Draft Environmental Evaluation Document

Anarraaq and Aktigiruq Exploration Program

August 2018

Teck American Incorporated

Teck

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TABLES

FIGURES

LIST OF ACRONYMS

ADEC ..... Alaska Department of Environmental Conservation
ADFG ..... Alaska Department of Fish and Game
ADNR ..... Department of Natural Resources
ANSCA ..... Alaska Native Claims Settlement Act
APDES ..... Alaska Pollutant Discharge Elimination System
APE ..... Area of Potential Effect
ATV ..... all-terrain vehicles
AVEC ..... Alaska Village Electric Cooperative
BLM ..... Bureau of Land Management
BMP ..... Best Management Practice
CFR ..... Code of Federal Regulation
cy ..... cubic yards
DMTS ..... Delong Mountain Transportation System
EA ..... Environmental Assessment
EED ..... Environmental Evaluation Document
EFH ..... Essential Fish Habitat
ft ..... feet
HUC ..... Hydrologic Unit Code
IPaC ..... Information, Planning, and Consultation System
LEDPA ..... Least Environmentally Damaging Practicable Alternative
MBTA ..... Migratory Bird Treaty Act
MSS ..... Minor Source Specific
MSGP ..... Multi Sector General Permit
MT ..... million tonnes
N ..... North
NAB ..... Northwest Arctic Borough
NEPA ..... National Environmental Policy Act
NPS ..... National Park Service
PAG ..... potentially acid generating rock
R ..... Range
RECP ..... Rolled Erosion Control Product
SWPPP ..... Stormwater Pollution Prevention Plan
T ..... Township
TAI ..... Teck American Incorporated
USACE ..... U.S. Army Corps of Engineers
USFWS ..... US Fish and Wildlife Service
USGS ..... US Geological Survey
W ..... West
WAH ..... Western Arctic Herd
WOTUS ..... wetlands and waters of the U.S.
WRF ..... Waste Rock Facility

1 PURPOSE AND NEED

The purpose of this Environmental Evaluation Document (EED) is to support the U.S. Army Corps of Engineers' (USACE) environmental assessment (EA) in compliance with the National Environmental Policy Act (NEPA), per 15 Code of Federal Regulation (CFR) 1508.9. This EED provides the USACE with "sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" on an action authorized by the USACE. The EED will also assist the USACE in completing a 404(b)(1) evaluation, per 40 CFR 230, and guide other agency officials with jurisdiction in "taking actions that are based on understanding of environmental consequences, and take actions to protect, restore, and enhance the environment" (15 CFR sections 1500.1(c) and 1508.9(s)(1)).

On May 3, 2018, the USACE, received an application from Teck American Incorporated (TAI) for a Department of the Army permit to develop the Anarraaq and Aktigiruq Exploration Program. The USACE will be evaluating the permit application for discharges of fill under Section 404 of the Clean Water Act. An EA will be used as a basis for a permit decision in compliance with NEPA. This EED supports the USACE's EA by evaluating environmental consequences for the implementation of actions proposed by TAI as part of an exploration program at the Anarraaq and Aktigiruq mineral deposits.

1.1 Purpose and Need

Purpose: TAI holds State of Alaska mining claims in the Aktigiruq and Anarraaq mineral exploration areas. The project purpose is to develop a gravel access road from the end of Fish Weir Access Road to the Aktigiruq and Anarraaq mineral deposits to provide safe, year-round overland access and sufficient support facilities for a multi-year exploration drilling campaign to assess the technical and economic viability of the Aktigiruq and Anarraaq mineral deposits.

Need: A road is needed to support specialized heavy equipment to drive to and from mineral exploration areas. Initial mineral exploration at Aktigiruq and Anarraaq was previously conducted during summer months by helicopter-supported operations with portable drill rigs. To define the viability of the deposit, the project requires a higher density drilling program in order to reach deep deposits that are no longer practical to reach from the surface during helicopter-supported seasonal campaigns. The only practical means of completing the definition drilling required is from an underground ramp system that would allow a year-round program and shorter, more closely spaced drill holes to reach mineral horizons. The development of an underground ramp system would require the use of specialized heavy equipment that

would need to be driven to and from the project area, and surface support facilities such as: personnel camp facilities; equipment laydown areas; an underground access portal; underground vents; and a temporary exploration waste rock storage facility.

1.2 Project Location

TAI proposes development of exploration access roads and support facilities to safely and practically continue mineral exploration of the Aktigiruq and Anarraaq mineral deposits, located in Northwest Alaska, approximately 51 miles (mi) east of Kivalina and 8 mi north of the existing Red Dog Mine (Figure 1). The proposed exploration project is wholly owned and operated by TAI, a separate legal entity from Teck Alaska who owns and operates the existing Red Dog Mine.

The project site is located within Section 18, Township (T.) 31 North (N.), Range (R.) 18 West (W.); Sections 18, 19, 30, 31, T. 32N., R. 18W.; Sections 1, 12, 13, T. 31N., R. 19W.; Sections 11, 12, 13, 14, 15, 22, 23, 36, T. 32N., R. 19W.; Kateel River Meridian; and US Geological Survey (USGS) Quad Map Delong Mountains A-2. The proposed road terminus is located at Latitude 68.1584; Longitude -162.9603 and the proposed facility area is located at Latitude 68.1795; Longitude -162.9567.

1.3 Authority

Construction of the proposed facilities would require terrain modification and discharge of clean fills. Due to the abundance of wetlands within the project area, avoiding all discharges into waters of the U.S. (WOTUS) is not practicable. The WOTUS within the project area are hydrologically connected to the Chukchi Sea through a surface water connection via the Ikalukrok Creek and Wulik River. Therefore, the USACE has authority over this action and must determine the Least Environmentally Damaging Practicable Alternative (LEDPA) to authorize under Section 404 of the Clean Water Act. A Section 404 permit is required for the placement of fill within jurisdictional WOTUS.

1.4 Scope of Review

Scope of Analysis for NEPA: The scope of analysis under NEPA for the proposed project includes all WOTUS as well as uplands where there is sufficient federal responsibility to warrant USACE review. For this project, the scope of analysis for NEPA includes all proposed project components as depicted on Figure 2.

Scope of Analysis for Section 7 of the Endangered Species Act: The Action Area for compliance with Section 7 of the Endangered Species Act is not applicable to this project, as no federally recognized Threatened or Endangered Species occur within the project area (See also Section 3.1, Table 2).

Determination of Permit Area for Section 106 of the National Historic Preservation Act: The Preliminary Area of Potential Effect (APE) is depicted on Figure 2 and includes areas of direct and indirect disturbance including the access road, material sites, vent raises, and portal area.

2 ALTERNATIVES

2.1 Alternatives Development

TAI evaluated the feasibility of several off-site and on-site road route alignments that could provide safe, year-round overland access, to allow a multi-year advanced exploration campaign. TAI also evaluated several on-site alternative options for pad and facility siting configurations in order to avoid and minimize impacts to WOTUS.

This EED provides an alternatives evaluation to assist the USACE in the NEPA and 404(b)(1) evaluation process. The USACE uses the following framework for alternatives evaluation:

- "Reasonable" alternatives under NEPA are screened based on: project purpose; common sense; cost; and technology.
- "Practicable" alternatives under 404(b)(1) criteria are screened based on: Impacts to WOTUS; project purpose; logistics; cost, and technology.

TAI evaluated a number of alternatives based on screening criteria developed in consultation with TAI engineering technical groups, regulatory agencies, and input during 2016 and 2017 site walks with subsistence users from Noatak and Kivalina. The following screening criteria covers key issues understood during these preliminary consultations:

- Safety
- Geologic hazards
- Impacts to fish habitat
- Acres of impact to WOTUS
- Number of water crossings
- Impacts to secondary caribou migration trails
- Impacts within the Wulik River watershed

Route screening for the criteria Acres of impact to WOTUS was completed for Routes 1, 3, and 4 early in the alternatives development process and was based on a preliminary access road footprint that could be compared across alternatives. In order to provide a true comparison on impacts across alternate routes, an estimated 31-foot wide road footprint (19-foot wide, 2-foot fill, 3H:1V toe slope) was used for access road routes to the facility area (Figure 2). Therefore, acres of impacts noted in alternatives evaluations are different than those presented in the Proposed Action. A comparison for Acres of impact to WOTUS for

Routes 1B, 1C, and Route 2 was not completed, as these alternatives were dismissed for safety reasons and further evaluation of WOTUS impacts was not warranted.

The following on-site and off-site road route alternatives (Figure 3, Figure 4) were evaluated based on the above criteria, and determinations were made to either dismiss them without further study or carry them forward for full environmental evaluation.

The Proposed Action is the only reasonable and practicable alternative that meets the purpose and need of the project. The other alternatives evaluated were dismissed from further analysis as described below.

Table 1: Alternatives Evaluation

Off-Site Alternatives	Description	Alternative Evaluation
Route 1 (Proposed Action)	**Route 1** begins at the end of Fish Weir Access Road and continues north on the east side of Ikalukrok Creek to the confluence of Grayling Junior Creek near the East Fork Ikalukrok Creek. From there the route splits off into three on-site alternative alignments before connecting to the advanced exploration area: • **Option 1A (Proposed Action)**: After crossing the East Fork Ikalukrok Creek, this route follows Ikalukrok Creek and switches between the north and south banks of the creek to take advantage of gentle terrain before accessing the exploration area. • **Option 1B**: This route crosses the East Fork Ikalukrok Creek and continues northward along the ridge of hills on the east bank of Ikalukrok Creek. It then turns to the southeast and crosses Ikalukrok while staying on the ridge to access the exploration area. • **Option 1C**: This route does not cross the East Fork Ikalukrok Creek but rather follows the east bank of the creek along the eastern slopes of a nearby ridge, then joins Route 1B and crosses Ikalukrok while staying on the ridge to access the exploration area. Route 1, Option 1A would impact 8.8 acres of WOTUS using the comparison criteria described above	**Route 1, Option 1A is considered feasible and was refined to form the Proposed Action.** This route has reduced risks of slope instability and follows much gentler terrain as compared to the other routes. Route 1 also provides relatively safe year-round access for equipment and personnel using the road. In addition, Route 1 is located within a wider valley as compared to other routes, which allows for safer weather conditions and fewer concerns associated with drifting snow. Environmental considerations such as wetlands, water crossings, and caribou migration impacts are also fewer along this route. Route 1 has fewer wetland impacts, allows for shorter bridge spans at stream crossings (which allow for temporary bridges) and avoids impacts to secondary caribou migration trails. Option 1A also minimizes impacts within the Wulik river watershed, which is considered more environmentally preferable by subsistence users. Route 1, Option 1A is considered a reasonable and practicable alternative and is carried forward for further evaluation. **Option 1B is dismissed from further evaluation** due to very steep terrain. Use of the Option 1B route would not be viable year-round due to safety concerns. Therefore, Option 1B is not considered a reasonable or practicable alternative. **Option 1C is dismissed from further evaluation** due to possible geologic hazards along the route such as possible slope failures and landslide hazards that could pose safety risks to drivers. Therefore, Option 1C is not considered a reasonable or practicable alternative.

Off-Site Alternatives	Description	Alternative Evaluation
Route 2	**Route 2** (Noa Creek Valley) begins at the end of the Fish Weir Access Road and follows Route 1 to a point just south of Noa Creek. The route then crosses Ikalukrok Creek, follows the south bank of Noa Creek and continues northwest up to the exploration area.	**This alternative is dismissed from further evaluation** due to very steep, unsafe terrain. The Noa Creek Valley has a generally uniform, steep grade through very rugged terrain for most of the route. Most of the grades in the Noa Creek Valley are in excess of 5%, and in some locations in excess of 10%. In addition, the route would be located in a narrow, steep valley bottom, flanked by very steep slopes that are in excess of 45 degrees. Building a year-round road route in this valley would require safety berms as well as benching the valley side slopes to maintain safety for drivers using the road. Therefore, Route 2 is not considered a reasonable or practicable alternative.
Route 3	**Route 3** (Sled Pass Lower Route) begins at the end of the Fish Weir Access Road and follows Red Dog Creek northwest to cross Ikalukrok Creek via a double span bridge with in water pier. The route then heads north up the Sled Creek Valley to Sled Pass, on the east side of Sourdock Creek to Competition Creek. The route follows Competition Creek for a short distance before veering to the north-northeast up to the exploration area. **Route 3** stays generally at a low elevation within the pass approximately halfway up the east side of the valley. Route 3 would impact 11.1 acres of WOTUS using the comparison criteria described above.	**This alternative is dismissed from further evaluation** due to technical and environmental considerations. The narrow valley bottom and steep side slopes would make it difficult to construct and maintain a road in a manner that is safe for year-round use. In addition, a double span bridge across Ikalukrok Creek would require permanent impacts to fish habitat when compared with other routes. The narrow valley and close proximity to Sourdock and Competition Creek (containing rearing Dolly Varden) make it impossible to construct a road without impacting numerous wetlands and other waters associated with the creeks. Route 3 has more acres of impacts to WOTUS than other routes. Lastly, input from subsistence users determined the passage between the base of steep hillsides and Competition Creek was too narrow for a full-size road, without significantly impact existing secondary Caribou trails. Therefore, Route 3 is not considered a reasonable or practicable alternative.
Route 4	**Route 4** (Sled Pass Upper Route) begins at the end of the Fish Weir Access Road and parallels Route 3, but generally at a higher elevation. It crosses Ikalukrok Creek at a point a little further upstream than Route 3 but still requires a double span bridge with in water pier. It then heads north up the Sled Creek Valley to Sled Pass, on alternating sides of Route 3 to minimize wetlands impacts and avoid culturally sensitive areas. North of the pass, it parallels Sourdock Creek and Competition Creek, but considerably to the east and at a higher elevation. Route 4 would impact 12.7 acres of WOTUS using the comparison criteria described above.	**This alternative is dismissed from further evaluation** due to technical and environmental considerations. Large quantities of fill and side slope benching would be required to construct the route at the higher elevation and within steep terrain. In addition, a double span bridge across Ikalukrok creek would require additional permanent impacts to fish habitat when compared with other routes. Sourdock Creek and Competition Creek contain rearing Dolly Varden in the Wulik River watershed. While Route 4 stays a considerable distance away from both creeks, it is still located closer to the Wulik River when compared to other routes, and therefore less preferable by subsistence users. Therefore, Route 4 is not considered a reasonable or practicable alternative.

2.2 Proposed Action

TAI proposes an advanced exploration program to assess the technical and economic viability of the Aktigiruq and Anarraaq mineral deposits. The Proposed Action includes exploration roads and facilities that cannot be practicably or logistically located off-site, including: exploration camp facilities; equipment laydown areas; an underground access portal; underground vents; a temporary waste rock storage facility; material sites; and approximately 13 miles of connecting roads (Figure 2). The Proposed Action would include ground disturbance activities typically associated with road and pad construction projects such as: vegetation removal; grading; and placement of fill. Construction of the proposed project is anticipated to start in January 2019, subject to receipt of necessary authorizations. Exploration activities would occur year-round, for an estimated four years. Construction of the Proposed Action would require placement of approximately 83,778 cubic yards (cy) of clean fill into 16.1 acres and 5,031 linear feet of WOTUS. The following describes the Proposed Action components in more detail:

2.2.1 Exploration Roads

The proposed exploration road infrastructure consists of the following (Figure 2):

- Placement of 74,037 cy of fill into 15.7 acres of wetlands and loss of 1,928 linear feet of WOTUS to construct 10.2 miles of access road connecting the Anarraaq and Aktigiruq exploration area to existing surface roads.
- Placement of 5,444 cy of fill into 0.4 acres of wetlands and loss of 512 linear feet of WOTUS to construct 2.7 miles of secondary roads to connect the exploration access road with the surface facility pads and material sites.

All roadway sections are designed as a single lane, with pullouts as needed to accommodate two-way traffic. Access and secondary roads would have a running surface width of up to 19-feet (ft) wide, with typical embankment side slopes of 3H:1V (Maximum 2H:1V), and cut section back slopes of 1.5H:1V (Figures 7-1 and 7-2). Pullouts (11-ft-wide x 160-ft-long) along the access road would be spaced 0.5 mile apart, to allow safe vehicle passage (Figure 7-3). The total roadway running surface width at pullouts is 30 ft. Roadway fill depths vary depending on ground contours but would be at least 5 feet deep at the top of the roadway shoulder.

The proposed road design would maintain natural flow patterns through construction of six bridges and 27 culverts. Each bridge consists of a temporary Bailey-type steel bridge design spanning the width of the creeks, supported by bridge abutments built with precast concrete blocks (Figure 7-4). Bridge

abutments would be constructed above ordinary high-water levels as to not hinder natural flow patterns or modify natural stream channels. A bridge construction and maintenance area of 120 ft x 120 ft would be required on one side of the bridge. Culverts would consist of a steel pipe spanning the width of the road (toe to toe) and range from 24 to 48 inches in diameter in consideration of seasonal drainage. Culverts would be underlined and surrounded by 1 ft minimum of bedding material (Figure 7-5). Slope protection around the culvert would be placed, as needed, and may consist of a variety of engineered Rolled Erosion Control Product (RECP) or natural materials (Riprap). Culverts installed within potential high water would be embedded by 10% to aid flows and durability during high water events. Fill in WOTUS below ordinary high water required for culvert installation are included in roadway quantities.

Roadway construction would begin in winter by first constructing a pioneer road staring at the southern end of the Anarraaq and Aktigiruq access road and working to the north. Ice bridges would be used to allow road construction to advance in winter, with bridge installation occurring after spring thaw. Bridge abutments would be constructed during winter above ordinary high-water levels and without modifying the natural stream channels. Material from an existing and permitted material site (DD2) would be used to build the first 0.5-mile section of road until the route reaches the first identified material site at AA-MS-1 (See Section 2.2.3). From there the road would be built using material from the identified material sources adjacent to the road as construction advances to the north (Section 2.2.3 and Figure 2). Culvert crossings would also be constructed in winter to avoid flowing water. A geotextile fabric underlayment would be installed under the road embankment where required for road stability.

2.2.2 Surface and Underground Facilities

The proposed facilities (Figure 5-5) necessary for the advanced exploration of the Anarraaq and Aktigiruq deposits consist of:

- Underground ramp system
- Portal and camp area
- Vent raises and pads
- Laydown areas
- Temporary Exploration Waste Rock Facility

Underground activities would include developing an underground exploration ramp and executing exploratory drilling over a multi-year period. The underground ramp system allows equipment to access an underground exploration platform from which deeper drilling would occur. The underground system would be accessed via a portal, located at the main camp facility area. Groundwater would be

encountered during development and operation of underground exploration activities and would be pumped to an above ground treatment system before disposal. The underground exploration would be ventilated by a series of vent raises and associated pads that provide access for maintenance.

In addition to the camp facility, four laydown pads would be constructed to store drill core, fuel, and drilling and mining equipment and supplies, some of which would be stored in stacked connex containers. The laydown pads would be connected to the access road by various secondary roads (see Section 2.2.1). All pad facilities would be developed using cut and fill construction methods, with 2 percent cross slope gradients, and 2H:1V side slopes. All camp and pad facilities were sited to avoid impacts WOTUS except for the North Vent Raise. Placement of 2,853 cy of material would result in the loss of 642 linear feet of intermittent stream to construct the North Vent Raise pad. No other laydown or facility pads would require fill within WOTUS (Figures 5-5). Relocating the North Vent Raise pad outside of WOTUS is currently being evaluated to avoid impacts. It is almost certain that it can be moved, and Teck is committed to find a location for the North Vent Raise pad that is outside of WOTUS. However, since the evaluation is not complete, the impacts to WOTUS from the pad are still included in this EED.

Placement of 1,444 cy of material would result in the loss of 1,949 linear feet of intermittent stream to construct a temporary exploration waste rock facility (WRF). The exploration WRF would be located on a valley bottom, adjacent to the portal and camp, and would temporarily store rock and overburden extracted from the development of the underground exploration tunnels and vents (Figure 5-5). Any cut material from the road and pad construction that is unsuitable as fill material would also be placed in the exploration WRF. The exploration WRF would be a fully-lined facility and include adequate drainage control to handle expected precipitation events. The lining would consist of a geomembrane liner, placed over a crushed drain rock bedding approximately 2 ft thick, equipped with engineered underdrain channels. Surface runoff water would be collected and stored in a contact water pond designed to temporarily hold precipitation events prior to treatment. All contact water collected within the exploration WRF footprint would be treated and discharged. A drainage channel would be constructed around the perimeter of the exploration WRF to divert non-contact precipitation runoff.

2.2.3 Material Sources

Fill material would be locally sourced at four proposed material sites located adjacent to the proposed Anarraaq-Aktigiruq Exploration Road:

- Material Site AA-MS-1 (Milepost (MP) 0.5)
- Material Site AA-MS-2 (MP 3.3)

- Material Site AA-MS-3 (MP 4.2)
- Material Site AA-MS-4 (MP 7.2)

None of the proposed material sites would require excavation or fill within WOTUS. Material site excavation would be benched to maintain slope stability, drainage, and access for development and reclamation activities. Development of all four material sources would require blasting. Blasting would occur during initial development of the road in winter but is likely to continue throughout the spring and summer as the laydown pads and other features of the facility are developed.

2.2.4 Reclamation

Once exploration activities are completed, TAI would assess whether to advance mine development, or complete project reclamation as planned. Any mine development activities would require additional permits and authorizations. Currently, TAI is planning to reclaim the proposed facilities, per State of Alaska requirements. Proposed reclamation activities include:

- Removing the stockpiled material from the exploration WRF. The stockpiled material (including waste rock) from the exploration WRF would likely be transported to the existing Red Dog WRF or used to back fill the underground ramp system, or a combination of both. Once all stockpiled material is removed, the area would be graded to blend with the surrounding environment, seeded and/or allowed to naturally revegetate. Upon completion of reclamation of the temporary exploration WRF, no stockpiled material would remain at that location, thereby eliminating the need for long-term water management.
- Support facilities and portal. All surface structures would be removed, and the pads would be graded to blend with the surrounding environment, seeded, and allowed to naturally revegetate. Any clean stockpiled topsoil would be re-applied where the terrain is suitable for such application. The portal would be permanently barricaded to protect public safety and wildlife. If necessary, it would receive a hydraulic portal plug.
- Roads. Bridges (spans and abutments), and culverts would be removed, creating low water crossings. The road would be reseeded for stabilization and then allowed to naturally revegetate.

2.3 No Action

Under the No-Action Alternative, an access road and associated support facilities would not be constructed. As a consequence, there would be no safe, year-round overland access and sufficient support

facilities for a multi-year exploration drilling campaign to assess the technical and economic viability of the Aktigiruq and Anarraaq mineral deposits.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the existing environment and potential environmental consequences associated with the Proposed Action and No Action Alternatives.

The proposed project is located in Northwest Alaska, specifically the Headwaters of the Wulik River Hydrologic Unit Code (HUC) (1905040407, 168,557 acres) and Ikalukrok Creek HUC (1905040408, 123,791 acres) (Figure 1). These watersheds are dominated by permafrost tundra; including wetlands, perennial/intermittent streams, and upland foothills of the Brooks Range. The Red Dog Mine and associated Delong Mountain Transportation System (DMTS) are the only major developments in the region, and the center for local industrial activity. Weathering of geological formations create naturally occurring degraded water quality in some tributaries. The two local communities are Noatak and Kivalina, which rely on subsistence resources to continue culturally important local traditional use. These include fisheries resources from the Wulik River and caribou from the Western Arctic Caribou Herd which migrate through the area.

3.1 Non-Issue Resource Categories

This EED is issue-based, meaning that only resource categories that were identified as key issues through public and agency involvement are evaluated in detail. Table 2 summarizes resource categories identified as non-issues, and consequently not discussed further in this document.

Table 2: Non-Issue Resource Categories

Resource Category	Evaluation
Climate Change	• Observed local trends in increasing temperatures are taking place throughout the region (Tetra Tech 2009). Permafrost is assumed to be a dynamic, but fundamentally stable, condition in project design (Tetra Tech 2009). This project would not affect or accelerate climate change.
Endangered Species Act	• The IPaC (Information, Planning, and Consultation System) website was consulted for the project area (USFWS 2018) on May 23, 2018, and it indicated no threatened, endangered, or candidate species or critical habitats for the Proposed Action.
Essential Fish Habitat (EFH)	• Consultation with the Alaska Department of Fish and Game (ADFG) (Johnson and Blossom 2017) Anadromous Waters Catalog indicates that no salmon EFH occurs within the project area.

Resource Category	Evaluation
Coastal Resources	• The Alaska Coastal Management Program expired on June 11, 2011 and is no longer in effect. Although a state coastal consistency determination is no longer required, the Northwest Arctic Borough (NAB) Comprehensive Plan (1993) and the Northwest Area Plan (ADNR, 2008) were evaluated to confirm no adverse coastal impacts would occur from the Proposed Action and the project is consistent with coastal resource management plans referenced in these documents. • The **Public Interest Review** for **Shoreline Erosion and Accretion** finds no significant effect to coastal resources. The Proposed Action is not located near the shoreline.
Air	• Air quality permitting under the Proposed Action has been determined by the Alaska Department of Environmental Conservation (ADEC) to fit under a Minor Source Specific (MSS) Permit. Compliance with the permit would ensure no significant air quality impacts.
Health, Safety, and Public Welfare	• The proposed project would take place under a comprehensive TAI corporate Health, Safety, and Environmental compliance policy. This would ensure the health and safety of workers and other visitors to the site.
Energy Supply and Natural Resources	• The proposed project would develop and operate energy facilities and other utilities as required. Energy would be generated from onsite electricity generators. Freshwater sources would be permitted from appropriate surface water locations. All sewage and wastewater would be treated to meet ADEC water quality standards before being discharged. Solid waste would be collected on site and shipped to appropriate landfill locations outside of the Project Area. Construction materials, fill materials, and other natural resources are expected to be available through local sources. • No impacts are anticipated to any local community energy supplies or utilities.
Hazardous Materials and Contaminants	• The Red Dog Mine (ADEC File number 475.38.010) (Figure 1) is the only known hazardous site near the Proposed Action, located 8 miles southeast of the proposed exploration facility area. • No other known hazardous waste sites, generators, or contaminated sites are identified in the project area. Due to the natural state of the environment, anthropogenically caused contamination or hazardous waste would not likely be encountered during construction. • Fuel would be stored near the portal during exploration. TAI would develop an EPA-compliant Spill Prevention Control and Countermeasure Plan for fuel for the Proposed Action.

3.2 Physical and Chemical Environment

3.2.1 Noise

Affected Environment – The majority of existing noises within the project area are from the natural environment. The loudest natural noise within the undeveloped project area are sounds from storms. Transportation used to support subsistence activities throughout the region (e.g. snowmachines, aircraft) are also likely to periodically contribute noise to the environment. The most frequent anthropogenic noise in most of the project area is from intermittent helicopter operations to support exploration. Industrial noise (e.g. heavy equipment, blasting) occurs near the Fish Weir Road at the start of the Proposed Action

near the existing Red Dog Mine. Noise from these activities attenuate with distance from the Red Dog Mine. Noises from industrial activities near the project area have taken place since the development of the Red Dog Mine (1987), while noise from subsistence activities in the area have taken place for much longer.

No Action – There would be no increase to noise in the project area beyond is occurring currently. Some anthropogenic noise, such as subsistence activities, helicopter supported exploration, and industrial activity near Fish Weir Road, would continue.

Proposed Action – The Proposed Action would generate noise from heavy equipment and mining related activities. Blasting would be required to develop material sites during the construction phase and would likely be the largest noise contributor to the surrounding area during project development, although infrequently. Blasting noise may affect nearby activities by detracting from the secluded environment, or subsistence hunting activities by startling wildlife. Generators and heavy equipment would be in operation throughout the exploration project. The effects of noise from the Proposed Action would extend along the new access road and exploration area. Noise generation from the Proposed Action would cease in approximately 2023, 4 years from the estimated project start, and noise levels would return to pre-exploration conditions.

Avoidance, Minimization, and Mitigation

- Noise impacts to caribou would be limited through implementation of a caribou policy. The caribou policy would implement procedures for exploration access road users to minimize impacts to caribou from vehicular traffic on the road, including temporary road closures or halted traffic to accommodate caribou movements.
- Safety procedures for blasting would ensure compliance with MSHA noise standards for exploration workers.

3.2.2 Surface Water

Affected Environment – The major surface water sources in the project area include Ikalukrok Creek, Grayling Junior Creek, and Red Dog Creek (Figure 2). None are listed as Wild and Scenic Rivers by the National Park Service, or Essential Fish Habitat by the National Marine Fisheries Service (NMFS 2018) or ADFG for salmon at the locations of the crossing (Johnson and Blossom 2017).

There are six USGS hydrological sites with intermittent historical data on surface water in the vicinity of the Red Dog Mine, downstream of the Proposed Action (15746983, 15746988, 15746990, 15746980,

1574699020, 15746991, 15746900) (USGS 2018). Hydrographs demonstrate patterns typical for Northwest Alaska; including minimal winter flows, spring melt floods, summer decreases in discharge, and fall rainy seasons.

Water estates govern the legal use to use surface or groundwater in Alaska (ADNR 2018) through a number of permanent and temporary authorizations. Teck has three water rights at Red Dog Mine, (LAS1453, 25095, 25096). These rights include Bonns Creek, Red Dog Creek, and the South Fork of Red Dog Creek. The Wulik River has a water right for public drinking water issued to the City of Kivalina (ADL 72129). Driver Philip has a water right on the Wulik River (ADL 402491). A reservation of water has been issued to ADFG for the Wulik River from the mouth to the confluence with Ikalukrok Creek (LAS 20067).

No Action – The No Action alternative would have no impacts to water resources.

Proposed Action – Impacts to surface water from the Proposed Action have been minimized. Water quality impacts (Section 3.2.4) and fish habitat impacts (Section 3.3.2.3) are discussed in their respective sections.

Streams would be bridged or culverted with no in water work. 5,031 linear feet of WOTUS would be filled by roadway and pad embankments, however underdrains or other diversions would be constructed as needed to accommodate flows (Table 3).

Construction would require water supply withdrawals for dust control, road compaction, construction, and camp facilities. Temporary Water Use would be permitted through the Alaska Department of Natural Resources (ADNR). There are no anticipated impacts from withdrawals to existing water rights.

The **Public Interest Review** for **Navigation**, **Water Supply**, and **Conservation** finds no significant negative effect from the Proposed Action. The Proposed Action does not propose to alter Traditional Navigable Waters.

Avoidance, Minimization, and Mitigation

- Culverts and bridges have been designed to carry flows. Culverts will be installed without requiring in water work but will require fill to be placed during the winter below ordinary high water.
- Surface waterbodies would be permitted for Temporary Water Use through ADNR.

3.2.3 Geochemistry

Affected Environment – The soils of the area sit over shale and siltstone bedrock (Tetra Tech 2009). Soils consist of surface organics followed with silty, clayey, and sandy mineral soils (Tetra Tech 2009). All horizons are ice rich material. A shallow active layer thaws each summer, and permanent permafrost exists in deep layers between the bedrock and shallow active layer (Tetra Tech 2009).

The geochemistry of the region is naturally active. Naturally occurring minerals in the project area form harmful constituents (e.g. lead, zinc, cadmium, sulfur) when exposed to water and oxygen (Tetra Tech 2009). This process occurs naturally in exposed outcrops throughout the region and is not associated with any industrial activity (Tetra Tech 2009). For example, constituent concentrations have been documented in surface water exceeding water quality standards since before mining has taken place in the region (Water Quality Section 3.2.4) (SRK Consulting 2018). The presence of these chemicals (e.g. iron sulfide, lead sulfide, zinc sulfide) is visible at the surface and on aerial photography by the dark iron evidenced in nearby streams (e.g. Cub Creek).

No Action – Under the No Action alternative no disturbance to geology would occur from the Proposed Action. Naturally occurring minerals would continue to form harmful constituents during naturally occurring events.

Proposed Action – Development of access roads, material sites, and underground ramp system as the potential to expose naturally occurring geochemically active material, including potentially acid generating rock (PAG), to water and oxygen. PAG can't be avoided as it is widespread within the rock units that the exploration ramp will intersect. PAG would be temporarily stored in the WRF. At the end of the exploration program (2023), waste rock would be placed back underground, or permanently disposed of at another permitted WRF, preventing any further acid generating geochemistry from taking place. After the exploration program is complete, the temporary exploration WRF would be removed, the area graded and reclaimed to a naturally vegetated state.

TAI would construct a lined waste rock facility that would include contact water storage and underdrains to allow natural drainage to pass under the lined facility. ADNR and ADEC approval would be required before waste rock is placed in the WRF. The preliminary design of the engineered facility includes a water collection sump inside the facility as well as an "event" pond just below the facility to capture runoff.

Avoidance, Minimization, and Mitigation

- During excavation of cut slopes for construction of access roads, development of material sites, or any other areas resulting in exposure of PAG, a rock segregation plan would be implemented to identify and manage it. The segregation plan would be approved by ADEC. During construction, a qualified geologist would visually examine the cut material and make a determination whether or not it is suitable for construction (i.e. non-PAG). Cut material designated as PAG would be segregated, removed from the cut and be excluded from further use in accordance with the segregation plan.

3.2.4 Water Quality

Affected Environment –Baseline water quality is available from monitoring stations within the Wulik River, Ikalukrok Creek, and Red Dog Creek watersheds, taken intermittently from 2000 to 2017 (SRK Consulting 2018). ADFG speculate that Cub Creek (Figure 7), which often has a rusty color, may be what limits the presence of fish in Ikalukrok Creek above the confluence with the East fork Ikalukrok Creek (Al Ott, ADFG, 2018a).

Baseline exceedances in Alaskan Water Quality Criteria have been documented to be naturally occurring in each monitoring station (SRK Consulting 2018). Aluminum and zinc are consistently high, and pH consistently low, among all monitoring stations. Other exceedances include detections for selenium, cadmium, copper, lead, and iron (SRK Consulting 2018). Total Dissolved Solids tend to be within normal ranges, except for limited anomalous events.

No Action – The No Action alternative would have not impacts to water quality. Naturally occurring exceedances of the Alaskan water quality criteria would continue to occur.

Proposed Action – Material stored in the WRF has the potential to be geochemically active, generate acid and mobilize potentially harmful water quality constituents (e.g. sulfate and metals). All contact and seepage water collection associated with the WRF facility would be treated and discharged in accordance with Alaska Pollutant Discharge Elimination System (APDES) discharge permits.

Groundwater encountered underground, would also be treated prior to discharge under authority of an APDES permit from ADEC.

Minor, short term impacts to water quality may result from construction activities. These temporary impacts could originate from temporary water use, stormwater pollution, and stream crossings. Temporary water use would be permitted by ADNR. Stormwater impacts are expected to be minor with the implementation of required Stormwater Pollution Prevention Plan (SWPPP) and Best Management Practices (BMP). Bridge abutments would be constructed during winter above ordinary high-water levels and without modifying the natural stream channels. Culvert crossings would be constructed in winter to avoid flowing water.

The **Public Interest Review** for **Water Quality** and **Conservation** finds no significant negative effect from the Proposed Action. The Proposed Action would be treated and discharged in accordance with APDES discharge permits.

Avoidance, Minimization, and Mitigation

- Measures to minimize releases of sediment to water bodies would be implemented during construction as part of compliance with the APDES Multi Sector General Permit (MSGP). Compliance with the MSGP includes preparation of a SWPPP and implementation and monitoring of erosion and sediment control BMPs;
- Water withdrawal would require ADNR permitting and would specify appropriate BMPs; including water withdrawal volume limitations.
- All contact and seepage water collection associated with the WRF facility and underground activities would be treated and discharged in accordance with APDES discharge permits.
- Bridge abutments would be constructed during winter above ordinary high-water levels and without modifying the natural stream channels. Culvert crossings would be constructed in winter to avoid flowing water.

3.2.5 Floodplains

Affected Environment – Executive Order 11988 Floodplain Management requires federal agencies to avoid adverse impacts associated with the occupancy and modification of floodplains. There are no Federal Emergency Management Agency floodplain maps available for the Study Area.

Aufeis is a mass of layered ice formed when freezing forces groundwater to the surface, which freezes during cold temperatures. Streams near the Proposed Action can generate large masses of aufeis, which can both generate flooding and act as a large erosive force during spring break up (ADFG, 2018a).

No Action – No change would take place to the floodplain.

Proposed Action – As no floodplain maps are available, portions of the Proposed Action may be constructed within base floodplain areas susceptible to flooding but would not be located within a regulatory floodway or Federal Emergency Management Agency mapped 100-year floodplain.

The access road has been sited as far away from the valley bottom and associated aufeis as practicable. In many locations the contours of the natural landscape restrict completely avoiding susceptible valley bottoms. In these areas, and throughout its length, the road would be designed to accommodate flooding and aufeis.

The bridge abutments would be constructed above ordinary high-water levels and without modifying the natural stream channels. This would minimize effects to natural stream channels; while also allowing fish passage for the duration of the program. Construction would be performed during winter months, which would prevent floods from impacting the construction.

The **Public Interest Review** for **Flood Hazards** and **Floodplain Values** finds no significant negative effect from the Proposed Action. The Proposed Action does not alter any mapped floodplains and is being engineered to withstand potential flooding. The Proposed Action has been designed to not significantly reduce the floodplain capacity in the Proposed Action.

Avoidance, Minimization, and Mitigation

- Stream crossings, roads, and pads would be designed to incorporate expected high-water flows and aufeis.
- Bridge abutments would be constructed above ordinary high-water levels and without modifying the natural stream channels.

3.3 Biological Environment

3.3.1 Wetlands and Vegetation

Affected Environment – The project area was delineated for wetlands (WHPacific 2018), along an approximate 1,000-foot wide corridor of the Proposed Action (Figure 5). The survey found varied plant communities, including: wet and moist tundra with dense shrubs, sparse alpine communities on mountain tops, and barren rock areas. Vegetation was dominated by shrubs, ranging from tall (e.g. willow) to low (e.g. Labrador tea) Viereck classifications. Only a few emergent dominated wetlands were delineated (e.g. sedge and horsetail).

Wetlands geomorphic classifications included slope and riverine (flow-through and impounding) habitats. Slope wetlands are common in the project area given the steep gradient topography. Riverine habitats are located in and adjacent to streams draining the local topography. These included Ikalukrok Creek, and its tributaries, including Red Dog Creek and Grayling Junior Creek.

All streams flow to the Wulik River and into the Chukchi Sea, and are thus anticipated to be jurisdictional. All wetlands are expected to have significant surface or subsurface hydrologic connections to the stream systems and are considered jurisdictional under the Clean Water Act.

No Action – No impacts to wetlands and vegetation habitat would take place.

Proposed Action – Wetland habitat would be permanently filled from the Proposed Action (Table 3). Given the ubiquity of wetlands and Waters of the U.S. in the area, the relative loss of wetland habitat within the HUC 10 would be less than 1% and is considered minor.

The project is not expected to change the connectivity of wetlands. Culverts and bridges would ensure hydrologic connectivity is maintained during project operations. Culverts would be replaced with low water crossings at the end of project operations.

Table 3. Impacts to Waters of the United States

Proposed Action Component	Wetlands (acres)	Other Waters (linear feet)
Anarraaq-Aktigiruq Exploration Road	15.7	1,928
Main Vent Service Road	0.2	340
South Vent Service Road	0.2	172
North Vent Raise	-	642
Waste Rock Facility	-	1,949
Grand Total	**16.1**	**5,031**

The **Public Interest Review** for **Wetlands** finds a neutral effect from the Proposed Action. The Proposed Action does not impact a significant number of wetlands. Wetlands are common throughout the region, and the proposed Avoidance, Minimization, and Mitigation measures (below) will compensate for the impact.

Avoidance, Minimization, and Mitigation (per the June 15, 2018 Memorandum of Agreement between the Department of the Army and the Environmental Protection Agency)

- Avoidance: Due to the linear nature of the proposed project and the abundance of WOTUS within the project area, total avoidance is not practicable. Where practicable, facilities were located to avoid impacts to WOTUS.
    - Lower impact crossing methods (e.g. bridges) were utilized along fish streams instead of culverts.
    - The road corridor was located on drier ground with less WOTUS and greater use of uplands, where practicable.
- Minimization: The proposed project minimizes impacts to WOTUS to the maximum extent practicable by reducing the project footprint, maximizing the use of uplands and controlling the materials after the discharge:
    - The road was designed as a single lane road with vehicle pullouts, as opposed to a wider two-lane road, reducing WOTUS impacts where crossings could not be avoided.
    - The proposed road corridor maximized, to the extent practicable the use of flat terrain, reducing the need for fill material and side cut construction, reducing impacts where crossings WOTUS could not be avoided.
    - At some locations, the road alignment was designed to impact edges of wetlands rather than bisecting the entire wetland habitat, where practicable.
    - Stream crossings were designed to be perpendicular to flow direction, to the extent practicable.
    - Natural flow patterns would be maintained through the use of culverts and bridges;
    - The temporary WRF was designed to maximize waste rock storage capacity, while minimizing the facility footprint size and maintaining stability.
    - Sediment barriers would be installed around the perimeter of the construction areas at water crossings.
    - ADFG - Fish Habitat Permit restrictions and BMPs for in-water work and bridge abutment designs would be adhered to, in order to minimize potential impacts to fish and other aquatic species.
    - The construction contractor would develop and implement a SWPPP to address erosion and sediment control as required by the ADEC –APDES MSGP.
- Compensation: There are no existing mitigation banks, or In-lieu fee programs with service areas in the watershed that can satisfy the mitigation needs for the proposed project. Permittee-

responsible mitigation is the only practical mechanism to provide compensatory mitigation for the unavoidable loss of 16.1 acres, and 5,031 linear feet to streams of permanent impacts to WOTUS. TAI is proposing preservation of WOTUS within the Red Dog Creek watershed at a 1:1 ratio, by means of a deed restriction that would protect aquatic resources from future development as described in the wetlands mitigation plan.

3.3.2 Fish and Wildlife

3.3.2.1 Birds

Affected Environment – Most of the habitat in the Study Area can be potentially utilized by seasonal migrants which breed and raise their young during the short arctic summers (Audubon Alaska 2016, Tibbitts et al 2005). All of these species, and their nests and eggs, are protected under the *Migratory Bird Treaty Act* (MBTA) except for the resident Willow and Rock Ptarmigan.

Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act; and while both may occur, golden eagles are the most likely to occupy the area. Higher elevation cliffs, rock outcrops, and hill outcroppings in the region provide potential suitable breeding habitat for these and other raptors (ADFG 2008; BLM 1999).

The original 1984 EIS for the Red Dog Mine indicated that the region provides suitable habitat for cliff nesting raptors, such as the rough-legged hawk, gyre-falcon, and peregrine falcon (Dames & Moore 1983a, b). Nest surveys confirmed the nesting of all of these species except the peregrine falcon (Dames & Moore 1983b; SRK 2007). Several nests were located in the vicinity of the Red Dog mine in similar habitats, 8 miles to the south and east of the proposed facility area, and along the DMTS. In 2005, three rough-legged hawk nests were reported in the mine area near the DD-2 materials site, one near the confluence of the North Fork and Middle Fork Red Dog Creek and another approximately 2 miles downstream from the North Fork and Middle Fork confluence (Tetra Tech 2009). The nearest recorded peregrine falcon nest is located on the Omikviorok River bridge on the DMTS road (SRK 2007).

Two golden eagle nests were also documented in the vicinity of the Red Dog Mine in 1982 (Dames & Moore 1983a). The nests were inactive in 1982, and subsequent surveys over the past 16 years have not documented golden eagles using the area (Tetra Tech 2009). Other raptor species observed include merlin, northern harriers, and the short-eared owl.

No Action – No impacts to birds would take place.

Proposed Action – A permanent loss or alteration of bird habitat would result from construction of Proposed Action. The Proposed Action would remove and/or alter less than 200 acres of vegetation and topography which are used by various resident and migratory bird species. During construction, birds would likely relocate from disturbed areas to other nearby, similarly suitable habitats available in the project area resulting in no permanent impacts to bird species. Winter activities would limit impacts to resident species. Impacts by summer activities would be limited by adherence to recommendations from the US Fish and Wildlife Service (USFWS) about land clearing timing guidance for Alaska (USFWS 2017).

Although the Proposed Action may result in the direct loss of bird habitat, most habitat types are common and distributed ubiquitously throughout the region. In comparison with relatively undisturbed land surrounding the project, impacts are expected to be minimal. No specific take of bald or golden eagles or eagle nests is anticipated under the Proposed Action.

The **Public Interest Review** for **Fish and Wildlife Values** finds no significant negative effect from the Proposed Action. The impact to birds is expected to be non-significant given the proposed Avoidance, Minimization, and Compensation Measures (below).

Avoidance, Minimization, and Mitigation

- The Proposed Action alternatives have been routed to minimize with steep slopes and potential raptor nesting habitat wherever feasible;
- TAI would make note of any Golden Eagle activity in the area during construction activities and take all practical steps to minimize disturbance of the birds. TAI would contact USFWS if an active Golden Eagle nest site is identified.
- Where possible, vegetation clearing, site preparation, and construction activities would adhere to the recommended periods to avoid vegetation clearing from June 1–July 31 for Northern Alaska (USFWS 2017). If vegetation clearing, site preparation, and construction occurs within these periods, pre-construction nest surveys would be conducted by qualified personnel and appropriate mitigation developed in consultation with the USFWS.
- Winter road construction schedule would eliminate the risk of impacting the nests of migratory birds in the program area during the months when snow covers the ground. TAI has scheduled the access road and pad construction for the winter months to the greatest practical extent.
- Disturbed ground is less desirable to ground-nesting birds which otherwise rely on the tundra cover to disguise and construct their nests. If the actual schedule of activities indicates that

disturbance of native ground would be necessary during the typical nesting periods for the migratory birds, TAI would place "bird tape" to discourage birds from nesting in areas designated for disturbance during the nesting season.

- Temporary disturbance, reclaimed land, and other areas of ground disturbance would be revegetated with regionally appropriate seed mix that minimizes introduction of noxious weeds where practicable.

3.3.2.2 Wildlife

Affected Environment – Five species of large terrestrial mammals are known to occur in the Study Area: caribou (*Rangifer tarandus*), moose (*Alces alces*), muskoxen (*Ovibos moschatus*), Dall's sheep (*Ovis dalli)*, and brown bear (*Ursus arctos*). Caribou were identified as a key species, important to local and regional communities for subsistence purposes, and are discussed in additional detail below.

Caribou: The Western Arctic Herd (WAH) is the largest in the State of Alaska and is of both biological and subsistence importance to local communities. The WAH had a population estimate of 259,000 animals released in January 2018 (ADFG 2018b). The herd experiences large peaks and troughs (e.g. 490,000 animals in 2003, 201,000 in 2016). The herd uses a large section of Northwest Alaska, including the project area.

Satellite collar data (1988–2006) reveal the general WAH caribou distribution providing migration date approximations, which vary year to year (CARMA 2018). Caribou occupy the vicinity of the Study Area in dispersed winter densities between September 1–May 31, leave between June 1–June 30 for calving in the North, return July 1–July 31 for bug relief, and disperse August 1–August 31 for the Brooks Range to feed before dispersing for the winter season.

Caribou are considered especially sensitive during the fall southern migration to winter range. Since 1996, most individuals have wintered south of the Study Area, on the Seward Peninsula. Satellite collar data also revealed that a few individuals of the Teshekpuk Lake Herd may be present during the winter (CARMA 2018). These data suggest that caribou can be present in the Study Area at any time, except for the spring calving seasons.

No Action – No impacts to wildlife would take place.

Proposed Action – Construction of the project, as well as material source development and associated access, would result in habitat alteration for terrestrial mammals. The removal of these vegetation

communities would result in a relatively small reduction in the amount of potential foraging habitat for terrestrial mammals. No impacts are expected due to the large amount of substitute habitat available.

The Proposed Action may result in changes to other wildlife species, including migration patterns. Overall, potential effects depend on species, season, timing and duration activities (Benítez-López et al. 2010; Northrup et al. 2012; Beyer et al. 2013; Kite et al. 2016). Given the large amount of undisturbed suitable habitat available in the region, no impacts are expected to non-caribou species.

Caribou Migration Patterns and Movement: Roads and associated activities may alter caribou migration patterns and habitat use (Murphy and Curatalo 1987, Wilson et al. 2016). Wilson et al. (2016) studied the WAH response to the DMTS and observed individuals altering their movement behavior by taking longer to cross the road (i.e., delayed crossing time) and increasing their movement rates despite the relatively low traffic volume. Traditional and Ecological Knowledge suggest that letting the lead caribou pass encourages a traditional migration, as other caribou follow the leaders. Using this research, the caribou policy developed makes every effort to ensure that caribou are not disturbed in their efforts to cross the road. Impacts to caribou during construction are not anticipated as road construction activities are not scheduled during the fall caribou migration period, and blasting would occur during the winter months.

Mortality Risk: Overall, the degree of mortality risk during operations are dependent on seasonality and species but is regarded to be low. Winter coincides with environmental factors (e.g., poor driving conditions and reduced visibility) that can increase direct mortality risk. Implementation of the caribou policy is expected to reduce the risk to negligible levels.

The **Public Interest Review** for **Fish and Wildlife Values** finds no significant negative effect from the Proposed Action. The impact to wildlife is expected to be non-significant given the proposed Avoidance, Minimization, and Compensation Measures (below).

Avoidance, Minimization, and Mitigation

- The caribou policy implements procedures for exploration access road users to minimize impacts to caribou from vehicular traffic on the road, including temporary road closures or halted traffic to accommodate caribou movements.
- Construction activities are not scheduled during the fall caribou migration period, and blasting would occur during the winter months

3.3.2.3 Fish and Fish Habitat

Affected Environment –The major surface water sources include Ikalukrok Creek, Grayling Junior Creek, and Red Dog Creek. Other tributaries include Sled Creek, Moil Creek, and Noa Creek (Table 4, Figure 6). The following table describes fish presence in streams in the project area (ADFG, 2018a).

Table 4: Fishery Status of Creeks in the Project Area

Location	EFH	Anadromous	Dolly Varden	Arctic Grayling	Slimy Sculpin
West Fork Ikalukrok Creek	No	No	No	No	No
Ikalukrok Creek upstream on its confluence with West Fork Ikalukrok Creek	No	No	No	No	No
Ikalukrok Creek upstream of its confluence with East Fork Ikalukrok Creek	No	No	No	No	No
East Fork Ikalukrok Creek upstream of the confluence of East Fork and Ikalukrok Creek	No	Yes	rearing juveniles, resident and/or anadromous	adults and juveniles	No
Grayling Junior Creek	No	Yes	rearing juveniles, resident and/or anadromous	adults and juveniles	No
Noa Creek	No	No	No	No	No
Moil Creek	No	No	No	No	No
Sled Creek	No	No	No	No	No
Ikalukrok Creek downstream to mouth of Mainstem Red Dog Creek	Yes	Yes	rearing juveniles, resident and/or anadromous	adults and juveniles	adults and juveniles

Biomonitoring studies conducted in support of the Red Dog Mine have provided a detailed fisheries and invertebrate baseline for the region (ADFG 2017). The wetland report (WHPacific 2018) delineated numerous smaller streams in the project area, which have no documented presence of fish. Dolly Varden are the main fish of concern for direct impacts in the project area. Dolly Varden have complex life histories, with several alternative life strategies. Juveniles often spend multiple years in freshwater drainages growing into adults. Some adults (anadromous individuals) enter saltwater to feed during the summer, while others stay and feed in the freshwater system (resident). Anadromous individuals are generally larger than resident individuals.

Annual surveys conducted between 1979 and 2015 as part of ongoing monitoring for the nearby Red Dog Mine, estimated between 22,000 and 144,000 mixed stock Dolly Varden in the Wulik River in each year (Ott et al. 2016). In most years, greater than 90% of Dolly Varden overwintered downstream from Ikalukrok Creek (ADFG 2017). Most Dolly Varden spawning outside of the Wulik River occur in Tutak Creek and Dudd Creek (five miles below the project area), tributaries of Ikalukrok Creek downstream of the project area (Ott and Morris 2007, 2012, Ott et al. 2016). Individuals in the project area are likely a combination of juveniles that have not yet out migrated to the saltwater, and freshwater resident fish (ADFG 2017).

Arctic grayling are also residents in the project area, with well documented use of the Red Dog Creek drainage (ADFG 2017, Ott and Morris 2007, 2012, Ott et al. 2016). These fish overwinter in mainstem rivers and migrate into small tributaries in the spring and summer (ADFG 2017, Ott and Morris 2007). Arctic grayling dynamics are influenced by volume and water characteristics discharged from the Red Dog Mine site (ADFG 2017).

Essential Fish Habitat: There is no EFH within the project area. Five miles below the project area, lower sections of Ikalukrok Creek (below its confluences with Grayling Junior and Red Dog Creeks) support chum salmon (*Oncorhynchus keta*) (spawning), Chinook salmon (*O. tshawytscha*) (spawning, rearing), pink salmon (*O. gorbuscha*) (spawning), and sockeye salmon (*O. nerka*) (spawning).

No Action – No impacts to fish and fish habitat would take place.

Proposed Action – No impacts are anticipated to fish habitat. Bridges, culverts, and facility pads are being constructed above ordinary high water. No impacts associated with the WRF are anticipated as all contact water collected within the WRF footprint would be treated prior to discharge in accordance with permitting requirements.

Water Crossings: The proposed water crossings in fish-bearing streams all consist of bridges. Both bridges and culverts are used in the non-fish bearing streams. It is expected that topography and other factors would not allow a simple and consistent setback distance to follow for road design. Additional water management features such as ditches and sediment ponds may be required to manage impacts on the water quality of adjacent streams, especially during construction. Crossing sites would be evaluated for the potential for aufeis.

Water Withdrawal: Water withdrawal from area surface waterbodies would be required to support road construction for dust suppression and some bridge construction activities. The primary concern is

ensuring that fish are not directly impacted during water withdrawal. Especially during the winter, overwintering habitat can become anoxic or dewatered, resulting in impacts to fish. All water withdrawal would be permitted through the ADNR and ADFG, including appropriately sized screened intake and volume limitations to reduce accidental take of small fish.

The **Public Interest Review** for **Fish and Wildlife Values** finds no significant negative effect from the Proposed Action. The impact to fish is expected to be non-significant given the proposed Avoidance, Minimization, and Compensation Measures (below).

Avoidance, Minimization, and Mitigation

- Alternative evaluation selected route and bridge type that avoided permanent impacts to Red Dog Creek.
- Compliance with the APDES MSGP, and implementation of the required SWPPP and BMPs to reduce potential of sediment from entering fish bearing waterways.
- Water withdrawal activity would be coordinated with ADFG and ADNR.

3.4 Social and Economic Environment

3.4.1 Land Use and Recreation

Affected Environment – The project area lies north of the DMTS and Red Dog Mine. Landownership in the region consists of Bureau of Land Management (BLM), National Park Service (NPS), Native, and State lands. All lands in the project area are State lands and two parcels owned by NANA. NPS lands are limited to the Noatak National Preserve, east of the project. (Bureau of Land Management) BLM lands are scattered north and east, outside of the project area. There are no ANSCA (Alaska Native Claims Settlement Act) 17(b) easements or Revised Statue 2477 easements in the project area.

All of the project is in the NAB. The NAB has designated the lands as resource development (NAB 2011).

Area residents use all-terrain vehicles (ATVs) and snow machines as personal modes of transportation to conduct subsistence activities throughout the region.

No Action – No impacts to land use would take place.

Proposed Action – Use of the access road for travel would increase traffic in the area for subsistence, recreation, and other land uses. Although the access road is not open to the public, inadvertent casual use

of the access road is expected to consist of primarily snow machines from adjacent communities (Kivalina and Noatak). Proposed land use is compatible with the resource development zoning under the NAB.

The **Public Interest Review** for **Land Use** and **Recreation** finds no significant negative effect from the Proposed Action. In the long term, Land Use and Recreation is expected to have no significant impact from the Proposed Action.

Avoidance, Minimization, and Mitigation

- Public access would be restricted along the new access road under ADNR authority to protect public safety. This would limit road traffic to project construction and support vehicles.

3.4.2 Socioeconomics

3.4.2.1 Environmental Justice

Affected Environment – Kivalina and Noatak are the closest communities to the Proposed Action and are representative of all of the communities in the entire region (Table 5). Both are majority Alaska Native, with high levels of individuals below the poverty level. Incomes are relatively low, considering the high cost of living in rural Alaska.

Table 5: Noatak and Kivalina Socioeconomic Information (U.S. Census Bureau 2010)

	Noatak	Kivalina
Residents	514	374
Alaska Native	467	364
Other	47	10
Median Age	26.9	23.2
% High School Education or Greater	84%	63%
Housing Units	93	145
Median Household Income	$44,464	$59,063
Individuals below poverty level	29%	26%

Economic opportunities are limited, with many of the wage labor job/positions being part-time or seasonal. The Alaska Department of Labor and Workforce Development (DLWD 2016) reports most residents are employed by local government; with professional and business services, educational and

health services, and natural resources and mining also providing important jobs. Local employers include the City, Village Council, school district, local store, NANA Regional Corporation, and Red Dog Mine.

Community and public facilities include the washeteria, the City/Tribal Office, the U.S. Post Office, the Alaska Village Electric Cooperative (AVEC) facility, airport snow removal equipment building, and associated community halls. Some households do not have full plumbing. In these cases, water is hauled from the storage tanks to residences. Residential sewage is hauled from residences in "honey buckets" to disposal bunkers located throughout the community. Washeterias are community facilities which house a restroom, laundry, and bathing facility to allow community members to have access to running water and sewage disposal.

NANA is the Alaska Native Claims Settlement Act chartered regional corporation representing Kivalina and Noatak. The Native Village of Kivalina and Native Village of Noatak serve as the respective federally recognized tribal government. Maniilaq Association, a non-profit corporation, provides tribal government services for the twelve tribes of northwest Alaska.

No Action – A negative impact to Environmental Justice would take place under the No Action. Industrial activity provides an important source of economic activity for local residents. The No Action would result in fewer jobs, lower earnings, and increased poverty for the region. Without continued exploration, eventually current industrial activity and associated economic spending would end.

Proposed Action – The Proposed Action would provide economic stimulus for the region. Exploration activity could employ local residents, providing an important source of income for the region. Local industry has a proven track record with long relationships with community members, and the ability to implement meaningful local hire programs.

The **Public Interest Review** for **Economics** finds positive effects from the Proposed Action. The industrial activity is expected to provide benefits to local area residents, communities, and disadvantaged populations.

Avoidance, Minimization, and Mitigation

- Local hire efforts would take place under the Proposed Action, with the objective of providing sustainable jobs to local residents. These efforts spread the economic benefit to disadvantaged communities and increase local opportunities.

3.4.3 Subsistence

Affected Environment – Subsistence activities are an important cultural component of the area communities. Caribou are the principal subsistence resource in the project area. The Western Arctic Herd (WAH) provides food to communities throughout the North Slope Borough, NAB, Nome Borough, and unincorporated interior Alaska communities. As a result, potential disturbances to migration patterns are a significant risk to food security.

The most complete summaries of subsistence activities are from ADFG's surveys of community subsistence practices (ADFG 2010). Kivalina and Noatak are summarized here due to their proximity to the project and ability to represent a typical coastal and inland subsistence community.

Inland Noatak subsistence is dominated by caribou, freshwater fish, and saltwater resources they trade for or travel to the coast to capture (Table 6). Caribou is by far the most important resource and are customarily taken during the fall southern migration past town. Subsistence users have traditional locations they hunt caribou; and are sensitive to changes in migration patterns which may take the herd outside of their reach.

Table 6: Top 10 Noatak Subsistence Resources (ADFG, 2010)

Resource	Estimated Pounds Harvested	Percent of Total Harvest
Caribou	60,061	31
Trout	32,180	17
Bearded Seal	24,990	13
Chum Salmon	24,724	13
Whitefish	14,234	7
Beluga	7,633	4
Moose	5,691	3
Blueberry	4,268	2
Salmonberry	2,666	1
Walrus	1,851	1

Coastal Kivalina subsistence is dominated by reliance on freshwater and saltwater seafood and terrestrial caribou (Table 7). Saltwater seal, beluga, and cod are easy to access from boats and sea ice. The importance of trout (primarily Dolly Varden) is difficult to underestimate given their small size and large pounds harvested. The Wulik River produces the State's largest Dolly Varden, and Kivalina harvest large

quantities of these anadromous fish. Caribou are also important, and residents often have to travel up the Wulik River to intercept the herd as it migrates south in the fall. This can make residents very sensitive to changes in the herd's movements from customary migration routes.

Table 7: Top 10 Kivalina Subsistence Resources (ADFG, 2010)

Resource	Estimated Pounds Harvested	Percent of Total Harvest
Bearded Seal	96,188	37
Trout	67,739	26
Caribou	36,458	14
Beluga	28,285	11
Saffron Cod	5,294	2
Ringed Seal	5,280	2
Salmonberry	3,184	1
Blackberry	2,320	1
Chum Salmon	2,291	1
Moose	2,075	1

No Action – No impacts to subsistence would take place.

Proposed Action –The Proposed Action may increase the local access to subsistence resources for area residents. The access roads may be used incidentally during normal and traditional use of the area. It would expand subsistence harvest opportunities for residents, particularly during low snow years where snow cover or ice bridges may be rare.

Increased activity may cause changes to caribou movement (see Caribou Migration Patterns and Movement, Section 3.3.2.2 above). This could increase or decrease the amount of caribou available to harvest in traditional areas. Implementation of the caribou policy is expected to minimize any potential negative interaction with caribou migration.

Avoidance, Minimization, and Mitigation

- The caribou policy implements procedures for exploration access road users to minimize impacts to caribou from vehicular traffic on the road, including temporary road closures or halted traffic to accommodate caribou movements.

3.4.4 Aesthetics (Visual Resources)

Affected Environment – The project area occupies a variety of landscapes. The majority of the study area is in remote undeveloped land. This includes topography dominated by mountains, rolling hills, and wetland valleys. Vegetation is typical of Northwest Alaska, with alpine, tundra, and freshwater stream complexes visible during the summer. Most of the landscape is covered with scrub shrub vegetation. Winter brings a change in aesthetics, with frozen landscapes, windblown snow, and a more rugged visual resource. The closest local communities are at least 30 miles away.

An industrial resource extraction operation (e.g. Red Dog Mine) is present south of the project area. Visual elements include a large open pit mine, along with existing access roads and associated industrial equipment. Rehabilitated lands have been shaped to match existing topography and revegetated with vegetation visually matching the surrounding area.

Viewer groups include industrial workers and individuals taking part in subsistence activities. Subsistence activity may take place over any portion of the study area and is dispersed due to the lack of centralized access routes.

No Action – No impacts to aesthetics would take place.

Proposed Action – The magnitude of impacts would differ for separate Proposed Action elements. The access roads, bridges, culverts, and pads would have low to moderate visual contrast. Elements would be visible from a distance, but not significantly change the regional setting. The underground exploration would have little visual impacts, as the surface would be largely undisturbed. The WRF would have a local moderate visual impact. The facility would distract from the natural landscape but is relatively minor compared to regional resource extraction facilities.

The duration of visual impacts would differ for separate project elements. The bridges, culverts, WRF, and structures would extend through the life of the project but be removed when the project is complete. The pad and road impacts would be permanent and extend beyond the life of the project.

The scope of impact would be restricted due to the natural topography of the area. The potential viewers are industrial workers or dispersed subsistence users. The Proposed Action has been sited inside a valley, limiting long range visual impacts. Conducting underground exploration also limits the amount of disturbance to the viewshed; avoiding a large surface disturbance.

The context of the impact matches adjacent land uses. This area has a history of mixing industrial mineral development with subsistence land use practices. The existing visual resources are not recognized for specific scenic value, and do not have management standards protecting it. The NAB planning documents emphasize promotion of compatible industrial and subsistence use in the area (Northwest Arctic Borough. 1993).

The **Public Interest Review** for **Aesthetics** finds no significant negative effect from the Proposed Action. With the Avoidance, Minimization, and Mitigation Measures (below), the impact to aesthetics is expected to not be significant.

Avoidance, Minimization, and Mitigation:

Reclamation activities would include minimizing the impact to aesthetics, including:

- Removing the stockpiled material from the WRF.
- All surface structures would be removed, and the pads would be graded to blend with the surrounding environment, seeded, and allowed to naturally revegetate. Any clean stockpiled topsoil would be re-applied where the terrain is suitable for such application.
- Bridges (spans and abutments), and culverts would be removed, creating low water crossings.
- The road would be reseeded for stabilization and then allowed to naturally revegetate.

3.4.5 Cultural Resources

Affected Environment – Northwest Alaska has been occupied by humans for at least the last 10,000 years. Archaeological investigations intended to identify archaeological resources within the APE have included background research and pedestrian field investigations (August 24-29, 2017). Additional surveys are anticipated in the summer of 2018, focused on the facility area. Research included a literature review, archival research, and identification of expected resources. Field results included initial aerial overflights and pedestrian surveys at high probability areas. No structures are present, so no building surveys were conducted. Prehistoric and historic sites were identified, and site boundaries were identified in cultural resource reports (WHPacific, 2017b).

No Action – No impacts to cultural resources would take place.

Proposed Action – Pursuant to 36 CFR 800.5(b), implementing regulations of Section 106 of the *National Historic Preservation Act*, the USACE, in consultation with SHPO, will make a Finding of Effect to historic properties by the Proposed Action.

Archaeological investigations to date did not result in the identification of any elements which contribute to a continuing understanding of the prehistory or history within the APE. As such, construction of the Proposed Action would not have an adverse effect to the integrity of the sites or their continuing eligibility for the National Register of Historic Places.

We anticipate the USACE will determine that no historic properties would be affected and will seek concurrence from SHPO.

The **Public Interest Review** for **Historic Properties** finds no significant negative effect from the Proposed Action. Historic Properties have been avoided by the Proposed Action.

Avoidance, Minimization, and Mitigation:

- Eligible, or potentially eligible, sites within the APE, for which the project has been designed to avoid would include a protective buffer of 500 feet (ft). Where the protective buffer is less than 500 ft the site would be flagged by a cultural resources specialist meeting the qualification of 48 FR 44738-44739.
- TAI would provide cultural training to project personnel, contractors, and subcontractors within their first week of employment. The training materials would be prepared or approved by a qualified archaeologist meeting the qualifications of 48 FR 44738-44739.
- TAI also proposes to consult with local Native communities regarding DEL-00556 (reindeer bells) in order to determine if there is any interest in collecting the reindeer bells. These could be used to in an educational context to examine the role of the Alaska Reindeer Service in the history of the region. Further information is available in the restricted cultural resources technical report.

4 MITIGATON

Unavoidable effects associated with the Proposed Action would take place from: (1) temporary and localized increases in noise; (2) fill in WOTUS; (3) temporary water quality impacts; and (4) minor impacts to visual resources. The following measures have been incorporated into the Proposed Action to avoid, minimize, and mitigate for adverse impacts to the natural and human environment.

4.1 Avoidance, Minimization, and Mitigation:

Noise

- Noise impacts to caribou would be limited through implementation of a caribou policy. The caribou policy would implement procedures for exploration access road users to minimize impacts to caribou from vehicular traffic on the road, including temporary road closures or halted traffic to accommodate caribou movements.
- Safety procedures for blasting would ensure compliance with MSHA noise standards for exploration workers.

Surface Water

- Culverts and bridges have been designed to carry flows and not require in water work.
- Surface waterbodies would be permitted for Temporary Water Use through ADNR.

Geochemistry

- During excavation of cut slopes for construction of access roads, development of material sites, or any other areas resulting in exposure of PAG, a rock segregation plan would be implemented to identify and manage it. The segregation plan would be approved by ADEC. During construction, a qualified geologist would visually examine the cut material and make a determination whether or not it is suitable for construction (i.e. non-PAG). Cut material designated as PAG would be segregated, removed from the cut and be excluded from further use in accordance with the segregation plan.

Water Quality

- Measures to minimize releases of sediment to water bodies would be implemented during construction as part of compliance with the APDES Multi Sector General Permit (MSGP). Compliance with the MSGP includes preparation of a SWPPP and implementation and monitoring of erosion and sediment control BMPs;

- Water withdrawal would require ADNR permitting and would specify appropriate BMPs; including water withdrawal volume limitations.
- All contact and seepage water collection associated with the WRF facility and underground activities would be treated and discharged in accordance with APDES discharge permits.
- Bridge abutments would be constructed during winter above ordinary high-water levels and without modifying the natural stream channels. Culvert crossings would be constructed in winter to avoid flowing water.

Floodplains

- Stream crossings, roads, and pads would be designed to incorporate expected high-water flows and aufeis.
- Bridge abutments would be constructed above ordinary high-water levels and without modifying the natural stream channels.

Wetlands and Vegetation

- Avoidance: Due to the linear nature of the proposed project and the abundance of WOTUS within the project area, total avoidance is not practicable. Where practicable, facilities were located to avoid impacts to WOTUS.
    - Lower impact crossing methods (e.g. bridges) were utilized along fish streams instead of culverts.
    - The road corridor was located on drier ground with less WOTUS and greater use of uplands, where practicable.
- Minimization: The proposed project minimizes impacts to WOTUS to the maximum extent practicable by reducing the project footprint, maximizing the use of uplands and controlling the materials after the discharge:
    - The road was designed as a single lane road with vehicle pullouts, as opposed to a wider two-lane road, reducing WOTUS impacts where crossings could not be avoided.
    - The proposed road corridor maximized, to the extent practicable the use of flat terrain, reducing the need for fill material and side cut construction, reducing impacts where crossings WOTUS could not be avoided.
    - At some locations, the road alignment was designed to impact edges of wetlands rather than bisecting the entire wetland habitat, where practicable.
    - Stream crossings were designed to be perpendicular to flow direction, to the extent practicable.

- Natural flow patterns would be maintained through the use of culverts and bridges;
- The temporary WRF was designed to maximize waste rock storage capacity, while minimizing the facility footprint size and maintaining stability.
- Sediment barriers would be installed around the perimeter of the construction areas at water crossings.
- ADFG - Fish Habitat Permit restrictions and BMPs for in-water work and bridge abutment designs would be adhered to, in order to minimize potential impacts to fish and other aquatic species.
- The construction contractor would develop and implement a SWPPP to address erosion and sediment control as required by the ADEC –APDES MSGP.

- Compensation: There are no existing mitigation banks, or In-lieu fee programs with service areas in the watershed that can satisfy the mitigation needs for the proposed project. Permittee-responsible mitigation is the only practical mechanism to provide compensatory mitigation for the unavoidable loss of 16.1 acres, and 5,031 linear feet of permanent impacts to WOTUS. TAI is proposing preservation of WOTUS within the Red Dog Creek watershed at a 1:1 ratio, by means of a deed restriction that would protect aquatic resources from future development as described in the wetlands mitigation plan.

Birds

- The Proposed Action alternatives have been routed to minimize with steep slopes and potential raptor nesting habitat wherever feasible;
- TAI would make note of any Golden Eagle activity in the area during construction activities and take all practical steps to minimize disturbance of the birds. TAI would contact USFWS if an active Golden Eagle nest site is identified.
- Where possible, vegetation clearing, site preparation, and construction activities would adhere to the recommended periods to avoid vegetation clearing from June 1–July 31 for Northern Alaska (USFWS 2017). If vegetation clearing, site preparation, and construction occurs within these periods, pre-construction nest surveys would be conducted by qualified personnel and appropriate mitigation developed in consultation with the USFWS.
- Winter road construction schedule would eliminate the risk of impacting the nests of migratory birds in the program area during the months when snow covers the ground. TAI has scheduled the access road and pad construction for the winter months to the greatest practical extent.
- Disturbed ground is less desirable to ground-nesting birds which otherwise rely on the tundra cover to disguise and construct their nests. If the actual schedule of activities indicates that

disturbance of native ground would be necessary during the typical nesting periods for the migratory birds, TAI would place "bird tape" to discourage birds from nesting in areas designated for disturbance during the nesting season.

- Temporary disturbance, reclaimed land, and other areas of ground disturbance would be revegetated with regionally appropriate seed mix that minimizes introduction of noxious weeds where practicable.

Wildlife

- The caribou policy implements procedures for exploration access road users to minimize impacts to caribou from vehicular traffic on the road, including temporary road closures or halted traffic to accommodate caribou movements.
- Construction activities are not scheduled during the fall caribou migration period, and blasting would occur during the winter months

Fish and Fish Habitat

- Alternative evaluation selected route and bridge type that avoided permanent impacts to Red Dog Creek.
- Compliance with the APDES MSGP, and implementation of the required SWPPP and BMPs to reduce potential of sediment from entering fish bearing waterways.
- Water withdrawal activity would be coordinated with ADFG and ADNR.

Land Use and Recreation

- Public access would be restricted along the new access road under ADNR authority to protect public safety. This would limit road traffic to project construction and support vehicles.

Environmental Justice

- Local hire efforts would take place under the Proposed Action, with the objective of providing sustainable jobs to local residents. These efforts spread the economic benefit to disadvantaged communities and increase local opportunities.

Subsistence

- The caribou policy implements procedures for exploration access road users to minimize impacts to caribou from vehicular traffic on the road, including temporary road closures or halted traffic to accommodate caribou movements.

Aesthetics (Visual Resources)

Reclamation activities would include minimizing the impact to aesthetics, including:

- Removing the stockpiled material from the WRF.
- All surface structures would be removed, and the pads would be graded to blend with the surrounding environment, seeded, and allowed to naturally revegetate. Any clean stockpiled topsoil would be re-applied where the terrain is suitable for such application.
- Bridges (spans and abutments), and culverts would be removed, creating low water crossings.
- The road would be reseeded for stabilization and then allowed to naturally revegetate.

Cultural Resources

- Eligible, or potentially eligible, sites within the APE, for which the project has been designed to avoid would include a protective buffer of 500 feet (ft). Where the protective buffer is less than 500 ft the site would be flagged by a cultural resources specialist meeting the qualification of 48 FR 44738-44739.
- TAI would provide cultural training to project personnel, contractors, and subcontractors within their first week of employment. The training materials would be prepared or approved by a qualified archaeologist meeting the qualifications of 48 FR 44738-44739.
- TAI also proposes to consult with local Native communities regarding DEL-00556 (reindeer bells) in order to determine if there is any interest in collecting the reindeer bells. These could be used to in an educational context to examine the role of the Alaska Reindeer Service in the history of the region. Further information is available in the restricted cultural resources technical report.

4.2 Compensatory Mitigation

There are no existing mitigation banks, or In-lieu fee programs with service areas in the watershed that can satisfy the mitigation needs for the proposed project. Permittee-responsible mitigation is the only practical mechanism to provide compensatory mitigation for the unavoidable loss of 16.1 acres, and 5,031 linear feet of permanent impacts to WOTUS. TAI proposes preservation of WOTUS within the Red Dog Creek watershed at a 1:1 ratio, by means of a deed restriction that would protect aquatic resources from future development. TAI would submit a Compensatory Mitigation Plan to the USACE for the proposal, under separate cover, that would include timelines and designs, maintenance plans, performance standards, and monitoring requirements.

5 CUMULATIVE EFFECTS

Cumulative effects include effects resulting from past, current, or reasonably foreseeable future Federal, State, tribal, local or private actions that are reasonably foreseeable to occur in the project area. The scope of the cumulative effects is the longest period of time of the Proposed Action (4 years). The geographic area of cumulative effects is comprised of two watersheds totaling 292,348 acres (Headwaters of the Wulik River HUC (1905040407, 168,557 acres) and Ikalukrok Creek HUC (1905040408, 123,791 acres)). In comparison the Proposed Action would disturb less than 200 acres within these watersheds.

Past actions: The Red Dog Mine is the only other existing development in the geographic area. It is adjacent but unconnected to the Proposed Action. The Proposed Action would proceed independently of any actions at the Red Dog Mine.

Current actions: There is one current proposed project within the geographic area. Teck Alaska Incorporated has proposed to expand the Red Dog Mine's Tailings Storage Facility and Waste Dump facility to contain mill material and waste rock from the Red Dog Mine's Aqqaluk and Qanaiyaq deposits. The proposed wetland and upland disturbance area associated with this action is approximately 56 acres.

Reasonably foreseeable future actions: None. There are no known reasonably foreseeable future actions being proposed within the geographic area of the Proposed Action. Although the results of the exploration program may determine that the mineral resource is viable, it is premature to assume a mine would be constructed at the site at some point in the future. Development of a mine is outside of the scope and scale of what is considered a foreseeable future project as the likelihood of this taking place is not definitive enough to be able to evaluate it in a qualitative or quantitative manner at this time.

Kivalina and Noatak are the two local communities within or near the geographic extent of the project. Noatak is outside of the watershed HUCs but depends on subsistence resources which migrate through the area. Kivalina is downstream of the Proposed Action, but outside of the 10 digit HUC

The Proposed Action would incrementally increase disturbance within the watersheds. However, given the large undeveloped area in the region the Proposed Action is not anticipated to generate significant incremental adverse effects, when considered in conjunction with other past, present, and reasonably foreseeable future actions.

6 COORDINATION

Public involvement and agency coordination activities have occurred since 2015. Meetings in the community are held consistently for this project to keep the community involved and informed about ongoing activities in the region, including the current helicopter supported exploration activities as well as the plans for a year-round exploration program and what that program would entail (Proposed Action). Community input continues to be an important element of development planning in the region. Local elders and community members provided local perspective, subsistence advice, and are kept up to date on exploration work, the proposed access route, permitting and planned community engagement activities. Table 8 outlines the public involvement activities and Table 9 outlines agency coordination completed to date.

Planned exploration engagement for the remainder of 2018 would include:

- In depth socio-economic baseline study with door to door surveys in the Local Study Area (Kivalina and Noatak), and focus groups and surveys with community leadership and service providers in the remaining nine villages. Secondary data on social, economic, land use and health would be compiled for all 11 villages in the region.
- Monthly Kivalina IRA/City Meetings.
- Monthly Noatak IRA Meetings.
- Community Meetings at least once per year.
- Implementation of an Exploration Engagement Committee (TAI, NANA, Kivalina, Noatak representatives) to meet quarterly and discuss permitting processes, engagement and socio-economic study.
- Opening a Project Office in Kivalina.
- Training and Employment Plan.
- Development of software to track engagement and community concerns/comments.
- Implementation of a community level feedback mechanism.

6.1 Public Involvement

Table 8: Public Involvement

Public Involvement			
Date	**Community/ Organization**	**Activity**	**Description**
June 19, 2015	Elders of Noatak	In home Elders Visits	Meeting with elders in the community to introduce the Project and ask how they would like to be engaged on the Project
July, 2015	Elders of Kivalina	In home Elders Visits	Meeting with elders in the community to introduce the Project and ask how they would like to be engaged on the Project
September 24, 2015	NANA	Leadership meeting & Helicopter Site Tour	NANA leadership, including board members from Kivalina & Noatak, and the Red Dog Subsistence Committee visit Teck Exploration at the Red Dog camp to receive a PowerPoint presentation on exploration activities and take a helicopter site tour of the Anarraaq site.
December 9, 2016	Noatak	Student Visits & Community Meeting	Presented to the High School Students and held a community meeting in Noatak to introduce the exploration project. Followed by a community meal.
January 16, 2017	Kivalina	Student Visits & Community Meeting	Presented to the High School Students and held a community meeting in Kivalina to introduce the exploration project. Followed by a community meal.
April 13, 2017	Noorvik	Community Meeting	Part of a Red Dog Community Meeting 1-2 introductory slides provided on exploration
May 16, 2017	Selawik	Community Meeting	Part of a Red Dog Community Meeting 1-2 introductory slides provided on exploration
June 9, 2017	Buckland	Community Meeting	Part of a Red Dog Community Meeting 1-2 introductory slides provided on exploration
July 5, 2017	Kiana	Community Meeting	Part of a Red Dog Community Meeting 1-2 introductory slides provided on exploration
September 12, 2017	Kotzebue	Leadership Meeting	Part of a Red Dog Community Meeting 1-2 introductory slides provided on exploration to Kotzebue Leadership
April 13, 2019	Kivalina	Leadership Meeting	Meeting with Kivalina IRA to discuss the upcoming stages of the exploration work, the proposed access route, and planned community engagement activities
May 21, 2018	Noatak	Leadership Meeting	Meeting with Noatak IRA to discuss the upcoming stages of the exploration work, the proposed access route, and planned community engagement activities
May 21, 2018	Noatak	Community Meeting	Meeting with community of Noatak to discuss the upcoming stages of the exploration work, the proposed access route, permitting and planned community engagement activities

Public Involvement			
Date	**Community/ Organization**	**Activity**	**Description**
May 22, 2018	Kobuk	Community Meeting	Meeting with the Kobuk community to discuss the upcoming stages of the exploration work, the proposed access route, and planned permits
May 22, 2018	Shungnak	Community Meeting	Meeting with the Shungnak community to discuss the upcoming stages of the exploration work, the proposed access route, and planned permits
May 24, 2018	Deering	Community Meeting	Meeting with the Deering community to discuss the upcoming stages of the exploration work, the proposed access route, and planned permits
May 24, 2018	Noorvik	Community Meeting	Meeting with the Noorvik community to discuss the upcoming stages of the exploration work, the proposed access route, and planned permits
May 30, 2018	Ambler	Community Meeting	Meeting with the Ambler community to discuss the upcoming stages of the exploration work, the proposed access route, and planned permits
May 30, 2018	Kiana	Community Meeting	Meeting with the Kiana community to discuss the upcoming stages of the exploration work, the proposed access route, and planned permits
May 31, 2018	Kivalina	Leadership Meeting	Meeting with Kivalina IRA to further discuss the exploration work and proposed access route
May 31, 2018	Kivalina	Community Meeting	Meeting with community of Kivalina to discuss the upcoming stages of the exploration work, the proposed access route, permitting and planned community engagement activities
June 1, 2017	Regional Elders Council	Leadership Meeting	Meeting with regional Elders Council to discuss the upcoming stages of the exploration work, the proposed access route, permitting and planned community engagement activities
June 7, 2018	Kotzebue	Leadership Meeting	Meeting with Kotzebue leadership to discuss the upcoming stages of the exploration work, the proposed access route, permitting and planned community engagement activities
June 7, 2018	Buckland	Community Meeting	Meeting with the Buckland community to discuss the upcoming stages of the exploration work, the proposed access route, and planned permits

6.2 Agency Coordination

Table 9: Agency Coordination

Organization	Description
ADEC	• TAI makes frequent phone contact with ADEC staff as the company develops baseline environmental programs and strategies for managing water and development rock and reclamation planning for future activities associated with the Anarraaq and Aktigiruq exploration program. • In April 2018 TAI organized a web meeting with permitting agencies to review the entire proposed exploration program. • TAI principal contact at ADEC is Tim Pilon, Engineer with the Water Section.
ADNR	• TAI makes frequent phone contact with ADNR staff in the mining and water sections as the company has been developing its Plan of Operations for the Anarraaq and Aktigiruq exploration program. • ADNR staff provide information to the company on material sales requirements, reclamation, road construction, baseline studies and bonding requirements. • ADNR staff participated in the April 2018 Webinar where TAI presented plans for the project and discussed the permitting that would be required. • TAI's principal contact at ADNR is Brent Martellaro, Geologist in ADNR's Mining Section.
ADFG	• TAI makes frequent phone contact with ADFG particularly with regard to fish passage, fish habitat, bridge designs, stream crossings and Title 16 permitting for the Anarraaq and Aktigiruq exploration program. • ADFG participated in the April 2018 webinar. • ADFG would have input into bridge abutment designs for those bridges that are proposed for fish-bearing streams along the proposed road route. ADFG have been performing aquatic life studies in the project area for more than 20 years. • TAI's principal contact at ADFG is Audra Brase, Regional Supervisor.
SHPO	• TAI is in regular contact with SHPO for the purpose of discussing past and ongoing cultural resource surveys in the Anarraaq and Aktigiruq exploration area. • SHPO issues permits for the company's survey work and reviews the survey reports for adequacy. • TAI's principal contact at SHPO is McKenzie Johnson, Archaeologist.
EPA	• TAI has made infrequent contact with EPA for the purpose of discussing water management and water discharges. • TAI has no principal contact with EPA.

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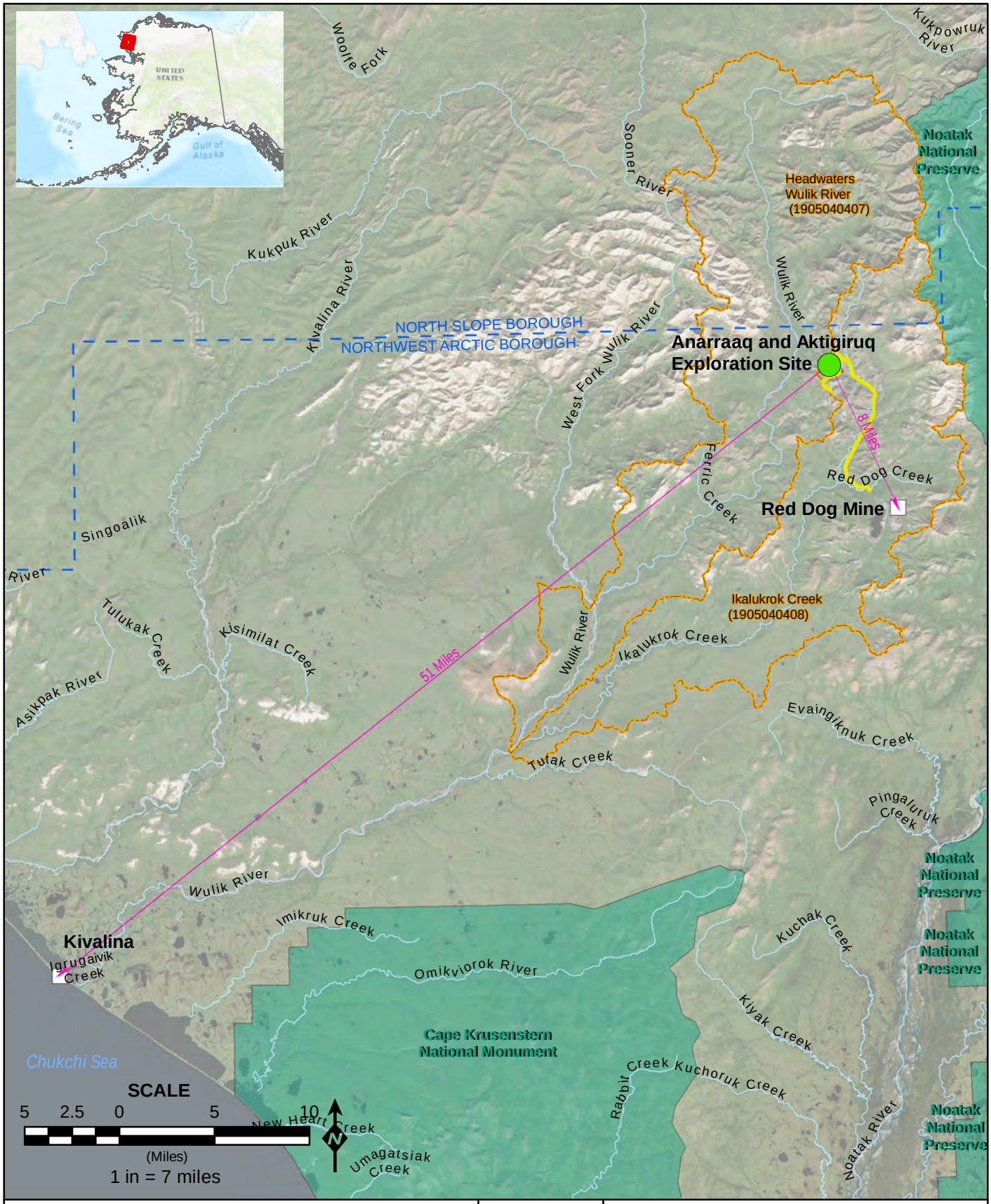


Anarraaq and Aktigiruq Exploration Site
Place of Interest
Proposed Road
Borough Boundary
Administrative Boundary
Watershed (HUC10)

Teck

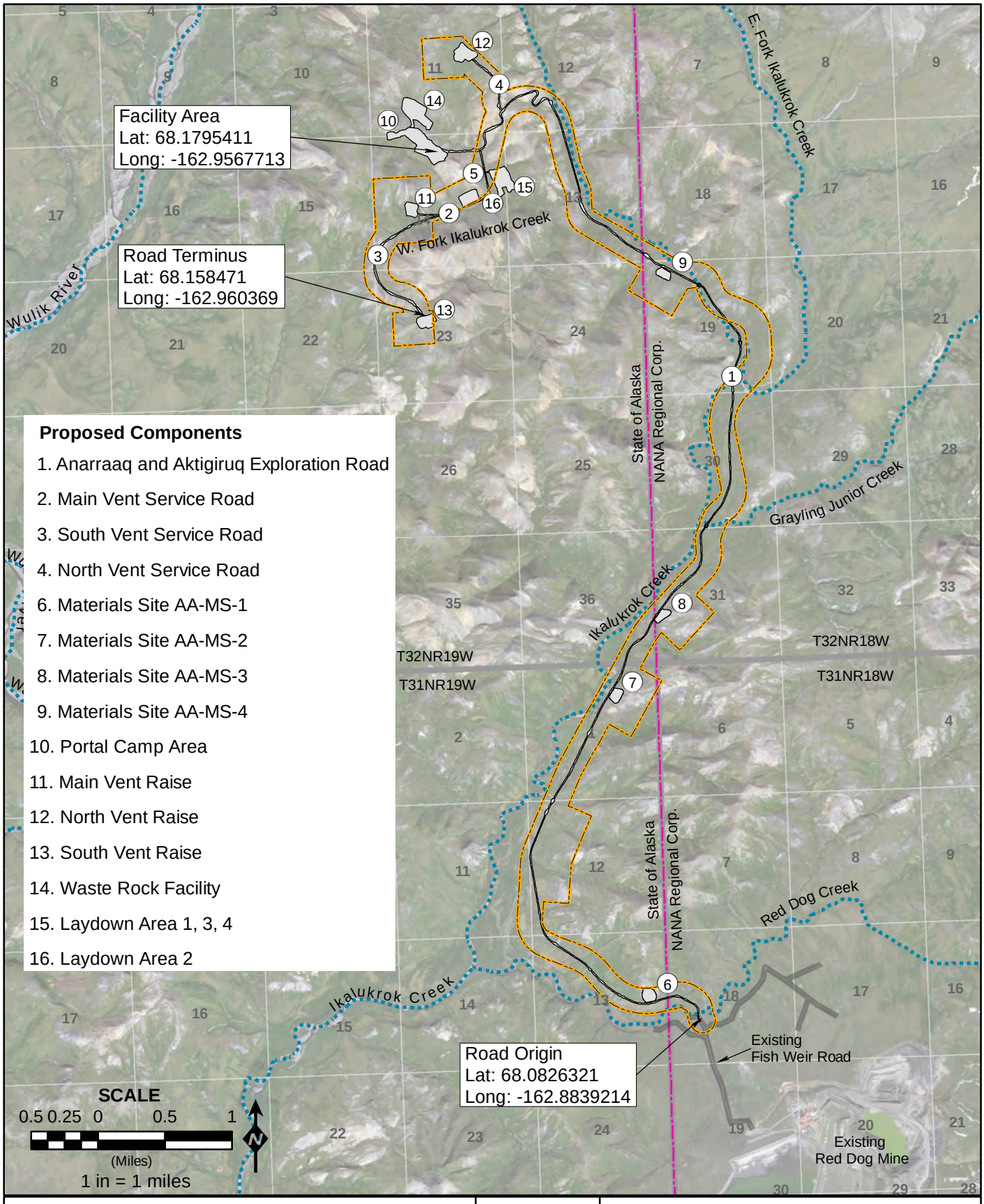
PROJECT LOCATION

Environmental Evaluation Document
Anarraaq and Aktigiruq Exploration Program

DATE: **06/22/2018**

FIGURE: **1**

ORNRC: TEA029, 07/11/2018, R04



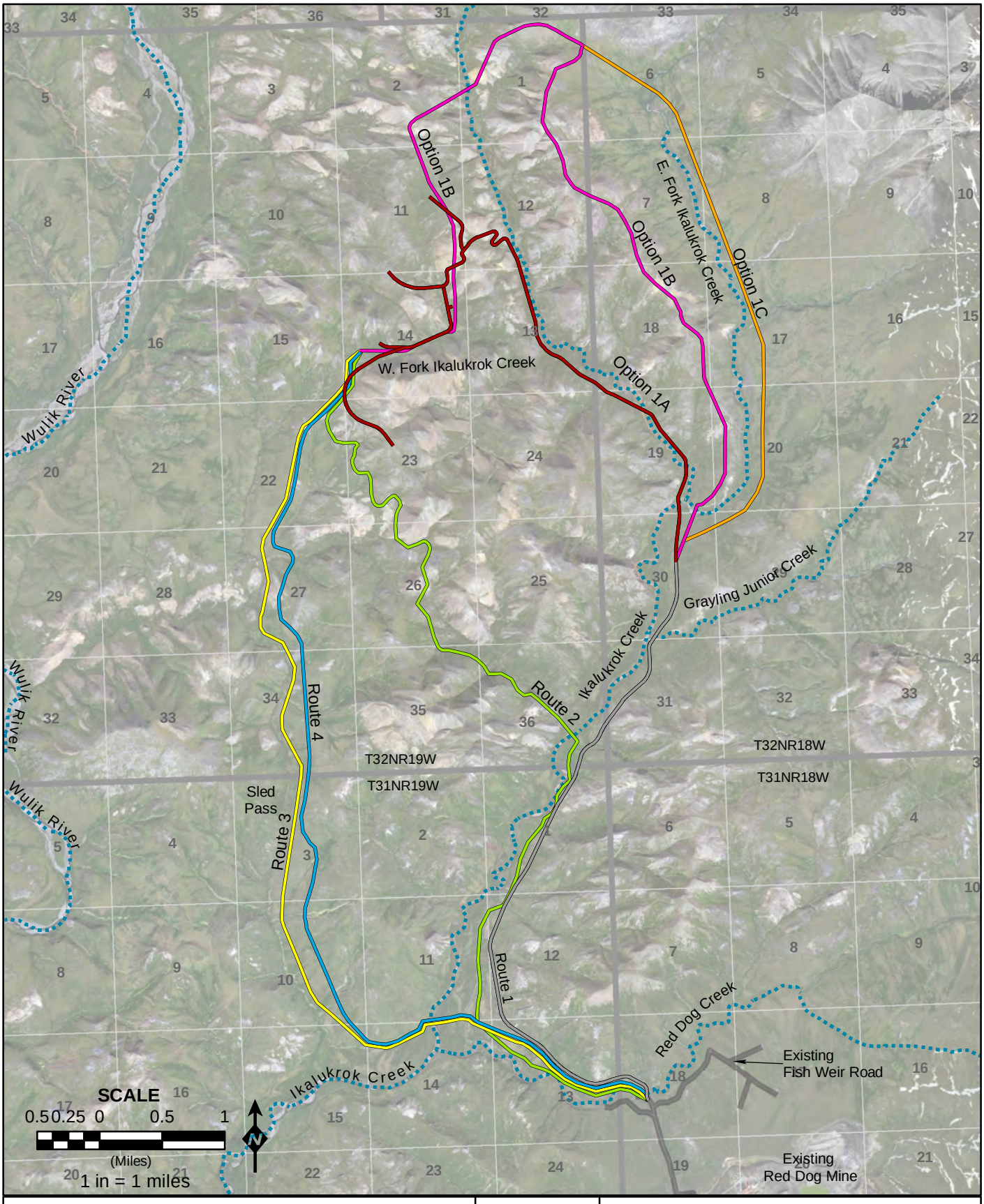
Teck

PROPOSED ACTION OVERVIEW

Environmental Evaluation Document
Anarraaq and Aktigiruq Exploration Program

DATE:	FIGURE:
06/22/2018	2

ORNRC: TEA030, 06/20/2018, R02



Route 1 (Proposed Action)
Option 1A (Proposed Action)
Option 1B
Option 1C
Route 2
Route 3
Route 4

Teck

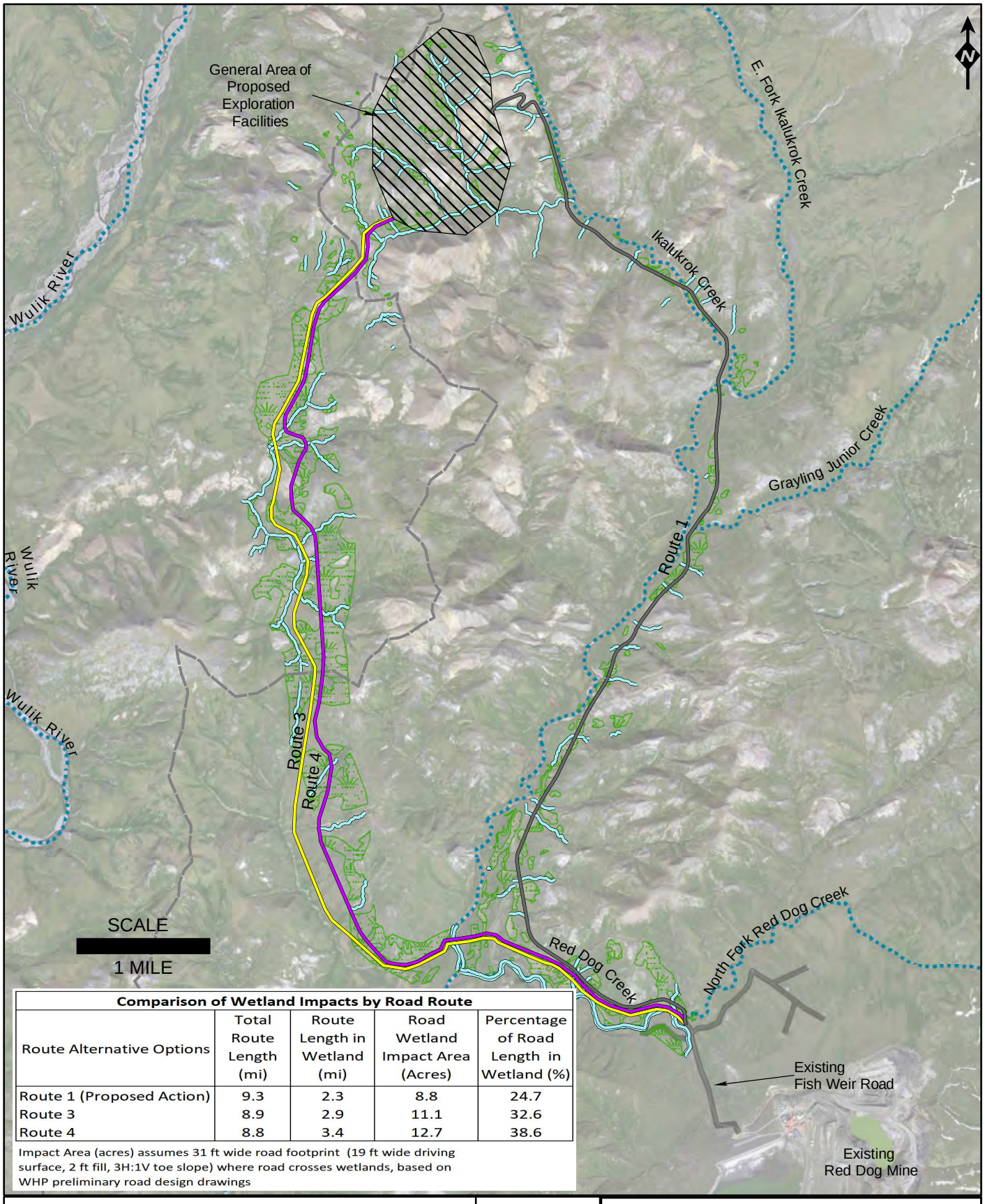
ROUTE ALTERNATIVE OPTIONS CONSIDERED

Environmental Evaluation Document
Anarraaq and Aktigiruq Exploration Program

DATE: **06/22/2018**

FIGURE: **3**

ORNRC: TEA036, 06/22/2018, R04



Comparison of Wetland Impacts by Road Route

Route Alternative Options	Total Route Length (mi)	Route Length in Wetland (mi)	Road Wetland Impact Area (Acres)	Percentage of Road Length in Wetland (%)
Route 1 (Proposed Action)	9.3	2.3	8.8	24.7
Route 3	8.9	2.9	11.1	32.6
Route 4	8.8	3.4	12.7	38.6

Impact Area (acres) assumes 31 ft wide road footprint (19 ft wide driving surface, 2 ft fill, 3H:1V toe slope) where road crosses wetlands, based on WHP preliminary road design drawings

Route 1 (Proposed Action)

Route Alternative Options

Route 3

Route 4

HUC10 Watershed Boundary

USGS Stream

Waters of the U.S.

Other Water

Wetland

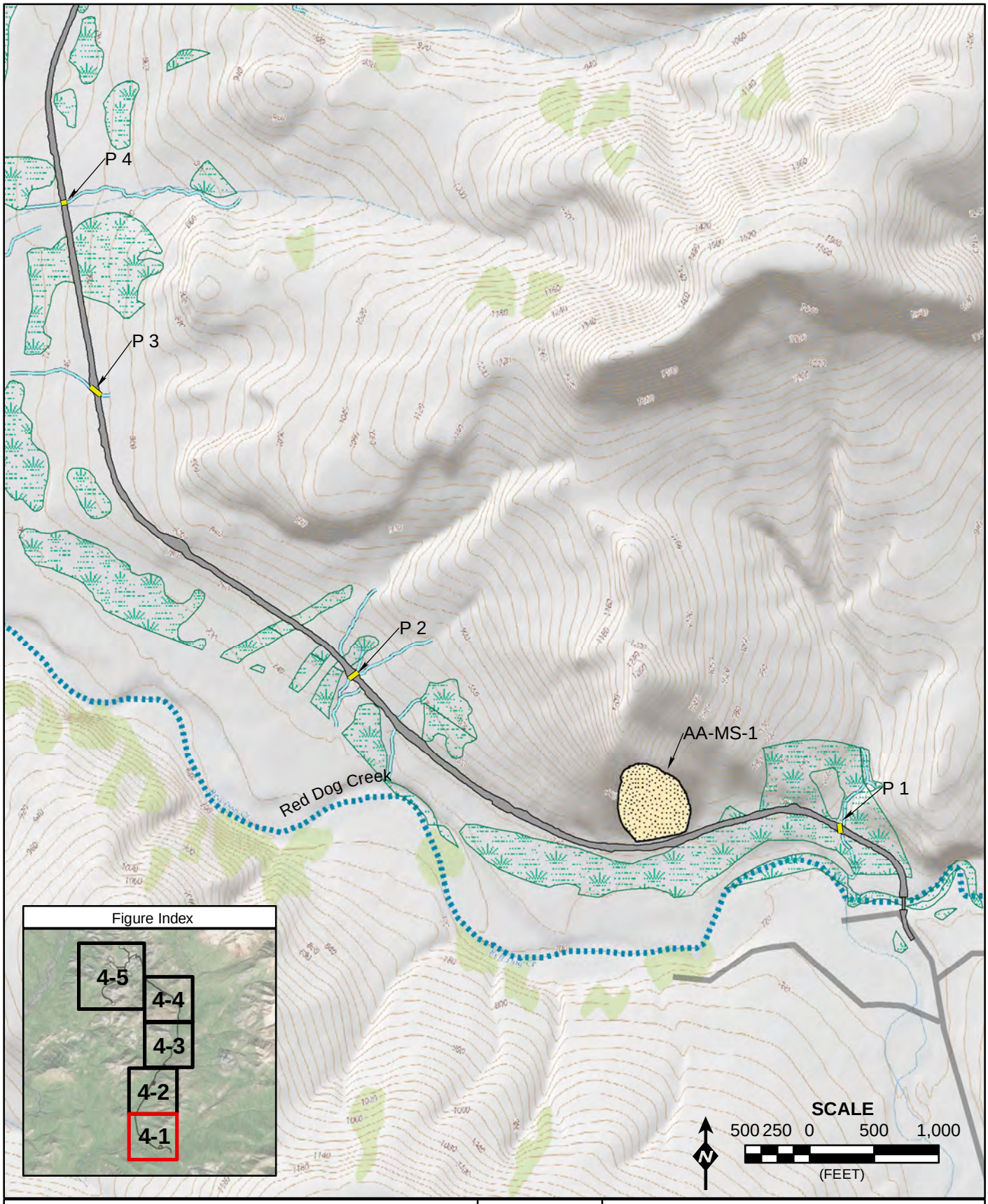
Teck

Comparison of Wetlands Impacts For Road Alternatives

DATE: **07/03/2018**

FIGURE: 4

ORNRC: TEA050, 07/03/2018, R01



Proposed Action

- Access Infrastructure
- Material Site
- Culvert

- USGS Stream

Waters of the U.S.

- Other Water
- Wetland

Teck

PROPOSED ACTION DETAILS

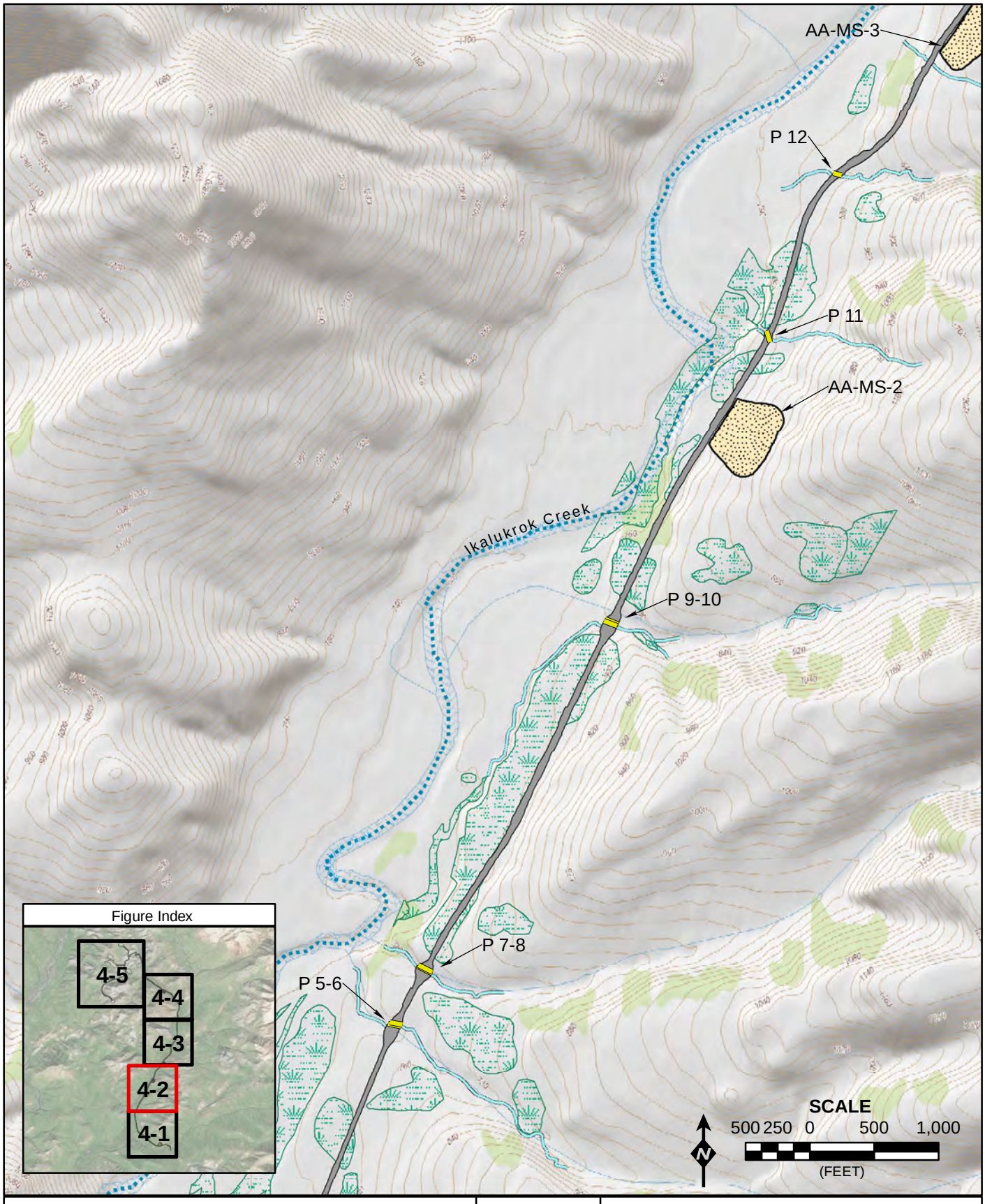
Environmental Evaluation Document

Anarraaq and Aktigiruq Exploration Program

DATE: **06/22/2018**

FIGURE: **5 - 1**

ORNRC: TEA031, 06/22/2018, R02



Proposed Action

- Access Infrastructure
- Material Site
- Culvert
- USGS Stream

Waters of the U.S.

- Other Water
- Wetland

Teck

PROPOSED ACTION DETAILS

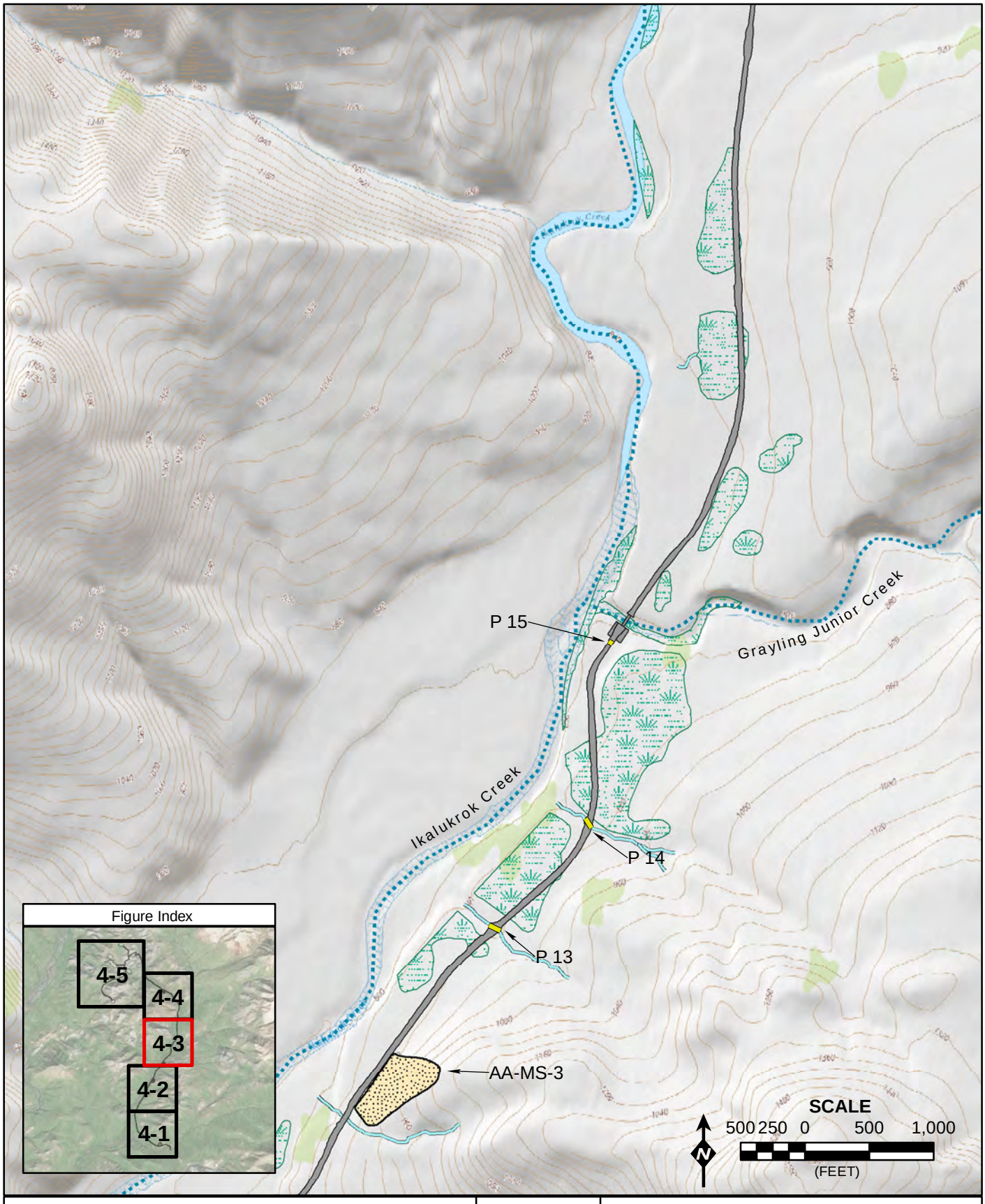
Environmental Evaluation Document

Anarraaq and Aktigiruq Exploration Program

DATE: **06/22/2018**

FIGURE: **5 - 2**

ORNRC: TEA032, 06/21/2018, R02



Proposed Action

- Access Infrastructure
- Material Site
- Culvert

- USGS Stream

Waters of the U.S.

- Other Water
- Wetland

Teck

PROPOSED ACTION DETAILS

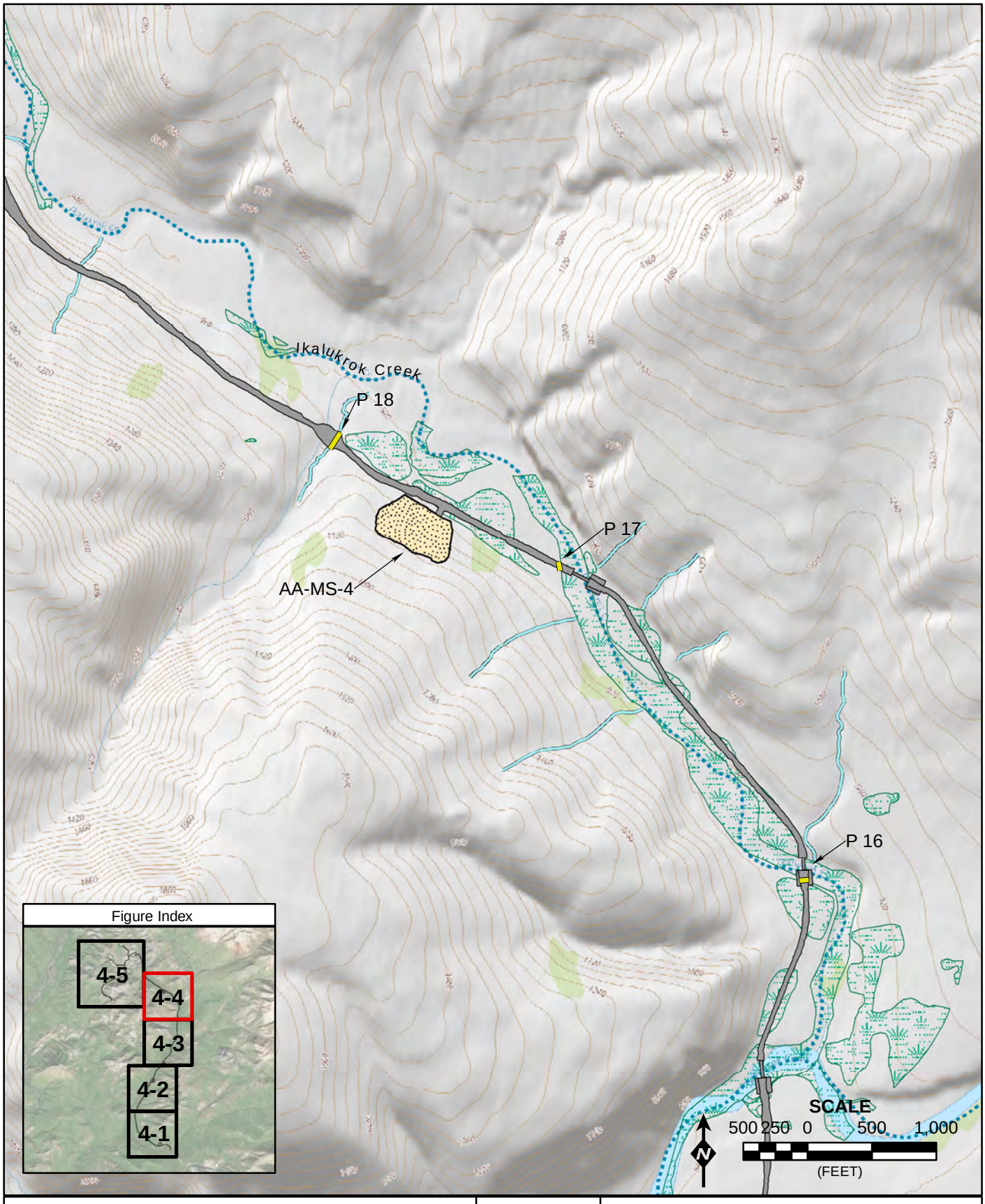
Environmental Evaluation Document

Anarraaq and Aktigiruq Exploration Program

DATE: **06/22/2018**

FIGURE: **5 - 3**

ORNRC: TEA033, 06/21/2018, R04



Proposed Action

- Access Infrastructure
- Material Site
- Culvert

- USGS Stream

Waters of the U.S.

- Other Water
- Wetland

Teck

PROPOSED ACTION DETAILS

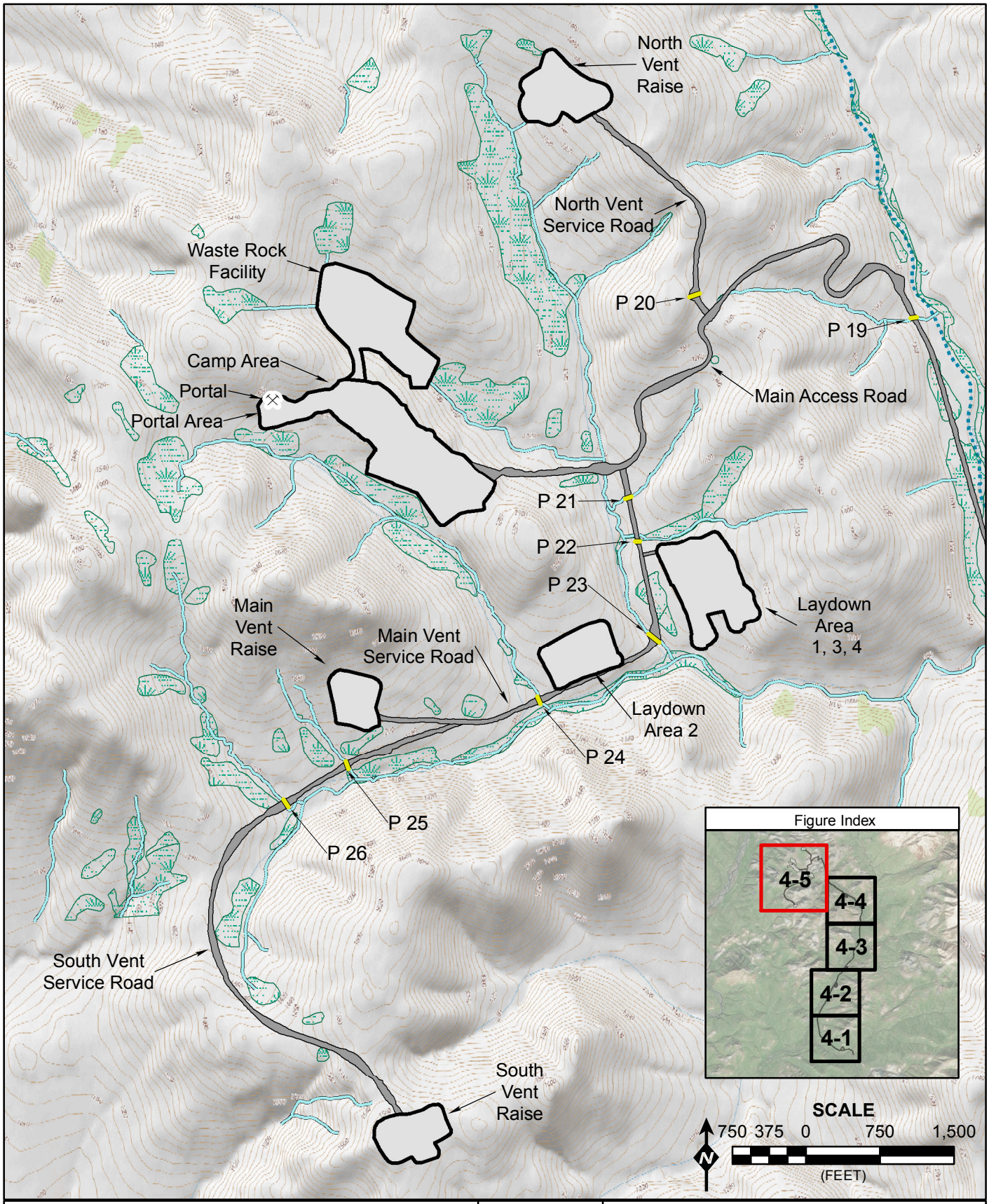
Environmental Evaluation Document

Anarraaq and Aktigiruq Exploration Program

DATE: **06/22/2018**

FIGURE: **5 - 4**

ORNRC: TEA034, 06/21/2018, R03



Proposed Action

- Access Infrastructure
- Facility Area
- Culvert
- USGS Stream

Waters of the U.S.

- Other Water
- Wetland

Teck

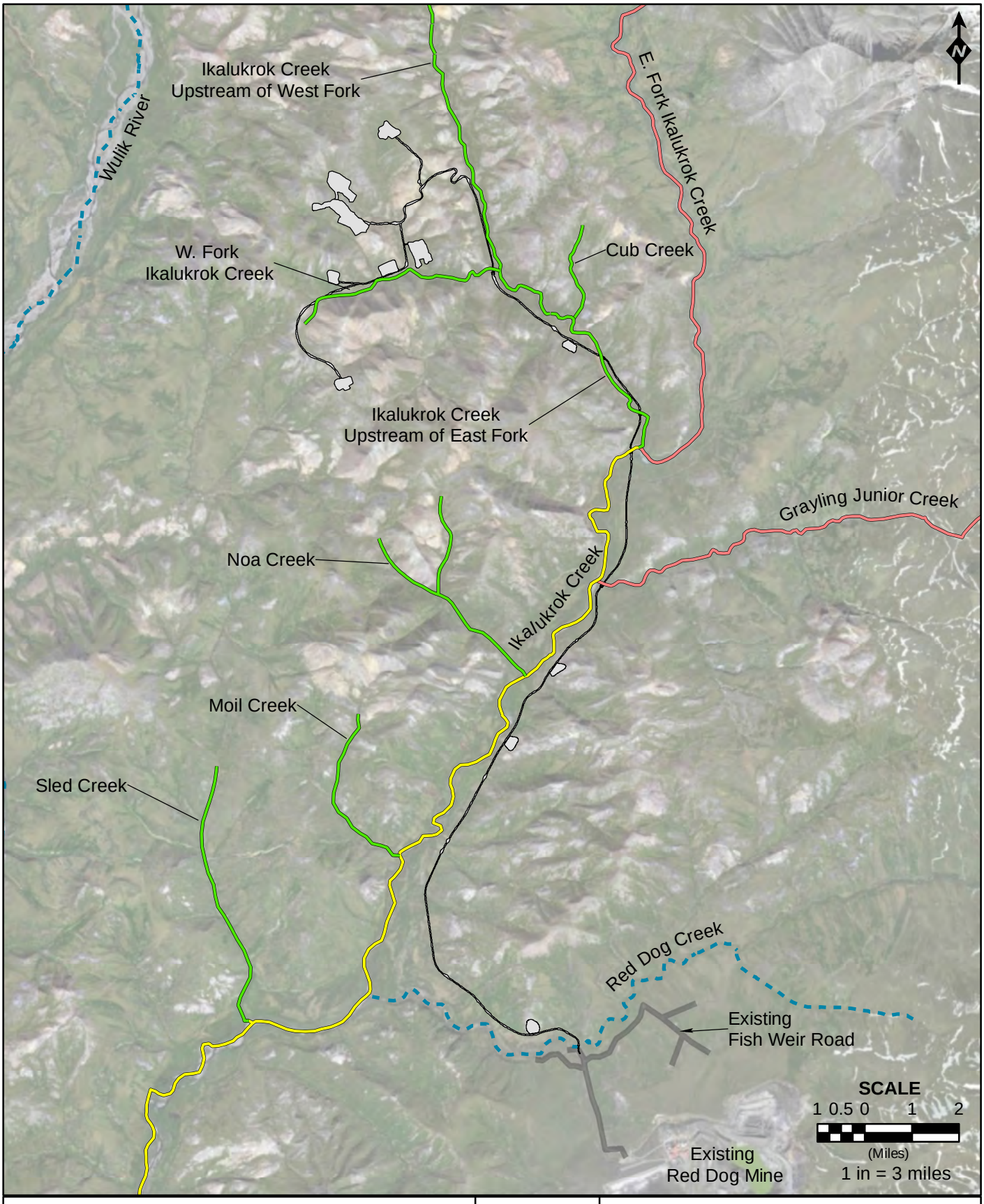
PROPOSED ACTION DETAILS

Environmental Evaluation Document

Anarraaq and Aktigiruq Exploration Program

DATE:	06/22/2018	FIGURE:	5 - 5

ORNRC: TEA035, 08/10/2018, R08



Fish Presence

- None
- DV, AG
- DV, AG, SS

- USGS Stream
- Proposed Project

DV -Dolly Varden
AG -Arctic Grayling
SS -Slimy Sculpin

Teck

AREA FISH PRESENCE

Environmental Evaluation Document
Anarraaq and Aktigiruq Exploration Program

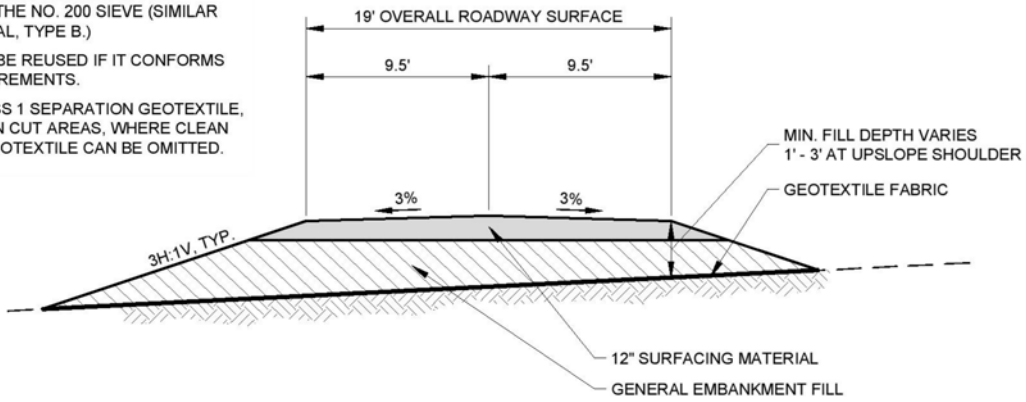
DATE: **07/11/2018**

FIGURE: **6**

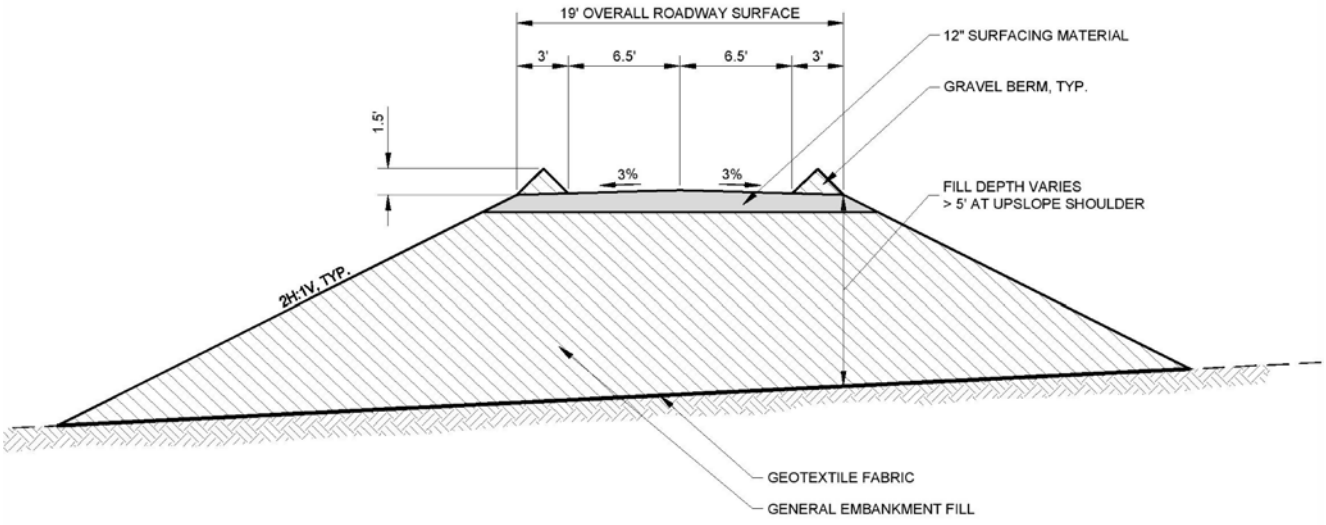
ORNRC: TEA051, 07/11/2018, R00

NOTES:

1. SURFACING MATERIAL TO BE 2" MINUS MATERIAL WITH 0-6% PASSING THE NO. 200 SIEVE (SIMILAR TO ADOT&PF SUBBASE, GRADING B.)
2. GENERAL EMBANKMENT FILL TO BE 12" MINUS PIT RUN MATERIAL WITH 0-10% PASSING THE NO. 200 SIEVE (SIMILAR TO ADOT&PF SELECTED MATERIAL, TYPE B.)
3. EXCAVATED MATERIAL SHOULD BE REUSED IF IT CONFORMS TO THE ABOVE MATERIAL REQUIREMENTS.
4. GEOTEXTILE FABRIC TO BE CLASS 1 SEPARATION GEOTEXTILE, AS DEFINED IN AASHTO M 288. IN CUT AREAS, WHERE CLEAN GRAVELS ARE PRESENT, THE GEOTEXTILE CAN BE OMITTED.



TYPICAL ROAD SECTION
AT FILL SECTION — 1 / B1



TYPICAL ROAD SECTION
AT DEEP FILL SECTION — 1 / B2

SCALE: AS DEPICTED	Teck	**TYPICAL SECTIONS** Environmental Evaluation Document Anarraaq and Aktigiruq Exploration Program DATE: **06/22/2018** FIGURE: **7 - 1**

NOTES:

1. SURFACING MATERIAL TO BE 2" MINUS MATERIAL WITH 0-6% PASSING THE NO. 200 SIEVE (SIMILAR TO ADOT&PF SUBBASE, GRADING B.)
2. GENERAL EMBANKMENT FILL TO BE 12" MINUS PIT RUN MATERIAL WITH 0-10% PASSING THE NO. 200 SIEVE (SIMILAR TO ADOT&PF SELECTED MATERIAL, TYPE B.)
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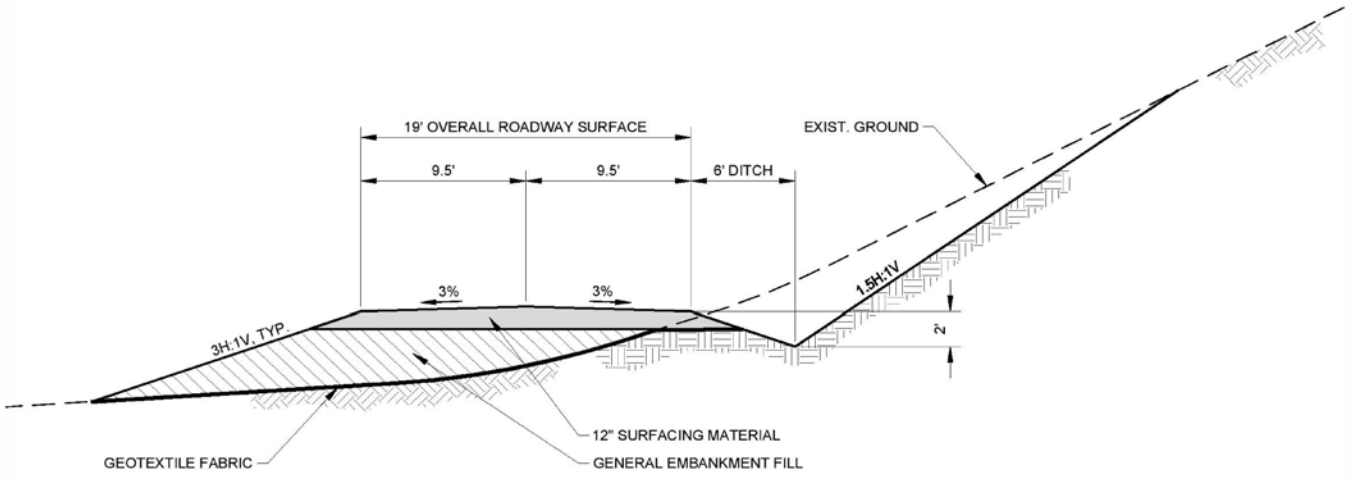
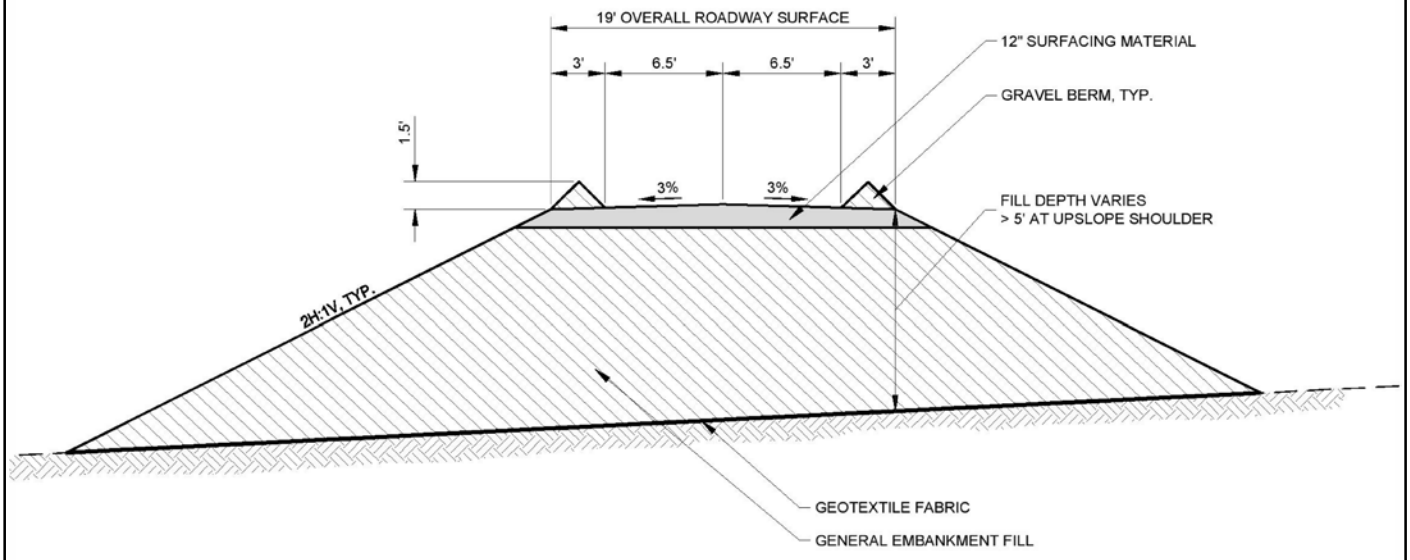
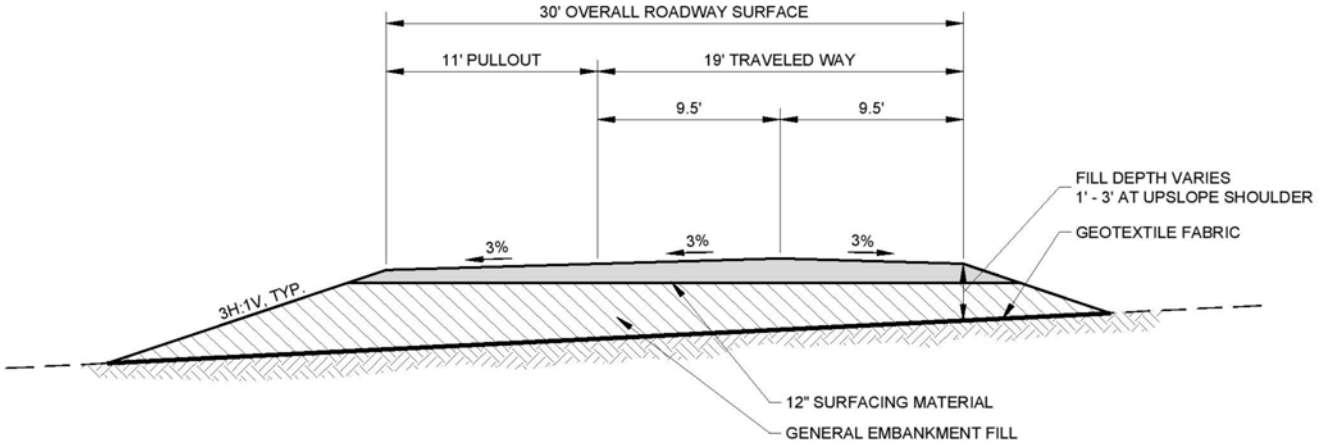


TYPICAL ROAD SECTION
AT CUT AND FILL SECTION — 3 / B1

SCALE: AS DEPICTED	Teck	**TYPICAL SECTIONS** Environmental Evaluation Document Anarraaq and Aktigiruq Exploration Program	
		DATE: **06/22/2018**	FIGURE: **7 - 2**

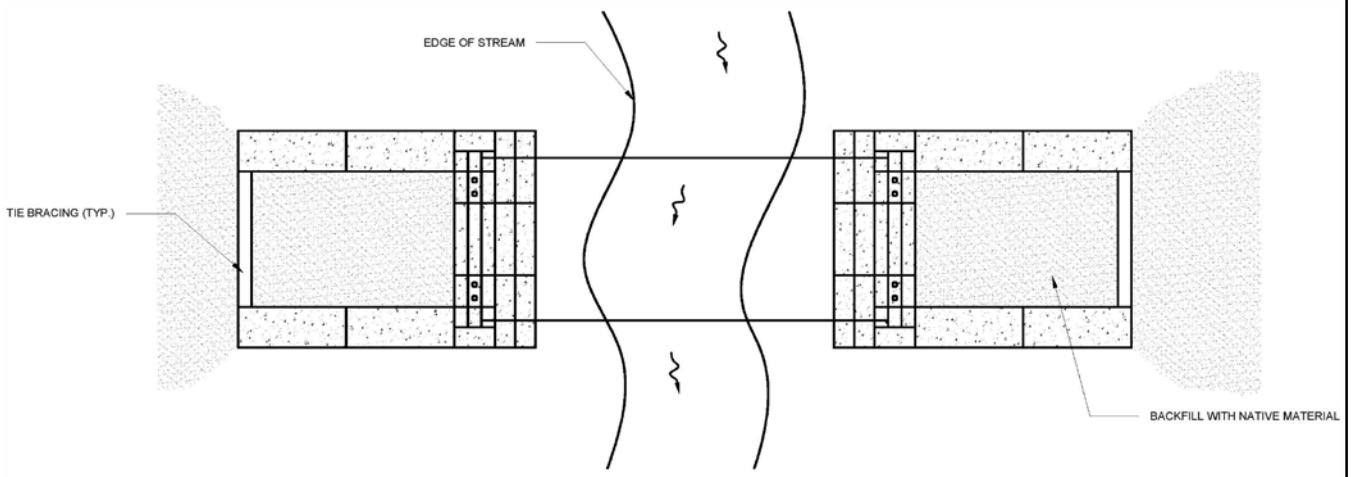


TYPICAL ROAD SECTION
AT DEEP FILL SECTION — 1 / B2

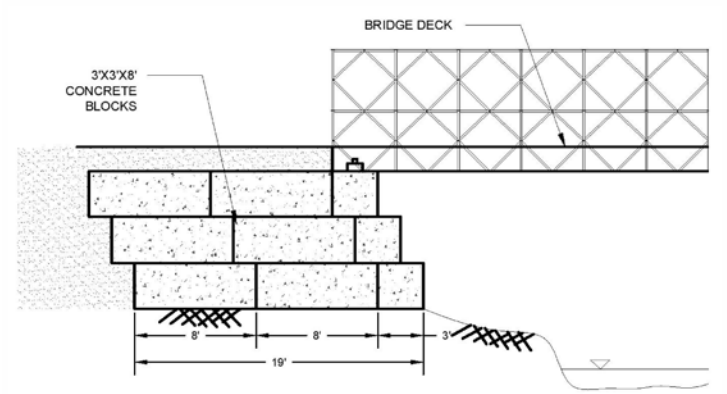


TYPICAL ROAD SECTION
AT PULLOUT SECTION — 2 / B2

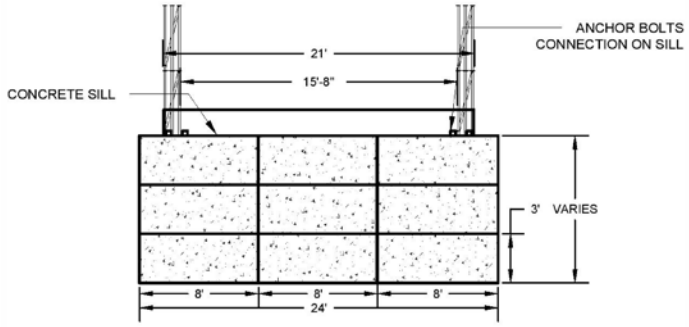
SCALE: AS DEPICTED	Teck	**TYPICAL SECTIONS** Environmental Evaluation Document Anarraaq and Aktigiruq Exploration Program DATE: **06/22/2018** FIGURE: **7-3**



PLAN VIEW
NTS



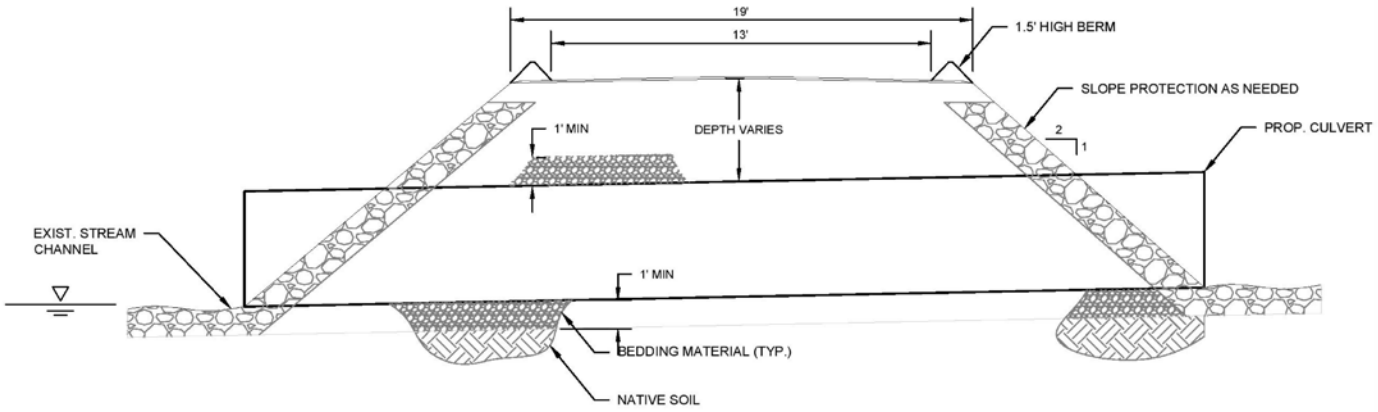
STREAM PROFILE
NTS



CROSS SECTION
NTS

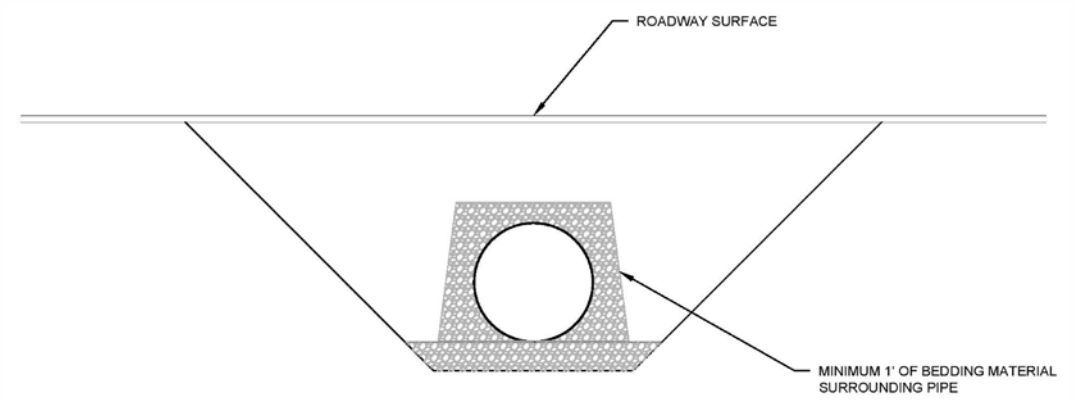
SCALE: AS DEPICTED	Teck	**TYPICAL SECTIONS** Environmental Evaluation Document Anarraaq and Aktigiruq Exploration Program
		DATE: **06/22/2018** FIGURE: **7 - 4**

ORNRC: TEA040, 06/22/2018, R00



STREAM PROFILE

NTS



CROSS SECTION

NTS

SCALE: AS DEPICTED	Teck	**TYPICAL SECTIONS** Environmental Evaluation Document Anarraaq and Aktigiruq Exploration Program	
		DATE: **06/22/2018**	FIGURE: **7 - 5**