferred habitat in this location includes low-lying, salt grass meadows and sparsely vegetated habitats. During their winter migration, black turnstones are commonly associated with rocky intertidal habitats and coastal beaches between Kodiak Island, Alaska, and Mexico. Habitat degradation along coastlines from pollution, development, and climate change are among the primary threats to the species. In their northward migration, black turnstones rely heavily on Pacific herring spawn in Prince William Sound as a food source. Additionally, they commonly feed on mussels and barnacles (Taylor et al. 2022).

Bristle-thighed Curlew

Bristle-thighed curlews (*Numenius tahitiensis*) breed solely on the Yukon-Kuskokwim Delta and Seward Peninsula. Their breeding range on the Seward Peninsula is north of Imuruk Basin, along Grantley Harbor and Coffee Dome. Preferred breeding habitat is dwarf shrub meadows primarily in hummock-ridge tundra and tussock-shrub tundra. It is estimated that 1,200 pairs may regularly appear within the Project area (Marks et al. 2020). Bristle-thighed curlews arrive at their breeding grounds in late May and typically stage and depart Alaska throughout August (Marks et al. 2020). Their diet is primarily composed of fruits but includes insects. Their population concerns are mainly attributed to habitat degradation in their winter range and predation by exotic animals during their winter molt when they become temporarily flightless. Habitat degradation is less of a concern in Alaska; however, local subsistence harvests may have contributed to overall population declines (Marks et al. 2020).

DUNLIN

Dunlins (*Calidris alpina*) exhibit a near circumpolar distribution with multiple subspecies. The dominant subspecies appearing near the Project area is *Calidris alpina pacifica.* Their diet is composed of insects, mollusks, and seeds. Threats to their population include wintering habitat loss, climate change, and environmental contamination such as oil spills. Dunlins are present on the Seward Peninsula during their breeding season starting mid-May and typically depart by late September. On the Seward Peninsula, dunlins have been found in the highest densities where wet meadow is mixed with drier dwarf shrub habitat (Fernández et al. 2010).

KITTLITZ'S MURRELET

Kittlitz's murrelets (*Brachyramphus brevirostris*) feed on small crustaceans. Their nests have been found in the western Seward Peninsula and west of the Baird Mountains, north of Kotzebue. Kittlitz's murrelets are found on breeding grounds between April and October, nesting on barren mountainsides primarily up to 1,400-foot elevation or in partially vegetated dwarf shrub habitat (Day et al. 2011). The Kittlitz's murrelet has experienced population declines, likely from habitat degradation due to climate change and bycatch in gillnet fisheries (ADF&G 2025c). Between 1989 and 2000, the Kittlitz murrelet population has decreased approximately 30 percent annually but has since stabilized (USFWS 2013).

RED KNOT

Red knots (*Calidris canutus*) feed primarily on mollusks. They breed on the Seward Peninsula and prefer habitats composed of dry, stony ground close to wetlands (Pohlen et al. 2021). Red knots are typically on breeding grounds between June and August (Carmona et al. 2013). The impact of small-scale disturbances at the few migratory stop-over locations has had an outsized impact on the species, particularly on the Atlantic coast and in their wintering range. In Alaska, impacts on the population have been limited. Habitat such as Imuruk Basin may provide important nesting locations, as well as pre-migration feeding areas (Pohlen et al. 2021).

ROCK SANDPIPER

Rock sandpipers (*Calidris ptilocnemis*) are one of the few shorebirds that breed in the Arctic and winter in Alaska on coastal rocks or rock jetties (Audubon 2025). There are multiple subspecies throughout their range in the Bering Sea, differentiated by breeding location. Rock sandpipers can appear within the Project area, both in their non-breeding and breeding season, depending on the subspecies, with *Calidris ptilocnemis tschuktschorum* the most likely to be present (Pruett and Winker 2005). Other subspecies, such as *C.p. ptilocenemis*, may also be present during the year and are more susceptible to disturbance effects on their population due to small, isolated breeding populations (Pruett and Winker 2005). Rock sandpipers largely inhabit shorelines, feeding on aquatic invertebrates, and nest on the ground in tundra habitats near freshwater or coastal areas (Cornell Lab of Ornithology 2025).

WANDERING TATTLER

Wandering tattler breeding distribution is widespread between Alaska, western Canada, and the northern Russian Far East. Wandering tattlers arrive on breeding grounds in June and depart in July (Weeden 1959). During their breeding period, they are commonly associated with subalpine areas of mountain landscapes. They often feed on insect larvae and nymphs, crustaceans, and mollusks (Gill Jr. et al. 2015). Habitat loss from climate change is a primary threat to their population as increasing shrub growth in the Arctic reduces open tundra nesting habitat (Cornell Lab of Ornithology 2025).

3.2.3.3 Waterfowl

Many waterfowl species are present within or near the Project area. Tundra swans, sandhill cranes, multiple species of geese, and over 20 species of dabbling, diving, and sea ducks are known to be present within the Project area. Spectacled eider (*Somateria fischeri*) and Steller's eider (*Polysticta stelleri*) are listed under the ESA and discussed further in Sections 3.2.6.10 and 3.2.6.11, respectively, while yellow-billed loon (*Gavia adamsii*) is a designated BCC due to evidence of long-term habitat loss.

All waterfowl are ground nesters and place their nests near a waterbody where they have escape access into the water, feed on select tundra and marsh plants, and target aquatic invertebrates and small fish (Cornell Lab of Ornithology 2025). Waterfowl are widely distributed, but are in particularly high concentration around Imuruk Basin, which contains high-quality habitat for breeding, feeding, and molting (Zimmerman 1982). Imuruk Basin has also been observed to have early openings in nearshore ice, creating critical congregation areas for spring migrants (Zimmerman 1982). Migratory waterfowl are managed by both USFWS and ADF&G as game species. Waterfowl are a common subsistence resource in Alaska. Local residents often collect eggs and subsistence hunt for waterfowl during spring. Hunting is also conducted during late summer and fall in the marshes and lagoons around Imuruk Basin (Conger and Magdanz 1990).

YELLOW BILLED LOON

Researchers estimate that fewer than 1,000 pairs of yellow-billed loons attempt breeding each year. In Alaska, their breeding range has a patchy distribution throughout the Subarctic and Arctic. Their range extends from Point Lay, including St. Lawrence Island and the coastal areas of the Seward Peninsula, to the Canning River on the Arctic Coastal Plain. Yellow-billed loons breed on lowland Arctic tundra in areas dominated by lakes, streams and wetlands. Within the Project area, yellow billed loons are likely to nest and rear their young near freshwater lakes and coastal waters, such as Imuruk Basin and the surrounding wetlands. Their preferred diet is composed of various fish species, making the quality of lake habitat a selecting factor for nesting and rearing site selection. Habitat loss and degradation from economic expansion is a primary threat to species persistence (Earnst 2004).

3.2.3.4 Raptors

Several raptor species occur within the Project area, including golden eagles, gyrfalcons (*Falco rusticolus*), peregrine falcons (*Falco perigrinus*), rough-legged hawks (*Buteo lagopus*), northern harriers (*Circus cyaneus*), snowy owls, and short-eared owls (*Asio flammeus*). All raptor species present are protected under the MBTA, and golden eagles are protected under the BGEPA.

Raptors target a wide variety of prey species, including waterfowl, ptarmigans, Arctic ground squirrels (*Spermophilus parryii*), and rodents such as northern red-backed voles (*Myodes rutilus*), northern collared lemmings (*Dicrostonyx groenlandicus*), common shrews (*Sorex cinereus*), and dusky shrews (*Sorex palustris*; Cornell Lab of Ornithology 2025). Prey species selection is largely driven by availability and can fluctuate seasonally or annually (Henderson et al. 2021). Raptors on the Seward Peninsula are commonly cliff-nesting species and build their nests on cliff ledges close to their preferred hunting habitat (Cornell Lab of Ornithology 2025). Owls within the Project area are ground nesters, choosing dry ground on raised sites with vegetation. All raptor species within the Project area are known to reuse nest sites, rebuilding and repairing nests annually or placing a new nest atop the nest from the previous year (Cornell Lab of Ornithology 2025), but they may also establish new nest sites.

SHORT EARED OWL

Alaska is the northernmost extent of the short-eared owl’s breeding distribution. Short eared owls preferred habitat is tundra and low shrubland habitat types. They predate on small mammals and often prefer meadow voles (*Microtus* spp.). Short-eared owl abundance and habitat is positively correlated with meadow vole abundance. High latitude areas where small mammals are less abundant than they were historically have displayed breeding failures for small mammal specialists such as short-eared owls. Other sources of short-eared owl population decline include low site fidelity (Booms et al. 2014). Short eared owls show low site fidelity as well as variable seasonal and annual movements. Short eared owls that have been tagged in Alaska did not return to the area in which they were previously abundant. This complicates monitoring of this species and obscures responsibility for management agencies, making this species vulnerable to decline due to nomadic movements making population estimates difficult.

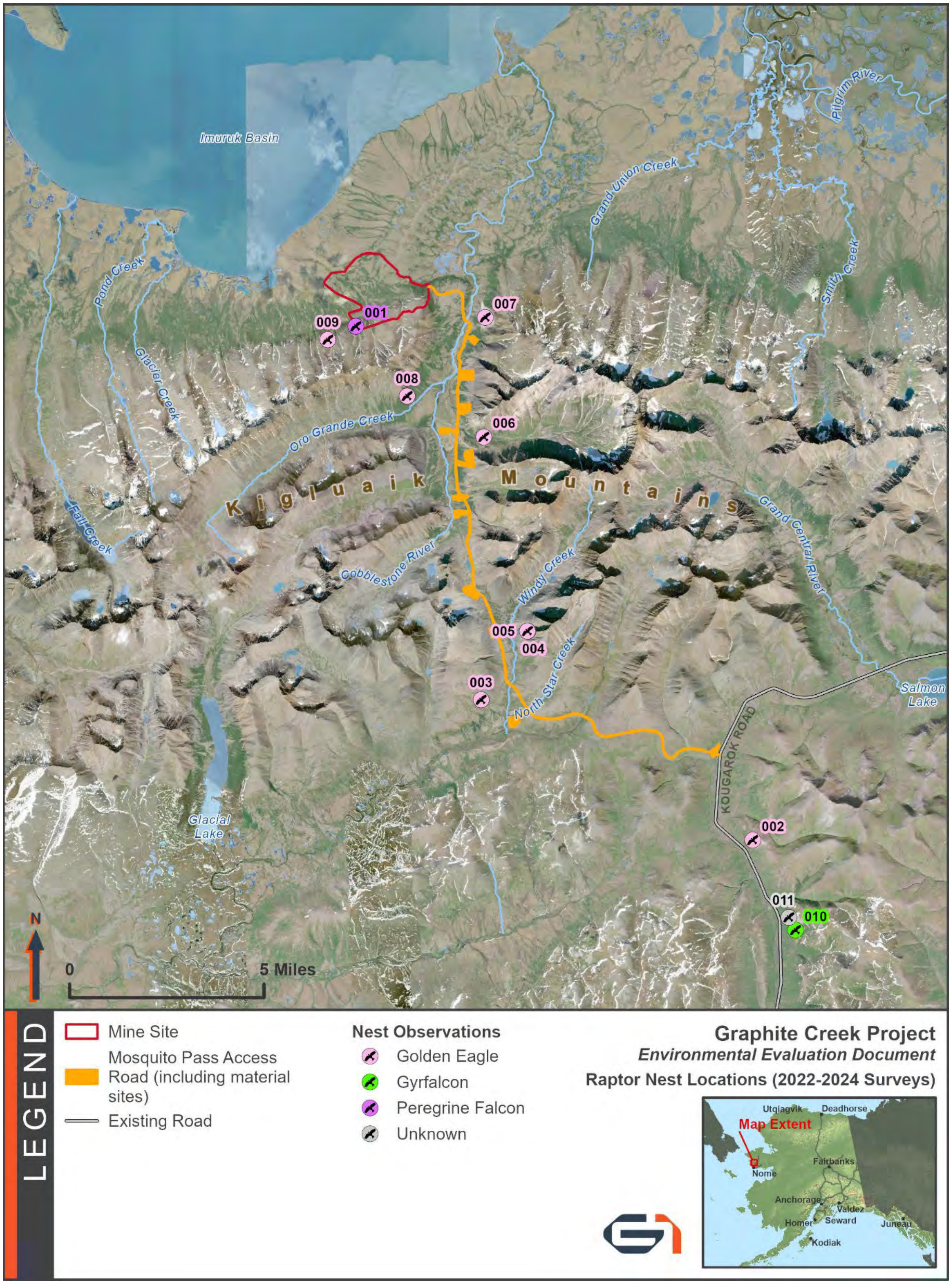
Snowy Owl

Snowy owls nest on Arctic tundra throughout its circumpolar range. In general, they breed in areas with abundant rodents in elevations below 1,000 feet. Their nests are often built on windswept ridges, mounds, hummocks, and rocky outcrops where little vegetation is present, often near the coast. The snowy owl diet is composed primarily of lemmings during the breeding season. Some individuals will winter in their breeding grounds, while others migrate (Holt et al. 2020; Therrien et al. 2014). Global warming is believed to be the primary contributor to snowy owl population decline (Gousy-Leblanc et al. 2023).

Raptor Nest Surveys

Since 2022, Graphite One has sponsored raptor nest surveys along the Mosquito Pass access corridor and near the mine site area to avoid impacts on nesting raptors during seasonal geotechnical and exploratory drilling. A total of 10 cliff nests have been identified; see for locations of identified and suspected nest sites. Eight of these nests have been confirmed as golden eagle nests, one is a gyrfalcon nest, and one could not be identified to a species. Sites 004 and 005 are located on the same cliff face within 50 feet of each other and are likely used by the same nesting pair of golden eagles. During the surveys, HDR biologists observed nesting behavior by peregrine falcons at one site (site 001 on Figure 3-20) as well as the presence of whitewash on rocky outcroppings; however, a nest has not been found within this area.

Figure 3-20. Raptor nest survey results (2022–2024)



3.2.4 Terrestrial Mammals

The study area for terrestrial mammals is 20 miles from all Project components, the extent of noise impacts from the Proposed Action. The terrestrial environment surrounding Imuruk Basin and Nome provides habitat for a variety of terrestrial mammals. Habitat within the study area includes high elevations within the Kigluaik Mountains as well as wetland and upland habitats sloping toward Imuruk Basin and Nome that are sparsely populated with shrubs. Section 3.2.1.1 describes vegetation present within the study area.

ADF&G identifies SGCN as species whose populations are small, declining, or under significant threat; are culturally, ecologically, or economically important; function as indicators of environmental change; and have a high percentage of their North American or global populations in Alaska. Game species are often not considered for SGCN classification. No terrestrial mammals that may occur within the Project area are listed as SGCN. Table 3-22 summarizes terrestrial mammal presence within the Project area.

Table 3-22. Terrestrial mammals with potential to occur within the Project area

Species	Presence within Project Area	Habitat Preference	Seasonality within Project Area
Beaver (*Castor canadensis*)	Common	Lakes and ponds exceeding 2 feet in depth near shrub habitat	Year-round
Black bear (*Ursus americanus*)	Rare	Forested habitat	Year-round
Brown bear (*Ursus arctos*)	Common	Varies: Shrub habitat near anadromous streams to denning habitat in alpine/ subalpine	Year-round
Caribou and reindeer (*Rangifer tarandus granti*)	Rare	Landscape containing lichen and may include graminoids, shrubs, moss, and forbs	Winter
Ermine (*Mustela erminea*)	Common	Shrub habitats near water, wet meadows, marshes, riparian woodlands, and riverbanks	Year-round
Gray wolf (*Canis lupus*)	Common	Areas where prey species are present	Winter and potentially year-round
Mink (*Neovison vison*)	Common	Saltwater beaches, riparian areas, and marshes	Year-round
Moose (*Alces alces*)	Common	Dwarf shrub and riparian areas	Year-round

Species	Presence within Project Area	Habitat Preference	Seasonality within Project Area
Muskox (*Ovibos moschatus*)	Common	Windblown ridge habitat during winter and riparian areas during spring through fall	Year-round
River otter (*Lutra canadensis*)	Common	River drainages	Year-round
Wolverine (*Gulo gulo*)	Common	Areas where prey species are present, typically high elevations during summer and low elevations during winter	Year-round

3.2.4.1 Beaver

Beavers (*Castor canadensis*) are abundant within the Project study area vicinity, and the population has grown rapidly over the last 20 years (Bogle 2022; Tape et al. 2022). Their diet is primarily composed of both aquatic and terrestrial vegetation. Between 2003 and 2017, ponds impacted by beavers on the Seward Peninsula more than doubled (BLM 2006). They prefer waterbodies with depths greater than 2 feet near shrub habitats. Beavers are ranked alongside river otters as the most important species targeted by trappers within the surrounding area (Game Management Unit [Unit] 22; Bogle 2022).

3.2.4.2 Black Bear

Black bears (*Ursus americanus*) primarily occupy forested habitat east of the Project study area. No current population estimates are available for black bears surrounding the Imuruk Basin (BLM 2006). Black bears occupy similar habitats as brown bears (*Ursus arctos*) but are often out competed where resources are limited due to their size differential. Black bears prefer deciduous and dwarf shrub/herbaceous vegetation types during spring, which may be correlated to the presence of berries from the prior year. This habitat preference carries over to the summer, when berries are present. Black bears tend to move to higher elevations for denning during winter months (Belant et al. 2009).

3.2.4.3 Brown Bear

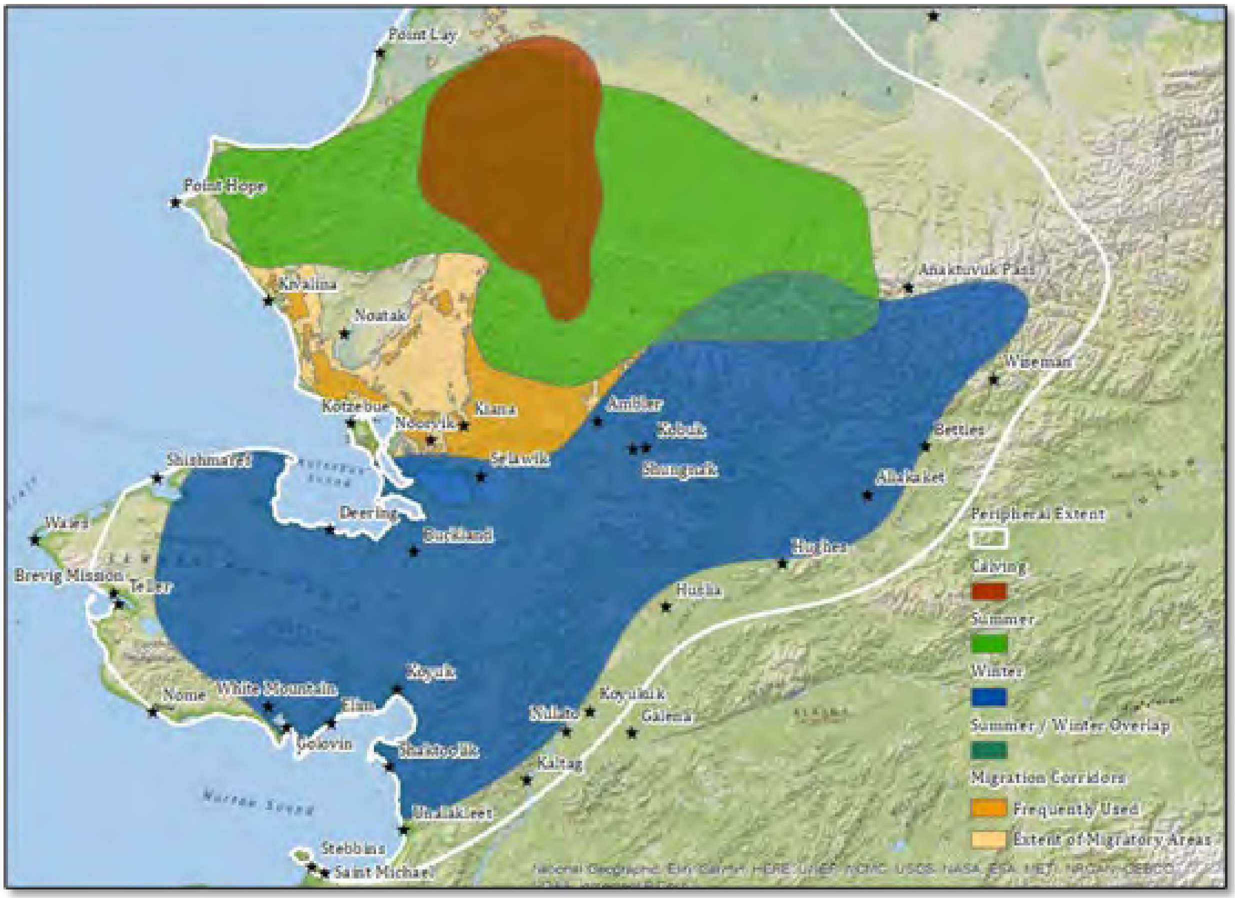
Brown bears are widely distributed throughout the Seward Peninsula. Brown bear density within the area surrounding the study area is approximately 36 bears per 1,000 square miles (Germain 2022). Their preferred diet includes salmon and forage material such as blueberry (*Vaccinium* spp.) and crowberry (*Empetrum nigrum*; Mangipane et al. 2017). Declining fish and other prey species on the Seward Peninsula have the potential to adversely influence brown bear populations. Brown bear habitat within the Project study area is considered to mostly be in its natural state, with few roads or other development impacting preferred habitat (BLM 2006). Preferred habitat includes shrub landscapes near anadromous waterbodies and alpine or subalpine habitat for denning. Brown bears are considered necessary for the traditional way of life on the Seward Peninsula and are heavily harvested. The average harvest between 2015 and 2018 was approximately 117 brown bears annually (ADF&G Unit 22; Germain 2022).

3.2.4.4 Caribou

Caribou (*Rangifer tarandus granti*) residing on the Seward Peninsula are part of the Western Arctic Caribou Herd (WACH). The WACH range extends beyond the Seward Peninsula to cover approximately 157,000 square miles of northwestern Alaska. The WACH tends to winter in the Nulato Hills as far south as the Unalakleet River Drainage. Since 1996, this wintering range has shifted away from the southern portion of the Nulato Hills toward the Seward Peninsula or Upper Kobuk and Koyukuk River drainages. At the southwestern extent of this range, the WACH overlaps with the Imuruk Basin (Figure 3-21). While their peripheral extent is believed to reach Norton Sound to the south and west of Imuruk Basin, individuals are most densely populated in the northern areas of the Seward Peninsula during winter. Wintering ranges coincide with cold growth lichen. The population was estimated to be 235,000 individuals in 2013. At the time this population estimate was produced, the population had experienced a 15 percent annual decline for 3 consecutive years, or a loss of 90,000 individuals. This is substantially higher than the 4 to 6 percent annual decrease between 2003 and 2011 (Harper and McCarthy 2015). As of 2023, the population size was 152,000 caribou (WACH Working Group 2024).

Approximately 83 percent of the WACH diet is lichen. The herd also forages for graminoids, shrubs, moss, and forbs (Jandt et al. 2003). Since 2000, subsistence communities have harvested approximately 10,000 to 15,000 caribou annually. Since 2016, an additional 250 individuals have been harvested annually by hunters living outside the region (WACH Working Group 2019).

Figure 3-21. Western Arctic Caribou Herd seasonal ranges (2002–2017)



Source: Harper and McCarthy 2015

3.2.4.5 Reindeer

Reindeer are domesticated or semi-domesticated caribou (*Rangifer tarandus* spp.; BLM 2008). Reindeer on the Seward Peninsula are privately owned and descendants of domesticated European stocks. These stocks were first introduced on the Seward Peninsula near Teller in 1982. At that time, caribou had been extant from the Seward Peninsula for at least 50 years (BLM 2008).

Since their introduction in 1982, reindeer herding has been a critical component of the Seward Peninsula economy. At the height of the industry, reindeer production was significant enough to sustain communities with meat, bartering resources, and local employment (BLM 2008). Reindeer herding is considered a valued cultural tradition for Alaska Natives.

All of the Seward Peninsula is subdivided into reindeer grazing units. One reindeer grazing unit, the Karakuk Unit (encompassing 838,000 acres), contains all of the Project's components. All reindeer herding on the Seward Peninsula is free range. Two herds are located near the project area, the Kakaruk Reindeer Herd (approximately 2,200 reindeer) and the Midnight Sun Herd (approximately 220 reindeer). The Midnight Sun herd typically uses the area along the Upper Sinuk and the Kakaruk herd grazes east of the project area around Canyon Creek. The Karakuk Unit's positioning on the western side of the Seward Peninsula, away from the WACH range, has helped buffer it from individuals joining the WACH, as compared to reindeer herds on the eastern side of the Seward Peninsula. As a result, the Karakuk Herd has been commercially viable during times when other herds were not.

Modern WACH expansion onto the Seward Peninsula has made reindeer management difficult because individuals have been known to join the WACH and not return to their home ranges (WACH Working Group 2019). Between 1992 and 2005, more than 17,000 reindeer joined the WACH. This loss translates to 11 of the 15 reindeer herds on the Seward Peninsula losing at least 90 percent of their population size. As a result of this loss, many reindeer herds have become too small to be economically viable. Seward Peninsula reindeer displacement results in an annual loss of $1.4 million per year to the regional economy (Rattenbury et al. 2009).

In 2016, ADF&G established the RC800 caribou hunting permit in Unit 22, which encompasses the entire project area, to allow for caribou hunting while also protecting the reindeer herds from accidental harvest. ADF&G opens areas within Unit 22 to caribou hunting by Emergency Order if caribou are observed in active reindeer ranges to minimize conflicts with Seward Peninsula reindeer herding. Hunting is authorized under the RC800 permit for residents and for nonresidents under a general season harvest ticket.

3.2.4.6 Ermine

Ermines (*Mustela erminea*) are common within Project study area vicinity (Bogle 2023). They occupy shrub habitats near water as well as wet meadows, marshes, riparian woodlands, and riverbanks. Their diet is mainly composed of small mammals such as shrews and mice. Ermines are adapted for heavy snow conditions. They will create tunnels within the snow where they can forage and avoid predators (ADF&G 2025d).

3.2.4.7 Gray Wolf

Gray wolves (*Canis lupus*) are present within the Project study area in stable numbers where prey species are found. Gray wolves feed on moose, muskoxen, and caribou as a primary food source supplemented with small mammals, including voles, lemmings, ground squirrels, snowshoe hares, beavers, and occasionally birds and fish (BLM 2006; Hughes 2022). Wolves are generally concentrated where the WACH overwinters, and their range has shifted in response to the WACH winter range changes throughout the 1900s and 2000s. No recent estimates on wolf populations within the area are available; however, anecdotal reports and observations from ADF&G biologists suggest that the wolf population is increasing (Hughes 2022).

3.2.4.8 Mink

American minks (*Neovison vison*) are common on the Seward Peninsula. Their preferred habitat includes saltwater beaches, riparian areas, and marshes. The minks' diet is composed of fish, birds, insects, crabs, clams, and small mammals. Minks are commonly harvested on the Seward Peninsula (Bogel 2023; ADF&G 2025e).

3.2.4.9 Moose

Moose (*Alces alces*) only recently moved onto the Seward Peninsula in the mid-twentieth century (Grauvogel 1986) but are now found throughout the area. They tend to prefer habitats such as riparian areas that contain willow and birch shrubs for foraging. Despite their widespread distribution, populations near the study area have declined between 35 and 50 percent since the 1980s (BLM 2006; Stimmelmayr et al. 2003). Population decline has been attributed to over browsing in wintering areas and a subsequent decline in winter forage (Stimmelmayr et al. 2003). A survey conducted in 2002 surrounding the Imuruk Basin produced an estimate of 1,594 individuals (BLM 2006).

3.2.4.10 Muskox

Muskoxen (*Ovibos moschatus*) had become locally extinct on the Seward Peninsula before or during the nineteenth century. The animals that currently populate the Project study area are descendants of a population introduced to the region in 1970. Reintroduction efforts have been successful and have resulted in rapid population growth. The population on the Seward Peninsula is established as far east as the Buckland River and Darby Mountains. Muskoxen have been reported farther east on the Seward Peninsula, but infrequently and in small numbers. In 2005, the population was estimated at 2,387 individuals, with the highest population density occurring on the western side of the Seward Peninsula (BLM 2006).

During winter, muskoxen prefer windblown ridge habitat when snow depth exceeds 12 inches. Due to the lack of available vegetation during winter, muskoxen primarily survive on body-fat reserves. During summer, they seek out riparian areas for foraging (BLM 2006).

3.2.4.11 River Otter

River otters (*Lutra canadensis*) are commonly found in river drainages within the Project study area (BLM 2006). They are adapted to both aquatic and terrestrial environments. River otter diet is primarily composed of snails, insects, fish, and occasionally birds and small mammals. Trappers within the region ranked river otters as the most important furbearer to harvest, alongside beavers (Bogle 2022).

3.2.4.12 Wolverine

Wolverines (*Gulo gulo*) are common within the Project study area and have stable populations (BLM 2006). Male wolverines in Alaska exhibit large home ranges that extend between 200 and 260 square miles. Female ranges are smaller but can be as large as 115 square miles. Wolverines are opportunistic feeders and are adapted for scavenging. Their diet often reflects seasonal changes in food availability, relying primarily on moose and caribou carrion during winter and small mammals the remainder of the year (ADF&G 2025f).

3.2.5 Marine Mammals

This section discusses marine mammal species likely to be found near the Project area that are not listed as threatened or endangered under the ESA. Section 3.2.6 Threatened and Endangered Species, and Critical Habitat describes ESA-listed marine mammal species found near the Project area. Marine mammals that have been observed in the Imuruk Basin include beluga whales (*Delphinapterus leucas*), ribbon seals (*Histriophoca fasciata*), and spotted seals (*Phoca largha*). Marine mammal species with the potential to be present in marine waters between the Imuruk Basin and Nome (marine study area) include those three species as well as gray whales (*Eschrichtius robustus*), harbor porpoises (*Phocoena phocoena*), killer whales (*Orcinus orca*), minke whales (*Balaenoptera acutorostrata*), narwhals (*Monodon monoceros*), and northern fur seals (*Callorhinus ursinus*).

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). Marine mammals provide an important food source for communities near the Project area such as Teller and Brevig Mission, forming a proportionally high component of their diet (Brigham et al. 2008).

3.2.5.1 Beluga Whale

Local subsistence hunters have observed beluga whales (*Delphinapterus leucas*) in the Imuruk Basin. However, beluga whales have been absent from Imuruk Basin in recent years (NSBSRPT 2015). Beluga whales that may be present between Imuruk Basin and the Port of Nome are part of the Eastern Chukchi Sea and Eastern Bering Sea stocks. Members of the Eastern Bering Sea stock may be present year-round, while members of the Eastern Chukchi Sea stock would only be present during their winter migration to the southern Bering Sea (NOAA 2025a).

Beluga whales may seasonally inhabit estuaries and large river deltas to feed on fish, targeting herring and salmon runs like those in Imuruk Basin. The Eastern Bering Sea and Eastern Chukchi Sea stocks are not designated as depleted under the MMPA. Changing Arctic conditions such as sea ice temperatures, ice extent, and their associated effects on beluga whale prey species are a threat to the two stocks. Nearby communities have recorded beluga whale subsistence harvests; however, beluga whales form a smaller component of their diet than other marine mammals (Brigham et al. 2008).

3.2.5.2 Gray Whale

Gray whales are found in the North Pacific Ocean. Gray whales with the potential to inhabit waters between Port Clarence and the Port of Nome are part of the Eastern North Pacific stock. Gray whales from the Eastern North Pacific stock feed primarily in the northern Bering and Chukchi Seas during summer but can be found southward through the Pacific Coast between Southeast Alaska and northern California. Gray whales migrate south during fall to overwinter in warmer waters and migrate north during spring. Their diet is composed primarily of benthic and epibenthic invertebrates. The Eastern North Pacific stock is not designated as depleted under the MMPA. Common threats to gray whales include entanglement in fishing gear, vessel strikes and other boat disturbances, underwater anthropogenic noise, and habitat degradation (NOAA 2025b).

3.2.5.3 Harbor Porpoise

The harbor porpoise's range extends from Point Barrow along the Alaska coastline and south to Point Conception, California. Those that have the potential to occupy the marine study area are part of the Bering Sea stock. Harbor porpoises tend to occupy waters less than 328 feet deep and are most often found in nearshore and inland waters. Their diet is composed of schooling fish. The Bering Sea stock is not designated as depleted under the MMPA. Threats to the stock include physical alterations of nearshore habitat for urban and industrial development, habitat change from warming climates that may alter their distribution, and shipping noise (NOAA 2025c).

3.2.5.4 Killer Whale

Killer whales are known to inhabit marine waters globally, though their distribution is concentrated in cold-temperate waters. Killer whales transit through the Bering Sea seasonally following ice-free areas. Those with the potential to be present in the marine study area would be members of either the Alaska resident stock or the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock. These stocks are not designated as depleted under the MMPA. Killer whales are opportunistic feeders. The diet of resident killer whales is composed primarily of fish such as salmon, herring, halibut, and cod; transient stocks of killer whales typically predate on other marine mammals. Common threats to killer whales include habitat degradation and entanglement with fisheries equipment (NOAA 2025d).

3.2.5.5 Minke Whale

Minke whales can be found in both coastal and offshore areas in polar, temperate, and tropical waters. Minke whales are common in the Chukchi and Bering Seas. Minke whales feed opportunistically on crustaceans, plankton, and small schooling fish. Minke whales are not designated as depleted under the MMPA. Their abundance estimate is currently unknown. Threats to minke whale populations include elevated levels of sound from anthropogenic sources, changes in prey distribution from changing habitats, entanglement in fishing gear, ship strikes, and oil and gas activity (NOAA 2025e).

3.2.5.6 Narwhal

Narwhals are rare but may be present year-round north of 60 degrees North in the Bering Sea. They feed near the ocean bottom. The narwhal's diet is composed primarily of medium to large-size Arctic fish such as Arctic or polar cod (*Boreogadus saida*) and turbot (*Scophthalmus maximus*) in addition to squid (various species) and shrimp (from the families Hippolytidae, Pandalidae, and Crangonidae). Narwhals are not designated as depleted under the MMPA. They prefer areas with significant ice cover during winter. Warming conditions in the Arctic may influence narwal prey species presence and distribution and may pose a long-term threat to narwhals. Additionally, changing ice conditions risk ice entrapment. Other threats to narwhals include increased shipping and development in the Arctic, which put narwhals at risk of increased noise pollution and ship strikes. Killer whale predation is also a threat to narwhals (NOAA 2025f; Laidre et al. 2006, 2015).

3.2.5.7 Northern Fur Seal

Northern fur seals off the western coast of North America occur between southern California and the Bering Sea. During the summer breeding season, most of the worldwide population is found on the Pribilof Islands in the southern Bering Sea. During the reproductive season, males can be found on shore between May and August, while females may be on shore between June and November. After leaving reproductive areas, northern fur seals remain at sea until the following breeding season and generally move southward. Their diet is primarily composed of walleye pollock (*Theragra chalcogramma*) and includes Pacific sand lance (*Ammodytes personatus*), Pacific herring, northern smoothtongue (*Leuroglossus schmidti*), Atka mackerel (*Pleurogrammus monopterygius*), Pacific salmon, and squid (various species). Northern fur seals in Alaska are designated as depleted under the MMPA. Threats to northern fur seals include environmental perturbation, disease, predation, contaminants, indirect effects of commercial fishing, incidental take, poaching, and the effects of human presence and development at or near fur seal rookeries (NOAA 2025g).

3.2.5.8 Ribbon Seal

Ribbon seals are found in the Bering and Chukchi Seas, following the ice edge seasonally until summer when they concentrate around the Bering Strait (Young et al. 2023), and have been known to enter the Imuruk Basin (NSBSRPT 2015). They are primarily a pelagic species and have been found to feed most frequently on shrimps, crabs, mysids, pollock, and Arctic cod (Quakenbush and Citta 2008). Ribbon seals are distributed throughout much of the north Pacific Ocean but are found mostly in the Okhotsk and Bering Seas. During winter, spring, and early summer, ribbon seals are found on sea ice and remain associated with sea ice throughout their whelping, breeding, and molting periods. They tend to be found in the central and western areas of the Bering Sea between March and May. Between May and mid-July, seals move to northern areas of the Bering Sea, where they become concentrated in the Bering Strait and southern edge of the Chukchi Sea after ice melt. The seasonal distribution patterns displayed by ribbon seals make them unlikely to occur in the Imuruk Basin, but they may occur in the marine portion of the Project area. Ribbon seals are not designated as depleted under the MMPA. Modifications to sea ice extent from the changing Arctic climate pose threats to ribbon seals (Boveng et al. 2013).

3.2.5.9 Spotted Seal

Spotted seals that have the potential to be in the Imuruk Basin and marine study area are part of the Bering Sea Distinct Population Segment (DPS) and range throughout the Bering, Chukchi, and Beaufort Seas. Spotted seal distribution fluctuates seasonally depending on sea ice cover. During winter, spotted seals move from nearshore to offshore habitats when sea ice becomes available near the continental shelf break (Lowry et al. 2000). Between August and October, spotted seals use coastal haul outs where prey is abundant far from the ice break. They are known to inhabit Port Clarence near Imuruk Basin (Lowry et al. 2000). Herring, crustaceans, and pollock are important dietary components for spotted seals across their range. Spotted seals are not designated as depleted under the MMPA. Changes in the extent and timing of sea ice pose threats to spotted seals (NOAA 2025h).

3.2.6 Threatened and Endangered Species, and Critical Habitat

This section describes the affected environment for T&E species and their habitat. The study area for T&E species includes the Project footprint and the surrounding areas that include potential Project-related and downstream effects on T&E species. The Project is subject to review under the NEPA as well as Section 7 of the ESA. The ESA is implemented by the USFWS and the National Marine Fisheries Service (NMFS). The USFWS in Alaska oversees terrestrial T&E species as well as select marine T&E species, including polar bears, walruses, and sea otters. NMFS oversees the management of the majority of marine T&E species as well as anadromous T&E fish species.

An endangered species is a plant or animal in danger of extinction throughout all or a significant portion of its range. A threatened species is one in danger of becoming an endangered species in the foreseeable future throughout all or a significant portion of its range (40 CFR 230.30). ESA regulations (50 CFR 402.02) define the study area for T&E species as the area within which all direct and indirect effects, described as "all consequences to listed species or critical habitat that are caused by the proposed action," will occur. Eleven ESA-listed animal species, including two DPSs of humpback whales (Table 3-23) have the potential to be affected by the Project.

Table 3-23. ESA-listed species within the Project area

Species	Status	Does Critical Habitat overlap with Project Area? (Y/N)	Jurisdictional Agency
Mammals	—	—	—
Humpback whale, Western North Pacific DPS (*Megaptera novaeangliae*)	Endangered	No	NMFS
Humpback whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	No	NMFS
Fin whale (*Balaenoptera physalus*)	Endangered	No designated critical habitat	NMFS
North Pacific right whale (*Eubalaena japonica*)	Endangered	No	NMFS
Bowhead whale (*Balaena mysticetus*)	Endangered	No designated critical habitat	NMFS
Polar bear (*Ursus maritimus*)	Threatened	Yes	USFWS
Steller sea lion, Western DPS (*Eumetopias jubatus*)	Threatened	No	NMFS
Bearded seal, Beringia DPS (*Erignathus barbatus*)	Threatened	Yes	NMFS
Ringed seal, Arctic DPS (*Pusa hispida*)	Threatened	Yes	NMFS
Birds	—	—	—
Short-tailed albatross (*Phoebastria albatrus*)	Endangered	No designated critical habitat	USFWS
Spectacled eider (*Somateria fischeri*)	Threatened	No	USFWS
Steller's eider (*Polysticta stelleri*)	Threatened	No	USFWS

3.2.6.1 Humpback Whale

Humpback whales were listed as endangered under the Endangered Species Conservation Act (ESCA) in 1970 and listed at the inception of the ESA in 1973. In 2016, NMFS changed the status of the humpback whale under the ESA (81 FR 62259) to include 14 DPSs based on distinct breeding areas in tropical and temperate waters. Nine of the DPSs were delisted, one DPS was downlisted to threatened, and the final four DPSs remain listed as endangered.

DPSs with the potential to be present in the Project area include the Western North Pacific DPS (endangered), Hawaii DPS (not listed), and Mexico DPS (threatened). These DPSs migrate to productive summer feeding grounds in the North Pacific Ocean off the coast of Alaska, including the Aleutian Islands and Bering, Chukchi, and Beaufort Seas (Wade 2021). Wade (2021) estimated the probability of encountering humpback whales from each DPS in this region of the North Pacific Ocean (Table 3-24). Critical habitat for the Western North Pacific DPS and Mexico DPS was designated in 2021 (86 FR 21082) and does not overlap with the Project area. The abundance estimate for humpback whales in the Bering Sea and Aleutian Islands during summer months is estimated to be 7,758 animals (Wade 2021).

Table 3-24. Probability of encountering humpback whales from DPSs that feed seasonally in marine waters of the Project area

Summer Feeding Area	Western North Pacific DPS (endangered)	Hawaii DPS (not listed)	Mexico DPS (threatened)
Aleutian Islands and Bering, Chukchi, and Beaufort Seas	2%	91%	7%

Source: Wade 2021

Humpback whales have potential to occur in the Project area along the marine transportation corridor between Nome and Grantley Harbor; however, based on a population study conducted by Wade (2021), only approximately 9 percent of humpback whales in the region are ESA-listed. Therefore, the likelihood of encountering an ESA-listed humpback whale along the marine transportation corridor is very low.

3.2.6.2 Fin Whale

Fin whales were listed as endangered under the ESCA in 1970 and listed at the inception of the ESA in 1973 (35 FR 8491). Like other large whales, fin whale populations were depleted due in large part to commercial whaling practices (NMFS 2010). Critical habitat has not been designated for this species.

Fin whales are found seasonally in the central North Pacific Ocean, with peak detection rates during summer, fall and winter (Stafford et al. 2007). Whale abundance surveys indicate the Bering Sea is an important habitat for fin whales (Moore et al. 2000). From May to October, fin whales are frequently found in the southeastern Bering Sea (NMFS 2010) but have also been observed in the northern Bering Sea and as far north as the Chukchi Sea (Young et al. 2023).

Fin whales are commonly observed in areas of high productivity, such as the eastern Bering Sea continental shelf near the 200-meter isobath (Moore et al. 2000) and to a lesser extent, the middle shelf (Young et al. 2023). In the Bering Sea, fin whale abundance is consistently higher in cold years than warm years (Friday et al. 2013). Because fin whales tend to favor habitat along the outer continental shelf, which is 350 to 550 miles offshore of the coastline along the marine transportation corridor, they are extremely unlikely to be in the Project area.

3.2.6.3 North Pacific Right Whale

North Pacific right whales were listed as endangered under the ESCA in 1970 and listed at the inception of the ESA in 1973 (35 FR 18319). In 2008, NMFS reclassified right whales as two separate species: the North Pacific right whale and North Atlantic right whale (NMFS 2013). North Pacific right whales, among the rarest of all large whale species, were historically abundant in the southeastern Bering Sea during summer months. Commercial whaling depleted the North Pacific right whale population to the brink of extinction between 1860 and 1940 (Scarff 2001). NMFS designated critical habitat for this species in 2008 (73 FR 19000), which includes the southeastern Bering Sea. The Project area, including the marine transportation corridor, does not overlap with designated critical habitat.

North Pacific right whales are divided into two populations: eastern and western. The western population of North Pacific right whales has been observed in significant numbers in historically important feeding grounds in the Okhotsk Sea as well as the adjacent Kuril Islands and Kamchatka Coast. Small numbers of the eastern North Pacific right whale population have been observed in the Bering Sea, a historically important feeding area; however, their numbers appear to be much more depleted (Brownell et al. 2001). There are likely fewer than 500 North Pacific right whales remaining, and less than 30 individuals estimated to remain of the eastern population that is found in Alaskan waters (Young et al. 2024). Because North Pacific right whales occur in such low numbers, it is extremely unlikely one would be observed during Project activities.

3.2.6.4 Bowhead Whale

Bowhead whales were listed as endangered under the ESCA in 1970 (35 FR 8491; 35 FR 18319) and continued to be listed as endangered following the passage of the ESA. The Western Arctic stock is the only bowhead whale stock found in US waters. While commercial whaling had severely reduced bowhead whale numbers from historical levels, the Western Arctic bowhead whales have shown considerable population recovery (NOAA 2025i). Critical habitat has not been designated for bowhead whales.

Most bowhead whales in Alaska migrate annually from the northern Bering Sea wintering areas (December to March), through the Chukchi Sea in spring (April to May), to the Beaufort Sea, where they spend much of the summer feeding (June through early to mid-October), before returning to the Bering Sea in fall (September to December) (Citta et al. 2020; NMFS 2023). During the fall migration, bowhead whales tend to travel closer to shore in waters ranging from 49 to 656 feet deep (NMFS 2023). It is possible that bowhead whales may be present in the Project's marine transportation corridor during their fall migration between September and October.

3.2.6.5 Polar Bear

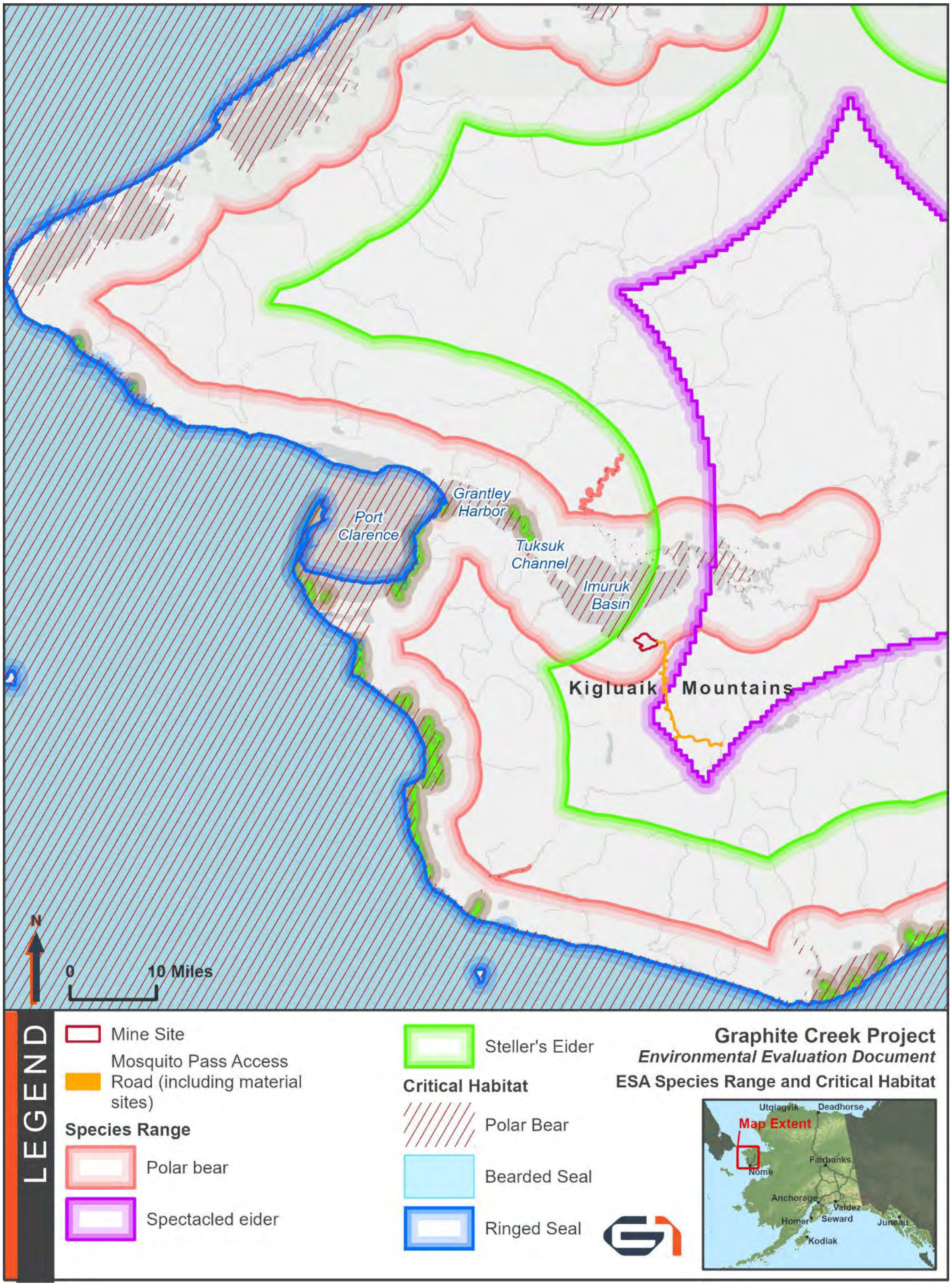
Polar bears were listed as threatened under the ESA in 2008 throughout their range (73 FR 2812) and 187,157 square miles of critical habitat were designated in 2011 (75 FR 76086). Within the Project area, polar bear critical habitat includes Imuruk Basin and several surrounding rivers but does not overlap with the footprint of the mine site (Figure 3-22).

Polar bears occur in five countries across the circumpolar north: Canada, Greenland, Norway, Russia, and the United States. Polar bears are divided into 19 subpopulations and occur in one of four ecoregions that are recognized based on the spatial and temporal dynamics of sea ice in Arctic and Subarctic marine waters (USFWS 2016). The Chukchi-Bering Seas polar bear population, the population that may occur within the Project area, includes polar bears in the northern Bering, Chukchi, and East Siberian Seas (75 FR 76086). Polar bears are found as far south as Nome, with observations typically being made in Norton Sound (Voorhees 2014). Often, when they are observed in or near communities such as Nome, they have been attracted by carcasses left over from subsistence hunts (USFWS 1995).

Polar bears are carnivores whose main prey source is ice-dependent seals. Their diet consists primarily of ringed seals and to a lesser extent, bearded seals. They are also known to hunt larger animals such as walruses, narwhals, and beluga whales (75 FR 76086). In some locations, they are known to feed on carrion, such as bowhead whale carcasses left over from subsistence hunters (Rogers et al. 2015).

Polar bear critical habitat is composed of sea-ice, terrestrial denning, and barrier island habitats. Approximately 96 percent of critical habitat (179,508 square miles) consists of sea-ice, which ranges from the mean high tide line to the 300-meter sea depth contour and includes land-fast ice and pack ice. Land-fast ice is frozen to the land or bottom of the sea, extends seaward from the coast, and remains stationary throughout the winter. Pack ice, located in the open ocean, is highly dynamic and consists of annual and multi-year ice. Polar bear distribution is closely linked to the extent of available sea-ice habitat, which they use as a platform for hunting, feeding, breeding, traveling, and occasionally maternal denning (75 FR 76086).

Figure 3-22. Critical habitat and species range overlap for polar bears, spectacled eiders, Steller's eiders, bearded seals, and ringed seals



Sea-ice critical habitat does not extend beyond the United States' 200-nautical-mile exclusive economic zone to the north, International Date Line to the west, or United States-Canada border to the east. The southern extent of polar bear sea-ice critical habitat is defined as the southern boundary of the Chukchi-Bering Seas population, which is determined by the southern extent of sea ice (75 FR 76086). The Chukchi-Bering Seas population of polar bears typically remains in close proximity to sea-ice extent throughout the year. They move seasonally to maintain association with sea ice and have been recorded moving distances as great as 621 miles in a summer season (75 FR 76086).

Approximately 2 to 3 percent of designated critical habitat (5,657 square miles) includes areas adequate for terrestrial denning. Terrestrial denning critical habitat designation contains known denning habitat on the northern coast of Alaska and does not include habitat in western Alaska. Between November and April, during the denning period, female polar bears may be found farther inland. Pregnant females begin denning by excavating their den during fall or early winter. Dens are commonly formed from snow drifts located on land near the coastline but are occasionally built on ice. Only pregnant female polar bears will overwinter in dens, and they will often emerge between February and March (USFWS 2024). Due to the proximity of sea ice, the Chukchi-Bering Seas polar bear population typically use terrestrial den sites in Russia and do not den in western Alaska.

Barrier island critical habitat, accounting for 1 to 2 percent of total critical habitat, covers an estimated 4,083 square miles. This critical habitat includes barrier islands and other terrestrial habitat within 1 mile of the islands (75 FR 76086). Barrier island critical habitat is essential for life history functions such as denning, refuge from human disturbance, coastal movement, and access to optimal feeding areas.

Because polar bears feed primarily on ringed seals and rely on ice as a hunting platform, it is extremely unlikely that polar bears would be present within the Project area during the ice-free season. There is a possibility that polar bears could be present in the Project area during the remainder of the year when sea ice is present; however, the likelihood is still low due to the shallow depth of Imuruk Basin and the resulting limited presence of ringed seals in the area.

3.2.6.6 Steller Sea Lion

In Alaska, two DPSs of Steller sea lions occur: the Western DPS and the Eastern DPS. The Western DPS, which includes animals born at and west of Cape Suckling, was listed under the ESA as threatened in 1990. In 1997, after continuous population decline, their status was changed to endangered (62 FR 24345). Critical habitat for Steller sea lions was designated in 1993 (58 FR 45269) and amended in 1994 (59 FR 30715) to include all rookeries and major haulouts, those supporting more than 200 Steller sea lions, as well as the land and air extending 3,000 feet from rookeries and major haulouts as well as marine waters that extend 20 nautical miles from rookeries and major haulouts west of 144 degrees West longitude.

The Steller sea lion abundance and distribution in the northern Bering Sea is poorly understood; however, they are believed to be expanding their range northward and extending their seasonal use of the Bering Strait region (Sheffield and Jemison 2021). Observations of sea lions have been recorded by researchers as well as hunters, especially on St. Lawrence Island (Sheffield and Jemison 2021). Sea lions born at rookeries as far away as the Kuril Islands in Russia and near the Canada-United States border in Alaska have been observed at haul outs in the Bering Strait region (Sheffield and Jemison 2021). There are no recorded observations of Steller sea lion haulouts or rookeries near the Project area. Most observations of Steller sea lions in the Bering Strait region are on St. Lawrence Island. As such, it is very unlikely Steller sea lions would be found within the Project area.

3.2.6.7 Bearded Seal

Since 2012, the Beringia DPS of bearded seal has been listed as threatened under the ESA due to concerns about ongoing sea ice habitat loss and bearded seals' overall sensitivity to the effects of climate change (77 CFR 76740; Young et al. 2023). In 2022, NMFS designated critical habitat for this species, which includes marine habitat in the Bering, Chukchi, and Beaufort Seas, including the marine portion of the Project area (87 FR 19180). A minimum population estimate of 273,676 individuals has been calculated for United States Bering Sea bearded seals. This estimate is likely an undercount of the real population size because it is based only on Bering Sea survey numbers and not the whole of Beringia (Young et al. 2023).

Throughout the year, bearded seals depend on available sea ice over shallow water (less than 650 feet deep) for major biological events, including breeding, birthing, nursing, weaning, and molting (Burns and Frost 1979). Shallow water with thin, moving ice allows for naturally occurring holes to be used by bearded seals. This type of ice also creates ideal conditions for seals to make breathing holes. Bearded seals also require relatively shallow water to feed on a mixture of bottom-dwelling invertebrates and fish (NOAA 2025j).

In the Bering-Chukchi region, bearded seals do not typically haul out in coastal areas, likely due to the availability of sea ice. Most bearded seals move seasonally to remain on sea ice year-round; however, a significant portion of juvenile and subadult seals remains in the open sea, and may enter estuaries and rivers (Burns and Frost 1979). Bearded seals have been observed in Imuruk Basin, but to enter the basin, seals must travel approximately 17 miles in marine waters from the main bay up a long, narrow channel. Bearded seal pups have also occasionally become trapped in nets during fall freeze-up. Several accounts report seals becoming trapped on land after freeze-up of Imuruk Basin, with two reports tracking down dead seals (Burns and Frost 1979). Due to the infrequent occurrence of bearded seal observations within the Project area, the likelihood of bearded seals being present during Project activities is low.

3.2.6.8 Ringed Seal

All five subspecies of ringed seal were listed under the ESA in 2012. Arctic ringed seals, the subspecies of ringed seal found within the Project area, were listed as threatened due to the ongoing loss of sea ice (77 FR 76706). Critical habitat was designated for Arctic ringed seals in 2022 and includes marine habitat in the Bering, Chukchi, and Beaufort Seas, including the marine portion of the Project area (87 FR 19232).

Ringed seals are the most common seal in the Arctic region; however, due to lack of abundance estimates in the Chukchi and Beaufort Seas, no reliable population estimates are available for the entire region. The minimum population estimate for the United States Bering Sea is 158,507 seals (Young et al. 2023).

Like bearded seals, ringed seals rely on sea ice, both shore-fast and pack ice, for major life history events. Sea-ice habitat is used for birthing, nursing, molting, and hauling out (Von Duyke et al. 2020). In addition to sea ice, snow is also biologically important for ringed seals. They depend on ample snow depths to create lairs for birthing and nursing pups. These snow lairs, also known as subnivean lairs, are important for pup survival, providing protection from both the elements and predators, including polar bears, foxes, wolves, gulls, and ravens (Von Duyke et al. 2020).

When sea ice is at its maximal extent during winter and early spring, ringed seals are abundant in the Chukchi, Beaufort, and northern Bering Seas, as well as Kotzebue and Norton Sounds. During winter, their distribution may range as far south as the Yukon-Kuskokwim Delta (Von Duyke et al. 2020). Seasonal movements of Arctic ringed seals are not well studied, but it is thought they migrate north seasonally from the Bering, Beaufort, and Chukchi Seas to summer on the pack ice in the Beaufort and Chukchi Seas. Ringed seals rarely haul out on land in the Arctic region (77 FR 76706).

Ringed seals tend to favor habitat on the continental shelf for foraging, likely due to the productivity of this region compared to the deep and less productive Arctic basin (Von Duyke et al. 2020). The primary prey species of ringed seals are Arctic cod, saffron cod, shrimps, and amphipods (primarily from the families Gammaridae and Hyperiidae) (87 FR 19232), but they are also known to feed on walleye pollock, Pacific cod (*Gadus macrocephalus*), herring, and capelin (*Mallotus villosus*) (77 FR 76706).

Ringed seals maintain their association with the ice during summer months, and it is extremely unlikely they will be within the Project area during this time. Because ringed seals are more highly associated with deeper waters in the Bering Sea than the area where the Project would occur, it is unlikely they will be present in Imuruk Basin during winter months.

3.2.6.9 Short-tailed Albatross

Short-tailed albatrosses were listed under the ESA as endangered in 2000 (65 FR 46643), and no critical habitat has been designated for this species. Short-tailed albatrosses can be found in Alaska oceanic waters but are not known to breed or nest in Alaska. They congregate over the open ocean and along the edge of the continental shelf, preferring shelf-edge and canyon habitats with depths ranging from 164 to 590 feet deep (Piatt et al. 2006; USFWS 2020). In the Bering Sea, short-tailed albatrosses are primarily found during the non-breeding season (principally June through September) along the continental shelf margin (Kuletz et al. 2014). Due to their pelagic distribution along the continental shelf edge, it is extremely unlikely that short-tailed albatrosses would be found within the Project area.

3.2.6.10 Spectacled Eider

Spectacled eiders were listed as a threatened species under the ESA in 1993. Spectacled eider populations declined severely from the 1970s until stabilizing at low numbers during the early 2000s (58 FR 27474; Fischer and Stehn 2014). Critical habitat for this species was designated in 2001 (66 FR 9146) and includes habitat in Norton Sound and the southeast Bering Sea; it does not overlap with the Project area. The causes of the spectacled eider's population decline are largely unknown but are suspected to be attributed to lead-shot poisoning, predation, exposure to contaminants, and habitat loss.

The entirety of the spectacled eider population winters in the central Bering Sea in pack ice openings between St. Lawrence and St. Matthew Islands (66 FR 9146). Due to reductions in sea ice, the timing of northward movement and winter distribution is likely changing. The Alaska breeding population migrates to the Yukon-Kuskokwim Delta or the Beaufort Sea coast to nest. Historically, spectacled eiders have been known to breed across western Alaska on the Seward Peninsula (USFWS 2021b). Spectacled eiders are typically on their breeding grounds from May to late June and prefer coastal areas in wet sedge and grass marshes with shallow waterbodies (Spectacled Eider Recovery Team 2002). Spectacled eiders migrate from their breeding grounds to molting grounds in July and congregate in large numbers to molt in Norton Sound and Ledyard Bay from early July through October. Female and juvenile spectacled eiders from the Yukon-Kuskokwim Delta breeding population tend to use Norton Sound for molting. Males from the same population occasionally use Norton Sound but are also known to use Ledyard Bay as well as molting grounds in Russia (66 FR 9146). Spectacled eiders are not expected to occur within the Project area but could be observed while transiting during their May or July migrations.

3.2.6.11 Steller's Eider

The Steller's eider is the rarest of all eider species, and the Alaska breeding population was listed as a threatened species under the ESA in 1997. Critical habitat was designated in 2001 and does not overlap with the Project area (62 FR 31748). Common stressors on Steller's eiders include predation, prey resource abundance, habitat loss, and ingestion of lead shot (USFWS 2019). The Alaska breeding population of Steller's eiders is composed of two subpopulations: the northern and western Alaska subpopulations. Both populations often mix with the Russian-Pacific breeding population during winter.

Steller's eiders spend most of their life in shallow, nearshore, marine environments and move to terrestrial habitats to nest. The Alaska breeding population spends the majority of the year in the marine waters of southwest Alaska. From July to October, when Steller's eiders are molting, they tend to concentrate in shallow areas with eelgrass beds. While some Steller's eiders remain in their molting areas through the winter, many others disperse across southwest Alaska to the Aleutian islands, the southern side of the Alaska Peninsula, and Kodiak Island, and as far east as Cook Inlet (USFWS 2002). Steller's eiders prefer wintering grounds with waters less than 30 feet deep and within 400 yards of shore (USFWS 2002).

During spring, prior to migration, Steller's eiders congregate in the thousands in estuaries along the northern side of the Alaska Peninsula. Nesting in Alaska begins in late May and lasts until October (Quakenbush et al. 2004; USFWS 2002). Steller's eiders prefer nesting in tundra habitat adjacent to small ponds, generally near the coast. However, their nests have been found as far as 56 miles inland (USFWS 2002). While historically found on the Seward Peninsula, the western Alaska subpopulation's habitat has contracted to the central coastal area of the Yukon-Kuskokwim Delta (USFWS 2019). Steller's eiders are not expected to occur within the Project area but could be observed while transiting during migration.

3.3 Human Environment

This section describes the affected environment of resources that may be impacted by the proposed Project. Resources discussed include visual and aesthetic; land ownership, management, and use; recreation; cultural resources; subsistence and traditional uses; socioeconomics; and human health and safety.

Resources considered but eliminated include contaminated sites. No known contaminated sites are reported within 10 miles of the Project, and the potential for encountering pre-existing contaminated soil or groundwater during construction or operation is low due to the undisturbed nature of the area. Therefore, contaminated sites are not discussed.

3.3.1 Visual and Aesthetic Resources

The Project is located within State of Alaska-owned lands in the Southwest Seward Peninsula Region. This region includes land within drainages surrounding the northern side of Norton Sound. Rivers within the Project area include the Sinuk and Cobblestone Rivers, and Imuruk Basin is a major waterbody north of the proposed mine site. As described by ADNR's *Northwest Area Plan for State Lands*, "many parts of the region consist of gently rolling coastal lowlands, although hilly to some mountainous terrain occurs in the northeastern parts of the region. The pattern of vegetation reflects proximity to the coast, and the distribution of lowland and upland (hilly) areas. With the lowlands, which concentrate along the coast, wet tundra is characteristic, while a mixture of high brush and alpine tundra is typical of the remaining areas of uplands" (ADNR 2008).

No major industries or developments are within the Project's viewshed. Ground-disturbing resource exploration within the viewshed is limited, with the majority of the historic and current exploration occurring in association with the graphite deposit that is the focus of this Project.

Three major roads radiate out from Nome: Nome-Teller Road, Kougarok Road, and Nome-Council Road (ADNR 2008). The proposed Mosquito Pass access road would be visible from the viewshed of Kougarok Road. No interconnected utilities are within the viewshed that contribute to horizontal visual features (Barr 2025).

The study area for visual resources is defined in this evaluation as a 31-mile viewshed from the mine site and a 15.5-mile viewshed from the Mosquito Pass access road. Natural visual boundaries to the viewshed are the Kigluaik Mountains. The natural landform slopes from 4,714 feet (from Mount Osbourne, the highest peak of the Kigluaik Mountains) to approximately sea level at the Imuruk Basin to the north. In the Cobblestone River valley, the terrain is much steeper, ranging from approximately 308-foot elevation on the valley floor to more than 3,150-foot elevation. Water is a primary visual element, with the basin, lakes, slow streams, and meandering rivers. During summer, contrast occurs between the greens, reds, grays, and browns of vegetation and barren soils as well as the blues and grays of the waterbodies, and white patches of snow. During other times of the year, less color variation occurs as vegetation returns to a dormant state and the landscape becomes covered with snow.

Visual modifications primarily occur far outside the study area except for historical mining structures within or adjacent to the proposed mine site. Visual modifications outside the study area include structures and infrastructure associated with the communities of Mary's Igloo, Teller, Brevig Mission, and Port Clarence as well as settlements along Kougarok Road. The community of Nome also has substantial modifications to the natural environment from homes, businesses, internal community roads, roads to the local landfill and the water supply lake, and a public airport. The study area itself is largely unmodified from its natural state.

3.3.2 Landownership, Management, and Use

3.3.2.1 Land Ownership and Management

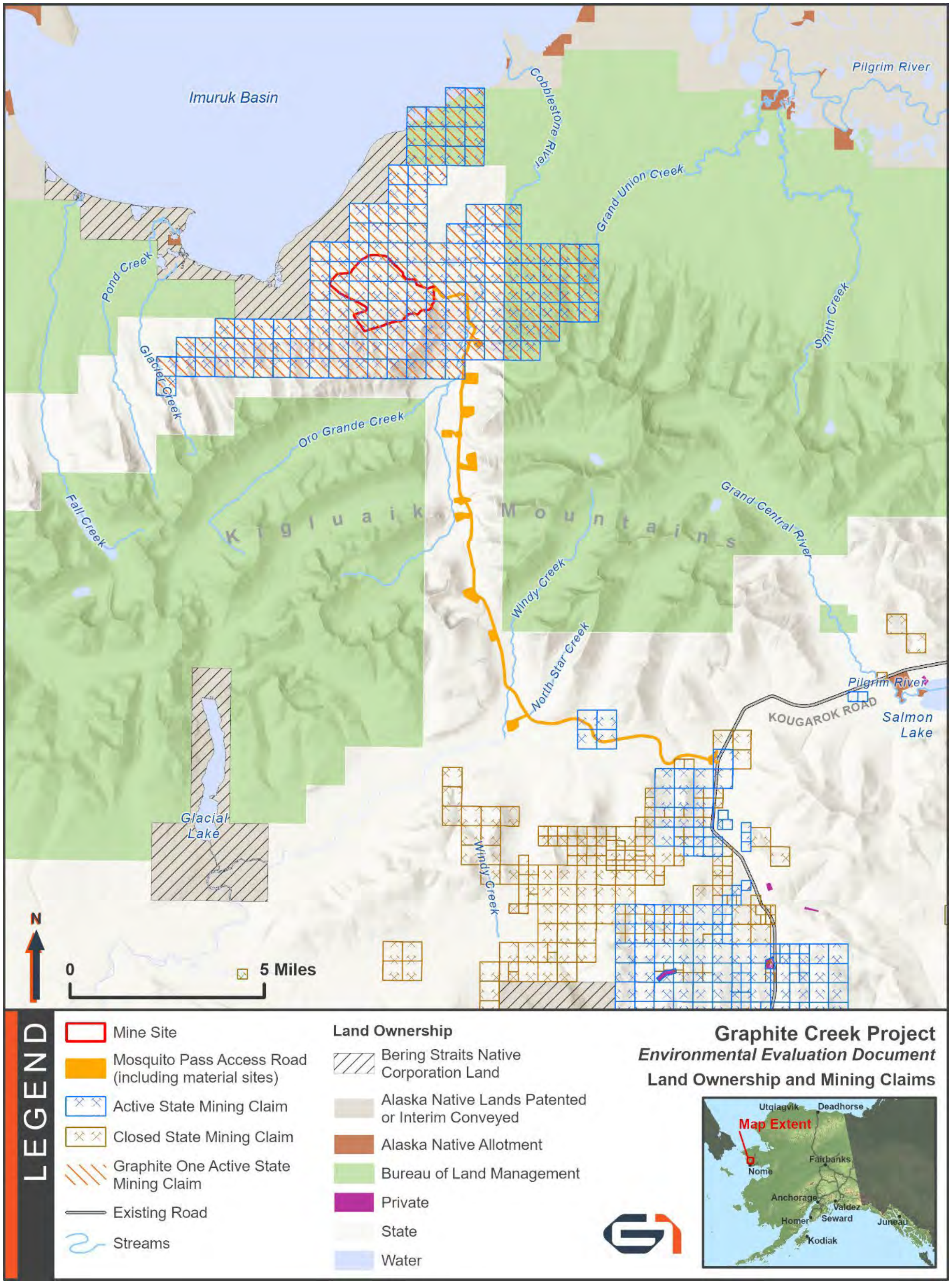
The State of Alaska owns nearly all surface and subsurface land within the Project area and manages the land through the ADNR. According to the Alaska Constitution, state lands are to be managed for multiple uses. The *Northwest Area Plan for State Lands* (ADNR 2008) provides management intent, land-use designations, and management guidelines for the study area. The only portion of the Project not owned and managed by the ADNR is the temporary gravel staging pad that would be constructed on BSNC land and leased to Graphite One.

The study area for land ownership, management, and use includes the area within a 5-mile buffer surrounding the Project footprint (Table 3-25; Figure 3-23). Because the Project footprint falls entirely on state land, except the BSNC leased land, this section focuses on the State Land Units where features of the Project could occur.

Table 3-25. Land ownership within the Project study area

Ownership	Acres	Percentage of Study Area (%)
Alaska Native Allotment	72.7	0.04
Alaska Native Lands Patented or Interim Conveyed	4,593.7	2.58
Bureau of Land Management	62,615.1	35.18
Private	27.2	0.02
State	95,535.9	53.67
Undetermined (water)	15,146.9	8.51
Total Area Within 5-mile Radius of Project Footprint	177,991.6	—

Figure 3-23. Land ownership and mining claims within the Project study area



SURFACE LAND OWNERSHIP

The proposed mine site, Mosquito Pass access road, and material sites are located on Alaska state lands. At least 0.5 mile of state land surrounds the mine site on all sides. Beyond the state land boundary, BLM land surrounds the mine site to the north, east, and south. The BSNC-owned land runs along Imuruk Basin northwest and west of the mine site. From the mine site heading south, beyond the state land boundary, the access road is surrounded by BLM land for most of its duration on both the eastern and western sides. The southern end of the road, where it intersects Kougarok Road, is bordered by state land. Eleven material sites, all located on state land, are located along the Mosquito Pass access road.

SUBSURFACE LAND OWNERSHIP

Mining claims grant the claimholder, in this case Graphite One, exclusive rights to locatable minerals, but do not include gravel and sand resources. Additionally, claimholders are not able to restrict access to public lands.

Within the Project study area, Graphite One owns 176 Alaska state mining claims divided into three groups: Leased Property (13 claims), Staked Property (117 claims), and Purchased Property (46 claims). Of these 176 claims, all are associated with one or more production royalties that range from 1 to 5 percent net smelter returns to Kougarok, Taiga, and/or Graphite One (Malhi). Additionally, there are graphite resource royalties ranging from 3.5 to 8 percent. Each group and its associated royalties are further described in the *Graphite Creek Project NI 43-101 Technical Report and Feasibility Study* (Barr 2025). Mining claims within the Project area are shown in Figure 3-23.

3.3.2.2 Land Use

Each parcel of state land has a unit number and is assigned a land use designation that indicates the primary and co-primary uses and resources for each unit (ADNR 2008). The Project components, State Land Unit numbers, and designations that the Project footprint would be located within are described in Table 3-26 and are shown in Figure 3-24 (ADNR 2008). The Project area is a largely undisturbed, natural habitat and is currently used primarily for recreation and subsistence purposes. Sections 3.3.3 and 3.3.5 describe recreation and traditional land use, respectively. The Mosquito Pass access road would be closed to the public. Access would be controlled with a gate and guard shack located near the junction of Mosquito Pass and Kougarok Roads. The guard shack would be manned 24 hours per day, 7days per week, 365 days per year for the Project duration.

Table 3-26. State Land Unit designation descriptions and management intent

Project Component	Unit Number	Designation(s)	State Management Intent
Mine Site and Mosquito Pass Access Road	S-01	Ha (Habitat)	Manage for sensitive species, grazing, and habitat values. Grazing is recognized as an appropriate use. Mineral development may be appropriate within the unit but shall consider impacts upon grazing activities and habitat and shall adhere to the following guidelines: • Authorizations issued in this unit involving long-term or permanent uses are to consider impacts upon the WACH, particularly during the winter when parts of this unit are used as part of their winter range, Consult ADF&G prior to issuing an authorization involving long-term or permanent use. • Maintain access associated with local/regional trails and RS 2477 routes.
Mosquito Pass Access Road	S-03	Gu (General Use)	Manage for multiple uses. Grazing and mining are recognized as appropriate uses. Protect moose and bird concentration areas and anadromous streams. Mineral development may be appropriate within the unit but shall consider impacts upon grazing activities and habitat and shall adhere to the following guidelines: • Authorizations issued in this unit involving long-term or permanent uses are to consider impacts upon the WACH, particularly during the winter when parts of this unit are used as part of their winter range, Consult ADF&G prior to issuing an authorization involving long-term or permanent use. • Maintain access associated with local/regional trails and RS 2477 routes.
Mine Site and Mosquito Pass Access Road	S-05	Mi (Minerals) Rd (Public Recreation-Dispersed)	Manage for recreation and mineral values. Mineral development may be appropriate within the unit but shall consider impacts upon habitat and recreational values/uses.

Project Component	Unit Number	Designation(s)	State Management Intent
Mosquito Pass Access Road	W-05	Se (Settlement)	Unit is considered appropriate for land disposal during the planning period. Land disposals shall take into consideration grazing activities and habitat values in their configuration and design and follow the design principles described in Chapter 2 of the ADNR (2008) *Northwest Area Plan* under *Settlement.*

Source: ADNR 2008
Notes: RS = Revised Statute

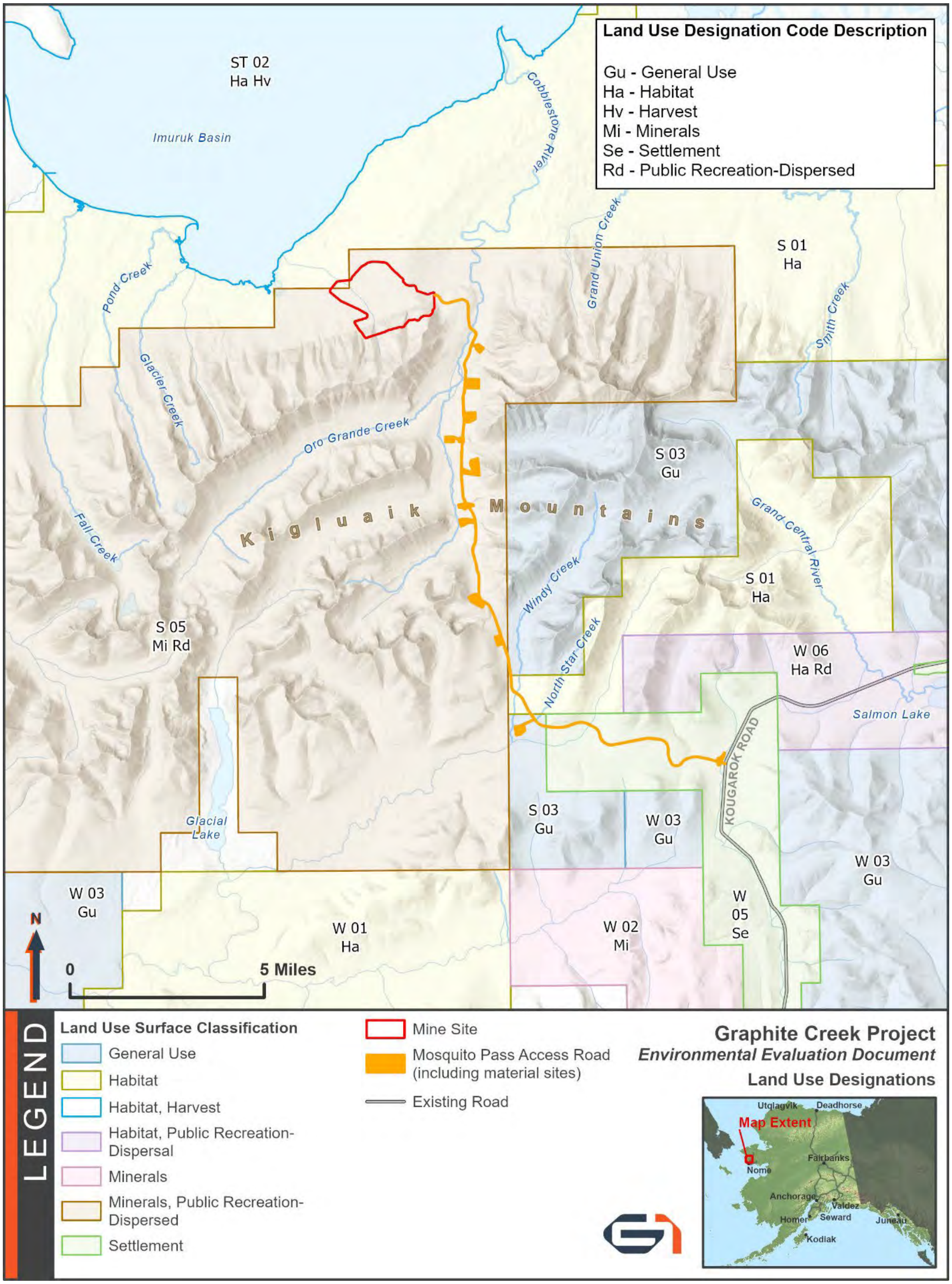
3.3.3 Recreation

Because the Project would occur mostly on state lands, the study area for recreation resources includes the State Land Units where features of the Project could occur. These state lands are designated for mineral development and dispersed recreation, as determined by ADNR's (2008) *Northwest Area Plan for State Lands*. This plan identifies land-use designations, management intent, and management guidelines for all state lands in the northwestern Alaska region. Additional guidance and steering for recreation on state lands in Alaska comes from *Alaska's Statewide Comprehensive Outdoor Recreation Plan*, which evaluates the demand and supply of public outdoor recreation resources, documents emerging trends shaping future public recreation facility needs, identifies top public recreation priorities for the state (or by regions), and provides opportunities for ample public participation (ADNR 2022a). According to this plan, Nome is the community hub of the Seward Peninsula due to its comparatively extensive road system for a rural region. Visitors using the road system can partake in wildlife viewing and birding, with Nome attracting serious birders seeking "life list" birds (ADNR 2022a). The State Land Units are described in Table 3-26, and their locations are shown in Figure 3-24.

This section only describes recreational sport hunting within the Project study area; Section 3.3.5 describes subsistence hunting and traditional land uses.

Recreation resources in this area include informal public trails and natural, backcountry preserves for the purposes of leisure, entertainment, and recreational pursuits. No Revised Statute 2477 Historic Transportation Routes occur within the study area.

Figure 3-24. Land use designations for the Project area



Visitors to the study area may take part in self-guided activities, or work with a number of licensed outfitters, guides, and adventure or tour services based out of the Nome area (Nome Convention and Visitors Bureau 2019). Table 3-27 lists typical recreation activities within the region, organized by season, as suggested by the Nome Convention and Visitors Bureau (2019).

Table 3-27. Typical recreational activities within the Project study area by season

Summer	Fall	Winter/Spring
• Bait fishing (lures) • Seine fishing (net) • Berries and greens harvesting • Birding • Gold panning/mining • Four-wheeling • Flightseeing • Hiking • Photography • Dispersed camping	• Hunting • Ice fishing • Four-wheeling • Hiking • Flightseeing • Photography	• Ice fishing • Muskox hunting • Dog sledding • Snowmachining • Cross-country skiing • Snowshoeing • Northern lights viewing • Flightseeing • Photography

Source: Nome Convention and Visitors Bureau 2019

In addition to the typical recreational activities listed in Table 3-27, other recreational activities that some residents partake in locally include mountain climbing, mountaineering, and river floating in rafts or boats on the Sinuk River (Bogart 2025).

3.3.3.1 Recreation within State Lands

"Generally allowed uses" and activities on state lands within the study area are those uses that do not require a permit from the ADNR, Division of Mining, Land, and Water (DMLW; ADNR 2024). Generally allowed recreational activities include hiking; backpacking; skiing; climbing; bicycling; and traveling by horse, dogsled, or pack animal. Motorized recreational vehicles such as all-terrain vehicles, motorcycles, and snowmachines are permitted to be used off road with specific conditions outlined by ADNR. Similarly, landing a single-engine airplane or helicopter, or using watercraft, is permitted if the activity does not cause damage to the land, shoreland, tideland, or submerged lands. Recreational gold panning and recreational hard-rock mineral prospecting or mining are generally allowed on state lands but must adhere to specific conditions.

No developed campgrounds are within the study area. Setting up and using a camp for personal, noncommercial, recreational purposes is generally allowed for up to 14 days at each site and must adhere to other state regulations and conditions. Recreationists may also harvest a small number of wild plants, mushrooms, berries, and other plant materials for personal, noncommercial use, and dead and down wood may be used for a cooking or warming fire within areas that are not closed to fires during the fire season.

The Project study area is within Unit 22, more specifically, Unit 22D: the portion of Unit 22 that drains into the Bering Sea north of, but not including, the Tisuk River to, and including, Cape York and St. Lawrence Island. Hunting, fishing, and trapping are generally an allowed use on state lands and must comply with applicable state and federal laws and regulations (ADF&G 2025g). No state-restricted areas are within Unit 22, and ADF&G has no additional hunting restrictions to the bag limit and special instructions for this unit.

3.3.3.2 Recreation within BSNC Lands

As one of the primary landholders in the Seward Peninsula region, the BSNC encourages investment in regional tourism. With a land use permit, shareholders can use BSNC land for tourism, guiding, and other profit-making ventures. The BSNC also maintains a shareholder Campsite Program, which allows shareholders to select a campsite along Kougarok Road; however, these recreational camping opportunities are only open to BSNC shareholders to promote local tourism within their lands. The nearest BSNC Campsite Program lands are located approximately 5 miles northeast from where the Mosquito Pass access road would intersect with Kougarok Road.

Pilgrim Hot Springs is a popular tourist location approximately 60 miles northeast of Nome and approximately 18 miles from the nearest point of the Project. Pilgrim Hot Springs is accessible by car; is open to the public; and is a cultural, historical, and recreational site managed by BSNC and Kawerak, Inc. (Unaatuq 2025). This tourist destination offers tent camping sites, cabin accommodations, and activities such as hot-spring soaking, hiking, bikepacking, gardening, and event hosting. Visitors to the hot springs are encouraged to explore remote recreation in the region, which includes the Kigluaik Mountains, Hen and Chickens Hill, and more accessible scenic points of interest typically along Kougarok Road.

3.3.4 Cultural Resources

Cultural resources commonly refer to the physical remains associated with past human activities. They can include historic properties, which are defined under the National Historic Preservation Act (NHPA; 36 CFR 800.16(l)) as, “any prehistoric or historic district, site, building, structure, or object included in, or eligible for, listing in the National Register of Historic Places (NRHP).” They may also include places such as traditional cultural properties, sacred sites, and cultural or ethnographic landscapes.

The study area for cultural resources includes areas within 0.5 mile of proposed Project infrastructure. The study area accounts for potential direct and indirect impacts on cultural resources and maintains consistency with study areas defined in previous cultural resources studies carried out in support of the Project (e.g., Hosken and Miller 2023; Hosken et al. 2024; Hodgson et al. 2025).

The Project is subject to review under NEPA as well as Section 106 of the NHPA (36 CFR 800). NEPA requires federal agencies to review potential impacts of major federal actions on the human environment, including cultural resources but not limited to historic properties (40 CFR 1508.4). Section 106 requires federal agencies to consider the effects of undertakings on historic properties (36 CFR 800.16(l)(1)). Federal regulations encourage agencies to coordinate NEPA and Section 106 review processes, where possible (36 CFR 800.8). As the Project is located solely on State of Alaska lands, it is also subject to compliance with the AHPA (AS 41.35), which governs historic, prehistoric, and archaeological resources on land owned or controlled by the state. The AHPA requires a review of state public construction projects to determine if historic, prehistoric, or archaeological sites may be adversely affected (AS 41.35.070). The Project may also be required to adhere to other applicable environmental and cultural resources regulatory requirements, including, but not limited to Section 4(f) of the U.S. Department of Transportation Act; and EOs 11593 (*Protection and Enhancement of the Cultural Environment*), 13007 (*Indian Sacred Sites*), and 13175 (*Consultation and Coordination with Indian Tribal Governments*).

The Project will require authorization from USACE for work within wetlands and waterbodies under Section 404 of the CWA. Because the Project will require a permit from USACE, it is considered a federal undertaking subject to compliance with Section 106 of the NHPA and its implementing regulations (36 CFR 800).

NHPA requires agencies to define an Area of Potential Effects (APE) for their undertakings. The APE refers to the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist (36 CFR 800.16(d)). The APE is influenced, in part, by the scale and nature of an undertaking and may vary for distinct types of effects, such as physical, auditory, visual, or atmospheric effects caused by the undertaking. The APE should encompass the potential direct, indirect, and cumulative effects on historic properties and consider aspects of historic integrity, including setting, feeling, association, materials, workmanship, and location, as applicable. The lead federal agency is responsible for defining the APE in consultation with the State Historic Preservation Office (SHPO) and other consulting parties. Once the APE is formally established, identification of historic properties within the APE and assessment of effects on those historic properties may proceed. As the Section 106 process for the Project has not yet been initiated by the USACE, the Project APE remains undefined and may differ from the study area used in this analysis.

To define the APE and assess effects on historic properties, Section 106 requires consultation (36 CFR 800.3), defined as “the process of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the Section 106 process” (36 CFR 800.16(f)). Participants involved in this process include the USACE as lead federal agency, SHPO, and other consulting parties with a demonstrated interest in the Project such as Tribes and Alaska Native organizations, representatives of local governments, Project applicants, or members of the public. It is the responsibility of the lead federal agency to initiate consultation efforts. As the Section 106 process for the Project has not yet been initiated by the USACE, initiation letters have not been sent to potential consulting parties.

3.3.4.1 Previous Surveys and Previously Identified Cultural Resources

Once the APE has been defined, Section 106 requires identification of historic properties as outlined in 36 CFR 800.4. The lead federal agency must make a “reasonable and good faith effort” (36 CFR 800.4(b)(1)) to locate historic properties within the APE, which typically involves reviewing existing cultural resources data and seeking input from consulting parties as well as pedestrian field surveys. Identification of historic properties is ongoing, with field surveys conducted in 2023, 2024, and 2025 (Hosken and Miller 2023; Hosken et al. 2024; Hodgson et al. 2025).

Graphite One contracted HDR to provide environmental permitting support for the Project, including cultural resources field surveys of the Project vicinity. HDR conducted a desktop study of the Project area, and the results highlight human activity and occupation of the area from precontact through the current era (Hosken and Miller 2023). In 2023, 2024, and 2025, HDR archaeologists conducted aerial reconnaissance, pedestrian survey, and minimal subsurface testing within select locations surrounding the proposed mine area, potential access routes and materials sites through Mosquito Pass, and areas subject to geotechnical drilling. Details regarding the field efforts are in HDR’s cultural resources reports (Hosken et al. 2024, Hodgson et al. 2025) and summarized in the following section.

During the 2023, 2024, and 2025 identification efforts, HDR visited three of the seven previously documented historic properties within the study area (NOM-00141, NOM-00145, TEL-00056) and identified 32 newly documented historic properties (NOM-00331, NOM-00332, NOM-00333, NOM-00334, NOM-00335, NOM-00336, NOM-00337, NOM-00338, NOM-00339, NOM-00340, NOM-00341, TEL-00292, TEL-00293, TEL-00294, TEL-00298, TEL-00299, TEL-00300, TEL-00301, TEL-00302, TEL-00303, TEL-00304, and temporary site numbers 2025-EDH-001 through 2025-EDH-011 for 2025). The site types generally consist of:

- 20 precontact sites (NOM-00335, NOM-00337, NOM-00338, NOM-00339, NOM-00340, NOM-00341, TEL-00294, TEL-00298, TEL-00299, TEL-00300, TEL-00301, 2025-EDH-002, 2025-EDH-004, 2025-EDH-005, 2025-EDH-006, 2025-EDH-007, 2025-EDH-008, 2025-EDH-009, 2025-EDH-010, 2025-EDH-011);
- Nine historic mining sites (NOM-00331, NOM-00332, NOM-00334, NOM-00336, TEL-00292, TEL-00302, TEL-00303, TEL-00304, 2025-EDH-001);
- One Quonset hut (TEL-00293); and

- Two linear features (NOM-00333, 2025-EDH-003).

A total of 39 known cultural resources have been identified within the study area ranging from precontact to historical in age. Of these 39 resources, three have been determined eligible for NRHP listing: Miocene Ditch (NOM-00076), Campion Ditch (NOM-00077), and Seward Peninsula Railroad (NOM-00141). The remaining 36 cultural resources are currently unevaluated. Table 3-28 lists the previously documented cultural resources within the study area, including a brief description and NRHP status for each. Details pertaining to site location in relation to proposed Project activities are found in HDR's cultural resources reports for this Project (Hosken et al. 2024, Hodgson et al. 2025).

Table 3-28. Cultural resources within the Project study area

AHRS No.	Site Name	Description	NRHP Eligibility	DOE Year (NRHP Criteria)
NOM-00076	Miocene Ditch	This mining ditch was initially constructed in 1901 and measures 36 miles long. Remains also include associated tunnels and siphons.	Eligible	1990 (A, B)
NOM-00077	Campion Ditch	This mining ditch was constructed in 1903 and 1904, and served as a feeder to the Miocene Ditch (NOM00076).	Eligible	1992 (A)
NOM-00082	David Creek Ditch	This mining ditch was constructed in 1903.	Unevaluated	N/A
NOM-00141	Seward Peninsula Railroad	This railroad was built and used between approximately 1906 and 1920; it was abandoned and salvaged during the late 1950s and 1960s.	Eligible	2014 (A, B)
NOM-00145	NOM-00145	This is a surface lithic scatter with caribou bones. The bone yielded a radiocarbon date of 110+/-40 years BP (Beta-197559). Archaeologists also identified several stacked-rock structures at the site: 2 rock rings, 3 stacked rock piles, a fire ring, and a collapsed rock wall.	Unevaluated	N/A
NOM-00331	Mining Ditch	This is a 2-mile-long mining ditch and metal coulter disk, associated with early-twentieth-century gold mining on the Seward Peninsula.	Unevaluated	N/A
NOM-00332	Mining Ditch	This is a 2-mile-long mining ditch, associated with early-twentieth-century gold mining on the Seward Peninsula.	Unevaluated	N/A
NOM-00333	Pack Trail	This is a 2,000-foot-long by 3-foot-wide section of a pack trail. This trail is depicted on the 1956 edition of the USGS 1:250,000 Nome quadrangle map. The trail may be associated with early transportation routes during the Nome Gold Rush.	Unevaluated	N/A
NOM-00334	Prospect Trenches	This includes 3 prospect trenches within an approximately 160- by 260-foot area.	Unevaluated	N/A

AHRS No.	Site Name	Description	NRHP Eligibility	DOE Year (NRHP Criteria)
NOM-00335	Rock Shelter	This is a roughly circular rock feature made of approximately 50 phyllite slabs arranged horizontally with some at a nearly vertical angle. Based on the viewsheds to the north, east, and south overlooking Windy Creek, the feature may be a hunting blind or other temporary shelter.	Unevaluated	N/A
NOM-00336	Historic Ditches	This site consists of 2 historic mining ditches (Ditch 1 and Ditch 2) and a collapsed wooden structure located along Ditch 2. Both ditches are approximately 1.1 miles long by 1.5 to 6 feet wide and 3 feet deep with a linear/curvilinear shape.	Unevaluated	N/A
NOM-00337	Lithic Scatter	This site includes 2 discrete concentrations of lithic debitage. A total of 85 flakes were found at Loci 1. Loci 2 yielded a total of 29 quartz flakes. The site is likely a primary reduction area for quartz stone tool manufacture.	Unevaluated	N/A
NOM-00338	Rock Cairn	This is a single rock cairn sitting atop a large 6.6-foot-tall boulder. The cairn consists of approximately 12 flat rocks and measures 3.3 feet long by 2 feet wide and 1.6 feet tall.	Unevaluated	N/A
NOM-00339	Rock Ring and Fire Pit	This site consists of two rock features. Feature 1 is a rock ring (9.8 by 9.8 feet) constructed of approximately 15 locally sourced boulders. Feature 2 is a potential hearth/fire pit (3.3 by 1.6 feet) constructed of approximately 10 locally sourced boulders and cobbles.	Unevaluated	N/A
NOM-00340	Rock Features	This site consists of 3 rock groupings and a quartz edge-modified flake.	Unevaluated	N/A
NOM-00341	Lithic Scatter	Three loci were identified within a 459.3-foot-square area. A total of 3 flakes were recorded at Locus 1, 12 flakes at Locus 2, and 299 flakes at Locus 3. The site yielded primary, secondary, and tertiary flakes with a possible burin spall identified at Locus 3. The largest locus (i.e., Loci 3) is interpreted as the primary reduction area for quartz stone tool manufacture.	Unevaluated	N/A

AHRS No.	Site Name	Description	NRHP Eligibility	DOE Year (NRHP Criteria)
TEL-00056	Glacier Canyon Adit	This site consists of a narrow (approximately 3–3.5 feet wide) adit in what appears to be a natural seam in the rocks. The adit measures approximately 7 feet tall and has been excavated into the rocks for approximately 20 feet. It is reported that this site is the result of mineral exploration conducted by the Tweet family of Teller, who have mined on the Seward Peninsula for many years. HDR archaeologists were unable to locate the adit during a pedestrian survey effort in August 2023. Archaeologists later examined the area from a helicopter and observed a fissure in the rock. The fissure corresponds more closely with the "steep drop" described in the original site record.	Unevaluated	N/A
TEL-00145	Pamnikotut	This is a traditional berry-picking area near the shore of Imuruk Basin.	Unevaluated	N/A
TEL-00292	Graphite Creek Adit	This is a historical mining adit located on a bench above Graphite Creek. The rectangular adit is 4.25 feet wide by 5.75 feet tall and 5.25 feet deep. Items found near the adit include a metal wheel, an auger, a pickaxe, a metal pulley, a section of wire, wire nails, a wooden handle, a wooden dowel, and milled lumber.	Unevaluated	N/A
TEL-00293	Quonset Hut	This site consists of the remains of a Quonset hut and a large set of skids. Structural and domestic debris is scattered across an area 45 feet long by 30 feet wide, including the Quonset hut's metal ribs, lumber, fiberboard, steel food cans, stovepipes, a doorknob and hinge, electrical hardware, fragments of cloth, and a metal bedframe.	Unevaluated	N/A
TEL-00294	Rock Ring Site	This site consists of a rock ring and 4 depressions. The rock ring measures 5.6 by 6.6 feet and consists of approximately 2 dozen small, granitic boulders embedded in the ground surface. According to informants from a local graphite mining camp, in 2022, a resident of Brevig Mission identified the ring as a "refrigerator" (i.e., food storage) for the depression directly adjacent to the ring (House Pit 1), which he identified as a house pit. In 2023, HDR archaeologists surveyed the site and documented 3 additional depressions (HP2 to HP4), which ranged from 58 feet to 31.2 feet across and up to 2.6 feet deep.	Unevaluated	N/A

AHRS No.	Site Name	Description	NRHP Eligibility	DOE Year (NRHP Criteria)
TEL-00298	Stacked Rocks and Rock Ring	This site consists of 2 distinct rock features. Feature 1 is a stack of approximately 21 rocks arranged in a conical shape. Feature 2 is an oblong rock ring of approximately 14 rocks (13.1 feet long by 9.8 feet wide).	Unevaluated	N/A
TEL-00299	Lithic Scatter	This site is a surface lithic scatter composed of 3 high-quality quartz flakes: 1 secondary and 2 tertiary.	Unevaluated	N/A
TEL-00300	Surface Depressions	This site consists of 4 surface depressions. Two features (Feature 1 and Feature 2) are linear trenches with no berms or discarded soil piles and 2 features (Feature 3 and Feature 4) are roughly circular, likely associated with mining activities.	Unevaluated	N/A
TEL-00301	Rock Cairn	This is a single rock cairn consisting of 1 large schist boulder standing upright and approximately 20 rocks stacked along the base. The cairn measures 6.6 feet long by 3.3 feet wide and 3.6 feet tall.	Unevaluated	N/A
TEL-00302	Collapsed Structure	This site consists of the collapsed remnants of a wooden frame structure and associated debris scatter. A variety of structural, domestic, and industrial artifacts are scattered across a 150- by 100-foot area. Diagnostic artifacts suggest occupation between 1910–1920, although items such as black and tan plastic garbage bags and plastic cutlery also indicate more recent use.	Unevaluated	N/A
TEL-00303	Cabin Foundation	This site consists of remnants of a rectangular shelter consisting of a rectangular depression measuring approximately 13.5 feet long by 8.2 feet wide and 2.5 feet to 3.0 feet deep. A 3-foot-wide entrance faces downslope toward Graphite Creek. Assorted refuse was found scattered within the depression. The stove was completely disassembled, with most fragments stacked in the corner of the depression. Fragments of lumber were found at the edges of the depression, suggesting the shelter may have been lined with wood. A lump of graphite found nearby indicates this building was probably used for nearby mining activities in the Kigluaik Mountains.	Unevaluated	N/A

AHRS No.	Site Name	Description	NRHP Eligibility	DOE Year (NRHP Criteria)
TEL-00304	Mining Trench	This mining trench measures approximately 100 feet long and up to 5 feet deep. Two elongated spoil piles flank either side of the trench. A 10-inch-wide fissure runs north-south through the western end of the trench, perpendicular to the trench's alignment. On the southern side of the trench, near the eastern end, archaeologists also noted a large boulder that had been partially excavated from the local gravel. A 6-foot-wide stack of cobbles and small boulders was found approximately 20 feet south of the boulder.	Unevaluated	N/A
2025-EDH-001	2025-EDH-001	This is a historical mining adit	Unevaluated	N/A
2025-EDH-002	2025-EDH-002	This is a surface lithic scatter with tertiary flake.	Unevaluated	N/A
2025-EDH-003	2025-EDH-003	This is a tractor road segment potentially associated with historical mining in the vicinity.	Unevaluated	N/A
2025-EDH-004	2025-EDH-004	This is a collapsed cobblestone rock stack; circular formation.	Unevaluated	N/A
2025-EDH-005	2025-EDH-005	This site consists of 2 rock features composed of a rock wall and a rock ring.	Unevaluated	N/A
2025-EDH-006	2025-EDH-006	This is a collapsed rock wall; semi-circular formation.	Unevaluated	N/A
2025-EDH-007	2025-EDH-007	This is a high-quality, quartz, biface, lithic tool fragment.	Unevaluated	N/A
2025-EDH-008	2025-EDH-008	This is a rock cairn.	Unevaluated	N/A
2025-EDH-009	2025-EDH-009	This site consists of 2 rock features composed of a probable hunting blind structure and second collapsed feature.	Unevaluated	N/A
2025-EDH-010	2025-EDH-010	This site consists of 3 features: a prospect trench, a rock cairn, and a collapsed rock feature.	Unevaluated	N/A
2025-EDH-011	2025-EDH-011	This is an isolated core lithic artifact made of high-quality quartz. It was found in association with 2 additional cores, 3 tertiary flakes, and lithic shatter, all high-quality quartz.	Unevaluated	N/A

Source: Hodgson et al. 2025; 2025 Field Report (forthcoming)

Notes: AHRS = Alaska Heritage Resources Survey; DOE = Determination of Eligibility; N/A = not applicable; No. = Number

3.3.4.2 Placenames and Traditional Land Use

Ethnographic and historical literature has documented numerous Iñupiaq placenames within the Bering Strait region of northwestern Alaska (Fair 1997; Koutsky 1981; Marino 2005; Oquilluk 1973; Orth 1967; Ray 1971). Although Iñupiaq toponyms specifically within the Project study area are few, placenames within the general vicinity offer insights into broader patterns of occupation and land use. Names identified near the Project study area, particularly those within the central Kigluaik Mountains and eastern Imuruk Basin, are listed in Table 3-29 along with English correlates and translations of the Iñupiaq name, where known. Locational descriptors are provided for toponyms lacking an English equivalent. Note that spellings of Iñupiaq names mirror those provided in the respective source material and may not reflect modern Iñupiaq orthography.

Table 3-29. Iñupiaq placenames within the Project vicinity.

English Correlate	Iñupiaq Name	Translation
Kigluaik Mountains	*Kigluait*	Sharp peaks
Mosquito Pass	*Ohkiineeak*	—
Tigaraha Mountain	*Tikiġaq*	Index finger
Grand Central Pass	*Kigmiu*	—
Kuzitrin River	*Kuziklium*	New river
Nome River	*Uinakrauik*	—
Sinuk River	*Singuk*	—
Pilgrim River	*Kruzgemapa*	One of two rivers
Agiapuk River	*Agiapuk*	Big one opposite the Kuzitrin River(?)
Tuksuk Channel	*Tuksuk or tukshuk*	Narrow canyon wall, narrow entrance; passage
Imuruk Basin	*Imaġruk*	Large lake
Berry-picking area near Imuruk Basin	*Pamnikotut*	Many blackberry bushes
Shore of Windy Cove	*Manilik*	Hummocky area
Former village on Windy Cove	*Ogluk/Ugluk*	—
Former fish camp on Windy Cove	*Igluk*	—
Kauwerak (former village)	*Qawiaraq*	Gravel bar
Mary's Igloo/Mary's Mountain	*Aviunak*	Black whale

Source: Koutsky 1981; Orth 1967; Ray 1971
Note: "—" indicates no translation available

In addition to the locations in Table 3-29, ethnographic data establish other places where cultural activities have traditionally occurred. Although research has not identified names for these areas, this information aids in understanding former habitation and land use. For example, Oquilluk (1973:101) explains how Qawiaraġmiut, near Imuruk Basin, gathered stones from

Graphite Bay (now called Windy Cove) for use as net sinkers. Koutsky (1981:43) identifies the aptly named Cobblestone River as another source for net sinkers within this area. According to oral traditions, the headwaters of the Cobblestone River once contained a source of copper that locals used for trade with Siberian peoples, although rockslides have reportedly buried the site (Koutsky 1981:43). From the Kigluaik Mountains, the Qawiaraġmiut also gathered slate to make knives and other tools, as well as graphite to darken the engravings in their ivory carvings (Koutsky 1981:43; Oquilluk 1973:101).

Local knowledge indicates that Mosquito Pass itself has long served as a thoroughfare between Imuruk Basin and the southern Seward Peninsula (Koutsky 1981:49). Previously, the pass offered access to caribou hunting camps along the Cobblestone River (Pratt 2009:375), and a 1917 report from the Bureau of Education mentions federal reindeer herding programs using Mosquito Pass to move herds between Nome and Mary's Igloo (Johnson 1917:73). Currently, ADNR DMLW continues to issue grazing permits for commercial reindeer herds within this area (ADNR 2022b).

In addition to land use, ethnographic data also describe the landscape with reference to oral tradition and historical events. The Kigluaik Mountains provide a backdrop for various Qawiaraq stories such as the origin of the Eagle-Wolf Dance, also known as the Messenger Feast or kivgiq. According to Oquilluk (1973:149–167), this celebration began after a series of events that took place in the Kigluaik Mountains east of the Cobblestone River. Another important cultural site, the Bear Rock Monument (TEL-00150), is located within a mountain pass east of the study area and commemorates the acts of Ahgosalik (called Tudliq in some versions), a figure from Qawiaraq oral history (Ganley 2009).

3.3.5 Subsistence and Traditional Use

Subsistence is defined by state and federal laws as the "customary and traditional uses" of wild resources (ADF&G 2018). This applies to food, cloth making, fuel, transportation, construction, arts and crafts, and trade. These practices vary and are an essential economic and cultural activity for rural Alaska communities. It is also common for harvests to be shared with those in the community who may not be able to participate in subsistence activities, such as elders or disabled individuals.

The study area for subsistence and traditional land use is the area used by the communities of Brevig Mission, Teller, Mary's Igloo, King Island, and Nome for subsistence and traditional land use practices. These communities were identified due to their proximity to the Project and the potential for their subsistence resources and traditional use practices to overlap with the Proposed Action. The residents of Teller, Brevig Mission, and Mary's Igloo primarily practice subsistence lifestyles and rely on the harvest of local resources due both to the cultural value of the practice and the high importation cost of food and other commodities (Barr 2025). In addition, local resources also provide health benefits due to their high nutritional values. Nome residents use a portion of Kougarok Road and the Project area for subsistence hunting and fishing, as well as recreational activities; however, this road is closed during winter.

The subsistence study area is centered on the Project mine site and is based on analysis of harvest patterns and available resources from available subsistence data as well as supplemental information gathered through public engagement activities. The geographical extent of the subsistence and traditional use study area includes the area from Kougarok Road (Nome-Taylor Highway) to the mine site, including the mine access road through the Kigluaik Mountains, as well as Port Clarence, Grantley Harbor, Tuksuk Channel, Imuruk Basin, and the lands just north and east of Imuruk Basin (including Mary's Igloo).

3.3.5.1 Regulations Governing Subsistence Practices

Subsistence practices in Alaska are protected under Title VIII of the Alaska National Interests Land Conservation Act (Public Law 96-487). Subsistence harvests are regulated by either the state or federal government, depending on the area, under a dual management system due to the overlap between state and federal jurisdictions (ADF&G 2018). The study area includes a mix of federal, state, and private lands, including Alaska Native Claims Settlement Act (ANCSA) lands owned by area Native corporations.

The federal government regulates subsistence practices on federal public lands and federally reserved waters in Alaska, prioritizing subsistence harvest by Alaska rural residents on federal land (16 USC 3112). The Federal Subsistence Board is the entity that oversees management of federal subsistence resources and includes regional directors from USFWS, National Park Service, BLM, Bureau of Indian Affairs, and the U.S. Forest Service, as well as rural subsistence users (DOI n.d.).

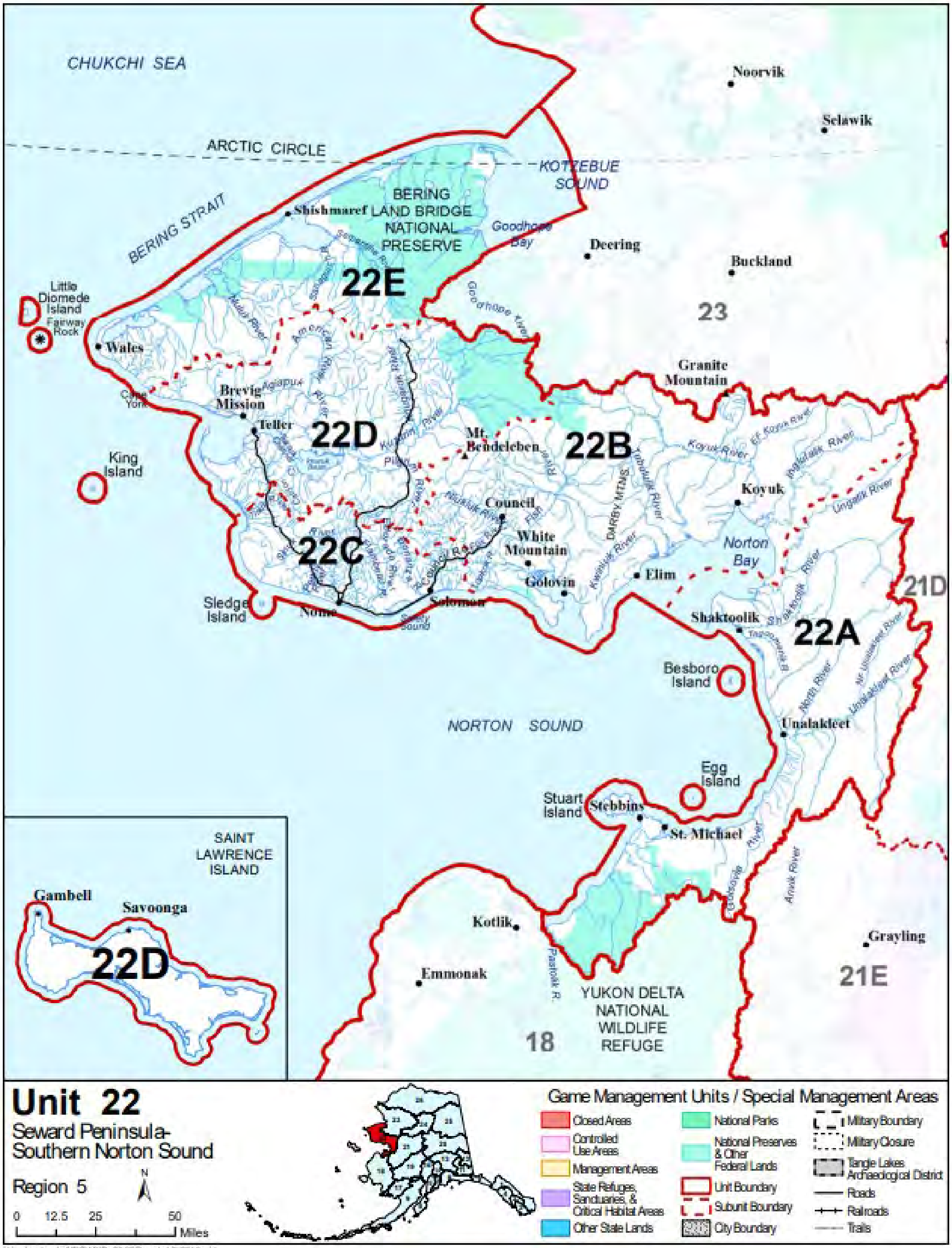
The State of Alaska regulates subsistence practices on all Alaska lands and waters, including municipal/borough, private, and ANCSA lands (ADF&G 2018, 2025g). State subsistence fisheries and hunts are regulated by the ADF&G Alaska Board of Fisheries (as defined in AS 16.05.251) and the ADF&G Alaska Board of Game (as defined in AS 16.05.255). Contrary to federal regulations, under state regulations, all Alaska residents, regardless of rural status, may practice subsistence activities if the lands are not located in "nonsubsistence areas" (ADF&G 2018). The study area is not located in a nonsubsistence area.

NMFS and USFWS both manage marine mammal hunting, depending on the mammal (ADF&G 2018). For example, NMFS manages the hunt of seals and sea lions, while USFWS manages the hunt of sea otters and walruses. The harvest of marine mammals in Alaska is protected by the MMPA Section 1371, which includes exceptions for Alaska Native subsistence users (16 USC 1371(b)). USFWS also manages subsistence migratory waterfowl hunting during spring and summer (ADF&G 2018).

ADF&G Unit 22 broadly covers the Project study area (ADF&G 2025g). The study area is covered primarily by Unit 22C, with the lands north and east of Imuruk Basin covered by Unit 22D; see Figure 3-25.

The Norton Sound-Port Clarence Management Area includes subsistence fishing activities in Alaska waters from Cape Prince of Wales (north of the study area) and Point Romanof (south of the study area; ADF&G n.d.-a).

Figure 3-25. Game Management Unit 22, Seward Peninsula-Southern Norton Sound



Source: ADF&G 2025g

3.3.5.2 Traditional Subsistence Knowledge of the Study Area

Meetings about the Project have been held with the communities of Brevig Mission, Teller, Mary's Igloo, and Nome since 2014. During the first 2 years of meetings, "leadership round tables" were held with elected leaders and representatives to establish important questions and issues surrounding Project development. Concerns regarding subsistence resources and access emerged from early public engagement activities as a primary issue for area communities. As a result of community engagement, the Project's Subsistence Advisory Committee (SAC) was formed in 2018.

The SAC consists of community leaders and representatives from communities that engage in subsistence activities across the Project area. The SAC informed Project development by advising on Project planning and design, the nature and timing of conducting baseline research studies, helicopter activities, protocols for potential wildlife interactions, and the development and maintenance of a subsistence resource database. The SAC also serves as a liaison between the Project team and community members (Barr 2025).

SAC membership includes representatives from the City of Brevig Mission, Native Village of Brevig Mission, Brevig Mission Native Corporation, Native Village of Mary's Igloo, Mary's Igloo Native Corporation, City of Teller, Native Village of Teller, Teller Native Corporation, BSNC, King Island Native Corporation, Nome Eskimo Community, Sitnasuak Native Corporation, and Kawerak, Inc. Each representative on the SAC is selected by their respective entity.

Table 3-30 provides details from SAC meetings regarding references to particular subsistence resources areas and access. These details aided in the development of the study area.

Table 3-30. Subsistence resource areas identified at SAC meetings.

Date	Meeting Topic	Subsistence Resource Discussion
August 22 and 23, 2018	SAC Tisuk Camp Site Visit	• Most northern sockeye spawning habitat in the world at Salmon Lake • Seals, fish, birds, moose, bears, berries, and people's camps in/near Imuruk Basin • Whitefish (short-nose and long-nose) in Windy Cove • A Kakaruk[(a)] (reindeer) herd roams freely; the herd owner is now deceased; BLM has moved the herd toward Windy Cove • Caribou identified near areas such as Fish River, Independent Mountain, and Emerald Lake • Geese (snow and Canada geese from Russia) nest on the northern side of Imuruk Basin • Pike in the rivers
October 30, 2018	Winter SAC Meeting	• Moose breeding grounds from Windy Cove westward • Fish is an important subsistence resource used by Teller and Brevig Mission

Date	Meeting Topic	Subsistence Resource Discussion
January 27, 2020	2019 Field Program, Permitting, Environmental Program, Fisheries Overview, Next Steps	• No specific resource areas addressed
April 17 and 18, 2023	2022 Field Program, Permitting, Aquatic and Water Quality Studies, 2023 Field Program, Next Steps, Summary of PFS, General Discussion, and Q&A Session	• Moose hunting season typically occurs during August; typically a bad month for helicopter use • Fishing season typically starts at the end of June or beginning of July; season can run until late September • Seal hunting occurs during September and October, and some hunt for seal during early spring • At least 20 people fish using nets on either side of the channel into Imuruk Basin • Ideal windows for the barge into Imuruk Basin would be right after ice breakup, before fish enter; and at the end of fishing season, at the end of September or early October
June 2, 2023	SAC Membership Invite	• No specific resource areas addressed
June 12, 2023	Joining Subsistence Advisory Council	• No specific resource areas addressed
August 8, 2023	Site Visit and Tour	• The best windows for the barge into Imuruk Basin would be following ice breakup in spring and before the ice forms in late fall/early winter to avoid subsistence use
April 23, 2024	2023 Field Program, Permitting, Aquatic and Water Quality Studies, 2024 Field Program, Next Steps, Summary of PFS, General Discussion, and Q&A Session	• Cobblestone and Canyon Creek have all five Pacific salmon species; the small drainages around the Project area tend to have pinks and chums • Varying species and numbers of fish in Imuruk Basin depending on the time of the year; three-spined sticklebacks, long-nose suckers, and some whitefish are most common during early spring/summer; least cisco, rainbow smelt, whitefish, saffron cod, and long-nose suckers increase in numbers in the basin by fall • Historic use of water resources within the Project area as a freshwater source • Camping or hunting along the Tuksuk Channel; get water from the area • Three-spined sticklebacks are easy to pop open and eat the roe; typically found in Teller when snagging for salmon • Raptor nests along proposed access road alignment in Mosquito Pass.
May 19, 2025	FS, 2024 Field Program Review	• No specific resource areas addressed

Source: SAC Meeting Minutes

Notes: Q&A = Question and Answer

[a] Reindeer are a primary source of meat for communities (Kawerak 2014, 2017); however, its use as a cash product means it does not technically constitute as a subsistence resource. Teller's Kakaruk/Lee reindeer herd is the largest herd on the Seward Peninsula, with approximately 2,800 reindeer in 2010 (Haecker 2010).

The Project team worked with SAC representatives and individual community members to map important subsistence areas, such as for egg collecting, berry picking, and moose and caribou hunting. This input provided the Project team with traditional ecological and subsistence knowledge held by subsistence users and residents of the nearby communities. Identified subsistence areas (discussed further in Section 3.3.5) supplement the overall description of subsistence use within the Project study area.

Key concerns regarding subsistence and traditional use discussed during SAC meetings include:

- Protection of important subsistence habitat and resources, including anadromous fish, whitefish, reindeer, moose, caribou, berries, Canada geese, raptors, pike, and walrus
- Protection from contamination of important subsistence habitat and resources
- Protection of Imuruk Basin as a critical subsistence area
- Addressing increasing levels of algae in Imuruk Basin
- Protection from pollution of water resources that people, animals, and fish rely upon
- Addressing potential conflicts between Project development/operations and hunting seasons
- Addressing the potential for increased competition with outside hunters and fishers due to improved access to the area because of the Project

3.3.5.3 Subsistence Resources and Practices within the Study Area

The study area communities of Brevig Mission, Teller, Mary's Igloo, and Nome harvest a variety of mammals, fish, and birds, as well as eggs (fish and bird) and vegetation. Subsistence users have identified the resources listed in Table 3-31 as important.

Table 3-31. Subsistence resources within the study area

Resource Group	Species
Fish and Shellfish	Blackfish, burbot, capelin, tom-cod, saffron cod, Dolly Varden, eel, flounder, grayling, halibut, herring (and eggs), northern pike, salmon, sculpin, sheefish, smelt, whitefish, clam, crab, king crab
Terrestrial Mammals	Arctic and red fox, brown bear, beaver, caribou, coyote, lynx, marten, mink/weasel, moose, muskox, rabbit/hare, reindeer[(a)], squirrel, wolf, wolverine
Marine Mammals	Bearded seal, beluga whale, ribbon seal, ring seal, spotted seal, otter, walrus

Resource Group	Species
Birds and Eggs	Arctic tern, auklet, black brant, black scoter, bristle-thighed curlew, bufflehead, cackling goose, Canada goose, canvasback, common eider, common loon, common merganser, cormorant, duck, emperor goose, glaucous gull, godwit, golden plover, goldeneye, green-winged teal, grouse, guillemot, harlequin duck, king eider, kittiwake, lesser Canada goose, lesser snow goose, long-tailed duck, mallard, mew gull, murre, northern pintail, northern shoveler, Pacific loon, ptarmigan, puffin, red-breasted merganser, red-throated loon, Sabine's gull, sandhill crane, scaup, small shorebird, spectacled eider, spruce grouse, Steller's eider, spruce hen, surf scoter, tundra swan, whimbrel, white-fronted goose, white-winged scoter, wigeon, yellow-billed loon
Vegetation	Beach grass, beach peas, blackberry, blueberry, cranberry, currant, dwarf fireweed, Eskimo potato, fireweed, Labrador tea, pink plume, raspberry, rhubarb, salmonberry, saxifrage, seaweed, sourdock, stinkweed, wild celery, wild chive, willow leaf

Source: Kawerak 2014, 2017, 2025; ADF&G n.d.-b, 2025g; DOI 2024

[a] Reindeer are considered a primary source of meat for area communities; however, its use as a cash product means it does not technically constitute a subsistence resource.

Caribou, moose, seal (bearded, ribbon, ringed, spotted), walrus, and fish (especially salmon) are considered the primary sources of meat for Brevig Mission and Teller (ADF&G n.d.-b; Kawerak 2014). Seal oil is used to preserve greens, roots, and meats and is relied upon as a nutritional staple of residents' diets, while terrestrial and marine mammal skins, bones, and ivory are used for clothes, boats, and crafts (Kawerak 2014; ISC 2024).

Ducks were previously reported to be the most common category of bird species harvested in mainland Bering Strait Region communities, followed by geese and upland game birds (Paige et al. 1996). Duck species commonly harvested included pintails, common eiders, and mallards. Ducks, geese, and upland game birds remain important subsistence resources for residents of Brevig Mission, Teller, and Nome (ADF&G n.d.-b).

Blueberries, salmonberries, and blackberries were the most used and harvested berries by Brevig Mission and Teller communities in 2006, the most recent year for which detailed data are available (ADF&G n.d.-b). For Teller residents, plants/greens/mushrooms and willow leaves were additionally commonly harvested vegetation.

It should be noted that reindeer are an important source of meat and are considered a community meat source and traditional practice (Kawerak 2014, 2017). However, reindeer is also used as a cash product, so it is not considered a subsistence resource. For additional information on reindeer, see Section 3.2.4.5.

PREVIOUSLY RECORDED HARVESTS

The following sections describe previous subsistence harvests in Brevig Mission, Teller, and Nome. Data was gathered from ADF&G's Community Subsistence Information System database (ADF&G n.d.-b). There is high variability in annual harvests, and the data provided are from the most representative year except Teller. While ADF&G identifies 1995 as the most representative year for Teller, the harvest data are from a migratory bird study and is not comprehensive. Therefore, this analysis summarizes harvest data from 2006, the most recent of the comprehensive data available for Teller. No subsistence harvest data are available for Mary's Igloo.

The harvest data include multiple units, but "per capita pounds" is used for the purposes of this analysis. ADF&G defines "per capita pounds" harvested for each resource as the total estimated pounds harvested divided by the number of people in the community (ADF&G n.d.-b).

ADF&G (n.d.-b) has subsistence harvest data for Brevig Mission for 1984, 1989 (most representative year; Conger and Magdanz 1990), 1995 (migratory birds), 2000 (WACH), 2006 (comprehensive), and 2015 (WACH). As shown in Table 3-32, fish, walrus, and seal comprised the majority of harvests for Brevig Mission during the most representative harvest year (1989; ADF&G n.d.-b). Salmon accounted for 118 pounds per capita of harvest. Of the non-salmon fish, whitefish account for 36 pounds of the per capita harvest.

Table 3-32. Brevig Mission select subsistence harvests

Resource	Per Capita Pounds (1989)	Per Capita Pounds (2006)
All Resources	579.36	185.46
Fish	190.86	108.72
Salmon	117.94	104.92
Chum Salmon	28.64	14.89
Coho Salmon	33.85	15.86
Chinook Salmon	6.04	1.06
Pink Salmon	14.13	17.70
Sockeye Salmon	35.28	55.13
Non-Salmon Fish[(a)]	72.92	3.81
Land Mammals	25.54	32.29
Large Land Mammals	25.31	32.29
Moose	25.31	12.77
Caribou	0.00	17.52
Small Land Mammals	0.22	0.00
Hare	0.20	0.00
Muskrat	0.03	N/A
Marine Mammals	326.81	29.49
Seal	133.22	21.66
Bearded Seal	59.06	7.78
Ringed Seal	40.47	1.93
Spotted Seal	33.68	11.63

Resource	Per Capita Pounds (1989)	Per Capita Pounds (2006)
Walrus	192.5	7.83
Gray Whale	1.09	0.00
Birds and Eggs	18.93	2.55
Migratory Birds	16.94	2.47
Ducks	2.98	0.10
Geese	13.61	2.38
Swan	0.16	0.00
Crane	0.19	0.00
Upland Game Birds	1.43	0.05
Ptarmigan	1.43	0.05
Bird Eggs	0.55	0.03
Marine Invertebrates	1.44	0.00
Crab	1.44	0.00
Vegetation	15.78	12.40
Berries	13.38	12.36
Plants/Greens/Mushrooms	2.41	0.04

Source: ADF&G n.d.-b

Notes: N/A = not applicable

[a] Non-salmon fish harvested included herring, smelt, cod, saffron cod, flounder, sculpin, char, Dolly Varden, pike, and whitefish. Whitefish had the largest per capita harvest in 1989, representing 36 per capita pounds.

ADF&G (n.d.-b) has subsistence harvest data for Teller for 1995 (most representative year; Paige et al. 1996), 2000 (WACH), 2005 (WACH), 2006 (comprehensive), and 2015 (WACH). Similarly to Brevig Mission, much of the harvest in Teller resolves around fish, seal, and walrus. Salmon represented nearly 260 per capita pounds of harvest for the community, with sockeye representing the largest share. Non-salmon fish comprised a smaller share of the harvest pounds per capita (Table 3-33). Note that the 2006 comprehensive data are not considered to be from a representative year by ADF&G; however, the year considered representative for the community (1995) provides only bird and egg harvest information.

Table 3-33. Teller select subsistence harvests

Resource	Per Capita Pounds (1995)	Per Capita Pounds (2006)
All Resources	N/A	502.12
Fish	N/A	291.27
Salmon	N/A	259.76
Chum Salmon	N/A	42.32
Coho Salmon	N/A	15.07
Chinook Salmon	N/A	2.63

Resource	Per Capita Pounds (1995)	Per Capita Pounds (2006)
Pink Salmon	N/A	37.66
Sockeye Salmon	N/A	162.07
Non-Salmon Fish[(a)]	N/A	31.51
Land Mammals	N/A	10.76
Large Land Mammals	N/A	10.76
Moose	N/A	10.76
Marine Mammals	N/A	186.35
Seal	N/A	163.26
Bearded Seal	N/A	97.21
Ribbon Seal	N/A	1.51
Ringed Seal	N/A	13.11
Spotted Seal	N/A	51.43
Walrus	N/A	23.09
Birds and Eggs	6.54	3.76
Migratory Birds	5.73	2.61
Ducks	2.85	0.84
Geese	1.81	1.42
Swan	0.58	0.00
Crane	0.48	0.35
Upland Game Birds	0.52	0.38
Ptarmigan	0.52	0.38
Bird Eggs	0.29	0.77
Marine Invertebrates	N/A	0.10
Clams	N/A	0.10
Vegetation	N/A	9.88
Berries	N/A	9.38
Plants/Greens/Mushrooms	N/A	0.41

Source: ADF&G n.d.-b

Notes: N/A = not applicable

[a] Non-salmon fish harvested include, smelt, cod, flounder, char, Dolly Varden, pike, and whitefish. Smelt, char, and Dolly Varden had the highest per capita harvest at 7 pounds each.

ADF&G has additionally reported more recent big game harvest data for Brevig Mission and Teller from 2015 (Mikow et al. 2018; ADF&G n.d.-b). Table 3-34 provides this data, which show an increase in caribou and moose harvests when compared to community data from 1998 and 2006. Note that these data are not considered to be from a representative year by ADF&G.

Table 3-34. Brevig Mission and Teller large land mammal harvests, 2015

Resource	Brevig Mission	Teller
Land Mammals	68.23	47.45
Large Land Mammals	68.23	47.45
Caribou	35.19	15.47
Moose	33.04	31.65
Brown Bear	0.00	0.34

Source: ADF&G n.d.-b

The only available ADF&G subsistence harvest data, and ADF&G's reported most representative data, for Nome are from 1995; however, these data are focused on birds and eggs (see Table 3-35). Because of its larger population, Nome residents likely harvest the most seals of any community in the area, but there are no reliable take estimates (ISC 2024).

Table 3-35. Nome select subsistence harvests

Resource	Per Capita Pounds (1995)
Birds and Eggs	5.13
Migratory Birds	3.30
Ducks	0.77
Geese	1.26
Swan	0.18
Crane	0.52
Seabirds & Loons	0.58
Upland Game Birds	1.18
Grouse	0.01
Ptarmigan	1.17
Bird Eggs	0.65

Source: ADF&G n.d.-b

Seasonal Patterns of Harvest

Subsistence resource harvests within the study area follow a seasonal pattern. The Teller area historically followed a "Small Sea Mammal Pattern" (seal, beluga, fishing, and caribou), while Kauwerak people (now Mary's Igloo people residing in Teller) followed a "Caribou Hunting Pattern" (caribou, fishing, seal, and beluga) (Ray 1964)

For people following a Caribou Hunting Pattern, winter caribou hunting was most important; however, Kauwerak people also traveled to Tuksuk Channel and the Agiapuk River to fish as well as Grantley Harbor to hunt seals and beluga whales (Ray 1964).

People following the Small Sea Mammal Pattern on the Seward Peninsula traveled short distances for caribou but relied mainly on seal and beluga. They typically hunted seal on ice as well as fished and hunted ptarmigan during winter (BLM 2007). During early spring break-up, people hunted bearded seals and walrus. By summer, residents moved to fish camps located near rivers, and harvested greens, migrating waterfowl, eggs, and berries. During fall, residents hunted migrating caribou.

Within the study area, seals were typically hunted during spring and winter near Point Spencer, at the tip of Port Clarence (Ray 1964). People also traveled to Cape Douglas for seal hunting. Fishing historically occurred year-round but was especially productive during spring in Tuksuk Channel as well as during summer and fall in Imuruk Basin, Grantley Harbor, and their tributary rivers (Ray 1964). Fishing sites along Tuksuk Channel were occupied as early as April. The typical pattern was to first fish for whitefish during April in Tuksuk Channel, then fish for salmon during July and August in area tributary rivers. However, whitefish were also often bountiful in the lower Kuzitrin River during both summer and winter. Many river fishing sites were passed down through the generations for proprietary use; some rivers, such as the Agiapuk and Kuzitrin Rivers (north and east of Imuruk Basin), required permission to fish in certain spots.

Currently, historical subsistence patterns practiced by those on the Seward Peninsula are still generally used, while incorporation of modern technology (e.g., snowmachines, gas-powered boats, off-highway/all-terrain vehicles) allows fishers and hunters to travel larger areas with less effort (BLM 2007). Additionally, moose harvests have become a more recent source of meat within the study area. The moose population on the Seward Peninsula grew substantially during the 1970s, making them a more viable subsistence resource (Grauvogel 1986).

However, some changes in the region's climate have affected typical patterns of subsistence. Less sea ice coverage from fall to spring creates potentially unstable conditions for hunting and traveling on ice (Kawerak 2017). Brevig Mission fishers have noted salmon potentially running and spawning earlier than in the past (Kawerak 2015). Fishers now seek to catch fish early during June or July but also note this is partially to avoid leaving salmon out during the rainy season that begins in August.

Discussions at SAC meetings also indicate changing trends in subsistence practices (Table 3-30). According to community members, fishing season typically starts at the end of June and can run until September, while seal hunting occurs during September and October as well as early spring. Fish are present throughout the year in Imuruk Basin; during early spring and summer, the most common fish in the basin are three-spined sticklebacks, long-nose suckers, and whitefish. By fall, least cisco, rainbow smelt, whitefish, saffron cod, and long-nose suckers increase in numbers in Imuruk Basin. Additionally, community members indicate that moose hunting typically begins during August.

Bird and egg harvests occur year-round within the study area, and migratory waterfowl remain an important source of meat during spring (BLM 2007; ADF&G n.d.-b). Migratory bird hunts (e.g., ducks, crane, swans, seabirds) are generally timed with spring and fall migrations, while winter hunts are for non-migratory species (e.g., ptarmigan,) (Paige et al. 1996; ADF&G n.d.-b).

3.3.5.4 Primary Subsistence Resources and Practices within the Project Area

The following resources have been identified as primary subsistence resources within the study area. Resource locations near the Project area, including in the waterways that may be used for tug and barge access, are discussed below. In general, subsistence camps in the Project vicinity exist along the Grantley Harbor and Imuruk Basin shorelines (Kawerak 2014; SAC meeting in August 2018 [Table 3-30]).

and show the broad locations of subsistence resources within the study area in relation to the Project area. Note that only resources within the study area are mapped but they exist in the broader area. The mapped locations were identified based on previous studies and reports, including Kawerak (2013, 2015), BLM (2007), Mikow et al. (2018), and Conger and Magdanz (1990). Note that and are broad in scope as they are a synthesis of multiple studies; these figures additionally avoid pinpointing specific harvest locations.

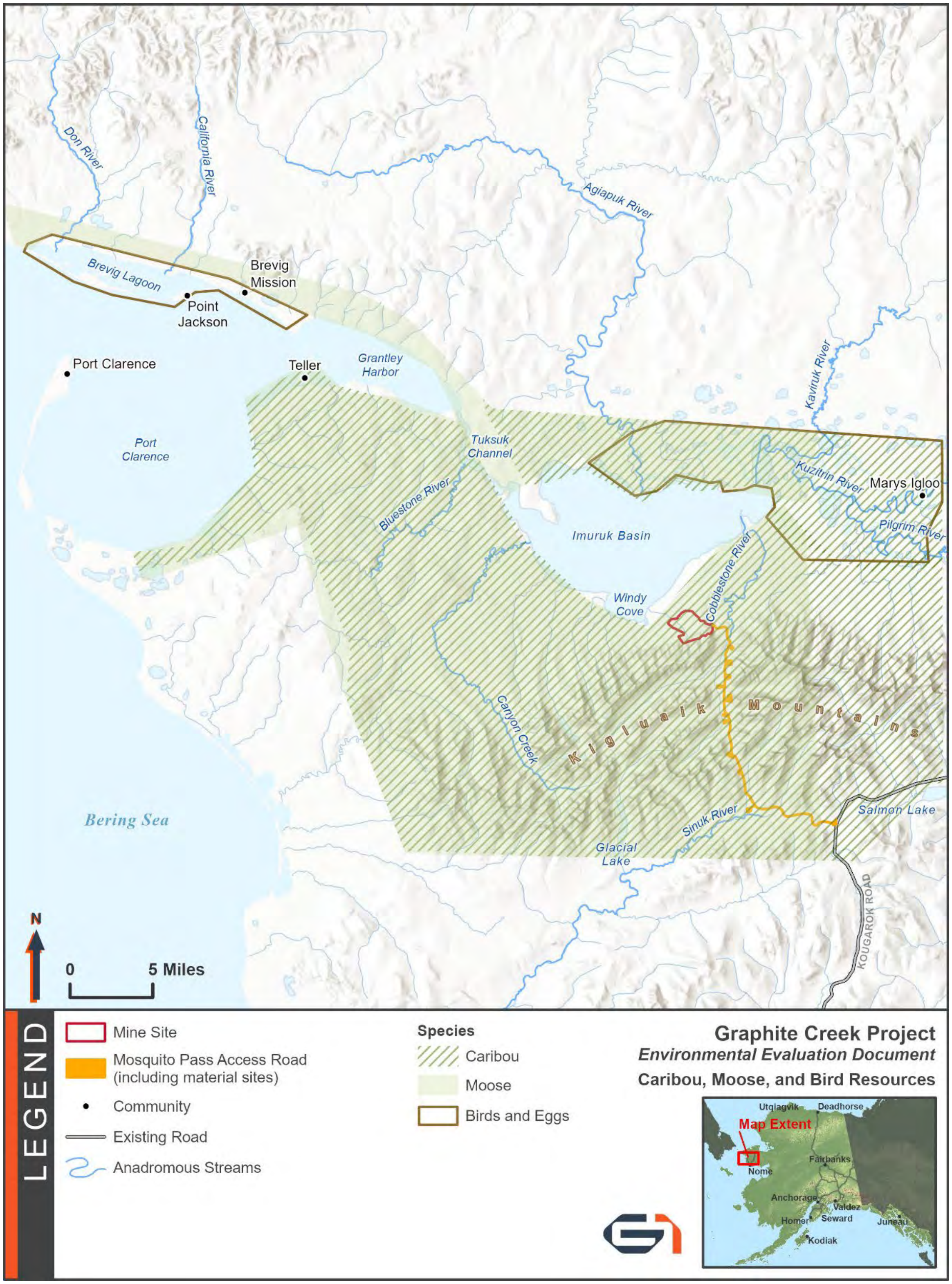
LARGE LAND MAMMALS

As discussed in Section 3.2.4.4 Caribou, the southwestern extent of the WACH wintering range overlaps with Imuruk Basin and the Project area but is low in density. Harvest areas for caribou exist within the Project vicinity, surrounding Imuruk Basin (Figure 3-26; Mikow et al. 2018; BLM 2007).

A 2015 ADF&G survey (which corresponds to 2015 data provided in Table 3-34), found that Brevig Mission residents were willing to travel farther to pursue caribou, which may account for the higher use of caribou by Brevig Mission households (94 percent compared to Teller’s 47 percent; Mikow et al. 2018). Additionally, higher levels of caribou use compared to lower levels of harvest attempts may be due to the traditional sharing and bartering associated with subsistence practices.

Moose harvest areas additionally occur within the Project vicinity, surrounding Imuruk Basin (Figure 3-26; Mikow et al. 2018; BLM 2007). SAC representatives and community members additionally identified moose breeding grounds west of Windy Cove, with moose hunting also occurring west of Imuruk Basin (Table 3-30; Figure 3-26).

Figure 3-26. Caribou, moose, and bird subsistence resources near the Project area



Source: Mikow et al. 2018; Conger and Magdanz 1990; BLM 2007

FISH

Salmon are harvested in Imuruk Basin, Grantley Harbor, Tuksuk Channel, and Point Jackson, and people often harvest salmon along the beaches (Kawerak 2015; Figure 3-27). In Port Clarence, salmon are typically harvested on the northern side of the spit. Imuruk Basin tributaries are also important salmon fishing areas; Agiapuk River and its mouth are now more frequently used, while the Kuzitrin River is less frequently used. Other area salmon fishing includes the American and Pilgrim Rivers, as well as Salmon Lake. Section 3.2.2 Fish, Essential Fish Habitat, and Invertebrates notes the presence of salmon in the Cobblestone River, Sinuk River, Nome River, Oro Grande Creek, and Windy Creek.

Herring were identified in Windy Cove, while burbot, trout, flounder, pike, and grayling have been identified in Imuruk Basin and nearby drainages in subsistence fishing maps (Kawerak 2013). Tomcod, smelt, herring, and whitefish were also identified in Grantley Harbor.

Mary's Igloo, located on the Kuzitrin River and surrounded by a number of important fishing rivers, serves as a seasonal fish camp (Kawerak 2017). However, Brevig Mission fishers have reported a general trend in staying closer to the village rather than traveling as far as the Kuzitrin River so as to not expend too much gas (Kawerak 2015).

MARINE MAMMALS

Marine mammal harvests, including for seals and walruses, have been mapped in Port Clarence (Figure 3-27; BLM 2007). Spotted seals specifically are known to inhabit Port Clarence and could potentially be located in Imuruk Basin (see Section 3.2.5.9; Figure 3-27). SAC meeting participants have additionally identified seals in the basin (Table 3-30).

BIRDS AND EGGS

Shorebirds, waterfowl, and ptarmigan are likely present and harvested (for eggs or meat) within the Project area (Figure 3-26). Shorebirds can typically be found near wetlands, streams, and shorelines; Imuruk Basin provides habitat for many of these birds (see Section 3.2.3.2 Shorebirds). Waterfowl are known to be highly concentrated around Imuruk Basin (see Section 3.2.3.3 Waterfowl), and waterfowl hunting and egg collection is common in the marshes and lagoons around Imuruk Basin (Figure 3-26; Conger and Magdanz 1990). Bird hunting in the Imuruk Basin vicinity was additionally discussed by SAC members, with bird egg collection identified by community members on the shoreline of Windy Cove as well as the northern part of Imuruk Basin.

Figure 3-27. Fish and marine mammal subsistence resources near the Project area

Source: Kawerak 2013, 2015; BLM 2007

Rock and willow ptarmigan are present within the Project area (Table 3-20; Figure 3-26; Section 3.2.3 Birds). Rock ptarmigan typically prefer slopes or high valleys and breed in hilly or mountainous tundra on high, rocky ground (ADF&G n.d.-c). Willow ptarmigan prefer willow-lined waterways on coastal planes, typically seeking wetter areas for breeding than other species of ptarmigan (ADF&G n.d.-d). During winter, which is a prominent season for harvesting upland birds, both species of ptarmigan (with the exception of rock ptarmigan hens) move to lower elevations (ADF&G n.d.-b).

VEGETATION

Blueberries, salmonberries, blackberries, plants/greens/mushrooms, and willow leaves were among the berry and green resources harvested within the study area that may also be present within the Project area (ADF&G n.d.-b). Berries can be harvested in a variety of areas, such as tundra, low-lying bogs, open woods, stream sides, shorelines, and above the treeline (BLM n.d.). Section 3.2.1.1 Vegetation notes that low shrubs present within the Project area primarily include alpine blueberry and willow (among others), while dwarf shrubs primarily include black crowberry and northern mountain cranberry (among others) in wetter areas. Tall willow was also present within the study area. Dwarf shrubs represent approximately 4,797 acres, low shrubs represent 4,073 acres, and tall willows represent 491 acres within the Project area.

SAC representatives noted berry picking occurs in the Imuruk Basin vicinity, including on the southern side near Windy Cove (Table 3-30).

3.3.6 Socioeconomics

This section describes the existing social and economic conditions (socioeconomics) supporting economic and social well-being in the communities within the Project vicinity. Socioeconomic indicators described include population, community infrastructure, economic and workforce characteristics, and quality of life and housing availability.

The socioeconomic study area includes the communities of Mary’s Igloo, Teller, and Brevig Mission, which are closest to the Project area and could experience localized socioeconomic effects from Project development. Nome (and the Nome Eskimo Community) is also included in the socioeconomics study area due to the city being the proposed location for materials storage and housing during construction and operation, as well as graphite and fuel storage facilities during mine site operation. Mary’s Igloo is located approximately 16 miles from the mine site, Teller is located approximately 28 miles away, Brevig Mission is approximately 33 miles away, and Nome is approximately 38 miles away. These communities have been the focus of Graphite One’s public involvement efforts over the past 10 years due to potential impact from the Project.

The communities are located in the Nome Census Area. Figure 1-1 in Chapter 1 (Introduction) shows where these communities are located in relation to the Project. Other incorporated cities in the Nome Census Area that are located in the broader vicinity of the Project area but are not analyzed in-depth due to the distance from the Project and additional limitations in access to it (such as for employment at the mine site) include Wales, Shishmaref, White Mountain, Golovin, Elim, Koyuk, Shaktoolik, Unalakleet, Stebbins, and St. Michael (ADL&WD 2020). The community of Dexter, which includes some seasonal camps and year-round homes, is located approximately 7 miles north of Nome by way of the Dexter Bypass and the Kougarok Road.

GOVERNANCE AND DEMOGRAPHICS

Mary's Igloo is used primarily as a seasonal-use fish camp with no formal facilities or services, and most of the original people of Mary's Igloo live in Teller (Kawerak 2017). The original townsite for Mary's Igloo was called "Kauwerak" and located approximately 15 miles downriver of the current townsite. The site was abandoned by 1900 when most villagers moved to Nome and Teller to follow work and education opportunities, while others settled at the current townsite, called "Aukvaunlook." Residents abandoned this second townsite for Nome and Teller during the 1940s and 1950s. Currently, there is no active townsite at Aukvaunlook, but the community has maintained its federally recognized tribal government status and retained private land ownership of the area established under ANCSA (Barr 2025). The Mary's Igloo Traditional Council is the federally recognized tribe, and Mary's Igloo Native Corporation is the ANCSA entity.

Teller is a traditional Kawerak Eskimo village, with residents following a subsistence lifestyle (Kawerak 2014). The current townsite was established in 1900 following the development of the Bluestone Placer Mine 15 miles to the south. The City of Teller is a second-class city in an unorganized borough. The Teller Traditional Council is the federally recognized tribal body, and Teller Native Corporation is the ANCSA entity. Many residents of Teller are from Mary's Igloo, and discussions of the socioeconomic environment in Teller also applies to those from Mary's Igloo.

Brevig Mission (originally called Teller Mission) was established in 1900 by missionaries and was associated with missionaries and reindeer farmers (Kawerak 2025). Sitaisagmuit refers to the real people of Sitaisaq, or Brevig Mission. Prior to Brevig Mission's establishment by missionaries, the Sitaisagmuit people lived as nomadic people; the majority of Sitaisagmuit people are Iñupiaq and follow a subsistence and harvest lifestyle. Brevig Mission is a second-class city in an unorganized borough. The Brevig Mission Traditional Council is the federally recognized tribal body, and the Brevig Mission Native Corporation is the ANCSA entity. Alcohol sales, importation, or possession are banned in the village.

Nome is the largest community in the Nome Census Area and serves as a transportation, goods, and services hub for the Bering Strait region (Nome 2012). The Gold Rush created an enormous surge in population that led to the creation of Nome and a population of more than 20,000 in 1900, which dwindled following the boom years. Nome is a first-class city in an unorganized borough. The Nome Eskimo Community is the federally recognized tribe in the Nome area.

Table 3-36 provides a breakdown of the population size and race of each of the communities within the socioeconomic study area, with the exception of Mary's Igloo, where census data is not available. The communities of Brevig Mission and Teller are primarily Alaska Native, while the majority of the Nome population is Alaska Native or identifies as two or more races.

Table 3-36. Demographics, population and race, 2023

Characteristic	Alaska	Nome	Brevig Mission	Teller
Population	733,971	3,668	691	309
Median age, years	35.6	31.6	22.0	31.2
White, percent	60.7	27.1	1.6	1.0
Black or African American, percent	3.1	2.8	0.0	0.0
American Indian and Alaska Native, percent	13.8	50.7	92.6	98.1
Asian, percent	6.4	3.8	1.0	0.0
Native Hawaiian and Other Pacific Islander, percent	1.6	0.0	0.0	0.0
Some other race, percent	2.2	0.5	0.0	0.0
Two or more races, percent	12.2	15.2	4.8	1.0

Source: USCB 2023
Note: Data is from American Community Survey 5-year estimates for 2019–2023.

The population in the Nome Census Area, which includes Nome, Brevig Mission, and Teller, is anticipated to decline between 2023 and 2050 by approximately 343 residents (Table 3-37; ADL&WD 2024). The Alaska Department of Labor and Workforce Development's (ADL&WD's) state population projections do not indicate what may drive the population decline in the census area but noted that the state would experience a net migration loss and lower birth rates over this period. However, ADL&WD projected the Alaska Native population would grow through 2050 and comprise a larger percentage of the total population. This projection is aligned with statements in local economic development plans for Brevig Mission and Teller, which indicate the communities have been experiencing a growing population locally (Kawerak 2014, 2025).

Table 3-37. Population projections, 2023 to 2050 (select years)

Population Area	July 1, 2023, Estimate	July 1, 2030, Projected	July 1, 2040, Projected	July 1, 2050, Projected
Nome Census Area Total Population	9,628	9,527	9,431	9,285

Source: ADL&WD 2024

3.3.6.1 Education and Employment

Mary's Igloo is used primarily as a seasonal-use fish camp with no formal facilities or services.

In Teller, students attend the Bering Strait School District (BSSD) James C. Isabell School (Kawerak 2014). In Brevig Mission, students attend the BSSD-operated Brevig Mission School; additionally, there is a Head Start school (Kawerak 2025). The community is working to expand school infrastructure in Brevig Mission to better accommodate larger enrollment numbers.

Nome community facilities include the Northwest Campus of the University of Alaska-Fairbanks. Nome City School District schools include the Anvil City Science Academy, Nome Elementary School, and Nome-Beltz Junior/Senior High School; the district offers an Extensions Correspondence Program (Nome Public Schools, n.d.).

Table 3-38 shows the typical high school graduation rate, as well as workforce characteristics for communities within the study area. The unemployment rate within the study area is higher than the state's rate. While Nome's median household income surpasses the state's median income, the percentage of families living below the poverty line is the same, indicating a high cost of living.

Table 3-38. Economic and workforce characteristics, 2023

Characteristic	Alaska	Nome	Brevig Mission	Teller
In labor force, total	380,935	1,972	221	113
In labor force, percentage	66.4	72.0	55.1	47.9
Not in labor force, percentage	33.6	28.0	44.9	52.1
Unemployment rate, percentage	5.8	8.5	18.6	13.3
Median household income, dollars	89,336	113,561	55,000	42,500
Families and people whose income in the past 12 months is below the poverty level (all families), percentage	6.8	6.8	48.1	28.9
High school graduate or higher (for population at least 25 years old), percentage	85.1	92.3	85.1	79.2

Source: USCB 2023
Note: Data is from American Community Survey 5-year estimates for 2019–2023.

While there is no commercial activity or employment in Mary's Igloo, the community's local economic development plan notes that Tribal members are interested in rebuilding the town near "Kauwerak," the original townsite (Kawerak 2017).

Most employment in Teller and Brevig Mission is seasonal (Barr 2025). The economy of Teller is primarily based on subsistence activities that are supplemented with part-time jobs (Kawerak 2014). The major employers include the Norton Sound Health Corporation (NSHC), BSSD, Kawerak Inc., and the local government, but there is some seasonal employment in construction, mining, commercial fishing, and tourism.

The draft *Brevig Mission Local Economic Development Plan 2019–2023* does not provide details on the area economy; however, the plan notes that the community is interested in growing local employment opportunities (Kawerak 2025). The residents of Brevig Mission additionally practice a subsistence and harvest lifestyle; details on subsistence activities are in Section 3.3.5.

Workers in Nome are primarily employed in educational and health services, trade, and transportation and utilities, reflecting the community's role as a regional hub (Nome 2012).

Table 3-39 shows that the study area communities are primarily employed in education, health care, and social assistance work, as well as local government, with minimal employment in resource development and construction. The *Nome Comprehensive Plan 2020* notes that the NSHC is the largest employer in the Bering Straits Region (Nome 2012).

Table 3-39. Employment by select industries, 2023

Industry	Nome	Brevig Mission	Teller
Agriculture[(a)], forestry, fishing and hunting, and mining, percentage	5.5	0.6	0.0
Construction, percentage	3.4	5.0	1.0
Retail trade, percentage	5.8	13.3	4.1
Transportation and warehousing, and utilities, percentage	11.7	20.0	18.4
Professional, scientific, and management, and administrative and waste management services, percentage	1.3	4.4	4.1
Educational services, and health care and social assistance, percentage	37.7	31.1	42.9
Arts, entertainment, and recreation, and accommodation and food services, percentage	5.9	5.6	2.0
Public administration, percentage	15.9	14.4	20.4

Source: USCB 2023

Note: The percentage shown is for the employed civilian population. Not all employment industries are shown. Data is from American Community Survey 5-year estimates for 2019–2023.

[a] For discussion on reindeer herding, a culturally and historically important source of income, see Section 3.2.4.5 Reindeer.

3.3.6.2 Community Infrastructure

HOUSING

Mary's Igloo is used primarily as a seasonal-use fish camp with no formal facilities or services, and residents instead live in Teller (Kawerak 2017). However, Mary's Igloo Tribal members living in Teller note that there is inadequate housing for them, including for those who do not qualify for new units, or who have financial or credit issues.

Housing is inadequate in Teller, with multiple families living together in one unit (Kawerak 2014). Criminal convictions or lack of job opportunities create obstacles in accessing housing assistance or constructing additional units.

In Brevig Mission, population growth is outpacing available housing (Kawerak 2025). The city faces one of the greatest housing shortages in the Kawerak region, and the renter vacancy rate is 0 percent, indicating that all rental units are occupied. Additionally, the majority of homes were built before 2000, and have structural problems requiring repair and upgrades (Kawerak 2025).

There is a shortage for all housing and income types in Nome, which has been exacerbated in the past by the construction of major facilities such as the NSHC Regional Hospital (Nome 2012). Nome continues to experience a housing shortage and competitive rentals due to high construction costs (Lerner 2021).

Table 3-40 shows a tight ratio between available and occupied housing units in the study area. Most housing units are heated using fuel oil and kerosene. The vast majority of homes in Teller and a small portion of homes in Brevig Mission do not have indoor plumbing facilities. As Table 3-40 shows, Brevig Mission and Teller are faring worse than the state average in terms of housing availability and available plumbing facilities, while Nome is faring better.

Table 3-40. Housing characteristics, 2023

Characteristic	Alaska	Nome	Brevig Mission	Teller
Housing units	327,610	1,502	161	115
Occupied housing units	267,865	1,180	150	96
Occupied housing units, percentage	81.8	78.6	93.2	83.5
Occupied housing units using fuel oil, kerosene, etc. for heating fuel, percentage	28.2	88.3	98.0	90.6
Occupied housing units lacking complete plumbing facilities, percentage	3.6	0.4	16.0	71.9

Source: USCB 2023
Note: Data is from American Community Survey 5-year estimates for 2019-2023.

TRANSPORTATION

Mary's Igloo is accessible from Teller, Brevig Mission, and other area villages only by riverboat during summer and trails during winter (Kawerak 2017).

Teller is connected to Nome by the state-owned, gravel Nome-Teller Highway, which is typically accessible from May to October or November (Kawerak 2014). The road is classified as a Major Collector (Rural), running from Nome (MP 0) to Teller and Grantley Harbor (MP 72; ADF&G n.d.-e). DOT&PF annual average daily traffic (AADT) data are available in Table 3-41, which indicates low levels of traffic farther from Nome. Winter-only routes connect Teller to various camps and settlements along the Bering Sea and inland on the Seward Peninsula (Kawerak 2014). Teller additionally has a state-owned gravel runway that provides daily service to Nome. Residents of Brevig Mission and Teller often use skiffs to travel between the two communities and to other area villages. Brevig Mission is located approximately 5 miles by boat from Teller (Kawerak 2025).

Table 3-41. AADT for the Nome-Taylor and Nome-Teller Highway

Station ID	Description	Milepoint	Functional class	2022 AADT	2023 AADT	2024 AADT
30024000	Nome-Taylor Hwy at MP 2	2	Major Collector (Rural)	320	330	320
30024009	Taylor Hwy north of Dexter Bypass (MP 8)	8.7–32.6	Major Collector (Rural)	250	250	250
13900002	Nome-Teller Hwy north of Little Creek Rd (CCS)	0–2.4	Major Collector (Rural)	2,130	2,050	2,130
37025003	Nome-Teller Hwy west of Dexter Bypass	2.4–3.5	Major Collector (Rural)	990	1,000	990
30025007	Nome-Teller Hwy at Snake River Bridge	3.5–7.1	Major Collector (Rural)	130	130	130
30025012	Nome-Teller Hwy at Penny River Bridge (MP 12)	7.1–70.7	Major Collector (Rural)	20	20	20

Source: DOT&PF n.d.
Notes: Hwy = Highway; ID = Identifier; Rd = Road

A state-owned gravel airstrip in Brevig Mission provides year-round access to the community, and the community is also accessible by boat (Kawerak 2025). Regular air service is provided to Nome, while charters also fly to Nome and Teller. During winter, the community can be accessed by land or ice.

Port Clarence, a natural deep-water port being considered for harbor development, is west of Teller and Brevig Mission; while Grantley Harbor, a natural harbor, is located east of the communities (Kawerak 2014). There are currently no definitive plans to develop Port Clarence (BSNC n.d.). Both Port Clarence and Grantley Harbor receive regular traffic from vessels—

barges, other large landing craft, and local boaters—that are performing maintenance, transferring goods, or traveling to area villages (Kawerak 2014). Most of the bulk goods received in Teller are delivered via barges that arrive during summer months. Because there is no dock or harbor infrastructure in the community, the barges pull up directly onto the beach. Similarly, in Brevig Mission, a cargo barge visits annually to deliver goods, but there is no formal dock or harbor infrastructure (Kawerak 2025).

Nome is considered the center of supply, service, and transportation in the Bering Straits Region. The state-owned Nome Airport is northwestern Alaska's primary commercial airport (Nome 2012). The airport provides service to area communities, such as Shishmaref, Brevig Mission, and St. Michael (BTS 2025). However, the vast majority of trips from Nome are to Ted Stevens Anchorage International Airport. From May 2024 to April 2025, approximately 43,000 passengers traveled to Anchorage, while approximately 3,000 traveled to Shishmaref, the second most-popular destination (BTS 2025). Between 2024 and 2025, there has been a 3.41 percent increase in scheduled flights from the Nome Airport, with 8,320 departures in 2024 and 8,604 departures in 2025 (data based on 12 months ending in April of each year; BTS 2025).

The Port of Nome, which includes multiple docks, a barge ramp, and a protected small boat harbor, is the only harbor that provides moorage and vessel services within the region (Nome 2012). The City Dock receives bulk cargo and fuel, and the Westgold Dock handles rock/gravel and heavy equipment. The barge ramp provides roll-on/roll-off capabilities for cargo vessels and has 2 acres of uplands for storing containers, vessels, and equipment. An effort to construct the first Arctic deep draft port in the United States is underway at the Port of Nome. Aggregate vessel traffic at the Port of Nome has declined from 786 transient vessels in 2012 to 616 vessels in 2022 (PND Engineers, Inc. et al. 2024). Declines are primarily associated with cargo, fuel, research, and pleasure-sailing vessel traffic, while major increases in cruise ship and gravel/equipment traffic partially offset the decreased traffic.

In August 2025, the USACE awarded a contract to begin the first portion of the Port of Nome Modification Project that will increase the size of the Port of Nome and allow for deep draft vessels (USACE 2025).

The use of off-road vehicles and snowmachines for travel is common for study area communities.

The Nome-Taylor Highway (Kougarok Road) is a state-owned gravel road that runs north from Nome (MP 0) to the Kougarok River Bridge (MP 86), well past the Project mine site (ADF&G n.d.-f). The road is classified as a Major Collector (Rural) and is only maintained year-round between Nome and the Nome River Bridge (MP 13) by DOT&PF but is otherwise impassable after snowfall (Barr 2025). DOT&PF AADT data is available only for the portions of highway closer to Nome, which is included in Table 3-41. Crash data for Kougarok Road, where the Mosquito Pass access road would connect, is provided in Section 3.3.7.4 Public Safety.

UTILITIES

Since Mary's Igloo is used as a seasonal fish camp, there are no formal utilities (Kawerak 2017). Instead, water is hauled from any nearby water sources, and outhouses are used.

Teller's main water supply is sourced from Coyote Creek, which is stored in a 1-million-gallon storage tank, treated, and then transported by water truck to homes or piped to the school and teacher housing (Kawerak 2014). The school and teacher housing are connected to a sewage system with an undersized lagoon, while homes use honey buckets; waste is hauled to a landfill 5 miles southeast of Teller.

Brevig Mission sources groundwater from north of the community and operates water and sewer systems; the majority of homes are connected to the water and sewer system, but some still use honey buckets due to high service costs and limited water tank capacity (Kawerak 2025). The existing landfill and sewage lagoon are in close proximity to Liituq Lake, and residents believe it should be relocated due to health and environmental hazards.

Electricity in Teller and Brevig Mission is sourced from diesel generation operated by the Alaska Village Energy Cooperative (Kawerak 2014, 2025). Brevig Mission is additionally working to install a solar array and wind turbine systems.

Nome provides water and sewer, electricity, and trash services to residents through the Nome Joint Utility System (Nome 2012). The primary water source is the Moonlight Springs aquifer. The city also operates a Class II municipal solid waste landfill (Nome n.d.-a).

Healthcare facilities are discussed in Section 3.3.7 Human Health and Safety.

3.3.6.3 Existing Graphite One-BSNC Economic Development Agreement

According to Graphite One, due to BSNC's 2023 investment in Graphite One, the company has developed an agreement to promote regional economic development using the following mechanisms:

- Give preferential goods/services contracts to BSNC subsidiaries, which must be commercially competitive within a given margin.
- Perform preferential hiring of BSNC shareholders and descendants, with residents of Nome, Teller, and Brevig Mission given priority but residents of other communities also eligible.
- Establish scholarship funds for BSNC shareholders and descendants, with residents of Nome, Teller, and Brevig Mission given priority but residents of other communities also eligible.

- Establish a community project fund for Teller and Nome for projects that benefit the community.

3.3.6.4 Tax Revenue

The mine site and access road are located on state land. Applicable tax revenue for the Project includes a 9.4 percent Alaska Corporate Income Tax, 7.0 percent Alaska Mining License Tax, and 3 percent Alaska Production Royalty Tax (Barr 2025). Additionally, there is a 5 percent Sales Tax in Nome levied on all sales and rentals for goods and services within the city (Nome n.d.-b).

3.3.7 Human Health and Safety

The following section describes human health and safety, which evaluates the public health, quality of life, and safety characteristics present in the communities and industries within the Project vicinity.

The study area is the same as for socioeconomics (Section 3.3.6) due to the communities' proximity to the Project site and potential to interact with or be impacted by Project activities. However, much of the available health and worker safety data is for the broader Nome Census Area or State of Alaska.

3.3.7.1 Healthcare

The Tribally owned and operated NSHC is a non-profit health care organization that provides services to communities in the Bering Straits Region (Nome 2012). The organization operates the NSHC Regional Hospital in Nome, a Critical Access Hospital with 18 beds (NSHC n.d.-a). The hospital's emergency facilities include an emergency department, emergency medical services/air ambulance, vehicular ambulances, and ambulatory surgery services. The hospital also provides primary and urgent care, mental health services, and social services, among other services. NSHC's Quyanna Care Center provides long-term care to Bering Straits Region elders in Nome (NSHC n.d.-b). Should full-service care or additional beds be required, patients would likely be transported to the Alaska Regional Hospital, Providence Alaska Medical Center, or Alaska Native Medical Center in Anchorage.

NSHC operates a Community Health Aide Program to support health care delivery in the region's Alaska Native Villages (NSHC n.d.-c). The program includes training local Community Health Aides/Practitioners that provide 24-hour-per-day, 7-days-per-week care to the community, as well as communicate with doctors in Nome through Radio Medical Traffic when necessary. Additionally, providers from NSHC travel to villages throughout the year to provide dental, eye, and audiology services.

Village Health Services within each community manage community clinic operations (NSHC n.d.-c). Community clinics include the Brevig Mission Clinic, which has three exam rooms, and the Teller Clinic, which has two exam rooms, a trauma room, and a dental/specialty exam room (Kawerak 2017, 2025). The Brevig Mission Clinic currently staffs three community health aides/practitioners, one nurse practitioner, and two clinic travel clerks (NSHC 2025). The Teller Clinic staffs three community health aides/practitioners and one clinic travel clerk.

The vast majority of residents in the study area have health insurance; however, the number of residents with insurance coverage in Nome and Teller is lower than the state average (Table 3-42; USCB 2023). Additionally, in Teller, the percentage of the population with a disability is greater than that of the state.

Table 3-42. Disability and health insurance coverage, 2023

Characteristic	Alaska	Nome	Brevig Mission	Teller
Total civilian noninstitutionalized population	704,133	3,517	691	309
Population with a disability, percentage	13.1	10.6	11.7	14.2
Population with health insurance coverage, percentage	88.8	85.1	92.2	77.3
Population with public health insurance coverage, percentage	37.1	29.3	86.7	63.1

Source: USCB 2023
Note: Data is from American Community Survey 5-year estimates for 2019–2023.

3.3.7.2 Health and Well-being

According to the University of Wisconsin Population Health Institute, health includes being free from pain and disease and having capacity to thrive; well-being includes quality of life and capacity to contribute to society (University of Wisconsin Population Health Institute n.d.). Both elements are measured in the annual County Health Rankings and Roadmaps results. According to the data, the Nome Census Area is generally faring worse in elements of health and well-being than the state (University of Wisconsin Population Health Institute 2025).

Table 3-43 provides an excerpt from the data. Notable metrics conclude that the child mortality rate, suicide rate, teen birth rate, chlamydia rate, and percentage of households with severe housing problems in the Nome Census Area is more than double the average rate of the state overall. Additionally, residents in the Nome Census Area experience more physically and mentally unhealthy days each month, have less access to exercise opportunities, have a higher percentage of the adult population with diabetes, and have nearly double the injury death rate than the state overall.

Table 3-43. Nome Census Area health rankings, 2025

Data Element	Description	Alaska	Nome
Average Number of Physically Unhealthy Days	Average number of reported physically unhealthy days per month	3.9	5.5
Average Number of Mentally Unhealthy Days	Average number of reported mentally unhealthy days per month	4.7	6.2
% Fair or Poor Health	Percentage of adults that report fair or poor health	16	29
% with Access to Exercise Opportunities	Percentage of the population with access to places for physical activity	79	46
Food Environment Index	Indicator of access to healthy foods: 0 is worst, 10 is best	7.1	6.1
Primary Care Physicians Ratio	Population to Primary Care Physicians ratio	1,033:1	759:1
Mental Health Provider Ratio	Population to Mental Health Providers ratio	131:1	89:1
Dentist Ratio	Population to Dentists ratio	954:1	984:1
% Severe Housing Problems	Percentage of households with at least 1 of 4 housing problems: overcrowding, high housing costs, or lack of kitchen or plumbing facilities	20	52
Injury Death Rate	Injury mortality rate per 100,000	108	212
Life Expectancy	Average number of years people are expected to live	76.3	68.9
Premature Age-Adjusted Mortality Rate	Number of deaths among residents under age 75 per 100,000 population (age-adjusted)	439	703
Child Mortality Rate	Number of deaths among residents under age 20 per 100,000 population	73	178
% of Adults with Diabetes	Percentage of adults aged 18 and above with diagnosed diabetes (age-adjusted)	8	14
% of Adults with Obesity	Percentage of the adult population (age 18 and older) that reports a body mass index greater than or equal to 30 kilograms per square meter (age-adjusted)	32	37
Suicide Rate (Age-Adjusted)	Number of deaths due to suicide per 100,000 population (age-adjusted)	28	88
Teen Birth Rate	Number of births per 1,000 female population, ages 15–19	18	55
Chlamydia Rate	Number of newly diagnosed chlamydia cases per 100,000 population	727.7	2,857.1
% of Excessive Drinking	Percentage of adults reporting binge or heavy drinking (age-adjusted)	20	20
% of Driving Deaths with Alcohol Involvement	Percentage of driving deaths with alcohol involvement	34	50

Source: University of Wisconsin Population Health Institute 2025

Note: Data for this report was collected from various sources between 2017 and 2024 and published in 2025.

3.3.7.3 Worker Safety

Workplace safety statistics are provided at the state level by ADL&WD using data from the U.S. Bureau of Labor Statistics. The following tables provide data on the incident rates of nonfatal occupational injuries and illnesses (Table 3-44), as well as the total fatal occupational injuries (Table 3-45). The industries correspond to those listed in , which provided information on area employment by industry.

Table 3-44. Incident rates of nonfatal occupational injuries and illnesses, Alaska, 2023

Industry	Total Recordable Cases	Total Cases with Days Away from Work, Job Transfer, or Restriction	Other Recordable Cases
Agriculture, forestry, fishing and hunting[(a)]	5.2	2.0	3.2
Mining, quarrying, and oil and gas extraction[(b)]	1.0	0.4	0.5
Construction	3.2	1.6	1.6
Retail trade	3.3	2.2	1.0
Transportation and warehousing	4.8	3.5	1.3
Utilities	4.0	2.3	1.7
Professional and business services	1.8	0.9	0.9
Education and health services	3.3	1.4	1.9
Leisure and hospitality	2.6	1.5	1.0
Public administration	4.1	2.9	1.2

Source: BLS 2024a

Note: Incident rates represent the number of injuries and/or illnesses per 100 full-time workers

[a] Agriculture data exclude farms with less than 11 employees.

[b] Coal, metal, and nonmetal mining operator data is provided by the Mine Safety and Health Administration (MSHA), but data for mining also includes companies not regulated by MSHA rules and reporting. Independent mining contractors are not included in the coal, metal, and nonmetal mining industries. The data does not reflect Occupational Safety and Health Administration recordkeeping requirements effective January 1, 2002, making industry estimates not comparable to other industries.

Table 3-45. Fatal occupational injuries by industry, Alaska, 2023

Industry	Total Fatal Injuries
Agriculture, forestry, fishing and hunting[(a)]	3
Mining, quarrying, and oil and gas extraction[(b)]	3
Construction	—
Retail trade	1
Transportation and warehousing	6
Utilities	—
Professional and business services	3

Industry	Total Fatal Injuries
Education and health services	—
Leisure and hospitality	—
Public administration	6

Source: BLS 2024b

[a] Agriculture data exclude farms with less than 11 employees.

[b] Coal, metal, and nonmetal mining operator data is provided by the Mine Safety and Health Administration (MSHA), but data for mining also includes companies not regulated by MSHA rules and reporting. Independent mining contractors are excluded from the coal, metal, and nonmetal mining industries. The data does not reflect Occupational Safety and Health Administration recordkeeping requirements effective January 1, 2002, making industry estimates not comparable to other industries.

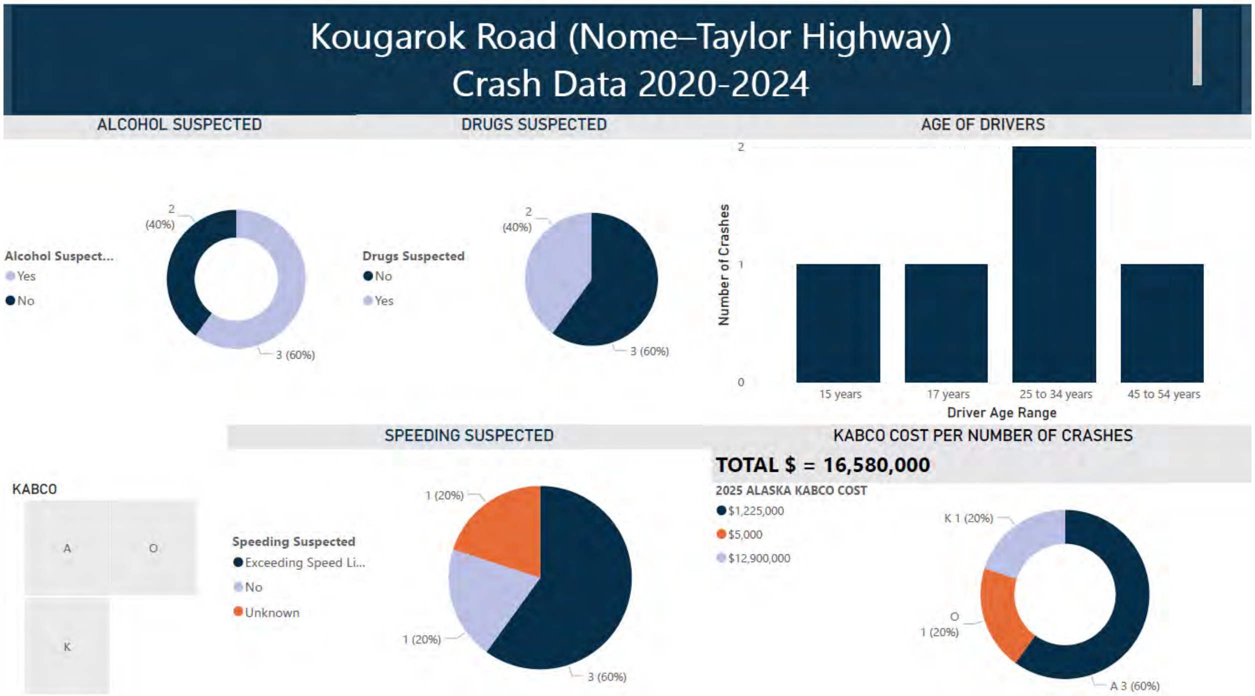
3.3.7.4 Public Safety

Alaska State Troopers (AST) C Detachment is responsible for providing law enforcement, patrol, and search and rescue to communities in the Bering Strait Region, among other regions (DPS n.d.-a). Approximately 60 troopers cover the 216,077 square miles that comprise C Detachment. The study area is located in the Nome region of C Detachment, and the nearest trooper post is in Nome, with the next-closest post located in Unalakleet (DPS n.d.-a; Payne and Kisarauskas 2020). From 2013 to 2018, there was a total of 8,698 AST incidents reported throughout the Nome region, with a mean annual number of incidents of approximately 1,450.

AST is responsible for enforcing traffic laws and regulations in rural areas. On Kougarok Road, which would be used for transport to the Project access road, there were five reported vehicle crashes from 2020 to 2024 between Nome and the location of the Mosquito Pass access road (Figure 3-28; DOT&PF 2025).[1] Crash severity included one fatal injury and three suspected serious injury crashes. Additionally, alcohol was involved in all of the suspected serious injury crashes, and drugs were suspected in two of the crashes. Speeding was suspected in three of the five crashes. Winter driving conditions can be hazardous in the study area and, as discussed in Section 3.3.6.2 Community Infrastructure, Kougarok Road is gravel and currently inaccessible during winter months. provides a visualization of the DOT&PF crash data.

[1] Information from the crash database is compiled for highway safety planning purposes. Federal law prohibits its discovery or admissibility in litigation against state, tribal, or local government that involves a location or locations mentioned in the crash data (23 USC 407; 23 USC 148(h)(4); *Walden v. DOT*, 27 P.3d 297, 304–305 (Alaska 2001). The data compilation is derived from crash reports completed by a responding law enforcement officer, or by a citizen, and maintained by the Division of Motor Vehicles. Crashes for which there are no motor vehicle crash reports are not included. DOT&PF can make no representation about crash data accuracy.

Figure 3-28. Kougarok road crash data, 2020–2024



Source: Crash data provided by DOT&PF 2025; KABCO values derived from DOT&PF 2024.
Notes: KABCO acronym is derived from K = VSL (Value of Statistical Life) (Fatality); A = (Suspected Serious Injury); B = (Suspected Minor injury); C = (Possible injury); O = (Property damage only). See Footnote 1 for disclaimer about crash data.

Nome is served by the Nome Police Department, which includes two patrol sergeants, eight sworn police officers, one full-time investigator, one community service officer, and a dispatch center (Nome n.d.-c). Public safety data is only available for Nome, which is reported by the Nome Police Department to the Alaska Department of Public Safety (DPS 2023). Table 3-46 summarizes the monthly return of offenses recorded by the Nome Police Department.

Table 3-46. Monthly Return of Offenses, Nome Police Department, 2022

Classification of Offense	Actual Offense (Number)
Criminal Homicide	0
Rape	48
Robbery	1
Assault	192
Burglary	1
Larceny – Theft	16
Motor Vehicle Theft	1
Total	259

Source: DPS 2023

Teller and Brevig Mission are served by the Village Public Safety Officer (VSPO) program (Kawerak n.d.). The program is funded by Kawerak, Inc., the non-profit Tribal consortium that represents communities in the Bering Strait Region. VSPOs are first responders that provide law enforcement, search and rescue, fire prevention and protection, emergency medical services, and probation and parole services. There is a VSPO in Brevig Mission, but the position is vacant in Teller as of July 2025 according to an informational page about the VSPO Program on Kawerak Inc.'s website (Kawerak n.d.).

Additionally, village-based counselors (VBCs) are first responders for suicide prevention (Kawerak 2025). However, the draft *Brevig Mission Local Economic Development Plan 2019–2023* notes that safety is a concern when community health aides or VBCs must respond to these emergencies without a VSPO. Residents of Brevig Mission additionally expressed concerns about the ability to contact VSPOs after normal work hours.

Brevig Mission's Search and Rescue Department, coordinated by the local VSPO, requires reorganization (Kawerak 2025). Additionally, emergency planning and evacuation shelter planning are needed in Brevig Mission. In Teller, there is a local volunteer search and rescue team that is not formally organized or trained (Kawerak 2017). The team has two snowmachines, and limited access to boats and all-terrain vehicles (Kawerak 2014).

The 42-member Nome Volunteer Fire Department provides services, including fire protection, search and rescue, and hazardous material response (Nome n.d.-d). The Teller Volunteer Fire Department does not operate out of a building or have firefighting equipment. (Kawerak 2017). The Brevig Mission Fire Department and Nome Volunteer Fire Department are currently registered in the Alaska Department of Public Safety Fire and Life Safety Fire Department's Registration Status database, which requires departments to submit an annual summary report, a current roster of firefighters, and statutory reporting of fires and fire-related incidents (DPS n.d.-b); Teller's fire department is not listed in the database.

Emergency medical services are described in Section 3.3.7 Human Health and Safety.

4 Environmental Consequences

This chapter of the EED describes the environmental impacts associated with the Proposed Action and No Action alternatives. This chapter evaluates the short-term impacts of construction activities and long-term impacts of operating and reclaiming the mine for the Proposed Action. This chapter does not include an analysis of impacts from construction of facilities in Nome or improvements to existing roads. Mitigation, minimization, and avoidance measures as well as BMPs to reduce or eliminate an alternative's impacts on a resource are summarized in Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Analysis of the environmental consequences focuses on those areas of concern identified during public and agency coordination as well as direct and indirect environmental consequences inherent to the Proposed Action. Direct impacts are those caused by the action and occurring at the same time and place, whereas indirect effects are caused by the action and are later in time or farther removed in distance but still reasonably foreseeable.

Impacts are characterized as beneficial or adverse and short or long term. Beneficial impacts are those that would result in a positive change in the condition or appearance of the resource or a change that would move the resource toward a desired condition. Adverse impacts are those that would result in a negative change in the condition or appearance of the resource. Short-term impacts are those that would be temporary and associated with the construction or reclamation phase but would no longer occur once construction and reclamation is completed or shortly thereafter. Long-term impacts are those that would persist for the operational life of the mine or would be permanent.

Qualitative terms used to assess the anticipated impacts associated with the alternatives are generally defined below. These terms may be adapted to address the unique characteristics of each resource category. Impacts are characterized with respect to intensity, ranging from none to substantial impacts.

- None: No measurable impacts are expected to occur.
- Minimal: Barely perceptible impacts are expected to occur.
- Minor: Measurable impacts on a resource are expected to occur but would be slight and may not be perceptible to an observer.
- Moderate: Measurable impacts are expected to occur and have a medium effect on the resource that would be noticeable to an observer but less than significant.
- Substantial: Measurable impacts would be obvious and would have serious consequences on the resource that would be readily noticed by an observer.

The following sections describe the environmental consequences of the Proposed Action and No Action alternatives on physical resources within the Project area. The impacts of the mine site, infrastructure, and Mosquito Pass access road construction, operations, and reclamation and closure are described for each resource.

4.1 Physical Environment

4.1.1 Paleontology

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on paleontological resources, which include fossilized remains, traces, or imprints of organisms preserved in the geologic record.

4.1.1.1 Proposed Action

Potential direct and indirect impacts on paleontological resources could potentially occur during the construction, operation, and reclamation phases of the Project. The primary activity during these phases that has the potential to impact paleontological resources is the removal or disturbance of surficial deposits and bedrock where paleontological resources could potentially be found. While no paleontological resources have been recorded within the Project area, they have been recorded within the region (more than 9 miles from the Project site) in unconsolidated surficial deposits that are geologically similar to those within the Project area (Section 3.1.1). An Inadvertent Discovery Plan would be prepared to provide directions to on-site staff on what to do, who to contact, and how to secure an area if ground disturbing activities unearth an unanticipated discovery.

Construction and Operations Phases

Potential effects to paleontological resources would occur across the same areas where bedrock and soils would be impacted, as described in Section 4.1.2 Geology and Mineral Resources and Section 4.1.3 Geomorphology, Permafrost, and Soils; paleontological resources typically occur within bedrock units but also have the potential to be recovered in surficial materials. However, no paleontological resources have been recorded within the Project area and the likelihood of these resources occurring within the Project area is primarily unknown. Based on BLM's PFYC system, the southern portion of the mine site is a Class 1 unit and unlikely to yield scientifically important paleontological resources (487.1 acres; see Table 3-1 and Table 3-2, and Figure 3-1). This unit has fossil potential due to the igneous and metamorphic category of rock found in the area, but is unlikely to contain any recognizable paleontological resources. Much of the mine site and road are classified as "Unknown" (1,804.2 acres; see Table 3-1 and Table 3-2, and Figure 3-1). This Unknown area is geologically composed of unconsolidated surficial deposits containing primarily Pleistocene- and Holocene-age glacial and periglacial deposits as well as some Tertiary-age deposits, which are less than 2.6 million years in age, and has potential for encountering fossil-bearing substrates below these surficial deposits. Geologic units with unknown potential have medium to high management concerns (BLM 2016).

During the construction and operations phases, approximately 2,440 acres of land would be disturbed related to the mine pit, Mosquito Pass access road, and associated mine infrastructure. Approximately 301 Mt of material, including ore and waste material, are expected to be removed during mine construction and operations. The destruction of bedrock at the mine site through blasting, excavation, and grading could have long-term, minor to substantial, adverse impacts on potential paleontological resources by destroying them; exposing them to the elements and resulting in damage; or making them more susceptible to erosion, damage, or inadvertent or purposeful collection. The removal of bedrock and consequent exposure of new bedrock could also result in increased access to and identification of fossils. Permafrost warming effects associated with development of the mine, outlined in Section 4.1.3 Geomorphology, Permafrost, and Soils, could have a long-term, minor to substantial, adverse impact on paleontological resources in that fossils located in newly warmed permafrost soils could be exposed through thermodynamic processes. The access road to the mine site would be private, and entry to the mine site would be restricted. In addition, employees would be restricted from collecting paleontological resources which would limit the potential for unauthorized collecting of potential paleontological resources (see Chapter 5 Avoidance, Minimization, and Mitigation Measures).

If paleontological resources are encountered, the Proposed Action construction and operations phases would potentially result in long-term, substantial, adverse impacts on previously undocumented paleontological resources within the mine site area, road, and footprint of associated infrastructure. The context and likelihood of occurrence cannot be determined without more detailed analysis of the potential for paleontological resources within the study area.

Reclamation and Closure Phase

Waste rock material would be managed throughout the life of the mine, The mine pit would eventually become permanently covered by water, limiting access to any potential paleontological resources remaining in that area. Similar to the construction and operations phases, the Proposed Action reclamation and closure phases would potentially result in long-term, substantial, adverse impacts on previously undocumented paleontological resources within the mine site area, road, and footprint of associated infrastructure.

4.1.1.2 No Action Alternative

Under the No Action Alternative, the Project would not proceed to construction or operation. Major Project components, including the open-pit mine, access road, and support infrastructure, would not be developed; therefore, ground disturbance and bedrock removal associated with their construction would not occur. Extraction or reduction of existing mineral resources or aggregate would not occur.

4.1.2 Geology and Mineral Resources

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on the geology and the primary economically recoverable mineral resource, graphite, within the Project footprint.

4.1.2.1 Proposed Action

The Proposed Action involves the construction, operation, reclamation, and closure of an open-pit graphite mine with the lowest pit bench approximately 100 feet asl. The north pit rim would be approximately 575 feet asl and the south pit wall, which is on the mountain side, would extend up to approximately 1,445 feet asl. The mine is anticipated to deliver up to 10,000 tons of graphite ore concentrate daily and 71 Mt of graphite containing Mineral Reserves over an operational mine life of 21 years.

CONSTRUCTION AND OPERATIONS PHASES

The Proposed Action would disturb geological and mineral resources during site preparation, construction, and operation of the open-pit mine, mine infrastructure (including mine site roads), and gravel access road. Mine construction would potentially require excavation of bedrock within a total footprint of 1,326 acres, resulting in the production of approximately 301 Mt of ore and waste rock, including an anticipated 71 Mt of proven and probable graphite mineral reserves to be removed from the mine pit during construction and operations (Table 4-1). Long-term, substantial, adverse impacts on bedrock and mineral resources are expected within the mine footprint during construction and operations.

Table 4-1. Quantity of bedrock material and mineral resources to be removed

Mine Pit Material	Quantity (Mt)
Graphite-containing Bedrock	71.22
Waste Rock	229.76
Total Bedrock Removed	300.98

RECLAMATION AND CLOSURE PHASE

Infrastructure would be dismantled during the Proposed Action's reclamation phase. The Project footprint would be regraded to the extent possible, spread with salvaged topsoil, and reseeded according to permit requirements. Long-term, minimal, adverse impacts on geology and mineral resources could occur due to ground disturbance during this regrading.

4.1.2.2 No Action Alternative

Under the No Action alternative, the Project would not be developed, and no disturbance to geology and mineral resources associated with the mine, infrastructure, and access road would occur.

4.1.3 Geomorphology, Permafrost, and Soils

The following section details the environmental consequences associated with area landforms, permafrost, and soils under the No Action Alternative and Proposed Action.

4.1.3.1 Proposed Action

The Proposed Action would have short- to long-term, moderate, adverse impacts on the Project area's geomorphology, including alteration of landforms from excavation and grading; soil, wetlands, and permafrost disturbance; the development of a built environment; and changes to the hydrological processes that have shaped and continue to alter area landforms due to pit dewatering.

The Proposed Action would have short- to long-term, minor to moderate, adverse impacts on area soils and permafrost, including wetlands.

The infrastructure constructed under the Proposed Action is anticipated to experience long-term, minimal to minor, adverse impacts under various mass wasting scenarios and be susceptible to long-term, moderate to substantial, adverse impacts from avalanche hazards. Through the design and permitting process, impacts and hazards would be further identified to mitigate adverse impacts (see Chapter 5 Avoidance, Minimization, and Mitigation Measures).

CONSTRUCTION AND OPERATIONS PHASES

GEOMORPHOLOGY, PERMAFROST, AND SOILS

The Proposed Action would impact approximately 2,440 acres of soils through ground-disturbing activities (e.g., excavation) during Project development. Table 4-2 summarizes the mapped soil units that would be impacted. There are no prime or other important farmlands within the study area (USDA-NCRS n.d.-a).

The Proposed Action would require the removal of area topsoil and the vegetative mat, which can lead to erosion. Topsoil stripped during construction of the access road, mining pit, mill areas and facilities, WMF, and WMP would be preserved, stockpiled, and placed near the WMF. An alluvial material borrow source would also be developed and stored near the WMF. The material borrow source would be used to balance material excavated from the WMF and pit, as well as material excavated during construction.

Table 4-2. Soil disturbance impacts from the Proposed Action

Map Unit Symbol	Soil Map Unit	Hydric Rating[a]	Acres Disturbed[b]
E40W	Nulato Hills, Seward Peninsula Highlands-Maritime Water, Saline	Predominantly Nonhydric	—
E41P1	Seward Peninsula Highlands-Arctic Upland and Lowland-Glaciated Valleys	Partially Hydric	811
E41P2	Seward Peninsula Highlands-Arctic Upland-Loess Plain	Partially Hydric	559
E41LM3	Seward Peninsula Highlands-Arctic Upland-Rounded Mountains, Calcareous	Partially Hydric	922

[a] Hydric rating provided by USDA-NRCS n.d.-b
[b] Acreage of soil type that intersect Project footprint.

Soil disturbance during mine construction and operation additionally includes impacts on wetlands from pit dewatering, or lowering groundwater levels to ensure stable pit walls and allow for excavation of waste rock and ore. Pit dewatering would create a localized cone of depression within the pit by lowering the groundwater table immediately surrounding the pit, due to pumping water out, and below the WMF, due to its impermeable lining (Tundra Consulting 2024). Groundwater would be required to be lowered below the bottom of the final pit, which would have a depth of approximately 1,475 feet. Construction of the mine and pit dewatering could impact wetlands not located on permafrost by reducing surface flow and lowering of the groundwater. Wetlands located on permafrost are not expected to be impacted by pit dewatering because they are not hydrologically connected groundwater. Construction of the WMF would limit water infiltration within the WMF footprint which could reduce recharge downslope. This reduction in recharge could have a limited effect on downslope wetlands adjacent to the WMF.

As discussed in Section 4.1.6 Hydrology and Floodplains, the spatial extent of the drawdown is anticipated to be limited but may reduce seepage and delay recharge downslope of the pit throughout mine operations. The drawdown is anticipated to propagate westward due to the capture of bedrock groundwater flow by the pit, the presence of permafrost to the north that limits water movement, decreased sediment recharge in the area underlying the lined WMF north of the pit, and high hydraulic conductivity of the geologic units northwest of the pit (glaciofluvial and fan deposits; Tundra Consulting 2024).

The artificial lowering of the groundwater level would depressurize the surrounding aquifer; bedrock inflow rates are projected to start at 0 gpm and increase to 125 gpm gradually as the depth reaches below the groundwater table (Tundra Consulting 2024). A total change in groundwater discharge flows to rivers, creeks, or wetlands at the end of mine life is predicted to be -1,066 gpm and the discharge flows to Imuruk Basin to be -1,156 gpm. It is anticipated that streams and wetlands located adjacent to the pit as well as the WMF would experience long-term, minimal, adverse impacts from changes in hydrological connectivity that maintains soil saturation and nutrients delivery to area wetlands.

In-depth discussion of impacts to vegetation and wetlands can be found in Section 4.2.1 Vegetation, Wetlands, and Other Waters of the United States, while discussion of the changes to area drainage patterns can be found in Section 4.1.6 Hydrology and Floodplains.

Land disturbance associated with Project construction and operations would also have long-term, moderate, adverse impacts on permafrost warming (Barr 2025). As discussed in Section 3.1.3.2 Permafrost and Soils, permafrost has been identified in the vicinity of the WMF, mine pit, and barge landing. Discontinuous permafrost on the Seward Peninsula is especially susceptible to thawing from disturbance of the vegetative mat that provides insulation (Recon 2023). Permafrost thaw could cause infrastructure differential settlement if not accounted for in the Project design. Permafrost beneath the WMF is predicted to progressively warm and thaw during the operations and closure phases. Placement of tailings and waste rock within the WMF cells is expected to limit seasonal heat transfers between the atmosphere and the underlying foundation which would reduce the overall effect of increasing temperatures on permafrost degradation. Establishing a frozen zone above the original ground surface is anticipated to reduce thaw in the underlying foundation (NPC 2024). Substantial thaw that leads to major differential settlement could render the staging pad unusable (Recon 2023). Further investigation will be undertaken by Graphite One to identify permafrost extent in the study area and used for detailed engineering of the facilities to minimize impacts to permafrost; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Avalanche and Seismic Hazards

Seismic hazards have the potential to impact Project infrastructure developed under the Proposed Action due to soil liquefaction associated with ground shaking, but it is not possible to reliably predict when and where future events would occur. Various slope stability and liquefaction modeling efforts conducted as part of the FS and additional design efforts (Barr 2026) have been undertaken that show that the Proposed Action may experience long-term, minimal to minor, adverse impacts under various mass wasting scenarios.

Slope stability analysis of long-term soil conditions within Project area found that the WMF’s preliminary design had acceptable slope stability conditions (Barr 2026). Slope-stability analysis was not performed for conditions that would inform detailed design analysis; these efforts are ongoing as part of the mine design. Additionally, the seismic deformation analysis found that, overall, the WMF structure would remain stable under design earthquake loads, with no tailings release or structure failure. Static deformation modeling found that ground movement may occur from the weight of the structures at the base of the WMF, as well as from continuous tailings deposits during Project operations (Barr 2026). However, post-liquefaction modeling indicated that filtered tailings liquefaction would be limited to approximately 0.7 foot of downstream deformation, which is considered safe for overall WMF stability.

Impacts on the Project from avalanche and seismic hazards would be avoided, minimized, or mitigated through measures and BMPs; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

The Proposed Action would also be susceptible to short- to long-term, moderate to substantial avalanche hazard impacts. Table 3-8 and Table 3-9 (in Section 3.1.3.3 Avalanche and Seismic Hazards) show that D2- and D3-sized avalanches originating from 25 avalanche pathways would impact the proposed access road, crossing structures, material sites, mine pit, and pit diversion channel, with estimated frequencies indicating avalanches would occur multiple times over the life of the Project. The destructive potential of these avalanches could bury, injure, or kill a person (D2) or bury/destroy a car, damage a truck, destroy a wooden-framed house, or break trees (D3). There would likely not be an impact to the WMF, mill, water treatment pond, and existing camp. Excavation, fill, and other alterations of the terrain associated with Proposed Action construction may create new avalanche terrain. With the implementation of appropriate mitigation measures, avalanche hazards and their impacts on proposed infrastructure would be minimized; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Additional hazard studies will be completed to further assess hazard impacts within the Project area, including:

- Avalanche hazard monitoring and reassessment during Project construction and operations, as alterations of the existing terrain during construction may create new avalanche terrain.
- A slush flow hazard analysis that evaluates slush flow impacts to the Proposed Action. This analysis will determine if Project facilities or infrastructure may be impacted by slush flows.
- Assessment of the seismic hazards of Kigluaik Fault using contemporary tools, such as high-resolution topography and aerial imagery, as well as three-dimensional visualization and data manipulation tools.
- Continuous monitoring of area permafrost conditions, such as depth, ice content, and rock and soil moisture content, throughout operations for potential impacts on pit slope stability.

RECLAMATION AND CLOSURE PHASE

GEOMORPHOLOGY, PERMAFROST, AND SOILS

Impacts on the Project area's geomorphology would be minimized during reclamation and closure by reclaiming the site as practicable and leaving the site in a stable condition. Recontouring would occur where practicable, but some soils, including wetlands, streams, and permafrost, may be permanently altered.

Reclamation would involve dismantling facilities with the goal of restoring the area close to its original condition. The stored topsoil and overburden would be used as reclamation and cover material The disturbed areas would be seeded and revegetated according to permit requirements. These activities are intended to reduce adverse impacts on soils while improving surface insulation to avoid additional impacts on permafrost thaw.

AVALANCHE AND SEISMIC HAZARDS

Avalanche and seismic conditions, combined with water table recovery, would continue to pose hazards to structure stability during reclamation activities and following mine closure. Most built infrastructure that could be affected or used to reduce impacts from these hazards (i.e., snow net systems), would be removed and disposed in the pit. However, seismic and avalanche activity could adversely affect the Graphite Creek diversion structure, pit, and capped WMF facility that would remain after closure. These hazards should be monitored and controlled; avalanches could impact the Graphite Creek diversion structure by carrying debris and forcefully interacting with the structure, as well as by changing flow volumes from snow melt from the snow deposited by avalanches adjacent to or into the diversion structure. Graphite One, in accordance with State of Alaska mining permit requirements, would develop a design for closure that ensures the Graphite Creek diversion structure, pit, and WMF facility would maintain structural integrity under projected seismic or avalanche conditions following closure. Post-closure monitoring would involve inspections for mass stability and monitoring for seepage flow.

4.1.3.2 No Action Alternative

Under the No Action alternative, the Project would not be developed and no disturbance to area geomorphology, permafrost, or soils associated with infrastructure development would occur.

Changes to ground temperature affecting permafrost due to land development would be avoided under the No Action Alternative but permafrost warming associated with climate trends would continue (Barr 2025). Avalanche and seismic hazards would remain the same; however, they would impact undeveloped areas and not affect physical infrastructure.

4.1.4 Air Quality

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on air quality within the Project area.

4.1.4.1 Proposed Action

The Proposed Action would result in short- to long-term, minor to moderate, localized emissions of air pollutants during the construction, operations, and post-closure phases of the Project. Emission sources include stationary diesel generators, mobile heavy equipment, mining operations, unpaved haul road traffic, barge and offloading activity, and ore processing infrastructure. Regulated pollutants such as nitrogen oxides (NOx), PM, CO, SO_2, VOCs, and hazardous air pollutants (HAPs) would be introduced into a remote airshed with little to no baseline industrial emissions. Emissions would be regulated under Alaska's Title I and Title V air quality permitting programs, with additional requirements under the Prevention of Significant Deterioration (PSD) program if major source thresholds are exceeded. Project emissions would be quantified and modeled to demonstrate compliance with the NAAQS and, if necessary, PSD increments. Air quality impacts are expected to be temporary during construction, continuous but spatially limited during operations, and negligible after final reclamation. The operator must take reasonable precautions to prevent PM from being emitted into the air as required by ADEC's 18 AAC 50.045. Additionally, the operator must comply with any permit-based controls, operational limits, monitoring, and reporting to ensure emissions remain within regulatory limits and do not adversely affect nearby environmental receptors, noting that no highly sensitive human receptors currently exist near the Project boundary (ADEC 2024).

CONSTRUCTION PHASE

Project construction for the Proposed Action would occur intermittently over approximately 2 years, resulting in short-term, minor, localized air emissions associated with land clearing, material handling, road development (Mosquito Pass access road and mine site roads), heavy equipment operation, camp operations, and support facility installation. While emissions during the construction phase are transient in nature, they would introduce both combustion-related pollutants and fugitive PM into a remote and currently undeveloped airshed. These emissions would be generated by diesel-powered construction equipment, camp power generation, barge and offloading activity, mechanical disturbance of soils during infrastructure buildout, and other construction activities.

Construction activities would include the use of bulldozers, excavators, graders, dump trucks, front-end loaders, generators, fuel transport vehicles, and other emission sources. Emissions from these sources will include all criteria pollutants, including NOx, CO, SO_2, PM, and VOCs, as well as HAPs. Combustion emissions from generator operation during construction would be intermittent compared to operations but would still be measurable and contribute to the Project's overall emissions profile.

Fugitive dust emissions are expected to be an important contributor to local air quality impacts during construction. For instance, mechanical disturbance of soil surfaces; vehicle traffic on unpaved roads; and excavation for culverts, bridges, and facility pads may release fine PM into the atmosphere, particularly PM_{10} and $PM_{2.5}$. These impacts are likely to be greatest during dry summer periods when exposed soils and roadbeds are most vulnerable to wind entrainment and mechanical disruption. Laydown yards and material sites may contribute additional sources of dust during equipment staging and truck activity. Graphite One would control fugitive dust through good work practices such as watering the road surface.

Barge-related construction activity near the Imuruk Basin may result in intermittent emissions from vessel engines, offloading equipment, and temporary vehicle traffic on the staging pad. These emissions would include criteria pollutants such as NOx, CO, and $PM_{2.5}$, but would be short in duration and confined to the open-water season. Marine vessel emissions will comply with EPA's marine emission standards (40 Code of Federal Regulations [CFR] 1043). No stationary emission sources would be installed at the gravel pad, and all equipment would be removed following initial mobilization. The pad would be reclaimed following completion of the access road and is not expected to contribute to long-term air quality impacts. However, windblown dust from stockpiled materials and unpaved surfaces may occur during staging and would be subject to the same dust suppression requirements applicable to mine site construction areas.

Construction-phase air quality impacts would be temporary and spatially limited. With implementation of good work practices and full permit compliance, emissions are expected to remain within regulatory thresholds with minimal impact.

Operations Phase

During the operations phase, the Project would introduce long-term, continuous sources of air pollutant emissions across the mine site, camps, and access road corridor. These emissions would result from stationary diesel combustion, mobile vehicle exhaust, fugitive dust generation from unpaved road use, mining activities, and ore handling and processing. In addition to stationary and mobile combustion sources, drilling and blasting associated with mine operations may generate short-term emissions of PM, NOx, and CO. While these events would be episodic, they contribute to operational air emissions. Furthermore, emissions may occur from fuel storage tanks (e.g., VOCs from evaporating and working losses), which would be managed in compliance with applicable state and federal air quality regulations. The Project site is currently located in an undeveloped region of the Seward Peninsula with no existing industrial emissions. Mining operations would introduce regulated air pollutants, including NOx, SO2, CO, PM, VOCs, and HAPs, into the airshed.

The primary stationary emission source would be the on-site power generation facility located adjacent to the processing plant and tailings infrastructure. The facility would operate continuously and consist of two 7.5-MW diesel generators and one 7.4-MW standby generator, supplying approximately 12.5 MW of electrical load to support ore processing, water treatment, winter operations, and facility heating (Barr 2025). Generators would run on ultra-low sulfur diesel delivered by truck from Nome and stored in a double-walled 850,000-gallon aboveground tank. Emissions from these units would include NOx, CO, SO2, PM, and VOCs. Given the projected annual emission rates for NOx, which may approach or exceed 250 tons per year, the power system may qualify as a PSD major source.

If the PSD permitting process is triggered, the power plant would need to undergo a best available control technology review to identify feasible emission reduction technologies or operational practices. This review would evaluate combustion efficiency, fuel quality standards, and available emissions controls such as low-NOx burners, selective catalytic reduction, or other exhaust treatment systems. Final generator stack heights, runtime schedules, and fuel throughput limits would be set to ensure compliance with PSD increments and NAAQS. Stack testing may be required during commissioning and would be repeated as needed to confirm ongoing permit compliance.

Mobile sources, which include haul trucks, graders, loaders, and an array of other support vehicles, would be operating within the mine footprint and along the 17.3-mile access road. These vehicles would generate additional emissions of CO, NOx, and diesel PM. All non-road equipment would meet the applicable EPA emission standards, and vehicles would comply with applicable national fuel economy standards (40 CFR 1039). Fuel use logs and operational hours may need to be recorded and submitted in annual emission inventories as required by the Title V permit. During peak production periods, traffic-related emissions may increase in proportion to haul volumes and material movement across the site.

To minimize dust-related impacts, the Project would need to develop a fugitive dust control plan, which may include application of water or dust suppressants, vehicle speed limits, stabilization of stockpiles and road surfaces, routine inspection of high-traffic areas, or other mitigation measures as needed. If dust control is insufficient, additional engineering controls may be required.

Ore processing activities, including crushing, semi-autogenous grinding, flotation, filtration, drying, and packaging, would occur in enclosed buildings. Graphite dust can be a nuisance to workers, and prolonged exposure can cause respiratory irritation and chronic lung conditions. Mitigation measures, such as enclosed conveyors, cartridge filters, and negative-pressure ventilation, can reduce worker exposure. To limit emissions, the processing facilities may be equipped with high-efficiency particulate collection systems, such as baghouses or cartridge filters, particularly at crushing and drying units. Enclosed conveyors, transfer points, and negative-pressure ventilation systems could further reduce the release of graphite fines to ambient air.

In addition to PM, operations would result in trace emissions of VOCs and HAPs, primarily from fuel combustion and maintenance activities. Trace pollutants could include benzene, formaldehyde, polycyclic aromatic hydrocarbons (PAHs), and other combustion byproducts. Although total emissions of these pollutants are not anticipated to exceed major source thresholds under 40 CFR 63, individual sources may be subject to New Source Performance Standards or National Emission Standards for HAPs subparts, including those for reciprocating internal combustion engines and nonmetallic mineral processing. Emissions would be characterized in the permit application and modeled to ensure that Project-level concentrations remain below significance thresholds.

Dispersion modeling would need to be conducted to evaluate compliance with NAAQS and, if PSD is triggered, PSD increments. The modeling would be prepared in accordance with the EPA's Guideline on Air Quality Models (Appendix W to 40 CFR 51), ADEC's Air Quality Modeling Guidelines, and EPA's AERMOD modeling system.

During operations, the Project would be subject to multiple air permit conditions that govern monitoring, reporting, and record keeping. These conditions may include stack testing for generator engines, fuel use tracking, dust control documentation, and submission of an annual or triannual emissions inventories. Additionally, the ADEC may require ambient air quality monitoring near the Project boundary if modeled concentrations approach regulatory thresholds. All monitoring and reporting activities would need to be reviewed during regular permit renewals and compliance evaluations.

In summary, air quality impacts during operations would be continuous and driven by diesel combustion, mining activities, ore processing, and unpaved road use. Emissions would introduce regulated pollutants into an otherwise undeveloped airshed, but compliance with Title I and Title V air permits, air dispersion modeling, and, if required, implementation of best available control technologies would minimize risks to human health and the environment. Currently, no sensitive human receptors are in proximity to the Project; therefore, impacts on sensitive receptors are anticipated to be negligible. With proper mitigation and performance monitoring, the operational phase is expected to remain in compliance with all applicable air quality standards and permit limits. Fugitive dust concerns, if any, would be addressed through the fugitive dust control plan.

RECLAMATION AND CLOSURE PHASE

Following the end of active mining, the Project would transition into a post-closure phase characterized by equipment demobilization, site reclamation, and long-term stabilization of disturbed areas. During this period, most air pollutant sources associated with combustion and fugitive dust would be eliminated. Air quality conditions within the Project area are expected to improve progressively as construction and operational activities cease, and revegetation and grading measures take effect.

The post-closure phase is anticipated to span approximately 5 years, with most emissions occurring within the first 2 years (Barr 2025). Temporary emissions would occur during the first year of closure as equipment is used to dismantle buildings; remove infrastructure; and regrade haul roads, pads, and process areas. These activities would involve the use of diesel-powered bulldozers, excavators, haul trucks, and loaders to relocate material, transport demolition debris, and restore surface contours. While these sources are similar to those used during initial construction, the scope and duration of activity would be substantially reduced. Emissions would include NOx, CO, and PM, but only for short periods at specific reclamation sites. Given the reduced scale and absence of continuous generation, these emissions are not expected to trigger additional permit modifications or modeling requirements. Dust suppression and fuel tracking practices established during operations would continue to be implemented and recorded until final earthmoving activities are completed.

As the site is regraded and stabilized, emissions from road traffic and surface disturbance would decline rapidly. The 17.3-mile access road and internal haul roads would be closed, recontoured where necessary, and either stabilized with permanent erosion controls or allowed to revegetate. Dust emissions would be further minimized by surface roughening, revegetation using site-appropriate seed mixes, and removal of windblown materials from temporary stockpiles. Areas near the WMF, processing plant footprint, and laydown yards would be leveled and capped to prevent surface erosion. The use of water trucks may continue on a limited basis until surfaces become vegetated or naturally stabilized.

With the exception of power needs for the WTP, other stationary emission sources should be permanently removed during the early phase of post-closure. When the WTP is closed, the power generation facility and all associated fuel storage tanks would be dismantled, and generators would be transported off-site. No fixed combustion sources would remain after closure. Without the power plant, mill, and ore handling infrastructure, the potential for CO, SO_2, VOCs, or HAPs to be released into the environment would cease. The Project's Title V operating permit would be closed out upon verification of full cessation of emissions, and the ADEC air construction permit would not require further action after post-closure confirmation is submitted.

Although routine emissions monitoring would no longer be required when stationary and mobile sources are decommissioned, post-closure air quality assessments may still be required if dispersion modeling or public concern during operations had identified any elevated near-field pollutant concentrations. If such conditions exist, the ADEC may require a short-term ambient monitoring program to verify return to background conditions. However, given the remote location, prevailing wind conditions, and elimination of all long-term emissions sources, future air quality across the site is expected to meet or exceed baseline levels without further mitigation.

In conclusion, the post-closure phase would mark the end of most emissions associated with the Project. Air quality would gradually return to predevelopment conditions as combustion equipment is removed, dust sources are stabilized, and natural vegetation reestablishes itself across the site. Remaining regulatory obligations would focus on verification of source decommissioning and documentation of compliance with permit closure conditions. With no long-term air pollutant sources remaining, residual impacts on the regional airshed are not expected.

4.1.4.2 No Action Alternative

Under the No Action alternative, the Project would not proceed to construction or full-scale operation. Major Project components, including the open-pit mine, ore processing facilities, access road, power generation systems, and support infrastructure, would not be developed. As a result, no long-term or large-scale emissions sources would be introduced, and no mining-related air pollutant emissions would occur within the Project area. Ambient air quality in the region would remain largely unchanged, continuing to reflect background conditions typical of remote areas of western Alaska.

4.1.5 Noise and Vibration

The following section details the environmental consequences of the No Action Alternative and the Proposed Action from noise and vibration within the Project area.

4.1.5.1 Proposed Action

Noise and vibration impacts from the Proposed Action may occur during all phases of the Project. During construction, operations, and reclamation, heavy machinery would generate elevated sound levels at the mine site, new access road, and temporary barge facilities.

No noise-sensitive receptors are located within 15 miles of the Project area. The nearest community, Mary's Igloo, is a seasonal fishing camp approximately 15 miles from the Project area. The nearest town, Teller, is approximately 30 miles from the Project area. Due to the Project’s remote location, vibration impacts from the mine site would not be experienced by nearby communities. Noise and vibration impacts from the Proposed Action during construction, operation, and reclamation of the mine would be long-term, minor, and adverse.

Impacts on other resources from noise (in-air and underwater) and vibration are discussed in Section 4.2.2 Fish, Essential Fish Habitat, and Invertebrates; Section 4.2.3 Birds; Section 4.2.4 Terrestrial Mammals; Section 4.2.5 Marine Mammals; and Section 4.2.6, Threatened and Endangered Species, and Critical Habitat.

Noise

Heavy or earth-moving equipment such as excavators, backhoes, front loaders, graders, and dump trucks have average maximum sound pressure levels (SPLs) at 50 feet of 73 to 101 dBA for non-impact equipment. Stationary equipment such as pumps, power generators, and air compressors can range from 68 to 88 dBA at 50 feet, while impact equipment such as jackhammers, pavement breakers and rock drills can range from 79 to 114 dBA at 50 feet. Instantaneous SPLs associated with blasting can reach up to 126 dBA near the blasting area (WSDOT 2020; FHWA 2006).

The Occupational Health and Safety Administration has developed noise standards for sound levels permissible by duration of work per day (29 CFR 1910.95). When an employee is exposed to noise that exceeds the limits, then engineering controls and/or personal protective equipment needs to be put in place. The Mining Safety and Health Administration also has noise standards in which a miner cannot be exposed to noise exceeding the permissible exposure level of 115 dBA during any work shift without hearing protection (30 CFR 62.130). These regulations would minimize the exposure of noise to workers within the Project area. Due to the remote location of the Project, it is not likely that nearby communities would experience noise impacts.

Vibration

Ground vibrations are created through explosive energy (e.g., blasting) that is used to break rock, such as for mining and road construction. While most of the energy is directed at breaking rock, some of it escapes into the atmosphere as air blast or air vibrations, and through the surface soil and bedrock as ground vibrations (OSMRE 1983). Ground vibration from blasting can cause damage to surrounding ground and underground buildings and structures (Liu et al. 2023).

CONSTRUCTION AND OPERATIONS PHASES

During construction and operations, blasting and heavy machinery would generate elevated sound levels at the mine site. Blasting would occur approximately 3 to 4 times per week during the day shift. Blasting at the mine would primarily use gassed-emulsion explosives that would be manufactured on site. Heavy machinery and equipment would likely operate 24 hours per day.

Elevated sound and vibration levels from blasting and heavy machinery would occur during construction of the Mosquito Pass access road. During construction, all material sites have the potential for blasting to occur, as well as along several sections of the access road. During operations, elevated sound levels from the access road would be generated by vehicle traffic, which would include large trucks transporting heavy equipment and machinery as well as containerized graphite concentrate. Blasting for avalanche control would be required during construction and operations when the snowpack is deemed to be hazardous. Between November and May, it is estimated that blasting would occur around 24 times for avalanche control, depending on snow conditions for any given year.

Elevated sound levels would be generated at the temporary barge facilities through the use of heavy machinery and equipment during Project construction. During construction, elevated sound levels would be associated with the installation of the temporary gravel pad, and transportation of materials to and from the barge landing from the gravel pad. Then, vehicle traffic would be concentrated between the barge landing and temporary gravel pad during the open-water season, and between the gravel pad and mine site during winter, once a seasonal winter road could be constructed. Vessels such as landing crafts and tugs and barges would generate in-air and underwater noise.

Reclamation and Closure Phase

Elevated sound levels from heavy machinery and equipment would be anticipated during reclamation and closure of the mine site and Mosquito Pass access road. Overall noise levels will decrease from operational levels as the mine is reclaimed and closed and equipment is no longer needed.

4.1.5.2 No Action Alternative

Under the No Action alternative, the proposed Project would not be developed. No elevated sound levels would occur because construction or operation of the mine, access road, and temporary barge facilities would not occur. However, there may be temporary elevated sound levels from the use of equipment, machinery, and aircraft during reclamation activities for exploratory work that have occurred near the mine site.

4.1.6 Hydrology and Floodplains

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on hydrology and floodplains within the Project area.

4.1.6.1 Proposed Action

The Proposed Action would result in long-term, moderate, adverse impacts on surface and shallow subsurface hydrology within the Project area. Hydrologic impacts would differ by Project phase but are expected to be most pronounced during construction, when widespread terrain modification, vegetation removal, and initial infrastructure development would disrupt natural drainage networks, alter runoff patterns, and disturb permafrost-limited basins. During operations, hydrologic conditions would remain modified through the activation of containment systems, diversion infrastructure, and dewatering of the open pit, resulting in long-term redirection of runoff and localized groundwater drawdown. Post-closure, the site would transition into a hydrologically stable configuration defined by the presence of a permanent pit lake, capped and reclaimed waste storage facilities, and long-lived diversion structures that control flow and minimize infiltration. Across all phases, the Project is expected to alter the timing, volume, and routing of runoff; permanently modify groundwater gradients in the pit vicinity; and restructure watershed behavior within the Project footprint. These effects would be managed through engineered drainage systems, containment and treatment infrastructure, progressive reclamation, and long-term monitoring, as required by applicable permits.

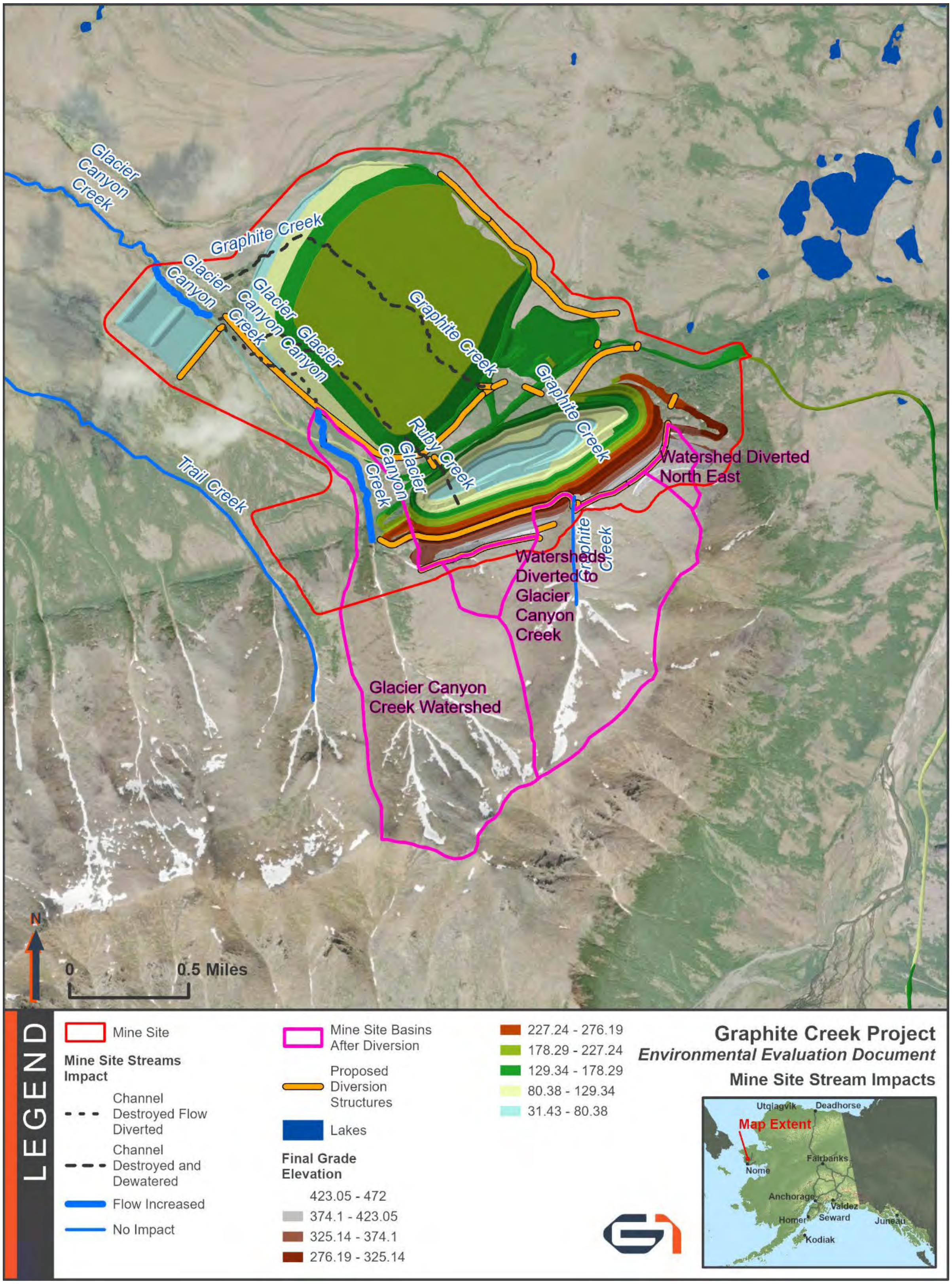
CONSTRUCTION PHASE

Construction of the Project is expected to generate the most substantial hydrologic impacts of any Project phase. Project activities during this phase would involve clearing vegetation; grading terrain; installing drainage infrastructure; and building permanent components, including the open pit, the WMP, the process pond (PP), the WMF, internal site roads, and the 17.3-mile access road (Barr 2025). These activities may disrupt existing surface and shallow subsurface hydrology.

Construction would alter natural drainage patterns by replacing vegetated, high-porosity soils with compacted gravel surfaces, regrading slope geometry, and redirecting runoff into culverts and ditches. Flow paths that currently function as broad, interconnected overland channels may be fragmented by fill embankments and road crossings. Ephemeral drainage features, which convey flow primarily during spring breakup and high-intensity storm events, may be shortened, diverted, or eliminated. The redirection of flow would reduce water delivery to downstream wetlands, increase the speed and variability of runoff peaks, and modify flow permanence in small receiving basins. These impacts would be persistent given the engineered nature of the drainage systems replacing diffuse tundra hydrology.

In addition to diffuse and ephemeral runoff, perennial stream channels within the mine area would be permanently lost, with flow diverted around the open-pit mine and WMF. Approximately 1 square mile of the Graphite and Ruby Creek drainages would be permanently diverted around the proposed pit and WMF starting during the construction phase, resulting in a complete loss of approximately 1 mile of stream channel. The approximately 1,000-gpm annual diversion would meet Glacier Canyon Creek 1.5 miles upstream of where the streams currently confluence, doubling the flow in the channel (Figure 4-1). Approximately 0.6 mile downstream of this, the entire Glacier Canyon Creek would be diverted into a ditch for 0.5 mile, re-entering the natural channel downstream of the WMF.

Figure 4-1. Mine site stream impacts



The construction of the access road would require numerous waterbody crossings, including 6 bridges, approximately 32 drainage culverts, and 7 fish passage culverts. The drainage culverts would be constructed across streams and ephemeral drainages that have limited channel definition under baseline conditions (Barr 2025). During installation, streambed and bank material would be disturbed to construct bridge foundations and set culvert bedding, and temporary diversions may be used to maintain construction access. If culverts are undersized, misaligned, or blocked by sediment or debris during construction, impoundment or overtopping could occur. Outlet scour may result if flow velocity increases at the discharge point, particularly in poorly armored tundra channels. Short-term sediment pulses are also likely during earthwork near active flow zones. All crossings would be constructed and maintained according to ADNR and ADF&G permit requirements.

Several Project components would be constructed in terrain that exhibits seasonal surface flooding, including the gravel staging pad near Imuruk Basin, the northern WMF perimeter, and portions of the access road near Mosquito Pass. Although these areas are not classified as mapped Federal Emergency Management Agency floodplains, field data confirm that they function as flood-prone basins during spring breakup. Surface water commonly flows laterally across saturated soils above the permafrost table, and snowmelt can accumulate where drainage is impeded. Placement of fill and grading within these areas would interrupt natural runoff continuity, potentially creating unanticipated ponding or increasing the velocity of runoff through downslope constriction. The interruption of active layer drainage may also increase soil saturation and cause slope instability where thaw-sensitive soils are exposed or loaded. If culverts are insufficient to accommodate diverted flows, local ponding or lateral erosion may develop in areas adjacent to infrastructure.

Ground disturbance during construction may also initiate permafrost thaw in ice-rich soils. The Project area is underlain by discontinuous permafrost, with ice lenses and massive ground ice identified in geotechnical borings, particularly beneath the WMF, stream crossings, and gravel pad locations. The removal of vegetation and placement of gravel fill increases heat transfer into the ground, lowering the thermal stability of frozen soils. Where thaw occurs, the ground may subside, forming thermokarst depressions. These features can act as new water collection zones or reroute runoff away from engineered drainage systems. In some locations, thaw-induced settlement may compromise the structural integrity of culverts, embankments, or roadbeds. Areas with high ice content are especially vulnerable during construction when excavation, loading, or rapid surface warming occur in combination. Ground temperature monitoring and the use of insulation materials such as geotextile fabric and subdrainage layers would be required in high-risk areas to reduce the likelihood of thermokarst development and associated flow disruption.

Soil disturbance and slope grading would substantially increase the risk of erosion and sediment mobilization, particularly during spring melt or storm events before final stabilization is complete.

Erosion-prone areas would include cut-and-fill zones, stream approach slopes, and stockpiled material along haul roads and building pads. Fine sediments mobilized from these areas may enter ephemeral creeks or tundra basins, increasing turbidity and depositing silts in wetlands or low-energy channels. These impacts are most likely where natural buffering capacity is limited, such as near headwater streams and low-gradient tundra wetlands. Erosion control measures would be implemented as required under the ADEC Construction General Permit (CGP), including perimeter ditches to isolate clean water, slope-stabilizing practices such as hydroseeding and erosion control matting, and temporary sediment basin installation at culvert outlets and construction laydown areas. Sediment traps and silt fencing could also be used where runoff from active construction zones may enter waterbodies.

The WMP and PP would be constructed during early stages of site development and would provide critical detention capacity for sediment-laden construction runoff. These ponds would be used to contain the runoff water and settle solids prior to reuse or discharge, allowing the full water treatment system to be brought online in a phased approach. Because natural hydrology is highly sensitive to terrain disturbance in permafrost-affected tundra, construction-phase stormwater management would require continuous maintenance, seasonal adaptation, and regular inspection of erosion control features to ensure function throughout each stage of infrastructure development.

OPERATIONS PHASE

During operations, the Project would maintain a year-round footprint of active mining, ore processing, tailings deposition, vehicle traffic, and utility use. This phase would result in long-term alteration of both surface water and shallow groundwater systems across the mine site and access road corridor. Hydrologic impacts would include removal of natural channels and diversion of flows to neighboring streams around the mine area, sustained runoff from compacted surfaces along the road and mine area, continued disturbance of permafrost terrain, groundwater extraction from pit dewatering, and operation of permanent drainage and water treatment infrastructure. The natural streamflow and surface runoff would be replaced by a combination of engineered conveyance, containment, and diversion systems. Subsurface hydrologic gradients may also shift due to pit dewatering, settlement under fill, and permafrost degradation, particularly beneath the WMF.

Water management during this phase would be structured around the separation of contact and non-contact flows. All water that interacts with operational areas, including the open pit, haul roads, WMF, laydown pads, and the process plant, would be classified as contact water and would be collected, contained, and treated under APDES permit conditions. Runoff from undisturbed terrain or diverted catchments would need to be managed as non-contact water and would be routed around the Project footprint to join another natural flow path wherever feasible. The diversion structures would be designed and maintained to keep Graphite Creek streamflow out of the pit.

The mine would generate contact water through a combination of direct precipitation, snowmelt, and groundwater inflow over disturbed surfaces. Sources of contact water would include rainfall and meltwater falling on the open pit, meltwater from avalanches that enter the pit from several major avalanche paths, haul roads, and laydown areas; seepage from the WMF foundation, tailings lifts, and waste rock cells; and process area runoff from the mill, reagent handling zones, and material stockpiles. Groundwater inflow is estimated to increase with the depth of the pit to 125 gpm, while direct precipitation and snowmelt is estimated to contribute up to 450 gpm of contact water, with the other components more minor.

All contact water would be conveyed through a network of perimeter ditches, underdrains, and gravity-fed pipelines to two containment features: the PP and WMP. The PP, located adjacent to the mill, would provide approximately 21.1 million gallons of operational water storage and act as a buffer during mill shutdowns. The WMP, located downslope of the WMF, would hold up to 343.5 million gallons and is designed to accommodate runoff and seepage from a 100-year, 24-hour storm event while maintaining a 3.3-foot freeboard (Barr 2025). The two ponds would be hydraulically linked, with the WMP receiving overflow from the PP when inflow volumes exceed daily mill requirements. Both ponds would be fully lined and constructed to permit visual and instrumentation-based monitoring of water levels, flow routing, and potential leak detection.

Discharge from the WMP would be routed to the on-site WTP, which is designed to operate at a maximum treatment capacity of 1.37 million gallons per day (MGD). The WTP will use a high-density sludge precipitation system, filtration, and reverse osmosis to remove suspended solids, major ions, and dissolved metals. Final treated effluent would be discharged to the Glacier Canyon Creek watershed through a dedicated HDPE pipeline. Effluent discharge must comply with the APDES permit and meet applicable criteria under 18 AAC 70, including numerical standards for pH turbidity; nitrate; sulfate; TDS; and metals such as aluminum, cadmium, copper, manganese, nickel, and zinc (Tundra Consulting 2024). Discharge monitoring would occur in real time, supported by periodic sampling and reporting. Operational adjustments to the WTP would be made as needed based on seasonal changes in precipitation, runoff chemistry, groundwater inflow, or inflow volumes from the WMF.

Non-contact water from undisturbed upland areas would be diverted around Project infrastructure using engineered berms, HDPE pipes, lined channels, and perimeter ditches. These diversion structures would be located around the WMF and pit perimeter, along the upslope side of haul roads and mill pads, and adjacent to cut-and-fill road segments. Roadside ditches and swales would convey runoff from these zones to natural drainage outlets or stabilized release points. The function of these diversions is to minimize the volume of water entering the contact water system, protect downgradient aquatic habitats, and maintain natural watershed boundaries wherever possible. These systems would remain active throughout the operational period and would require routine inspection, regrading, and sediment removal to function effectively, particularly during spring thaw and after intense storm events. If diversions are inadequately maintained or compromised by thermokarst activity, contact and non-contact water streams may intermingle, potentially increasing the volume of water requiring treatment and jeopardizing permit compliance.

Open pit dewatering would be required continuously throughout operations to maintain safe working conditions and control slope stability. Groundwater inflow to the pit is expected to be modest due to the low permeability of the host metamorphic rocks. Inflow rates are projected to start at 0 gpm and increase to 125 gpm gradually as the depth reaches below the groundwater table (Tundra Consulting 2024). The dewatering system would include pit sumps, pumps, pipelines, and groundwater monitoring wells. Pumped water would be managed as contact water and directed to the WMP for treatment. Drawdown would create a localized cone of depression centered on the pit, with limited influence outside the bedrock domain. The Kigluaik Fault, located along the northern pit wall, acts as a semi-permeable structural boundary and is expected to inhibit hydraulic connection with the lowland aquifer system.

Potential impacts from pit dewatering include localized lowering of the water table in areas surrounding the pit and haul roads, temporary reduction in baseflow contributions to downslope tundra wetlands, and shifts in active layer saturation depending on the rate of groundwater recharge and seasonal permafrost dynamics. These effects would be tracked through a network of observation wells and compared against predictive groundwater drawdown models. Corrective actions, such as modifying the dewatering rate or installing additional monitoring locations, would be implemented if data indicate that the drawdown extent is expanding beyond modeled expectations or if groundwater chemistry shows signs of adverse change in adjacent aquifers.

The WMF would be a major hydrologic feature during operations, generating both surface runoff and subsurface seepage. Tailings would be thickened, filtered, and co-deposited with waste rock in a lined facility that includes a liner system, an underdrain collection network, and perimeter drainage ditches. Surface runoff from the tailings and waste lifts would be directed to the WMP through a system of lined ditches and culvert crossings, while underdrain seepage would be collected at the base of the facility and routed via a sump-and-pump system to the same containment structure. During early years of operation, the WMF would generate increasing contact water volumes as tailings and waste volumes grow, and as surface exposure increases. Over time, concurrent reclamation activities, including progressive capping and slope stabilization, would reduce the area of exposed material and lower surface runoff volumes. Subsurface drainage behavior would depend on the condition of the permafrost beneath the WMF; thaw-related settlement may compromise drainage gradient and lead to localized infiltration or saturation of the subbase.

Hydrologic risks associated with the WMF include concentrated surface flow leading to ditch erosion or slope failure, changes in seepage pathways due to thaw-induced settlement, and the potential for contact water to bypass the underdrain collection system if sump infrastructure is undersized or clogged. Performance of the WMF drainage systems would be tracked through settlement monitoring, water level gauging, and water quality sampling at collection points and downgradient monitoring wells.

The access road and internal haul roads would continue to function as semi-permanent hydrologic structures. Surface runoff from road prisms, switchbacks, and cut slopes would be directed into cross-culverts and roadside ditches sized to accommodate storm events, with design parameters based on local drainage conditions. The compacted gravel surface of the road would reduce infiltration and increase runoff velocity, particularly during spring breakup and early summer storms. Culverts and ditches would require regular inspection to prevent sediment buildup, erosion at outlets, and deformation from frost heave or thawing permafrost. Additional risks include ice blockage of culverts during freeze-up, slope slumping, or outlet erosion in areas lacking adequate armoring. Culverts would be designed to accommodate 80-ton vehicle loads, and fish passage structures would remain subject to ADF&G inspection and permitting.

Dust palliatives such as calcium chloride would be applied to road surfaces during summer to reduce particulate generation, which could otherwise contribute to water quality degradation in roadside runoff. Drainage features would be stabilized with geotextiles or riprap as needed, and long-term erosion monitoring would be integrated into the overall water management system.

Reclamation and Closure Phase

Following the end of mining operations, the Project would enter a long-term, post-closure phase defined by hydrologic stabilization, infrastructure decommissioning, and ongoing performance monitoring. While major surface facilities such as the process plant and haul roads would be removed, several permanent structures, including the open pit, the WMF, groundwater monitoring wells, and the surface water diversion system, would remain in place and continue to interact with the local hydrologic system. The most important post-closure hydrologic features include the formation and behavior of a permanent pit lake, the persistence of seepage and runoff from the WMF, and the long-term performance of diversion structures intended to divert Graphite and Ruby Creeks around the pit. Although most active water management would cease, the Project's hydrologic modifications would persist for decades, and would continue to influence both surface water and groundwater movement within the Project area. The diversion structures would be monitored and maintained to ensure they continue to function as designed.

During reclamation, all mine infrastructure not required for long-term monitoring or closure containment would be dismantled and removed. Fill slopes, laydown areas, and disturbed surfaces would be regraded to approximate predevelopment contours where feasible, and revegetated using salvaged topsoil and native tundra seed mixes. The PP and WMP would be decommissioned, and the WTP would be shut down once influent volumes and constituent concentrations fall below closure thresholds established in the site's APDES permit and reclamation plan. Infrastructure slated to remain in place includes the open pit, capped WMF, diversion structures, and groundwater and surface water monitoring systems. These features would be managed and inspected throughout the post-closure period under permits issued by the ADEC and ADNR.

As dewatering operations cease, the open pit would begin to fill with a combination of precipitation, snowmelt, and groundwater inflow. Pit lake water quality predictions indicate that groundwater recharge is the main outflow from the pit lake, but that there would be a surface discharge after the pit lake reaches an elevation of approximately 400 feet above mean sea level approximately 58 years into closure without continued pumping and treatment (SRK 2026a). After closure, Graphite One intends to pump and treat water from the open pit to maintain the pit lake level at or below its maximum management level as needed. Groundwater outflow from the pit lake into shallow aquifers are separated from the fractured bedrock system by the Kigluaik Fault, which acts as a semi-permeable barrier to lateral flow (Tundra Consulting 2024). However, groundwater outflow may influence groundwater levels in the adjacent lowlands.

The WMF would also remain in place after closure and would continue to contribute to site hydrology through long-term seepage and surface runoff. Although the facility would be fully capped and regraded, with a final surface designed to shed precipitation and minimize infiltration, internal consolidation of tailings and waste rock would continue for decades, generating residual porewater discharge. Seepage would be collected through the existing underdrain system and directed to monitoring locations established under the site's closure plan. In early post-closure years, some collected water may continue to require treatment if concentrations of metals, sulfate, or other parameters exceed regulatory thresholds. As consolidation progresses and cover system performance is confirmed, these volumes are expected to decline.

The long-term hydrologic risks associated with the WMF include the possibility of seepage reaching groundwater through liner defects or settlement-related damage, accumulation of water within the facility if the drainage gradient is compromised and increased vertical infiltration if permafrost beneath the facility continues to thaw. These risks would be assessed by continued monitoring of ground temperature, porewater pressure, and drainage flow rates. Groundwater monitoring wells located around the WMF would be used to assess the extent and quality of potential seepage plumes. If data indicate that containment performance is degrading or that water quality is declining, contingency actions such as retrofitting sumps, installing pump-back wells, reestablishing drainage slopes, or installing passive treatment systems may be implemented.

The Graphite Creek diversion structure, constructed during operations to permanently reroute surface water around the pit, would remain in place after closure. This system would redirect upstream flow westward into Glacier Canyon Creek. The structure would be designed to convey runoff from Graphite Creek at a crest elevation above the projected pit lake maximum. As a result, it would continue to prevent surface inflow into the pit and erosion of reclaimed slopes. The diversion would be maintained in perpetuity through funding provided by Graphite One and secured through the State of Alaska bonding process. Long-term maintenance would include inspections of culvert integrity, replacement of the HDPE pipes as they degrade, inlet and outlet alignment, and regrading after erosion or sediment accumulation, particularly during spring thaw and following high-precipitation years.

Additional surface water control features around the WMF, including stormwater ditches and outlet channels, would also remain in place to ensure that precipitation does not accumulate against reclaimed embankments or contribute to slope instability. Over time, these drainage features would transition from active stormwater systems to passive channels but would still require inspection for erosion, blockages, or thermokarst-related deformation. Maintenance of these features would be included in the site's long-term monitoring and closure plan, with documentation provided to regulatory agencies as part of scheduled permit reviews.

Post-closure monitoring requirements would be specified by ADEC and ADNR as part of the approved closure plan, and would include groundwater sampling at perimeter wells and downgradient aquifers; surface water quality and flow monitoring at all discharge locations; and routine inspections of pit lake elevation, reclaimed slopes, culverts, and embankments. Ground temperature would be monitored beneath the WMF and other reclaimed surfaces to assess long-term permafrost stability. Bonded financial assurance would remain active to fund monitoring, maintenance, and contingency response. When all closure performance criteria have been met, including declining seepage volumes and no exceedance of regulatory thresholds, state agencies may authorize transition to passive closure, followed by decommissioning of selected infrastructure and the phased release of financial assurance obligations.

The Mosquito Pass access road would be decommissioned when monitoring and maintenance activities cease to require it. Culverts and bridges would be removed, and the road surface would be regraded and vegetated. Permafrost loss and associated impacts on surface and subsurface runoff may persist through the post-closure phase, but scour risk, floodplain functions, and sediment transport would return to near-natural conditions for Project area stream and rivers.

4.1.6.2 No Action Alternative

Under the No Action alternative, the Project would not be developed. No construction or operation of the mine, tailings and waste rock facility, access road, processing infrastructure, or barge landing area would occur. As a result, no disturbance to tundra or permafrost, alteration of surface drainage patterns, and new infrastructure placed within natural drainages or flood-prone areas would occur. State-authorized activities associated with mineral exploration and field studies may continue. However, reclamation activities would be performed following exploration activities to return the area to a natural state, minimizing impacts. The No Action alternative would result in no direct or indirect impact on surface and ground water hydrology or floodplain function. Existing conditions would remain unchanged.

4.1.7 Water Quality

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on water quality within the Project area.

4.1.7.1 Proposed Action

The Proposed Action would result in sustained changes to water quality throughout the life of the Project. During construction, short-term water quality impacts may occur from erosion; sediment transport; and the potential release of fuels, reagents, and trace metals associated with site preparation and infrastructure development. As operations commence, water quality would be influenced by the interaction of stormwater and snowmelt with potentially acid-generating materials, and groundwater inflows into the open pit. These sources of contact water would be collected, treated, and discharged under permit conditions designed to meet effluent limits. In the post-closure phase, long-term water quality concerns would center on the geochemical behavior of the developing pit lake as well as the persistence of trace metals and sulfate in seepage from the reclaimed WMF. The effectiveness of containment systems, the longevity of treatment infrastructure, monitoring, and ongoing regulatory oversight would determine the site's ability to maintain compliance with applicable permit requirements during and after closure. Across all phases, careful separation of contact and non-contact water, timely activation of water treatment systems, and performance-based monitoring would be essential to avoiding and minimizing adverse impacts to water resources.

CONSTRUCTION PHASE

Construction of the Project would introduce multiple pathways for short- and long-term adverse impacts on surface and shallow groundwater quality across the Project area. These impacts would occur from land disturbance; excavation in permafrost-affected soils; placement of mineralized materials; installation of temporary infrastructure; and use of fuels, chemical reagents, and explosives. During this phase, water quality would be influenced primarily by erosion, sediment transport, accidental chemical releases, contact water runoff, and changes in subsurface hydrologic flowpaths associated with permafrost degradation and drainage alteration. While full-scale ore processing would not begin until operations commence, the scale of construction activities, proximity to scrub shrub wetlands and ephemeral streams, and exposure of geochemically reactive materials would all contribute to the potential for adverse water quality effects if not properly managed (Barr 2025; ERM 2020).

During construction runoff from disturbed ground surfaces would result in short-term, moderate, adverse impacts on water quality. Vegetation clearing; grading; and placing compacted fill for roads, pads, and the WMF foundation would expose large areas of mineral soil. These surfaces are susceptible to erosion, especially during spring breakup and storm events, and may deliver fine sediment and suspended solids to adjacent tundra drainages and lowland basins. Many of the ephemeral streams and headwater wetlands within the Project area have low buffering capacity and limited sediment transport capacity, making them sensitive to turbidity, deposition, and habitat alteration. If sediment-laden runoff enters these systems, short-term increases in TSS, turbidity, and sediment oxygen demand may occur (ERM 2020; Tundra Consulting 2024). Adverse impacts on water quality during construction would be minimized through the use of standard sediment control measures, or BMPs, and would be installed in accordance with the ADEC CGP.

In addition to sediment, runoff from construction areas may transport hydrocarbons, nitrogen compounds, or trace metals associated with fuel handling, explosives storage, and initial placement of mine-derived materials. Diesel fuel, gasoline, lubricants, and reagents for flotation and emulsion preparation may be present on-site during construction of the mill pad, power plant, and explosives magazines. These substances are toxic to aquatic life at low concentrations and can reduce dissolved oxygen or impair microbial and macroinvertebrate communities if released to surface waters (ADEC 2022a). Spill risks are highest during refueling operations, mobile tank transfers, or storage failures. If containment structures such as berms, lined secondary containment, or spill kits are not adequately maintained, spilled liquids could enter the surface water system or migrate into thawed active layer soils (Barr 2025). Adverse impacts on water quality from these sources are expected to be short term and minimal due to the lined spill containment berms present to collect runoff from all mine infrastructure pads and protocols that are likely to be in place due to requirements of various permits.

The explosives magazines constructed along the haul road would store both high explosives and emulsion components, including ammonium nitrate and diesel-based sensitizers. Leaching of these compounds is unlikely under normal dry storage conditions, but if contact with surface water or saturated soils occurs, particularly during thaw periods, there is potential for nitrate or nitrite to migrate into surface runoff or shallow groundwater. These nutrients can cause eutrophication or disrupt aquatic redox balances if delivered to receiving waters (ERM 2020). Potential impacts on water quality from explosives storage facilities would be avoided by storing these materials in impermeable containment, runoff diversion, and regulatory inspection under applicable Department of Transportation and Mine Safety and Health Administration (MSHA) protocols (Barr 2025).

Ground disturbance for the WMF foundation as well as early tailings and waste rock placement also presents geochemical risk. Geochemical testing of waste rock units has confirmed that a majority of the schist lithologies to be excavated are PAG, with elevated concentrations of aluminum, cadmium, nickel, and sulfate in both total and leachable forms (SRK 2026b). This risk would be minimal because the WMF underdrain system and liner would route contact water to the WMP. If the WTP is not fully operational during this initial phase, the WMP would contain all contact water until treatment can occur (Barr 2025).

The 5-acre gravel staging pad near Imuruk Basin presents additional water quality risks due to its proximity to a sensitive tundra-wetland shoreline system. Although the pad would be constructed above the ordinary high-water mark, surface runoff from this area could flow laterally through thawed soil into adjacent wetlands or nearshore aquatic features, particularly during snowmelt. If fuels, equipment, or modular facility components are stored on the pad without full secondary containment, leaching or wash-off of hydrocarbons or fine particulates may occur.

Overall, water quality impacts during construction are expected to be short term, minor, and localized to the area within the footprint of the access road, staging pad, and mine infrastructure. Impacts would be minimized through implementation of BMPs, compliance with construction and stormwater permitting requirements, and staged activation of water treatment and contact water collection infrastructure; see Chapter 5 Avoidance, Minimization, and Mitigation Measures. However, the interaction between thaw-sensitive soils, ice-rich permafrost, and high-consequence materials would require close monitoring and adaptive response capacity throughout the construction period.

OPERATIONS PHASE

During operations, the mine facilities would generate wastewater and manage contact water streams that are both hydrologically and chemically distinct from natural baseline conditions. Water quality would be influenced by continued dust from gravel roads; routine handling of fuels and reagents; contact with PAG materials; and the activation of process water, seepage collection, and treatment systems. The Project would rely on engineered containment and treatment infrastructure to manage water that comes into contact with the open pit, haul roads, WMF, and the mill facilities pad. While these systems are designed to minimize pollutant loading to downstream environments, any failure in segregation, containment, or treatment processes may result in localized or permit-exceeding discharge events.

Water management during this phase would be governed by a number of permits, including an APDES permit issued by the ADEC. The permit would establish numerical effluent limits, monitoring requirements, and reporting obligations for contact water released to Glacier Canyon Creek (ADEC 2022a). Contact water would include all precipitation, snowmelt, and seepage that interacts with the mine footprint and mineralized materials. As part of water management, Graphite Creek would be diverted into Glacier Canyon Creek to control contact water and manage flow around active mine facilities (Barr 2025). Non-contact water, such as runoff from undisturbed uplands, would be diverted around active facilities and excluded from treatment systems. This separation would be enforced through perimeter ditches, stormwater controls, and grading.

The most chemically complex contact water would originate from the open pit and WMF, including the tailings pond. Groundwater inflow into the pit, though relatively low in volume, is expected to contain elevated concentrations of aluminum, sulfate, iron, and nickel based on baseline sampling in fractured metamorphic bedrock (Tundra/ABR 2026). This water would be pumped continuously to the WMP, pumped back to the mill for reuse in ore processing, and eventually treated prior to discharge. Surface runoff and seepage from the WMF would represent a larger and more variable source of contact water. Filtered tailings and waste rock would be co-disposed in the WMF and compacted to reduce permeability. Residual moisture, precipitation, and snowmelt would generate ongoing seepage within the WMF. Humidity cell testing has demonstrated that exposed PAG rock and tailings can become acidic within weeks, and release rates of several constituents increased as pH decreased (e.g., aluminum, cadmium, copper, manganese, nickel, and zinc) (SRK 2026b). Geochemical modeling of the pit lake (SRK 2026b) indicates several constituents will exceed ADEC aquatic life criteria (e.g., pH, sulfate, aluminum, cadmium, cobalt, copper, manganese, nickel, phosphorus, selenium and zinc). The potential for leaching to impact water quality would be long term but minimal as it would be treated at the WTP prior to discharge, in accordance with the required APDES permit.

Seepage would be collected by an underdrain system at the WMF base and conveyed to the WMP. Surface runoff within the WMF would be contained within the WMF footprint and routed to the WMP. During early operations, when the facility is still being constructed in phases, uncovered rock surfaces may contribute higher loading to the contact water stream due to oxidation and moisture exposure. As reclamation advances and the WMF is progressively capped, runoff quality is expected to improve, though some metal concentrations may remain elevated. The facility liner and compacted waste lifts are designed to prevent infiltration into underlying soils. Ongoing monitoring would be required to detect any evidence of seepage bypass or liner degradation (Barr 2025).

The WTP would operate continuously during the life of the mine and be designed to treat up to 1.37 MGD. The treatment process would include lime dosing for pH adjustment, polymer-assisted sedimentation, filtration, and reverse osmosis for nitrate and selenium removal (Barr 2025). The treatment process would be designed to meet effluent limits in an APDES Wastewater Discharge Permit, including potential limits for aluminum, cadmium, cobalt, copper, iron, Pb, manganese, nickel, silver, thallium, zinc, sulfate, selenium, TDS, and nitrate/nitrite (ADEC 2022a). The WTP would discharge to Glacier Canyon Creek through a permitted outfall, and effluent would be monitored for flow, pH, turbidity, TDS, and other parameters determined during the permitting process.

Ore processing during operations would involve multiple flotation stages that rely on chemical reagents to separate graphite from host rock. Reagents used in typical graphite flotation systems include frothers (e.g., methyl isobutyl carbinol), collectors (e.g., kerosene, diesel, or alkyl sulfates), pH modifiers (e.g., lime or sodium hydroxide), and flocculants (e.g., polyacrylamide). Many of these compounds are classified as hazardous substances if released into surface waters and can pose risks to aquatic life at concentrations at low concentrations (ADEC 2022a). The mill would operate as a closed-loop system, recycling process water and minimizing reagent discharge to the WMP. However, temporary situations such as upset conditions, leaks, or operational errors may result in reagent-containing water entering the contact water stream. In these cases, the WTP must be capable of degrading or removing residual hydrocarbons and organic compounds to meet discharge standards. These situations would be temporary and are not expected to cause more than minimal impacts to the overall treatment system.

Fuel storage and handling would also continue during operations. The on-site tank farm includes an 850,000-gallon diesel storage tank within a lined, secondary containment structure, as well as mobile fueling stations and reagent delivery systems. The potential for localized spills during refueling, maintenance, or transfer operations is highest during winter conditions when frozen valves, slippery surfaces, and reduced visibility increase risk. Fuel constituents such as PAHs, benzene, toluene, ethylbenzene, and xylene (BTEX compounds) can be transported in runoff or meltwater and persist in cold-water environments. Although fuel is not anticipated to reach aquatic systems under normal operating procedures, any release that breaches containment must be reported, cleaned, and assessed for surface water or soil contamination under ADEC’s Oil Discharge Prevention and Contingency Plan program (ADEC 2022b).

Operational water quality at the mine would be driven by the interaction between mine-derived materials, stormwater and snowmelt volume, and the performance of the containment and treatment systems. While most sources of contact water are accounted for in the facility designs and treatment flow estimates, system failures, extreme storm events, or unanticipated reagent discharges may require adaptive management and contingency response. Continuous monitoring, real-time flow tracking, and performance-based adjustments would be essential to ensuring compliance with discharge criteria and minimizing impacts to downstream aquatic systems.

Similar to the mine infrastructure pads and infield roads, the mine access road would be a source of long-term, adverse impacts on water quality from runoff and dust. Traffic would be limited to the access road, which would help limit impacts on water quality; however, dust could be deposited on vegetation during summer and snow during winter, which could then be introduced into waterbodies when melting or precipitation occurs. In order to minimize impacts from dust, dust abatement would be included as part of the access road maintenance. Water for construction or maintenance activities would be required to obtain a State of Alaska temporary water use authorization. Stormwater and fish habitat permits would also contain stipulations and BMPs to limit impacts on water quality.

Representative samples of rock were collected from proposed borrow and quarry sources along the proposed Mosquito Pass access road in 2024 and geochemical testing was conducted. All samples were classified as non-PAG and non-metal leaching (SRK 2026b).

The trucks carrying the graphite ore concentrate to Nome would be contained within specially lined and air sealed containers to prevent any graphite dust escaping during transport. Material sites would be required to meet permitting requirements, including a Stormwater Pollution Prevention Plan (SWPPP), to reduce impacts from dust and other potential contaminants on nearby water quality.

See Section 4.1.6.1 Hydrology and Floodplains, Proposed Action for additional information on water quality impacts from operation of the access road.

RECLAMATION AND CLOSURE PHASE

Following the cessation of mining and ore processing, the Project would enter a long-term closure phase during which site facilities would be decommissioned, reclamation activities would be completed, and water quality would continue to be monitored and treated. While most infrastructure would be removed, several features, including the open pit, WMF, and diversion structures, would remain in place and continue to interact with the hydrologic and geochemical environment. Post-closure water quality conditions would be influenced by the chemical composition of the developing pit lake, residual seepage from the WMF, and the performance of site drainage and water treatment systems during the transition to passive closure. The effectiveness of long-term source isolation and containment would determine whether water discharged from the site meets regulatory standards or requires continued treatment.

After active mining ceases, the open pit would begin to fill with water derived from precipitation, snowmelt, avalanches, and groundwater inflow. A portion of the water within the pit would be discharged to groundwater. Modeling indicates the lake would eventually spill over the rim of the pit approximately 58 years without continued pumping and treatment at the WTP (SRK 2026b). Additional detailed modeling of the pit lake will be conducted in conjunction with State water quality permitting..

The pit walls are composed of schistose units with low buffering capacity and elevated solid-phase concentrations of aluminum, cadmium, copper, manganese, nickel, and sulfur (Barr 2025). Geochemical modelling of the pit lake (SRK 2026b) indicates the lake will be acidic and several constituents will exceed the ADEC aquatic life limits (e.g., pH, sulfate, aluminum, cadmium, cobalt, copper, manganese, phosphorus, nickel, selenium and zinc). A high wall would exist above the pit lake with sulfide present as pyrrhotite with little neutralization potential. Sustained oxidation of the pit walls would therefore provide a continuous source of acidic drainage to the pit lake resulting in long-term acidic pit lake water with elevated constituent concentrations. However, as the pit fills with water during mine closure, the surface area exposed to the atmosphere will decrease, which will in turn decrease the reactive surface area potential to generate acid conditions (SRK 2026b).

Residual seepage from the WMF would also influence post-closure water quality. Upon reaching final height, the WMF will be regraded, and the surface will be lined with an impermeable liner to prevent solution from contacting the WMF. The upper liner will be capped with topsoil and reclaimed. Solution falling on the reclaimed areas of the WMF will be classified as non-contact solution under the closure plan. Long-term consolidation of tailings and waste rock in between the upper and lower impermeable liners would generate seepage which will be captured and treated to meet ADEC standards. Modeled concentrations in WMF porewater exceed ADEC water quality criteria for aluminum, cadmium, cobalt, and nickel under acidic conditions (SRK 2025). The WMF would be underlain by an impermeable liner with an underdrain collection system to collect any solution that would pass through the underliner due to failures associated with mechanical aging, settlement, or localized failure. Down-gradient sample wells would be placed below the WMF to ensure that the groundwater is not being contaminated. If increased levels of contaminates are detected in the ground water, pump back wells would be used to stop the spread of the contamination.

The WTP would continue to operate during early post-closure to treat WMF seepage and any remaining contact water from the WMP. As site water volumes decrease and water quality stabilizes, treatment frequency and volume would be reduced. Discharge from the WTP would remain subject to APDES discharge permit until monitoring confirms compliance with discharge criteria under baseflow and high-flow conditions. At the end of this period, ADEC and ADNR would determine whether permit conditions can be lifted and the site can transition to passive closure. This determination would depend on long-term trends in water chemistry, flow volume, and hydrogeologic stability.

Post-closure water quality risks would be managed through a combination of performance monitoring, regulatory oversight, and financial assurance mechanisms. Monitoring requirements are likely to include:

- Routine sampling of pit lake surface and deep water to evaluate stratification, pH, and metal concentrations
- Groundwater sampling at downgradient wells around the mine pit to track metals and sulfates.
- Groundwater sampling at upgradient and downgradient wells around the WMF to track plume migration
- Flow and chemistry monitoring of residual seepage collection and treated discharge
- Geotechnical and hydrologic inspections of capped facilities, diversion structures, and culverts

The Graphite Creek diversion structure, which prevents inflow of surface water into the pit, would remain in place following closure and be maintained through a State of Alaska bonding mechanism. This structure would require periodic inspection for sediment accumulation, culvert integrity, and structural deformation due to freeze-thaw cycles and avalanches. Its long-term function is critical to ensuring that the pit remains a hydrologically isolated basin and surface runoff is diverted toward Glacier Canyon Creek without contamination.

Post-closure water quality would be shaped by the evolving geochemistry of the pit lake, behavior of WMF seepage over time, and performance of long-term containment and treatment systems. The potential for groundwater migration of metals and sulfates remains. Water treatment is expected to continue for multiple decades, and the site would require regulatory oversight through the duration of monitoring and stabilization. If performance criteria are met, regulators may authorize the transition to passive closure, but groundwater and surface water quality protection would remain a key requirement for long-term site management.

4.1.7.2 No Action Alternative

Under the No Action alternative, the Project would not be developed and no disturbance to water quality would occur. State-authorized activities associated with mineral exploration and field studies may continue. However, reclamation activities would be performed following exploration activities to return the area to a natural state, minimizing impacts. The No Action alternative would result in no direct or indirect impacts on surface or ground water quality. Existing conditions would remain unchanged.

4.2 Biological Environment

4.2.1 Vegetation, Wetlands, and Other Waters of the United States

The following section details the environmental consequences of the No Action alternative and the Proposed Action on vegetation, wetlands, and other WOTUS within the Project area.

4.2.1.1 Proposed Action

The Proposed Action would result in the permanent loss of wetlands and vegetation within the Project footprint as well as the alteration of wetlands and vegetation beyond the Project footprint. The Project footprint includes the area where vegetation would be cleared and wetlands and waterbodies filled during construction of the barge landing and staging pad, Mosquito Pass access road and bridges, material sites, and mine site.

CONSTRUCTION AND OPERATIONS PHASES

VEGETATION

Construction and operation of the Proposed Action would result in the permanent loss of native vegetation within the Project footprint, the temporary loss of native vegetation within a 20-foot buffer of the footprint, and the alteration of native vegetation adjacent to the temporary impact buffer. A total of approximately 2,440 acres of vegetation would be removed during construction of the Proposed Action and would be permanently lost (Table 4-3). An additional approximately 132 acres would be temporarily removed during construction and later replaced with native vegetation. Long-term, minor, adverse impacts on vegetation would occur from construction of the Mosquito Pass access road, material sites, and mine site due to vegetation clearing and the placement of gravel fill. Temporary impacts would occur due to vegetation clearing during the construction process, and for the temporary placement of fill for the proposed barge landing facilities. The types of vegetation most impacted would be alder shrubs (1,268 acres), followed by dwarf shrubs (453 acres) and low shrubs (444 acres; Table 4-3). Construction of the Proposed Action would result in long-term, moderate, adverse impacts on vegetation within the Project footprint. Removal of vegetation types within the Project footprint or alteration of native vegetation adjacent to the footprint would also result in adverse impacts and alterations to fish and wildlife habitat (see Section 4.2.2 Fish, Essential Fish Habitat, and Invertebrates; Section 4.2.3 Birds; and Section 4.2.4 Terrestrial Mammals).

Long-term, minimal, adverse impacts from the Proposed Action to adjacent vegetation are likely to occur. Vegetated areas adjacent to cleared areas would be exposed to road dust during construction and operations, as well as increased sun exposure following the removal of taller shrubs during construction. Alteration of adjacent vegetation would occur from construction activities that result in changes to soils and hydrology. Impacts on adjacent vegetation were assessed within 328 feet of the access road and mine site, where the majority of impacts from fugitive dust are expected to occur, based on previous studies (Walker and Everett 1987; Auerbach et al. 1997; Myers-Smith et al. 2006). Dust impacts on vegetation during construction and operations are expected to be greatest closest to the road and mine, particularly within the 20-foot temporary impact zone. Dust deposition on vegetation could change the vegetation community composition near the road due to reduced photosynthetic capabilities, increased soil pH, shifting of soil nutrients, decreased biomass, reduced species richness, and reduced moss and lichen cover (Auerbach et al. 1997; Walker and Everett 1987). Dust deposition could also cause early snowmelt along roadsides, which could result in changes to the vegetation community composition due to early green-up along the road corridor (Walker and Everett 1987). Wind, standing water, road design, vehicle traffic, and vehicle speed could influence the amount and extent of fugitive dust deposition. Approximately 2,087 acres of vegetation adjacent to the Project footprint could be impacted by dust from the Proposed Action (Table 4-3). The Proposed Action would cause long-term, minor, adverse impacts on vegetation adjacent to cleared areas due to fugitive dust. Dust palliatives such as calcium chloride would be applied to road surfaces during summer to reduce impacts from fugitive dust.

Table 4-3. Proposed Action impacts to vegetation community types within Project footprint.

Mapped Vegetation Community Type	Vegetation Mapped (acres) [(a)]	Proposed Action Permanent Impacts (acres)	Proposed Action Temporary Impacts (acres) [(b)]	Proposed Action Dust Impacts (acres) [©]
Shrub	—	—	—	—
Alder	2,979.7	1,268.2	25.6	413.4
Dwarf Shrub	4,796.9	453.1	65.2	1,038.4
Low Shrub	4,072.9	443.6	33.0	521.2
Tall Willow	490.8	0	0	0
Total Shrub	**12,340.4**	**2,164.8**	**123.8**	**1,973.0**
Herbaceous	—	—	—	—
Sedge	144.7	0	0	0
Tussock Tundra/Lichen	2,965.9	274.8	7.9	114.0
Total Herbaceous	**3,110.6**	**274.8**	**7.9**	**114.0**
Total Vegetated Cover	**15,451.0**	**2,439.6**	**131.7**	**2,086.9**
Unvegetated Cover[(d)]	237.0	< 0.1	0.1	9.7
Total Area	**15,688.0**	**2,439.7**	**131.8**	**2,096.6**

Source: ACCS 2023

Note: Total acreage presented may not reflect the sum of the individual cells due to rounding.

[a] The mapped area includes approximately 1,000 feet from each side of the road centerline (2,000 feet total corridor width), a 1,000-foot buffer of material sites, and a large area surrounding the mine site that encompasses all proposed infrastructure.

[b] Temporary impact area is a 20-foot buffer of the Project footprint.

[c] Dust impact area is an approximate 328-foot buffer of the Project footprint within the Project study area and includes the 20-foot temporary impact buffer.

[d] Unvegetated cover type includes freshwater and saltwater.

INVASIVE PLANTS

The Proposed Action could introduce or cause the spread of invasive species from Nome or existing roads throughout the Project study area and surrounding environment. Invasive species and/or seeds could be inadvertently introduced during construction from equipment and construction materials brought from Nome and can easily be transported via construction personnel's boots and clothing. The permanent loss of native vegetation resulting from construction of the Proposed Action could create a more suitable environment for invasive species, potentially enabling them to outcompete native species. The area disturbed during construction activities would likely be susceptible to invasion and colonization by invasive species until open soil is covered with construction fill or revegetated. During operations, the new road would increase the risk of invasive species spreading along the proposed Mosquito Pass access road alignment. Construction and operation of the Proposed Action could result in long-term, minor, adverse impacts on native vegetation if invasive species are introduced and become established within the Project area. See Chapter 5 Avoidance, Minimization, and Mitigation Measures for BMPs and measures to reduce impacts from invasive plants.

Rare Plants

The Proposed Action could increase the risk of extinction of the Alaska glacier buttercup if any of this species were to be inadvertently destroyed during construction and operation. However, no Alaska glacier buttercups were found during pedestrian surveys conducted in 2024 and 2025 at elevations where this species has been known to occur that overlap with the Project area. Construction and operation of the Proposed Action could result in long-term, minor, adverse impacts on the Alaska glacier buttercup if any occur in areas outside of the survey zone within the Project area.

Wetlands and Other Waters of the United States

Under the Proposed Action, approximately 419.2 acres of wetlands and waterbodies would be directly impacted and permanently lost within the Project footprint due to fill for construction of the Mosquito Pass access road and bridges, material sites, and mine site. Approximately 1.1 acres would be temporarily impacted due to the placement of gravel fill for the proposed access ramp for the barge landing staging pad and for temporary bridge crossings. Approximately 2.6 acres of wetlands and waterbodies that are preliminarily determined under USACE jurisdiction would be impacted within the Project footprint. No jurisdictional wetlands or waterbodies would be impacted by the barge landing staging pad; however, approximately 0.1 acre of jurisdictional wetlands would be temporarily impacted during construction of the access ramp for the staging pad. Table 4-4 summarizes these impacts by wetlands type.

Impacts on wetlands were estimated by overlaying the mapped footprint of the Proposed Action on the mapped wetland boundaries and calculating the area of wetland within the footprint. Of the total mapped wetlands and waterbodies within the Project study area (approximately 15,688 acres), the Proposed Action would have long-term, moderate, adverse impacts on approximately 6.4 percent of the Project area corridor wetlands and waterbodies due to fill within the Project footprint. The Proposed Action would have long-term, moderate, adverse impacts on the approximately 2.6 acres of WOTUS due to fill within the Project footprint. The Proposed Action would have short-term, minor, adverse impacts on approximately 0.4 acre of WOTUS due to the temporary fill for the proposed barge landing staging pad access ramp and temporary bridge crossing approaches.

Table 4-4. Direct impacts on wetlands and waterbodies under the Proposed Action

Wetland and Waterbodies	Proposed Action Permanent Impacts (acres)	Percent (%) Impacted in Project Study Area	Proposed Action Temporary Impacts (acres)	Jurisdictional Impacts (acres)
Estuarine Wetlands	0	0	0.1	0.1
Scrub-Shrub Wetlands	260.0	8.3	0.6	0.1
Emergent Wetlands	136.8	4.9	0.1	0.2
Mosaics	19.3	56.4	0	0
Total Wetlands	416.2	7.0	0.9	0.5
Estuarine Waters	0	0	0	0
Freshwater Lakes	0	0	0	0
Freshwater Ponds	1.1	1.0	0	0
Streams	1.9[a]	0.6	0.2	2.1[b]
Total Waterbodies	3.0	0.6	0.2	2.1
Total Wetlands and Waterbodies	419.2	6.4	1.1	2.6[c]
Total Uplands	1,324.6	14.4	0.8	—
Total Impacts within Footprint[d]	1,743.8	11.1	1.9	—

Note: Acreages are approximate and subject to adjustment during final design.

a An additional 25,076 linear feet of streams would be impacted by the Proposed Action.

b An additional 12,440 linear feet of streams that are preliminarily jurisdictional would be impacted by the Proposed Action.

c Total includes permanent (2.2 acres) and temporary (0.4 acre) impacts.

d Minor discrepancies between total fill footprint numbers between EED and USACE Project Description due to rounding and minor deviations to fill footprint.

The Proposed Action would include construction of six bridges, as well as stream and drainage culverts that would have temporary impacts on waterbodies. Construction of all bridges and culverts has the potential to cause a temporary increase in sedimentation within waterbodies (see Section 4.1.7 Water Quality). Bridge construction and culvert installation would cause short-term, minor, adverse impacts on waterbodies.

Long-term, minor, adverse impacts on WOTUS, as well as other non-jurisdictional wetlands and waterbodies beyond the Project footprint would also occur. Alteration of wetland types and their associated functions would follow construction and operation activities that result in changes to soil characteristics, hydrology, or vegetation composition. The placement of fill in wetlands within the Project footprint can slow the movement of water through the entire wetland complex, altering the natural wetland hydrology of adjacent wetlands. A reduction in the overall hydrological connectivity of the wetland complex to waterbodies could occur. Water withdrawal from freshwater sources for dust control during construction and operations could also reduce hydrological connectivity and the amount of shoreline wetlands if the rate of withdrawal is greater than the rate of surface water recharge. Contaminants and sediment contained in runoff from the proposed road, material sites, and mining facilities could be introduced to adjacent wetlands and waterbodies, reducing water quality (see Section 4.1.7 Water Quality). Fish and wildlife that use wetlands within these areas would be affected by habitat fragmentation and reduced water quality (see Section 4.2.2 Fish, Essential Fish Habitat, and Invertebrates; Section 4.2.3 Birds; and Section 4.2.4 Terrestrial Mammals). Alteration of wetlands may include conversion from one wetland type to another (changes in vegetation community or hydrologic regime), conversion of wetlands to uplands, and decreased performance of wetland functions.

RECLAMATION AND CLOSURE PHASE

Infrastructure would be dismantled during reclamation of the Proposed Action, and the Project footprint would be regraded as close to natural contours as possible, spread with salvaged topsoil, and reseeded according to permit requirements. However, areas revegetated during reclamation would not likely have the same plant composition or structure that was present prior to disturbance.

4.2.1.2 No Action Alternative

The No Action alternative would not change the current status of wetlands or vegetation within the Project area. Wetlands would not be filled or altered, and vegetation would not be removed as a result of the No Action alternative. Invasive species would not be introduced into the Project area as proposed construction would not occur, and impacts on the Alaska glacier buttercup would not occur.

4.2.2 Fish, Essential Fish Habitat, and Invertebrates

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on fish, EFH, and invertebrates within the Project area.

4.2.2.1 Proposed Action

Fish habitat is present within the Project area, including numerous freshwater streams and Imuruk Basin, which has freshwater to brackish conditions varying with depth, tidal influence, and time of year. Adverse impacts on fish, EFH, and invertebrates could occur during all phases of mine development. Short- to long-term, minor, adverse impacts on fish, EFH, and invertebrates within the Project area would result from construction of bridges and culverts, the barge landing, barging activities in Imuruk Basin, and runoff from the mine site. Adverse impacts to anadromous fish species and EFH are unavoidable; however, impacts would be minimized through fish passage design, BMPs, and other proposed mitigation measures; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

CONSTRUCTION PHASE

The proposed Mosquito Pass access road would cross and has the potential to impact habitats important for the spawning, migration, and rearing of anadromous fish as designated in the AWC, including rivers such as the Cobblestone River, Sinuk River, Nome River, Windy Creek, and Osborn Creek (see Figure 3-18). Additionally, two unnamed tributaries; one to the Cobblestone River and the other to Windy Creek are pending AWC listing and will be legally designated in 2026.

Five of the six proposed bridges would be at fish stream crossings: Nome River, Sinuk River, Windy Creek, Osborn Creek, and the Cobblestone River. All bridges would be single span with the exception of the Cobblestone River bridge, which would be two spans. All bridges would be supported by piles driven into the substrate for abutment and pier construction. Both juvenile and adult fish use the habitat that would be affected by bridge construction. Piles may be located below OHW and remove EFH. In the Cobblestone River, there is catalogued spawning habitat for chum and sockeye salmon located in proximity to the bridge location that may be impacted. Noise, including pile driving activity, and disruptions to natural hydrologic processes including intercepting flow beneath the streambed, have the potential to deter adult salmonids from entering spawning habitat and disturb juveniles in rearing habitat. Driving piles can generate underwater sound pressure waves that have the potential to displace, injure, or kill fish. The extent of injury or harm to fish is difficult to quantify. Injuries in salmonids exposed to pile driving can range from mild hematomas at the lowest sound exposure levels to organ hemorrhage at the highest sound exposure levels (Halvorsen et al. 2012). As single strike and cumulative sound exposure levels increase, physiological injuries increase. However, the survival of salmonids receiving one or two mild injuries resulting from pile driving is unlikely to be affected (Casper et al. 2012). If the ADF&G determines that pile driving or blasting will occur in a location and during a timeframe that significant impacts to EFH species could occur, a noise monitoring and mitigation plan would be required to help mitigate the potential to exceed the various criteria set forth in the Alaska Blasting Standard (Timothy 2013). The proposed access road alignment would be routed so stream crossings are as close to perpendicular to the axis of the channel as engineering and routing conditions allow to minimize bridge and culvert length as well as reduce stream impacts.

Culverts would be installed at approximately 41 stream crossings at the mine site and new access road, 7 of which would be installed in fish-bearing streams and required to meet fish passage criteria. Fish habitat would be affected during culvert installation due to modification of the drainage areas and temporary removal of some riparian vegetation. This could affect the ability of fish to forage due to increased siltation or make them more susceptible to predation due to lack of vegetative cover. To minimize impacts on fish and EFH, existing drainage patterns would be maintained and properly sized, and designed culverts would be used in appropriate locations to maintain the natural flow patterns and timing of surface water inflows to adjacent wetlands and waters. Culverts would be sized to reduce maintenance associated with debris clogging and icing, potential glaciation concerns, and sediment deposition. Culverts would also be designed to minimize the potential for ponding and allow for breakup flow capacity if ice forms within the culverts. All crossings of fish-bearing streams would be permitted consistent with ADF&G Title 16 permit conditions and crossings of anadromous streams built to USFWS Culvert Design Standards for Ecological Function; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Development of the mine pit and facilities would not have a direct impact on fish streams since none are within the mine footprint. The Cobblestone River supports all five species of Pacific salmon, as well as Dolly Varden and Arctic grayling and is an important subsistence resource for local communities. Due to its importance to local residents, Graphite One has designed the mine so that no mine facilities are in the Cobblestone drainage and to avoid potential impacts to fish and EFH. See Section 4.1.6 Hydrology and Floodplains for a discussion of impacts and mitigation measures from development of the mine on surface water and Section 4.1.7 Water Quality for a discussion of impacts from development of the mine and access road on water quality. Impacts from changes in water quantity and quality may have negative effects on fish habitat, increasing sediment loads and introducing pollutants that may affect the ability of fish to forage and navigate. The mitigation measures identified in Chapter 5 Avoidance, Minimization, and Mitigation Measures would minimize impacts on fish and habitat in the Project area.

Barges used during the first couple years of mine construction would travel from Nome through Imuruk Basin. Approximately 44 barge trips are planned between Imuruk Basin and Grantly Harbor. Barge landing and travel on the beach to the temporary ramp to the gravel pad may lead to localized increases in sediment loads and potential for fuel spills in Imuruk Basin. The noise produced by vessel operations and increased turbidity may cause localized disturbance to individuals. However, due to availability of equivalent habitats outside the barge corridor, adverse impacts are expected to be short term and minor.

OPERATIONS PHASE

During operations, impacts on fish and EFH would be limited to waters in the vicinity of the Project footprint and associated watersheds, including Imuruk Basin. Adverse impacts to water quality from fugitive dust and runoff may impact fish. Water quality and temperature can affect fish distribution and health, including growth, reproduction, and overall survival. Pacific salmon Dolly Varden, and other cold-water fish, as well as many aquatic invertebrates require cool, clean, and well-oxygenated water to thrive (WDFW 2009). See Section 4.1.7 Water Quality for potential water quality impacts from the Proposed Action. Permit-mandated water management practices at the mine site would avoid and mitigate effects on downstream aquatic habitat; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Reclamation and Closure Phase

Permit requirements at the time of closure would include monitoring and hydrologic stabilization of the site that would avoid and mitigate effects on fish habitat; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

4.2.2.2 No Action Alternative

The No Action alternative would not change current or future aquatic conditions within the study area and would not result in impacts on fish, EFH, and invertebrates.

4.2.3 Birds

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on birds within the Project area.

4.2.3.1 Proposed Action

The Proposed Action has the potential to affect bird species through habitat alteration, noise disturbance, and vehicle collision. Impacts on bird species are anticipated to be long term, minor, and adverse.

Construction Phase

The Proposed Action would convert approximately 2,440 acres of terrestrial habitat for the placement of the Mosquito Pass access road, mine site facility, and other Project infrastructure. Gravel placement would result in the direct and indirect loss and alteration of native vegetation within the Project area. Vegetation types (i.e., bird habitats) within the Project area that would be affected are presented in Table 4-3. The majority of vegetation clearing and ground disturbing activities are located in alder shrub (1,268 acres) and dwarf shrub habitat (453 acres). These habitats are used by many species of birds for nesting and feeding. Table 4-5 lists BCC species using these habitats and acres of impact. Impacts on ESA-listed birds are discussed in Section 4.2.6 Threatened and Endangered Species, and Critical Habitat.

The Proposed Action would affect terrestrial vegetation communities and avian nesting sites, contribute to the acoustic masking of biologically important sounds, and increase the potential risk of avian-vehicle collisions and disturbances associated with vessel traffic. Vegetation clearing and ground-disturbing activities would be performed in accordance with USFWS timing recommendations for vegetation clearing and ground disturbing to limit impacts on nesting birds to the greatest extent practicable. On the Seward Peninsula, open (i.e., tussock tundra, meadows) and shrub breeding habitats that overlap the Project area are typically used for breeding habitat between May 10 and July 20, although geese and swans may begin nesting as early as April 20 (USFWS 2017).

Table 4-5. Species habitat preference by vegetation type and impact

Vegetation Type	Species	Permanent Impact (Acres)
Tussock tundra/herbaceous sedge	Aleutian tern	274.8
Dwarf shrub	American golden plover Bar-tailed godwit	453.1
Herbaceous sedge	Black turnstone Yellow-billed loon	0.0
Tussock tundra/dwarf shrub	Bristle-thighed curlew	727.9
Dwarf shrub/herbaceous sedge	Dunlin	453.1
Unvegetated cover	Kittlitz's murrelet	< 0.1
Tussock tundra/unvegetated cover	Red knot Snowy owl Wandering tattler	274.9
Herbaceous sedge/low shrub	Rock sandpiper	443.6
Low shrub/tussock tundra	Short-eared owl	718.4

Anticipated construction equipment noise levels are presented in Section 4.1.5 Noise and Vibration. Birds are much more resistant to hearing loss and auditory damage from acoustic overexposure than are humans and other mammals. Birds can mitigate acoustic disturbances by increasing their distance from the noise source through flight displacement. Traffic and construction noise, even at extreme levels, is unlikely to cause threshold shift, hearing loss, auditory damage, or damage to other organ systems in birds (Caltrans 2016). Blasting activities would occur during construction and mining operations. Single blast noises over 140 dB SPL or multiple blasts over 125 dB SPL may result in damage and loss of inner ear sensory hair cells. Blasting noise is anticipated to be lower than what would cause threshold shifts in birds at 50 feet or greater (see Section 4.1.5 Noise and Vibration for blasting noise details). If acoustic overexposure occurs, birds have the ability to regenerate the sensory hair cells of the inner ear, providing a mechanism for recovery (Caltrans 2016). Noise would cause the greatest disturbance to birds between May 10 and July 20, when birds on nests would be unlikely to move away from the disturbance or noise, potentially resulting in nest abandonment. Due to the temporary nature of construction, availability of intact habitat for birds to use, and commitments for preconstruction nest surveys noted above, construction noise under the Proposed Action is anticipated to have short-term, minor, adverse impacts on birds. It is unlikely that any individual bird would remain within the construction vicinity long enough to accumulate physical effects from noise.

The use of Imuruk Basin as a transportation corridor for vessels would primarily affect seabird and waterfowl species using the basin. Vessel transportation would only occur during the open water season (June to October) until access road construction is complete, approximately 2 to 3 years. Disturbance by passing vessels can cause a loss in foraging time and resting habitat, and an increase in energy expenditure (Schwemmer et al. 2011). Birds would have to forage at higher rates to make up the increase in energy expenditure when disturbed by a vessel. Shorebirds are able to compensate for lost foraging time and an increase in energy expenditure by increasing foraging rates or increasing total foraging time. Waterfowl species (e.g., sea ducks, loons) are less able to compensate for lost foraging time due to limitations of dive time and digestion periods (Schwemmer et al. 2011). Imuruk Basin has existing vessel traffic for subsistence, traditional uses, and recreation for local users. Due to the existing vessel traffic and short-term use of Imuruk Basin as a transportation corridor, vessel traffic from the Proposed Action is anticipated to have short-term, minor, adverse impacts on avian species using Imuruk Basin.

OPERATIONS PHASE

Anticipated noise from mining operations has the potential for masking, which can have a detrimental effect on a bird's ability to detect the communication signals of other birds. To overcome masking, birds have strategies for communicating in noise that results in the doubling to quadrupling of the efficiency of hearing in noise (Caltrans 2016). Strategies to overcome masking include adjusting the amplitude of their vocalizations in response to increased noise, adjusting the timing of their vocalizations to avoid periods with high noise levels, and changing their location within their habitat to one that offers a better acoustic pathway (i.e., moving higher in the vegetative canopy) (Caltrans 2016). Noise impacts would cause localized shifts in avian species movement and preferred habitat to surrounding intact suitable habitats that are less disturbed by the Proposed Action. Noise impacts from Proposed Action mine operations are anticipated to have long-term, minor, adverse impacts on birds.

Vehicle traffic on the Mosquito Pass access road poses the greatest potential for injury or mortality to low flying birds and flightless birds during summer, when the greatest number of birds are present within the Project area. Geese attracted to roadsides by early vegetation sprouting, brood rearing waterfowl, and ptarmigan using roadside grit are susceptible to collisions with vehicles. Raptors may be attracted to the road due to roadkill and are susceptible to collisions with vehicles (USFWS 2025b). The short-eared owl commonly forages at the same height as vehicles, which makes them prone to vehicle collisions. However, short-eared owls primarily hunt during late evening and early morning, when vehicle traffic on the road would be low (ADF&G 2025h). Due to low traffic volumes and speeds on the Mosquito Pass access road, vehicle collision risks are low and present long-term, minor, adverse impacts on birds.

Impacts on ESA-listed birds are discussed in Section 4.2.6 Threatened and Endangered Species, and Critical Habitat.

Reclamation and Closure Phase

During reclamation and closure, noise from mining operations would cease and the mine site would be graded and seeded or allowed to naturally revegetate. As the native vegetation returns, bird habitat would replace the previously disturbed areas. Birds also have the potential to be affected during all Project phases by the tailings pond and open pit. Birds that use the water in the pit may be at risk of injury or mortality due to potential water contamination. Transiting birds may use the water in the pit as a resting area during migration, but are unlikely to use it for foraging due to more suitable habitat in nearby areas. Impacts on birds from the water-filled mine pit would extend beyond the life of the Project since it would persist post-reclamation.

Impacts on ESA-listed birds are discussed in Section 4.2.6 Threatened and Endangered Species, and Critical Habitat.

4.2.3.2 No Action Alternative

The No Action alternative would not change the state of bird habitat or have any impact on birds.

4.2.4 Terrestrial Mammals

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on terrestrial mammals within the Project area.

4.2.4.1 Proposed Action

Construction Phase

Construction would cause indirect habitat loss due to disturbance of terrestrial mammals from blasting and noise from heavy machinery used to remove waste rock and construct the mine facilities. Noise has the potential to cause annoyance or stress, behavioral changes, avoidance, masking of communication or important biological sounds, and injury in terrestrial mammals. Because terrestrial mammals can move away from noise during construction and operations, physical injury from noise is not anticipated to occur (Erbe et al. 2022). Mammals would likely leave the immediate area and stay away from the construction zone due to noise as well as the presence of humans and machinery. The avoidance of construction activity could cause animals to travel long distances around the mine site to reach preferred habitats, causing habitat fragmentation or abandonment of previously valuable habitats.

Construction of the Mosquito Pass access road would fragment an area of the Kigluaik Mountains and create the potential for vehicle-wildlife collisions. Noise impacts from blasting at material sites and the use of heavy equipment to construct the road would likely cause mammals to move away from active road construction, which is expected to take approximately

2 years. During construction, the frequency and number of vehicles on the road may be higher than during operation due to the delivery of mine equipment and construction materials to Nome. Although construction vehicles typically travel at slow speeds, which would reduce the chance of collisions, the potential for injury and mortality would exist, especially at night or during winter, when large animals such as moose may use the road to escape deep snow.

Proposed Action impacts on foraging material for omnivorous and herbivorous terrestrial mammals would include approximately 2,440 acres of vegetated habitat within the footprint of roads, facilities, and other Project infrastructure, while temporary impacts may occur over approximately 132 acres from vegetation clearing. The removal of this vegetation would cause localized shifts in terrestrial mammal movement throughout the study area as terrestrial mammals seek more favorable habitats with foraging material and cover that are less or not disturbed by the Proposed Action. Terrestrial mammals that prey on species directly affected by habitat loss may also exhibit localized changes in habitat use. Species that have large area needs, appear in low densities, and have low reproductive rates tend to be more sensitive to habitat conversion (FHWA 2011).

Due to the temporary nature of construction and available surrounding habitat for wildlife to flee to, construction noise under the Proposed Action is anticipated to have short-term, minor, adverse impacts on terrestrial mammals.

OPERATIONS PHASE

Long-term noise from mining activities may cause localized changes in behavior. Behavioral changes would likely be limited to long-term avoidance of operational areas, which would expand as the mine grows to its maximum size (Erbe et al 2022). Due to the availability of suitable intact habitat surrounding the Proposed Action footprint, noise from Proposed Action operations is anticipated to have long-term, minor, adverse impact on terrestrial mammals.

Terrestrial mammals may be reluctant to cross the Mosquito Pass access road, restricting their movement and putting them at risk of vehicle collisions, which may result in injury or mortality. Traffic on the access road would be limited to mining vehicles and speed restricted, which would reduce the risk of injury or mortality from collisions with animals, but would still be a source of disturbance. Terrestrial mammals tend to be more affected by roads with high volumes of traffic and high speeds (FHWA 2011). Graphite One would work with the Reindeer Herder’s Association to accommodate reindeer movement across the access road when the herds are being moved through Mosquito Pass. Due to the low traffic volumes and slow speeds on the access road, vehicle collision risks are low and present long-term, minor, adverse impacts on terrestrial mammals.

Given the loss of habitat preferred by some species and creation of edge habitat preferred by others such as moose, habitat loss and fragmentation from the Proposed Action is anticipated to have long-term, minor impacts that are both beneficial and adverse.

Reclamation and Closure Phase

During reclamation and closure, the mine site would be subject to periodic monitoring activities that would likely involve a small number of people and vehicles for relatively brief periods. The potential disturbance of terrestrial mammals from these activities would be short term, minimal, and adverse.

At mine closure, the open pit is expected to fill with water, which would be a long-term, adverse, moderate impact to habitat for all species that use low alpine habitats.

4.2.4.2 No Action Alternative

The No Action alternative would not change current or future conditions within the study area and would not result in impacts on terrestrial mammals.

4.2.5 Marine Mammals

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on marine mammals.

4.2.5.1 Proposed Action

Besides barging activities, construction, operation, and reclamation of the Proposed Action is not expected to affect marine mammals. Project components are at least 1.4 miles from Imuruk Basin and more than 18 miles from the marine environment; therefore, it is unlikely that potential impacts from Project-related activities would overlap with marine mammal presence.

Impacts on marine mammal prey species are discussed in Section 4.2.2 Fish, Essential Fish Habitat, and Invertebrates.

Underwater Noise

Vessels generate noise during normal operations via cavitation (i.e., the collapse of air bubbles created when propeller blades move rapidly through the water). Effects of vessel noise on marine mammals can include masking and disturbance reactions. Masking is the obfuscation of sounds from interfering sounds. Masking, like that occurring from vessel noise, can interfere with a marine mammal’s ability to communicate, detect prey, and detect or avoid hazards such as predators. Disturbance reactions, or an individual’s behavioral response to a disturbance such as vessel traffic, may include avoidance of the vessel or area, or interference with foraging or other important behaviors.

Continuous sound from ships generally exceeds 120 dB relative to 1 micropascal root mean square to distances between 0.3 to 1.2 miles (Jacobs 2017), and marine mammals may have behavioral responses to the sounds associated with vessel traffic. Beluga whales may decrease or cease vocalizations in response to sounds from ships and other activities, or their vocalizations may be masked (Castellote et al. 2016). Scheifele et al. (2005) found that shipping noise caused beluga whales to vocalize louder. Lesage et al. (1999) described more persistent vocal responses when whales were exposed to a ferry as opposed to a small boat, including a progressive reduction in calling rate while vessels were approaching, an increase in the repetition of specific calls, and a shift to higher frequency bands when vessels were close to the whales.

Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects from anthropogenic (i.e., human-made) sounds such as shipping traffic. Baleen whales may also exhibit behavioral changes in response to vessel noise. Potential impacts of vessel disturbance on pinnipeds have not been well studied, and the responses would likely depend on the season and stage in the reproductive cycle. Pinnipeds are more likely to be disturbed when hauled out on land or ice, where in-air vessel noise or visual presence could cause behavioral responses.

Vessel Collisions

Increased Project-related vessel traffic in the marine environment could increase the potential for collisions between marine mammals and vessels. Landing vessels and barges would follow well-established shipping lanes between the Project site and Port of Nome. Based on the relatively slow-moving nature of barges and loaded landing vessels, the potential for collisions between a vessel and marine mammals is anticipated to be negligible.

CONSTRUCTION PHASE

Overall, the Proposed Action has the potential to impact marine mammals during the first 2 to 3 years of construction, when equipment and materials would be barged between Nome and Imuruk Basin until the Mosquito Pass access road becomes operational. Vessel traffic has the potential to adversely affect marine mammals through elevated noise levels and vessel strikes. Underwater noise during barge and landing vessel operations has the potential to cause short-term, minor, adverse impacts on marine mammals. The potential for collisions between a vessel and marine mammals is anticipated to be negligible.

IMURUK BASIN

A barge and landing vessel would be used between Imuruk Basin and Nome to transport equipment and materials during open water, or ice-free periods, in the basin (approximately June to October). Non- ESA marine mammal species that have the potential to be present in Imuruk Basin include beluga whales, ribbon seals, and spotted seals. Reported beluga whale sightings in Imuruk Basin occurred more than a decade ago (Section 3.2.5.1 Beluga Whale), and it is anticipated that beluga whales, ribbon seals, and spotted seals would occur rarely to uncommonly in Imuruk Basin based on past sighting records. Impacts on ESA-listed marine mammal species are discussed in Section 4.2.6 Threatened and Endangered Species, and Critical Habitat.

MARINE ENVIRONMENT

Vessel operations in the marine environment outside of Imuruk Basin have the potential to affect the following non-ESA listed marine mammal species: beluga whales, gray whales, harbor porpoises, killer whales, minke whales, narwhals, northern fur seals, ribbon seals, and spotted seals. Narwhals, however, typically occur in ice-covered seas and at more northern latitudes and are extremely unlikely to be present in the marine vessel transit route. Impacts on ESA-listed marine mammal species are discussed in Section 4.2.6 Threatened and Endangered Species, and Critical Habitat.

OPERATIONS PHASE

No impacts on marine mammals are anticipated during operation of the Proposed Action. While water from mining operations would be discharged into Imuruk Basin, the discharged water would meet ADEC wastewater standards (Section 4.1.7 Water Quality) and would have no impact on marine mammals.

RECLAMATION AND CLOSURE PHASE

No impacts on marine mammals are anticipated during reclamation and closure of the Proposed Action.

4.2.5.2 No Action Alternative

The No Action alternative would not change current or future conditions within the Project area and would not result in impacts on marine mammals.

4.2.6 Threatened and Endangered Species, and Critical Habitat

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on T&E species and critical habitat within the Project area.

The Project has the potential to affect T&E species by causing behavioral disturbance, injury, or mortality, or by altering habitat.

NMFS and USFWS administer the ESA. If the Proposed Action is pursued, the USACE, as the lead federal agency, will initiate Section 7 review in consultation with NMFS, USFWS, the Project proponent, and other consulting parties. Section 7 consulting parties would then assess whether the Proposed Action would result in adverse effects to T&E species and, if needed, would develop measures to mitigate those effects.

4.2.6.1 Proposed Action

Many of the T&E species only have the potential to be impacted by the Proposed Action during specific times (Table 4-6). Humpback whales, fin whales, North Pacific right whales, bowhead whales, Steller sea lions, and short-tailed albatrosses are marine ESA-listed species that would only be present in the Project area along the marine transportation corridor during the construction phase of the Project.

Table 4-6. Potential for ESA-listed species to be present in the Project Area by month

Species	Jan	Feb	Mar	Apr	May	Jun[(a)]	Jul[(a)]	Aug[(a)]	Sep[(a)]	Oct[(a)]	Nov	Dec
Humpback whale	—	—	—	—	—	x	x	x	x	x	—	—
Fin whale	—	—	—	—	—	x	x	x	x	x	—	—
North Pacific right whale	—	—	—	—	—	x	x	x	x	x	—	—
Bowhead whale	x	x	x	—	—	—	—	—	x	x	x	x
Steller sea lion	—	—	—	—	—	x	x	x	x	x	—	—
Polar bear	x	x	x	x	x	—	—	—	—	—	x	x
Bearded seal	—	—	—	—	x	x	x	x	x	x	—	—
Ringed seal	—	—	—	—	x	x	x	x	x	x	—	—
Short-tailed albatross	—	—	—	—	x	—	x	x	x	x	—	—
Spectacled eider	—	—	—	—	x	x	—	x	x	—	—	—
Steller's eider	—	—	—	—	x	x	—	x	x	—	—	—

Note: “—” denotes the species is not present in the Project during a phase of the Project; “x” denotes the potential for a species to be located in the Project area during a phase of the Project

[a] Open water or ice-free season in Imuruk Basin is approximately June to October

CONSTRUCTION PHASE

WHALES, SEALS, AND SEA LIONS

The Proposed Action would have short-term, minor, adverse impacts on humpback whales, fin whales, North Pacific right whales, bowhead whales, Steller sea lions, ringed seals, and bearded seals during the marine transportation component of construction. Due to the short duration of barging over the span of the Project and the rare to low likelihood of a T&E species being present in the Project area, behavioral disturbance due to barging is expected to be minimal, the risk of injury or mortality from a vessel strike is low. The marine transportation component of the Project has the potential to cause behavioral disturbance from vessel noise as well as injury or mortality resulting from accidental spills or collision with vessels. With appropriate mitigation measures, these impacts are unlikely to occur; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

The barge planned to be used for the marine transportation corridor would abide by mitigation measures developed during the ESA Section 7 consultation process, which would decrease the likelihood of behavioral disturbance or injury to whale, seal, and sea lion species. Additionally, barging is anticipated to occur over two to three open-water seasons. Bering Strait vessel traffic has more than doubled since 2012. In 2024, approximately 665 vessels transited the Bering Strait, including tugs and barges, tankers, passenger cruise ships, cargo ships, fishing vessels, military vessels, research vessels, ice breakers, and drill rig ships (Port of Nome 2025). The additional vessel traffic from barging during the construction phase of the Project is a relatively minor increase.

Increased levels of underwater noise from barging operations have the potential to affect whale, seal, and sea lion species. The effects of underwater noise from increased vessel traffic include one or more of the following: tolerance; masking of natural sounds; hearing impairment; injury; or behavioral disturbance, including changes in activity (from resting or feeding to active avoidance), surfacing-respiration-dive cycles, and speed and direction of movement. Vessel noise rarely exceeds thresholds that may result in injury (NMFS 2020), and it is not anticipated that these thresholds would be exceeded during this Project.

In addition to potential behavioral disturbance from vessel noise, increased vessel traffic has the potential to result in injury or mortality to whale, seal, and sea lion species from collisions with vessels or exposure to contamination resulting from an accidental spill. Due to the relatively slow nature of the barge, and mitigation measures that would be in place, it is unlikely that the Project vessel would collide with a marine species. Vandrelaan and Taggart (2007) found that likelihood of lethal injury from a vessel strike drops below 50 percent at 11.6 knots and below 17 percent at 8 knots.

An incidental spill has the potential to result in injury or death; however, spill prevention control measures implemented by construction operations make the event of a spill unlikely. If a spill did occur, rapid response and cleanup would occur before the situation would become an emergency; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Polar Bears

The Proposed Action would have short-term, minor, adverse impacts on polar bears. Project activities throughout all Proposed Action phases have the potential to cause behavioral disturbance to polar bears. Behavioral disturbance could result from increased noise, the presence of humans, vehicles and equipment in the area, and vessels transiting Imuruk Basin. Polar bears occur infrequently in the area and only during sea ice conditions, so disturbances would likely be infrequent, minor, and temporary; however, disturbed polar bears may abandon the area. If a polar bear remained in the area, it would potentially acclimate to human presence and routine industrial noises. Potential injury or mortality could result from human and polar bear interactions; however, these impacts are unlikely to occur and are avoidable if mitigation measures are followed; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Birds

The Project would have short-term, minor, adverse impacts on spectacled eiders, Steller's eiders, and short-tailed albatross, if these species are present during Project construction barging.

Short-tailed albatross only have the potential to be impacted by the marine transportation component of construction. Impacts include injury or mortality resulting from accidental spills or collisions with vessels. Due to the rare occurrence of short-tailed albatross in the Project area and the implementation of mitigation measures (Chapter 5 Avoidance, Minimization, and Mitigation Measures), these impacts are unlikely to occur.

Spectacled and Steller's eiders may rarely transit through the Project area during all Proposed Action phases during both May and July. Night-time lighting could result in localized behavioral disturbance to both species by causing disorientation. Avian species, including eiders, have been documented colliding with structures during nocturnal migration. The magnitude of this impact would be minimal due to the increased daylight hours that northern Alaska experiences during summer and the relatively brief period that eiders might be using the Project area. Since spectacled and Steller's eiders typically transit over oceanic waters and are unlikely to transit through the area where the mine site is located, these impacts are extremely unlikely to occur. Further, nighttime lighting can be mitigated by down shielding and orienting lights away from water; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Spectacled and Steller's eiders also have a small potential to be affected during all Proposed Action phases by the tailings pond and water in the open pit. Birds that use the pit may be at risk of injury or mortality due to potential exposure to untreated contact water. Transiting birds may use the pit lake as a resting area during migration, but are unlikely to use it for foraging due to more suitable habitat in nearby coastal areas. The duration of impacts would be beyond the life of the Project since the pit lake would persist post-reclamation; however, the likelihood of species occurrence in the Project area is extremely low. Therefore, the potential impact on spectacled and Steller's eiders is negligible.

Critical Habitat

The Project would have short-term, minor, adverse impacts on critical habitat during the marine transportation component of construction. The barge is expected to transit through polar bear, bearded seal, and ringed seal critical habitat. Due to the short duration of barging over the life span of the Project and the lack of sea ice during barging operations, impacts on critical habitat are expected to be minimal. Potential habitat changes could result from changes in water quality

(Section 4.1.7) and air quality (Section 4.1.4), causing animals to temporarily abandon the area; however, the likelihood of species occurrence in the area is low and mitigation measures would make air or water quality impacts in critical habitat unlikely to occur; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

OPERATIONS PHASE

No impacts on T&E whales, seals, and sea lion species are anticipated during operation of the Proposed Action.

Potential impacts on polar bears and T&E bird species are expected to be the same during the operations phase as the construction phase and are discussed in the Construction Phase section above.

RECLAMATION AND CLOSURE PHASE

No impacts on T&E whales, seals, and sea lion species are anticipated during reclamation and closure of the Proposed Action.

Potential impacts on polar bears and T&E bird species are expected to be the same during the reclamation and closure phase as the construction phase and are discussed in the Construction Phase section above.

4.2.6.2 No Action Alternative

The No Action alternative would not change the current status of ESA-listed T&E species within the Project area. T&E species would not be affected by the No Action alternative. Behavioral disturbance, risk of injury or mortality, or habitat alteration would not occur if the Project components were not constructed.

4.3 Human Environment

4.3.1 Visual and Aesthetic Resources

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on visual and aesthetic resources within the Project area. The *Visual Resources and Aesthetics Technical Report* was prepared for the Project and is included in Appendix D.

Impacts on visual and aesthetic resources from the Proposed Action would result due to modifications to the viewshed within the Project area. Overall, impacts would be major; while some impacts would be temporary during construction, other impacts would last for the life of the Project (e.g., use of exterior lighting, introduction of built environment and industrial activities into a natural viewshed), or permanently, such as the open pit remaining after mining activities have ceased.

The visual impact assessment qualitatively examines the likely impacts of the Proposed Action based on the Project description and the visual quality of the existing landscape. Impacts are described in terms of visual contrast. Modifications in a landscape that repeat the landscape's basic elements are said to be in harmony with their surroundings. Modifications that do not harmonize often look out of place and are said to contrast or stand out in unpleasing ways.

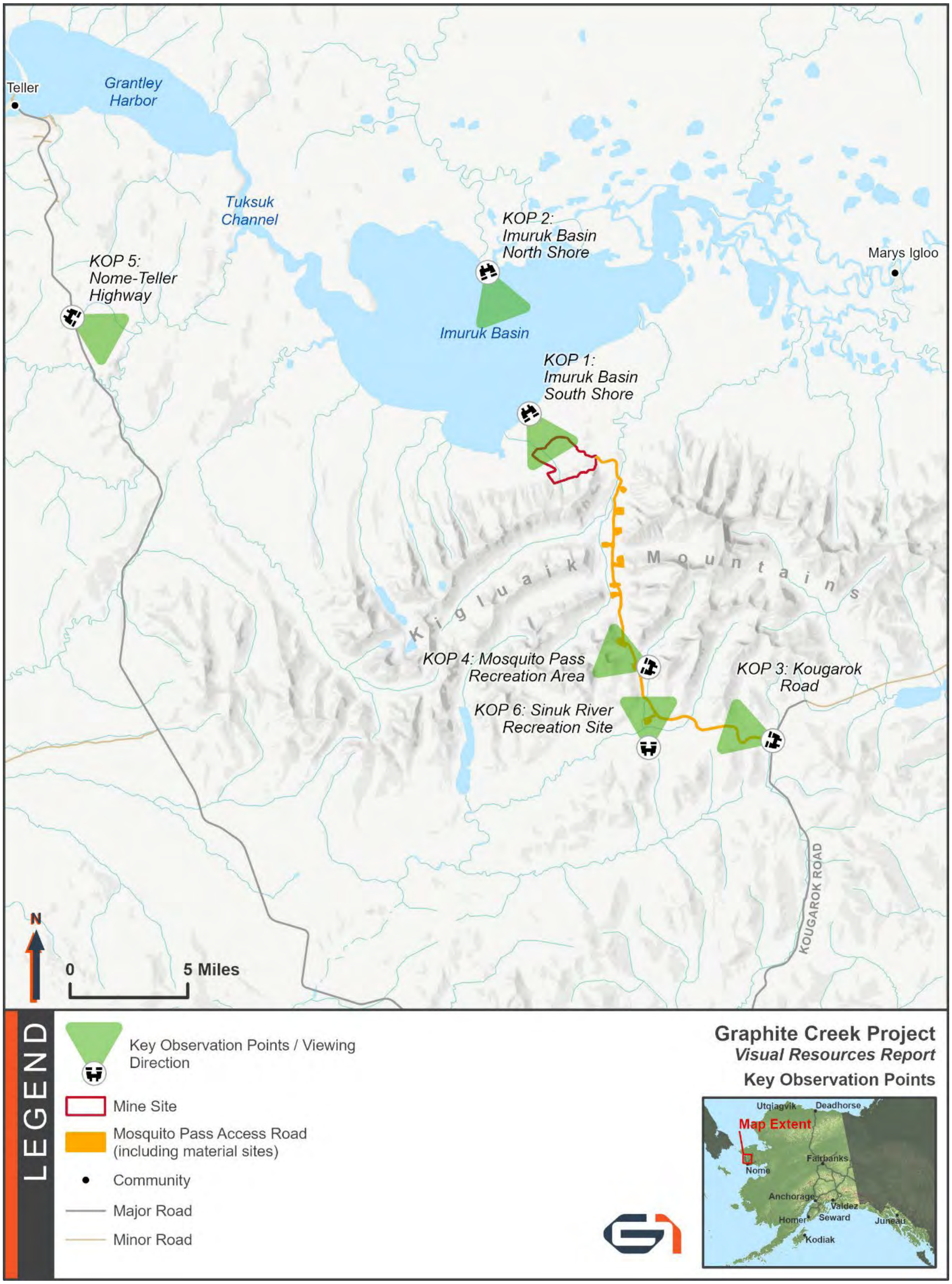
Visual sensitivity is a component in identifying the amount of change acceptable within a particular area. The area around Imuruk Basin and the Kigluaik Mountains is of high visual value to area communities; however, because of the remoteness of the Project site from established communities, the study area itself is of low sensitivity. In addition to intensity and duration, the visual impacts analysis considers geographic extent: limited (i.e., noticeable within the foreground range, or less than 0.5 mile); proximal (i.e., noticeable within the middleground range, or within 5 miles); and extensive (i.e., noticeable from a distance greater than 5 miles).

Six key observation points (KOPs) were selected for the visual resources analysis. These KOPs were determined during scoping processes from community feedback regarding areas and viewsheds that hold importance for cultural, subsistence, recreational, or aesthetic reasons. The KOPs are detailed in Table 4-7 and shown on Figure 4-2.

Table 4-7. Key observation points for Proposed Action features

KOP	Latitude	Longitude	Rationale for KOP Site Selection
Mary's Igloo	65.14741	-165.06446	Traditional community site
Barge Landing/Subsistence Use Area	65.07165	-165.61008	Identified subsistence use area for berry picking
Imuruk Basin/Tuksuk Channel	65.12941	-165.88005	General vista of Imuruk Basin and Kigluaik Mountains upon entering the basin from Tuksuk Channel
Kougarok Road	64.86985	-165.26179	Kougarok Road would have a partial view of the access road from the existing highway
Mosquito Pass Recreation Area	64.91567	-165.44015	Fishing site that would have views of the access road
Nome-Teller Highway	65.13114	-166.27458	The KOP is adjacent to a community-identified moose area; offers a view of the Project area from an elevated location

Figure 4-2. Key observation point locations and viewing directions



4.3.1.1 Proposed Action

The Proposed Action would place a large, new, industrial development in an area where previously little to no development was visible. According to the ADNR Office of Project Management and Permitting's Large Mine Permitting Team, no other mines or exploration projects of this size currently, or are planned to occur in the reasonable future, occur on the Seward Peninsula. Potential adverse impacts on visual resources may occur from elements in the visual environment that contrast in line, shape, form, color, texture, or illumination that do not complement the baseline visual character of the Project area. Project features that could interrupt and contrast with the visual environment conditions include buildings, towers for radio and telecommunications, exterior lighting, ground disturbance from mining, and overburden and waste rock deposition and mounding for the WMF.

CONSTRUCTION PHASE

Construction activities would occur year-round when visibility and daylight hours are highly variable and seasonally dependent. During winter, the days are short, and artificial lighting would play a larger role in the visibility of the Proposed Action within the landscape by creating new illumination for extended hours where previously none existed. Illumination during the dark winters may also be seen as a glow on the horizon, which could be reflected to various degrees of intensity by fog or a low cloud ceiling. During summer, natural illumination from the sun, for longer than 19 hours each day, would greatly diminish any effect of artificial lighting from the Project. Additionally, strong seasonal contrasts exist in the regional color palette; during summer, greens and browns color the landscape, and during winter, the color palette is dominated by the whites and grays of snow. While the buildings of the Proposed Action might be more visible when contrasting against the snow, there are generally fewer people using the area who may see the buildings.

Nighttime lighting of construction areas would create strong contrasts over long distances in an area that currently lacks existing human-made lights. Lighting on tall equipment and structures could have adverse impacts; however, directing artificial light inward and downward would reduce the extent of illumination impacts (Chapter 5 Avoidance, Minimization, and Mitigation Measures). Vehicle lights and reflective winter road signage would be a visible intrusion of the natural night sky.

In summary, construction of the barge landing and staging area would have a short-term, moderate, adverse effect on visual resources and aesthetics over a limited geographic extent due to ground disturbance as well as vehicle and equipment storage; note the barge landing/staging area would only be needed during the construction phase and would be reclaimed once the access road is complete. Construction of the road and bridges, mine, and mining facilities would have a short-term, minor to moderate, adverse impact on visual resources and aesthetics within a limited to proximal geographic extent. Lighting during construction would have a short-term, minor to moderate, adverse impact on visual resources and aesthetics within a proximal to extensive geographic extent.

Operations Phase

The Project facilities would introduce a contrast with the natural landscape. Structures or features that would be long-term are the mill site, haul and access roads, stormwater collection and contact water ponds, the WMF, and the open pit of the mine. Administrative and warehouse buildings would be approximately 30 feet in height; however, facilities such as the truck service bays, crushed ore stockpile storage building, and the mill building would be considerably taller at 75, 93, and 118 feet, respectively (Barr 2025). Such Project structures would introduce a contrasting vertical line and could potentially be visible over long distances. These facilities, typically of steel construction, would also contrast in color, reflection, and texture with the natural vegetation. Depending on the atmospheric conditions, level of light, and elevation of the viewer, these features, along with the open-pit mine, could potentially be visible from a distance greater than 30 miles. The mine facility buildings would be most visible during the construction phase and through much of the operations phase of the Proposed Action. However, as the WMF grows in height with the continued deposition of mining overburden and host material that was separated from the ore, the facility buildings would be obscured from a pedestrian viewpoint.

During winter or periods of low light, facility and equipment lighting would contrast with the dark viewshed. Contrasts for roads would be weak in comparison to the open-pit mine and mine facilities. The access road would not create vertical interruptions on the landscape like the mining facilities would, and the road would follow the contours of the mountain toe slopes in the valley. The unpaved access road would be constructed from locally sourced gravels that would match the surrounding color palette. Safety features for the access road would include earthen berms or metal guardrails where needed for site-specific conditions, and reflective signs marking speed restrictions, mile markers, and other features such as turnouts. Visual renderings of the proposed access road are included in Appendix D. The visual renderings demonstrate the anticipated level of contrast with the natural surroundings from the road’s form and design. Additionally, active use of the unpaved road by Project-related vehicles has the potential to create a dust plume and could result in dust deposition on vegetation along the road’s ROW. Avoidance, minimization, and mitigation measures for potential impacts on visual resources from the presence and use of the proposed access road are discussed in Chapter 5 Avoidance, Minimization, and Mitigation Measures).

Nighttime lighting of the open-pit mine and mining facilities would create strong contrasts over long distances, particularly in foggy or low cloud-cover conditions, in an area without existing human-made lights. Lighting on tall equipment and structures could have adverse impacts; however, directing artificial light inward and downward would reduce the extent (see Chapter 5

Avoidance, Minimization, and Mitigation Measures). Vehicle lights and reflective winter road signage would be a visible intrusion of the natural night sky.

In summary, operation of the mine would have a long-term, major, adverse impact on visual resources and aesthetics within a proximal geographic extent. Operation of the mine facilities would have a long-term, moderate, adverse impact on visual resources and aesthetics within a proximal geographic extent. Operation of the road and bridges, material sites, and WMF and WTP would have a long-term, minor, adverse impact on visual resources and aesthetics within a proximal geographic extent. Lighting during operation would have a long-term, minor to moderate, adverse impact on visual resources and aesthetics within a proximal to extensive geographic extent. Note the magnitude of Proposed Action lighting impacts on visual resources during the operations phase would vary seasonally, and impacts would be greater in magnitude and extent during winter, especially during foggy conditions.

RECLAMATION AND CLOSURE PHASE

After mining operations conclude, the mill, most facilities, foundations, haul roads, and facility pads would be reclaimed. The access road would remain until water treatment is complete which is anticipated to take multiple years. It is assumed that the demolition activities would be mostly completed in 1 year (Barr 2025). Disturbed ground would be regraded to approximate the original contours and reseeded according to permit requirements (Barr 2025). Many of the visual and aesthetic impacts of the ground disturbance would be mitigated and remediated; however, the mine pit would largely remain post-reclamation. The remaining mine pit would likely be a long-term, adverse impact on visual resources. Because the pit would be in a low-sensitivity zone due to the remote location and sparse visitation to the area, the remaining ground disturbance of the open-pit mine would be considered a moderate adverse impact, even though there may be a strong visual contrast to the surrounding natural environment. Other reclaimed areas would take several years for the vegetation to mature and become robust. Post-reclamation monitoring and maintenance activities can facilitate revegetation of disturbed areas, which would continue to reduce the long-term impacts on visual resources over time.

Reclamation and closure of the mine facilities would have a long-term, minor, adverse impact on visual resources and aesthetics within a proximal geographic extent. Lighting during reclamation and closure would have a short-term, minor to moderate, adverse impact on visual resources and aesthetics within a proximal geographic extent.

ADDITIONAL CONSIDERATIONS FOR VISUAL AND AESTHETIC RESOURCES

The KOPs for the Proposed Action have been analyzed from a static, pedestrian viewpoint. However, considering the extensive use of aviation travel within Alaska, impacts on visual resources and aesthetics can also be observed from a dynamic aerial perspective. Without topography and vegetation shielding views, impacts such as ground disturbance, building and infrastructure presence, and lighting could be more obvious and observable from a farther distance than would be from most ground KOPs.

While aviation travel between Nome and the communities of Mary's Igloo, Teller, and Brevig Mission occurs year-round, the flight paths to these locations would not be directly over, or proximal, to the Proposed Action. Recreational flights for hunters, fishers, and flight-seers would occur primarily during summer and autumn, and viewers are more likely to have a view of the mine facility buildings. To mitigate adverse visual impacts for proximal aerial viewers, mine facility buildings could be painted with a matte texture in a matching summer and autumn palette to the adjacent vegetation; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Impacts Observed from Key Observation Points

Digital renderings of the Proposed Action during the operations phase were made from each of the KOPs, and the full analysis of each location can be found in Appendix D. Table 4-8 presents a summary of the visual impacts that could potentially be observed from the KOPs.

Overall, Project construction activities would have short-term, minor to moderate, adverse impacts on aesthetics and visual resources. During operation, long-term, minor to major, adverse impacts are anticipated. Unavoidable adverse effects related to the Proposed Action would be the creation of a permanent open pit from where the graphite would be mined.

Other adverse impacts on visual resources may occur from Project equipment, buildings, and infrastructure that contrast in line, shape, form, color, or texture with the shrubs and low vegetation of the tundra and alpine environments. Vertical and textural intrusions from structures interrupt and contrast the natural visual environment conditions. Project lighting introduces human-made lights in a primarily dark viewshed. The new development would not be near any existing developments, which would change the viewshed from no visual interruptions to periodic interruptions on the landscape, depending on point of view. BMPs, including minimizing and directing Project lighting, and employing the use of exterior building colors that have a low contrast with the adjacent vegetation, may mitigate and reduce impacts; see Chapter 5 Avoidance, Minimization, and Mitigation Measures.

Table 4-8. Proposed Action impacts on visual resources and aesthetics when viewed from the key observation points

KOP	Construction Impacts to Visual Resources from the KOP	Operation Impacts to Visual Resources from the KOP
Mary's Igloo	Ground disturbance and other construction activities would not be visible from this KOP. During cloudy or foggy conditions, artificial lighting has the potential to create a glow that may be visible from a greater distance. The anticipated possible impacts would be short term, minor, and adverse within an extensive geographic extent.	Ground disturbance and operations activities would not be visible from this KOP. During cloudy or foggy conditions, artificial lighting has the potential to create a glow that may be visible from a greater distance. The anticipated possible impacts would be long term, minor, and adverse within an extensive geographic extent.
Barge Landing/Subsistence Use Area	Construction activities, materials/infrastructure storage, and artificial lighting would be visible from this KOP. Probable impacts are anticipated to be short term, moderate, and adverse within a proximal geographical extent.	Ground disturbance and operations activities, such as ore mining and hauling, would be visible from this KOP. The anticipated impacts, including the creation of a new open-pit mine, would be long term, major, and adverse within a proximal geographic extent.
Imuruk Basin/Tuksuk Channel	Construction activities and artificial lighting would be visible from this KOP. Probable impacts are anticipated to be short term, minor, and adverse within an extensive geographical extent.	Ground disturbance, including the creation of a new open-pit mine, operations such as ore mining and hauling, and artificial lighting would be visible from this KOP. Probable impacts are anticipated to be long term, moderate, and adverse within an extensive geographical extent.
Kougarok Road	Ground disturbance, construction activities, and artificial lighting would be visible from this KOP. Probable impacts are anticipated to be short term, minor, and adverse within a limited to proximal geographical extent.	Operation activities such as gravel mining, materials hauling, and artificial lighting would be visible from this KOP. Probable impacts are anticipated to be long term, minor, and adverse within a limited to proximal geographical extent.
Mosquito Pass Recreation Area	Ground disturbance, construction activities, and artificial lighting would be visible from this KOP. Probable impacts are anticipated to be short term, minor, and adverse within a limited geographical extent.	Operation activities such as gravel mining, materials hauling, and artificial lighting would be visible from this KOP. Probable impacts are anticipated to be long term, minor, and adverse within a limited geographical extent.
Nome-Teller Highway	Ground disturbance and other construction activities would not be visible from this KOP. During cloudy or foggy conditions, artificial lighting has the potential to create a glow that may be visible from a greater distance. The anticipated possible impacts would be short term, minor, and adverse within an extensive geographic extent.	Ground disturbance and operations activities occurring higher on the mountainside are unlikely to be visible from this KOP. During cloudy or foggy conditions, artificial lighting has the potential to create a glow that may be visible from a greater distance. The anticipated possible impacts would be long term, minor, and adverse within an extensive geographic extent.

4.3.1.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed. No impacts on visual and aesthetic resources would occur as a result.

4.3.2 Landownership, Management, and Use

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on landownership, management, and use within the Project area.

4.3.2.1 Proposed Action

CONSTRUCTION AND OPERATIONS PHASES

Construction of the Proposed Action would not affect land ownership and management because no change in land ownership would occur and Project activities within the Project footprint would not fall outside the management intent of their respective land management units. Land use would change due to the presence of the mine site and the restrictions on recreational and subsistence use of the mine property.

Because processing permit applications is considered routine work, the administrative burden on the ADNR, the state management agency responsible for processing permit applications for the Project, would have no impact on land management. Graphite One has secured state mining claims and would apply for authorization for a ROW to construct the access road. The access road would cross two private mining claims at MPs 0 and 4, for which Graphite would secure permits and/or ROW for the proposed access road. If Graphite One is granted a ROW across the two mining claims, surface use of the land within the ROW would be limited, and the owners of the mining claims would not be able to conduct surface activities within the ROW.

Impacts on land use during construction and operations were assessed to determine whether they would be perceived as adverse or beneficial by landowners or managers. Land use plans and policies were evaluated to determine if the Proposed Action meets the intended use of the management area. The Proposed Action would occur almost completely on state-owned lands. As such, the Northwest Area Plan for State Lands (ADNR 2008) was used to evaluate the compatibility of the proposed land use with the intended use. The existing land use of the Project area would change from undeveloped to industrial/transportation uses. This is an allowable land use under the area's land designations and would result in obvious changes in land use at the mine site, but would not create a land use conflict with current uses. Development of the land for mineral resources is a priority for state and national interests and is viewed as a beneficial use of these lands from an economic standpoint.

Impacts on land use during Proposed Action construction and operations of the mine would be short- to long-term, minor to moderate, and adverse. The land use designation of the mine site is open for mineral entry but must account for other uses such as habitat, recreation, and subsistence use; for an evaluation of impacts on these resources, see Section 4.2 Biological Environment, Section 4.3.3 Recreation, and Section 4.3.5 Subsistence and Traditional Use. The mine site would be located in an area with little to no development, creating an industrial presence that would result in increased noise levels, human-presence, and traffic.

Land use impacts resulting from the temporary staging area during construction would be short-term and minor to moderate. The temporary staging area would be on a small area of land owned by BSNC and would be used only during the construction phase. The lease agreement and subsequent permit could provide a financial benefit to BSNC. A land use permit from BSNC would be required to lease the land, and all stipulations under the permit would be followed by the Project.

Under the Proposed Action, all mineral extraction during operations would occur under existing mining claims and land use plans. Land use impacts resulting from the access road would have a long-term, minor impact on land use. The access road would support mineral entry, which is within the intended land use designation for the area, and the road itself is not an incompatible land use of the area. The access road would be a private industrial mining road and would not be open for public use. A gate and guard shack, which would be staffed 24 hours per day, 7 days per week, 365 days per year would inhibit unauthorized use of the access road.

RECLAMATION AND CLOSURE PHASE

During mine reclamation and closure, many Project features and facilities would be removed, and the ground would be graded, re-contoured, covered with stockpiled topsoil, and revegetated. Some equipment would be buried in the WMF, but this is not expected to impact land use upon closure. The access road would remain, as a restricted road, until permit requirements are met for water quality standards and reclamation requirements are met in order to allow access to the mine. When reclamation monitoring is complete the road, bridges, and culverts would be removed, the road graded and revegetated and land use would eventually return to pre-mine conditions.

After closure, land use at the mine site would revert to nearly pre-mining levels, except for the open pit, WMF, and easements that remain. After closure, land restrictions would remain on the WMF and pit lake to restrict future activities so they are not disturbed.

Closure and reclamation of the mine and associated facilities would have a long-term, moderate impact on land use as potential land uses, such as habitat, recreation, and subsistence, would return to a similar state as existing conditions.

4.3.2.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and Graphite One would not develop their mining claims. Graphite One could relinquish their mining claims back to the State of Alaska; another company could acquire these claims, or Graphite One could continue to maintain them and develop the mine at a later date. If no mine is developed, the area would continue to be managed in accordance with the Northwest Area Plan (ADNR 2008) and would be available for dispersed public recreation.

4.3.3 Recreation

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on recreation within the Project area.

The proposed Project's mine, mill facilities, and access road would be located in a state-managed unit that is designated for mineral development and dispersed recreation (Barr 2025). This designation indicates that ADNR permits mineral development within this area, but requires that activities are managed in a manner that minimizes harm to dispersed public recreation.

In Alaska, new access into remote areas is always a controversial issue, with most discussions revolving around Alaskans' access to hunting and fishing (Barr 2025). The major area of controversy, if the Project is approved, is whether the access road to the Project would become a permanent road that is open to the public or would be reclaimed at the end of the Project's life. The discussion centers on whether hunters would view new roads as an option to access previously inaccessible areas and to what extent the development of roads would draw out-of-area hunters who may compete with local subsistence hunters. This section only describes recreational sport hunting and fishing within the study area; subsistence hunting and traditional land uses are described in Section 4.3.5 Subsistence and Traditional Use.

4.3.3.1 Proposed Action

The Proposed Action would place a new, large, industrial development in an area where little to no development exists, which has the potential to impact recreation in the region. Given the Project's remote location, recreational use of this area is limited. There is some limited recreational use of the Mosquito Pass area by Nome residents; occasional sport fishing that occurs through chartered flights to the Cobblestone River (Barr 2025); and sport hunting for large mammals such as moose, caribou, and muskox.

CONSTRUCTION PHASE

Construction activities would occur year-round, potentially affecting the quality of recreation within the study area. Access to state lands for recreation could be restricted within active construction areas. Recreationists would still be able to access the Cobblestone River valley and lands around Imuruk Basin using current means, but they would not be able to use access roads associated with the Proposed Action. Construction activities have the potential to affect sport hunting and fishing activities. Access to sport hunting areas by traditional means and routes would not be affected unless access requires crossing mine-restricted property, which would be located at the mine site and not include the access road; the access across would not be open to the public, but recreational users would be allowed to cross it.

The additional workers needed for construction of the mine (approximately 400 workers) would be a mix of local residents and people who move to Nome to work for the mine. This temporary increase in local residents has the potential to increase hunting pressure on area wildlife. Currently, ADF&G manages large game hunting through a mix of general season hunts (e.g., wolf, wolverine, black and brown bear), registration hunts (moose and caribou), and a subsistence permit hunt (muskox). ADF&G manages game species to ensure harvest goals are not exceeded; however, due to the increased hunting pressure, hunts may close earlier, or the chances of obtaining a permit may decrease. Employees would be prohibited from hunting while on rotation at the mine but would be subject to the same regulations as the general public while off duty. When hunting off duty, they would be required to provide their own transportation and would not be allowed to use the mine access road to access hunting sites.

Construction noise and vehicle traffic could affect the presence of wildlife within the area, thereby affecting recreational hunting; impacts on wildlife are discussed in Section 4.2 Biological Environment and subsistence hunting is discussed in Section 4.3.5 Subsistence and Traditional Use.

Construction impacts from the barge landing, staging area, road, bridges, material sites, mine and facilities, and lighting would be short term, minor to moderate, and adverse.

OPERATIONS PHASE

The Proposed Action's facilities would introduce industrial operations where none had previously existed. This industrial activity would result in increased human presence. The increased noise generated from blasting and mining operations, presence of humans in the area, and vehicle traffic could all result in adverse effects for recreationists because fish and wildlife behavior could be altered (see Section 4.2 Biological Environment). Additionally, access to active mining, facilities, and other mine-related areas (approximately 2,440 acres total) would be unavailable for recreational use during the operation phase of the Proposed Action.

In other areas where recreation would still be accessible by current methods (e.g., aircraft drop-off to Mosquito Pass), access road traffic could disrupt recreationists' enjoyment and appreciation of the natural environment. Noise from blasting, vehicles, and mining and ore processing as well as lighting from vehicles and the facilities could also result in visitors' perception of change in the area's recreational quality.

Mine operations would require fewer workers (approximately 125), so anticipated pressures on sport fishing and hunting could decrease during operations.

Operations impacts from the road, bridges, material sites, mine and facilities, and lighting would be long term, minor to moderate, and adverse.

RECLAMATION AND CLOSURE PHASE

When operations are complete, Graphite One would initiate reclamation and closure of the mine facilities. After the Project is closed and reclamation is performed, it is anticipated that recreational activities and opportunities would eventually return to conditions similar to existing conditions. Mine closure and reclamation impacts from the road, bridges, material sites, and mine and facilities would be long term, minor to moderate, and adverse.

Avoidance, minimization, and mitigation measures for potential impacts on recreation resources during construction, operations, and closure and reclamation are discussed in Chapter 5 Avoidance, Minimization, and Mitigation Measures.

4.3.3.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed. Dispersed recreation would continue as it does under existing conditions.

4.3.4 Cultural Resources

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on cultural resources within the Project area.

Impacts on cultural resources or historic properties can be direct or indirect and occur when Project activities result in the diminishment of the resource’s integrity, potentially leading to loss of NRHP eligibility. Direct impacts on cultural resources include actions that may result in physical damage, such as destruction, removal, or relocation; they are long term or permanent in duration. Indirect impacts on cultural resources are more varied, and may include the introduction of visual, audible, or atmospheric elements that may diminish the setting, feeling, or association of a cultural resource, thereby degrading a resource’s overall character defining features. Indirect impacts on cultural resources may also occur if the Project results in an increase in visitation or access to an area, leading to intentional or inadvertent site looting or damage. Additionally, indirect impacts include changes to the physical environment that may structurally degrade a resource such as through actions that cause permafrost damage or vibratory effects. Some indirect impacts may be temporary or short term, limited to construction or short-term actions, while others may result in permanent physical damage or long-term changes to the pattern of use within an area.

Since Section 106 of the NHPA and AHPA processes for the Project have not yet been initiated by the USACE, the lead federal agency, the Project APE remains undefined and may differ from the study area used in this analysis. The study area for cultural resources includes areas within 0.5 mile of Project infrastructure and is consistent with study areas defined in previous cultural resources studies carried out in support of the Project (e.g., Hosken and Miller 2023; Hosken et al. 2024; Hodgson et al. 2025).

The information in this section is based on currently available Project and Alaska Heritage Resources Survey data and is subject to review by the lead federal agency (USACE), SHPO, Tribes, Project proponent, and other consulting parties. Additional identification and consultation efforts are ongoing, and will likely continue throughout the Section 106, AHPA, and NEPA processes. Additionally, once the Section 106, AHPA, and NEPA reviews are underway and the Project's APE is defined, if additional information is obtained from consulting parties, the analysis and recommendations herein may need revision.

4.3.4.1 Proposed Action

CONSTRUCTION, OPERATIONS, AND RECLAMATION AND CLOSURE PHASES

Based on the desktop study of the Project study area, and the results of the 2023, 2024, and 2025 cultural resource investigations (aerial reconnaissance, pedestrian survey, and minimal subsurface testing within select Project locations) conducted to date (Hosken and Miller 2023; Hosken et al. 2024; Hodgson et al. 2025), a total of 39 known cultural resources have been identified within the Project study area and could be directly or indirectly adversely affected by the Proposed Action, 3 of which have been determined eligible for listing in NRHP. The known cultural resources sites include 20 precontact sites, 9 historic mining sites, a Quonset hut, and 2 linear features (Table 4-9). Of these resources, 11 are within the Project footprint and 28 are within the study area as currently delineated; these resources have the potential to be directly or indirectly impacted by Proposed Action activities. See Section 3.3.4 Cultural Resources for further information regarding cultural resources identified within the Project study area.

Table 4-9. Documented cultural resources that could be affected by the Proposed Action

AHRS No.	Site Name	NRHP Eligibility/ DOE Year (NRHP Criteria)	Within Project Footprint or Study Area
NOM-00076	Miocene Ditch	Eligible/1990 (A, B)	Study area
NOM-00077	Campion Ditch	Eligible/1992 (A)	Study area
NOM-00082	David Creek Ditch	Unevaluated	Study area
NOM-00141	Seward Peninsula Railroad	Eligible/2014 (A, B)	Study area
NOM-00145	NOM-00145 (surface lithic scatter with caribou bones)	Unevaluated	Study area

AHRS No.	Site Name	NRHP Eligibility/ DOE Year (NRHP Criteria)	Within Project Footprint or Study Area
NOM-00331	Mining Ditch	Unevaluated	Footprint
NOM-00332	Mining Ditch	Unevaluated	Footprint
NOM-00333	Pack Trail	Unevaluated	Footprint
NOM-00334	Prospect Trenches	Unevaluated	Study area
NOM-00335	Rock Shelter	Unevaluated	Study area
NOM-00336	Historic Ditches	Unevaluated	Study area
NOM-00337	Lithic Scatter	Unevaluated	Study area
NOM-00338	Rock Cairn	Unevaluated	Study area
NOM-00339	Rock Ring and Fire Pit	Unevaluated	Study area
NOM-00340	Rock Features	Unevaluated	Study area
NOM-00341	Lithic Scatter	Unevaluated	Study area
TEL-00056	Glacier Canyon Adit	Unevaluated	Footprint
TEL-00145	Pamnikotut	Unevaluated	Study area
TEL-00292	Graphite Creek Adit	Unevaluated	Footprint
TEL-00293	Quonset Hut	Unevaluated	Footprint
TEL-00294	Rock Ring Site	Unevaluated	Footprint
TEL-00298	Stacked Rocks and Rock Ring	Unevaluated	Study area
TEL-00299	Lithic Scatter	Unevaluated	Study area
TEL-00300	Surface Depressions	Unevaluated	Study area
TEL-00301	Rock Cairn	Unevaluated	Study area
TEL-00302	Collapsed Structure	Unevaluated	Footprint
TEL-00303	Cabin Foundation	Unevaluated	Footprint
TEL-00304	Mining Trench	Unevaluated	Study area
2025-EDH-001	2025-EDH-001 (historical mining adit)	Unevaluated	Footprint
2025-EDH-002	2025-EDH-002 (surface lithic scatter)	Unevaluated	Study area
2025-EDH-003	2025-EDH-003 (tractor road segment)	Unevaluated	Study area
2025-EDH-004	2025-EDH-004 (collapsed, circular, cobblestone rock stack)	Unevaluated	Study area
2025-EDH-005	2025-EDH-005 (rock wall and rock ring)	Unevaluated	Footprint
2025-EDH-006	2025-EDH-006 (collapsed, semi-circular rock wall)	Unevaluated	Study area
2025-EDH-007	2025-EDH-007 (quartz biface fragment)	Unevaluated	Study area
2025-EDH-008	2025-EDH-008 (rock cairn)	Unevaluated	Study area
2025-EDH-009	2025-EDH-009 (probable hunting blind rock structure and collapsed rock feature)	Unevaluated	Study area

AHRS No.	Site Name	NRHP Eligibility/ DOE Year (NRHP Criteria)	Within Project Footprint or Study Area
2025-EDH-010	2025-EDH-010 (prospect trench, rock cairn, and collapsed rock feature)	Unevaluated	Study area
2025-EDH-011	2025-EDH-011 (quartz lithic artifacts)	Unevaluated	Study area

Notes: AHRS = Alaska Heritage Resources Survey; DOE = Determination of Eligibility; No. = Number

Construction, operation, and mine closure and reclamation of the Proposed Action have the potential to have short- to long-term, minor to substantial, adverse impacts on cultural resources and/or historic properties. Direct, long-term, substantial adverse impacts may result from physical damage (e.g., destruction, removal, or relocation) to the resource. Indirect, short- to long-term, minor to substantial, adverse impacts may result from the introduction of visual or audible conditions that may diminish the resource's character-defining features; increased accessibility that may lead to intentional or inadvertent site looting or damage; or changes to the physical environment that may degrade the resource. As the Section 106, AHPA, and NEPA processes have not been completed, specificity regarding impacts on cultural resources and/or historic properties within the Project study area is currently unknown.

Avoidance, minimization, and mitigation measures for potential impacts on cultural resources and/or historic properties during construction, operation, and closure and reclamation are discussed in Chapter 5 Avoidance, Minimization, and Mitigation Measures.

4.3.4.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed; therefore, no impacts on cultural resources and/or historic properties would occur, similar to existing conditions.

4.3.5 Subsistence and Traditional Use

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on subsistence and traditional use within the Project area.

Potential impacts on subsistence and traditional uses are based on subsistence resource abundance and availability, user access to resources, and cultural connection to subsistence practices. Impacts on subsistence uses can result from interrelated effects among many resources. For example, impacts to water quality and flow as well as vegetation may affect fish and wildlife populations, which in turn could affect subsistence harvest patterns and use. Section 4.2.1 Vegetation, Wetlands, and Other Waters of the United States; Section 4.2.2 Fish, Essential Fish Habitat, and Invertebrates; Section 4.2.3 Birds; Section 4.2.4 Terrestrial Mammals; Section 4.2.5 Marine Mammals; and Section 4.2.6 Threatened and Endangered Species, and Critical Habitat describe impacts on subsistence resources.

During Project-related public meetings facilitated by Graphite One, regional residents often expressed concerns regarding availability of, access to, and cultural connection to subsistence resources (Graphite One 2024; Appendix E *Graphite One Community and Tribal Engagement Summary*), resulting in the development of the Subsistence Advisory Council (SAC); see Section 3.3.5.2 Traditional Subsistence Knowledge of the Study Area for details about the SAC and their comments regarding subsistence resources within the Project area.

4.3.5.1 Proposed Action

CONSTRUCTION AND OPERATIONS PHASE

The Proposed Action is anticipated to directly and indirectly affect subsistence resource abundance and availability, subsistence user access, and cultural connection to subsistence practices. Proposed Action construction and operation activities may also result in increased competition between subsistence users and other hunters and anglers.

RESOURCE ABUNDANCE AND AVAILABILITY

Construction and operation of the Proposed Action would affect subsistence resource abundance and availability within the study area. Impacts on subsistence resource categories (fish, marine mammals, large land mammals, birds, and vegetation) are described below.

Based on subsistence harvest studies (see Section 3.3.5Subsistence and Traditional Use), fish (especially salmon, whitefish, and Dolly Varden) are an important subsistence resource to harvesters in the region. Impacts on fish populations and habitat, which are tied to resource abundance and availability, from the Proposed Action are described in Section 4.2.2 Fish, Essential Fish Habitat, and Invertebrates. These impacts could be caused by habitat loss; habitat avoidance or displacement due to noise and Project activities; and animal mortality or injury caused by construction and operation activities as well as runoff and contaminant spills. While impacts on water quality as well as fish populations and their habitats would be mitigated through permit requirements and BMPs, harvesters may avoid fishing near the Project area due to perceptions of resource contamination.

Harvesters may find fish abundance and availability affected in traditionally used fishing areas, such as the Cobblestone River, Sinuk River, Nome River, Oro Grande Creek, Windy Creek, Grantley Harbor, Tuksuk Channel, and Imuruk Basin, due to Proposed Action construction and operation. Overall, subsistence fish resource availability and abundance are anticipated to have short- to long-term, minor to moderate, adverse impacts from construction and operation of the Proposed Action.

Marine mammals (especially seals and walruses) are also an important subsistence resource to harvesters in the region (see Section 3.3.5 Subsistence and Traditional Use). Impacts on marine mammal populations and habitats, which are tied to resource abundance and availability, are anticipated to occur primarily during construction-related temporary barging operations between Nome and Imuruk Basin. These impacts could include habitat avoidance due to noise from Project activities. Due to the slow speed of construction related barge traffic, it is unlikely that marine mammal injuries or deaths would be caused by collisions with marine vessels (see Section 4.2.5 Marine Mammals). Adverse impacts to marine mammals are expected to be short term and minimal during the construction phase of the Project.

Harvesters could encounter impacts on marine mammal abundance and availability in traditionally used hunting areas, such as Port Clarence and Imuruk Basin, due to Proposed Action construction. Imuruk Basin currently hosts existing subsistence and recreational user vessel traffic, and Grantley Harbor commonly hosts barge traffic; therefore, the construction barging is not anticipated to substantially increase impacts on marine mammal abundance and availability over existing conditions. Due to the temporary nature of the barging (only during construction) overall, subsistence marine mammal resource availability and abundance are anticipated to have short-term, minor, adverse impacts from construction of the Proposed Action.

Large land mammals (especially caribou and moose) are also an important subsistence resource to harvesters in the region (see Section 3.3.5 Subsistence and Traditional Use). Impacts on large terrestrial mammal populations and habitats, which are tied to resource abundance and availability, from the Proposed Action are described in Section 4.2.4. These impacts could be caused by habitat loss and fragmentation, habitat avoidance or displacement due to noise as well as construction and operation activities (e.g., aerial and overland traffic), and animal mortality or injury caused by collisions with vehicles.

Harvesters could encounter impacts on large land mammal abundance and availability in traditionally used hunting areas, such as west of the Project area or north of Imuruk Basin (Mikow et al. 2018; BLM 2007); however, Proposed Action construction and operation is not anticipated to directly affect resource abundance and availability or subsistence user access in those areas. Overall, large land mammal resource availability and abundance are anticipated to have short- to long-term, minor to moderate, adverse impacts from construction and operation of the Proposed Action. It should be noted that while local harvesters have reported concerns regarding disturbances to hunting by Project-related aerial traffic, this type of traffic would not be planned during the fall hunting season to minimize disturbing large land mammals and hunters (see Chapter 5 Avoidance, Minimization, and Mitigation Measures).

While birds and eggs do not comprise a large portion (based on pounds per capita) of the study area communities' subsistence harvests, this harvest is still important to these communities (see Section 3.3.5 Subsistence and Traditional Use). Impacts on bird populations and habitats, which are tied to resource abundance and availability, from the Proposed Action are described in Section 4.2.3. These impacts could be caused by habitat loss (e.g., from vegetation clearing or ground disturbance), habitat avoidance or displacement due to noise as well as construction and operation activities, and resource mortality or injury caused by noise masking as well as collisions with vehicles/vessels and Project infrastructure.

Harvesters could encounter impacts on bird and egg abundance and availability in traditionally used harvest areas, such as around Imuruk Basin and on the shoreline of Windy Cove; however, Proposed Action construction and operation is not anticipated to directly affect resource abundance and availability or subsistence user access in those areas. Overall, subsistence bird and egg resource availability and abundance are anticipated to have short- to long-term, minor, adverse impacts from construction and operation of the Proposed Action.

While vegetation (e.g., blueberries, salmonberries, blackberries, plants/greens/mushrooms, and willow leaves) does not comprise a large portion (based on pounds per capital) of the study area communities' subsistence harvests, this harvest is still important to these communities (see Section 3.3.5 Subsistence and Traditional Use). Impacts on vegetation, which are tied to resource abundance and availability, from the Proposed Action are described in Section 4.2.1. These impacts could be caused by vegetation clearing and ground disturbance, filling of wetlands, dust deposition, and spread of invasive plants, resulting in the loss of vegetation or change in vegetation types available to harvesters.

Harvesters could encounter impacts on vegetation abundance and availability in traditionally used harvest areas, such as around Imuruk Basin and near Windy Cove, due to Proposed Action construction and operation. Note that vegetation targeted by area subsistence harvesters has been documented within the Project area; additionally, the berry harvesting area identified by local residents is nearly 5 miles from proposed mine site infrastructure and approximately 3 miles from the temporary barge landing. Overall, subsistence vegetation availability and abundance are anticipated to have short- to long-term, minor, adverse impacts from construction and operation of the Proposed Action.

Access to Resources

The Proposed Action is anticipated to have short-term, minor to moderate, adverse impacts on subsistence users' access to subsistence resources during construction and long-term, moderate, adverse impacts to access during operations within the Project area. While residents would not be able to use the Project area for subsistence harvests, the majority of community-identified subsistence practices occur outside the Project area, and residents would continue to be able to access subsistence resources in other locations of the region.

During construction, it is anticipated that the Proposed Action would have short-term, minimal, adverse impacts on subsistence access due to increased vessel traffic in Grantley Harbor, Tuksuk Channel, and Imuruk Basin. Due to the relatively small number of trips and short construction period, as well as the presence of existing vessel traffic in this area from barges as well as subsistence and recreational boaters, it is anticipated that subsistence users would continue to be able to access water-based subsistence resources during construction. However, consideration should be given to subsistence fishing schedules and locations in order to develop a marine construction traffic schedule and route into and through Imuruk Basin that would be the least disruptive to subsistence users (see Chapter 5 Avoidance, Minimization, and Mitigation Measures).

Once constructed, the mine site and access road would be private, with restricted access; residents would lose access to the Project area and potentially areas directly adjacent to the Proposed Action due to noise and visual disturbance displacing birds and terrestrial mammals. Graphite One will work with stakeholders to establish safe crossing sites for snowmachines traveling through the area. The access road would disrupt access to salmon-fishing in fish-bearing streams crossed by the road, such as the Cobblestone River. Both Brevig Mission and Teller are located west of the Project site and can harvest resources west or north of the Project area, minimizing the magnitude of impacts from the access road. Additionally, Mary's Igloo is typically accessed north of the Project site by riverboat during summer (Section 3.3.6.2 Community Infrastructure). Due to resource access opportunities in the remainder of the study area, the access road would likely minimally impact Nome residents.

While the proposed mine site and access road contains areas of previously recorded moose and caribou subsistence harvests, the majority of recorded harvests in 2015 occurred west of the Project area or north of Imuruk Basin (Mikow et al. 2018; ADF&G n.d.-b; see Section 3.3.5.4 Primary Subsistence Resources and Practices within the Project Area – Large Land Mammals). This indicates that, despite possible interruption in access within the Project area, potential exists for subsistence resource harvests in the broader study area.

Improvements to Kougarok Road would make it available for year-round use, which would have both beneficial and adverse impacts for subsistence users, depending on where the user resides. While the road would expand winter access opportunities for subsistence users traveling from Nome into the study area, it could increase the number of harvesters and competition for subsistence resources with Brevig Mission and Teller residents. The limited winter fishing and hunting opportunities could draw in new subsistence users via Kougarok Road, resulting in increased competition. The access road to the mine will be closed to the public and will not be available for access to subsistence or sport fishing and hunting.

Cultural Values Related to Subsistence Resources and Practices

The Proposed Action would result in the decreased availability of and access to subsistence resources, potentially creating long-term, minor to moderate, adverse impacts on cultural practices related to subsistence within and adjacent to the Project footprint. These activities maintain strong cultural bonds and perpetuate traditional cultural practices and ecological knowledge. Any Project-related impact on the resources' abundance or availability, or access to them, has the potential to adversely affect the tradition of passing down hunting and subsistence practices to future generations.

Other indirect impacts on cultural values related to subsistence may occur if community residents, who become employed by the mine, are not able to spend as much time engaging in subsistence harvesting activities. Their employment commitments could take away time and energy that could be spent on traditional subsistence activities, which includes passing along subsistence knowledge and engaging with community, family, and friends in harvesting, processing/production, and sharing activities. Employment with the mine could increase reliance on a cash economy, rather than a subsistence lifestyle, over the long term, which could further strain the ability to pass down subsistence knowledge or decrease the time available to practice subsistence activities (see Section 4.3.6 Socioeconomics for potential socioeconomic impacts of this lifestyle change). However, employment created by the Proposed Action and its contribution to communal wealth would generate income that may be spent on subsistence harvesting gear and transportation. Improved gear and technology, such as all-terrain vehicles, snowmachines, or gas-powered boats, could improve access to resources, but also increase competition among harvesters.

RECLAMATION AND CLOSURE PHASE

During reclamation and closure, operations would cease, and the mine site would be graded and seeded or allowed to naturally revegetate, and other Project infrastructure would be removed or reclaimed. It would take time for the Project footprint to become suitable for subsistence practices, following revegetation and the return of previously displaced wildlife. It is likely that ecological conditions within portions of the Project footprint would not return to pre-Project conditions. However, as conditions return to something similar to existing (e.g., native vegetation returning, noise decreasing), subsistence resources could return to previously used habitats, and subsistence users would regain access to the Project area. Overall, impacts on subsistence resource availability and abundance, access to subsistence resources, and cultural connections to subsistence activities from reclamation and closure activities would result in short- to long-term, minor, adverse impacts.

4.3.5.2 No Action Alternative

Under the No Action alternative, the Proposed Action would not be constructed. Impacts on subsistence resource availability and abundance, access to subsistence resources, and cultural connections to subsistence activities would continue similar to existing conditions.

4.3.6 Socioeconomics

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on socioeconomics within the Project area.

4.3.6.1 Proposed Action

CONSTRUCTION AND OPERATIONS PHASE

The Proposed Action would provide short- and long-term, minor to moderate, beneficial socioeconomic impacts for the nearby communities of Brevig Mission, Teller, Mary's Igloo, and Nome through the creation of Project construction and operation jobs and training opportunities, creation of indirect jobs, and increased spending on local goods and services. Construction would provide short-term, minor to moderate, beneficial impacts over the approximately 30-month construction period, creating up to 400 jobs throughout the construction phase (Barr 2025). Operations are expected to employ approximately 242 people.

People with trade skills needed to support Project construction and operation would likely not be immediately available within the communities surrounding the Project site to support the majority of the projected employment opportunities. However, Graphite One has entered into an agreement with BSNC to maximize the local workforce and contribute to funds for locals to attend training programs in order to develop an adequate workforce. Under the agreement, preference for hiring and scholarships would be given to BSNC shareholders and descendants, with priority for local residents of Nome, Teller, and Brevig Mission. Under the Graphite One-BSNC agreement, scholarship funds are anticipated to amount to approximately $130,000 between 2024 and 2027 (Graphite One 2024). However, according to Graphite One, most training is anticipated to occur on-the-job.

Short- to long-term, minor, adverse impacts on area transportation may occur due to increased levels of air, marine, and roadway traffic during construction and operations.

Construction work is anticipated to be performed by contractors who will temporarily be on-site, rather than by direct-hire employees, and leave when their work is completed (Graphite One 2025). However, BSNC subsidiaries would be given priority for delivering goods and services necessary to support the Project, providing potential beneficial regional impact. Other communities within the Nome Census Area that are farther from the Project site may additionally experience short- to long-term, minimal to minor, beneficial economic benefits should residents travel to work at the Project site.

The workforce required for operation of the mine is anticipated to be made up mainly of locals, with some relocated individuals to the Nome area, as well as those traveling between the Project and their homes outside of the Nome Census Area. Some relocated employees may travel to Nome with families, which would increase enrollment at schools in Nome and create increased demand for local goods and services, as well as add new people into the labor force. An increase in school-age children could strain existing school systems in Nome but may also increase funding and expansion of such services over the life of the Project.

Project operations would create employment opportunities over the anticipated mine life of about 21 years and provide year-round employment for an estimated 242 mine jobs in a full production year (Barr 2025). Under the BSNC-Graphite One agreement, BSNC residents and shareholders would be priority hires, with Nome, Teller, and Brevig Mission residents given first preference. Additionally, there would be potential for indirect job creation, such as for trucking contractors or fuel suppliers.

During operations, there would be indirect minor to moderate positive economic benefits from support services, as well as mine employees with consistent wages living in Nome due to spending more on goods and services locally. During operations, some residents in the study area may choose to leave other industries to work for the proposed Project, while increased demand for local goods and services as a result of the Proposed Action may increase the number of job opportunities in other industries. Due to these factors, as well as the high unemployment rates in Nome, Brevig Mission, and Teller, the impact on employment opportunities in other industries is anticipated to be beneficial.

If the workforce is primarily local to Nome, Brevig Mission, and Teller, with some commuters and relocations—as discussed in the FS (Barr 2025)—the Nome Census Area population would not change substantially. However, by creating new employment opportunities and increased revenue streams for the communities of Nome, Brevig Mission, Teller, and Mary's Igloo, the Proposed Action may increase or stabilize population levels – and consistent employment and income would be beneficial for area schools and community infrastructure development.

Under the Proposed Action, the Graphite One-BSNC community project fund for Teller and Brevig Mission would support community infrastructure improvements. To date, these funds include $50,000 to each community in 2023 and in 2024. Funds procured through the Graphite One-BSNC agreement may support housing development or other community infrastructure improvements in Teller and Brevig Mission.

The state and city of Nome would experience long-term, minor, beneficial economic impacts from tax revenue generated over the life of the Project. According to Graphite One, estimated tax revenue over the life of the Project includes $225 million generated by the Alaska State Corporate Income Tax (based on combined in- and out-of-state income), $19 million generated from the Alaska Mining License Tax, and $8 million generated by the Alaska Production Royalty Tax. Additional spending on goods and services in Nome throughout the life of the Project would additionally be captured through the city's five percent sales tax, creating an additional source of local revenue. Three Alaska Native Corporations have invested in Graphite One: BSNC, Doyon Limited, and Aleut and could profit from development of the mine.

Reclamation and Closure Phase

Mine closure would result in long-term, minor to moderate, adverse impacts on employment within the Project study area due to the loss of direct and indirect jobs supported by the Proposed Action. During mine site closure and reclamation, the workforce would be reduced to those employees responsible for road maintenance (including bridges and culverts), removing equipment/structures, replacing topsoil, maintenance of the water diversion structures, and operation of the water treatment system and power facility (Graphite One 2025). It is likely that skilled trades would remain in demand within the study area, but the reemployment of a large number of study area residents would take time to occur. Closure would also result in the loss of state tax revenue, and a decrease in local sales tax revenue.

4.3.6.2 No Action Alternative

Under the No Action alternative, the Project would not be developed, and no infrastructure associated with Project development would be required. Advanced royalties paid by Graphite One to Kougarok, LLC, as well as payments to the BSNC Community Project Fund for training and community development projects, would also end under the No Action alternative.

4.3.7 Human Health and Safety

The following section details the environmental consequences of the No Action Alternative and the Proposed Action on human health and safety within the Project area.

Related to health and quality of life, air quality impacts are described in Section 4.1.4, noise and vibration impacts are described in Section 4.1.5, and subsistence and traditional land use impacts are described in Section 4.3.5. Avoidance, minimization, and mitigation measures for potential impacts on human health and safety during construction, operation, and closure and reclamation are discussed in Chapter 5 Avoidance, Minimization, and Mitigation Measures.

4.3.7.1 Proposed Action

CONSTRUCTION AND OPERATIONS PHASE

HEALTHCARE

As the Proposed Action construction and operation would likely bring an influx of Project personnel into the region, this increase could create additional strain on the limited healthcare facilities and providers. This would result in a short-term, minor, adverse impact for the larger construction workforce, and long-term, minimal, adverse impacts for the smaller operations workforce. However, local economic growth as a result of the Proposed Action may increase funding and expansion of such services over the life of the Project, which would still benefit regional residents.

While the majority of the workforce may have health insurance coverage (Table 3-42), employment through the Project may provide additional coverage opportunities for employees and their families, creating a long-term, minor to moderate, beneficial impact.

Health and Well-being

The communities of Brevig Mission, Teller, and Mary's Igloo may experience long-term, minor to moderate, adverse mental and physical health impacts from the Proposed Action due to both the concern over Project impacts on cultural practices/subsistence activities, subsistence resources (food security), and natural resources; see Section 4.3.5 for a description of subsistence and traditional use impacts.

Teller, Brevig Mission, Mary's Igloo, and Nome residents may also experience long-term, minor to moderate, beneficial impacts on health and well-being as a result of the increased job and training opportunities from the Proposed Action (see Section 4.3.6 Socioeconomics). Households of those employed in primary or secondary roles supporting the Project would experience benefits from increased economic opportunities that reduce stress and improve mental health as well as create opportunities to improve housing or financial stability.

Long-term, minor to moderate, adverse impacts to health and well-being could occur from the influx of workers to the region. These workers have the potential to increase the spread of infectious diseases, as well as violence, accidental deaths, and injuries related to drug and alcohol abuse in the local community. The local community has expressed concerns that workers residing in employee housing in Nome would have increased income and access to alcohol, which could lead to a higher potential for alcohol-related problems to be experienced by Nome residents and the workers themselves. Alcohol-related problems are acute in Alaska and among Alaska Natives, with the incidence of alcohol-related problems highest in Alaska's isolated villages (Shively et al. 2008). Some local communities in the area, such as Brevig Mission, are considered "dry" communities that prohibit the sale, importation, or possession of alcohol. Workers from nearby "dry" communities may be more susceptible to alcohol-related problems. Graphite One is committed to a drug and alcohol-free workplace. Workers at the mine will be subject to pre-employment, post-incident testing, and random drug testing. A drug and alcohol policy would be developed before construction of the mine begins.

Worker Safety

Short- and long-term, minor to moderate, adverse impacts on safety associated with injuries from construction and operation activities, including transportation of materials and goods to and from the Project site, could occur during the construction and operations phases of the Proposed Action. Table 3-44 and Table 3-45 provide data on the rate of nonfatal and fatal occupational injuries associated with this work in Alaska.

The Proposed Action would result in long-term, minor to moderate, adverse impacts from increased traffic on Kougarok Road and new traffic introduced on the Mosquito Pass access road due to the year-round, daily transport of workers, concentrate, and fuel between Nome and the mine site. The transportation and warehousing industry has the highest incident rates compared to other industries (see Table 3-44). Due to these factors, the Proposed Action is likely to result in an increase in traffic incidents on Kougarok Road and the proposed access road, especially during hazardous winter driving conditions. Additionally, workers have the potential to experience exposure to hazardous materials during accidental release, including hazardous material spills associated with fuel truck crashes on Kougarok Road.

The Proposed Action would result in long-term, minor to moderate, adverse impacts from incidents at the mine site requiring emergency medical care or fire suppression.

Public Safety

During public meetings, residents of Nome, Brevig Mission, and Teller expressed concerned about safety from interactions between workers and their communities, as well as trespassing onto Alaska Native corporation lands (Appendix E). Should local workforce be maximized, long-term, none to minimal, adverse impacts may occur to the residents of Brevig Mission and Mary's Igloo or access to Alaska Native corporation lands from outsiders. The seasonal Nome-Teller Highway may create opportunities for access to Teller by non-residents, leading to long-term, minimal, adverse impacts. If the majority of the workforce is non-local, the likelihood of the impact may increase, but this is uncertain due to access challenges to these communities.

The potential for vehicle crashes due to year-round increased traffic on Kougarok Road could also affect the public traveling on the roadway by vehicle, snowmachine, and all-terrain vehicle, creating long-term, minor, adverse impacts.

Reclamation and Closure Phase

Following mine closure, short- to long-term, minor to moderate, adverse impacts on health and well-being associated with the loss of the Project's direct and indirect economic benefits to the study area may occur; it is uncertain how long these adverse impacts would persist following closure.

Adverse impacts related to interactions between workers and communities as well as from workers and the public potentially trespassing on Alaska Native corporation lands would be short-term, minor to moderate, and adverse during reclamation and eliminated following closure.

4.3.7.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed and operated, so area communities would not receive beneficial economic impacts from new job training and opportunities associated with Project development that may positively impact health and well-being. Residents would continue to feel stressors associated with lack of employment and opportunity. Stressors associated with concern over impacts on subsistence activities and natural resources would remain similar to existing conditions.

Additional strain on Nome’s medical facilities would remain similar to existing conditions, but economic development, or population stabilization or growth, from the Proposed Action would also not occur, resulting in no potential additional resources or personnel to regional healthcare facilities occurring.

5 Avoidance, Minimization, and Mitigation Measures

Avoidance and minimization measures as well as BMPs have been incorporated into the design and construction of the proposed Project to the maximum extent practicable. The purpose of this section is to describe the proposed avoidance and minimization of impacts on resources within the Project area and describe the BMPs that would be incorporated into Project development. Table 5-1 provides a brief description of the terms used in this section.

Table 5-1. Definition of avoidance, minimization, and mitigation terms

Term	Definition
Mitigation	Any measure that may avoid, minimize, reduce, or compensate for impacts associated with the Project
Best Management Practices and Industry Standards	Standard actions that comply with permit requirements or regulatory requirements that are meant to reduce environmental impacts
Avoidance and Minimization Measures	Design features or impact-reducing actions that are proposed commitments under the Project intended to avoid or minimize environmental impacts to the extent practicable
Compensatory Mitigation	Action of mitigating environmental impacts by replacing or providing substitute resources or environments

In addition to federal permits required for the proposed Project, many of the permits required for Project approval are under State of Alaska jurisdiction. Specific agencies may have clear compliance standards and requirements for monitoring environmental conditions that would be addressed in specific permitting authorizations. Potential mitigation and monitoring measures included in this document are not intended to be inclusive of all conditions in permit approvals, but to identify potential measures for consideration, as applicable.

A list of anticipated local, state, and federal permits and authorizations required for Project approval are described in Table 1-2 in Chapter 1 (introduction). These permits would guide standard practices used to reduce environmental impacts from Project construction, operation, and reclamation. These practices, as well as standard industry best practices aimed at mitigating environmental impacts, are described below.

5.1 Preconstruction and Construction Phase General and Project-Wide Best Management Plans and Avoidance/Minimization Measures

This section summarizes typical BMPs, avoidance and minimization measures, and standard permit conditions that would likely be required for the proposed Project during the preconstruction and construction phases of the project. Given the purpose and size of the proposed Project's footprint and access road, complete avoidance of physical, biological, and social resources analyzed in this EED is not possible. However, the Project has been designed to avoid and minimize impacts on these resources, wherever practicable. Graphite One would follow BMPs and industry standards required to comply with regulations as well as standard permit requirements that are designed to reduce impacts on the environment.

The following BMPs and avoidance/minimization measures would be implemented during the preconstruction and/or construction phase of the Project.

5.1.1 Paleontology

- The access road to the mine site would be private, and entry to the mine site would be restricted, which would limit the potential for unauthorized collecting of potential paleontological resources.
- Employees would be restricted from collecting paleontological resources.
- Any paleontological resources found during construction and operation of the Project would be reported to ADNR, Office of History and Archaeology.

5.1.2 Geomorphology, Permafrost, and Soils

5.1.2.1 Stability

- The Project would comply with ADNR Dam Safety permit requirements for construction and operation of dams, including performing seismic and hydrologic analyses to inform design, developing an Emergency Action Plan, and meeting Quality Assurance/Quality Control, inspection, and closure requirements.
- Topsoils will be salvaged to the extent possible, stockpiled and stored appropriately, and reused for reclamation.
- The mine site design would incorporate extensive geotechnical investigation and foundation design to minimize potential impacts from seismic hazards on facilities.

5.1.2.2 Permafrost

- BMPs for construction in permafrost include completing certain construction activities during winter (February to April), avoiding removal of the vegetative mat, using overlay construction, and constructing an overthickened embankment or using insulation where possible.
- Ground temperature monitoring and the use of insulation materials, such as geotextile fabric and subdrainage layers, would be required in high-risk permafrost thaw areas to reduce the likelihood of thermokarst development and associated flow disruption.
- As part of the ADNR Dam Safety permit application, Graphite One will evaluate the effects to permafrost from construction of the WMF and will recommend design specifications to limit impacts.
- Active or passive thermosyphons may be used to maintain permafrost temperatures under certain facilities.

5.1.2.3 Avalanches

- Short-term mitigation measures focus on seasonal hazard variability, including:
  - Seasonally closing facilities or hazard areas exposed to avalanches (relies on accurate forecasting).
  - Forecasting avalanche hazards to incorporate regular monitoring and logging of conditions and activities.
  - Restricting access to and/or requiring evacuation of areas during elevated hazard periods.
  - Directing avalanche triggering using hand-charging, helicopter explosives deployment, or Remote Avalanche Control Systems where appropriate.
  - Development of avalanche rescue plans that include employee avalanche awareness training, avalanche rescue training for rescue personnel, avalanche-specific rescue equipment, and detailed procedures.
- Long-term mitigation measures include engineered measures that minimize the frequency or magnitude of avalanche hazards or eliminate them, including:
  - Locating Project structures outside avalanche hazard areas, where possible; when structures must be placed be placed close to the edge of a runout area, an Avalanche Hazard Zone Map would be developed to identify optimal location siting and safe areas for workers to congregate, such as for parking
  - Implementing fencing/snow net systems in avalanche starting zones that can retain and support snow to reduce or eliminate the hazard

  - Implementing retarding mounds, catchment dams/ditches, stopping walls, or deflection berms that can divert, contain, or slow avalanches to reduce or eliminate the hazard

5.1.3 Air Quality

- Air emissions from Project construction or operation would comply with AAAQS and NAAQS.
- Construction contractors would implement air quality controls during construction in accordance with the Project's Title I air permit and the Alaska CGP for stormwater and dust control.
- A dust mitigation plan would be developed based on final Project design and permit conditions.
- Construction contractors would be required to maintain fugitive dust control logs and demonstrate compliance with opacity limits defined under 18 AAC 50.055 and the Project's air quality permit.
- If the PSD permitting process is triggered, the proposed Project, including the power plant would undergo a Best Available Control Technology review to identify feasible emission reduction technologies or operational practices.
- Graphite One would conduct dispersion modeling to demonstrate compliance with the AAAQS. If the Project requires a PSD permit, then Graphite One would also conduct dispersion modeling to demonstrate compliance with the NAAQS and PSD increments. The modeling would be prepared in accordance with EPA's Guideline on Air Quality Models (40 CFR 51, Appendix W), and 18 AAC 50.215.

5.1.4 Noise and Vibration

- Construction contractors would follow Occupational Safety and Health Administration (OSHA) and MSHA noise standards for workers. Construction contractors would require engineering controls and/or personal protective equipment as needed or required by these standards.
- Graphite One would minimize helicopter use during the hunting season based on input from the Subsistence Advisory Council (SAC).
- A Blasting Plan would be prepared that includes mitigation for noise and vibration impacts. All blasting would comply with ADF&G requirements to protect aquatic resources.

5.1.5 Hydrology, Floodplains, and Water Quality

- The proposed WMF would be underlain with a HDPE liner or clay liner, and compacted waste lifts would be designed to prevent infiltration into underlying soils, but ongoing monitoring would be required to detect any evidence of any seepage bypassing the collection system, or liner degradation.
- Groundwater monitoring wells would be installed around the WMF and used to assess the extent and quality of potential seepage plumes. The Project will have a plan to implement corrective measures to protect downstream groundwater should any seepage plumes be detected.
- The WTP would operate continuously during the life of the mine and would continue after mine closure until water quality standards are met. The WTP would be designed to treat up to 1.37 MGD. The treatment process would include lime dosing for pH adjustment, polymer-assisted sedimentation, filtration, and reverse osmosis for nitrate and selenium removal. Treatment goals would meet ADEC’s AWQS criteria.
- The mill would operate as a closed loop system, recycling process water and minimizing reagent discharge to the WMP.
- All water that comes into contact with mine facilities would be collected and reused or treated and discharged.
- Diversion channels would be constructed to limit contact water flowing into the mine pit and WMF, and onto the mill pad and roads.
- Construction contractors would develop an Erosion and Sediment Control Plan (ESCP) prior to construction to establish formal sediment-control strategies for stabilizing areas of soil disturbance and restoring vegetation. Sediment control measures such as silt fences, wattles, fiber rolls, perimeter berms, and detention basins would be installed in accordance with the ADEC CGP.
- The Project would comply with the ADEC Multi-Sector General Permit for stormwater discharges.
- Construction contractors would prepare a SWPPP prior to the start of construction and implement stormwater pollution prevention control measures during construction.
- Areas where grading and fill occur would be stabilized using appropriate BMPs and revegetated with native seed mix within the first growing season following the work.
- All culverts and bridges impacting fish-bearing waters will need ADF&G approval and must comply with ADF&G design standards to protect fish.

- During bridge and culvert installation, appropriate measures, including working during low-flow and winter periods, would be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable.
- Culverts would be sized to reduce maintenance associated with debris clogging, icing, and sediment deposition.
- Culverts would be designed to minimize the potential for backwatering (ponding) at the inlet and scour at the outlet.
- Certain culverts will be equipped with methods of ice thawing in the spring.
- Additional culverts may be installed to reduce or remove the need for ditching the upstream side of the road. These cross-drainage culverts would be placed regularly between stream channels to accommodate sheet flow during storms and provide relief if any stream culverts become partially blocked with debris or exceed capacity.
- Engineered containment and treatment infrastructure would be designed to avoid pollutant loading to downstream environments by managing water that comes into contact with the open pit, haul roads, WMF, mill complex, and laydown areas.
- The gravel staging pad would include stormwater diversion channels, perimeter berms, and designated spill prevention zones to prevent migration of contaminants into Imuruk Basin.
- Explosives storage facilities would require impermeable containment, runoff diversion, and regulatory inspection under applicable Department of Transportation, the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), and MSHA protocols to avoid nitrates and other compounds entering the water treatment process.

5.1.6 Vegetation, Wetlands, and Other Waters of the United States

5.1.6.1 Vegetation

- Construction contractors would develop and implement an Invasive Species Prevention and Management Plan and non-native invasive species management standards.
- Salvaged growth media and topsoil removed during construction would be used for revegetation. Salvaged material would be stored using methods to prevent erosion of the stockpiled salvaged material. Native seed mixes and natural recolonization would be used to the extent practicable in reclamation activities to minimize potential for introducing non-native or invasive species. All native seed mixes will be developed in consultation with ADNR’s Plant Material Center.

- Construction contractors would ensure that all equipment arrives on site clean of invasive species.

5.1.6.2 Wetlands

- The proposed access road route has been designed to avoid and minimize impacts on WOTUS (including EFH) to the maximum extent practicable. Design engineers used field-verified digital wetland mapping to adjust the route throughout the length of the Project access road to avoid WOTUS, move road crossings perpendicular to stream channels, and cross wetlands at the narrowest possible point in consideration of topography and design criteria constraints.
- The dimensions of the road would be the minimum required to meet the overall Project purpose and MSHA regulations.
- The proposed mine layout would be minimized to the greatest extent practicable to meet the overall Project purpose.
- Access road material sites and access spur roads would be sited in uplands to the maximum extent practicable.
- Existing drainage patterns would be maintained; properly sized and designed culverts would be used in appropriate locations to maintain the natural flow patterns and timing of surface water inflows to adjacent wetlands and waters.
- Affected wetlands outside the fill footprint would be restored to pre-existing conditions (hydrology, grade, vegetation) to the extent practicable to minimize subsidence, scarring, and habitat alteration.
- Wetlands would be protected from construction-generated sediment and pollutants (i.e., soil sediments, fuels, grease, oil) through the implementation of appropriate BMPs to avoid and minimize water quality degradation.
- Construction contractors would not fuel or service vehicles or equipment within 100 feet of wetlands or fish-bearing streams. All fuel will be stored a minimum of 100 feet from any waterbody and will be stored in double walled tanks and a lined containment in tank volumes minimized to suit the work.
- Appropriate erosion control measures would be used that have minimal additional habitat impacts (e.g., weed-free gravel, weed-free erosion control materials, erosion control materials without plastic mesh netting).
- Industry-standard matting would be used when appropriate during construction to help protect wetland vegetation by dispersing equipment weight. Construction contractors

would ensure matting arrives on site clean (i.e., free of invasive species) and is properly cleaned between uses.

5.1.7 Fish, Essential Fish Habitat, and Invertebrates

- Earthwork and bridge pier construction would adhere to fish timing windows to avoid impacts on salmonids.
- Crossings of anadromous streams would be built to USFWS Culvert Design Standards for Ecological Function, and to ADF&G requirements.
- Properly sized and designed culverts would be installed to minimize impacts on fish in fish-bearing streams and would be permitted according to ADF&G Title 16 guidelines. Fish passage culvert diameters would be sized to convey peak 100-year flows.
- ADF&G would determine timing windows during which in-water work in fish streams would be authorized to minimize potential impacts on sensitive fish life stages such as spawning and/or migration periods. Timing windows for in-water work would be incorporated into the construction schedule.
- Construction activities would not result in a migration barrier for resident or anadromous fish. Fish passage would be maintained through ADF&G-approved methods.
- Construction contractors would not fuel or service vehicles or equipment within 100 feet of fish-bearing streams. Fuel would be stored a minimum of 100 feet from any waterbody.
- Construction contractors would comply with ADNR Temporary Water Use Authorizations and Water Rights to monitor water withdrawal rates and volumes as well as avoid withdrawal impacts on fish and fish habitat.

5.1.8 Birds, and Terrestrial and Marine Mammals

- A Wildlife Interaction Plan would be developed in conjunction with the Plan of Operations. The goal of the plan would be to minimize human-wildlife interactions and resolve potential conflicts. This would be done through identifying potential conflicts and acceptable preventative measures. The plan would include education and training for Project personnel and contractors, procedures for reporting wildlife sightings and interactions, and potential deterrence and hazing methods.
- Graphite One would coordinate with USFWS prior to construction to avoid and minimize impacts on nesting eagles in compliance with the BGEPA.
- Raptor nest surveys would be conducted at least once annually during pre-construction and active construction. Blasting would not take place within 0.5 mile of an active nest.

- Construction contractors would perform vegetation-clearing and ground-disturbing activities in accordance with USFWS timing recommendations to limit impacts on nesting birds.
- Graphite One would work with local reindeer herders to coordinate crossings of the Mosquito Pass access road for reindeer during seasonal migrations.
- Graphite One would establish and maintain gaps in the road berm and snow berms to allow moose a travel way off of the access road.
- Graphite One will establish communication protocols for access road drivers to alert other vehicles of wildlife presence.
- The access road will be closed to the general public, and Project employees would be prohibited from hunting from Project facilities and during their work hours.

5.1.9 Threatened and Endangered Species

- USACE and Graphite One would coordinate with USFWS and NMFS through the ESA Section 7 consultation process and adhere to agreed-upon mitigation measures. Potential mitigation measures could include:
    - Maintaining a watch for ESA-listed marine mammals while underway (e.g., through the use of Protected Species Observers or dedicated crew members), and
    - Vessel speed restrictions, where applicable.

5.1.10 Visual and Aesthetic Resources

- BMPs would include minimizing and directing artificial lights on tall equipment and structures.
- Project facilities would use inward- and downward-directed lighting to reduce the extent of illumination impacts.
- Project facilities would use exterior building colors that have a low contrast with the adjacent vegetation.

5.1.11 Recreation

- Ramps would be installed at several locations along the Mosquito Pass access road for subsistence access and snowmachine crossings. Graphite One would coordinate with local community members and SAC members to identify the ramp locations.

5.1.12 Cultural Resources

- Cultural resources within the APE that cannot be avoided by Project design would be evaluated for NRHP eligibility. If historic properties (i.e., cultural resources eligible for or listed in the NRHP) may be affected by Project activities, then the lead federal agency, in consultation with the SHPO and Tribes, would develop measures to avoid, minimize, or mitigate any adverse effects.
- Graphite One anticipates that a Section 106 Programmatic Agreement or Memorandum of Agreement would be prepared for the Project that would stipulate the agreed-upon mitigation measures, outline roles for the respective responsible parties for implementation of the agreement, and include required protocols such as an Unanticipated Discovery Plan. This plan would be tailored to Project construction activities, and staff would be trained on the procedures to follow if cultural resources are encountered.

5.1.13 Subsistence and Traditional Use

- Graphite One would minimize impacts on subsistence through relocation of mine facilities out of the Cobblestone drainage, which is an important subsistence area for local communities.
- Graphite One would implement a no hunting/fishing policy for employees at work sites to minimize competition between employees and local residents for resources.
- Project-related air traffic would be limited to the extent possible during the fall hunting season to minimize disturbance to large land mammals and hunters.
- Ramps would be installed at several locations along the Mosquito Pass access road for subsistence access and snowmachine crossings. Graphite One would coordinate with local community members and SAC members to identify the ramp locations.
- Graphite One would continue to coordinate with the SAC during construction and operation.

5.1.14 Socioeconomics

- Graphite One has entered into agreements with the BSNC to maximize the local workforce and contribute funds for locals to attend training programs.
- Graphite One would institute a hiring preference for BSNC shareholders and descendants as well as local residents of Nome, Teller, and Brevig Mission.
- BSNC subsidiaries and local businesses would be given priority for delivering goods and services necessary to support the Project.

- Graphite One would continue to contribute to the Graphite One-BSNC community project funds for Teller and Brevig Mission, which would support community infrastructure improvements.

5.1.15 Human Health and Safety

- Workers at the mine would be subject to pre-employment, post-incident, and random drug testing consistent with mining industry standards.
- Graphite One would establish safety training and operating policies and practices that meet or exceed the requirements of MSHA.

5.2 Operation Phase Best Management Practices, and Avoidance and Minimization Measures

The following describes BMPs as well as avoidance and minimization measures that would be implemented during the operation phase of the Project in addition to those described in Section 5.1 Preconstruction and Construction Phase General and Project-Wide Best Management Plans and Avoidance/Minimization Measures.

5.2.1 Paleontology

- Employees would be restricted from collecting paleontological resources.
- Any paleontological resources found during operation of the Project would be reported to the ADNR, Office of History and Archaeology.

5.2.2 Geomorphology, Permafrost, and Soils

- Graphite One would develop and maintain an Avalanche Hazard Mitigation Plan which would include measures to protect and maintain the Graphite Creek diversion structure from avalanche debris.
- Topsoil and overburden muck, not promptly redistributed to an area being reclaimed, would be separated and stockpiled for future use. This material would be protected from erosion and contamination by acidic or toxic materials and would not be buried by broken rock.

5.2.3 Air Quality

- To minimize fugitive dust-related impacts, Graphite One would implement control measures that may include application of water or calcium chloride-based dust suppressants, enforcement of vehicle speed limits, stabilization of stockpiles and road surfaces, and routine inspection of high-traffic areas for dust generation. These measures would be documented in fugitive dust control plans submitted as part of the Project's air quality permit.

- Air quality controls during operation would be implemented under the Project's Title I air permit and the Alaska CGP for stormwater and dust control. Mitigation measures could include application of water or dust suppressants, vehicle speed restrictions, stabilization of roadbeds and storage areas, and visual monitoring of high-traffic zones. Measures could also include stabilized entry points, truck washing facilities to prevent track-out, covered truck beds, and reduced activities during high-wind conditions.
- Graphite One would be required to maintain fugitive dust control logs and demonstrate compliance with opacity limits defined under 18 AAC 50.070 and the Project's air quality permit. If site conditions or operational data suggest that dust levels exceed acceptable thresholds, ADEC may require additional mitigation measures or real-time particulate monitoring near sensitive locations.
- To limit emissions, the processing facilities may be equipped with high-efficiency particulate collection systems, such as baghouses or cartridge filters, particularly at crushing and drying units. Enclosed conveyors, transfer points, and negative-pressure ventilation systems would further reduce the release of graphite fines to ambient air.
- Graphite ore concentrate would be transported from the mine and shipped in lined containers designed to eliminate the potential for dust leaving the container.

5.2.4 Hydrology, Floodplains, and Water Quality

- The Project would comply with ADNR Temporary Water Use Authorizations and Water Rights to monitor water withdrawal rates and volumes as well as avoid withdrawal impacts on fish and fish habitat.
- Water discharge would be governed by the APDES permit issued by ADEC. The permit would establish numerical effluent limits, monitoring requirements, and reporting obligations for treated contact water released to Glacier Canyon Creek.
- Culverts and ditches would be inspected regularly to prevent sediment buildup, erosion at outlets, deformation from frost heave or thawing permafrost, ice blockage, slope slumping, and outlet erosion.
- Graphite One would implement SWPPPs and ESCPs that follow industry standards to mitigate sediment transfer and erosion.
- Graphite One would implement revegetation, watering, and dust suppressants to control fugitive dust.

- Secondary containment would be used to store all fuel and hazardous chemicals to avoid potential releases from handling, tank failures, and/or stormwater contamination.
- Graphite One would develop and maintain Oil Discharge Prevention and Contingency Plans; Spill Prevention, Control, and Countermeasure Plans; and Facility Response Plans.
- Graphite One would ensure consistent monitoring of the seepage collection system at the tailings storage facility and at downgradient monitoring wells. Graphite One will have an action plan with corrective measures to protect groundwater quality should any unanticipated seepage bypass the collection systems.

5.2.5 Vegetation, Wetlands, and Other Waters of the United States

- Surfaces would be progressively reclaimed throughout operation. Sediment controls would include site grading, capping of erodible material, revegetating, preserving native vegetation, stockpiling topsoil for restoration activities, and removing trash and debris.

5.2.6 Cultural Resources

- An Unanticipated Discovery Plan would be prepared for Project operational activities, and staff would be trained on the procedures to follow if cultural resources are encountered.

5.2.7 Subsistence and Traditional Use

- Graphite One and the SAC would continue to meet throughout mine operations and exchange information in an effort to minimize impacts on subsistence resources and traditional uses.
- Graphite One would coordinate with the SAC as needed on the placement and maintenance of the access road ramps so they are functioning as intended and meeting the communities' needs.

5.2.8 Socioeconomics

- Graphite One would avoid adverse impacts from the Project on Nome's housing shortage by constructing a subdivision of single- and multi-family homes and apartments for the Project's Nome-based employees. Camp-style accommodations would be developed to house village residents traveling to the area for work.

5.2.9 Human Health and Safety

- All commercial truck drivers, including those hired by contractors, would undergo the necessary training to obtain their Commercial Driver's License and operate under safety regulations associated with licensure.
- The proposed Mosquito Pass access road would be private and subject to a speed limit appropriate for design. Additionally, workers would be transported from Nome to the mine site via bus or van, further reducing the number of vehicles traveling to and from the mine site as well as the potential for incidents.
- Commercial road traffic will be speed monitored either manually or using electronic monitoring systems to ensure safe operating practices on both the access and public roads.
- The risks of exposure to hazardous materials would be managed and mitigated through regulatory requirements such as right-to-know, safety, and hazardous material handling and accidental release training. Any hazardous materials used during construction would follow local, state, and federal regulations for storage and handling, and Graphite One would develop health and safety plans.
- Graphite One would maintain appropriate screening, acceptance, storage, and transport plans for dangerous cargo.
- A nurse or medic would be available on site; an on-site ambulance would provide transport to the NSHC Regional Hospital; and air ambulance services are also available at the hospital. An on-site emergency response team and fire protection system would be provided at the mine site. The fire protection system would include a dedicated fire-water system storage tank and distribution network, hose stations, portable fire extinguishers, mine water trucks, and fire trucks.
- Bear guards will be used on an as needed basis to minimize interactions and protect field workers.
- Graphite One would have emergency housing at the mine for employees should they be unable to return to Nome from the mine site due to severe weather or an avalanche event.
- Graphite One would ensure cultural sensitivity training and employment standards for all employees.
- All prospective employees would be required to pass a criminal background check.
- Social awareness campaigns and driver safety education would be considered on an as-needed basis.

- Graphite One would comply with federal MSHA and OSHA regulatory employee protection measures.
- Graphite One would develop a drug and alcohol policy that would apply to all mine workers and will include pre-employment, post-incident, and random drug testing.

5.3 Closure/Post-Closure Phase Best Management Plans, and Avoidance and Minimization Measures

Final closure details would be described in the Reclamation and Closure Plan and would be subject to approval by ADNR. Listed below are BMPs as well as avoidance and minimization measures that would be incorporated into the Reclamation and Closure Plan, with additional measures added as required by ADNR.

5.3.1 Geomorphology, Permafrost, and Soils

5.3.1.1 Seismic

- Graphite One would develop a design for closure that ensures the Graphite Creek diversion structure, pit, and WMF would maintain structural integrity under projected seismic or avalanche conditions following closure. Post-closure monitoring would involve inspections for mass stability and monitoring for seepage flow.

5.3.1.2 Soils/Permafrost

- Graphite One would prepare a Reclamation and Closure Plan in accordance with ADNR requirements. The plan would include long-term monitoring as well as soil and permafrost management of the site.
- At closure, Graphite One would ensure the Project footprint is regraded to the extent possible, spread with salvaged topsoil, and revegetated according to permit requirements, and generally stabilized to prevent erosion.
- Graphite One would ensure monitoring of the ground temperature beneath the WMF and other reclaimed surfaces to assess long-term permafrost stability.
- Graphite One will be required to post a financial assurance (bond) to ensure that the State has the financial resources to reclaim the mine site and continue monitoring and water management should Graphite One not be able to do so.

5.3.2 Hydrology, Floodplains, and Water Quality

- Post-closure monitoring requirements specified by ADEC and ADNR as part of the approved Reclamation and Closure Plan would be implemented and could include groundwater sampling at perimeter wells and downgradient aquifers; surface water quality and flow monitoring at all discharge locations; and routine inspections of pit lake elevation, reclaimed slopes, culverts, and embankments.

- Surface water control features around the WMF, including stormwater ditches and outlet channels, would remain in place to ensure that precipitation does not accumulate against reclaimed embankments or contribute to slope instability. Over time, these drainage features would transition from active stormwater systems to passive channels but would still require inspection for erosion, blockages, or thermokarst-related deformation. Maintenance of these features would be included in the site's long-term monitoring and Reclamation and Closure Plan, with documentation provided to regulatory agencies as part of scheduled permit reviews.
- Groundwater monitoring wells located around the WMF would be used to assess the extent and quality of potential seepage plumes. If data indicate that containment performance is degrading or that water quality is declining, contingency actions such as retrofitting sumps, operating pump-back wells, re-establishing drainage slopes, or installing passive treatment systems may be implemented.
- Graphite One would ensure routine sampling of the pit lake surface and deep water to evaluate stratification, pH, and metal concentrations; this sampling would be conducted according to the Reclamation and Closure Plan.
- Graphite One would ensure groundwater sampling at upgradient and downgradient wells around the WMF to track plume migration would be conducted according to the Reclamation and Closure Plan.
- Graphite One would ensure flow and chemistry monitoring of residual seepage collection and treated discharge would be conducted according to the Reclamation and Closure Plan.
- Graphite One would ensure geotechnical and hydrologic inspections of capped facilities, diversion structures, and culverts would be conducted according to the Reclamation and Closure Plan.
- Graphite One would ensure periodic inspections of the Graphite Creek diversion structures would be performed to check for sediment accumulation, culvert integrity, and structural deformation due to freeze-thaw cycles and avalanches.
- Graphite One would ensure the Project follows appropriate bonding/financial assurance procedures for closure activities, as well as post-closure monitoring. Graphite One will be required to post a financial assurance (bond) to ensure that the State has the financial resources to reclaim the mine site and continue monitoring and water management should Graphite One not be able to do so.

6 References

ABR, Inc. Environmental Research & Services

2024a *Graphite Creek Water Quality Surveys, 2023: Final Report*. Prepared for Graphite One Inc. and Tundra Consulting, LLC, by ABR, Inc. – Environmental Research & Services, *Anchorage*, Alaska. May 2024.Forster, Caitlin E., and John C. Seigle

2024b *Graphite Creek Water Quality Surveys, 2024*. Prepared for Graphite One Inc. and Tundra Consulting, LLC, by ABR, Inc. – Environmental Research & Services, Anchorage, Alaska. December 2024

ACCS (Alaska Center for Conservation Science)

2023 Alaska Vegetation and Wetland Composite. Accessed February 26, 2025, at https://accscatalog.uaa.alaska.edu/dataset/alaska-vegetation-and-wetlandcomposite.

2025a Non-Native Plant Species List. Accessed on February 26, 2025, from https://accs.uaa.alaska.edu/invasive-species/non-native-plant-species-list/.

2025b ACCS Rare Plant Data. Obtained June 2025.

2025c Alaska Natural Heritage Program (AKNHP) Wildlife Conservation Data Portal. Accessed June 1, 2025, at https://biotics.aknhp.axds.co/#map?lg=5d60b854-cfd0-11e3-a3a1-00219bfe5678&z=4&ll=60.00000%2C-150.00000.

ADEC (Alaska Department of Environmental Conservation)

1998 *Alaska's PM2.5 Monitoring Network Description*. Final, June 25, 1998. Updated July 2, 1998. State of Alaska Department of Environmental Conservation, Air and Water Quality Division, Air Quality Improvement Section.

2011 *Overview of Alaska and Air Quality.* Adopted February 11, 2011.

2018 *Prevention of Significant Deterioration (PSD) Annual Data Report Format*.

2022a *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances*. As amended through September 8, 2022. Anchorage, Alaska.

2022b *Alaska Regional Contingency Plan.* Version 2. February 15, 2022. Prepared by the Alaska Regional Response Team (ARRT). Anchorage, Alaska.

2024 *Alaska Water Quality Standards, 18 AAC 70.*

2025a *Alaska Air Quality Control Regulations, 18 AAC 50.* Effective December 14, 2024. ADEC Division of Air Quality.

2025b *Air Quality Monitoring Network Plan.* ADEC Division of Air Quality.

2025c *Alaska Water Quality Standards, 18 AAC 70*. Amended January 8, 2025. Juneau, Alaska.

2025d *Alaska Integrated Water Quality Monitoring and Assessment Report (2024), Final Report.* Approved February 6, 2025.

ADF&G (Alaska Department of Fish and Game)

No Date-a Norton Sound-Port Clarence Management Area: Subsistence Fishing. Available at https://www.adfg.alaska.gov/index.cfm?adfg=ByAreaSubsistenceNortonSound.main.

No Date-b Community Subsistence Information System (CSIS). Available at https://www.adfg.alaska.gov/sb/CSIS/.

No Date-c Small Game Hunting in Alaska, Small Game Species – Rock Ptarmigan. Accessed August 2025 at https://www.adfg.alaska.gov/index.cfm?adfg=smallgamehunting.rockptarmigan.

No Date-d Small Game Hunting in Alaska, Small Game Species – Willow Ptarmigan. Accessed August 2025 at https://www.adfg.alaska.gov/index.cfm?adfg=smallgamehunting.willowptarmigan.

No Date-e Teller Highway. Accessed August 2025 at https://www.adfg.alaska.gov/index.cfm?adfg=viewinglocations.tellerhighway.

No Date-f Kougarok Road (Nome–Taylor Highway). Accessed August 2025 at https://www.adfg.alaska.gov/index.cfm?adfg=viewinglocations.kougarokroad.

1978 Sheefish Life History and Habitat Requirements Arctic, Western, and Interior Regions.

2015 *2015 Alaska Wildlife Action Plan*. Juneau, Alaska.

2018 *Subsistence in Alaska: A Year 2017 Update*. ADF&G Division of Subsistence. Anchorage, Alaska. Available at https://www.adfg.alaska.gov/static/home/subsistence/pdfs/subsistence_update_2017.pdf.

2025a Invasive species. Accessed February 6, 2025, at https://www.adfg.alaska.gov/index.cfm?adfg=invasive.main.

2025b Species found in Alaska. Accessed July 1, 2025, at https://www.adfg.alaska.gov/index.cfm?adfg=animals.listall.

2025c Kittlitz's Murrelet Species Profile. Accessed July 28, 2025, at https://www.adfg.alaska.gov/index.cfm?adfg=kittlitzmurrelet.main.

2025d Ermine (*Mustela erminea*) Species Profile. Accessed July 26, 2024, at https://www.adfg.alaska.gov/index.cfm?adfg=ermine.main.

2025e American Mink (*Neovison vison*). Accessed July 26, 2024, at https://www.adfg.alaska.gov/index.cfm?adfg=americanmink.main.

2025f Wolverine (*Gulo gulo*) Species Profile. Accessed July 24, 2024, at https://www.adfg.alaska.gov/index.cfm?adfg=wolverine.main.

2025g *2025–2026 Alaska Hunting Regulations*. Accessed August 5, 2025, at https://www.adfg.alaska.gov/static/regulations/wildliferegulations/pdfs/gmu22.pdf.

2025h Alaska's Owls. Short-eared owls. Access on July 1, 2025, at https://www.adfg.alaska.gov/index.cfm?adfg=owls.short_eared

ADL&WD (Alaska Department of Labor and Workforce Development)

2020 Nome Census Area Map. Accessed at https://live.laborstats.alaska.gov/sites/default/files/maps/Nome_Census_Area-02180.pdf.

2024 Alaska Population Projections 2023 to 2050. July 2024. Accessed at https://live.laborstats.alaska.gov/pop/projections/pub/popproj.pdf.

ADNR (Alaska Department of Natural Resources)

2008 *Northwest Area Plan for State Lands*. ADNR, Division of Mining, Land, and Water Resource Assessment and Development Section. Adopted October 2008. Accessed May 29, 2025, at https://dnr.alaska.gov/mlw/planning/areaplans/northwest/.

2022a Alaska's Statewide Comprehensive Outdoor Recreation Plan 2023-2027. ADNR, Division of Parks and Outdoor Recreation. December 2022.

2022b Land Administration System, Case File No. 13862 (Reindeer Grazing Permit). ADNR, Land Administration System. Accessed May 19, 2025, at https://dnr.alaska.gov/projects/las/#filetype/LAS/filenumber/13862/landflag/y/searchtype/casefile/reporttype/summary.

2024 Fact Sheet: Generally Allowed Uses (as per 11 AAC 96.020). June 2024.

AKEPIC (Alaska Exotic Plant Information Clearinghouse)

2025a AKEPIC database. Alaska Center for Conservation Science, University of Alaska, Anchorage. Accessed February 26, 2025, at https://akepic.accs.axds.co.

2025b Alaska Elodea Survey Map Viewer. AKEPIC, Alaska Center for Conservation Science, University of Alaska, Anchorage. Accessed February 26, 2025, at https://accs.uaa.alaska.edu/invasive-species/non-native-plants/.

Alpine Solutions

2024 Snow Avalanche Hazard Assessment for the Graphite Creek Project. V.20240614. June 14, 2024.

Alt, K.T.

1973 Contributions to the Biology of Bering Cisco (*Coregonus Laurettae*) in Alaska. Alaska Department of Fish and Game. *J. Fis. Res. Board Con.* 30: 1885-1888

Arctos Database

2025 ARCTOS cooperatively managed specimen database, facilitated by the University of Alaska Fairbanks and University of California Davis. Accessed June 13, 2025, at http://arctos.database.museum/.

Arrobas, D.L., K.L. Hund, M.S. McCormick, J. Ningthoujam, and J.R. Drexhage

2017 The Growing Role of Minerals and Metals for a Low Carbon Future (English). Washington, D.C. World Bank Group. Available at http://documents.worldbank.org/curated/en/207371500386458722

Audubon

2025 *Guide to North America Birds*. Accessed July 1, 2025, at https://www.audubon.org/field-guide.

Auerbach, N.A., M.D. Walker, and D.A. Walker

1997 Effects of roadside disturbance on substrate and vegetation properties in Arctic tundra. *Ecological Applications* 7(1):218–235.

Barr (Barr Engineering Co.)

2025 *Graphite Creek Project NI 43-101 Technical Report and Feasibility Study Seward Peninsula, Alaska*. Prepared for Graphite One Inc. March 25, 2025.

2026 *Tailings Deposition Alternatives*. Graphite Creek. Prepared for Graphite One Inc. February 2026.

Barton, L.H.

1978 *Finfish Resource Surveys in Norton Sound and Kotzebue Sound*. ADF&G, Final Report AYK Region Herring Report #8.

Belant, J.L., B. Griffith, Y. Zhang, E.H. Follmann, and L.G. Adams

2009 Population-level resource selection by sympatric brown and American black bears in Alaska. *Polar Biology* 33:31–40.

BLM (Bureau of Land Management)

No Date Alaska Wild Berries Infographic. Accessed at https://www.blm.gov/sites/blm.gov/files/docs/2021-08/AK-Wild-Berries-Infographic.pdf.

2006 *Kobuk-Seward Peninsula Resource Management Plan and Environmental Impact Statement*. April 2006.

2007 *Kobuk-Seward Peninsula Resource Management Plan and Final Environmental Impact Statement*. Volume 2. Available at https://eplanning.blm.gov/public_projects/lup/66967/132959/162523/Kobuk-Seward_Peninsula_Proposed_RMP-Final_EIS_Volume_2_part_1.pdf.

2008 *Reindeer Grazing Permits on the Seward Peninsula*. Environmental Assessment: DOI-BLM-AK-010-2009-0007-EA. December 2008. Available at https://www.blm.gov/sites/blm.gov/files/uploads/Program_Rangelands-Grazing_Reindeer_Grazing_Permits_Seward_Peninsula_EA2007.pdf.

2012 *Seward Peninsula – Nulato Hills – Kotzebue Lowlands Rapid Ecoregional Assessment*. Final Report II-3-c. October 2012

2016 *Potential Fossil Yield Classification system*. BLM Instruction Memorandum No. 2016-124 (PFYC revised from BLM 2007).

BLS (U.S. Bureau of Labor Statistics)

2024a Incidence rates of nonfatal occupational injuries and illnesses by selected industries and case types, Alaska, 2023. BLS, U.S. Department of Labor, Survey of Occupational Injuries and Illnesses in cooperation with participating state agencies, November 14, 2024.

2024b Fatal occupational injuries by industry and event or exposure, Alaska, 2023. BLS, U.S. Department of Labor, in cooperation with state, New York City, District of Columbia, and federal agencies, Census of Fatal Occupational Injuries. December 19, 2024.

Bogart, B.

2025 Email communication with Community Liaison Blake Bogart regarding recreation activities in the Proposed Action Area. August 7, 2025.

Bogle S.E.

2022 *2021 Alaska Trapper Report: 1 July 2021 – 30 Jume 2022*. Wildlife Management Report ADF&G/DWC/WMR-2022-1. ADF&G, Division of Wildlife Conservation. Juneau, Alaska.

2023 *2022 Alaska Trapper Report: 1 July 2022 – 30 June 2023*. Wildlife Management Report ADF&G/DWC/WMR-2023-3. ADF&G, Division of Wildlife Conservation. Juneau, Alaska.

Booms, T.L., G.L. Holyrod, M.A. Gahbauer, H.E. Trefry, D.A. Wiggins, D.W. Holt, J.A. Johnson, S.B. Lewis, M.D. Larson, K.L. Keyes, and S. Swengel

2014 Assessing the Status and Conservation Priorities of the Short-Eared Owl in North America. *The Journal of Wildlife Management* 78(5):772–778. ODI:10.1002/jwmg.719.

Boreal

2025 *Graphite Creek Meteorological Monitoring Program. 2024-2025 Annual Data Report*. Prepared for Graphite One, Inc. June 2025.

Boveng, P.L., J.L. Bengtson, M.F. Cameron, S.P. Dahle, E.A. Logerwell, J.M. London, J.E. Overland, J.T. Sterling, D.E. Stevenson, B.L. Taylor, and H.L. Ziel

2013 *Status review of the ribbon seal (Histriophoca fasciata)*. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-AFSC-255.

Brailey (Brailey Hydrologic Consultants)

2025 *2025 Stream Gauging Report, Graphite Creek Project*. Prepared for Tundra Consulting. December 2025.

Brailey and Tundra (Brailey Hydrologic Consultants and Tundra Consulting LLC)

2026 *2024–2025 Tidal Discharge Monitoring, Tuksuk Channel, Graphite Creek Project*. January 2026.

Brigham, L., M. Cerne, K. Cole, N. Durham, A. Fish, C. Johnson, M. McCammon, R. Meehan, S. Montoya, T. Newbury, J. Overland, R. Pawlowski, G. Sheffield, and M. Wang
2008 Bering Strait Region Case Study. Institute of the North. https://pame.is/images/03_Projects/AMSA/AMSA_Background_Research_Docs/Scenarios/5.5-Bering-Strait-Region-Case-Study.pdf.

Brownell, R.L., P.J. Clapham, T. Miyashita, and T. Kasuya
2001 Conservation status of North Pacific right whales. *The Journal of Cetacean Research and Management* (Special Issue 2):269–286.

BSNC (Bering Straits Native Corporation)
No Date Port Clarence webpage. Bering Straits Native Corporation website. Accessed July 29, 2025, at https://beringstraits.com/port-clarence/.

BTS (Bureau of Transportation Statistics)
2025 TranStats, Nome, AK: Nome Airport (OME). April 2025. Accessed August 2025 at https://www.transtats.bts.gov/airports.asp?20=E&Nv42146=bZR&Nv42146_anzr=a1zr,%20NX:%20a1zr%20Nv42146&pn44vr4=SNPgf.

Burns, J.J., and K.J. Frost
1979 *The Natural History and Ecology of the Bearded Seal, Erignathus barbatus*. Environmental Assessment of the Alaskan Continental Shelf, Final Reports 19:311–392.

Caltrans (California Department of Transportation)
2016 *Technical Guidance for Assessment and Mitigation of the Effects of Highway and Road Construction Noise on Birds*. June (Contract 43A0306.) Sacramento, California. Prepared by ICF International, Sacramento, California; Robert Dooling, Gaithersburg, Maryland; and Arthur Poppy, Silver Spring, Maryland.

Carey, M.P., S.A. Sethi, S.J. Larsen, and C.F. Rich
2016 A primer on potential impacts, management priorities, and future directions for Elodea spp. in high latitude systems: learning from the Alaskan experience. *Hydrobiologia* 777.1(2016):1–19.

Carlson, M.L., M. Aisu, E.J. Trammell, J.R. Fulkerson, D. Merrigan, and T. Nawrocki
2016 Section D. Biotic Change Agents. In *Central Yukon Rapid Ecoregional Assessment,* edited by E.J. Trammell, T. Boucher, M.L. McTeague, J. Reimer, and J. Schmidt. Prepared for the U.S. Department of the Interior, BLM. Anchorage, Alaska.

Carmona, R., N. Arce, V. Ayala-Perez, A. Hernandez-Alvarez, J.B. Buchanan, L.J. Salzer, P.S. Tomkovich, J.A. Johnson, R.E. Gill Jr, B.J. McCaffery, J.E. Lyons, L.J. Niles, and D. Newstead
2013 Red Knot *Calidris canutus roselaari* migration connectivity, abundance, and non-breeding distribution along the Pacific coast of the Americas. *Wader Study Group Bulletin* 120(3):168–180.

Case, G.N.D., S.M. Karl, S.P. Regan, C.A. Johnson, E.T. Ellison, J.S. Caine, C.S. Holm-Denoma, L.S. Pianowski, and J.H. Marsh
2023 Insights into the metamorphic history and origin of flake graphite mineralization at the Graphite Creek graphite deposit, Seward Peninsula, Alaska, USA. *Miner Deposita* 58:939–962. Available at https://doi.org/10.1007/s00126-023-01161-3.

Casper, B.M., A.N. Hopper, F. Matthews, T.J. Carlson, and M.B. Halvorsen.
2012 Recovery of barotrauma injuries in Chinook salmon, *Oncorrhynchus tshawytcha*, from exposure to pile driving sound. *PloS One* 7(6):e39593.

Castellote, M., R.J. Small, J. Mondragon, J. Jenniges, and J.P. Skinner
2016 *Seasonal distribution and foraging behavior of Cook Inlet belugas based on acoustic monitoring*. ADF&G, Final Wildlife Research Report, ADF&G/DWS/WRR-2016-3. Juneau, Alaska.

Center for Biological Diversity
2024 Petition to List the Alaskan Glacier Buttercup (*Ranunculus glacialis subsp. alaskensis*) as Threatened or Endangered Under the Endangered Species Act and to Concurrently Designate Critical Habitat. February 1, 2024.

Citta, J.J., L. Quakenbush, and C. George
2020 Distribution and behavior of Bering-Chukchi-Beaufort bowhead whales as inferred by telemetry. In *The Bowhead Whale: Balaena mysticetus: biology and human Interactions*, J.C. George and J.G.M.H. Thewissen, editors, pp. 31–56. Elsevier Science & Technology, San Diego, California.

CIM
2014 *CIM Definition Standards for Mineral Resources and Mineral Reserves*. Available at https://mrmr.cim.org/media/1128/cim-definition-standards_2014.pdf.

Clay, R.P., A.J. Lesterhuis, and O. Johnson
2010 *Conservation Plan for the American Golden-Plover (Pluvialis Dominica)*. Version 1.1. Manoment Center for Conservation Sciences. Manoment, Massachusetts.

Coats, R.R.
1944 *Graphite deposits on the north side of the Kigluaik Mountains, Seward Peninsula, Alaska*. U.S. Geological Survey Open-File Report 10. Available at https://dggs.alaska.gov/pubs/id/10414.

Cobb, J.N.
1927 *Pacific Cod Fisheries*. Bureau of Fisheries Document No. 1014. Department of Commerce Bureau of Fisheries.

Cornell Lab of Ornithology
2025 *All About Birds Field Guide*. Accessed June 9, 2025, at https://www.allaboutbirds.org/guide/.

Conger, A.O., and J. Magdanz
1990 *The Harvest of Fish and Wildlife in Three Alaska Communities: Brevig Mission, Golovin, and Shishmaref*. Technical Paper No. 188. ADF&G, Division of Subsistence, Juneau, Alaska, and USFWS, Anchorage, Alaska. February 1990. Available at https://www.adfg.alaska.gov/download/Technical%20Papers/tp188.pdf.

Day, R.H., A.E. Gall, A.K. Prichard, G.J. Divoky, and N.A. Rojek
2011 The Status and Distribution of Kittlitz's Murrelet *Brachyramphus brevirostris* in Northern Alaska. *Marine Ornithology* 39:53–63.

DOI (U.S. Department of the Interior)
No Date Federal Subsistence Board webpage. Available at https://www.doi.gov/subsistence/board.
2024 Federal Subsistence Management Regulations for the Harvest of Wildlife on Federal Lands in Alaska. Available at https://www.doi.gov/media/document/wildlife-regulations-book-2024-2026.

DOT&PF (Alaska Department of Transportation and Public Facilities)
No Date Alaska Traffic Data produced by Drakewell. Accessed August 2025 at https://alaskatrafficdata.drakewell.com/publicmultinodemap.asp.
2024 KABCO Values Effective April 1, 2024. Developed by DOT&PF.
2025 Alaska Crash Data V3. Data provided by DOT&PF.

DPS (Alaska Department of Public Safety)
No Date-a C Detachment webpage. DPS, Alaska State Troopers website. Accessed May 2025 at https://dps.alaska.gov/AST/CDetachment/Home.
No Date-b Fire Department Registration Status webpage. DPS, Fire and Life Safety website. Accessed May 2025 at https://dps.alaska.gov/Fire/FDRegistrationStatus.
2023 Crime in Alaska 2022. Uniform Crime Reporting Program Summary Reporting System Annual Report. October 2023. Accessed at https://dps.alaska.gov/getmedia/143c5db6-6206-4fd8-b45e-7a0cbb7f611e/Crime-in-Alaska-2022.

Earnst, S.L.
2004 *Status Assessment and Conservation Plan for the Yellow-billed Loon (Gavia adamsii)*. Scientific Investigations Report 2004-5258. U.S. Geological Survey.

eBird
2019 Explore eBird. Accessed June 1, 2025, at https://ebird.org/explore.

Eccles, D.R., S. Nicholls, and R. Hough
2015 *Indicated and inferred mineral resource estimate at the Graphite Creek Property, Alaska, United States*. Technical Report. Prepared for Graphite One Resources, Inc. March 17, 2015.

EPA (U.S. Environmental Protection Agency)
1981 *Noise Effects Handbook*. July 1981. Published by the National Association of Noise Control Officials. Fort Walton Beach, Florida.
2000 *Meteorological Monitoring Guidance for Regulatory Modeling Applications*. EPA-454/R-99-005. EPA, Office of Air Quality Planning and Standards. February 2000. Available at https://www.epa.gov/sites/default/files/2020-10/documents/mmgrma_0.pdf.
2025a *National Ambient Air Quality Standards (NAAQS) Table.* Last updated July 31, 2025. Washington, D.C. Available at https://www.epa.gov/naaqs.
2025b *Region 10 (Pacific Northwest).* Washington, D.C. Available at https://www.epa.gov/aboutepa/epa-region-10-pacific-northwest.

Erbe, C., M.L. Dent, W.L. Gannon, R.D. McCauley, H. Romer, B.L. Southall, A.L. Stansbury, A.S. Stoeger, and J.A. Thomas
2022 The Effects of Noise on Animals. In *Exploring Animal Behavior Through Sound: Volume 1*. doi.org/10.1007/978-3-030-97540-1_13.

ERM (ERM Alaska, Inc.)
2020 *Final Surface Water Hydrology – Environmental Baseline Studies Report: Graphite Creek Deposit*. ERM Alaska, Inc., February 17, 2020.

Fair, Susan W.
1997 Inupiat Naming and Community History: The Tapqaq and Saniniq Coasts near Shishmaref, Alaska. *Professional Geographer* 49(4):466–480.

Fernández, G., J.B. Buchanan, R.E. Gill Jr., R. Lanctot, and N. Warnock
2010 *Conservation Plan for Dunlin with Breeding Populations in North America (Calidris alpina arcticola, C. a. pacifica, and C. a. hudsonia), Version 1.1*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.

FGDC (Federal Geographic Data Committee)

2013 *Classification of wetlands and deepwater habitats of the United States.* Second Edition. FGDC-STD-004-2013. Wetlands Subcommittee, Federal Geographic Data Committee and USFWS, Washington, D.C.

FHWA (Federal Highway Administration)

2006 *Construction Noise Handbook.* August 2006. Available from https://www.nrc.gov/docs/ML0832/ML083250584.pdf

2011 *Wildlife Crossing Structure Handbook Design and Evaluation in North America*. Publication No. FHWA-CFL/TD-11-003. March 2011.

Fischer, J.B., and R.A Stehn

2014 *Nest Population Size and Potential Production of Geese and Spectacled Eiders on the Yukon-Kuskokwim Delta, Alaska, 1985–2013*. USFWS, Anchorage, Alaska.

Fortier, S.M., N.T. Nassar, G.W Lederer, J. Brainard, J. Gambogi, and E.A. McCullough

2018 *Draft critical mineral list—Summary of methodology and background information—U.S. Geological Survey technical input document in response to Secretarial Order No. 3359*. U.S. Geological Survey Open-File Report 2018–1021. Available at https://doi.org/10.3133/ofr20181021.

Friday, N.A., A.N. Zerbini, J.M. Waite, S.E. Moore, and P.J. Clapham

2013 Cetacean distribution and abundance in relation to oceanographic domains on the eastern Bering Sea shelf in June and July of 2002, 2008, and 2010. *Deep Sea Research Part II: Topical Studies in Oceanography* 94:244–256.

Funk, F.

2007 Pacific Hering. ADF&G. Available at https://www.adfg.alaska.gov/static/education/wns/pacific_herring.pdf.

Ganley, Matthew L.

2009 Luck and the Art of Leaving No Stone Unturned: The Search for Bear Rock Monument. In *Chasing the Dark: Perspectives on Place, History and Alaska Native Land Claims,* edited by Kenneth L. Pratt, pp. 230–240. Bureau of Indian Affairs, Alaska Region, Division of Environmental and Cultural Resources Management, ANSCA Office, Anchorage, Alaska.

Germain, S.R.

2022 *Brown Bear Management Report and Plan, Game Management Unit 22*. ADF&G Species Management Report and Plan ADF&G/DWC/SMR&P-2022-14.

Gill Jr., R.E., and B.J. McCaffery

1999 Bar-tailed Godwits Limosa lapponica in Alaska: a Population Estimate from the Staging Grounds. *Wader Study Group Bulletin* 88:49–54.

Gill Jr., R.E., P.S. Tomkovich, and M.N. Dementyev

2015 Breeding Ecology of Wandering Tattlers Tringa incana: a study from south-central Alaska. *Wader Study Group Bulletin* 122(2):99–114. doi:10.18194/ws.00016.

Gousy-Leblanc, M., J. Therrien, T. Broquet, D. Rioux, N. Curt-Rand-Gaudin, N. Tissot, S. Tissot, I. Szabo, L. Wilson, J.T. Evans, V. Bowes, G. Gauthier, K.L. Wiebe, G. Yannic, and N. Lecomte

2023 Long-term Population Decline of a Genetically Homogeneous Continental-Wide Top Arctic Predator. *International Journal of Avian Science* 165(4):1251–1266. doi.org/10.1111/ibi.13199.

Graphite One (Graphite One (Alaska) Inc.)

2024 Meeting Outcome Summary. Tribal Council – Native Village of Brevig Mission, Graphite One. April 24, 2024.

2025 Graphite Creek Project Career Opportunities. Revision 1 – April 2025.

Grauvogel, Carl A.

1986 *Moose Move to the Seward Peninsula: A view of Successful Management*. ADF&G. Available at https://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/research_pdfs/moose_move_seward_peninsula.pdf.

Greenberg, R., D.W. Demarest, S.M. Matsuoka, C. Mettke-Hofmann, D. Evers, P.B. Hamel, J. Luscier, L.L. Powell, D. Shaw, M.L. Avery, K.A. Hobson, P.J. Blancher, and D.K. Niven

2011 *Boreal Birds of North America*. University of California Press. doi.org/10.1525/9780520950580-012

Haecker, Diana

2010 Reindeer Herding Holds Great Future for Seward Peninsula. Published in *ADF&G Wildlife News*, October 2010; originally published in the *Nome Nugget* on August 12, 2010. Accessed at https://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=484.

Halvorsen, M.B., B.M. Casper, C.M. Woodley, T.J. Carlson, and A.N. Popper.

2012 Threshold for onset of injury in Chinook salmon from exposure to impulsive pile driving sounds. *PLoS One* 7(6):e38968.

Harper, P., and L.A. McCarthy

2015 *Caribou Management Report of Survey-Inventory Activities, 1 July 2012-30 June 2014*. Species Management Report ADF&G/DWC/SMR-2015-4. Alaska Department of Fish and Game.

Harrington, G.L.

1919 Graphite mining in Seward Peninsula. In *U.S. Geological Survey, Mineral resources of Alaska, report on progress of investigations in 1917*. U.S. Geological Survey Bulletin 692:363–367. Available at https://dggs.alaska.gov/pubs/id/3447.

HDR (HDR, Inc./HDR Engineering, Inc.)

2024 *Draft Noise Assessment Technical Memo*. Prepared for Graphite One, Inc. December 2024.

2025a *Graphite Creek Project Jurisdictional Determination Report*. Prepared for Graphite One (Alaska), Inc. August 2025.

Henderson, M.T., A.J. Eichenwalk, D.L. Johnson, T.L. Booms, C.J. McClure, A.L. Pyke, and D.L. Anderson

2021 Species and Sex Composition of Ptarmigan Consumed by Nesting Gyrfalcons on the Seward Peninsula. *Journal of Raptor Research* 55(1):33–44.

Hodgson, Liam, Henrietta Stover, Elliot Hubbard, and Robyn Miller

2025 *Cultural Resources 2024 Field Survey Report*. Prepared by HDR Engineering, Inc., for Graphite One (Alaska), Inc., Anchorage, Alaska.

Höfle, Claudia, Mary E. Edwards, David M. Hopkins, Daniel H. Mann, and Chien-Lu Ping

2000 The Full-Glacial Environment of the Northern Seward Peninsula, Alaska, Reconstructed from the 21,500-Year-Old Kitluk Paleosol. *Quaternary Research* 53(2):143–153. Available at https://doi.org/10.1006/qres.1999.2097.

Holt, D.W., M.D. Larson, N.E. Smith, D.L. Evans, and D.F. Parmelee

2020 *Snowy Owl (Bubo scandiacus)*. Birds of the World. Cornell Lab of Ornithology. Ithaca, New York. doi.org/10.2173/bow.snoowl1.01.

Hopkins, David M.

1963 *Geology of the Imuruk Lake Area, Seward Peninsula, Alaska*. U.S. Geological Survey Bulletin 1141-C.

Hosken, Kaitlyn, Liam Hodgson, and Robyn Miller

2024 *Cultural Resources 2023 Field Survey Report*. Prepared by HDR Engineering, Inc., for Graphite One (Alaska), Inc., Anchorage, Alaska.

Hosken, Kaitlyn, and Robyn Miller

2023 *Cultural Resources Data Gap Analysis: Graphite One Project*. Prepared by HDR Engineering, Inc., for Graphite One (Alaska), Inc., Anchorage, Alaska.

Hudson, T.

2024 *Observations of Pleistocene Features in the Bering Strait Region of Seward Peninsula, Alaska*. Preliminary Interpretive Report 2024-5. Alaska Department of Natural Resources.

Hudson, T. L.

1981 *Preliminary notes on the Kigluaik graphite deposits, Seward Peninsula, Alaska.* Anaconda Minerals Company internal memorandum. Anchorage, Alaska. Report held by Cook Inlet Region, Inc., Anchorage, Alaska.

Hughes, L.

2022 *Wolf Management Report and Plan, Game Management Unit 22*. Species Management Report and Plan ADF&G/DWC/SMR&P-2022-16. Alaska Department of Fish and Game.

ISC (Ice Seal Committee)

2024 *The Subsistence Harvest of Ice Seals in Alaska – A Compilation of Existing Information, 1960–2022*. Approved by ISC on September 30, 2024. Available at https://www.iceseals.org/_files/ugd/bc4c23_6997555a650541a5b0dda5be934915a7.pdf.

Jacobs (Jacobs Engineering Group)

2017 *Biological evaluation for offshore oil and gas exploratory drilling in the Kitchen Lights Unit of Cook Inlet, Alaska*. Prepared for Furie Operating Alaska, LLC., Anchorage, Alaska. March 2017.

Jandt, R.R., C.R. Meyers, and M.J. Cole

2003 *Western Arctic Caribou Herd Winter Habitat Monitoring and Utilization*. BLM Alaska Open File Report 88. Bureau of Land Management. January 2003.

JDS (JDS Energy & Mining, Inc.)

2022 *Preliminary Feasibility Study Technical Report*. Report prepared for Graphite One, Inc.

Johnson, O.W.

2003 Pacific and American Golden-Plovers: reflections on conservation needs. *Wader Study Group Bulletin* 100:10–13.

Johnson, P., and J. Winters

2018 *Northwest Arctic Subarea Contingency Plan*. U.S. Department of the Interior and ADF&G. March 2018.

Johnson, Walter H.

1917 Report of the First Reindeer Fair. In *Report on the Work of the Bureau of Education for the Natives of Alaska, 1914–15*, pp. 73–82. Bulletin 1916, No. 47. U.S. Department of the Interior, Bureau of Education, Washington, D.C.

Jorgenson, Torre, Kenji Yoshikawa, Mikhail Kanevskiy, Yuri Shur, Vladimir Romanovsky, Sergei Marchenko, Guido Grosse, Jerry Brown, and Ben Jones

2008 Permafrost characteristics of Alaska. In *Proceedings of the Ninth International Conference on Permafrost*, edited by D.L. Kane and K.M. Hinkel, pp. 121–122. Institute of Northern Engineering, University of Alaska Fairbanks, Fairbanks, Alaska.

Kaufman, D.S., P.E. Calkin, W.B. Whitford, B.J. Przybyl, D.M. Hopkins, B.J. Peck, and R.E. Nelson

1989 Surficial Geologic Map of the Kigluaik Mountains Area, Seward Peninsula, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 2074, 1 sheet, scale 1:63,360. 1989. Accessed at https://dggs.alaska.gov/webpubs/usgs/mf/oversized/mf-2074sht01.pdf.

Kaufman, D.S., and D.M. Hopkins

1989 Late Cenozoic geologic controls on placer-gold distribution in the Nome nearshore area. In *Geologic studies in Alaska by the U.S. Geological Survey*. U.S. Geological Survey Bulletin 1903, pp. 26–45. U.S. Government Printing Office. Accessed at https://pubs.usgs.gov/bul/1903/report.pdf.

Kawerak (Kawerak, Inc.)

No Date VSPO Program. Kawerak website. Accessed May 2025 at https://kawerak.org/community-services/vpso-program/.

2013 *When the fish come, we go fishing: Local Ecological Knowledge of Non-Salmon Fish Used for Subsistence in the Bering Strait Region*. Available at https://kawerak.org/wp-content/uploads/2018/04/Non-Salmon-Report.pdf.

2014 *Teller Local Economic Development Plan 2013–2018*. July 7, 2014. Available at https://kawerak.org/wp-content/uploads/2018/02/teller.pdf.

2015 *"Always taught not to waste": Traditional Knowledge and Norton Sound/Bering Strait Salmon Population*. Available at https://www.kawerak.org/wp-content/uploads/2018/04/TK-of-Salmon-Final-Report.pdf.

2017 *Mary's Igloo Local Economic Development Plan 2016–2021*. November 14, 2017. Available at https://kawerak.org/wp-content/uploads/2018/10/Marys-Igloo-LEDP-2016-2021-final-ready-for-publication.pdf.

2025 *Brevig Mission Local Economic Development Plan 2019–2023.* Update in progress. Accessed February 3, 2025, at https://kawerak.org/download/ledp-brevig-mission/?tmstv=1690837870.

Koutsky, Kathryn

1981 *Early Days on Norton Sound and Bering Strait: An Overview of Historic Sites in the BSNC Region, Volume III: The Port Clarence and Kauwerak Areas*. University of Alaska Fairbanks, Cooperative Park Studies Unit, Anthropology and Historic Preservation, Fairbanks, Alaska.

Kuletz, K.J., M. Renner, E.A. Labunski, and G.L. Hunt Jr.
2014 Changes in the distribution and abundance of albatrosses in the eastern Bering Sea: 1975-2010. *Deep Sea Research Part II: Topical Studies in Oceanography* 109: 282–292.

Laidre, K.L., M.P. Heide-Jørgensen, and J. Orr
2006 Reactions of narwhals, Monodon monoceros, to killer whale, *Orcinus orca*, attacks in the eastern Canadian Arctic. *The Canadian Field-Naturalist* 120:457–465.

Laidre, K.L., H. Stern, K.M. Kovacs, L. Lowry, S.E. Moore, E.V. Regehr, S.H. Ferguson, Ø. Wiig, P. Boveng, R.P. Angliss, E.W. Born, D. Litovka, L. Quakenbush, C. Lydersen, D. Vongraven, and F. Ugarte
2015 Arctic marine mammal population status, sea ice habitat loss, and conservation recommendations for the 21st century. *Conservation Biology* 29(3):724–737.

Leppi, J.C., D.J. Rinella, M.S. Wipifi, and M.S. Whitman
2022 Broad Whitefish (*Coregonus nasus*) isotopic niches: Stable isotopes reveal diverse foraging strategies and habitat use in Arctic Alaska. *PLOS One* 17(7):e0270474. doi.org/10.1371/journal.pone.0270474.

Lerner, Julia
2021 Nome's Housing Crisis Worsened. Published in *The Nome Nugget*. Accessed at https://nomenugget.net/news/nome%E2%80%99s-housing-crisis-worsened.

Lesage, V., C. Barrette, M.C.S. Kingsley, and B. Sjare
1999 The effect of vessel noise on the vocal behavior of belugas in the St. Lawrence River Estuary, Canada. *Marine Mammal Science* 15(1):65–84.

Lettis (Lettis Consultants International, Inc.)
2024 *Report on Site-Specific Seismic Hazard Evaluation of Graphite Creek Mine, Seward Peninsula, Alaska*.

Liu, C., F. Wang, Q. Ren, B. Chen, H. Jin, S. Cui, and Z. Zhu.
2023 Field test of blasting vibration and adjacent slope stability under the influence of blasting vibration in mining. *Journal of Vibroengineering* 25(4):713–728.

Lowry, L.F., V.N. Burkanov, K.J. Frost, M.A. Simpkins, R. Davis, D.P. DeMaster, and A. Springer
2000 Habitat Use and Habitat Selection by Spotted Seals (*Phoca largha*) in the Bering Sea. *Canadian Journal of Zoology* 78(11):1959–11971.

Mangipane, L.S., J.L. Belant, D.J. R. Lafferty, D.D. Gustine, T.L. Hiller, M.E. Colvin, B.A. Mangipane, and G.V. Hilderbrand
2017 Dietary plasticity in a nutrient-rich system does not influence brown bear (*Ursus arctos*) body condition or denning. *Polar Biology* 41:763-772.

Mansfield, K.
2004 *Longnose Sucker*. Alaska Department of Fish and Game. Available at https://www.adfg.alaska.gov/static/education/wns/longnose_sucker.pdf.

Marino, Elizabeth K.
2005 *Negotiating the Languages of Landscape: Place Naming and Language Shift in an Inupiaq Community*. Master's thesis, Department of Anthropology, University of Alaska, Fairbanks, Alaska.

Marks, J.L., T.L. Tibbits, R.E. Gill, and B.J. McCaffery
2020 Bristle-Thighed Curley (*Numenius tahitiensis*). Version 1.0. *Birds of the World*. Cornell Lab or Ornithology, Ithaca, New York. doi:10.2173/bow.brtcur.01.

McCaffery, B.J., and R.E. Gill
2020 Bar-tailed Godwit (*Limosa lapponica*). Version 1.0. *Birds of the World*. Cornell Lab of Ornithology, Ithaca, New York. doi:10.2173/bow.batgod.01.

Mertie Jr., J.B.
1918 Lode mining and prospecting on Seward Peninsula. In *Mineral resources of Alaska, report on progress of investigations in 1916*. U.S. Geological Survey Bulletin 662:425‑449. Available at https://dggs.alaska.gov/pubs/id/4741.

Mikow, Elizabeth, Daniel Gonzalez, and Marylynne Kostick
2018 *Subsistence Wildlife Harvests in Brevig Mission, Teller, and White Mountain, Alaska, 2015–2016*. Special Publication No. 2018-03. ADF&G, Division of Subsistence. Available at https://www.adfg.alaska.gov/specialpubs/SP2_SP2018-003.pdf.

Moffitt, F.H.
1913 *Geology of the Nome and Grand Central quadrangles, Alaska*. U.S. Geological Survey Bulletin 533. Available at https://dggs.alaska.gov/pubs/id/3410.

Moore, S.E., J.M. Waite, L.L. Mazzuca, and R.C. Hobbs
2000 Provisional estimates of mysticete whale abundance on the central Bering Sea shelf. *The Journal of Cetacean Research and Management* 2(3):227–234.

MPCA (Minnesota Pollution Control Agency)
2015 *A Guide to Noise Control in Minnesota*. November 2015.

Myers-Smith, I.H., B.K. Arnesen, R.M. Thompson, and F.S. Chapin III.
2006 Cumulative impacts on Alaskan arctic tundra of a quarter century of road dust. *Ecoscience* 13 (4): 503-510.

NatureServe Explorer

2025 Glacier Buttercup. Accessed February 26, 2025, at https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.145606/Ranunculus_glacialis_ssp_alaskensis.

NMFS (National Marine Fisheries Service)

2010 *Recovery plan for the fin whale (Balaenoptera physalus)*. NMFS, Silver Spring, Maryland.

2013 *Final Recovery Plan for the North Pacific Right Whale (Eubalaena japonica).* NMFS, Office of Protected Resources, Silver Spring, Maryland.

2023 *Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion for the Port of Nome Modification Project, POA-2022-00341.* July 27, 2023. NMFS Consultation Number: AKRO-2022-03034.

NOAA (National Oceanic and Atmospheric Administration)

2024 Tidal Predictions _ NOAA Tides & Currents. Available at https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=9469146.

2025a Beluga Whale. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/beluga-whale.

2025b Gray Whale. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/gray-whale.

2025c Harbor Porpoise. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/harbor-porpoise

2025d Killer Whale. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/killer-whale.

2025e Minke Whale. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/minke-whale.

2025f Narwhal. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/minke-whale.

2025g Northern Fur Seal. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/minke-whale.

2025h Spotted Seal. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/spotted-seal.

2025i Bowhead Whale. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/bowhead-whale.

2025j Bearded Seal. Accessed July 1, 2025, at https://www.fisheries.noaa.gov/species/bearded-seal.

Nome (City of Nome)

No Date-a Landfill. City of Nome website. Accessed May 2025 at https://www.nomealaska.org/landfill.

No Date-b Sales Tax Overview. City of Nome website. Accessed July 29, 2025, at https://www.nomealaska.org/city-clerk/page/sales-tax-overview.

No Date-c The Nome Police Department. City of Nome website. Accessed May 2025 at https://www.nomealaska.org/police.

No Date-d Nome Volunteer Fire Department. City of Nome website. Accessed May 2025 at https://www.nomealaska.org/volunteer-fire-department.

2012 *Nome Comprehensive Plan 2020*. May 30, 2012. Accessed at https://www.nomealaska.org/sites/default/files/fileattachments/nome_planning_commission/page/125/ncp-2020.pdf.

Nome Convention and Visitors Bureau

2019 *There's No Place Like Nome: Things to Do*. Accessed July 7, 2025, at https://www.visitnomealaska.com/.

Nome Public Schools

No Date Nome Public Schools website. Accessed May 2025 at https://www.nomeschools.org/.

NPC (Northern Permafrost Consulting)

2024 *Graphite Creek Project – Waste Management Facility Thermal Modeling (Draft).* Prepared by Christopher Stevens. November 3, 2024.

Nowacki, G., P. Spencer, M. Fleming, T. Brock, and T. Jorgenson

2001 *Unified Ecoregions of Alaska: 2001*. U.S. Geological Survey Open-File Report 2002-297.

NPFMC (North Pacific Fisheries Management Council)

2018 *Fishery Management Plan for the Salmon Fisheries in the EEZ Off Alaska*. October 2018. Anchorage, Alaska.

2024 *Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area*. October 2024. Anchorage, Alaska.

NPS (National Park Service)

2023 Quaternary Period—2.58 MYA to Today. April 27, 2023. Available at https://www.nps.gov/articles/000/quaternary-period.htm.

NSBSRPT (Norton Sound-Bering Strait Regional Planning Team)

1996 *Norton Sound-Bering Strait Regional Comprehensive Salmon Plan 1996–2010*. June 1996.

2015 *Norton Sound-Bering Strait Regional Comprehensive Salmon Plan: Phase II*. July 2015.

NSHC (Norton Sound Health Corporation)

No Date-a Norton Sound Regional Hospital. NSHC website. Accessed May 2025 at https://www.nortonsoundhealth.org/locations/norton-sound-regional-hospital/.

No Date-b Quyanna Care Center. NSHC website. Accessed May 2025 at https://www.nortonsoundhealth.org/services/hospital-services/quyanna-care-center/.

No Date-c Village Health Services. NSCH website. Accessed May 2025 at https://www.nortonsoundhealth.org/services/community-health-services/village-health-services/.

2025 Village Clinic Listing. NSHC website, updated March 24, 2025. Accessed May 2025 at https://www.nortonsoundhealth.org/services/community-health-services/village-health-services/.

Oquilluk, William A.

1973 *People of Kauwerak: Legends of the Northern Eskimo.* Alaska Methodist University, Anchorage, Alaska.

Orth, Donald J.

1967 *Dictionary of Alaska Place Names*. Professional Paper 567, U.S. Geological Survey, Washington, D.C.

OSHA (Occupational Safety and Health Administration)

2022 *OSHA Technical Manual (OTM) Section III: Chapter 5 - Noise.* July 2022. Available from https://www.osha.gov/otm/section-3-health-hazards/chapter-5

OSMRE (Office of Surface Mining, Reclamation and Enforcement)

1983 *Explosives and Blasting Procedures Manual.* U.S. Department of Interior, Office of Surface Mining, Reclamation and Enforcement.

Owl Ridge (Owl Ridge Natural Resource Consultants, Inc.)

2025 *Graphite Creek Project Aquatic Baseline Studies: 2024 Report*. September 2025

Padilla, A.J., R.J. Bown, and M.J. Wooler

2016 Determining the Movements and Distribution of Anadromous Bering Ciscoes by Use of Otolith Strontium Isotopes. *Transactions of the American Fisheries Society* 145:1374–1385. DOI:10.1080/00028487.2016.1225599.

Paige, Amy W., Cheryl L. Scott, David B. Andersen, Susan Georgette, and Robert J. Wolfe

1996 *Subsistence Use of Birds in the Bering Strait Region, Alaska*. Technical Paper No. 239. ADF&G Division of Subsistence. Juneau, Alaska. Available at https://www.adfg.alaska.gov/download/Technical%20Papers/tp239.pdf.

Paleobiology Database

2025 The Paleobiology Database. August 11, 2025. Available at https://paleobiodb.org/#/.

Payne, Troy C., and Yevgenii Kisarauskas

2020 *Alaska State Troopers C Detachment Patrol Staffing Study Final Report and Description of Police Incidents*. Prepared by the University of Alaska Anchorage Alaska Justice Information Center for the Alaska Department of Public Safety. July 7, 2020.

Piatt, J.F., J. Wetzel, K. Bell, A.R. DeGange, G.R. Balogh, G.S. Drew, T. Geernaert, C. Ladd, and G.V. Byrd

2006 Predictable hotspots and foraging habitat of the endangered short-tailed albatross (*Phoenastria albatrus*) in the North Pacific: Implication for conservation. *Deep-Sea Research II* 53:387–398. doi:10.1016/j.dsr2.2006.01.008.

PND Engineers, Inc., Corvus Design, Inc., and Northern Economics

2024 *Port of Nome Strategic Development Plan Update – Phase A*. Background & Engagement. May 2024. Available at https://www.nomealaska.org/sites/default/files/fileattachments/port_of_nome/page/12402/2024-05-13_pon_strategic_plan_update_-_phase_a_final.pdf.

Pohlen, Z.M., L.H. Decicco, J.A. Johnson, J.B. Buchanan, and P.S. Tomkovich

2021 Sex Determination of Red Knots *Calidris canutus roselaari* Using Morphometrics. *Wader Study Group Bulletin* 128(2):183–188. doi:10.18194/ws.00241.

Port of Nome

2025 Nome: The Nation's Arctic Port. Brochure available from https://www.nomealaska.org/sites/default/files/fileattachments/port_of_nome/page/1981/pon_brochure_-_2025_revised_1.pdf.

Powell, L.L., T.P. Hodgman, and W.E. Glanz

2010 Home Ranges of Rusty Blackbirds Breeding in Wetlands: How Much would Buffers from Timber Harvest Protect Habitat? *The Condor* 112(4):834–840

Pratt, Kenneth L. (editor)

2009 *Chasing the Dark: Perspectives on Place, History and Alaska Native Land Claims*. Bureau of Indian Affairs, Alaska Region, Division of Environmental and Cultural Resources Management, ANSCA Office, Anchorage, Alaska.

Pruett, C.L., and K. Winker

2005 Biological Impacts of Climatic Change on a Beringian Endemic: Cryptic Refugia in the Establishment and Differentiation of the Rock Sandpiper (*Calidris ptilocnemis*). *Climatic Change* 68(1):219–240.

Quakenbush, L., and J. Citta

2008 *Biology of the Ribbon Seal in Alaska*. Alaska Department of Fish and Game. Fairbanks, Alaska. September 2008.

Quakenbush, L., R. Suydam, T. Obritschkewitsch, and M. Deering

2004 Breeding Biology of Steller's Eiders (Polysticta stelleri) near Barrow, Alaska, 1991–99. *Arctic* 57(2):166–182.

Rattenbury, K., K. Kielland, G. Finstad, and W. Schneider.

2009 *A reindeers herder's perspective on caribou, weather and socio-economic change on the Seward Peninsula, Alaska*. doi:10.1111/j.1751-8369.2009.00102.x

Ray, Dorothy Jean

1964 Nineteenth Century Settlement and Subsistence Patterns in Bering Strait. *Arctic Anthropology* 2(2):61–94.

1971 Eskimo Place-Names in Bering Strait and Vicinity. *Names: A Journal of Onomastics* 19(1):1–33.

Raymond-Yakoubian, J.

2013 *When the fish come, we go fishing: Local Ecological Knowledge of Non-Salmon Fish Used for Subsistence in the Bering Strait Region*. Final Report for Study 10-151. Kawerak Incorporated. August 2013.

Recon (Recon LLC)

2018 *Graphite Creek Project 2018 Proposed Access Routes Reconnaissance Preliminary Summary of Field Work and Observations*.

2023 *Imuruk Basin Barge Landing Geotechnical Evaluation*. Prepared for Bering Straits Native Corporation.

Renner, H.M., M.D. Romano, M. Renner, S. Pyare, M.I. Goldstein, and Y. Arthukin

2015 Assessing the Breeding Distribution and Population Trends of the Aleutian Tern *Onychoprion aleuticus*. *Marine Ornithology* 43:179–187.

Richardson, R.M., C.L. Amundson, J.A. Johnson, M.D. Romano, A.R. Taylor, M.D. Fleming, S.M. Matsuoka

2024 Rapid Population Decline in McKay's Bunting, an Alaskan Endemic, Highlights the Species' Current Status Relative to International Standards for Vulnerable Species. *Ornithological Applications* 126(2). May 2024. doi:10.1093/ornithapp/duad064.

Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea, and W.B. Scott

1991 Common and scientific names of fishes from the United States and Canada. *American Fisheries Society Special Publication* (20):183.

Rogers, M.C., E. Peacock, K. Simac, M.B. O'Dell, and J.M. Welker

2015 Diet of female polar bears in the southern Beaufort Sea of Alaska: evidence for an emerging alternative foraging strategy in response to environmental change. *Polar Biology* 38:1035–1047.

Sainsbury, C.L.

1975 Geology, ore deposits, and mineral potential of the Seward Peninsula, Alaska. U.S. Bureau of Mines Open-File Report 73-75. U.S. Bureau of Mines. Available at https://dggs.alaska.gov/pubs/id/21444.

Scarff, J.E.
2001 Preliminary estimates of whaling-induced mortality in the 19th century North Pacific right whale (*Eubalaena japonicus*) fishery, adjusting for struck-but-lost whales and non-American whaling. *Journal of Cetacean Research and Management* Special Issue 2:261–268.

Scheifele, P.M., S. Andrew, R.A. Cooper, M. Darre, F.E. Musiek, and L. Max
2005 Indication of a Lombard vocal response in the St. Lawrence River beluga. *The Journal of the Acoustical Society of America* 117(3):1486–1492.

Schick, C.T., and J.H. Boisert
2005 *Avian Surveys, Habitat Mapping and Breeding Bird Impact Assessments for the Proposed Rock Creek and Big Hurrah Mine Developments*. Seward Peninsula, Alaska.

Schwemmer, P., B. Mendel, N. Sonntag, V. Dierschke, and S. Garthe
2011 Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. *Ecological Applications* 21(5):1851–1860.

Shaw, Glenn E.
1995 The Arctic Haze Phenomenon. *Bulletin of the American Meteorological Society* 76(12):2403–13.

Sheffield, G., and L. Jemison
2021 *Community Report: Steller sea lion distribution and counts in the Bering Strait*.

Shively, M., D. Wood, L. Olsho, W. Rhodes, and M. Chapman
2008 *Evaluation of the Rural Alaska Alcohol Interdiction, Investigation, and Prosecution Program.* March 2008. Prepared for Office of Research and Evaluation, National Institute of Justice. Prepared by Abt Associates, Inc.

Spectacled Eider Recovery Team
2002 *Spectacled Eider Somateria fischeri Recovery Plan*. Prepared for USFWS. October 1996.

SRK Consulting (Canada) Inc.
2025 *Graphite Creek Project – Access Road Sample Static Geochemical Testing Results*. Memo to Kevin Torpy and Maria Sanders. January 28.
2026a *Graphite Creek – Pit Lake Water Quality Predictions.* Draft memo to Ed Fogels and Kevin Torpy, Graphite One. January 19, 2026.
2026b *Draft Graphite Creek Project – Baseline Geochemical Characterization*. January 2026.

Stafford, K. M., D. K. Mellinger, S. E. Moore, and C. G. Fox.
2007 Seasonal variability and detection range modeling of baleen whale calls in the Gulf of Alaska, 1999-2002. *The Journal of the Acoustic Society of America* 122(6):3378–3390.

Stimmelmayr, R., J.A.K. Maier, A. Okudo, J. Battig, and K. Persons
2003 A complex picture of dental pathology in a moose population on the Seward Peninsula, Alaska [abstract]. Page 141 in Extreme Events: Understanding perturbations to the physical and biological environment. Program and abstracts of the 54th Arctic Science Conference, September 21-24, 2003, Fairbanks, Alaska. Arctic Division of the American Association for the Advancement of Science.

Tape, K.D., J.A. Clark, B.M. Jones, S. Kanter, B.V. Gaglioti, G. Grosse, and I. Nitze
2022 Expanding beaver pond distribution in Arctic Alaska, 1949 to 2019. *Scientific Reports* 7123(2022).

Taylor, A., M.A. Bishop, A. Schaefer, R. Porter, and K. Sowl
2022 Using Geolocator Data to Address Changes in Migration Patterns for Black Turnstone. *Animal Migration* 9:1–26. doi.org/10.1515/ami-2022-0118.

Therrien, J.F., G. Gauthier, D. Pinaud, and J. Bety
2014 Irruptive Movements and Breeding Dispersal of Snowy Owls: a Specialized Predator Exploiting a Pulsed Resource. *Journal of Avian Biology.* June 2014. doi.org/10.1111/jav.0426.

Till, A.B., J.A. Dumoulin, M.B. Werdon, and H.A. Bleick
2011 *Bedrock Geologic Map of the Seward Peninsula, Alaska, and Accompanying Conodont Data*: U.S. Geological Survey Scientific Investigations Map 3131, 79 pages, 2 sheets, scale 1:500,000. Available at https://pubs.usgs.gov/sim/3131/sim3131_sheet1.pdf and https://pubs.usgs.gov/sim/3131/sim3131_sheet2.pdf.

Timothy, J.
2013 *Alaska blasting standard for the proper protection of fish.* ADF&G Habitat Division Technical Report 13-02. Douglas, Alaska.

Tundra Consulting
2024 *2024 Hydrogeology Report*. Graphite Creek Project. Prepared for Graphite One Inc. November 2024.

Tundra/ABR (Tundra Consulting and ABR, Inc. Environmental Research & Services)
2026 *Graphite Creek Project Water Quality Surveys, 2014-2025*. Prepared for Graphite One Inc. February 2026.

Unaatuq (Unaatuq, LLC.)

2025 Welcome to Unaatuq Pilgrim Hot Springs: A Protected Arctic Oasis that Provides for Our People. Unaatuq website. Accessed August 6, 2025, at https://www.pilgrimhotsprings.com/.

University of Wisconsin Population Health Institute

No Date Nome, Alaska webpage. County Health Rankings & Roadmaps website. Accessed May 2025 at https://www.countyhealthrankings.org/health-data/alaska/nome?year=2025.

2025 2025 Alaska Data. County Health Rankings & Roadmaps. Accessed May 2025 at www.countyhealthrankings.org.

USACE (U.S. Army Corps of Engineers)

1987 *Corps of Engineers Wetland Delineation Manual.* Corps of Engineers Environmental Laboratory, Vicksburg, Mississippi.

2007 *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual, Alaska Region.* ERDC/EL TR-07-24. U.S. Army Engineer Research and Development Center. Vicksburg, Mississippi.

2025 *USACE awards construction contract for portion of Port of Nome Modification Project.* August 15, 2025. U.S. Army Corps of Engineers – Alaska District. Release No. 25-004. Available at https://www.nomealaska.org/sites/default/files/fileattachments/port_of_nome/page/1981/25-004_news_release_-_usace_awards_construction_contract_for_portion_of_port_of_nome_modification_project.pdf

USCB (U.S. Census Bureau)

2023 American Community Survey 5-Year Estimates (2019–2023). Accessed April 2025.

USDA-NRCS (U.S. Department of Agriculture-Natural Resources Conservation Service)

No Date-a Web Soil Survey. Accessed June 2025.

No Date-b Soil Survey Area – Soil Data Access (SDA) – Hydric Soils Rating by Map Unit. Accessed June 2025 at https://www.nrcs.usda.gov/publications/Hydric%20Soils%20Rating%20by%20Map%20Unit%205%20class.html.

No Data-c SDA Prime and other Important Farmlands. Accessed June 2025 at https://www.nrcs.usda.gov/publications/Legend%20and%20Prime%20Farmland%20-%20Query%20by%20Soil%20Survey%20Area.html.

No Data-a SDA Prime and other Important Farmlands. Accessed June 2025 at https://www.nrcs.usda.gov/publications/Legend%20and%20Prime%20Farmland%20-%20Query%20by%20Soil%20Survey%20Area.html.

USFWS (U.S. Fish and Wildlife Service)

1995 *Habitat Conservation Strategy for Polar Bears in Alaska*. August 1995. Anchorage, Alaska.

2002 *Steller's Eider Recovery Plan*. Fairbanks, Alaska.

2006 Alaska Seabird Information Series Aleutian Tern (*Onychoprion aleutica*). Anchorage, Alaska.

2012 *Whitefish Biology, Distribution, and Fisheries in the Yukon and Kuskokwim River Drainages in Alaska: a Synthesis of Available Information*. Alaska Fisheries Data Series Number 20121-4.

2013 Endangered and threatened wildlife and plants; 12-month finding on a petition to list Kittlitz's murrelet as an endangered or threatened species; Proposed rule. 78 *Federal Register* 192 (October 3, 2013):61764–61801.

2016 *Polar Bear (Ursus maritimus) Conservation Management Plan*. USFWS Region 7. Anchorage, Alaska.

2017 *Timing Recommendations for Land Disturbance and Vegetation Clearing: Planning Ahead to Protect Nesting Birds*. USFWS Region 7. Accessed June 9, 2025, at https://www.fws.gov/sites/default/files/documents/Timing%20Recommendations%20for%20Land%20Disturbance%20%26%20Vegetation%20Clearing%20-%20June%202017.pdf.

2019 Status Assessment of the Alaska-breeding Population of Steller's Eider. March 2019. Fairbanks, Alaska.

2020 Short-tailed Albatross (*Phoebastria albatrus*) 5-Year Review: Summary and Evaluation.

2021a Birds of Conservation Concern 2021. Migratory Bird Program.

2021b Species Status Assessment for the Spectacled Eider. September 2021. Fairbanks, Alaska.

2024 Polar Bear Interaction Guidelines. Available at https://www.fws.gov/pb-interaction-guidelines#:~:text=Polar%20bears%20use%20sea%20ice,%2C%20camps%2C%20and%20work%20areas.

2025a *Culvert Design Guidelines for Ecological Function.* January 2025. Alaska Fish Passage Program. Available at https://www.fws.gov/alaska-culvert-design-guidelines.

2025b Threats to Birds: Collision-Road Vehicles. Accessed on July 1, 2025, at https://www.fws.gov/story/threats-birds-collisions-road-vehicles.

USGS (U.S. Geologic Survey)

2023 National Hydrography Dataset. Available at https://www.usgs.gov/national-hydrography/national-hydrography-dataset.

Vandrelaan, A.S.M., and C.T. Taggart

2007 Vessel Collisions with Whales: The Probability of Lethal Injury Based on Vessel Speed. *Marine Mammal Science* 23(1):144–156. January 2007. DOI:10.1111/j.1748-7692.2006.00098.x. Available at https://www.phys.ocean.dal.ca/~taggart/Publications/Vanderlaan_Taggart_MarMamSci-23_2007.pdf.

Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wenzlick
1992 *The Alaska Vegetation Classification*. General Technical Report PNW-GTR-286. U.S. Department of Agriculture, U.S. Forest Service.

Von Duyke, A.L., D.C. Doughlas, J.K. Herreman, and J.A. Crawford
2020 Ringed Seal (*Pusa hispida*) Seasonal Movements, Diving, and Haul-out Behavior in the Beaufort, Chukchi, and Bering Seas (2011–2017). *Ecology and Evolution* 10(12):5595–5616. doi:10.1002/ece3.6302.

Voorhees, H., R. Sparks, H.P. Huntington, and K.D. Rode
2014 Traditional Knowledge about Polar Bears (*Ursus maritimus*) in Northwestern Alaska.

WACH Working Group (Western Arctic Caribou Herd Working Group)
2019 *Western Arctic Caribou Herd Cooperative Management Plan*. December 2019.
2024 Caribou Trails. Issue 2024:24. Nome, Alaska.

Wade, P.R.
2021 *Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas*. International Whaling Commission. SC/68c/IA/03. Available at https://archive.iwc.int/.

Walker, D.A., and K.R. Everett
1987 *Road dust and its environmental impact on Alaskan taiga and tundra*. Arctic and Alpine Research. University of Colorado.

WDFW (Washington Department of Fish and Wildlife)
2009 *Compiled White Papers for Hydraulic Project Approval Habitat Conservation Plan (HCP).* March 2009. Prepared by Anchor Environmental, Herrera Environmental Consultants, Jones & Stokes Associates, and R2 Resource Consultants for the Washington Department of Fish and Wildlife. Available at https://wdfw.wa.gov/publications/00803.

Webb, J.F.
2000 *A Newly Discovered Population of Arctic Char of the Kigluaik Mountains of Alaska*. U.S. Department of the Interior, Bureau of Land Management, National Science and Technology Center. Denver, Colorado.

Weeden, R.B.
1959 A New Breeding Record of the Wandering Tattler in Alaska. *The Auk* 76(2).

Wespestad, V.G., and L.H. Barton
1979 *Distribution and Migration and Status of Pacific Herring*. National Oceanic and Atmospheric Administration and ADF&G. December 1979.

Wolgemuth, L.G.
1982 *Graphite flake samples [from Kigluaik graphite deposits]*. Anaconda Minerals Company internal memorandum.

Wolorita Jr., R.J.
1985 *Saffron Cod (Eleginus gracilis) in Western Alaska: The Resource and its Potential*. NOAA Technical Memorandum NMFS F/NWC-79. May 1985.

WSDOT (Washington State Department of Transportation)
2020 *Biological Assessment Preparation Manual*. August 2020. Available at https://wsdot.wa.gov/sites/default/files/2021-10/Env-FW-BA_ManualCH07.pdf

Young, N. C., A. A. Brower, M. M. Muto, J. C. Freed, R. P. Angliss, N. A. Friday, B. D. Birkemeier, P. L. Boveng, B. M. Brost, M. F. Cameron, J. L. Crance, S. P. Dahle, B. S. Fadely, M. C. Ferguson, K. T. Goetz, J. M. London, E. M. Oleson, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini
2024 *Alaska marine mammal stock assessments, 2023*. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-493, 327 p.

Young, N.C., A.A. Brower, M.M. Muto, J.C. Freed, R.P. Angliss, N.A. Friday, P.L. Boveng, B.M. Brost, M.F. Cameron, J.L. Crance, S.P. Dahle, B.S. Fadely, M.C. Ferguson, K.T. Goetz, J.M. London, E.M. Oleson, R.R. Ream, E.L. Richmond, K.E.W. Shelden, K.L. Sweeny, R.G. Towell, P.R. Wade, J.M. Waite, and A.N. Zerbini
2023 *Alaska Marine Mammal Stock Assessments, 2022*. NOAA Technical Memorandum NMFSAFSC-474. July 2023.

Zimmerman, S.T.
1982 *Proceedings of a Synthesis Meeting: The Norton Sound Environment and Possible Consequences of Planned Oil and Gas Development Anchorage, Alaska – October 28–30, 1980*. Outer Continental Shelf Environmental Assessment Program. Juneau, Alaska. February 1982.

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Appendix A: *2024 Hydrogeology Report*, Graphite Creek Project

Appendix B: *Snow Avalanche Hazard Assessment for the Graphite Creek Project*

Appendix C: *Graphite Creek Project Aquatic Baseline Studies: 2024 Report*

Appendix D: *Visual Resources and Aesthetics Technical Report*

Appendix E: *Graphite One Community and Tribal Engagement Summary*