**RFI 056**
**Pebble Project EIS**

## Request for Information

| | |
|---|---|
| **Title/Subject:** | **Compensatory Mitigation Plan** |
| **Requestor:** | **Shane McCoy** |
| **Date Transmitted:** | **7/19/2018** |
| **Recipient:** | **Pebble Limited Partnership** |
| **Response Requested by:** | **09/15/2018** |
| **Rationale:** | A compensatory mitigation plan (CMP) will be used in our determination whether the proposal is in compliance with the 404(b)(1) guidelines and the public interest review, and to inform the NEPA analysis. We intend to append the draft CMP to the draft EIS. |
| **Describe the Information Requested and Level of Detail:** | We request the following: A compensatory mitigation plan, which describes how unavoidable impacts to waters of the US would be offset, and which is written in accordance with 33 CFR Part 332. |

## Recipient Response Form

| | |
|---|---|
| **Date Received from USACE:** | Click here to enter text. |
| **Response from Recipient (Describe Information Requested to the Level of Detail Requested; Provide Attachments as Needed):** | Click here to enter text. |
| **List Number and Type of Response Attachments:** | **PLP DRAFT Conceptual CMP D3.pdf** |
| **Date Returned to USACE:** | Click here to enter text. |

## AECOM Intake Form

| | |
|---|---|
| **Date Response was Received:** | **1/24/2019** |
| **Received by:** | **AECOM** |
| **Describe any Follow-up Related to this RFI:** | **None at this time** |

DRAFT REPORT

# Pebble Project
# DRAFT Conceptual Compensatory Mitigation Plan



January 2019

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**List of Tables**

**Attachment 1 – Figures**

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADEC | Alaska Department of Environmental Conservation |
| ADNR | Alaska Department of Natural Resources |
| ANCSA | Alaska Native Claims Settlement Act |
| AWI | Alaska Wetland Initiative |
| AWM | Alaska Wetlands Map |
| BBNA | Bristol Bay Native Association |
| CFR | Code of Federal Regulations |
| CMP | Compensatory Mitigation Plan |
| CWA | Clean Water Act |
| DA | Department of the Army |
| EPA | Environmental Protection Agency |
| FGDC | Federal Geographic Data Committee |
| HGM | Hydrogeomorphic |
| HUC | Hydrologic Unit Code |
| ILF | In-lieu Fee |
| MOU | Memorandum of Understanding |
| NHD | National Hydrography Dataset |
| NLCD | National Land Cover Database |
| NMFS | National Marine Fisheries Service |
| NWI | National Wetland Inventory |
| PLP | Pebble Limited Partnership |
| PRM | Permittee-responsible Mitigation |
| USACE | U.S. Army Corps of Engineers |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| WOUS | Waters of the U.S. |

# 1. Introduction

Pebble Limited Partnership (PLP) submitted a Department of the Army (DA) application, pursuant to Section 404 of the Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act of 1899 to the U.S. Army Corps of Engineers (USACE) on December 22nd, 2017 for the Pebble Project (Project) (POA-2017-271). The DA application proposed the development of a copper-gold-molybdenum porphyry deposit as a surface mine in Southwest Alaska. A list of relevant PLP DA application submittals and supporting documentation, including upcoming revisions, is provided in Table 1-1. The Project is located on State of Alaska lands in Southwest Alaska near Iliamna Lake, primarily within the Lake and Peninsula Borough with a portion of the supporting infrastructure in the Kenai Peninsula Borough. The Project consists of four primary project elements: the mine site, the transportation corridor, the Amakdedori Port, and the natural gas pipeline. Construction of the Project will permanently fill approximately 3,524 acres of Waters of the U.S.(WOUS), including wetlands.

PLP is submitting this Draft Compensatory Mitigation Plan (CMP) to the USACE. This Draft CMP fulfills requirements established by the Compensatory Mitigation for Losses of Aquatic Resources Final Rule (The Rule) issued by USACE and the U.S. Environmental Protection Agency (EPA) on April 10, 2008. The Rule emphasized the selection of compensatory mitigation sites on a watershed basis, established the operating standards for mitigation providers and identified three mechanisms: 1) mitigation banks, 2) in-lieu fee (ILF) programs, and 3) permittee responsible mitigation (PRM) plans.

Prior to The Rule, EPA, USACE, U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) issued the Alaska Wetland Initiative (AWI) (EPA et al 1994). This initiative states that no net loss of wetlands will not be achieved on a permit by permit basis in Alaska. The preamble of The Rule recognizes the provisions of the AWI as valid and still applicable for mitigation planning in Alaska. This CMP follows The Rule's guidance and recently released June 15, 2018 Memorandum of Understanding (2018 MOU) between USACE and EPA regarding Mitigation Sequence for Wetlands in Alaska under Section 404 of the CWA (USEPA, DA 2018).

PLP's analysis of the three mechanisms to compensate for the loss of wetlands and aquatic resource functions in the watershed is presented in the following sections.

*Table 1-1 PLP DA application submissions and supporting documentation to USACE*

| Submitted to USACE | Document Name | Remarks |
|---|---|---|
| December 22nd, 2017 | Department of the Army (DA) permit application package (POA-2017-271) | |
| December 22nd 2017 | Preliminary Jurisdictional Determination (PJD) | Accepted by USACE on March 20th, 2018. |
| Pending | Revised Department of the Army permit application package (POA-2017-271) | A revised DA application reflecting updates to the project description will be submitted to USACE. |
| Pending | Revised Preliminary Jurisdictional Determination | Revised wetlands JD with additional wetlands fieldwork conducted in 2018. |

Note: PLP DA application submissions and planned submissions to USACE as of January, 2019.

# 2. Proposed Project

The Pebble Project comprises four primary elements: The mine site at the Pebble deposit location; one port site in Kamishak Bay in Cook Inlet and two ferry terminals in Iliamna lake; a road corridor connecting the mine site, ferry terminals and port; and a natural gas pipeline connecting to existing infrastructure on the Kenai Peninsula.

- Mine Site. The proposed mine site is in the Iliamna region of Southwest Alaska, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the mine site in a general easterly direction. The fully developed mine site will include the open pit, tailings storage facility, low-grade ore stockpile, overburden stockpiles, material sites, water management ponds, milling and processing facilities, and supporting infrastructure such as the power plant, water treatment plants, camp facilities, and storage facilities.

- Transportation Corridor. The proposed transportation corridor will connect the mine site to the proposed Amakdedori Port on Cook Inlet, and includes two main components: 1) a private, double-lane road extending 30 miles south from the mine site to a ferry terminal on the north shore of Iliamna Lake; and 2) a private, double-lane road extending 35 miles southeast from the south ferry terminal to the Amakdedori Port on Kamishak Bay. Separate spur roads will connect the transportation corridor to the villages of Iliamna, Newhalen, and Kokhanok.

- Port and Ferry Terminals. The port site will be located north of the Amakdedori Creek outflow into Kamishak Bay on the western shore of Cook Inlet, approximately 190 miles southwest of Anchorage and approximately 95 miles southwest of Homer. The port site will include shore-based and marine facilities for the transfer, shipment, and temporary storage of concentrate, freight, and fuel for the Project. The marine component includes an earthen access causeway extending out to a marine jetty located in 15 feet of natural water depth. Copper-gold concentrate containers will be loaded onto lightering barges at the Amakdedori Port and then transported to one of two lightering locations for transfer to bulk carriers. The primary lightering location is approximately 12 miles offshore due east of the proposed Amakdedori Port, the alternative lightering location is approximately 18 miles east-northeast of the proposed Amakdedori Port between Augustine Island and the mainland. The lightering locations will consist of permanently anchored buoys for mooring the bulk carriers. Two ferry terminals, one the north shore of Iliamna Lake (located approximately 10.5 miles southwest of Newhalen) and the other on the south shore of the lake (located approximately 3.3 miles west of the village of Kokhanok), would support the operation of an ice-breaking ferry to transport materials, equipment, and concentrate 18 miles across Iliamna Lake.

- Natural Gas Pipeline. Natural gas will be the primary energy source for the Pebble Project. The natural gas pipeline alignment will connect to an existing natural gas pipeline, and new compressor station located north of Anchor River on the Kenai Peninsula. From there, the pipeline heads southwest across Cook Inlet before turning west to a landfall at the Amakdedori Port. The pipeline then follows the road corridor from the port to the mine site, including crossing Iliamna Lake on the lake bed.

# 3. WOUS Fill Impacts from Proposed Project

Construction of the Project will require the discharge of fill material into 4,038 acres of WOUS. This includes 3,524 acres of permanent impacts and 513 acres of temporary impacts in WOUS (Table 3-1). Permanent impacts include cut and fill activities at facility locations where the fill cannot be practicably removed from WOUS. Temporary impacts occur where fill is placed into wetlands or WOUS for a limited period during construction to facilitate construction activities, then removed within a calendar year allowing return of wetland functions. A summary of permanent and temporary WOUS impacts grouped by Hydrogeomorphic (HGM) and Cowardin classifications for each project element is provided in Table 3-2. Ninety seven percent of permanent WOUS impacts (3,430 acres) are associated with construction of the mine site; two percent (82 acres) with the transportation corridor; and less than one percent (13 acres) with the Amakdedori Port and Iliamna Lake ferry terminals. Construction of the natural gas pipeline would result in no permanent impacts to WOUS as the overland portions of the pipeline are constructed within the transportation corridor footprint and construction impacts associated with the placement of the pipeline on the seabed and lake bed are considered temporary. Most permanent discharges of fill for the mine site and transportation corridor will impact slope palustrine shrub-scrub, and slope-emergent WOUS.



*Table 3-1 Summary of permanent and temporary WOUS impacts (acres)*

| Facility | Permanent | Temporary | Total |
|---|---|---|---|
| Mine Site | 3,429.84 | -- | 3,429.84 |
| Transportation Corridor | 81.69 | 53.88 | 135.57 |
| Port and Ferry Terminals | 12.74 | 5.29 | 18.02 |
| Natural Gas Pipeline | -- | 454.14 | 454.14 |
| **Total** | 3,524.27 | 513.31 | 4,037.58 |

*Table 3-2 Summary of permanent and temporary WOUS impacts (acres) by project element*

| HGM and Cowardin Classification | Permanent Impacts | | | | Temporary Impacts | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mine Site | Trans-portation Corridor | Port and Ferry Terminals | Permanent Total | Trans-portation Corridor | Port and Ferry Terminals | Natural Gas Pipeline | Temporary Total | Grand Total |
| **MARINE** | **--** | **--** | **11.13** | **11.13** | **--** | **3.53** | **378.84** | **382.37** | **393.50** |
| Marine Intertidal Unconsolidated Shore | -- | -- | 0.73 | 0.73 | -- | 0.74 | 0.69 | 1.43 | 2.16 |
| Marine Subtidal Unconsolidated Bottom | -- | -- | 10.40 | 10.40 | -- | 2.79 | 378.15 | 380.94 | 391.34 |
| **LACUSTRINE** | **0.06** | **0.31** | **1.28** | **1.65** | **0.34** | **1.55** | **67.98** | **69.88** | **71.53** |
| Lacustrine Limnetic Unconsolidated Bottom | -- | 0.02 | 0.86 | 0.88 | 0.17 | 1.08 | 67.89 | 69.13 | 70.01 |
| Lacustrine Littoral Unconsolidated Bottom | -- | 0.23 | -- | 0.23 | 0.11 | -- | -- | 0.11 | 0.34 |

| HGM and Cowardin Classification | Permanent Impacts | | | | Temporary Impacts | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mine Site | Trans-portation Corridor | Port and Ferry Terminals | Permanent Total | Trans-portation Corridor | Port and Ferry Terminals | Natural Gas Pipeline | Temporary Total | Grand Total |
| Lacustrine Littoral Unconsolidated Shore | 0.06 | 0.06 | 0.42 | 0.54 | 0.06 | 0.48 | 0.10 | 0.64 | 1.18 |
| **LACUSTRINE FRINGE** | **0.59** | **--** | **--** | **0.59** | **--** | **--** | **--** | **--** | **0.59** |
| Palustrine Emergent | 0.27 | -- | -- | 0.27 | -- | -- | -- | -- | 0.27 |
| Palustrine Shrub-Scrub | 0.32 | -- | -- | 0.32 | -- | -- | -- | -- | 0.32 |
| **RIVERINE** | **232.94** | **5.66** | **--** | **238.60** | **2.26** | **--** | **1.22** | **3.48** | **242.08** |
| Palustrine Emergent | 58.93 | 0.98 | -- | 59.91 | 0.27 | -- | 1.14 | 1.42 | 61.33 |
| Palustrine Forested | -- | -- | -- | -- | 0.00 | -- | -- | 0.00 | 0.00 |
| Palustrine Shrub-Scrub | 169.38 | 4.57 | -- | 173.95 | 1.89 | -- | 0.07 | 1.96 | 175.91 |
| Palustrine Unconsolidated Bottom | 4.63 | 0.11 | -- | 4.74 | 0.09 | -- | -- | 0.09 | 4.82 |
| Riverine Intermittent Streambed | -- | 0.01 | -- | 0.01 | <0.01 | -- | -- | <0.01 | 0.01 |
| Riverine Upper Perennial Unconsolidated Shore | -- | -- | -- | -- | 0.01 | -- | -- | 0.01 | 0.01 |
| **RIVERINE CHANNEL** | **47.48** | **1.85** | **--** | **49.33** | **1.17** | **--** | **0.03** | **1.20** | **50.53** |
| Palustrine Emergent | 0.01 | -- | -- | 0.01 | -- | -- | -- | -- | 0.01 |
| Palustrine Unconsolidated Bottom | 0.07 | -- | -- | 0.07 | -- | -- | -- | -- | 0.07 |
| Riverine Intermittent Streambed | 3.41 | 0.30 | -- | 3.71 | 0.17 | -- | <0.01 | 0.17 | 3.88 |
| Riverine Upper Perennial Unconsolidated Bottom | 42.41 | 1.51 | -- | 43.92 | 0.95 | -- | 0.03 | 0.98 | 44.90 |
| Riverine Upper Perennial Unconsolidated Shore | 1.58 | 0.04 | -- | 1.62 | 0.06 | -- | -- | 0.06 | 1.68 |
| **FLAT** | **81.18** | **6.57** | **--** | **87.75** | **4.20** | **--** | **--** | **4.20** | **91.95** |
| Palustrine Emergent | 5.49 | 1.60 | -- | 7.09 | 1.01 | -- | -- | 1.01 | 8.10 |
| Palustrine Shrub-Scrub | 75.69 | 4.97 | -- | 80.66 | 3.18 | -- | -- | 3.18 | 83.85 |
| **SLOPE** | **3,024.00** | **66.47** | **0.33** | **3,090.79** | **44.80** | **0.20** | **6.07** | **51.07** | **3,141.86** |
| Palustrine Aquatic Bed | 0.01 | 0.14 | -- | 0.14 | 0.11 | -- | -- | 0.11 | 0.25 |
| Palustrine Emergent | 621.13 | 15.53 | 0.16 | 636.82 | 10.13 | 0.14 | 1.88 | 12.14 | 648.96 |
| Palustrine Shrub-Scrub | 2,390.48 | 45.48 | 0.17 | 2,436.13 | 30.46 | 0.07 | 4.19 | 34.72 | 2,470.85 |
| Palustrine Unconsolidated Bottom | 11.44 | 5.16 | -- | 16.60 | 4.04 | -- | -- | 4.04 | 20.64 |

| HGM and Cowardin Classification | Permanent Impacts | | | | Temporary Impacts | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mine Site | Trans-portation Corridor | Port and Ferry Terminals | Permanent Total | Trans-portation Corridor | Port and Ferry Terminals | Natural Gas Pipeline | Temporary Total | Grand Total |
| Palustrine Unconsolidated Shore | 0.94 | 0.16 | -- | 1.10 | 0.06 | -- | -- | 0.06 | 1.16 |
| **DEPRESSIONAL** | **43.59** | **0.83** | **--** | **44.42** | **1.11** | **--** | **--** | **1.11** | **45.54** |
| Palustrine Emergent | 3.71 | 0.08 | -- | 3.79 | 0.23 | -- | -- | 0.23 | 4.02 |
| Palustrine Shrub-Scrub | 9.41 | 0.36 | -- | 9.77 | 0.26 | -- | -- | 0.26 | 10.02 |
| Palustrine Unconsolidated Bottom | 24.35 | 0.30 | -- | 24.64 | 0.47 | -- | -- | 0.47 | 25.11 |
| Palustrine Unconsolidated Shore | 6.13 | 0.09 | -- | 6.22 | 0.16 | -- | -- | 0.16 | 6.38 |
| **Total** | **3,429.84** | **81.69** | **12.74** | **3,524.27** | **53.88** | **5.29** | **454.14** | **513.31** | **4,037.58** |

Note: Minor discrepancies in totals are the result of rounding numbers.

# 4. Compensatory Mitigation

PLP has avoided and minimized, to the extent practicable, discharges of fill into WOUS, including wetlands: avoidance and minimization measures are discussed in Block 23 of the DA Application. PLP is proposing compensatory mitigation for 3,524 acres of unavoidable impacts to WOUS and aquatic resource functions in the watersheds. PLP is not proposing compensatory mitigation for 513 acres of temporary impacts, as those WOUS and functions are expected to recover in the short term. The proposed permanent impacts are distributed among seven Hydrologic Unit Code (HUC) 10 watersheds. A summary of permanent WOUS impacts grouped by HGM and Cowardin classification for each HUC 10 watershed is provided in Table 4-1. Most of the proposed WOUS impacts (97% or 3,421 acres) are in the Headwaters Koktuli River HUC 10 watershed. Discharges of fill at the mine site would be placed in 239 acres of riverine HGM with mostly palustrine scrub-shrub and emergent wetlands, and 49 acres of riverine channel HGM, mainly palustrine upper perennial. Construction of the Amakdedori Port will discharge fill in 11.0 acres of marine HGM, including 0.7 acres of marine intertidal WOUS and 10.3 acres of marine subtidal WOUS. Construction of the ferry terminals would require the discharge of fill into 1.3 acres of lacustrine HGM.

The Rule emphasizes the selection of compensatory mitigation sites using a watershed approach and established three types of compensatory mitigation mechanisms: (1) mitigation banks, (2) ILF programs, and (3) permittee-responsible mitigation (PRM) plans. PLP has consulted the Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS) and confirmed the existence of The Conservation Fund ILF with a service area that includes the Project (USACE 2018). However, as of October 16, 2017 the fund is no longer authorized to sell credits (USACE 2017). The Project is not located in the service area of an approved bank or ILF with appropriate credits available. In the absence of mitigation banks or an ILF program in the watersheds, 33 Code of Federal Regulation [CFR] 332.3 (b)(4) states that "permittee-responsible mitigation is the only option." Three PRM options are identified in The Rule and 2018 MOU. PRM projects using a watershed approach are most favored. Such projects consider the needs of the watershed for advancing and sustaining aquatic resource functions, such as the need for specific habitat enhancements, water quality improvements, or flood control. On-site, in-kind PRM projects replace the specific wetland functions and values that are impacted at the same location as the fill site. Off-site, out-of-kind PRM projects focus on preserving, creating, restoring and enhancing WOUS with different functions and values than the impacted WOUS.

*Table 4-1 Summary of permanent WOUS impacts (acres) by HUC 10 watershed*

| HGM and Cowardin Classification | Headwaters Koktuli River | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Amakdedori Creek-Frontal Kamishak Bay | Cook Inlet | Total |
|---|---|---|---|---|---|---|---|---|
| **MARINE** | **--** | **--** | **--** | **--** | **--** | **10.98** | **0.15** | **11.13** |
| Marine Subtidal Unconsolidated Bottom | -- | -- | -- | -- | -- | 10.25 | 0.15 | 10.40 |
| Marine Intertidal Unconsolidated Shore | -- | -- | -- | -- | -- | 0.73 | -- | 0.73 |
| **LACUSTRINE** | **0.06** | **--** | **1.29** | **<0.01** | **--** | **0.30** | **--** | **1.65** |
| Lacustrine Limnetic Unconsolidated Bottom | -- | -- | 0.87 | <0.01 | -- | 0.00 | -- | 0.88 |
| Lacustrine Littoral Unconsolidated Bottom | -- | -- | -- | -- | -- | 0.23 | -- | 0.23 |
| Lacustrine Littoral Unconsolidated Shore | 0.06 | -- | 0.42 | -- | -- | 0.06 | -- | 0.54 |
| **LACUSTRINE FRINGE** | **0.59** | **--** | **--** | **--** | **--** | **--** | **--** | **0.59** |
| Palustrine Emergent | 0.27 | -- | -- | -- | -- | -- | -- | 0.27 |
| Palustrine Scrub-Shrub | 0.32 | -- | -- | -- | -- | -- | -- | 0.32 |
| **RIVERINE** | **232.48** | **0.01** | **0.66** | **--** | **5.45** | **--** | **--** | **238.60** |
| Palustrine Emergent | 58.77 | -- | 0.52 | -- | 0.62 | -- | -- | 59.91 |
| Palustrine Scrub-Shrub | 169.08 | -- | 0.14 | -- | 4.73 | -- | -- | 173.95 |
| Riverine Unconsolidated Streambed | 4.63 | -- | -- | -- | 0.11 | -- | -- | 4.74 |
| Riverine Intermittent Streambed | -- | 0.01 | -- | -- | -- | -- | -- | 0.01 |
| **RIVERINE CHANNEL** | **47.39** | **0.03** | **0.59** | **0.20** | **0.52** | **0.60** | **--** | **49.33** |
| Palustrine Emergent | 0.01 | -- | -- | -- | -- | -- | -- | 0.01 |
| Palustrine Unconsolidated Bottom | 0.07 | -- | -- | -- | -- | -- | -- | 0.07 |
| Riverine Intermittent Streambed | 3.41 | -- | 0.04 | 0.03 | 0.04 | 0.20 | -- | 3.71 |
| Riverine Upper Perennial Unconsolidated Bottom | 42.33 | 0.03 | 0.55 | 0.18 | 0.44 | 0.40 | -- | 43.92 |
| Riverine Upper Perennial Unconsolidated Shore | 1.58 | -- | -- | -- | 0.04 | <0.01 | -- | 1.62 |
| **FLAT** | **81.13** | **--** | **--** | **--** | **6.62** | **--** | **--** | **87.75** |
| Palustrine Emergent | 5.49 | -- | -- | -- | 1.60 | -- | -- | 7.09 |
| Palustrine Scrub-Shrub | 75.64 | -- | -- | -- | 5.02 | -- | -- | 80.66 |
| **SLOPE** | **3,016.35** | **0.84** | **17.47** | **9.01** | **32.26** | **14.86** | **--** | **3,090.79** |
| Palustrine Aquatic Bed | 0.01 | -- | 0.14 | -- | -- | -- | -- | 0.14 |

| HGM and Cowardin Classification | Headwaters Koktuli River | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Amakdedori Creek-Frontal Kamishak Bay | Cook Inlet | Total |
|---|---|---|---|---|---|---|---|---|
| Palustrine Emergent | 618.85 | 0.10 | 5.64 | 3.09 | 4.03 | 5.11 | -- | 636.82 |
| Palustrine Scrub-Shrub | 2,385.11 | 0.73 | 10.48 | 5.09 | 28.18 | 6.54 | -- | 2,436.13 |
| Palustrine Unconsolidated Bottom | 11.44 | -- | 1.13 | 0.83 | 0.05 | 3.15 | -- | 16.60 |
| Palustrine Unconsolidated Shore | 0.94 | -- | 0.07 | 0.01 | -- | 0.08 | -- | 1.10 |
| **DEPRESSIONAL** | **43.45** | **0.29** | **0.30** | **--** | **0.37** | **0.01** | **--** | **44.42** |
| Palustrine Emergent | 3.71 | -- | -- | -- | 0.08 | -- | -- | 3.79 |
| Palustrine Scrub-Shrub | 9.41 | 0.29 | 0.07 | -- | -- | -- | -- | 9.77 |
| Palustrine Unconsolidated Bottom | 24.26 | -- | 0.23 | -- | 0.14 | 0.01 | -- | 24.64 |
| Palustrine Unconsolidated Shore | 6.07 | -- | <0.01 | -- | 0.15 | -- | -- | 6.22 |
| **TOTAL** | **3,421.45** | **1.17** | **20.31** | **9.22** | **45.22** | **26.75** | **0.15** | **3,524.27** |

Note: Minor discrepancies in totals are the result of rounding numbers.

# 5. Affected Watersheds Analysis

A watershed approach is used to establish compensatory mitigation requirements to the extent appropriate and practicable (33 CFR 332.2). The watershed approach is an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It considers watershed needs, and how locations and types of compensatory mitigation projects address those needs. A landscape perspective is used to identify the types and locations of compensatory mitigation projects that will benefit the watershed and offset losses of aquatic resource functions and services caused by activities authorized by DA permits. This section provides a summary of available data and the analytical process followed to determine the watershed conditions.

The geographic area of the watershed analysis (Analysis Area) extends over three HUC 6 basins (Nushagak River, Kvichak-Port Heiden, and Western Cook Inlet) and includes seven Hydrologic Unit Code (HUC) 10 watersheds encompassing approximately 1,944,130 acres (Table 5-1, Figure 1 [Figures are included in Attachment 1]). The Project footprint includes facilities on the Kenai Peninsula, in the Stariski Creek-Frontal Cook Inlet HUC 10 watershed, but there are no impacts to WOUS and this watershed is excluded from the Analysis Area. Cook Inlet waters are also excluded from the Analysis Area as WOUS impacts will be minimal (approximately 0.1 acres) or temporary, and no compensatory mitigation is proposed for temporary impacts. The Paint River HUC 10 was included in the Analysis Area because, even though the Project does not propose discharges of fill into WOUS within this watershed, its inclusion provides continuity across basins within the Project footprint. Each watershed includes important physical features, ecological processes, and resource types for the sustainability of aquatic resource functions.

*Table 5-1 HUC 10 watersheds included in the geographic area of the watershed analysis*

| HUC 10 | Watershed | Project Element | Watershed Acres |
|---|---|---|---|
| **Nushagak River (HUC 6)** | | | |
| 1903030211 | Headwaters Koktuli River | Mine site | 170,633 |
| **Kvichak-Port Heiden (HUC 6)** | | | |
| 1903020514 | Newhalen River | Transportation corridor | 119,708 |
| 1903020609 | Iliamna Lake | Transportation corridor; natural gas pipeline and fiber optic cable | 1,201,854 |
| 1903020606 | Gibraltar Lake | Transportation corridor; natural gas pipeline and fiber optic cable | 81,581 |
| 1903020607 | Upper Talarik Creek | Mine site; transportation corridor; natural gas pipeline and fiber optic cable | 87,539 |
| **Western Cook Inlet (HUC 6)** | | | |
| 1902060208 | Paint River | Transportation corridor; natural gas pipeline and fiber optic cable | 128,354 |
| 1902060212 | Amakdedori Creek-Frontal Kamishak Bay | Transportation corridor; natural gas pipeline and fiber optic cable; Amakdedori Port | 154,461 |
| **Total** | | | **1,944,130** |

Source: USGS Watershed Boundary Dataset, 2018

## 5.1 Land Cover

The National Land Cover Database (NLCD) (Jim, et al. 2011) provides a rapid estimate of land cover types for watersheds including percent of developed areas, and percent of vegetated cover.

The most abundant land cover in the Analysis Area is open water at approximately 36.48 percent, approximately 91.41 percent of which are Iliamna Lake. Shrub/scrub and dwarf shrub are the most widely

distributed vegetation types at 36.48 percent and 18.78 percent respectively. Barren lands are unvegetated areas that generally occur at hill tops and shorelines and account for approximately 3.95 percent of cover type in the Analysis Area. Mixed forest, evergreen forest, and deciduous forest account for approximately 3.83 percent, 3.24 percent, and 3.12 percent of cover type respectively. Less than one percent is identified by the NLCD as emergent herbaceous wetlands, woody wetlands, perennial ice/snow, sedge/herbaceous and moss areas. Wetlands mapped in the NLCD are generally undercounted as the data analysis process is not optimized for this purpose. Wetlands are discussed in section 5.2. Developed areas cover less than 0.05 percent of the Analysis Area (See Table 5-2).

*Table 5-2 NLCD Classification for the watershed Analysis Area*

| Land Cover Class | Nushagak River | Kvichak-Port Heiden | | | | Western Cook Inlet | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | Headwaters Koktuli River | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Paint River | Amakdedori Creek-Frontal Kamishak Bay | % | Acres |
| Barren Land | 1.66% | 3.18% | 2.63% | 4.41% | 0.37% | 15.98% | 9.17% | **3.95%** | **76,775** |
| Deciduous Forest | 0.81% | 5.25% | 3.49% | 4.05% | 1.82% | 0.60% | 3.44% | **3.12%** | **60,538** |
| Developed, High Intensity | <0.01% | <0.01% | <0.01% | <0.01% | <0.01% | <0.01% | <0.01% | **<0.01%** | **29** |
| Developed, Low Intensity | <0.01% | 0.27% | 0.04% | <0.01% | <0.01% | <0.01% | <0.01% | **0.04%** | **753** |
| Developed, Medium Intensity | <0.01% | <0.01% | 0.01% | <0.01% | <0.01% | <0.01% | <0.01% | **0.01%** | **158** |
| Developed, Open Space | <0.01% | 0.05% | <0.01% | <0.01% | <0.01% | <0.01% | <0.01% | **<0.01%** | **75** |
| Dwarf Shrub | 42.34% | 13.21% | 12.19% | 37.60% | 47.23% | 30.35% | 12.66% | **18.78%** | **364,945** |
| Emergent Herbaceous Wetlands | 0.68% | 0.70% | 0.50% | 0.10% | 0.15% | <0.01% | 0.02% | **0.42%** | **8,256** |
| Evergreen Forest | 1.77% | 10.59% | 3.73% | 0.59% | 2.16% | 0.02% | 0.13% | **3.24%** | **63,058** |
| Mixed Forest | 0.20% | 11.23% | 4.87% | 1.02% | 0.95% | <0.01% | 0.32% | **3.83%** | **74,469** |
| Moss | <0.01% | 0.01% | <0.01% | <0.01% | <0.01% | <0.01% | <0.01% | **0.01%** | **36** |
| Open Water | 1.64% | 8.66% | 56.79% | 5.98% | 1.59% | 1.67% | 3.25% | **36.48%** | **708,879** |
| Perennial Ice/Snow | <0.01% | <0.01% | 0.02% | 0.44% | <0.01% | 0.99% | 0.09% | **0.10%** | **1,959** |
| Sedge/Herbaceous | 0.02% | 0.04% | 0.10% | <0.01% | 0.06% | <0.01% | 0.04% | **0.07%** | **1,397** |
| Shrub/Scrub | 50.61% | 45.62% | 15.53% | 45.79% | 45.63% | 50.39% | 70.81% | **29.77%** | **578,642** |
| Woody Wetlands | 0.27% | 1.20% | 0.12% | 0.02% | 0.04% | <0.01% | 0.07% | **0.18%** | **3,452** |
| **Total** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **1,943,423** |

Source: National Land Cover Database (Jim, et al. 2011). Differences in the acreage between the above and those shown in Table 5-1 are a result of the differences in data resolution, and data types (vector versus raster data).

## 5.2 Wetlands and Other Waters

Using a consistent dataset for the calculation of wetlands is desired for equitable assessment of habitat types on a broad level. There is one dataset available that covers the entire area with a uniform method of analysis and scale, it is the Alaska Wetlands Map (AWM) derived from L-band radar imagery acquired by Japanese Earth Resources Satellite (JERS-1) synthetic aperture radar (SAR) and is available with a resolution of 100-meter pixels. Another broadly available dataset is the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI). The NWI data cover approximately 60 percent of the Analysis Area and would need to be supplemented by the AWM dataset. The Headwaters Koktuli River is the only watershed covered

100 percent by the NWI data. A third dataset available is the PLP wetlands mapping for the immediate vicinity of the Project footprint and includes 89 percent of the surface area in the Headwaters Koktuli River watershed. The PLP wetlands data outside the Headwaters Koktuli River watershed are generally limited to the transportation corridor and are of limited use in the evaluation of the Analysis Area.

Most of the proposed Project wetland impacts are in the Headwaters Koktuli River watershed. It is appropriate to provide and use the most accurate data for that portion of the Analysis Area. The PLP-generated data for the Headwaters Koktuli River is provided in Table 5-3. Since the PLP wetlands mapping only includes 89 percent of the surface area in the Headwaters Koktuli River watershed, NWI data were used to supplement the remaining 11 percent of the watershed (Table 5-4). The AWM dataset is the only consistent dataset for the entire Analysis Area and was used for the remainder of the watersheds and is provided in Table 5-5. The AWM provides only wetlands; therefore, other waters were calculated from the National Hydrography Dataset (NHD) 1:63,360 scale mapping (USGS 2018).

The Headwaters Koktuli River watershed includes approximately 59,581 acres of wetlands including 48,693 acres mapped by PLP and 10,888 acres mapped by the NWI. Slope palustrine scrub-shrub (42.65%), slope palustrine emergent (18.3%) and riverine palustrine scrub-shrub (12.01%) and emergent (4.44%) are the most abundant wetlands mapped by PLP in the watershed. The NWI data are not grouped by HGM, but the most widely distributed wetlands are palustrine scrub-shrub (71.74%) and palustrine emergent (23.93%).

For the remaining Analysis Area watersheds, the percentage of wetlands and other waters ranges from 19 percent in the Paint River watershed, to 79 percent in the Iliamna Lake watershed (Table 5-5). The most abundant wetlands types are palustrine scrub-shrub and emergent. The Newhalen River, Iliamna Lake, Gibraltar Lake, and Upper Talarik Creek HUC 10 watersheds contains many rivers and streams that drain into Iliamna Lake. At 1,012 sq. mi, 77 mi long, up to 22 mi wide, and up to 984 ft. deep, Iliamna Lake is the largest freshwater body in the Analysis Area. The Kvichak River drains from Iliamna Lake southwest into Bristol Bay.

*Table 5-3 Wetlands and other waters mapped by PLP in the Headwaters Koktuli River*

| HGM and Cowardin Classification | Acres | % |
|---|---|---|
| **LACUSTRINE** | **975.0** | **2.00%** |
| Lacustrine Limnetic Unconsolidated Bottom | 844.4 | 1.73% |
| Lacustrine Littoral Aquatic Bed | 10.1 | 0.02% |
| Lacustrine Littoral Unconsolidated Bottom | 33.0 | 0.07% |
| Lacustrine Littoral Unconsolidated Shore | 33.8 | 0.07% |
| Palustrine Emergent | 1.1 | <0.01% |
| Palustrine Unconsolidated Bottom | 51.0 | 0.10% |
| Palustrine Unconsolidated Shore | 2.7 | 0.01% |
| **LACUSTRINE FRINGE** | **126.7** | **0.26%** |
| Lacustrine Littoral Emergent | 0.3 | 0.00% |
| Lacustrine Littoral Unconsolidated Shore | 9.4 | 0.02% |
| Palustrine Emergent | 50.7 | 0.10% |
| Palustrine Moss-Lichen | 0.2 | <0.01% |
| Palustrine Scrub-Shrub | 64.8 | 0.13% |
| Palustrine Unconsolidated Bottom | 0.5 | <0.01% |
| Palustrine Unconsolidated Shore | 0.9 | <0.01% |
| **RIVERINE** | **8,345.6** | **17.14%** |

| HGM and Cowardin Classification | Acres | % |
|---|---|---|
| Palustrine Aquatic Bed | 1.8 | <0.01% |
| Palustrine Emergent | 2,163.4 | 4.44% |
| Palustrine Forested | 38.5 | 0.08% |
| Palustrine Moss-Lichen | 2.9 | 0.01% |
| Palustrine Scrub-Shrub | 5,847.3 | 12.01% |
| Palustrine Unconsolidated Bottom | 160.6 | 0.33% |
| Palustrine Unconsolidated Shore | 67.6 | 0.14% |
| Riverine Intermittent Streambed | 0.1 | <0.01% |
| Riverine Lower Perennial Unconsolidated Bottom | 41.5 | 0.09% |
| Riverine Lower Perennial Unconsolidated Shore | 19.1 | 0.04% |
| Riverine Upper Perennial Aquatic Bed | <0.01 | <0.01% |
| Riverine Upper Perennial Unconsolidated Bottom | 2.2 | <0.01% |
| Riverine Upper Perennial Unconsolidated Shore | 0.5 | <0.01% |
| **RIVERINE CHANNEL** | **1,070.0** | **2.20%** |
| Palustrine Aquatic Bed | 1.0 | <0.01% |
| Palustrine Emergent | 0.3 | <0.01% |
| Palustrine Unconsolidated Bottom | 38.1 | 0.08% |
| Palustrine Unconsolidated Shore | 6.0 | 0.01% |
| Riverine Intermittent Streambed | 64.1 | 0.13% |
| Riverine Lower Perennial Aquatic Bed | 19.1 | 0.04% |
| Riverine Lower Perennial Emergent | 0.3 | <0.01% |
| Riverine Lower Perennial Unconsolidated Bottom | 166.6 | 0.34% |
| Riverine Lower Perennial Unconsolidated Shore | 9.1 | 0.02% |
| Riverine Upper Perennial Emergent | 0.1 | <0.01% |
| Riverine Upper Perennial Unconsolidated Bottom | 635.7 | 1.31% |
| Riverine Upper Perennial Unconsolidated Shore | 129.6 | 0.27% |
| **FLAT** | **6,599.8** | **13.55%** |
| Palustrine Aquatic Bed | <0.1 | <0.01% |
| Palustrine Emergent | 1,623.7 | 3.33% |
| Palustrine Forested | 0.2 | <0.01% |
| Palustrine Moss-Lichen | 33.7 | 0.07% |
| Palustrine Scrub-Shrub | 4,917.6 | 10.10% |
| Palustrine Unconsolidated Bottom | 4.1 | 0.01% |
| Palustrine Unconsolidated Shore | 20.3 | 0.04% |
| Riverine Intermittent | <0.1 | <0.01% |
| **SLOPE** | **29,813.9** | **61.23%** |
| Palustrine Aquatic Bed | 6.1 | 0.01% |
| Palustrine Emergent | 8,911.2 | 18.3% |
| Palustrine Forested | 2.2 | <0.01% |
| Palustrine Moss-Lichen | 27.5 | 0.06% |
| Palustrine Scrub-Shrub | 20,768.5 | 42.65% |
| Palustrine Unconsolidated Bottom | 69.3 | 0.14% |
| Palustrine Unconsolidated Shore | 28.3 | 0.06% |
| Riverine Upper Perennial Unconsolidated Bottom | 0.3 | <0.01% |
| Riverine Upper Perennial Unconsolidated Shore | 0.5 | <0.01% |
| **DEPRESSIONAL** | **1,561.2** | **3.21%** |
| Lacustrine Littoral Unconsolidated Shore | <0.1 | <0.01% |
| Palustrine Aquatic Bed | 4.8 | 0.01% |
| Palustrine Emergent | 155.3 | 0.32% |
| Palustrine Moss-Lichen | 0.5 | <0.01% |

| HGM and Cowardin Classification | Acres | % |
|---|---|---|
| Palustrine Scrub-Shrub | 172.7 | 0.35% |
| Palustrine Unconsolidated Bottom | 913.1 | 1.88% |
| Palustrine Unconsolidated Shore | 314.8 | 0.65% |
| **N/A** | **201.3** | **0.41%** |
| Palustrine Emergent | 2.6 | 0.01% |
| Palustrine Scrub-Shrub | 197.9 | 0.41% |
| Palustrine Unconsolidated Shore | 0.9 | <0.01% |
| **Grand Total** | **48,693.5** | **100%** |

Source: PLP mapped wetlands. Minor discrepancies in totals are the result of rounding numbers.

*Table 5-4 NWI wetlands and other waters in the Headwaters Koktuli River outside PLP mapped wetlands Analysis Area*

| Cowardin Classification | Acres | % |
|---|---|---|
| Palustrine Emergent | 2,605.4 | 23.93% |
| Palustrine Scrub Shrub | 7,811.1 | 71.74% |
| Palustrine Unconsolidated Bottom | 248.4 | 2.28% |
| Riverine Unknown Perennial Unconsolidated Bottom | 222.8 | 2.05% |
| **Grand Total** | **10,887.7** | **100%** |

Source: UFWS NWI mapped wetlands.

*Table 5-5 Wetlands and other waters on the Newhalen River, Iliamna Lake, Gibraltar Lake, Upper Talarik Creek, Paint River, and Amakdedori Creek-Frontal Kamishak Bay HUC 10 watersheds*

| | Kvichak-Port Heiden | | | | Western Cook Inlet | | |
|---|---|---|---|---|---|---|---|
| | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Paint River | Amakdedori Creek-Frontal Kamishak Bay | Total |
| **Wetlands** | | | | | | | |
| **Estuarine (ac.)** | **--** | **15** | **--** | **--** | **--** | **1,525** | **1,540** |
| Emergent (ac.) | -- | 15 | -- | -- | -- | 1,525 | **1,540** |
| Forested (ac.) | -- | -- | -- | -- | -- | -- | **--** |
| **Lacustrine (ac.)** | **116** | **42** | **--** | **--** | **--** | **35** | **193** |
| Emergent (ac.) | 116 | 42 | -- | -- | -- | 35 | **193** |
| **Palustrine (ac.)** | **56,577** | **270,572** | **21,558** | **35,355** | **21,965** | **25,968** | **431,995** |
| Emergent (ac.) | 30,908 | 133,446 | 7,594 | 13,200 | 6,291 | 5,666 | **197,105** |
| Forested (ac.) | 59 | 682 | -- | 44 | -- | 62 | **847** |
| Shrub-Scrub (ac.) | 25,610 | 136,444 | 13,964 | 22,111 | 15,674 | 20,240 | **234,043** |
| **Other Waters (ac.)** | | | | | | | |
| Ice (Glacier) (ac.) | -- | -- | 38 | -- | 61 | -- | **99** |
| Lakes (ac.) | 8,075 | 681,658 | 5,331 | 1,680 | 2,159 | 3,960 | **702,863** |
| Streams (mi.) | 250 | 881 | 91 | 250 | 557 | 684 | **2713** |
| **Summary of Wetlands and other Waters** | | | | | | | |
| Watershed Size (ac.) | 119,708 | 1,201,854 | 81,581 | 87,539 | 128,354 | 154,461 | **1,773,497** |
| Wetlands (ac.) | 56,693 | 270,629 | 21,557 | 35,356 | 21,965 | 27,527 | **433,727** |
| Wetlands (%) | 47% | 23% | 26% | 40% | 17% | 18% | |

| | Kvichak-Port Heiden | | | | Western Cook Inlet | | |
|---|---|---|---|---|---|---|---|
| | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Paint River | Amakdedori Creek-Frontal Kamishak Bay | Total |
| Other Waters (ac.) | 8,075 | 681,658 | 5,369 | 1,680 | 2,220 | 3,960 | **702,962** |
| Other Waters (%) | 7% | 57% | 7% | 2% | 2% | 3% | |
| **Wetlands and Other Waters (ac.)** | **64,768** | **952,287** | **26,926** | **37,036** | **24,185** | **31,487** | **1,136,689** |
| **Wetlands and Other Waters (%)** | **54%** | **79%** | **33%** | **42%** | **19%** | **20%** | **64%** |
| Streams (mi.) | 250 | 881 | 91 | 250 | 557 | 684 | **2,713** |

Source: Wetlands – Alaska Wetlands Map; Other Waters – National Hydrographic Dataset

## 5.3 Fish and Wildlife

The wetlands and other waters of the U.S. in the watersheds provide habitat for mammals, fish, and bird animal species, many of which are of high importance to the ecosystems they inhabit and to the local economies and subsistence lifestyles. Representative indicator animal species in the Analysis Area include:

- Caribou. Caribou (*Rangifer tarandus granti*) in this area are referred as the Mulchatna Caribou Herd. Caribou prefer tundra habitats. Their distribution in the watersheds include the Headwaters Koktuli River, Upper Talarik Creek, Newhalen River, and the western shores of Iliamna Lake. In the mid-1990s, the caribou population peaked at about 200,000 animals, and then the herd began simultaneously declining in numbers and expanding its range north and west. This current decade the population reached a low of approximately 18,000 caribou; although in 2015 it had shown an increase to over 30,000. During the late 1990s, reported annual harvests peaked at over 5,000 caribou but during the 2010s, the reported harvest has not exceeded 466 caribou per year (Van Lanen 2018).

- Lake Seals. Iliamna Lake provides habitat to a population of freshwater seals, which are believed to be harbor seals (*Phoca vitulina*), although the exact species identification remains uncertain. These seals are unique in that freshwater seal populations are very rare in the northern hemisphere. Over the 28 years of aerial surveys, counts have ranged from zero to more than 300 seals, with the largest numbers occurring during August. The seals spend most of their time in and around the island systems of the northeast portion of the lake and during salmon season feed near the mouths of the lake's tributary rivers and streams. Approximately 3-5 seals are harvested per community per year (Van Lanen, Iliamna Lake Seals Local and Scientific Understanding 2018).

- Fish. The Bristol Bay watershed, of which these watersheds are a part, support important commercial and sport fisheries for Pacific salmon and other fishes. The watersheds provide spawning and rearing habitat for all species of anadromous Pacific salmon (Figure 2): sockeye (*Oncorhynchus nerka*), coho (*O. kisutch*), Chinook (*O. tshawytscha*), chum (*O. keta*), and pink (*O. gorbuscha*). The most abundant species in the watersheds is sockeye salmon. Waters in the watersheds provide habitat for other fish species, including rainbow trout (*O. mykiss*), Dolly Varden (*Salvelinus malma*), Arctic char (*S. alpinus*), lake trout (*S. namaycush*), Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), and humpback whitefish (*Coregonus pidschian*). These fishes occupy a variety of habitats in the watershed, from headwater streams to wetlands to large rivers and lake. The Analysis Area includes approximately 571 miles and

684,616 acres of anadromous streams and waterbodies. Nearly 16 percent of the streams and 97 percent of the lakes in the Analysis Area provide habitat to Pacific salmon (Table 5-6).

*Table 5-6 Pacific salmon habitat in the watershed Analysis Area (miles and acres)*

| | Nushagak River | Kvichak-Port Heiden | | | | Western Cook Inlet | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | Headwaters Koktuli River | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Paint River | Amakdedori Creek-Frontal Kamishak Bay | % of Waters in the Analysis Area | Anadromous Waters |
| **Anadromous Streams (miles)** | 143 | 53 | 213 | 43 | 76 | -- | 41 | **16%** | **571** |
| **Anadromous Lakes (acres)** | 406 | 5,750 | 674,782 | 3,211 | 34 | -- | 433 | **97%** | **684,616** |

Source: ADF&G Anadromous Waters Catalog *(ADF&G 2018).*

The Headwaters Koktuli River watershed includes 143 stream miles and 406 lake acres of anadromous fish habitat for Arctic char, Chinook salmon, chum salmon, coho salmon, and sockeye salmon (ADF&G 2018). Sockeye and coho salmon have the greatest distribution of any anadromous fish in the Headwaters Koktuli River watershed (Table 5-7). Sockeye salmon spawning has been documented in 164 lake acres, and 59 stream miles, and rearing in 152 lake acres and 54 stream miles. Coho salmon spawning has been documented in 79 stream miles, and rearing in 187 lake acres and 125 stream miles. Chinook spawning has been documented in 64 stream miles and rearing in 82 stream miles. Chum spawning includes 64 stream miles and rearing 82 stream miles. Arctic char is present in 41 stream miles.

*Table 5-7 Anadromous fish habitat in the Headwaters Koktuli watershed*

| Fish Species | Present | Rearing | Spawning |
|---|---|---|---|
| **Arctic char** | | | |
| Stream (miles) | 41 | -- | -- |
| **Chinook salmon** | | | |
| Lake (acres) | 164 | -- | -- |
| Stream (miles) | 11 | 82 | 64 |
| **Chum salmon** | | | |
| Stream (miles) | 4 | 7 | 50 |
| **Coho salmon** | | | |
| Lake (acres) | 219 | 187 | |
| Stream (miles) | 20 | 125 | 79 |
| **Sockeye salmon** | | | |
| Lake (acres) | 52 | 152 | 164 |
| Stream (miles) | 16 | 54 | 59 |

Source: *ADF&G Anadromous Waters Catalog* (ADF&G 2018).

- Protected Species. Protected species in the watershed include southcentral stock northern Sea Otters, (*Enhydra lutris kenyoni*) which make use of the marine shorelines of Amakdedori Creek-Frontal Kamishak Bay.

- Other. The watersheds' wetlands and aquatic resources provide habitat for large carnivores such as brown bears (*Ursus arctos*), bald eagles (*Haliaeetus leucocephalus*), gray wolves (*Canis lupus*); ungulates such as moose (*Alces alces gigas*); and numerous waterfowl and small mammal species. Brown bears are abundant in the Nushagak River and Kvichak River watersheds. Moose are abundant, particularly in the Nushagak River watershed where felt-leaf willow, a preferred forage species, is plentiful.

## 5.4 Land Ownership

Generalized land status data to the section level (generally 1 square mile) including federal, State of Alaska, and native lands is produced by the Alaska Department of Natural Resources (ADNR 2018).

The Analysis Area comprises approximately 1,270,262 acres (72%) of public lands, including State of Alaska (40%) and federally owned (32%) lands. Overall, the State of Alaska is the largest surface land owner (Table 5-8). Private lands total 487,471 acres (28%) of the watershed and includes Alaska Native Claims Settlement Act (ANCSA) lands (26%) and private or municipal lands (1%). Approximately 212,960 acres (~12%) are grouped in administrative management areas including Katmai National Park and Preserve, Lake Clark National Park and Preserve, and the McNeil River State Game Refuge and Sanctuary (Figure 3).

*Table 5-8 Land ownership for the watershed Analysis Area (acres)*

| Land Ownership Types | Nushagak River | Kvichak-Port Heiden | | | | Western Cook Inlet | | Grand Total | |
|---|---|---|---|---|---|---|---|---|---|
| | Headwater Koktuli River | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Paint River | Amakdedori Creek – Frontal Kamishak Bay | Acres | Percent of Analysis Area |
| ANCSA | -- | 53,583 | 356,724 | 31,866 | 19,037 | 207 | -- | **461,417** | **26%** |
| Private or Municipal | -- | 4,344 | 21,710 | -- | -- | -- | -- | **26,054** | **1%** |
| State | 170,632 | 40,630 | 283,807 | 41,864 | 64,664 | 127,932 | 148,642 | **707,539** | **40%** |
| State and ANCSA | | 5,516 | 8,117 | -- | -- | -- | -- | **13,633** | **1%** |
| Federal | -- | 15,635 | 531,496 | 7,850 | 3,837 | 214 | 3,691 | **562,723** | **32%** |
| **Total** | **170,632** | **119,708** | **1,201,854** | **81,581** | **87,539** | **128,354** | **152,332** | **1,771,368** | **100%** |
| **Administrative Boundary** | | | | | | | | | |
| Katmai National Park & Preserve | -- | -- | 336 | 1,067 | -- | 174 | 25,620 | **27,198** | **2%** |
| Lake Clark National Park & Preserve | -- | 25,192 | 1,913 | -- | -- | -- | -- | **27,105** | **2%** |
| McNeil River State Game Refuge | -- | -- | 1,124 | 1,962 | -- | 111,335 | 11,789 | **126,210** | **7%** |
| McNeil River State Game Sanctuary | -- | -- | -- | -- | -- | 13,820 | 18,628 | **32,447** | **2%** |
| **Total** | **--** | **25,192** | **3,373** | **3,029** | **--** | **125,328** | **56,037** | **212,960** | **12%** |

Source: Alaska Department of Natural Resources General Land Status, 2018, section level data (ADNR 2018). In some cases, the land ownership was split between State of Alaska, and ANCSA owned land. In those cases, the data were not segregated and counted as "State and ANCSA". Discrepancies in the total acreage for the watershed in this table and those shown in Table 5-1 are a result of the differences in data boundaries between the Generalized Land Status and the HUC; in coastal areas, the Generalized Land Status data, and HUC 10 boundary limits do not match.

## 5.5 Land Use

The watersheds are largely undeveloped, except for seven rural communities including Nondalton, Iliamna, Newhalen, Pedro Bay, Pile Bay, Igiugig, and Kokhanok. The region is remote with no road access to the State's highway system and limited roads between Iliamna, Newhalen, and Nondalton, as well as a 15-mile road connecting Williamsport to Pile Bay. Most communities have gravel and earth surfaced streets. Surface access between most communities is by boat along the lake in the summer and by snow machine along winter trails in the winter. A few small air carriers provide regular year-round, air charter, and cargo flights from regional hubs to the smaller communities (BBNA 2018). The communities rely primarily on diesel electric generators for power, but some communities have implemented alternative energy sources as a means to lower fuel cost (BBNA 2018), and to alleviate spill risk concerns associated with fuel transport (HDR 1998): Iliamna, Newhalen, and Nondalton have implemented hydroelectric options at Tazimina Falls about 9 miles upstream of the confluence of the Tazimina River and the Newhalen River (HDR 1998); Igiugig is experimenting with a river power system (Caldwell 2014). The communities operate as both subsistence and cash economies. Most cash opportunities result from government development projects, commercial fishing, sport fishing, and sport hunting ventures. Iliamna Lake is noted for its sport fishing, primarily rainbow trout, Pacific salmon, and Arctic grayling.

Almost all State of Alaska lands within the Analysis Area are managed for multiple use and are open to mining. The watersheds include a history of mineral exploration, but to date no mines have been developed. The most significant placer mining districts in proximity to the Analysis Area are the Nyac (gold) 175 miles northwest of the mine site, and Goodnews Bay (platinum) 235 miles west of the mine site. The Alaska Resource Data File maintained by the U.S. Geological Survey provides a record of mines, prospects and mineral occurrences (USGS 2018). The watersheds within Nushagak River, Kvichak-Port Heiden, and Western Cook Inlet basins include six mineral occurrences and 26 prospects for gold, copper, iron, silver, and molybdenum. The State of Alaska closed many streams to mineral entry in the Nushagak-Mulchatna River drainage as well as streams around Iliamna Lake (Mineral Closing Order 393). This closure is aimed at protecting Pacific salmon streams, including the North Fork Koktuli River, South Fork Koktuli River, and Upper Talarik Creek. The Analysis Area has large quantities of sand, gravel, and rock materials. There has been little use for these materials except near communities that require them for airport and road construction or upgrades.

## 5.6 Water Quality

Wetlands, rivers, and streams that are free of contaminants are important for sustaining a healthy aquatic ecosystem. Potential sources of contaminants in the Analysis Area include: spills of chemicals or petroleum lubricants and fuels, stormwater runoff and erosion, community sanitation facilities including landfills and sewage management systems, and similar sources. PLP has reviewed available databases to locate potential sources of contamination in the Analysis Area:

- Alaska Department of Environmental Conservation (ADEC) contaminated sites. The ADEC maintains a database of contaminated sites in Alaska. The database includes 12 contaminated sites in the Analysis Area where cleanup actions have been complete, and six sites where cleanup actions are undergoing. Contaminants at these sites included oil and lubricants. There are no identified sites in the Analysis Area where clean up actions are not in progress.

- ADEC Solid Waste Sites. The ADEC maintains a database of solid waste sites in Alaska. The database includes 11 solid waste sites in the Analysis Area located in the proximity of each village. Six solid waste sites are active, one inactive, and four retired.
- ADEC Waste Erosion Assessment and Review (WEAR). The ADEC conducted the WEAR program to inventory sites that have the potential to release hazardous substances and garbage from Alaska's landfills, contaminated sites, tank farms, and other sites of environmental concern into state's waters, jeopardizing water quality, fish and wildlife (ADEC 2018). Highlights from this program are included in Table 5-9.

*Table 5-9 Selected sites of concern from WEAR 2012-2014*

| Site Name and Location | Description |
|---|---|
| **Igiugig** | |
| Tank Farm, 59.327258/-155.897948 (Active) | The site was constructed in 2004 for the Native Village of Igiugig and contains nine tanks with a total capacity of 111,000 gallons. The nearest source of erosion, the Kvichak River, is only 20 feet away. Erosion symptoms such as root exposure, undercutting, and slides were observed on the closest bank of the river. |
| Community Landfill, 59.325198/-155.905045 (Retired) | This is the location of a historical military landfill that was started in the 1950s. After the military left, the community used it as their landfill until 2001 when the new landfill was constructed. The field is 500 feet from the closest source of erosion, the Kvichak River. |
| **Iliamna** | |
| Landfill, 59.783836/-154.901292 (Active) | This permitted landfill is a self-haul facility that burns most of its waste in a Summit burn unit. It has been in operation since at least 1986. The Iliamna Landfill employs a landfill operator but would benefit from improved management of burning and special wastes. The landfill is located approximately 3.3 miles from Iliamna Lake. |
| Airport Crowley Tank Farm, 59.754428/-154.906141 (Active) | This Crowley tank farm, which is located across the street from the Iliamna Airport, is an active Contaminated Site (File ID 2560.38.012). A spill of 1,507 gallons of aviation gas occurred at the site in late 2009. 65 cubic yards of contaminated soil were excavated and landfarmed to remediate the soil beginning in 2011. After remediation, the soil was transported to and disposed of at the Newhalen Landfill in June 2013. This site is still being monitoring by the Contaminated Sites Program as not all contaminated soil was excavated. The tank farm is about 0.15 acres in size and holds six tanks, which have a total capacity of 258,000 gallons in a fenced and locked area. |
| FAA Living Quarters Landfarm, 59.761161/-154.828806 (Active) | This site is part of an active Contaminated Site (File ID 2560.38.001). The landfarm is remediating contaminated soil linked to above ground fuel tanks that used to exist in the area. The landfarm is within Iliamna Airport Tract II, near the Old FAA Landfill, and covers an area of approximately 0.08 acres. The site is 170 feet south of Lake Superior. |
| Former US Post Office, 59.751424/-154.815653 (Active) | The former Iliamna US Post Office was located on Iliaska Drive at this site. In November of 1999, it was reported that drums of used oil were shot and subsequently leaked. This caused the site to become an active Contaminated Site (File ID 2560.38.007). During inspection, the area appeared to be well vegetated aside from a cut in the bushes to provide access to the lake from the road. The site is no longer owned by USPS and is located right on the shoreline of Roadhouse Bay. |
| Abandoned Fuel Tanks, 59.749782/-154.812959 (Abandoned) | These tanks, with unknown size and contents, reside in the Iliaska Subdivision in front of Lots 30 and 31. The tanks were completely surrounded by dense vegetation and are 245 feet from Iliamna Lake. |
| **Newhalen** | |
| Landfill, 59.731888/-154.892355 (Active) | This unpermitted landfill has been operating since its construction in 1983. Necessary equipment for the removal of CFCs from white goods was unavailable, and batteries and used oil were poorly stored. The 5.5-acre landfill is located half a mile north of Newhalen and 2,000 feet east of erosion reported along the banks of the Newhalen River. |
| Crowley Contaminated Soil, 59.719562/-154.891769 (Active) | This site is an active landfarm to remediate contaminated soil under the Contaminated Sites Program. The site consists of two listings Crowley Jet A Fuel Tank 471 Newhalen Tank Farm (File ID 2619.38.002) and Newhalen Bulk Fuel Storage (File ID 2619.38.001). The site is associated with numerous historic spills and a former tank farm. The site dates back to a 1983 spill reported in relation to Newhalen's old utility tank farm. There are several data gaps in the history of this site that don't allow for identification of all spills; however, additional free product was discovered near the 1983 spill during sewer cleaning operations in August 1999. Later, on October 30, 2008, there was a jet fuel spill totaling approximately 13,630 gallons from Crowley Jet A Fuel Tank 471. The majority of the spill was recovered from secondary containment, but 2,777 gallons were suspected to have breached the containment. The tank farm has since been decommissioned with the site consisting mostly of the 2.9-acre landfarm at the time of inspection. Soil staining, 55-gallon drums, piles of dirty rags, and metal debris were identified along the perimeter of the landfarm. The site is located adjacent to the current Newhalen Tank Farm, on its lakeward side, and is 1,000 feet from Iliamna Lake. |
| **Nondalton** | |
| Drum Cache, 59.970533/-154.851000 (Abandoned) | This site is associated with the construction of generators and a new tank for the water plant. The site is about 0.02 acres in size and is located in the middle of town. It consists of a slightly depressed region, covered in black textiles with heavy staining on top of the textile. Vegetation surrounding the perimeter of the site was noted as distressed during the inspection. Several 55-gallon drums were strewn about the site with contents unknown. The site is believed to have originated around 2005 and is 250 feet from Sixmile Lake. |

| Site Name and Location | Description |
|---|---|
| Airport Tanks, 59.978880/-154.836069 (Abandoned) | These empty tanks are located at the airport. There are 10 tanks in total with the labeling "Out of Service, Do Not Fill, 10-1-02" and a total capacity of 80,500 gallons. The tanks were constructed by the City of Nondalton sometime in the early 1990s with the intent that they become storage for heating fuel and gasoline to be sold to local residences and businesses. However, the project was never completed. The site is unfenced and eight of the vertical tanks rest on a geotextile liner; two of the tanks are located outside of the containment. Roughly two inches of water were seen pooling within the containment at the time of inspection. Stacked alongside one of the tanks were several 55-gallon drums and miscellaneous buckets with contents unknown. The site is 0.15 acres in size and is located 1,230 feet from Sixmile Lake. |
| **Kokhanok** | |
| Landfill, 59.433225/-154.750637 (Active) | This unpermitted landfill is found a half mile due south of the school on a hill. It was constructed in 1992 by the U.S. Public Health Service. The landfill operates as a trench and fill with a working Tok burn unit. Metals, drums and white goods (household appliances) are separated at the site. The inactive areas of the landfill have been covered and are revegetated. It lies 1,600 feet from Piva Lake. |
| Old Tank Farm, 59.441288/-154.751535 (Abandoned) | This tank farm is no longer in use since the 2003 construction of the new tank farm. It is located approximately 540 feet northwest of the school. There were 2 vertical tanks and 5 horizontal tanks, which could hold a total of 52,500 gallons of diesel. The horizontal tanks were within a lined, earthen berm, and the vertical tanks were on wooden platforms with no visible berm or liner. There was evidence of staining on the ground, and ponded water around the tanks had a visible sheen. It is located approximately 400 feet from Iliamna Lake. |
| Slop Bucket Lake Dump, 59.441696/-154.759466 (Abandoned) | This lake can be found 1,000 feet east of Big Lake. It was reportedly used as a dump site for many years by the community with sporadic dumping still occurring. There was visible trash on the shores and lake bottom, which ranged from bags of trash to rusted barrels and tires. It is 350 feet from Iliamna Lake. |
| **Pedro Bay** | |
| Landfill, 59.791717/-154.102628 (Active) | This unpermitted landfill is located on the northeast side of town only 1,000 feet from the Village Council building. This one-acre site has been in operation since around 1985. An incinerator is on site, but it has never been used due to operational costs. A baler is also available, but it has not been used. Municipal waste is burned in a small pit and then mixed with dirt into a large pile that will eventually be pushed back into a trench. Batteries and other recyclables are separated out. There is a separate area for hide goods and other metals. There is a fence around part of the landfill, but it is falling down in places. The landfill lies 2,100 feet from Iliamna Lake. |

Source: ADEC Waste Erosion Assessment and Review (2018)

- Environmental Protection Agency (EPA) Brownfields Sites. The EPA maintains a list of brownfield sites. There are three brownfield sites located in Newhalen that resulted from large historic fuel spills on land, all near waters. Cleanup has been completed at one spill site abutting Iliamna Lake. The two remaining sites are 0.3 miles the Newhalen River and cleanup actions are underway. Contamination at these sites resulted from a ~13,630-gallon Jet-A spill, and a ~35,000-gallon diesel spill.
- EPA Superfund Sites. The EPA maintains a database of superfund clean-up sites. There are no listed superfund cleanup sites in the Analysis Area.
- Rural Sanitation. Most villages and private houses are equipped with septic tanks or a centralized sewage system. Community sanitation systems are in constant need of improvement in the Analysis Area. The Alaska Native Tribal Health Consortium is working on building a sludge disposal site for the sludge that is pumped from the individual septic tanks at Iliamna, but funding to complete the project is insufficient. Kokhanok, Nondalton, and Newhalen recently received approval for their water and wastewater feasibility study (ADEC 2018).
- Barge Landings. Barge and boat landings can be a source of shoreline erosion and sedimentation in Iliamna Lake. In 2009-2010 the Denali Commission funded the design of barge and boat landings for Iliamna, Kokhanok, Pedro Bay, Pile Bay, and Igiugig. Construction of these projects is pending (Denali Commision 2018).

## 5.7 Invasive Species

Invasive species pose a threat to ecosystems, including wetlands and other waters of the U.S., by altering the functional compositions of communities and from the loss of locally abundant species (Diaz, et al. 2006). While most invasive plants have been recorded along Alaska's road network, remote communities off the

road system may be increasingly and disproportionately vulnerable to harm from exposure to invasive species. Bristol Bay residents have expressed concern about the potential impacts of invasive plants on local natural resources, including subsistence foods (Spellman and Swenson 2012). Survey data from Bristol Bay indicated relatively small populations of several high-risk invasive species, including reed canarygrass (*Phalaris arundinacea*), yellow toadflax (*Linaria vulgaris Mill.*), white sweetclover (*Melilotus officinalis (L.) Lam*), bird vetch (*Vicia cracca L.*), orange hawkweed (*Hieracium aurantiacum L.*) and oxeye daisy (*Leucanthemum vulgare Lam.*) (Spellman and Swenson 2012). Fall dandelion (*Leontodon autumnalis L.*), oxeye daisy (*Leucanthemun vulgare Lam.*), pineapple weed (*Matricaria discoidea DC.*), Kentucky bluegrass (*Poa pratensis L. ssp. irrigata*), creeping buttercup (*Ranunculus repens L.*), common sheep sorrel (*Rumex acetosella L.*) and common chickweed (*Stellaria media*) were found in Igiugig in 2010 (AKEPIC 2018). It does not appear that surveys have been conducted in most of the communities in the Analysis Area.

Reed canarygrass, which grows very well in wetlands, has a high potential for impacting important subsistence foods resources. Reed canarygrass can invade active stream channels, accelerating siltation of gravel and sand bars, reducing the active-channel area, and altering fluvial dynamics (Galatowitsch, Anderson and Ascher 1999) (Wisconsin Reed Canary Grass Management Working Group (WRCGMWG) 2009) that could affect Pacific salmon and other fishes habitat. The results of a reed canarygrass vulnerability model for the Bristol Bay region completed in 2012 projected 39 kilometers of salmon stream could be vulnerable in the next 30 years. From 2039 to 2069, the amount of salmon streams vulnerable to reed canarygrass invasion would nearly double to 442.5 kilometers. The model projected that by 2099, the length of salmon streams vulnerable to potential adverse effects from reed canarygrass could total 1,074.5 kilometers. Modeling indicates the Iliamna area had the second greatest number of vulnerable streams for the same period (Spellman and Swenson 2012).

In 2006 most primary and secondary roads in the Kenai Peninsula were surveyed for reed canarygrass. The survey located 260 reed canarygrass populated sites, 51sites in wetlands, with 14 of those adjacent to coho salmon habitats (B. Spellman 2018). Authorities have determined that reed canarygrass on the Kenai Peninsula is beyond eradication efforts, as early detection and eradication efforts were missed, and decided to focus reed canarygrass management efforts in sensitive areas. During 2007-2009 reed canarygrass was surveyed at six streams; the following four had extensive reed canarygrass infestations: Kenai River, Bishop Creek, North Fork Anchor River, and Beaver Creek. In an approximately 20 mile-reach of the North Fork Anchor River reed canary grass was found in 256 sites, including sites directly along the active channel. Eradication efforts have had mixed result due in part to the extensive distribution of the reed canarygrass (B. Spellman 2018). While prevention of invasive species is the best management practice, early detection and eradication are crucial to fighting invasive species once established in an ecosystem.

## 5.8 Summary of Watershed Conditions

This watershed analysis has characterized conditions within the Analysis Area. The following is a summary of those conditions and provides general watershed improvement opportunities that could benefit aquatic functions in the watersheds.

Nearly all the Analysis Area is undeveloped and wetlands and aquatic resources have little to no degradation. The principal sources of land development in the Analysis Area are those associated with residential housing, fishing and hunting cabins and lodges, sanitation systems, community energy, and the limited transportation

infrastructure associated with the villages of Nondalton, Iliamna, Newhalen, Pedro Bay, Pile Bay, Igiugig and Kokhanok. Development accounts for less than 0.05 percent of the Analysis Area.

Wetland and other waters are widely distributed in the Analysis Area. The Headwaters Koktuli River watershed includes more than 59,581 acres, and the other watersheds a combined total of 1,136,689 acres of wetlands and other waters. Dominant wetlands include palustrine shrub-scrub and emergent, while estuarine and lacustrine emergent wetlands are rare.

Generalized land ownership in the Analysis Area is split between the State of Alaska (40%), federal government (32%), native owned lands (26%), and private and municipal lands (1%). Roughly 4 percent of the Analysis Area includes the Katmai and Lake Clark national parks and is permanently protected from development. While State of Alaska lands are open to multiple uses, including mining, the Alaska Department of Natural Resources has closed many streams to mineral entry in the Nushagak-Mulchatna River drainage, as well as streams around Iliamna Lake to protect Pacific salmon fish habitat. Regardless of land ownership and the occurrence of minerals in the watershed, the threat of development, other than the proposed Project, is low.

Aquatic habitats, though plentiful, do face potential threats from non-point source pollution associated with community growth, or invasive species. Most of the communities have documented contamination from fuel and lubricant spills, and substandard village sanitary systems, such as landfills, that could be improved. Invasive species are a threat to aquatic resources in the Analysis Area, but much of the area remains un-surveyed.

# 6. Project Effects on Aquatic Resources

The discharge of fill proposed by the project will permanently impact 3,524 acres of WOUS. Most of these impacts (3,421 acres) would be confined to the Headwaters Koktuli River watershed (Table 6-1). The remaining impacts to wetlands and other aquatic resources (103 acres) are divided among the Newhalen River, Iliamna Lake, Gibraltar River, Upper Talarik Creek, Amakdedori Creek-Frontal Kamishak Bay watersheds, and Cook Inlet watersheds (Table 6-2).

Approximately 5.74 percent of the currently existing aquatic resources in the Headwaters Koktuli River would be lost due to the proposed discharges of fill. The greatest impact would be to slope HGM aquatic resources which would be reduced by 10.12 percent. Slope palustrine unconsolidated bottom would be reduced by 16.51 percent, slope palustrine scrub-shrub would be reduced by 11.48 percent, and slope palustrine emergent would be reduced by 1 percent. Riverine, and riverine channel HGM aquatic resources will experience a 2.79 percent and 4.43 percent loss respectively. Most impacts to the riverine channel include upper perennial streams (unconsolidated bottom and unconsolidated shore) with a 7.88 percent reduction. Riverine channel intermittent streambed and palustrine emergent would experience a 5.32 percent and 4.58 percent reduction respectively. Slope HGM palustrine scrub-shrub and emergent wetlands are the most widely distributed aquatic resource in the watershed with approximately 20,769 acres and 8,911 acres respectively. These wetlands are broadly used by ungulates such as moose and caribou. Riverine and riverine channel aquatic resources impacted by the Project provide support to Pacific salmon.

*Table 6-1 Summary of aquatic resources (acres) in the HUC 10 Headwaters Koktuli River*

| HGM and Cowardin Classification | Baseline | | Impacts to WOUS | Reduction |
|---|---|---|---|---|
| | Acres | % | Acres | % |
| **LACUSTRINE** | **975.00** | **1.64%** | **0.06** | **0.01%** |
| Lacustrine Limnetic Unconsolidated Bottom [1] | 844.40 | 1.42% | -- | -- |
| Lacustrine Littoral Aquatic Bed [1] | 10.10 | 0.02% | -- | -- |
| Lacustrine Littoral Unconsolidated Bottom [1] | 33.00 | 0.06% | -- | -- |
| Lacustrine Littoral Unconsolidated Shore [1] | 32.80 | 0.06% | 0.06 | 0.18% |
| Palustrine Emergent [1] | 1.10 | <0.01% | -- | -- |
| Palustrine Unconsolidated Bottom [1] | 51.00 | 0.09% | -- | -- |
| Palustrine Unconsolidated Shore [1] | 2.70 | <0.01% | -- | -- |
| **LACUSTRINE FRINGE** | **126.70** | **0.21%** | **0.59** | **0.47%** |
| Lacustrine Littoral Emergent [1] | 0.30 | <0.01% | -- | -- |
| Lacustrine Littoral Unconsolidated Shore [1] | 9.40 | 0.02% | -- | -- |
| Palustrine Emergent [1] | 50.70 | 0.09% | 0.27 | 0.54% |
| Palustrine Moss-Lichen [1] | 0.20 | <0.01% | -- | -- |
| Palustrine Scrub-Shrub [1] | 64.80 | 0.11% | 0.32 | 0.50% |
| Palustrine Unconsolidated Bottom [1] | 0.50 | <0.01% | -- | -- |
| Palustrine Unconsolidated Shore [1] | 0.90 | <0.01% | -- | -- |

| HGM and Cowardin Classification | Baseline | | Impacts to WOUS | Reduction |
|---|---|---|---|---|
| | Acres | % | Acres | % |
| **RIVERINE** | **8,345.60** | **14.01%** | **232.48** | **2.79%** |
| Palustrine Aquatic Bed [1] | 1.80 | <0.01% | -- | -- |
| Palustrine Emergent [1] | 2,163.40 | 3.63% | 58.77 | 2.72% |
| Palustrine Forested [1] | 38.50 | 0.06% | -- | -- |
| Palustrine Moss-Lichen [1] | 2.90 | <0.01% | -- | -- |
| Palustrine Scrub-Shrub [1] | 5,847.30 | 9.81% | 169.08 | 2.89% |
| Palustrine Unconsolidated Bottom [1] | 160.60 | 0.27% | 4.63 | 2.88% |
| Palustrine Unconsolidated Shore [1] | 67.60 | 0.11% | -- | -- |
| Riverine Intermittent Streambed [1] | 0.10 | <0.01% | -- | -- |
| Riverine Lower Perennial Unconsolidated Bottom [1] | 41.50 | 0.07% | -- | -- |
| Riverine Lower Perennial Unconsolidated Shore [1] | 19.10 | 0.03% | -- | -- |
| Riverine Upper Perennial Aquatic Bed [1] | <0.1 | <0.01% | -- | -- |
| Riverine Upper Perennial Unconsolidated Bottom [1] | 2.20 | <0.01% | -- | -- |
| Riverine Upper Perennial Unconsolidated Shore [1] | 0.50 | <0.01% | -- | -- |
| **RIVERINE CHANNEL** | **1,070.00** | **1.80%** | **47.39** | **4.43%** |
| Palustrine Aquatic Bed [1] | 1.00 | <0.01% | -- | -- |
| Palustrine Emergent [1] | 0.30 | <0.01% | 0.01 | 4.58% |
| Palustrine Unconsolidated Bottom [1] | 38.10 | 0.06% | 0.07 | 0.18% |
| Palustrine Unconsolidated Shore [1] | 6.00 | 0.01% | -- | -- |
| Riverine Intermittent Streambed [1] | 64.10 | 0.11% | 3.41 | 5.32% |
| Riverine Lower Perennial Aquatic Bed [1] | 19.10 | 0.03% | -- | -- |
| Riverine Lower Perennial Emergent [1] | 0.30 | <0.01% | -- | -- |
| Riverine Lower Perennial Unconsolidated Bottom [1] | 166.60 | 0.28% | -- | -- |
| Riverine Lower Perennial Unconsolidated Shore [1] | 9.10 | 0.02% | -- | -- |
| Riverine Upper Perennial Emergent [1] | 0.10 | <0.01% | -- | -- |
| Riverine Upper Perennial Unconsolidated Bottom [1] | 635.70 | 1.07% | 42.33 | 6.66% |
| Riverine Upper Perennial Unconsolidated Shore [1] | 129.60 | 0.22% | 1.58 | 1.22% |
| **FLAT** | **6,599.80** | **11.08%** | **81.13** | **1.23%** |
| Palustrine Aquatic Bed [1] | <0.1 | <0.01% | -- | -- |
| Palustrine Emergent [1] | 1,623.70 | 2.73% | 5.49 | 0.34% |
| Palustrine Forested [1] | 0.20 | <0.01% | -- | -- |
| Palustrine Moss-Lichen [1] | 33.70 | 0.06% | -- | -- |
| Palustrine Scrub-Shrub [1] | 4,917.60 | 8.25% | 75.64 | 1.54% |
| Palustrine Unconsolidated Bottom [1] | 4.10 | 0.01% | -- | -- |
| Palustrine Unconsolidated Shore [1] | 20.30 | 0.03% | -- | -- |
| Riverine Intermittent Streambed [1] | <0.1 | <0.01% | -- | -- |

| HGM and Cowardin Classification | Baseline | | Impacts to WOUS | Reduction |
|---|---|---|---|---|
| | Acres | % | Acres | % |
| **SLOPE** | **29,813.90** | **50.04%** | **3,016.35** | **10.12%** |
| Palustrine Aquatic Bed [1] | 6.10 | 0.01% | 0.01 | 0.10% |
| Palustrine Emergent [1] | 8,911.20 | 14.96% | 618.85 | 6.94% |
| Palustrine Forested [1] | 2.20 | <0.01% | -- | -- |
| Palustrine Moss-Lichen [1] | 27.50 | 0.05% | -- | -- |
| Palustrine Scrub-Shrub [1] | 20,768.50 | 34.86% | 2,385.11 | 11.48% |
| Palustrine Unconsolidated Bottom [1] | 69.30 | 0.12% | 11.44 | 16.51% |
| Palustrine Unconsolidated Shore [1] | 28.30 | 0.05% | 0.94 | 3.33% |
| Riverine Upper Perennial Unconsolidated Bottom [1] | 0.30 | <0.01% | -- | -- |
| Riverine Upper Perennial Unconsolidated Shore [1] | 0.50 | <0.01% | -- | -- |
| **DEPRESSIONAL** | **1,561.20** | **2.62%** | **43.45** | **2.78%** |
| Lacustrine Littoral Unconsolidated Shore [1] | <0.1 | <0.01% | -- | -- |
| Palustrine Aquatic Bed [1] | 4.80 | 0.01% | -- | -- |
| Palustrine Emergent [1] | 155.30 | 0.26% | 3.71 | 2.39% |
| Palustrine Moss-Lichen [1] | 0.50 | <0.01% | -- | -- |
| Palustrine Scrub-Shrub [1] | 172.70 | 0.29% | 9.41 | 5.45% |
| Palustrine Unconsolidated Bottom [1] | 913.10 | 1.53% | 24.26 | 2.66% |
| Palustrine Unconsolidated Shore [1] | 314.80 | 0.53% | 6.07 | 1.93% |
| **N/A** | **11,089.00** | **18.61%** | **--** | **--** |
| Palustrine Emergent [1, 2] | 2,608.00 | 4.38% | -- | -- |
| Palustrine Scrub-Shrub [1, 2] | 8,009.00 | 13.44% | -- | -- |
| Palustrine Unconsolidated Shore [1] | 0.90 | <0.01% | -- | -- |
| Palustrine Unconsolidated Bottom [2] | 248.40 | 0.42% | -- | -- |
| Riverine Unknown Perennial Unconsolidated Bottom [2] | 222.80 | 0.37% | -- | -- |
| **Grand Total** | **59,581.20** | **100%** | **3,421.45** | **5.74%** |

Source: (1) PLP mapped wetlands, (2) NWI mapped wetlands.

Project impacts from fill discharges to aquatic resources in the Newhalen River, Iliamna Lake, Gibraltar Lake, Upper Talarik Creek, and Amakdedori Creek-Frontal Kamishak Bay Watersheds would be small relative to the abundance of wetlands and other waters in each watershed and the footprint of project impacts (Table 6-2). The largest reduction in aquatic resources (0.12%) would take place in the Upper Talarik Creek watershed. Aquatic resources most impacted include palustrine and marine subtidal habitats, both of which are abundant in the watershed. Fills will impact riverine aquatic resources that provide habitat to Pacific salmon and other fishes in the watersheds, but this will be minimized through project design by including bridges and culverts designed to allow for fish passage.

*Table 6-2 Summary of aquatic resources (acres) in the HUC 10 Newhalen River, Iliamna Lake, Gibraltar Lake, Upper Talarik Creek, and Amakdedori Creek-Frontal Kamishak Bay watersheds*

| | Kvichak-Port Heiden | | | | Western Cook Inlet | | Total |
|---|---|---|---|---|---|---|---|
| | Newhalen River | Iliamna Lake | Gibraltar Lake | Upper Talarik Creek | Paint River | Amakdedori Creek-Frontal Kamishak Bay | |
| **Baseline Aquatic Resources** | | | | | | | |
| Estuarine (ac.) | -- | 15 | -- | -- | -- | 1,525 | **1,540** |
| Lacustrine (ac.) | 116 | 42 | <0.01 | <0.01 | <0.01 | 35 | **193** |
| Palustrine (ac.) | 56,577 | 270,572 | 21,558 | 35,355 | 21,965 | 25,968 | **431,995** |
| Ice (Glacier) (ac.) | -- | -- | 38 | -- | 61 | -- | **99** |
| Lakes (ac.) | 8,075 | 681,658 | 5,331 | 1,680 | 2,159 | 3,960 | **70,2863** |
| Streams (mi.) | 250 | 881 | 91 | 250 | 557 | 684 | **2,713** |
| **Total Aquatic Resources (ac.)** | **64,768** | **952,287** | **26,926** | **37,036** | **24,185** | **31,487** | **1,136,689** |
| **Impacts to Aquatic Resources** | | | | | | | |
| Lacustrine (ac.) | 0.00 | 1.29 | 0.00 | 0.00 | -- | 0.30 | **1.59** |
| Palustrine (ac.) | 1.13 | 18.44 | 9.01 | 44.71 | -- | 14.87 | **88.16** |
| Riverine (ac.) | 0.03 | 0.59 | 0.20 | 0.52 | -- | 0.60 | **1.94** |
| Marine (ac.) | -- | -- | -- | -- | -- | 10.98 | **10.98** |
| **Total Impact to Aquatic Resources (ac.)** | **1.17** | **20.31** | **9.22** | **45.22** | **0.00** | **26.75** | **102.67** |
| **Reduction of Aquatic Resources (%)** | **<0.00%** | **<0.00%** | **0.03%** | **0.12%** | **<0.00%** | **0.08%** | **0.01%** |

# 7. Evaluation of Compensatory Mitigation Options

When the results of each of the watershed analysis sections are considered and synthesized it becomes apparent that: 1) wetlands and other waters in the area are abundant and in a natural state, 2) discharges of fill from the Project will impact a small percentage of aquatic resources, 3) Pacific salmon and other fish are an important component of the Analysis Area aquatic environment and of local economies, and 4) the primary threats to these aquatic resources arises from impacts associated with contaminated sites and community sanitary systems. These are important factors that need to be considered in the planning of compensatory mitigation options for the Project.

Compensatory mitigation may be performed using methods of restoration, enhancement, establishment, and in certain circumstances, preservation of wetlands and other waters. However, such options are effectively non-existent in the Analysis Area.

Restoration opportunities for aquatic resources in the Analysis Area are essentially unavailable as development in the Analysis Area is limited, and all existing developments are in use or needed. Enhancement opportunities are similarly unavailable because the limited development has caused negligible degradation to wetlands and other aquatic habitats. Establishment of wetlands is not highly desirable as wetlands are already abundant in the Analysis Area. Lastly, preservation opportunities are limited due to the land status and unjustifiable due to the lack of foreseeable development threat to existing wetlands and aquatic resources in the Analysis Area. Thus, the watershed approach, and on-site and in-kind compensatory mitigation are not practical to meet the Project's compensatory mitigation needs. Therefore, off-site, in-kind or out-of-kind mitigation opportunities must be considered.

Off-site wetlands mitigation would necessitate the evaluation of mitigation opportunities beyond the HUC 10 watersheds directly impacted by the Project. Given the limited amount of development and land status in the larger directly impacted (Nushagak, Kvichak, Tuxedni/Kamishak Bay HUC 8s) watersheds it is further likely that mitigation would be predominantly limited to wetlands preservation in the surrounding HUC 8 watersheds or even further afield.

There are however, potential out-of-kind mitigation opportunities within the directly affected watersheds and surrounding areas, to further enhance aquatic habitat by minimizing environmental impacts and future threats through water quality improvement projects, invasive species identification and eradication, and similar activities. There are also opportunities for fish habitat restoration in the directly affected and neighboring watersheds (Upper and Lower Kenai Peninsula, Lower Susitna River, Matanuska) through culvert rehabilitation and other fish passage improvements that have the potential to benefit the greater Bristol Bay and Cook Inlet watershed areas.

Consequently, PLPs approach to compensate for the permanent loss of wetlands and aquatic habitat in the Analysis Area resulting from the Project will primarily focus on opportunities that benefit water quality and enhance or restore fish habitat through out-of-kind mitigation. Although the preference is to seek such opportunities within the Analysis Area, PLP will also search for opportunities outside the directly impacted watersheds. If these opportunities are not sufficient, PLP may propose preservation as compensatory mitigation, but that would be the least preferred form.

The following factors will be used to evaluate compensatory mitigation options:

- Watershed health impacts. Sites within watersheds that are experiencing or may experience water quality, or other, impacts due to development and human activity. Water quality improvements and the duration of those improvements resulting from projects will be quantified. Future threats that are mitigated by projects would also be quantified.

- Environmental significance. Selected sites will be ranked according to the aquatic resources that are impacted or threatened and can be returned to health or protected by mitigation projects. Sites with wetlands, streams and other waters that provide regionally significant support to fish will be given higher priority consistent with the results of the watershed analysis.

- Threat of development. Aquatic resources that appear likely to experience destruction, fragmentation, and adverse modification are considered highly desirable for compensatory mitigation. Consideration of development trends is a key component of a watershed approach, because areas where development is most likely to occur are also areas where compensatory mitigation will be most beneficial. While no preservation options were found in the watershed (HUC 10), preservation options could be available outside of the watershed. Any preservation options proposed must meet the requirements of 33CFR 332.3(h). Preservation is the least preferred form of compensatory mitigation.

- Practicability. The sites selected must enable compensation that is capable of being completed after taking into consideration: cost, existing technology, and logistics in light of overall project purposes. Furthermore, the sites must be available for the implementation of mitigation projects.

- Amount of compensatory mitigation. The selected sites need to yield sufficient compensatory mitigation to replace the losses to aquatic resources. For out-of-kind mitigation PLP would, to the extent practicable, replace an equivalent amount of aquatic resources to those lost. For example, fish passage improvements would open, or improve, access to an equivalent number of stream miles of habitat suitable for anadromous fish. Should PLP propose preservation as mitigation an acreage compensation ratio greater than one-to-one will be proposed in accordance with 33 CFR 332.3 (f)(2).

- Location. Selected sites will be ranked according to their location using the following preference order:

    1) Sites within the HUC 10 watershed impacted by the Project;

    2) Sites outside of the HUC 10 watershed, but downstream of Project WOUS impacts;

    3) Sites outside of the HUC 10, and not downstream of the Project WOUS impacts, but in the same HUC 8;

    4) Sites outside of the HUC 10, and not downstream of the Project WOUS impacts, but in the same HUC 6;

    5) Sites outside of the HUC 10, and not downstream of the Project WOUS impacts, but in the same HUC 4;

    6) Other HUC 4 watersheds in Alaska.

# 8. Summary of Mitigation Program

PLP is currently evaluating potential compensatory mitigation opportunities. Future revisions of this CMP will include a list of the mitigation options evaluated. It is possible that given the scale of the proposed Project's potential WOUS impacts, more than one compensatory mitigation proposal may be required. Detailed information about each compensatory mitigation opportunity proposed will be included in Attachment 2. Each proposal will have a plan that will include the following information as required by 33 CFR 332.4 (c)(2-14):

- Objectives. A description of the resource type(s) and amount(s) that will be provided, the method of compensation (i.e., restoration, establishment, enhancement, and/or preservation), and the manner in which the resource functions of the compensatory mitigation project will address the needs of the watershed, ecoregion, physiographic province, or other geographic area of interest.
- Site selection. A description of the factors considered during the site selection process. This should include consideration of watershed needs, on-site alternatives where applicable, and the practicability of accomplishing ecologically self-sustaining aquatic resource restoration, establishment, enhancement, and/or preservation at the compensatory mitigation project site.
- Site protection instrument. A description of the legal arrangements and instrument, including site ownership, that will be used to ensure the long-term protection of the compensatory mitigation project site.
- Baseline information. A description of the ecological characteristics of the proposed compensatory mitigation project site and, in the case of an application for a DA permit, the impact site. This may include descriptions of historic and existing plant communities, historic and existing hydrology, soil conditions, a map showing the locations of the impact and mitigation site(s) or the geographic coordinates for those site(s), and other site characteristics appropriate to the type of resource proposed as compensation. The baseline information should also include a delineation of waters of the United States on the proposed compensatory mitigation project site. A prospective permittee planning to secure credits from an approved mitigation bank or in-lieu fee program only needs to provide baseline information about the impact site, not the mitigation bank or in-lieu fee project site.
- Determination of credits. A description of the number of credits to be provided, including a brief explanation of the rationale for this determination.
- Mitigation work plan. Detailed written specifications and work descriptions for the compensatory mitigation project, including, but not limited to, the geographic boundaries of the project; construction methods, timing, and sequence; source(s) of water, including connections to existing waters and uplands; methods for establishing the desired plant community; plans to control invasive plant species; the proposed grading plan, including elevations and slopes of the substrate; soil management; and erosion control measures. For stream compensatory mitigation projects, the mitigation work plan may also include other relevant information, such as planform geometry, channel form (e.g., typical channel cross-sections), watershed size, design discharge, and riparian area plantings.
- Maintenance plan. A description and schedule of maintenance requirements to ensure the continued viability of the resource once initial construction is completed.

- Performance standards. Ecologically-based standards that will be used to determine whether the compensatory mitigation project is achieving its objectives.
- Monitoring requirements. A description of parameters to be monitored in order to determine if the compensatory mitigation project is on track to meet performance standards and if adaptive management is needed. A schedule for monitoring and reporting of monitoring results to the district engineer must be included.
- Long-term management plan. A description of how the compensatory mitigation project will be managed after performance standards have been achieved to ensure the long-term sustainability of the resource, including long-term financing mechanisms and the party responsible for long-term management.
- Adaptive management plan. A management strategy to address unforeseen changes in site conditions or other components of the compensatory mitigation project, including the party or parties responsible for implementing adaptive management measures. The adaptive management plan will guide decisions for revising compensatory mitigation plans and implementing measures to address both foreseeable and unforeseen circumstances that adversely affect compensatory mitigation success.
- Financial assurances. A description of financial assurances that will be provided and how they are sufficient to ensure a high level of confidence that the compensatory mitigation project will be successfully completed, in accordance with its performance standards.
- Other information. The district engineer may require additional information as necessary to determine the appropriateness, feasibility, and practicability of the compensatory mitigation project.

# 9. Conclusion

PLP is proposing compensatory mitigation to offset environmental losses resulting from unavoidable impacts to 3,524 acres of WOUS. PLPs compensatory mitigation approach will focus on opportunities that benefit water quality and fish and their habitat. While the intent is to seek such opportunities within the watershed, if opportunities are not available PLP will reach for similar opportunities outside the watershed. The amount of compensatory mitigation PLP will propose will, to the extent practicable, replace an equivalent amount of aquatic resources to those lost. This CMP will be amended in the future to include proposed mitigation plans.

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# Attachments

# Attachment 1 – Figures


Proposed Project Transportation Corridor

Proposed Project Footprint

Area (Geographic Area of Watershed Analysis)

Miles
0 4 8 12 16 20

N

Scale 1:741,008

| NAD 1983 StatePlane Alaska 5 FIPS 5005 Feet Seward Meridian | Figure: 1 |
|---|---|

**Geographic Extent of the Watershed Analysis**

Compensatory Mitigation Plan
Pebble Project

| File: PLP105 | Date: 10/22/2018 |
|---|---|
| Revision: 03 | Author: RC/OR |


Anadromous Waters (AWC)

Proposed Project Transportation Corridor

Proposed Project Footprint

Area (Geographic Area of Watershed Analysis)

Miles
0 4 8 12 16 20

N

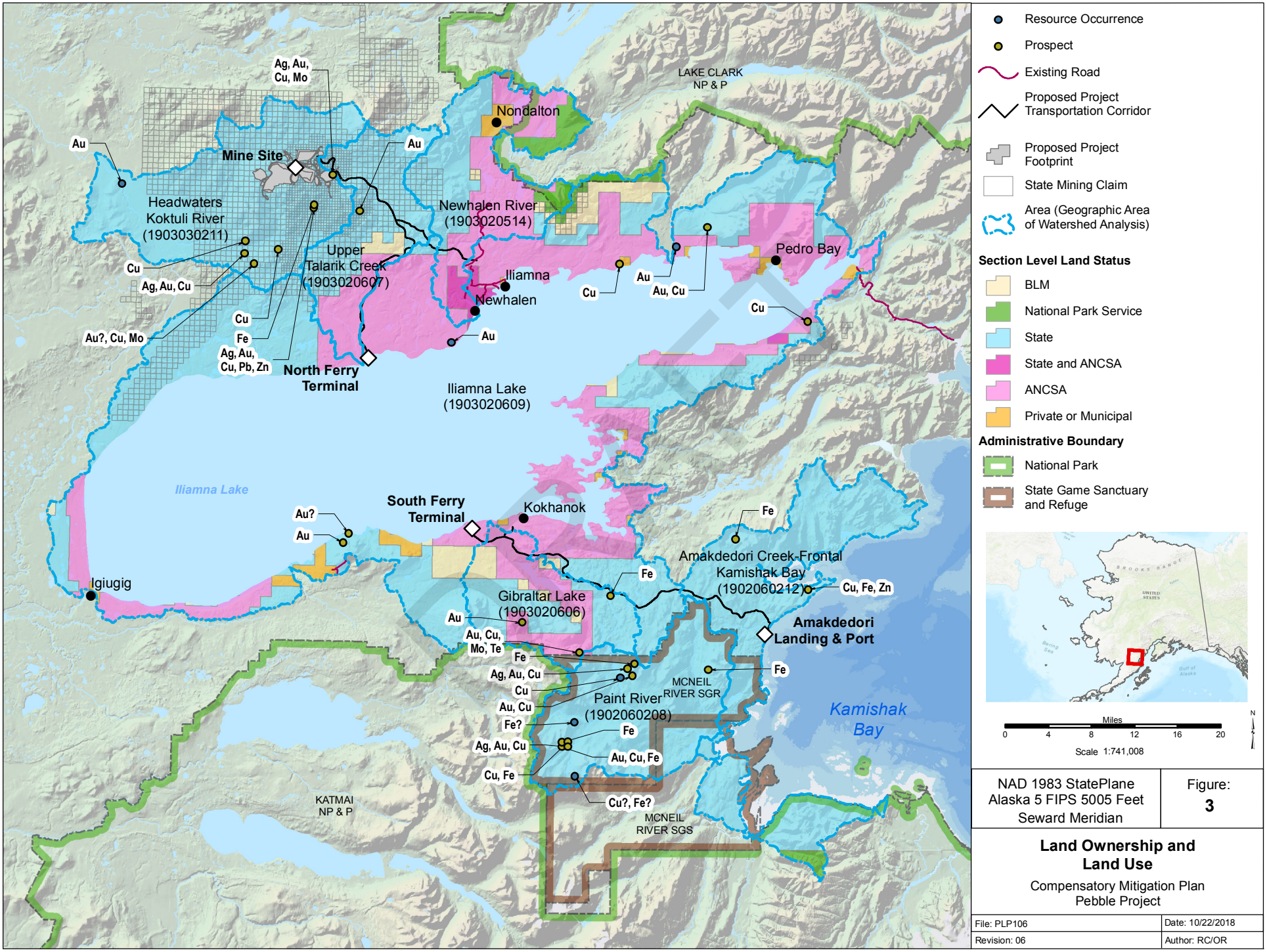
Scale 1:741,008

| | |
|---|---|
| NAD 1983 StatePlane Alaska 5 FIPS 5005 Feet Seward Meridian | Figure: **2** |

**Area Anadromous Waters**

Compensatory Mitigation Plan
Pebble Project

| | |
|---|---|
| File: PLP107 | Date: 1/8/2019 |
| Revision: 04 | Author: RC/OR |




Resource Occurrence
Prospect
Existing Road
Proposed Project Transportation Corridor
Proposed Project Footprint
State Mining Claim
Area (Geographic Area of Watershed Analysis)

**Section Level Land Status**

BLM
National Park Service
State
State and ANCSA
ANCSA
Private or Municipal

**Administrative Boundary**

National Park
State Game Sanctuary and Refuge



Miles
0 4 8 12 16 20
N
Scale 1:741,008

| NAD 1983 StatePlane Alaska 5 FIPS 5005 Feet Seward Meridian | Figure: 3 |
|---|---|

# Land Ownership and Land Use

Compensatory Mitigation Plan
Pebble Project

| File: PLP106 | Date: 10/22/2018 |
|---|---|
| Revision: 06 | Author: RC/OR |

# Attachment 2 – Permittee Responsible Mitigation Plans (Pending)