US Army Corps of Engineers
Alaska District

Environmental Assessment and Draft Finding of No Significant Impact

Moose Creek Dam Modification Study
Chena River Lakes Flood Control Project
North Pole, Alaska

September 2018

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers, Alaska District (USACE) has assessed the environmental effects of the following action:

Moose Creek Dam Modification Study
Chena River Lakes Flood Control Project,
North Pole, Alaska

The Alaska District would construct a barrier wall in the dam embankment at the Chena River Lakes Flood Control Project, near North Pole, Alaska. The low point drain would be connected to the barrier wall by sheetpile and a small amount of concrete. The construction of the barrier wall would require gravel extraction from two sources within the flood control project and directly impact 3.4 acres of mixed vegetation, as well as addition area for staging and stockpiling. The gravel pits will be closed in an ecologically beneficial manner, including the following features:

- Shallow littoral zone at least 20 feet wide
- Irregular shoreline
- Two to four inches of organic material placed in the littoral zone to promote re-vegetation
- A 25 foot buffer of native vegetation to help filter sediments and pollutants before they enter the water

This action has been evaluated for its effects on environmental resources, including fish and wildlife, vegetation, wetlands, threatened or endangered species, marine resources, and cultural resources.

This USACE action complies with the National Historic Preservation Act, the Endangered Species Act, the Clean Water Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the National Environmental Policy Act. The completed environmental assessment supports the conclusion that the action does not constitute a major Federal action significantly affecting the quality of the human and natural environment. An environmental impact statement is therefore not necessary for the Alaska District's proposed alterations to the USACE project at the Chena River Lakes Flood Control Project.

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Phillip J. Borders Date
Colonel, U.S. Army
Commanding

Moose Creek Dam Modification Study
Chena River Lakes Flood Control Project
North Pole, Alaska

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Table of Acronyms

USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
TRG	Tolerable Risk Guidelines
NAVD88	North American Vertical Datum of 1988
DSOG	Dam Safety Oversight Group
cfs	Cubic feet per second
OMBIL	Operations Maintenance Business Information Link
IRRM	Interim Risk Reduction Measures
ECRA	Existing Condition Risk Assessment
PAR	Population at Risk
CFR	Code of Federal Regulation
CEQ	Council on Environmental Quality
ER	Engineer Regulation
FEMA	Federal Emergency Management Agency
USFWS	United States Fish and Wildlife Service
ADF&GA	Alaska Department of Fish and Game
EPA	Environmental Protection Agency
NAAQS	National Ambient Air Quality Standards
FNSB	Fairbanks North Star Borough
$PM_{2.5}$	Particulate Matter smaller than 2.5 microns
NWI	National Wetlands Inventory
YoY	Young of Year
CWA	Clean Water Act
MBTA	Migratory Bird Treaty Act
EGM	Economic Guidance Memorandum
JLUS	Joint Land Use Study

1.0 PURPOSE AND NEED

1.1 Proposed Action

The Chena River Lakes Flood Control Project, commonly referred to as “Moose Creek Dam”, is located southeast of the City of North Pole, Alaska, approximately 15 miles east-southeast of the City of Fairbanks, Alaska. The dam is located at approximately 40 river miles upstream of the Chena’s confluence with the Tanana River. Figure 1 shows the existing project vicinity and location. The Alaska District proposes to construct a barrier wall within the dam embankment to increase the path of seepage. This wall would prevent groundwater from coming to the surface in the immediate area below the dam and creating erosive features that jeopardize the integrity of the dam.

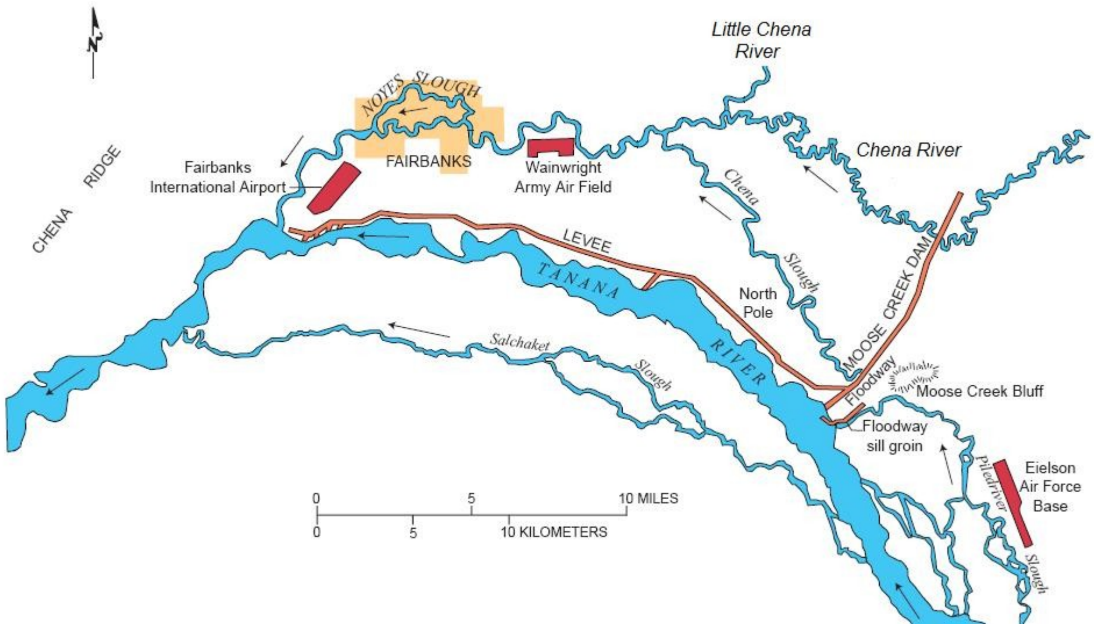

Figure 1 Overview of the Chena River Lakes Flood Control Project (modified from USGS Report WRI 00-4227)

1.1.1 Project Purpose

The purpose of the Moose Creek Dam Safety Modification is to reduce the risk of dam failure to human life, property, and the environment associated with geotechnical conditions to below the USACE Tolerable Risk Guidelines (TRG).

1.1.2 Project Need

The Alaska District proposes to modify structures at the existing Chena River Lakes Flood Control Project to reduce dam failure risk associated with geotechnical conditions that pose unacceptable risks to human life, property, and the environment in exceedance of USACE Tolerable Risk Guidelines (TRG).

The Moose Creek Dam Safety Modification Report (USACE 2018) describes the following three potential failure modes that create the need for the proposed action:

- Backward erosion and piping of a continuous fine sand or silty sand layer with vertical exit at the toe of the downstream stability berm
- Backward erosion and piping of a continuous fine sand or silty sand layer with horizontal exit in the South Seepage Collection Channel
- Contact erosion of a continuous fine sand or silty sand layer through open work gravels with horizontal exit in the South Seepage Collection Channel

The District proposes to begin construction no earlier than 2020. The proposed action is intended to present a permanent remedy to the identified failure modes.

1.2 Project Features

The primary purpose of the existing Chena Lakes River Flood Control Project is to provide flood risk reduction and flood damage reduction for the downstream areas; including the City of Fairbanks, North Pole, Fort Wainwright cantonment area, and unincorporated areas in the vicinity. Much of the greater Fairbanks area is in the floodplains of the Chena and Tanana rivers.

Moose Creek Dam is a 7.5-mile long dam located in North Pole, Alaska. The dam consists of an earth-filled embankment and a concrete control works with four gated bays to regulate flow on the Chena River. In non-operational mode, the dam is dry and the Chena flows unregulated through the control structure. During operation, gates are lowered to reduce flow through the control works, pooling water upstream of the dam. When the pool reaches an elevation of 507.1 feet North American Vertical Datum of 1988 (NAVD88), excess waters flow south into the Tanana River. Diverting water reduces flood risks to the cities of Fairbanks and North Pole and adjacent downstream areas.

Figure 2 is a project features illustration sheet that shows an aerial view of the Chena River Lakes Flood Control Project. All elevations stated in this document are referenced to the North America Vertical Datum of 1988, NAVD88. Major features are labeled. Their roles in flood control are described as follows:

1.2.1 Moose Creek Dam-Main Embankment

The main embankment is a 7.5-mile long zoned earthen fill structure that reaches a maximum height of 50 feet above the Chena River streambed. The northern end of the dam abuts an unnamed ridge a natural rock nose of schistose bedrock that was stripped of overburden and weathered rock during construction. The southern end terminates at the Tanana River. The southernmost 4,500 feet of the dam beyond the Tanana River Levee is referred to as the “Dam Extension” and directs floodwaters from the floodway directly into the Tanana River instead of allowing the flows to travel along the Tanana River Levee.

1.2.2 Moose Creek Dam-Outlet Control Structure

Commonly referred to as the "Control Works", the outlet control structure has four 25-foot-wide concrete bays divided by piers. Each bay is designed to pass a maximum of 3,000 cubic feet per second with additional flows through associated fishways and the fish ladder. Flow through the structure is regulated by four hydraulically-operated vertical steel sliding gates.

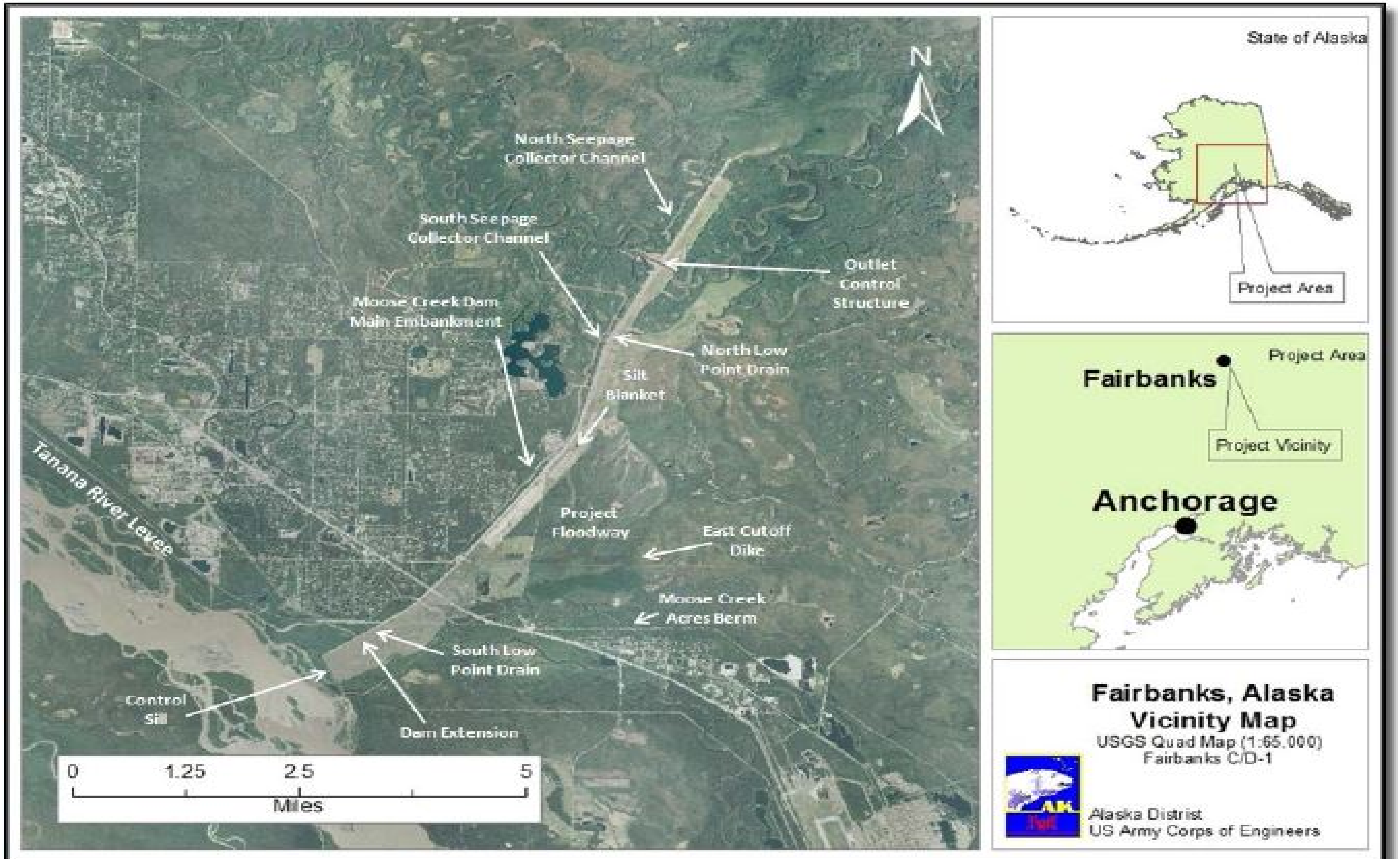

Figure 2 Aerial view of the Chena River Lakes Flood Control Project

1.2.3 Project Floodway

The Floodway is an excavated and cleared channel approximately 6.5 miles in length with a maximum width of 2,400 feet. The floodway has a maximum outflow of 160,000 cubic feet per second (cfs), limited by a constriction at the Richardson Highway Bridge. There is a control sill at the southern terminus of the floodway that prevents the Tanana River from flowing up into the floodway during Tanana River flood events. The sill height is 507.1 feet NAVD88. When the reservoir elevation exceeds the sill height, flood waters spill into the Tanana River. Figure 3 shows the southern end of the floodway and its juncture with the Tanana River.

Figure 3 Southern end of the cleared floodway and Tanana River.

1.2.4 East Cutoff Dike

The East Cutoff Dike is a 7,600-foot-long saddle dam that prevents impounded flood waters below an elevation of 524.1 NAVD88 from flowing into the Moose Creek drainage.

1.2.5 Low Point Drains

The embankment has two low point drains which are used to remove trapped, stagnant water from the floodway after floodwaters recede. The north or "main" low point drain is located near the mid-point of the embankment and is a concrete structure with four gates. The south low point drain is a gated corrugated metal pipe culvert that passes through the dam extension and into the Tanana River.

1.2.6 Seepage Collector Channels

Seepage collection channels on the north and south side of the Chena River collect seepage and outflow from relief wells on the downstream side of the dam and convey water back to the Chena River.

1.2.7 Moose Creek Acres Berm

The Moose Creek Acres Berm is a small levee that protects the neighborhood of Moose Creek Acres from inundation during high water events on Moose Creek related to high flows on the Tanana River.

1.2.8 Tanana River Levee

The Tanana River Levee is not part of the Corps' Chena River Lakes Flood Control Project, but is maintained by the Fairbanks North Star Borough as part of the Borough's flood risk management program. The Tanana River Levee runs along the Tanana River from Moose Creek Dam 22 miles downstream to the Tanana's confluence with the Chena River. It protects the greater Fairbanks area from high water on the Tanana River.

Remote meteorological and gaging stations arrayed across the 2,115-square-mile Chena River drainage provide information about rainfall, temperature, snow depth, and stream flows in tributaries to help project operators predict severity and duration of floods.

1.3 Current Operations

The control works structure on the Chena River is actively operated during flood events. Normal Chena River flows are less than 2,000 cubic feet per second (cfs), and the project typically is not operated for flood control until necessary to keep discharge in Fairbanks to less than 12,000 cfs. Chena River water is not retained by the project during normal flows; the dam control gates are open and the river flows downstream unimpeded.

During flood events, when river discharge in Fairbanks exceeds or is expected to exceed about 12,000 cfs, dam control gates are partially closed to control discharge of floodwaters. The gates at the outlet control structure are manipulated to ensure discharge from the Chena River, or other sources from below the dam, through downtown Fairbanks does not exceed 12,000 cfs. Minimum discharge of 1,000 cfs is maintained whenever control gates are lowered to ensure that fish and their habitat downstream from the dam have sufficient water.

Total damages prevented since the project became operational in 1981 are $397.6 million. Total project costs thru the end of Fiscal Year 2017 are $294 million. Including the 2016 operations, the Chena River Lakes Flood Control Project has regulated flows on the Chena River 25 times since becoming operational in 1981.

The project is also authorized for recreation and environmental stewardship, providing benefits for visitors pursuing water related activities including boating, hiking, hunting, fishing, swimming and picnicking. Using annual project visitation data obtained from the Corps' Operation and Maintenance Business Information Link (OMBIL) the average annual visitation during 2012 was approximately 171,000 visits, totaling 181,000 annual visitor days. Applying the Unit Day Value methodology (EGM15-03), the benefit annually from recreation visitation is estimated to be $1.6 Million. Similar recreation benefits are expected in the future.

The Chena River channel bottom at Moose Creek Dam is about 485 feet NAVD88. At average summer flows the water surface elevation of the river at the dam is 490 to 495 feet NAVD88. At elevations of 500 to 501 feet NAVD88, the Chena River begins to overflow its banks and into the floodway. Floodwaters pool in the floodway until they rise above 507.1 feet NAVD88, after which the water flows over the control sill into the Tanana River. The highest pool recorded in 39 years of Chena River Lakes Flood Control Project operation was in May and June 1992, when Chena River water surface elevations rose to 512.7 feet NAVD88; which was the height of the control sill at that time. The control sill was lowered to 507.1 feet NAVD88 in 2009 during the implementation of the interim risk reduction measures (IRRM) plan. This has been only event high enough to overflow the floodway sill.

1.4 Issues and Dam Safety Concerns

Principal issues associated with floodwater retention and operation of the Moose Creek Dam control structure are public safety in the inundation area downstream of the dam, potential for flooding downstream property structures, and effects on migratory fish passage. The safety of people who are protected by the Chena River Lakes Flood Control Project and who could be at risk by failure of any project component are the greatest concern. Their safety is the principal driving force leading to this action and to the decisions that will be made. Issues and concerns can be defined and categorized as follows:

1.4.1 Dam Safety

Moose Creek Dam and the smaller and lower East Cutoff Dike were constructed primarily of silty gravel and gravel. The Moose Creek Dam was constructed on soils that are primarily sands and gravels. The East Cutoff Dike was constructed on frozen silts and organic silts that are likely underlain with sands and gravels.

Water can migrate beneath both the dam and the East Cutoff Dike when floodwater is retained in the floodway. Water moving beneath both structures can weaken them and can lead to failure. Water beneath the dam or dike also raises groundwater down-gradient from them and may cause flooding in those down-gradient areas.

Current risk reduction considerations call for retained floodwaters to be discharged as soon as possible and to be kept at minimum pool elevations behind dams of this type. Other measures are employed in construction and operation to minimize water movement through dams. Upstream silt blankets and relief wells have been installed at the Chena River Lakes Flood Control Project to prevent water movement from causing damage to the structures and their foundations.

Vegetation control is important to prevent water from piping beneath dams, to ensure unimpeded discharge of flood waters into drainage channels, and to assist in performing effective inspection during flood events.

1.4.2 Flooding and Loss of Property

Flood risk management benefits (damages prevented) accruing from when the project began operation in 1981 through fiscal year 2017 are estimated at over $397 million. It is expected the dam will continue to provide a similar amount of annual flood risk management benefits. The flood risk management benefits are realized in the communities of North Pole, Fairbanks to its confluence with the Tanana River.

Additional justification is provided from the existing condition risk assessment (ECRA) when considering the estimated total population at risk (PAR) given a breach at maximum pool levels of approximately 85,000 people and the associated direct economic damages of over $6 Billion resulting from a failure.

2.0 ALTERNATIVES

2.1 Range of Alternatives

Based on the needs described in Section 1, the purpose of the study is to identify the best method of reducing the risk of potential dam failure due to geotechnical conditions. 40 CFR 1500-1508 requires that environmental assessment evaluate a full-range of reasonable alternatives based on the stated project purpose and need, including a no-action alternative.

Section 1 also identified issues and concerns related to resources in the study area. Potential for impacts to those resources, and measures to offset those impacts, are evaluated for each alternative considered in detail. The single most important objective is to protect the safety of people in the area influenced by the Chena River Lakes Flood Control Project.

The following objectives and constraints for protection of resources were identified in addition to that central objective:

- Alternatives will not adversely impact anadromous fish runs after applicable mitigation is considered
- Risks will not be transferred from one segment of the population to another
- Protect habitat identified as important to fish and wildlife
- Protect cultural resources
- Aggregate Risks will not be increased over the period of analysis
- Minimize damage to property and economic activities
- Minimize effects to water quality

There also are resource protection laws and regulations that must be considered in planning. They include the Clean Water Act, the Migratory Bird Treaty Act, and many others. Any action taken would be implemented to ensure compliance with those statutes.

Based on the project purpose and need, the following alternatives are evaluated in this environmental assessment:

- No-Action alternative
- No-Action alternative with dam failure
- Mix-in-Place barrier wall (preferred alternative)

The entire suite of structural and non-structural measures considered in plan formulation are described in the Moose Creek Dam Safety Modification Report (USACE 2018). These measures were eliminated from consideration in this document for concerns over lack of effectiveness, efficiency, implementability, acceptability, and/or unacceptable negative impacts to the environment or community.

2.2 Alternatives

2.2.1 No Action Alternative

Section 1502.14(d) of the President's Council on Environmental Quality (CEQ) NEPA Regulations requires an analysis of the no action alternative, as does the U.S. Army Corps of Engineers' Engineer Regulation (ER) 1105-2-100 and ER 200-2-2. Under the no action alternative for a proposed action where ongoing operations and activities initiated under existing legislation and regulations are expected to continue, "no action" is interpreted as "no change" from current operations or level of intensity. The "no action" alternative is therefore the continuation of the present course of action. Consequently, projected impacts of alternative operations or conditions are to be compared to those impacts projected for existing operations. The No Action alternative leaves the Chena River Lakes Flood Control Project in its existing condition and operational parameters. The probability of dam failure due to backward erosion, piping, and contact erosion of continuous fine or silty sand layers in the levee and foundation persists at current levels.

Areas downstream of the dam will see significant development generally characterized as "rural residential". Roads in this area can be expected to be substandard with ingress and egress compromised during saturated conditions, hindering evacuation efforts. The population will be reticent to evacuate on a voluntary basis. A mandatory evacuation lacks an efficient trigger mechanism and the Borough is unlikely to have an evacuation plan in place.

The level of risk associated with a failure at Moose Creek Dam will be sustained or increase with the selection of the No Action alternative.

The No Action Alternative presents two potential future conditions absent Federal action. The purpose for the proposed project is to reduce risk of dam failure due to geotechnical conditions that would exist regardless of the project's construction, so it is appropriate to document the environmental impacts of dam failure due to inaction on the behalf of the Government.

A dam breach at maximum high pool would inundate a large portion of the area including the City of North Pole, Fort Wainwright, and the majority of the City of Fairbanks. All critical facilities in the downstream area are subject to at least some level of inundation including schools, hospitals, airports, and power generation facilities. Inundation depths could be as high as 18 feet in some low-lying areas, with average depths in population centers as high as nine feet depending on breach scenario. Flood waters could reach North Pole in as little as two hours and Fairbanks in as little as 14 hours.

2.2.3 Preferred Alternative

The Mix-In-Place Barrier Wall has been tentatively selected by the Alaska District as the method of reducing dam failure associated with geotechnical conditions. It would consist of a mix-in-place partial barrier wall in Reaches 4, 5, 6, 8 and 9. This system uses in-situ soils, water, and a cement mix to construct a barrier that would effectively impede the development of pipes and increase the seepage path. As with other barrier wall measures, this measure is expected to experience some amount of cracking over time, but should remain effective even with minor cracking. The barrier wall would be located on the crest of the dam slightly upstream of the centerline where it would extend through the semi-pervious core, penetrating the Types II and III fill, extend into virgin material, and avoid penetrating the select gravel drain.

In general, a mix-in-place barrier wall is expected to reduce the likelihood of failure by 1.5 orders of magnitude, cost $133million, be highly acceptable and implementable, and have minimal environmental impacts.

The preferred alternative would not require the clearing of any vegetation for the construction of the wall; however, land clearing may be required for the disposal of spoils material and gravel mining (Figure 5).

The barrier wall would be connected to the low point drain by sheetpile and a small amount of concrete in order to create a continuous barrier and prevent the formation of pipes. The sheetpile would be driven using a vibratory or impact hammer.

Three additional temporary access ramps would be constructed to enable construction access to the crest of the dam. Material for these ramps would be procured locally; quarries excavated downstream of the dam on lands owned by the Alaska District. Barrier wall construction would generate spoils by displacing the in-situ materials.

The project is anticipated to produce about 61,441 cubic yards of Portland cement/bentonite mixed spoils, which would be disposed in the Fairbanks North Star Borough landfill. Gravel mining would require the removal of overburden consisting primarily of organic material, silt, and soil in order to access the gravel. The suitable overburden would be stockpiled for reclamation and unusable material would be placed in the disposal area upstream of the dam. The proposed borrow sites and disposal area are shown in relation to the barrier wall and existing site conditions in figure 5.

A 188 acre location has been identified for the disposal of overburden cleared from the quarries, upstream of the embankment and about 7,500 feet directly south of the project office. This area covers about 188 acres, including 18.9 acres of wetlands. The total volume of material to be disposed in this area is about 16,425 cubic yards, which would cover an area of about two acres when piled to a height of five feet above base elevation. The South Disposal area is adjacent to existing roads and has been partially cleared in the past. Paper birch is the dominant species in the uplands of the north facing slope and quaking aspen dominates the low-lying uplands at the base of the hill to the cleared power line right-of-way bisecting the site. The areas north of the right-of-way are mixed; anthropogenic disturbance, shrubs such as resin birch and green alder, and spruce-birch forest.

The North Borrow Site is an area covering 109 acres, adjacent to the North Seepage Collector Channel. An area of 0.4 acres would be cleared and excavated to a maximum depth of 35 feet below ground surface. Additional area for staging may be developed as well. This area is bisected by an old trail leading to the pond and contains some old burn areas, as well as a cleared area managed for moose browse and grouse cover. The entire area is uplands; primarily mature stands of white spruce, paper birch, and balsam poplar.

The South Borrow site is located adjacent to the Chena Lakes, about 7,500 feet north of the project office. This area covers about 78 acres, including 11.1 acres of wetlands and abuts existing roads. A three acre site would be excavated to a maximum depth of 35 feet below ground surface. Additional area may be cleared for staging and material stockpile. The plant communities are variable in this area; mature paper birch and white spruce dominate much of the upland areas, grading into shrubs like green alder and resin birch before transforming into grasses in the palustrine emergent wetlands.

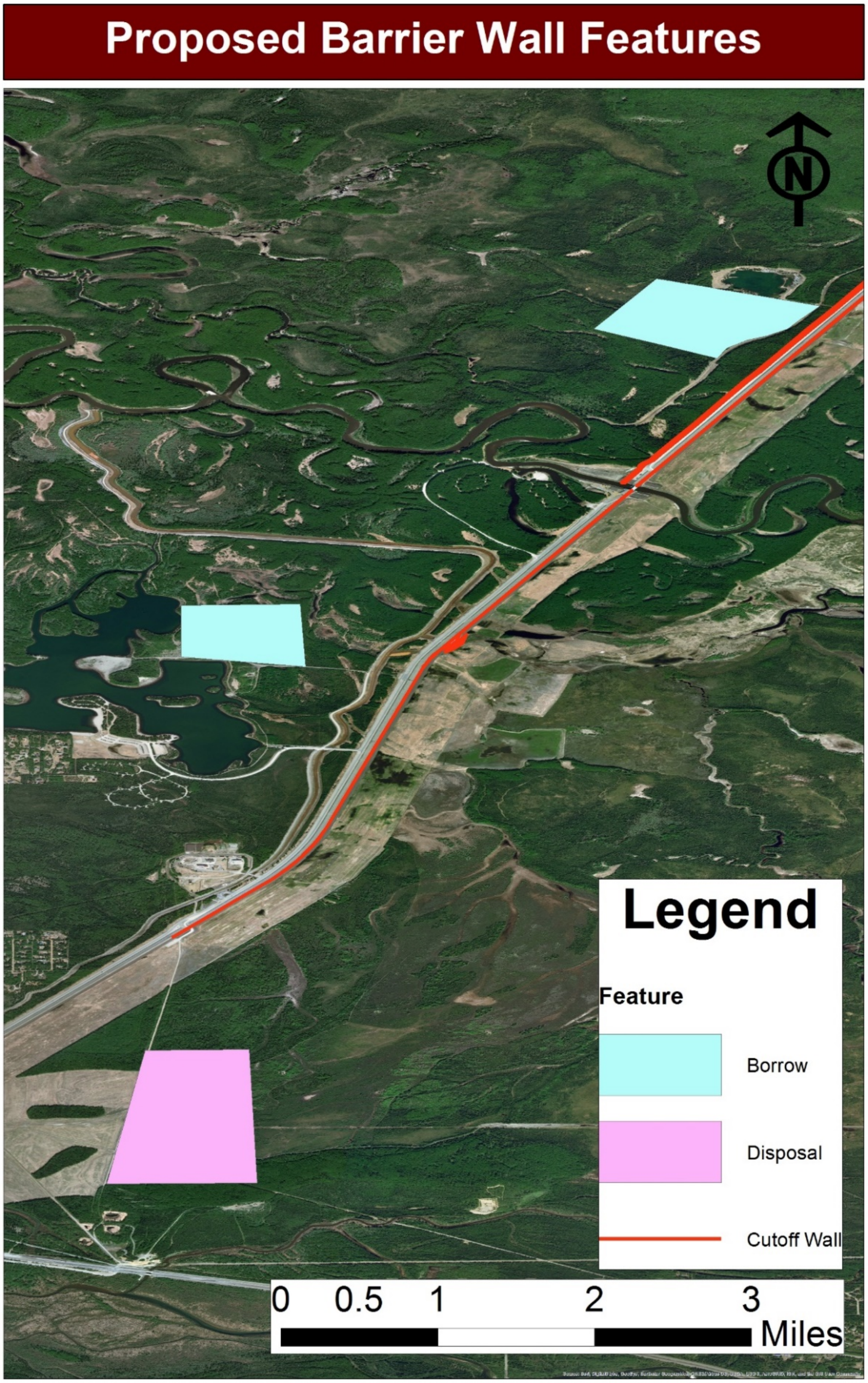

Figure 4 Barrier Wall Project Features

3.0 AFFECTED ENVIRONMENT

This section succinctly describes the existing environmental resources of the areas that would be affected in the Chena River Lakes Flood Control project area if any of the alternatives were implemented. The affected environment section, in conjunction with the description of the No Action Alternative, forms the baseline conditions for determining potential environmental impacts of the proposed action and reasonable alternatives. Further, the existing condition captures the risk associated with the Chena River Lakes Flood Control Project as it stands today. The risk also takes into account that if a failure was to occur as it stands today that local and Federal government would intervene and begin flood fighting.

3.1 The Project Area

The Chena River Lakes Flood Control Project is in central interior Alaska at approximately 64.7°N, 147.3°W near the community of North Pole (population 2,117), and a short distance from Fairbanks (the second largest city in Alaska, population 32,324). The project also is near Eielson Air Force Base (population 5,400) and Fort Wainwright (population 6,968).

Figure 1 shows the location of the Chena River Lake Project and those communities.

The project is less than 150 miles south of the Arctic Circle. Climate is typical of interior locations in the far north. Average January temperatures range from -19 to -2 °F; average July temperatures range from 49 to 71 °F. Extreme temperatures range from as low as -60 °F to almost 100 °F. Annual precipitation is 11.5 inches, with 67.8 inches of snowfall. Heaviest precipitation generally is in August and September.

The Chena River Lakes Flood Control Project is situated on the historical Chena River floodplain, within the central Tanana valley. The elevation slowly increases from about 500 feet NAVD88 at the Chena River bank to about 533 feet NAVD88 near the perimeter of the floodplain. The floodplain is interspersed with patches of wetlands, streams, ponds, and lakes. The north end of the dam terminates at the base of a fairly steep hill with a peak elevation of about 1040 feet NAVD88. The southern end of the project is bounded by the Tanana River; a broad, silty, braided river. Bedrock is estimated to be more than 600 feet below Moose Creek Dam in some areas, decreasing in depth until it reaches the surface at the north abutment. Discontinuous permafrost often forms hydrologically impermeable barriers in the far north, but groundwater moves readily through thawed gravelly strata that dominates the conditions found beneath Moose Creek Dam.

3.2 Resources of Concern

Section 3 provides information about the Chena and Tanana rivers, their floodplains, and their biological and cultural resources that might be affected by alternatives identified in Section 2. It also provides information to illustrate the need for action.

Principal resources of concern are as follows:

- Noise
- Hydrology
- Geology
- Soils
- Land use (including recreation)
- Socioeconomics
- Hazardous, Toxic, and Radioactive Waste
- Endangered species
- Air Quality
- Water quality
- Floodplain
- Vegetation
- Wetlands
- Fish
- Mammals
- Birds
- Historic and other cultural resources

3.2.1 Noise

Due to the relatively low level of development in the vicinity of the Dam, ambient noise levels are predicted to be fairly low. There are no significant noise producing activities within one kilometer of any component of the proposed action; however, there are three small airstrips and the Richardson Highway within 6.2 miles of the outlet control structure. The Moose Creek Dam embankment is over four miles from the maximum extent of Eielson Air Force Base noise contours exceeding 65 dB, the lowest level of emanation measured by the Fairbanks North Star Borough Community Planning Department's Joint Land Use Study (JLUS). Fort Wainwright's Ladd Army Airfield 65 dB noise contour ends over nine miles from the dam.

3.2.2 Hydrology

The Chena River drains a total of 2,115 square miles, 1,496 of which are upstream of the Moose Creek Dam. Most of the rest of the drainage flows into the Little Chena River, which joins the Chena River downstream from Moose Creek Dam. Chena River does not receive glacier melt water or water from any other major source of suspended sediment, so water is relatively clear and the stream bottom is gravel or rocky through most of its length. Flows typically are between 1,000 and 2,000 cfs in the summer and less than 100 cfs in the winter. Peak flows generally are in two periods: in the spring when the warming sun and rain melt snow in the highlands that make up much of the Chena River drainage and in late summer, which often is rainy in Alaska. Unusually deep snow in the upper drainage may contribute to larger spring flood events, and heavy rains may exacerbate flooding from the snowmelt. Table 1, based on hydrological modeling, provides information about high water events since the project began operation.

Table 1 Modeled Chena River Flows

Probability	Peak Inflow (cfs)
10-year flood	16,268
100-year flood	33,635
300-year flood	42,000
1948 flood	19,065
1967 flood	57,400
1992 flood	16,600
Standard project flood	74,000
Project maximum flood	186,000

3.2.3 Soils

The project area is underlain by soils of order Entisol, suborder Fluvent. Entisols are those soils that do not show any profile development other than an A horizon. Fluvents are typical of valleys and deltas of rivers, particularly rivers with high sediment load. Soils in the group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. The cool climate accelerates accumulation of organic materials, which has the effect of relatively thick organic horizon development and could create acidic soils. The dominant drainage class for the map units present at the project is well-drained. The Chena River meander and low velocity support little suspended sediment.

3.2.4 Land Use

The preeminent land use in the project area is flood control. The U.S. Army Corps of Engineers, Alaska District owns and controls the usage all of the land that would be affected by the construction of a partial barrier wall. The dam is operated to prevent flow in downtown Fairbanks from exceeding 12,000 cfs in accordance with the water control manual. The Alaska District maintains the Dam and attendant facilities in order to prevent flood damage to the downstream areas.

Other land uses in the Moose Creek Dam region are residential and recreational. Zoning in the Interior is generally permissive, with a variety of land uses being allowable. Construction downstream of the dam is subject to applicable floodplain permits, as most of the area is characterized as within the base flood elevation, but protected by levee. Population density is sparse and the area is characterized as rural. Residential areas would not be directly impacted by the construction of the proposed project.

The Fairbanks North Star Borough operates a recreational area including camping and lake access on USACE lands downstream of the Dam. The Chena River Lakes Flood Control Project is an important recreational site for residents and visitors to Interior Alaska. The site is home to a 260-acre lake formed from the borrow pit excavated during construction of the Moose Creek Dam and a river park meandering along four miles of the Chena River. Its grounds are also used for personal use hunting and fishing, and for training and education functions. Using annual project visitation data obtained from the

Corps' Operation and Maintenance Business Information Link (OMBIL), the average annual visitation during 2012 was approximately 171,000 visits, totaling 181,000 annual visitor days. Applying the Unit Day Value methodology (EGM15-03), the benefit annually from recreation visitation is estimated to be $1.6 Million. Similar recreation benefits are expected in the future.

3.2.5 Socioeconomics

The population of the Fairbanks North Star Borough was 97,581 at the 2010 census. The unemployment rate is 5.7%. The population is 53 percent male and 47 percent female and 11 percent of the population are over the age of 60. In 2010, the median household income was $69,485 and 8 percent of the population fell below the Federal poverty threshold. Important industries within the Borough include mining, transportation, and the provision of goods and services for outlying communities in central Alaska.

Military installations account for approximately 40 percent of the area's economic activity and act as a driver of economic growth. Other important industries include petroleum development support activities and tourism. While the amount of development within the Borough may fluctuate depending on several factors including infrastructure projects and military activity, the broader socioeconomics of the area are not expected to appreciably change. The population will continue to see relatively stable levels of median household income and poverty levels. The population will age slightly with the percentage of residents over age 65 increasing from 5.0 percent to 7.5 percent of total population over the period of analysis.

3.2.6 Hazardous, Toxic, and Radioactive Waste

Nike-Hercules Site Tare was a Cold War era anti-aircraft battery activated in 1959 and deactivated in 1971 on what is now the Chena River Lakes Flood Control Project. It consisted of the Integrated Fire Control (IFC) area and the launcher area. The property was transferred to the US Army Corps of Engineers for the construction of the Chena River Lakes Flood Control Project in 1973. Buildings in the launcher area are used as a cold storage warehouse and boat storage. Three underground storage tanks were removed by USACE through the Defense Environmental Remediation Program (DERP) and an Ultra Violet Optical Screening Tool (UVOST) investigation was conducted in order to delineate the extent of contamination. The results of the UVOST investigation indicated that contamination was present above the Alaska Department of Environmental Conservation (ADEC) cleanup level (250 mg/kg) for Diesel Range Organics (DRO) in two areas proximal to the Chena River Lakes Flood Control Project office in the former launcher area. (Figure 6) Nike Site Tare was determined to be eligible for the Formerly Used Defense Sites (FUDS) program in 2016; but as of the publication of this Environmental Assessment, USACE has no plans to perform any removal.

There are no other known sources of HTRW proximal to the project location.

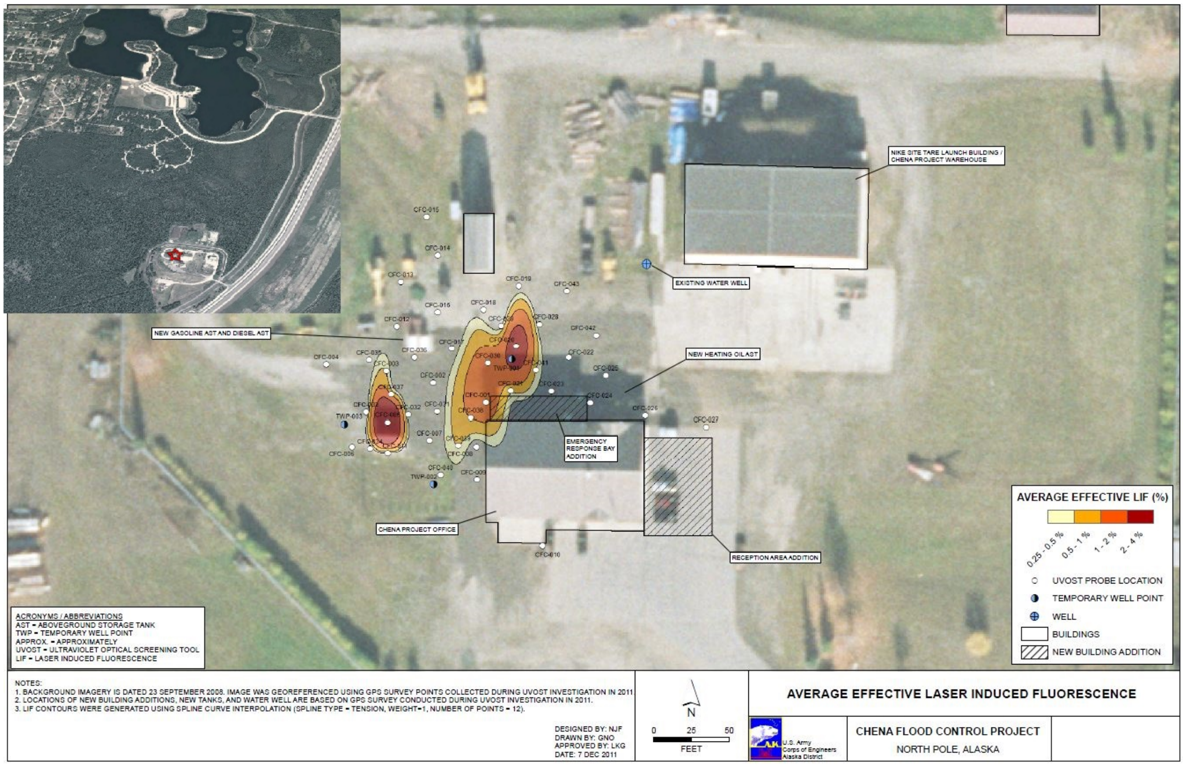

Figure 5 Depiction of the extent of diesel and residual range organic contamination in relation to the Chena River Lakes Flood Control project office and Chena Lakes recreation area (inset)

3.2.7 Endangered Species

A species list generated on September 18, 2018 contained no listed species in the vicinity of the project. (USFWS 2018)

3.2.8 Air Quality

Fairbanks is particularly susceptible to air quality problems during the winter due to increased heating requirements combined with temperature inversions during cold weather. Surrounded by hills on three sides, temperature inversions can trap a layer of cold air close to the ground. Even relatively small amounts of pollution can accumulate to unacceptable levels over periods of days or even weeks at a time.

The United States Environmental Protection Agency (EPA) designated the urban part of Fairbanks North Star Borough (FNSB) a non-attainment area for carbon monoxide in 1991. (Figure 7) However, FNSB has not violated the National Ambient Air Quality Standard (NAAQS) for carbon monoxide since 1999. Since that time, EPA approved the FNSB's carbon monoxide attainment plan and the area designated in 1999 became a Carbon Monoxide Maintenance Area on September 27, 2004. All of the activities proposed in the assessment are well outside the boundaries of the carbon monoxide maintenance area.

In December 2009, an expanded segment of the Fairbanks North Star Borough was designated as a nonattainment area (NAA) due to violations of recently promulgated national ambient air quality standards (NAAQS) for particulate matter smaller than 2.5 micrometers in diameter ($PM_{2.5}$) in the city of Fairbanks. The EPA's air quality designations are based on the most recent three years of air quality monitoring data, recommendations by the states and tribes, and other technical information. The $PM_{2.5}$ nonattainment area boundaries extend outside the city and are illustrated in Figure 7.

In 2017, the FNSB PM2.5 NAA was reclassified from moderate nonattainment to serious nonattainment for failure to meet the mandated air quality improvements. The State of Alaska has been required to update the State Implementation Plan (SIP) by including more stringent measures to reach the target reductions in PM2.5. The annual threshold for requiring general conformity analyses was reduced from 100 tons of PM2.5 and PM2.5 precursors to 70 tons. ADEC permitting thresholds were reduced to parallel the general conformity thresholds.

The nonattainment area encompasses part of the 8.2-mile-long Moose Creek Dam and extension, but does not extend to the control sill at the Tanana River. The construction of the barrier wall would be conducted wholly within the nonattainment area. Construction would occur during the summer months, when the frequency and persistence of inversions is much lower than the winter months. (Wendler and Nicpon, 1974)

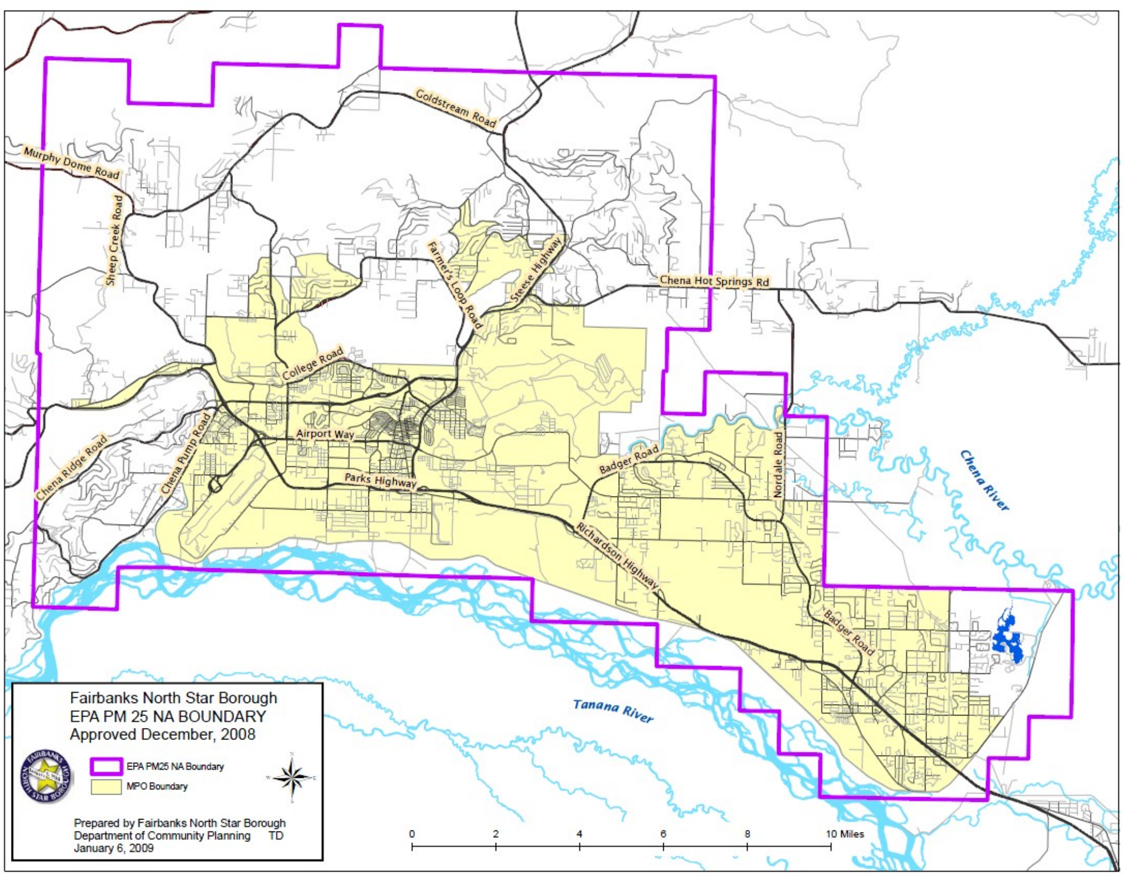

Figure 6 PM2.5 Non-attainment area, Fairbanks North Star Borough

Most of the $PM_{2.5}$ in Fairbanks is thought to be generated by combustion of fuel and wood for heat, electricity, and transportation. Typical $PM_{2.5}$ sources include power plants, vehicles, wood burning stoves, and wildland fires. In Fairbanks, air quality problems are most prevalent during cold weather temperature inversions. In fact, during a study conducted in the winter of 1967-1968, a surface inversion was observed about 95% of the time between the months of November and February. (Wendler and Nicpon, 1974) Figure 8 illustrates the number of days that $PM_{2.5}$ concentrations exceeded standards in downtown Fairbanks during recent winters.

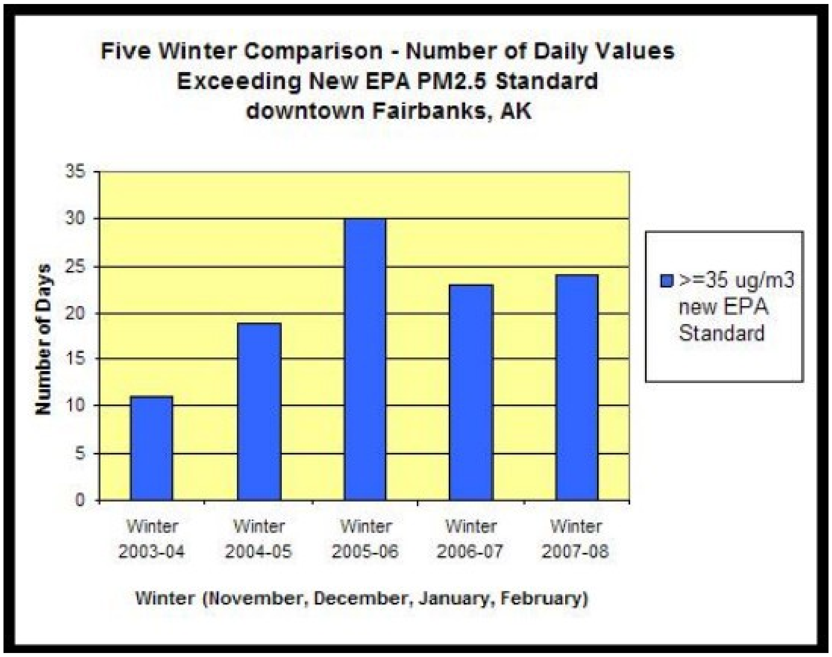

Figure 7 PM2.5 exceeding standards in Fairbanks 2003-2008

3.2.9 Water Quality

The Chena River is not fed by glacial runoff and turbidity is relatively low. Principal water quality issues are associated with the natural presence of elements from mineralization. Past mining probably has made metals more available to the system. Arsenic, barium, chromium, and zinc concentrations were relatively high in sediments sampled in the lower Chena River (USACE 1998).

The Chena River Lakes Flood Control Project and operation of the project do not appreciably affect Chena River water quality, although sediments may settle out of water impounded during flood events. Before human development in the Fairbanks area, floodwaters of the Tanana and Chena rivers comingled in their shared floodplains and periodically filled remnant channels left by meandering rivers. Silt and bedload material would have been introduced into the lower Chena River during those events. Levees, slough blocks, and drainage modifications now limit Tanana River incursions into the lower Chena River.

The Chena River in the project area does not receive water from the Tanana River; except when Tanana River elevation exceeds the control sill elevation of 507.1’ NAVD88, a 100-year flood event for the Tanana. Any nutrient benefit it may have gained from Tanana River sediment is lost, but light penetration for photosynthesis and sight feeding by fish and invertebrates is unimpeded by Tanana River suspended solids, and aquatic bottom habitat is not clogged with silt. Exclusion of Tanana River water may have benefited both salmon and grayling.

3.2.10 Floodplain

The 2,000-foot-long control sill was originally constructed to an elevation of 512.7 feet NAVD88 at the floodway outlet to prevent Tanana River water from entering the Chena River Lakes Flood Control Project floodway. The highest pool recorded in 39 years of operations was in May and June 1992, when Chena River water surface elevations rose to 512.7 feet NAVD88. The control sill height at the time of the pool of record was 512.7 feet NAVD88. Aside from the 1992 event, the Chena River and Tanana River have not comingled since the Chena River Lakes Flood Control Project was completed in 1979. The sill was lowered to 507.1 feet NAVD88 as a result of the 2010 Interim Risk Reduction Measures in order to reduce the risk of dam failure. Much of the area immediately downstream of the dam are mapped as Zone X, protected by levee. Flood mapping was most recently commissioned in 1983 in response to the construction of the Moose Creek Dam. That effort concluded in 1991 and resulted in the current flood zone mapping, depicted in Figure 9.

The Chena River Lakes Flood Control Project is operated to keep river discharge in Fairbanks to less than 12,000 cfs. It also is operated to minimize upland flooding in the 35-mile river reach between Moose Creek Dam and Fairbanks.

Flood Zones Downstream of Moose Creek Dam

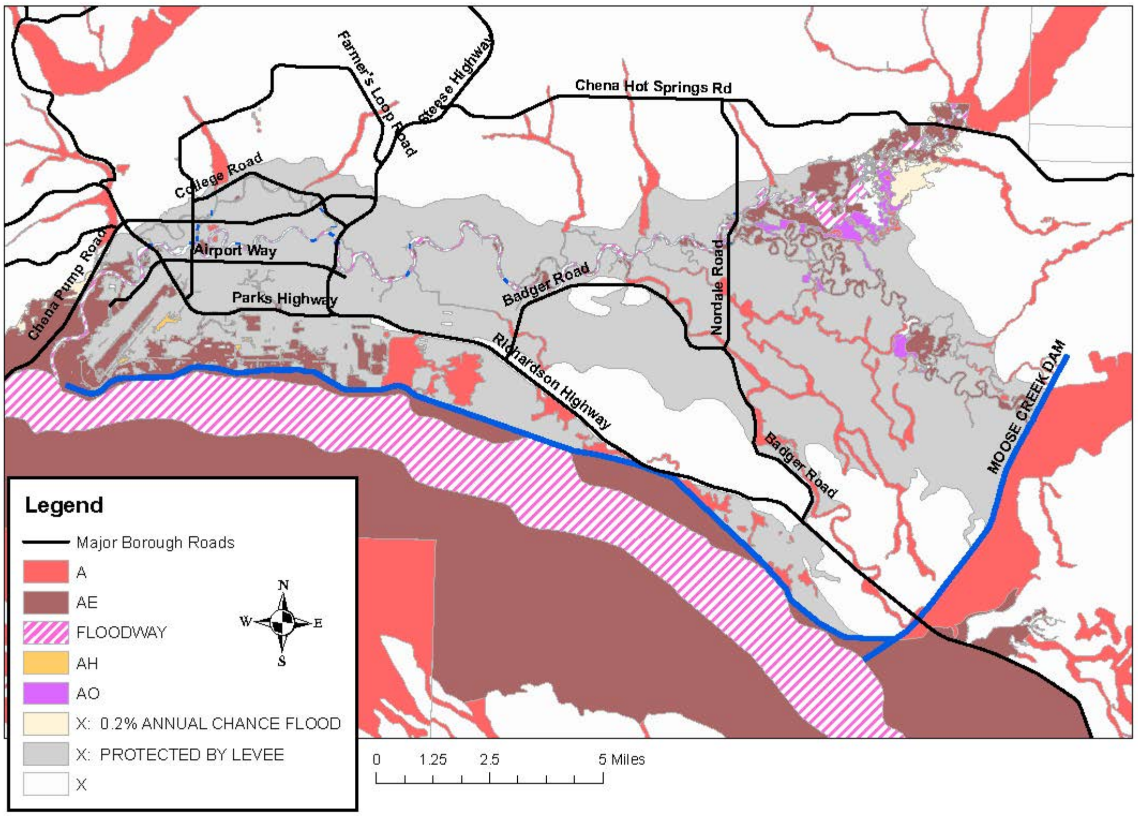

Figure 8 Flood zones downstream of the Moose Creek Dam

3.2.11 Vegetation

Vegetation in the project area is fairly typical of Interior Alaska and has been impacted from the construction and operation of the Moose Creek Dam since construction began in 1973. Land cover has been mapped to 30 (98.4 feet) meter resolution by the Alaska Center for Conservation Science, University of Alaska. (Figure 10) The project could impact the following types of plant communities, as described by level IV of the Alaska Vegetation Classification (Viereck et al. 1992):

- Bareground >50%
- White Spruce or Black Spruce (Open)
- Deciduous Forest (Open)
- Low Betula nana-Low Willow
- Herbaceous (Mesic) >20%
- Tall Shrub
- Deciduous Forest (Closed)
- Dwarf Shrub-Lichen
- Dwarf Shrub

- Low Shrub-Lichen
- White Spruce or Black Spruce/Lichen (Open)
- White Spruce or Black Spruce-Deciduous Forest (Open)
- White Spruce or Black Spruce-Deciduous Forest (Closed)

The floodway has also been kept clear of woody vegetation and dense grass, in widths varying in from 1,000 feet to 4,000 feet, in a meandering path generally parallel to the length of the dam. Vegetation is cleared from the floodway in order to maintain hydraulic design capacities. Trees and shrubs may restrict and significantly reduce diversion flows during flood control events, as well as increasing resistance as related to the size and density of the vegetation. Grasses are controlled in order to improve visibility and allow inspection of project features. (USACE, 1986)

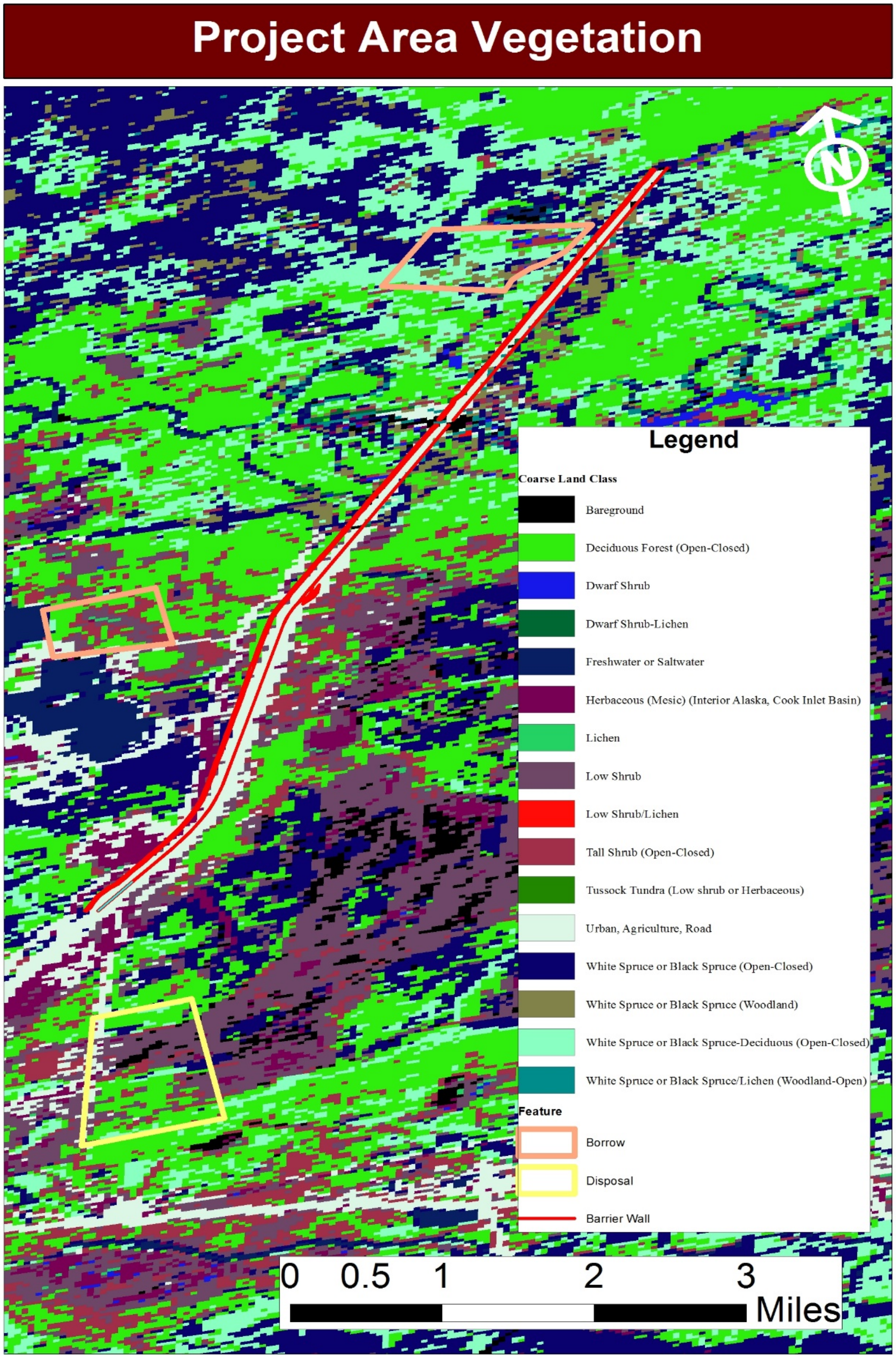

Figure 9 Figure 10. Land cover map of the project area, 30m resolution

3.2.12 Wetlands

Pockets of palustrine wetlands occur within the project area; emergent, scrub-shrub, and forested. Considering the high hydraulic conductivity of the soils in the area, it is likely that all the wetlands in the area share a shallow subsurface connection with the Chena River and are waters of the United States.

In order for an area to be recognized as wetland as defined by the Clean Water Act, the parameters of appropriate vegetation, hydrology, and hydric soils must be satisfied. A wetland delineation was performed on the proposed borrow and disposal locations in September 2017, revealing about 28 acres of wetlands within the 375 acres surveyed. The wetland delineation report is appended to this document.

The wetlands in the project area are typical floodplain wetlands found in Interior Alaska. Wetland development in floodplains is influenced by the history of the floodplain and often characterized by the historic deposition of restrictive sediments like silt. Relict sloughs are often the site of silt deposition due to the lower hydraulic energy of these areas; reduced water velocities allow fine grain sediments to precipitate from suspension and accumulate on the bed. After a slough is abandoned or a channel moves, this accumulation of silt acts as an aquitard and reduces drainage. Poor drainage creates saturated soil conditions and allows the dominance of hydrophytic vegetation; i.e., plants adapted for life in saturated soil conditions outcompete plant species that are less adapted for wet soil. In interior Alaska, these plant species often include those of the Heath family; Ericaceae. Common examples of Ericaceous plants in the Interior are leatherleaf, blueberries, and Labrador tea. Some willows, black spruce, resin birch and dwarf birch also tolerate saturated soil.

Interior Alaska wetlands are commonly influenced by seasonal frost and permafrost, where it is found. Frozen soil acts as an aquitard; but in areas without permafrost the seasonal frost only restricts drainage in the early part of the growing season. This is evidenced by variable reduced iron stratigraphy in the soil cross-section. Areas subject to seasonal frost may be poorly drained in the early part of the growing season and drain more freely after the upper part of the soil has thawed. When an area is poorly drained for long enough during the growing season to allow the dominance of hydrophytic vegetation and the reduction of iron in the soil, it is considered to be a wetland whenever the requisite hydrology is present.

The areas where the mining and disposal would be conducted are currently undeveloped, but have been impacted to varying degrees by the construction of the Moose Creek Dam, maintenance of the Dam, and various management practices. Large swathes of the survey area are dominated by mature stands of balsam poplar, white spruce, and quaking aspen. Some of the lower lying relict sloughs are dominated by resin birch, willows, and various Ericaceous species.

Two locations have been identified for the disposal of spoils material, one for each side of the river in order to limit equipment traffic over the control works. The North Disposal site is collocated with the North Borrow site, near North Chena Pond. It is an area covering 109 acres, adjacent to the North Seepage Collector Channel. This area is trisected by a relict looping channel severed by the construction of the North Seepage Collector Channel, contains some old burn areas, and a cleared area managed for moose browse and grouse cover. The entire area is uplands; primarily mature stands of white spruce, paper birch, and balsam poplar. A large area of open black spruce woodland with extensive bryophyte cover exists in the far northern edge of the survey area. The vegetation and landscape position suggests the area could be wetland, likely underlain by permafrost, but the community did not meet all three wetland parameters in the September 2017 delineation. The delineation was performed late in the growing season and during a period of low water levels, so a survey earlier in the year may produce different results.

Spoils generated on the south side of the outlet works would be disposed in the South Disposal area, upstream of the dam about 2,500 meters directly south of the project office. This area covers about 188 acres, including 18.9 acres of wetlands. The South Disposal area is adjacent to existing roads and has been partially cleared in the past. Paper birch is the dominant species in the uplands of the north facing slope and quaking aspen dominates the low-lying uplands at the base of the hill to the cleared power line right-of-way bisecting the site. The areas north of the right-of-way are mixed; anthropogenic disturbance, shrubs such as resin birch and green alder, and spruce-birch forest.

The South Borrow site is located adjacent to the Chena Lakes, about 2,500 meters north of the project office. This area covers about 78 acres, including 11.1 acres of wetlands and abuts existing roads. The plant communities are variable in this area; mature paper birch and white spruce dominate much of the upland areas, grading into shrubs like green alder and resin birch before transforming into grasses in the palustrine emergent wetlands. This area has been extensively disturbed by the construction and operation of the dam. Some of the wetlands were likely formed by excavations creating concave landforms, directing runoff. The construction of roads may impede natural hydrology and impound sheet flow that may otherwise drain to lakes and streams.

3.2.13 Fish

Intensive fish collections from above and below the Chena River Lakes Flood Control Project (USACE 1999) and earlier collections (Van Hulle; 1968, Walker 1983, and USFWS, 1984) identified the following species:

- Chinook salmon *(Oncorhynchus tshawytscha)*
- Chum salmon *(Oncorhynchus keta)*
- Coho salmon *(Oncorhynchus kisutch)*
- Arctic lamprey *(Lethenteron camtschaticum)*
- Lake chub *(Couesius plumbeus)*
- Arctic grayling *(Thymallus arcticus)*
- Longnose sucker *(Catostomus catostomus)*
- Round whitefish (*Prosopium cylindraceum)*
- Humpback whitefish *(Coregonus oidschian)*
- Broad whitefish *(Coregonus nasus)*
- Least cisco *(Coregonus said)*

- Sheefish *(Stenodus leucicthys)*
- Northern pike *(Esox lucius)*
- Burbot *(Lota lota)*
- Slimy sculpin *(Cottus cognatus)*
- Nine spine stickleback *(Pungitius pungitius)*

Three of those species, Chinook salmon, Chum salmon, and Arctic Grayling are of particular importance in the biology of the Chena River and are highly important in the Tanana River system fishery. Arctic Grayling are comparatively large, are abundant in the river, are important predators, and are highly prized in the recreational fishery. Both salmon species transport important nutrient sources into the system.

Grayling. Grayling overwinter in deeper water of home rivers or in glacially fed rivers. They are observed during the winter in the lower Chena. They disperse into spawning and feeding habitat as the ice begins to go out in the spring, typically in May. They have been reported to spawn over riffles with relatively small gravel, but are known to spawn on a variety of habitats and have been observed spawning in muddy sloughs of the Chena River. They typically spawn soon after ice-out as water temperatures begin to rise and stream discharges increase.

Embryos hatch in about 3 weeks and emerge as fry a few days later. Fry have very little mobility in their first two weeks and flooding may cause high mortality (USACE 1999). Young of year (YoY) are more mobile, but smaller YoY still prefer quieter water where they often form dense schools. Falling water levels may strand fry in isolated pools. The Chena River Lakes Flood Control Project floodway emulates a natural pool during flood events when the control structure gates are closed. YoY were observed in impounded water at the Chena River Lakes Flood Control Project, but limited observations did not find substantial numbers of dead YoY after drawdown. Although specific data are sparse, impounding Chena River floodwater is generally understood to increase potential for mortality to grayling fry and YoY during flood events in late spring and summer. Larger sub-adult and adult grayling may move into the floodway during flood events, but little evidence of post-flood mortality has been reported.

Substantially smaller Chena River grayling year classes were noted after the 1967 and 1981 Chena floods, indicating that both natural flooding before the project and flooding into the constructed floodway could have caused substantial mortality. There is no way to determine whether mortality from natural flooding before project construction was comparable with mortality from flooding into the constructed floodway during post-construction events. (Armstrong 1986)

Chinook Salmon. Chinook salmon spawning in interior Alaska is limited to relatively few streams. The Chena River is one of the more important spawning rivers in the middle reaches of the Yukon River drainage. Biologists (USACE 1999) estimated that approximately 6 percent of the total Yukon River Chinook harvest between 1987 and 1996 (10,800 average per year) were Chinooks contributed by the Chena River. Estimated escapement to the Chena River from 1986 to 2008 is shown in Figure 12.

Chinook typically first return to the Chena River to spawn in mid to late June. A few may spawn below Moose Creek Dam, but almost the entire spawning effort is upstream from the dam. Chinook spawn in the deepest, swiftest river waters used by Pacific salmon and in the coarsest substrate. Some spawning redds may be in areas of the river that are inundated when the control gates are closed. This can flood the redds and may reduce reproductive success.

Eggs hatch in early spring and fry emerge during or just after ice-out on the river. Most of the juveniles collected were taken within 3 weeks after ice-out. Juvenile salmon remain in the Chena River for more than a year, until the following spring or summer, and then migrate into the Yukon drainage and then into the Bering Sea.

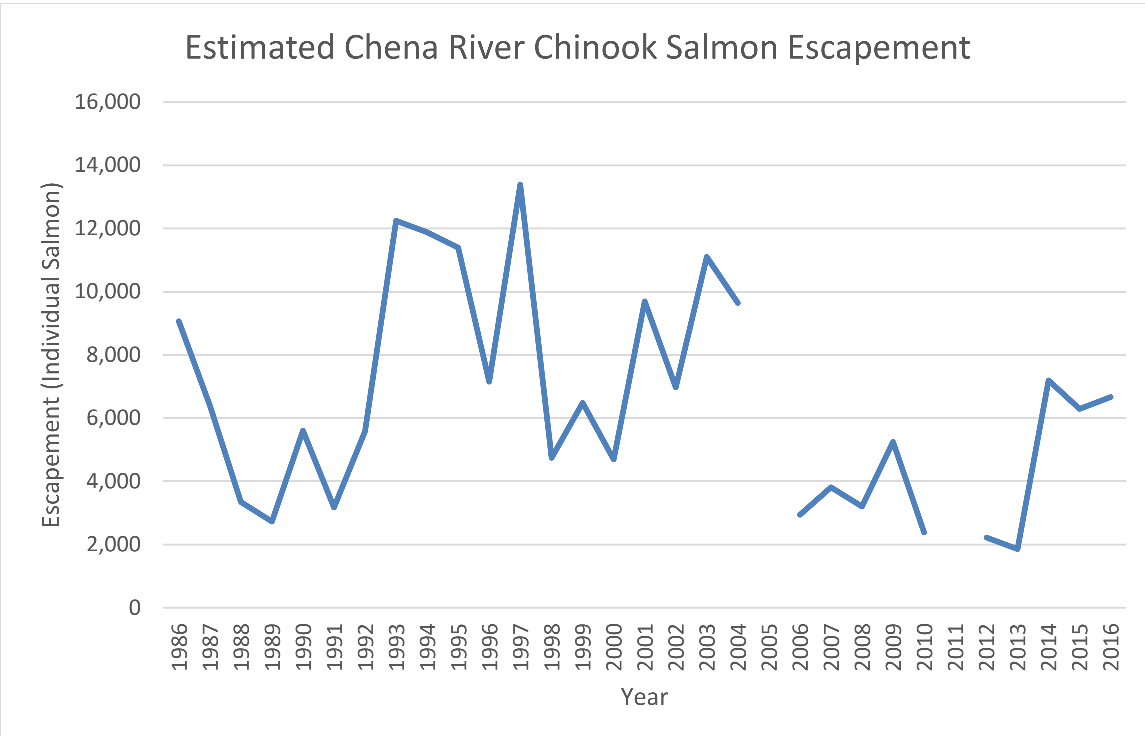

Figure 10 Chinook (king) salmon escapement to the Chena River 1986-2016 (Stuby and Tyers, 2016). No data exists for 2005 and 2011 due to water levels preventing enumeration.

The newly emerged fry feed on insects and plankton, grow, and gradually become more mobile. Chinook juveniles readily enter flood pools formed behind the Moose Creek Dam during flood events and were reported to be most abundant close to the dam, often in schools of 20 to 40, and may be attracted by the "astonishing" abundance of floating insects and spiders in the flood pool (USACE 1988). Second-year Chinooks are predatory. Along with insects and other invertebrates, they eat other fish. They have been observed feeding on chum salmon juveniles in the Chena River (USACE 1999), and they certainly feed on other juvenile fish.

Salmon juveniles may be better attuned to water flow and changes in flow than some nonmigratory species. Salmon juveniles, both Chinook and chum, are commonly observed in Moose Creek Dam flood pools when the control gates were closed, but seem to retreat back to the river as water drops, either directly or through the two low-point drains (USACE 1988; 1999). They may be more likely to remain behind as a pool is isolated where water is relatively deep, and there is concern that they may be trapped in the armor rock of the dam (USFWS 1984).

Grayling, whitefish, and other fish prey on juvenile salmon of both species. Biologists examining grayling stomach contents in the Chena River during a 3-year study estimated grayling predation at 0.03 juveniles taken per fish per day (USACE 1999). Individual fish, particularly when juveniles are concentrated, may take many more. During a flood event as juveniles were returning to the main river channel, biologists reported stomach contents of 28 juvenile salmon in one 14-inch grayling and 31 in the stomach of a 16-inch whitefish (USFWS 1984).

The Chena River Lakes Flood Control Project probably has little effect on juvenile salmon when the control gates are not being operated and water is not impounded. There may be less shoreline vegetation and other cover upstream of the dam, but the riverine habitat is largely unaffected. As floodwaters build up behind the dam control gates in the first weeks after ice-out, water velocity through the control structure increases and the young, less mobile juveniles may be injured as they are swept through. Studies of juvenile Chinook salmon in 1996 (USACE 1999) did not report substantial differences in scale loss between those collected above and below the control structure or correlation with increased water velocity, but did find that larger juveniles more frequently lost scales at both locations.

When the control gates are closed, impounded water flows out of the river banks and into the floodway where it creates a temporary lake. The impounded water may be warmer and prey organisms are more abundant. This may be an exceptional opportunity for juvenile salmon to feed and grow, which improves their mobility and potential to survive outmigration to the Bering Sea. This advantage is offset by predation and by the potential for juveniles to be stranded. There are insufficient data to evaluate losses when the Chena River is of out its banks, but there appears to be general consensus among experienced professional biologists that Chena River flood events are detrimental and that salmon year classes benefit when both natural and human-caused floodplain inundation is infrequent and limited in duration and extent. This is particularly important in the first few weeks after ice-out when young of year fish are less mobile. Salmon juveniles in the Chena probably benefit when flood events at the Chena River Lakes Flood Control Project are managed to be short in duration and volume of water impounded.

Chum Salmon. Unlike Chinook salmon, chums outmigrate to the ocean the same summer they emerge from spawning redds. Their early life history is similar to Chinook salmon; they begin to emerge as the ice goes out and reach peak abundance within about 3 weeks, are very poor swimmers for the first 2 or 3 weeks, and feed on plankton and small insects. Unlike Chinook, however, most chum juveniles outmigrate to the Tanana River within a few weeks after they emerge. Some chum juveniles are still in the river into early summer, and they were reported in pools in the floodway during a June flood.

Adult chum salmon typically begin returning to Chena River in July and may continue into late August. Estimated escapement to the Chena River from 1986 to 2008 is shown in Figure 13. Chum salmon escapement is underestimated in some years because census was halted while chums were still returning. They generally spawn in water that is shallower and bottom material that is smaller in grain size than the spawning habitat used by Chinook salmon.

Effects of operations are about like those associated with Chinook salmon, except that all the juveniles in the Chena are fry or young of year that have little mobility and are relatively unable to avoid predation or other hazards. They also are largely gone from the Chena by mid-June, so the juvenile chums are not affected much by events later in the summer.

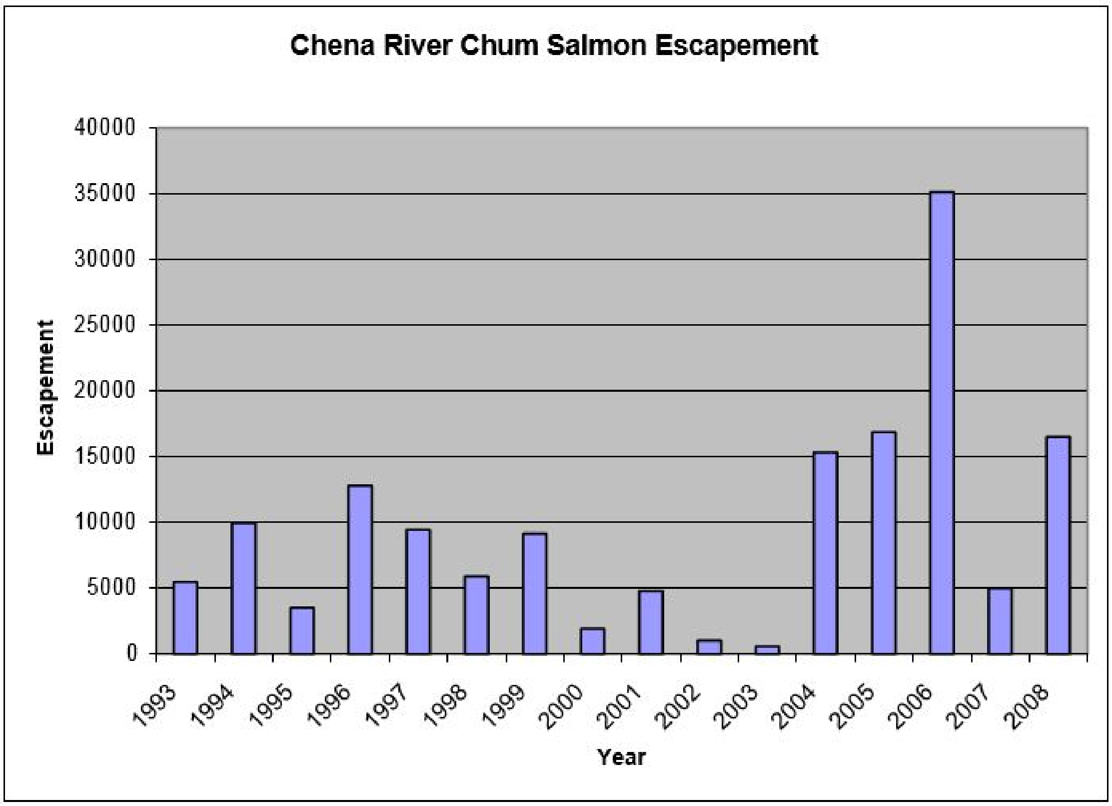

Figure 11 Chum salmon escapement to the Chena River 1993-2008 (ADF&G 2010).

Other Fish Species. Less is known about other fish species in the Chena River. Arctic lamprey, lake chubs, longnose suckers, and whitefish are probably the most abundant of fish species other than salmon and grayling in the Chena. They are widely distributed in interior Alaska. Project effects on those species are likely to be similar to effects on salmon and grayling. Longnose suckers may be more likely to be stranded after flood events.

3.2.14 Mammals

The following mammalian species could be present in the project area:

- Moose (*Alces alces)*
- Gray wolf (*Canis lupus)*
- Brown bear (*Ursus arctos)*
- Black bear (*Ursus americanus)*
- Beaver (*Castor canadensis)*
- Caribou (*Rangifer tarandus granti)*
- Coyote (*Canis latrans)*
- Ermine (*Mustela ermine)*
- Little Brown Bat (*Myotis lucifugus)*
- Red fox (*Vulpes vulpes)*
- Snowshoe hare (*Lepus americanus)*
- Lynx (*Lynx canadensis)*
- Hoary marmot (*Marmota caligata)*
- American marten (*Martes americana)*
- Mink (*Neovison vison)*
- Muskrat (*Ondrata zibethicus)*
- River otter (*Lutra canadensis)*
- Porcupine (*Erethizon dorsatum)*
- Arctic ground squirrel (*Spermophilus parryii)*
- Northern flying squirrel (*Glaucomys sabrinus yukonensis)*
- Red squirrel (*Tamiasciurus hudsonicus)*
- Meadow vole (*Microtus pennsylvanicus)*
- Red-backed vole (*Myodes rutilus)*
- Wolverine (*Gulo gulo)*

Habitat along the dam toe is segmented and disturbed by project features, roads, bike paths, and other structures and facilities. This is likely to diminish substantially its value as habitat for larger mammals. Moose, wolf, bear, fox, lynx, and coyote move through this habitat regularly, but its use does not appear to be of great importance or of more than moderate intensity for those species. Habitat in the disposal sites is less disturbed and more contiguous with the surrounding communities; it likely provides more valuable habitat for terrestrial species

3.2.15 Birds

At least 70 different species of songbirds, possibly 19 species of raptors, 5 species of grouse, more than a dozen species of waterfowl, and many species of marsh and shorebirds are present at least seasonally in the Chena River Watershed (USACE 1997). Most of those species are present at least occasionally in the Chena River Lakes Flood Control Project area. A bird survey in 2005 by the Alaska Bird Observatory identified three species that were of particular interest: Townsend's warbler, rusty blackbird, and Hammond's flycatcher. Those three were identified in brushy habitat near ponds/sloughs on the floodway closer to Moose Creek Bluff. The USFWS guidance regarding land clearing timing for the Interior region of Alaska recommends vegetation clearing be conducted outside of the May 1-July 15 nesting period. (USFWS 2009)

A review of the USFWS Information for Planning and Conservation website indicated nine species of migratory birds or birds protected by the Bald and Golden Eagle Protection Act that could potentially be affected by the proposed activity:

- Bald eagle (*Haliaeetus leucocephalis*)
- Fox sparrow (*Passerella iliaca*)
- Lesser yellowleg (*Tringa flavipes*)
- Olive-sided flycatcher (*Contopus cooperi*)
- Rusty blackbird (*Euphagus carolinus*)
- Short-eared owl (*Asio flammeus*)
- Solitary sandpiper (*Tringa solitaria*)
- Upland sandpiper (*Bartramia longicauda*)
- Whimbrel (*Numenius phaeopus*)
- Common raven (*Corvus corax*)
- Osprey (*Pandion haliaetus*)
- Red-tailed hawk (*Buteo jamaicensis*)

Any activity that results in a take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service. On April 11, 2018 the USFWS received an opinion from the Department of the Interior's Solicitor's Office concluding that the incidental take of birds resulting from an activity for which the activity's purpose is not to cause direct harm to birds is not prohibited by the MBTA.

Bald Eagle. *Haliaeetus leucocephalis* are present year-round and live near rivers, lakes, and marshes where they can find fish, their staple food. Bald eagles will also feed on waterfowl, turtles, rabbits, snakes, and other small animals and carrion. They require a good food base, perching areas, and nesting sites. Their habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. In winter, the birds congregate near open water in tall trees for spotting prey and night roosts for sheltering.
Eagles mate for life, choosing the tops of large trees to build nests, which they typically use and enlarge each year. Nests may reach 10 feet across and weigh a half ton. They may also have one or more alternate nests within their breeding territory. (USFWS, 2007)

Fox Sparrow, *Passerella iliaca* use the project area during breeding; commonly nesting in coniferous or mixed forests with dense undergrowth, woodland thickets, and riparian woodland. (Alsop III, et al., 2001; Byers, et al., 1995)

Lesser Yellowleg, *Tringa flavipes*, breed primarily in boreal forests and forest/tundra transition habitats and nest in shallow wetlands, trees/shrubs, and open areas. Population levels are estimated to be between 100,000-200,000 for the state, but declines of 4-9% per year were identified in 2003 without a clear understanding of the cause of the decline being identified. Some existing contributing issues are a lack of information regarding habitat preference, possible errors in census data, and alteration/loss of wetland and boreal habitat. (ADFG 2015)

Olive-sided flycatcher, *Contopus cooperi*, is primarily a forest inhabitant, typically found in forest edges and openings; in Central Alaska the Olive-sided flycatcher is primarily found in white and black spruce forests, predominantly with openings and water. Current estimates suggest that Alaska populations declined by 3.3% annually from 1980-2002. Population decline is expected to be primarily caused by habitat loss in flycatcher overwintering habitat in South America. In their breeding grounds in Alaska, forest management practices like salvage harvest and wetland drying associated with climate change and development is thought to be detrimental to the species' preferred habitat. Drying also reduces the breeding habitat for flying insects, reducing their availability for flycatcher forage. (ADFG 2015)

Rusty Blackbird, *Euphagus carolinus,* breeds in the inland portions of Alaska south of the Brooks Range; nesting in dense cover, usually in a conifer or in shrubs over freshwater. They spend most of their lives proximal to water and wetlands, foraging on wet ground and in shallow water and spending the summers in northern spruce bogs. Some researchers believe the global Rusty blackbird population may have declined by as much as 80% in the last few decades, but this figure is difficult to substantiate due to the remoteness of their range and preferred habitat. (Audubon 2015)

Short-eared Owl, *Asio flammeus,* breeds throughout Alaska. The female builds a nest lined with grass and feathers on a raised hummock or ridge among tall grass or under a shrub, usually in open areas such as marshes or tundra. The young are ambulatory beginning about 12-18 days post-hatch and typically begin to fly between 27-36 days of life. Short-eared owls are sensitive to habitat loss, probably exacerbated by nesting on the ground, to the point they've disappeared from many southern locations where they traditionally nested. (Audubon 2015)

Solitary Sandpipers, *Tringa solitaria,* breed and nest in muskeg bogs, spruce forests, and deciduous riparian woodlands in the inland portions of Alaska south of the Brooks Range. They are difficult to census due to their solitary nature, but current estimates indicate that Solitary Sandpiper numbers have been declining in Alaska at a rate of 4.1% annually; leading them to be considered "highly imperiled" by the Alaska Shorebird Group, of "high conservation concern" by Boreal Partners-In-Flight", and the continental population is considered a "species of high concern" in the U.S. Shorebird Conservation Plan. There are currently estimated to be about 4,000 Solitary Sandpipers in Alaska, making them one of the rarest shorebirds in North America. (ADFG 2015)

Upland Sandpiper, *Bartramia longicauda,* inhabit damp, upland tundra heath, and swales of tall grass and sedge amidst tall willows. They are primarily restricted to extensive, open tracts of short grassland habitat. Upland Sandpipers nest in peatlands and scattered woodlands near timberline, as well as in dry patches of wet meadows and in blueberry barrens. Research indicates a significant population decline of 11.4% annually between 1980 and 2007. (ASRSSR, 2013)

Whimbrel, *Numenius phaeopus,* is the mostly widely distributed curlew, occurring across the Arctic in North America and Eurasia. They breed on the tundra in the summer and are most commonly found on mudflats. Female Whimbrel build nests lined with lichen, moss, and grass in shallow depressions, usually on hummocks near wet, low lying areas, early in the breeding season. Hunting in the late 19th century seriously depleted Whimbrel numbers, but they have since recovered. (Audubon, 2015)

Common Raven, *Corvus corvax*,is a large, black bird with a broad distribution. Ravens are found nearly everywhere in Alaska and are opportunistic feeders; subsisting on everything from garbage to insects to the eggs and young of other birds. They are well adapted for living in proximity to humans and undergoing a range expansion in much of the United States after being depleted in the early 20th century. Ravens are present throughout the year, but may migrate locally. (Audubon, 2015)

Osprey, *Pandion halietus*, are also known as fish-hawks due to their close association with their obligate prey item; fish and fish-bearing waters. Osprey nest and live along coastlines, lakes, and rivers where they hunt fish swimming near the water surface. They were decimated by the effects of the pesticide DDT in the mid 20th century, but have been recovering well since the ban of DDT in 1972. Osprey are known to build nests in the tops of utility poles where they can be electrocuted or cause power distribution complications. They breed in Interior Alaska and overwinter along the southern coasts of North America. (Audubon, 2015)

Red-tailed Hawk, *Buteo jamaiscens*, is the most cosmopolitan hawk species in North America, with a distribution as far north as the Brooks Range during the summer for breeding and as far south as Central America. Red-tailed hawk numbers have increased since the middle of the 20th century and in some areas they have become adapted to nesting in cities. They are generally found in open country that provides some high perches for observing prey. Prey in the Interior includes small mammals and other birds. Red-tailed hawks may also feed upon carrion. (Audubon, 2015)

3.2.16 Historic and Other Cultural Resources

The Chena River Lakes Flood Control Project contains sites that are listed in the Federal register of historic places. None of those listed sites are in areas that would be cleared of vegetation, excavated for material extraction, or impacted by the disposal of organic material or the construction of the barrier wall. The Chena River Lakes Flood Control Project area has been intensively disturbed from the construction, operation, and maintenance of the dam and attendant facilities since the 1970’s when construction began. Due to the history of disturbance, the probability of encountering intact cultural resources is low.

4.0 ENVIRONMENTAL CONSEQUENCES

This section addresses the environmental consequences of the proposed actions and reasonable alternatives on the important resources of the action area. Effects on each of the resources addressed in Section 3 are considered in this section. A comparison of alternatives matrix is depicted in Table 2.

Table 2 Comparison of alternatives matrix

Resource	Preferred Alternative	No Action Alternative
Noise	LTSI	NE
Hydrology	BI	NE
Soils	LTSI	NE
Land Use	BI	NE
Socioeconomics	BI	NE
HTRW	LTSI	NE
Endangered Species	NE	NE
Air Quality	LTSI	NE
Water Quality	LTSI	NE
Floodplain	BI	NE
Vegetation	LTSI	NE
Wetlands	BI	NE
Fish	LTSI	NE
Mammals	LTSI	NE
Birds	LTSI	NE
Historic and Cultural Resources	NE	NE
Climate Change	LTSI	NE

LTSI Less Than Significant Impact
BI Beneficial Impact
NE No Effect

4.1 Noise

Preferred Alternative. The construction of a partial barrier wall would recruit diesel powered construction equipment for the trench excavation, spoils transport, and associated earth moving activities. The operation of this equipment would elevate noise levels during construction. Ambient noise levels are assumed to be low, as the Moose Creek Dam is not located proximal to any known sources of high sound pressure. Although sound levels could exceed 70 decibels in proximity to construction activities, attenuation with distance from the construction site would reduce the noise. Contractors would be required to meet local noise ordinances and place noise dampening equipment on trucks and machinery as needed. The effect of noise during construction would be localized and insignificant. This would result in a temporary increase in noise in the project area.

The construction of the partial barrier wall would have a less than significant impact on noise.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. No changes to noise generation would occur.

The No Action Alternative would have no effect on noise.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the dam would likely require the operation of construction equipment for tasks associated with recovery and rebuilding, resulting in the elevation of noise levels during this period, which could extend several years. Noise elevation in conjunction with recovery measures would be more widespread than that associated with the construction of a partial barrier wall, as equipment would be required for a multitude of tasks throughout the area affected by flood waters. These effects would be temporary and attenuation would vary with topography, distance, and vegetation cover.

The No Action Alternative with Dam Failure would result in less than significant impacts on noise.

4.2 Hydrology

Preferred Alternative. The construction of a partial barrier wall would isolate the flaw within the Moose Creek Dam, increasing the seepage path of subsurface flow in order to prevent the three dam failure modes addressed in the Moose Creek Dam Modification Study. This may have the effect of drying the area immediately downstream of the dam by reducing the amount of groundwater moving to the surface. Impacts to groundwater are not anticipated to extend more than 100 feet from either side of the barrier wall.

Gravel extraction could create additional open water areas near the Chena Lakes and North Chena Pond. These new water features would be up to 35 feet deep and cover three acres and 0.4 acres respectively. They would be reclaimed in accordance with the Corps' environmental operating procedure; including a broad littoral zone, irregular shoreline, and enrichment with organic material to increase productivity.

The Preferred Alternative would have a beneficial impact on hydrology by restoring the embankment to its design specification and protecting the downstream area from flood damage. Construction of the barrier wall may reduce the amount of shallow subsurface flow downstream of the dam and reduce groundwater infiltration into residential basements. The excavation of two gravel quarries, placement of unusable overburden, and alterations to the low point drain would not have a measureable impact on hydrology.

No Action Alternative. Project conditions and operational procedures would continue in the current manner.

The No Action Alternative would have no effect on hydrology.

No Action Alternative with Dam Failure. Failure of the Moose Creek Dam would open additional hydrologic conduits in the Chena River watershed. The location and capacity of the additional pathways would be dependent on the mode of failure. Although the Moose Creek Dam does not maintain a pool year-round, significant alterations to hydrology could result from a breach of the dam. An additional channel could be formed by dam failure as water moves through the lowest elevations of the floodplain. This channel would likely be full of water only during flood events, as access would be restricted to periods the Chena River exceeds its banks.

The No Action Alternative with Dam Failure would have a significant impact on hydrology.

4.3 Soils

Preferred Alternative. The materials used to construct the Moose Creek Dam embankment were mined from a proximal borrow location, which was subsequently converted into Chena Lakes Recreation Area. These materials are consistent with the Fluvents that compose the soils of the Chena River floodplain, which are primarily sand, silt, and gravel. Excess cement mixed embankment materials would be disposed in the Fairbanks North Star Borough landfill. Overburden that could not be used to reclaim the borrow sites would be place in the identified disposal area upstream of the Dam.

The construction of the partial barrier wall would result in persistent alterations to the consistency and alkalinity of soils in the embankment, but these impacts would be less than significant due to the localized and non-substantive nature of the impacts. The un-useable overburden placed in the disposal area would not disturb in situ soils.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. Maintenance of cleared areas would persist, but no additional areas would be disturbed. No changes to soils would occur.

The No Action Alternative would have no effect on soils.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. Soils present in the project area were developed by fluvial processes performed over millennia; subjecting those soils to another flood event would not have significant impact on them. Some new sediments would be deposited and some soil development would likely be translocated.

The No Action Alternative with Dam Failure would have a less than significant impact on soils.

4.4 Land Use

Preferred Alternative. Flood control is the preeminent land use in the project area and the proposed project purpose is to improve the Alaska District's ability to control flood damages by preventing excessive seepage through the embankment. Construction of the centerline barrier wall would not significantly change land use in the project area. All activities related to the construction of the preferred alternative would be conducted within lands managed and owned by the USACE. The barrier wall would present a beneficial impact to the primary land use of the area by improving the effectiveness of the flood control project.

The construction of a partial barrier wall would have a temporary impact on recreation during construction. The path along the crest of the embankment would be closed during construction. Pedestrian and bicycle traffic would be rerouted to avoid the construction area. Construction related traffic would likely cause delays entering and exiting the Chena Lakes Recreation area. Vegetation removal for the disposal of spoils could have a temporary negative impact on game species habitat quantities; relating a negative impact on hunting and trapping recreation.

The construction of a partial barrier wall would have a temporary, less than significant impact on recreation. Due to the deference placed on flood control as the preeminent land use of the project area and the temporary nature of the minor impacts to recreation, the overall impact of the proposed project on land use would be beneficial.

The construction of a partial cut-off wall would have a less than significant impact on land use.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. Maintenance of cleared areas would persist, but no additional areas would be disturbed. No disruption to existing land use would occur.

The No Action Alternative would have no effect on land use.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the Moose Creek dam would be driven by backwards erosion, piping, and contact erosion. The embankment would slump and render the path on its crest unusable. The Chena Lakes recreation area would be inundated and considerable damage may occur to facilities and recreation values associated with the area. Residences and businesses in the inundation area would be extensively damaged and many thousands of people would be temporarily displaced. Some individuals may never return. The base case economic damage assessment predicts as many as 28,000 structures could be affected and a total economic loss of $6.3 billion.

The No Action Alternative with Dam Failure would present a significant impact to land use.

4.5 Socioeconomics

Preferred Alternative. Construction of a partial barrier wall would likely involve the hire of local labor for earth moving activities, creating a positive impact on socioeconomics through the addition of federal money into the local economy. Construction would require several years of work, temporarily providing employment opportunities for equipment operators and others. Remediation of the flaw would reduce the risk of dam failure to downstream population, which could increase property values and discourage residents from moving out of the area.

The construction of a partial barrier wall would have a beneficial impact to socioeconomics.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. No additional employment would be generated.

The No Action Alternative would have no effect on socioeconomics.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A dam breach at maximum high pool could cause as much as $6.3 billion in total economic losses.

The No Action Alternative with a Dam Breach would present significant socioeconomic impacts.

4.6 Hazardous, Toxic, and Radioactive Waste

Preferred Alternative. Nike-Hercules Site Tare was a Cold War era anti-aircraft battery activated in 1959 and deactivated in 1971 on what is now the Chena River Lakes Flood Control Project. It consisted of the Integrated Fire Control (IFC) area and the launcher area. The property was transferred to the US Army Corps of Engineers for the construction of the Chena River Lakes Flood Control Project in 1973. Buildings in the launcher area are used as a cold storage warehouse and boat storage. Three underground storage tanks were removed by USACE through the Defense Environmental Remediation Program (DERP) and an Ultra Violet Optical Screening Tool (UVOST) investigation was conducted in order to delineate the extent of contamination. The results of the UVOST investigation indicated that contamination was present above the Alaska Department of Environmental Conservation (ADEC) cleanup level (250 mg/kg) for Diesel Range Organics (DRO) in two areas proximal to the Chena River Lakes Flood Control Project office in the former launcher area. Nike Site Tare was determined to be eligible for the Formerly Used Defense Sites (FUDS) program in 2016 and additional site investigation was recommended in the UVOST report.

The contamination does not extend into the area affected by the construction of the mix-in-place barrier wall 1,000 feet to the east. Furthermore, the materials used to construct the embankment were obtained from the Chena River Lakes Recreation area borrow source 2,000 feet north (down-gradient) of the launcher area. Tare was operated until 1971 and construction of the Chena River Lakes Flood Control Project embankment was completed in 1978; indicating that the underground storage tanks (UST) were unmaintained for only seven years before the excavation of gravel from the material site 2,700 feet north of the maximum extent of DRO contamination. The extremely high hydraulic conductivity of the substrate present at the project area would elevate dissolved oxygen content in the groundwater and improve biodegradation of organic constituents.

The section of the main embankment affected by the barrier wall is constructed from gravel of varying granularity, sourced from the borrow area downstream of the dam which now forms the Chena Lakes Recreation Area. Groundwater in the area moves in a generally northwesterly direction, transporting any soil contamination away from the embankment. The IFC is located 2,000 feet south of the South Disposal Area, removing the possibility that previously undocumented contaminated soils could be disturbed by disposal operations.

Construction of the centerline barrier wall would not create significant HTRW impacts.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. Maintenance of cleared areas would persist, but no additional areas would be disturbed. Petroleum products would continue to be present and used for the operation of the project in their current quantities and configuration.

The No Action Alternative would have no effect on HTRW.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. Dam failure would inundate HTRW containment systems and could release hazardous materials into the aquatic environment. The inundation area below the dam contains innumerable aboveground storage tanks, underground storage tanks, manufacturing and industrial facilities that store and use hazardous materials, municipal waste collection sites, and sewage conveyances that could become compromised in the event of a dam breach; releasing their contents into the flood waters to be distributed throughout the reach of the floodwaters and transported downstream to the Tanana River and ultimately Yukon River.

The No Action Alternative with a Dam Failure would present a significant impact on HTRW.

4.7 Endangered Species

A species list generated on September 18, 2018 contained no listed species in the vicinity of the project. (USFWS 2016)

4.8 Air Quality

Preferred Alternative. A conformity analysis is required for Federal projects in nonattainment areas unless they are exempted. Part of the proposed project would be constructed within the FNSB serious non-attainment area for particulate matter smaller than 2.5 microns (PM2.5) An applicability analysis has been prepared to predict that total mass of criteria pollutants that would be emitted by the proposed project. The results of that analysis are presented in table 3.

A list of all the equipment that would be used to construct the project was developed according to the tasks necessary for land clearing, construction, disposal, and attendant tasks. The tasks that would be take place outside the bounds of the PM2.5 non-attainment area (NAA) were removed from the analysis since they would not contribute to the total mass of pollutants emitted in the NAA. The NAA boundary in relation to project features is shown in figure 12

The number of hours that would be required to complete each task were estimated and broken down by year. The horsepower (HP) ratings of the specific equipment types required for each task were applied to the annual hour predictions to develop annual HP-hours. An emission factor for each criteria pollutant was applied to the HP-hour product before applying a grams-to-tons multiplier to generate the annual tonnage estimate. This produced a “worst-case scenario” of the potential annual emissions from the project because it included the maximum potential annual HP-hours for all tasks, including those that may not be performed concurrently. .

The *de minimus* threshold for PM2.5 in a serious non-attainment area is 70 tons/year. Federal projects with emissions that would not meet the *de minimus* threshold are exempted from general conformity requirements. The proposed project would result in a cumulative total of 7.424 tons/year on PM2.5 within the NAA, well below the *de minimus* threshold that would interfere with the State Implementation Plan (SIP).

The proposed project is exempted from general conformity due to the temporary nature of construction and low level of emissions from the inventory of mobile sources required for construction.

It is likely that woody vegetation cleared for the project would be released to the public and ultimately burned for residential heat, contributing to PM2.5 levels in the area. The removal of vegetation would also reduce carbon sequestration potential and contribute to increased atmospheric carbon.

Disposal of spoils in the Southern Disposal Area would require less vegetation be cleared and result in the combustion of little or no biomass due to the vegetation community present in the Southern Disposal Site. Confinement of vegetation removal to the Southern Disposal Area would result in less than significant impact to air quality.

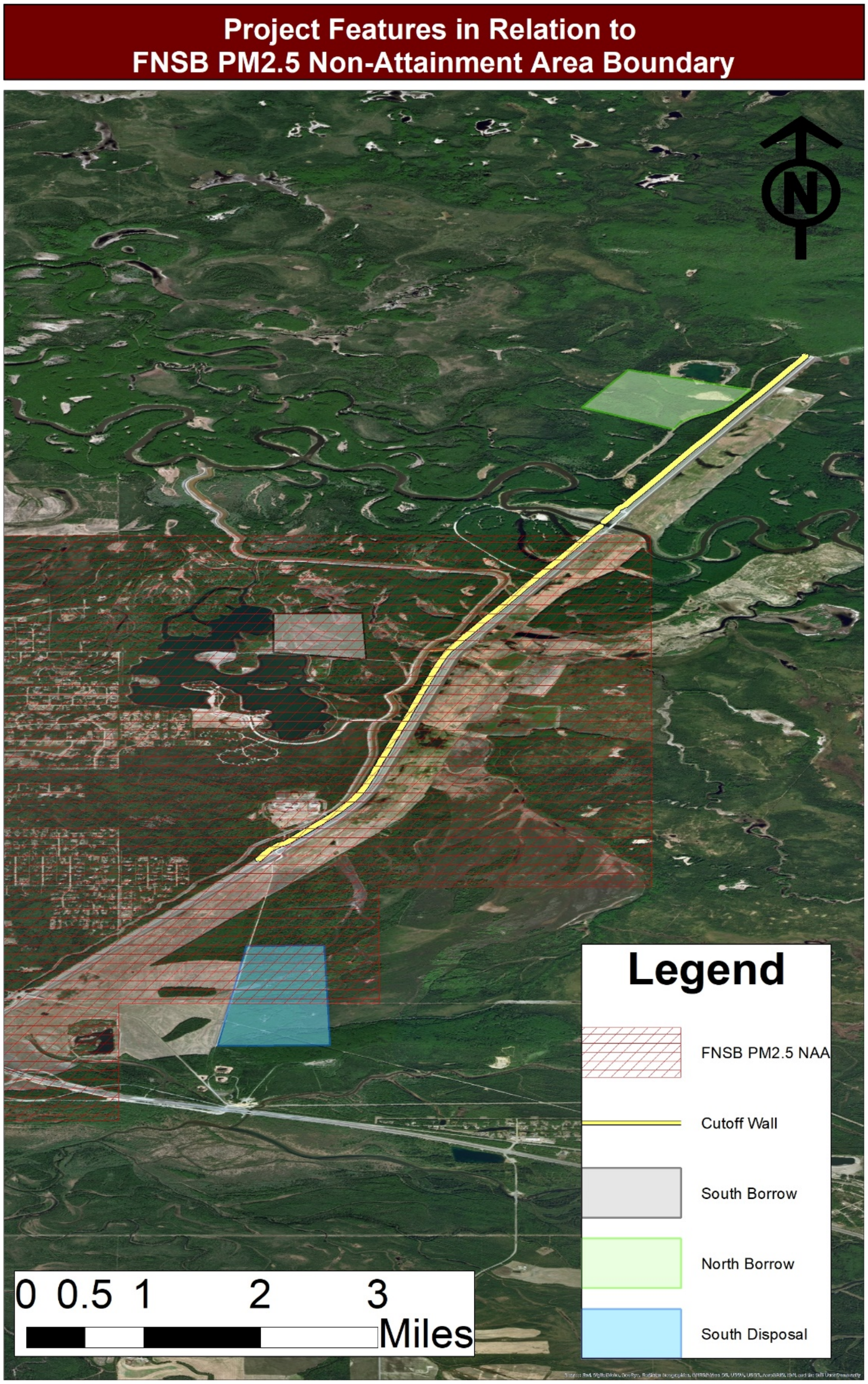

Figure 12 Project features with respect to FNSB PM2.5 NAA boundary

Table 3 Annual project emissions within the FNSB PM2.5 non-attainment area

Non-Attainment Area Emissions							
Type of Construction Equipment	**VOC tons/year**	**CO tons/year**	**Nox tons/year**	**PM10 tons/year**	**PM2.5 tons/year**	**SO2 tons/year**	**CO2 tons/year**
Water Truck	0.000	0.001	0.002	0.000	0.000	0.000	0.177
Diesel Road Compactors	0.039	0.158	0.523	0.036	0.035	0.079	57.237
Diesel Dump Truck	1.508	7.094	18.814	1.405	1.371	2.536	1836.868
Diesel Excavator	0.004	0.014	0.050	0.003	0.003	0.008	5.824
Diesel Bore/Drill Rigs	0.230	0.878	2.742	0.192	0.188	0.280	203.116
Diesel Cement & Mortar Mixers	0.053	0.203	0.637	0.042	0.041	0.064	46.367
Diesel Cranes	0.075	0.222	0.978	0.058	0.056	0.125	90.650
Diesel Graders	0.048	0.185	0.643	0.045	0.044	0.101	72.919
Diesel Tractors/Loaders/Backhoes	7.763	34.453	30.298	5.749	5.581	3.987	2900.150
Diesel Bull Dozers	0.001	0.004	0.014	0.001	0.001	0.002	1.609
Diesel Fork Lifts	0.124	0.484	0.534	0.087	0.084	0.059	43.095
Diesel Generator Set	0.032	0.100	0.159	0.019	0.019	0.022	15.621
Total	9.878	43.796	55.394	7.638	7.424	7.262	5273.633

No Action Alternative. Project conditions and operational procedures would continue in the current manner. The removal of large woody debris from the trash racks on the outfall structure and subsequent distribution of firewood cutting permits for the logs would continue, contributing to $PM_{2.5}$ concentrations during the winter months. No additional vegetation would be cleared and no additional vehicular traffic or construction related dust would occur.

The No Action Alternative would have no effect on air quality.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. It is difficult to predict the specific impacts to air quality that could result from a breach, but it is likely that infrastructure would be damaged and alter heating capabilities. Large amounts of debris would also be strewn across the area impacted by floodwaters. This could result in the combustion of materials such as unseasoned wood and rubbish in substandard devices such as barrels, BBQ grills, open pits, et cetera. The impact to air quality would be largely dependent on the time of year and extent of the breach. The Probable Maximum Flood is a rain on snow event when the ground is frozen, likely to occur in the springtime when inversions are uncommon.

The No Action Alternative with Dam Failure would have a less than significant impact on air quality due to the temporary nature of the impacts from the combustion of substandard materials in unsuitable vessels that may occur as a result of dam failure.

4.9 Water Quality

Preferred Alternative. Ground disturbing activities have the potential to incite erosion, which could have the effect of increasing turbidity. Best management practices will be employed to mitigate impacts from erosion. Vegetation clearing would not occur in any riparian corridor, so the project should not contribute to water temperature increase.

The proposed activity would not create any variation from current river elevation or significant impact to water quality.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. The project has a beneficial impact on water quality when flow exceeds 12,000 cfs and the control structure is actuated by reducing velocity and increasing settling time. A permanent pool is not retained above the dam, minimizing concerns of sediment starvation downstream.

The No Action Alternative would have no effect on water quality and river elevations.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. Dam failure would allow the flood pool to reach extents below the dam that are ordinarily subject only to precipitation runoff. Contact erosion would occur on a grand scale, suspending large amounts of sediment in the flood waters. Hazardous material containment systems not designed for floodwater inundation could breach, releasing materials into the pool.

The No Action Alternative with Dam Failure would have significant impacts on water quality and river elevation.

4.10 Floodplain

Preferred Alternative. The construction of a partial barrier wall would support a reduction in hazards and risks associated with floods and would reduce the impact of floods on human safety, health, and welfare. Disruption of the natural floodplain began with the construction of the Moose Creek Dike in 1948 and continued with Moose Creek Dam in 1981. Material needs for the project could generate up to 16,425 cubic yards of overburden bound for the South Disposal Area, inside the Chena River floodplain above the Dam.

The Moose Creek Dam does not maintain a pool and is only activated during events that would result in Chena River flow rates exceeding 12,000 cfs; effectively broadening the floodplain above the dam and severely constricting it below the dam. Manipulation of the floodplain in this manner creates a sediment deficit downstream of the dam and accelerates sediment accretion upstream of the dam. Disruption of the sediment balance will ultimately cause subsidence below the dam and uplift above it, but measurable changes in elevation will be manifested in a geologic temporal scale due to the relatively low sediment load in the Chena River and minimal duration of a flood pool. Remediation of the flaw would improve the integrity of the dam and reduce the risk of flood-induced floodplain alteration.

The preferred action alternative would present beneficial impacts to the floodplain.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. No organic material disposal within the floodplain would be required.

The No Action Alternative would have no effect on the floodplain.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. Dam failure would allow the flood pool to reach extents below the dam that are ordinarily subject only to precipitation runoff. Contact erosion would occur on a grand scale, suspending large amounts of sediment in the flood waters. Hazardous material containment systems not designed for floodwater inundation could breach, releasing materials into the pool. Sediment, as well as other materials suspended in the flood pool, would be deposited throughout the floodplain.

The No Action Alternative with Dam Failure would have a significant impact on the floodplain.

4.11 Vegetation

Preferred Alternative. The mix-in-place barrier wall would require the removal of vegetation for the disposal of organic material and excavation of gravel for attendant construction features such as temporary access ramps. The exact locations of the excavation would be determined pursuant to geotechnical investigation to determine gravel abundance. Preliminary assumptions are discussed forthwith. Excavation and staging in the North Borrow area would be confined to the previously cleared area along the North Seepage Collector Channel. The area is currently dominated by graminoids and has been burned in the past to be managed for moose and grouse habitat. The excavation in the North Borrow area would only cover 0.4 acres and adequate cleared land exists in the designated area for excavation and staging without additional woody vegetation removal.

The South Borrow area could be as large as three acres and require a 10 acre staging area. Opportunities exist to extensively utilize previously impacted areas in the vicinity of the Chena Lakes to minimize the impacts to vegetation of the gravel mining project component. The Alaska District would reduce the amount of vegetation clearing to the extent practicable in order to minimize the impacts of the proposed project on vegetation resources.

The disposal area upstream of the dam is collocated with a previously cleared area large enough to accommodate all of the excess material. This area is in the pioneering stage of regeneration and vegetation is sparse, mostly small alders.

The clearing of quarry and staging areas could require as much as 13 acres of vegetation removal. The vegetation communities affected by the land clearing operations for the spoils disposal are, as described by level IV of the Alaska Vegetation Classification (Viereck et al. 1992):

- Paper Birch (Closed)
- White Spruce or Black Spruce (Open)
- Tall Shrub
- White Spruce or Black Spruce (Woodland)
- White Spruce or Black Spruce (Open)
- Low Betula nana-Low Willow
- Deciduous Forest (Closed)
- Graminoid (Mesic)

The South Disposal Site, consisting of 188-acres, is south of the Chena River and is mainly characterized as low willow/dwarf birch; with a significant amount of spruce/deciduous land cover, as well as some tall shrub and open spruce. The North Borrow Area is adjacent to the North Chena Pond. It is dominated by mature stands of paper birch and white spruce, with some areas of stunted black spruce and ericaceous shrubs.

The expected volume of excess organic material produced during the construction of the mix-in-place barrier wall is 16,425 cubic yards. Distribution of 16,425 cubic yards of material in a five-foot thick layer would cover about two acres. A two acre portion of the South Disposal Area is recently disturbed, previously cleared, and is not connected to waters of the United States via surface water; making it the most environmentally favorable location for the disposal of organic material in the project area.

The South Disposal Area has existing road access and appears to be primarily colonized (~60 acres) by dwarf birch (*Betula nana)* and low willow *(Salix spp.).* The mound of excess material placed in the Disposal Area would be contoured to match natural grades and re-vegetated with native plant species. The site would be monitored to determine successful stabilization occurs after construction is completed.

Vegetation removal would be avoided and minimized to the extent practicable and would be conducted in the winter, resulting in less than significant impact to vegetation.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. The floodway and embankment would remain cleared in order to reduce resistance and allow safety inspections, respectively.

The No Action Alternative would have no effect on vegetation.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the dam would suddenly release the water impounded above the embankment and expose vegetation downstream to energy it is not adapted for. Trees could be uprooted, shrubs destroyed, and areas of herbaceous vegetation scoured away.

The No Action Alternative with Dam Failure would have a significant impact on vegetation.

4.12 Wetland Impacts

Preferred Alternative. Some of the areas impacted by disposal of spoils contain wetlands. A wetland delineation was conducted in September 2017 in order to verify the existence and distribution of wetlands meeting the parameters of appropriate hydrology, hydric soils, and hydrophytic vegetation. The largest potential impact to wetlands is the South Disposal Site; which contains 16.7 acres of palustrine wetlands (Figure 13). The Southern Disposal area is road accessible and parts have been previously cleared. Overburden material bound for this area would be configured to completely avoid wetland impacts.

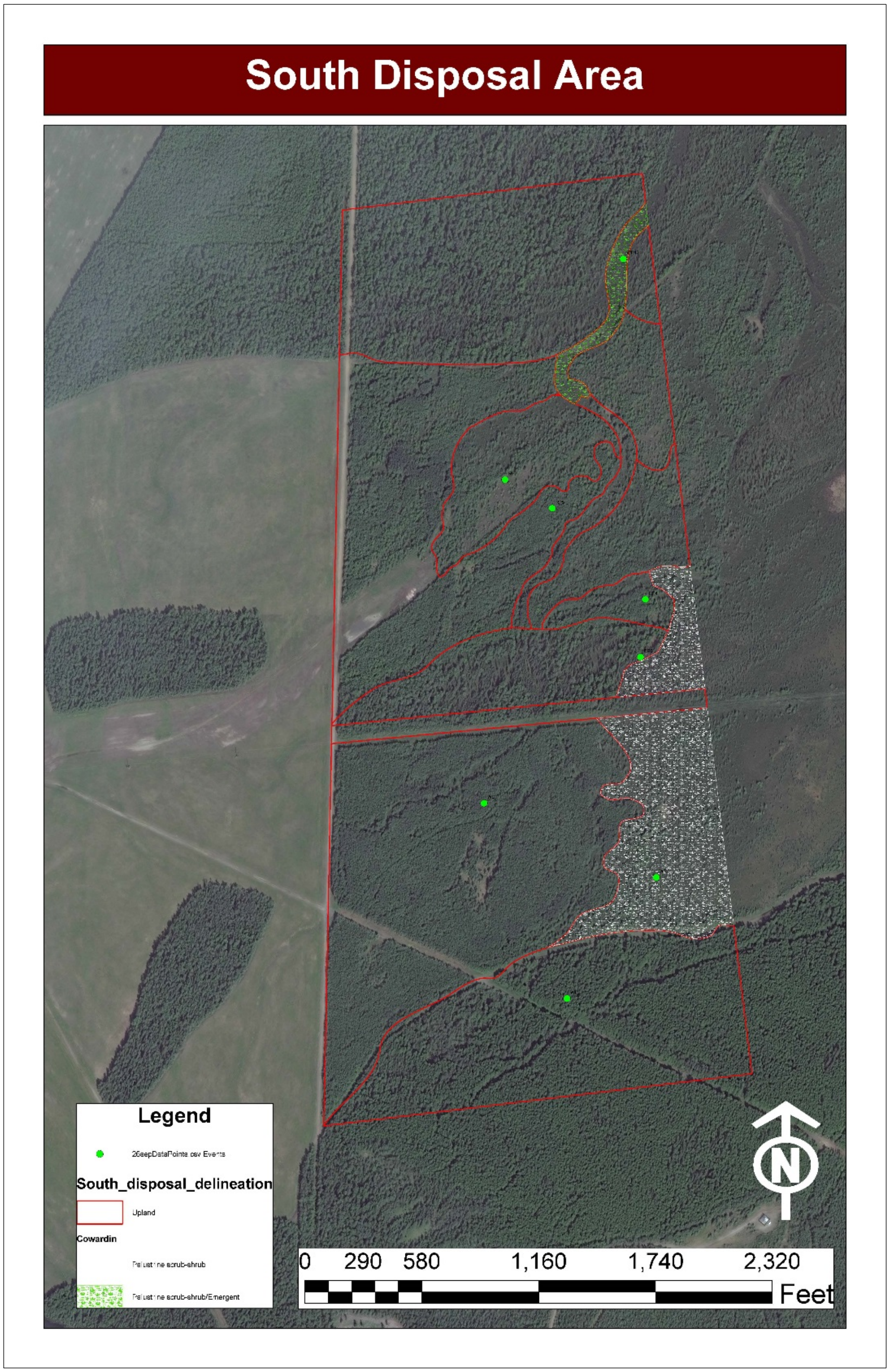

Figure 13 The South Disposal area covers 188 acres, including 16.7 acres of wetlands

The South Borrow location is 78 acres and contains 11.1 acres of wetlands (Figure 14). The planned excavation in this area would be an area of four acres, up to 35 feet deep. An additional area of up to 10 acres would be needed for staging. The excavation and staging in the South Borrow Area would be configured to completely avoid impacting wetlands. Groundwater in this area is relatively shallow and would infiltrate the excavated area, creating open water habitat. The quarry would be closed in accordance with local mining standards; featuring a shallow littoral zone at least 20 feet wide, irregular shoreline, two-to-four inches of organic material in the littoral zone to promote revegetation, and a 25 foot buffer of native vegetation to help filter sediment and pollutants before they enter the water. Organic and other suitable material generated from the land clearing would be reused to the extent practicable to enrich the reclaimed quarry and increase primary productivity potential. The area would be monitored after construction to determine successful reclamation.

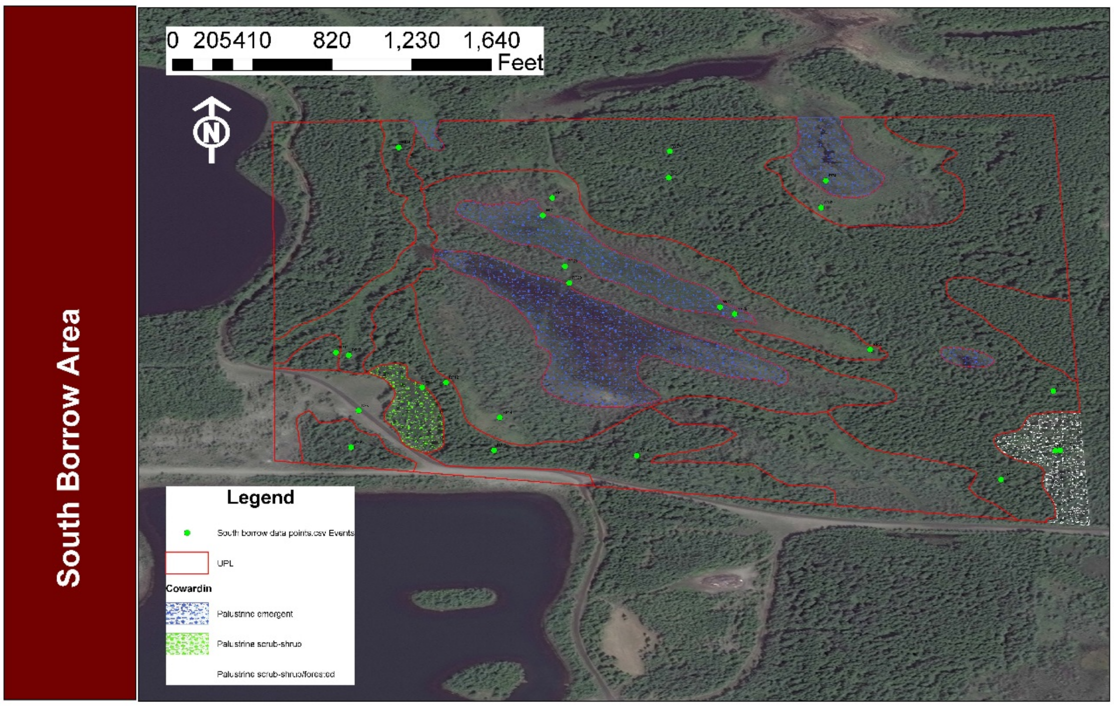

Figure 14 The South Borrow area covers 78 acres, including 11.1 acres of wetlands

The North Borrow (Figure 15) area is located near the North Chena Pond, a flooded gravel quarry from the construction of the dam. This area covers 109 acres, all of which is uplands. An area covering 0.4 acres would be quarried to a maximum depth of 35 feet to produce construction materials. Additional area would be needed for staging. Groundwater in this area is relatively shallow and would infiltrate the excavated area, creating open water habitat. The quarry would be closed in accordance with local mining standards; featuring a shallow littoral zone at least 20 feet wide, irregular shoreline, two-to-four inches of organic material in the littoral zone to promote revegetation, and a 25 foot buffer of native vegetation to help filter sediment and pollutants before they enter the water. Organic and other suitable material generated from the land clearing would be reused to the extent practicable to enrich the reclaimed quarry and increase primary productivity potential.

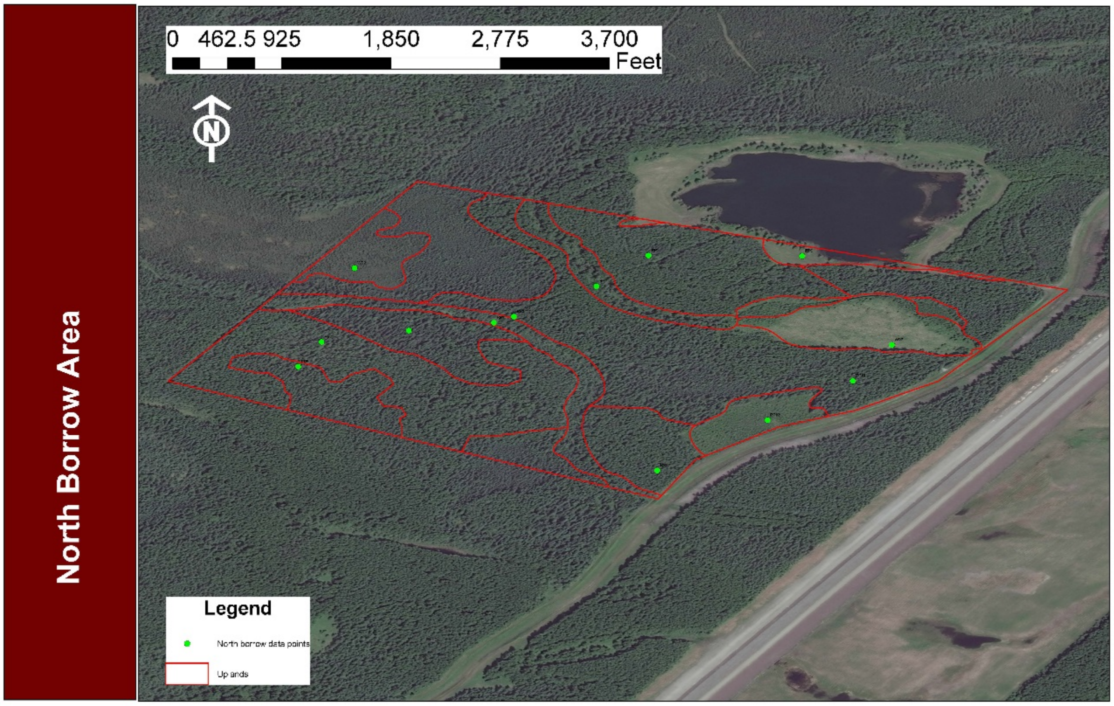

Figure 15 The North Borrow and Disposal area is 109 acres of uplands.

Discharge of spoils material would be configured to avoid wetlands in either the North or South Disposal areas. The proposed project would have a beneficial impact on wetlands due to the creation of additional wetlands in proximity to existing wetlands.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. The small area of fragmented wetlands at the downstream slope of the dam would retain the current source of wetland hydrology.

The No Action Alternative would have no effect on wetlands.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the dam would rapidly release the water impounded above the embankment and expose vegetation downstream to energy it is not adapted for. Trees could be uprooted, shrubs destroyed, and areas of herbaceous vegetation scoured away. Contact erosion could carve channels through palustrine areas below the dam, permanently altering the hydrology. Much of the wetland area below the dam can be characterized as palustrine forested/shrub, likely dominated by *P. mariana*; the roots of which exist primarily within the upper 7.8 inches of the organic horizon. This shallow root system coupled with saturated soil conditions would likely afford little resistance to energetic flood flows and result in large areas of uprooted trees, altering the wetland vegetation community distribution throughout the region.

The No Action Alternative with Dam Failure would have a significant impact on wetlands.

4.13 Fish

Preferred Alternative. The proposed activity is not expected to have a deleterious effect on fish, provided the best management practices required by the National Pollutant Discharge Elimination System (NPDES) are employed to protect water quality. The construction of a partial barrier wall would not directly impact anadromous fish habitat, as the only aquatic area impacted is immediately downstream of the low-point drain 5,100 feet south of the outlet control structure. This area is part of the South Seepage Collector Channel and fish access from the Chena River is restricted by a weir at the confluence of the Channel and the Chena River. Review of the Alaska Department of Fish and Game (ADF&G) Anadromous Fish Catalog indicates Chinook and Chum Salmon are present in the Chena River, both upstream and downstream of the outlet control structure, but they are unreported in the collector channel. Discussion with the Habitat Division of the Alaska Department of Fish and Game's Fairbanks office on 18 October 2016 indicated that a fish habitat permit would not be required.

The construction of a centerline barrier wall and associated disposal of spoils would not have a significant impact on fish.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. The fish ladder at the Chena River Lakes Flood Control outlet works has been activated twice during its operational history and performed well both instances. A weir at the confluence of the South Seepage Collector Channel (SSCC) prevents fish from leaving the Chena River at its confluence with the SSCC. Restriction of the flow through the outlet control structure to raise pool height can have the effect of stranding fish in low points after the pool is drained, but a naturally occurring flood would have the same effect.

The No Action Alternative has no effect on fish.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the dam would rapidly release the water impounded above the embankment and expose aquatic habitat to high levels of energy. Flood flows could reshape the bottom elevation of the Chena River, destroying, creating, and translocating fish habitat. Salmon spawning habitat is primarily up-river from the dam, but numerous other species whose spawning requirements are less understood are present in the Chena River. The release of hazardous materials into the aquatic environment that would likely accompany a breach in the dam would have a deleterious impact on fish. The relatively clear water of the Chena River would become very turbid as velocities were elevated and sediments suspended, impeding feeding attempts of native fish.

The No Action Alternative with Dam Failure would have a significant impact on fish.

4.14 Mammals

Preferred Alternative. Proposed vegetation removal would result in the loss of up to 13-acres of feeding and other general use habitat. The affected habitat is not identified as particularly valuable and is similar to other habitat abundant in the area. Loss of this habitat would be of no more than minor importance to local and regional populations of any affected species.

The construction of a centerline barrier wall and associated disposal of organic material would not have a significant impact on mammals.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. The floodway and embankment would remain cleared of vegetative habitat and human activity in the area would prevent the more wary animals from using the wooded areas adjacent to the Chena Lakes recreation area, walking trails, and project office.

The No Action Alternative would have no effect on mammals.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the dam would violently release the water impounded above the embankment and expose terrestrial habitat to high levels of energy. The probable timing of a breach event is coincidental with moose calving and birthing of smaller mammals. Newborn young and nursing mothers may be more vulnerable to death by drowning than mature animals.

The No Action Alternative with Dam Failure would present significant impacts to mammals.

4.15 Birds

Preferred Alternative. Vegetation clearing for disposal and quarry sites could result in the loss of up to 13-acres of woodland and shrub habitat, the majority of which is closed deciduous forest, Dwarf birch/Willow shrub land and Spruce forest.

Bald eagles nest in large trees bordering water, there is not suitable bald eagle nesting habitat in the areas proposed for clearing.

Upland Sandpipers and Short eared owls may find the grassy areas managed for grouse and moose browse suitable for nesting.

Fox Sparrows are common in the project area during the breeding season and often nest on the ground beneath low shrubs, such as the relict sloughs and other lowlands in the projects area.

Olive sided flycatchers and solitary sandpipers nest in trees like those found in the large areas of upland forests.

Lesser yellowlegs nest on the ground in open upland areas; the clearing around the North Chena Pond may provide suitable nesting habitat.

Rusty blackbirds may use the moist areas, wetlands, and black spruce woodlands for nesting.

Osprey and red-tailed hawk may benefit from the creation of additional cleared area and open water habitat due to the predation opportunities they provide.

Common ravens would not be impacted by the proposed project due to their opportunistic nature and ability to adapt to environmental changes and anthropogenic influences.

Short-eared Owls and Whimbrels are not expected to be encountered in any of the project areas; they are generally found in tundra, mudflats, and other open wetland habitats.

Vegetation clearing would be limited to periods when birds are not expected to be nesting in the action area (1 May -15 July by USFWS guidance) in order to avoid the taking of migratory or other birds.

Observation of USFWS vegetation removal timing window would result in less than significant impacts on birds.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. The floodway and embankment would remain cleared in order to reduce resistance and allow safety inspections, respectively. Anthropogenic activities would be sustained at current levels, allowing birds acclimated for those conditions to continue to use the area and denying access to more wary birds.

The No Action Alternative would have no effect on birds.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the dam would violently release the water impounded above the embankment and expose vegetation downstream to energy it is not adapted for. Trees could be uprooted, shrubs destroyed, and areas of herbaceous vegetation scoured away. The timing of the dam failure would determine the extent of the impact to birds; failure during nesting or fledging would almost certainly create significant prenatal and neonatal mortality, but a failure outside of those periods would have very little impacts on birds.

The No Action Alternative with Dam Failure could have a significant impact on birds if the breach occurred during nesting or fledging.

4.16 Historic and Other Cultural Resources.

Preferred Alternative. Review of the Alaska Heritage Resources Survey and an archaeological survey conducted for the initial construction of the Moose Creek Dam published on December 18, 1979 indicated no historic properties would be affected by work in any of the project areas (Yarborough, 1978). Ground disturbing activities in the disposal area could uncover previously undocumented sites. Failure to implement the measures presented in the Moose Creek Dam Safety Modification Report would endanger cultural resources outside the immediate action area by failing to reduce potential for dam failure and flooding.

The construction of a partial barrier wall has the potential to affect, by virtue of ground disturbing activities conducted during spoils disposal, but is not expected to affect cultural resources. Section 106 consultation with the State Historic Preservation Officer will be initiated one year prior to the start of construction in order to obtain concurrence on the Corps' determination that no historic properties would be effected.

No Action Alternative. Project conditions and operational procedures would continue in the current manner. Maintenance of cleared areas would persist, but no additional areas would be disturbed. No alterations of existing viewsheds would occur.

The No Action Alternative would have no effect on cultural resources.

No Action Alternative with Dam Failure. Project conditions and operational procedures would continue in the current manner. A breach of the Moose Creek dam would threaten known and undiscovered cultural resource downstream of the dam. A review of the Alaska Heritage Resources Survey (AHRS) database conducted on 17 November 2016 indicated that over 1,000 properties in the area inundated by a dam breach at maximum high pool could be at risk in the event of dam failure.

The No Action Alternative with Dam Failure would have a significant impact on cultural resources.

4.17 Climate Change

Preferred Alternative. The construction of a partial barrier wall would require the operation of carbon producing equipment such as the trenching machine, dump trucks, and other earth-moving equipment. Gravel mining operations could require vegetation to be cleared from up 13-acres, slightly reducing the carbon sequestration potential of the project area. Cleared vegetation would likely be burned onsite or by private citizens for residential heat through the issuance of firewood permits; releasing carbon into the atmosphere. Impacts to climate change would be minimized by restricting vegetation clearing to the smallest areal extent practicable within the southern borrow area. This restriction would minimize the impact to carbon sequestration capacity by avoiding clearing large trees, as well as reduce the amount of carbon released into the atmosphere through combustion.

The preferred alternative would have a less than significant impact on climate change

No Action Alternative. Project conditions and operational procedures would continue in the current manner. Maintenance of cleared areas would persist, but no additional areas would be disturbed.

The No Action Alternative would have no effect on climate change.

No Action Alternative with Dam Failure. Failure of the Moose Creek Dam would likely damage areas of vegetation downstream of the dam, reducing carbon sequestration potential. Recovery efforts would recruit carbon producing equipment, resulting in elevated generation of greenhouse gasses during the time after dam failure. These effects would be temporary and related to the damages caused by flooding.

The No Action Alternative with Dam Failure would have less than significant impacts on climate change.

4.18 Cumulative Effects

Cumulative environmental effects for the proposed project were assessed in accordance with guidance provided by the President's Council on Environmental Quality (CEQ). Cumulative effects are defined in 40 CFR 1508.7 as those effects that result from:

> *...the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

Interior Alaska is an area of the Nation with generally very low levels of development. Government, including the military, is the single largest employer. The F35 Joint Strike Fighter bed down project will be bringing as many as 5,000 service members and their families to Eielson AFB and many of them will likely settle in the North Pole area, due to its proximity to the Air Force Base. Eielson will be concurrently divesting in the F16 program, relieving some of the housing and infrastructure burden associated with the influx of F35 personnel. The US Air Force's F35A Operational Beddown-Pacific Final EIS indicated that there would not be a shortage of suitable housing units to support short-term construction personnel and in the long-term, military families and unaccompanied personnel. The Air Force Housing Requirements and Market Analysis identified that no new privatized housing would be needed on Eielson AFB to support the F35 beddown proposal.

Some large mining projects are proximal to the project location and two liquid natural gas pipelines are under development whose routes would likely pass through Fairbanks; but the high percentage of publicly held lands in the region, coupled with very low population density, large proportion of wetlands relative to areas suitable for development, undeveloped transportation infrastructure, and extreme winter weather would support the assumption that development levels are unlikely to increase dramatically in the foreseeable future.

The cumulative effects of the construction of a partial barrier wall are less than significant.

5.0 ENVIRONMENTAL COMPLIANCE

The Preferred Alternative was considered in relation to compliance with Federal environmental review and consultation requirements. The following paragraphs document compliance with applicable Federal statutes, Executive Orders, and policies.

BALD AND GOLDEN EAGLE PROTECTION ACT, AS AMENDED

This act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Disturbance of eagles can include any action causing interference with normal breeding, nesting, or feeding activities.

The Corps will survey the area around the project site for active or potential eagle nests, and coordinate further with the USFWS as needed. Removal of the North Disposal Site on the banks of the Chena River upstream of the dam significantly reduced the potential to impact bald eagle nests.

CLEAN AIR ACT OF 1963, AS AMENDED

The proposed barrier wall project is partially within the Fairbanks North Star Borough PM2.5 serious non-attainment area. The proposed project constitutes a Federal project requiring a general conformity analysis, unless exempted. The Alaska District is conducting an applicability analysis to substantiate the preliminary determination that the project is exempted from general conformity requirements. Coordination with the Alaska Department of Environmental Conservation Air Quality Division is ongoing.

CLEAN WATER ACT OF 1972, AS AMENDED

The objective of the Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act (CWA) of 1977 (Public Law 92-500), is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Specific sections of the CWA control the discharge of pollutants and wastes into aquatic and marine environments.

The project, as proposed, does not fall within the jurisdiction of the CWA because there would be no discharge of fill materials into waters of the United States (WOUS) or wetlands. A wetland delineation was performed in September 2017 to verify the boundaries of the wetlands mapped by the National Wetland Inventory (NWI) online mapping utility.

The project is in compliance with the Clean Water Act.

COASTAL BARRIER RESOURCES ACT

This Act is not applicable. The study area is not in a designated Coastal Barrier Resources Act unit.

COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED

As of July 1, 2011, the CZMA Federal consistency provision no longer applies in Alaska. Federal agencies shall no longer provide the State of Alaska with CZMA Consistency Determinations or Negative Determinations pursuant to 16 U.S.C. 1456(c)(1) and (2), and 15 CFR part 930, subpart C. Persons or applicant agencies for Federal authorizations or funding shall no longer provide to the State of Alaska CZMA Consistency Certifications pursuant to 16 U.S.C. 1456(c)(3)(A), (B) and (d), and 15 CFR part 930, subparts D, E and F. Because the CZMA Federal consistency provisions no longer apply in Alaska, consistency determinations from Federal agencies and consistency certifications from applicants for Federal authorizations or funding that are currently pending ACMP response are no longer required to receive a response from the ACMP and may proceed in accordance with other applicable law and procedures.

ENDANGERED SPECIES ACT OF 1973, AS AMENDED

Species listed under the Endangered Species Act of 1973 are not present in the project area and would not be affected by the construction of the preferred alternative. Please see Appendix A for the Species List.

ESTUARY PROTECTION ACT OF 1968

No estuaries under the Act are in the project area. The Chena River contributes to the Tanana River watershed, which flows into the Yukon River and flows into the Bering Sea over 800 river miles downstream. Failure of the dike, a possibility under the No Action Alternative, could severely adversely impact the Tanana River and possibly the Middle Yukon River, but impacts to water chemistry and associated environmental resources would likely be diminished below measurable thresholds before reaching the Yukon River Estuary. The preferred alternative would not negatively affect estuaries. The project is in compliance.

FISH AND WILDLIFE COORDINATION ACT OF 1958, AS AMENDED

The Fish and Wildlife Coordination Act (FWCA) requires the Corps to consult with the USFWS whenever the waters of any stream or other body of water are proposed to be impounded, diverted, or otherwise modified. The Act authorizes USFWS to take the lead in consultation to conduct surveys and investigations to determine the possible damages of proposed actions on wildlife resources, and to make recommendations to the Corps regarding measures to prevent the loss or damage to wildlife resources, as well as regarding the development and improvement of such resources. The Corps is authorized to transfer funds to USFWS to carry out these investigations. The Corps is required give full consideration to the reports and recommendations of the wildlife agencies and include such justifiable means and measures for wildlife mitigation or enhancement as the Corps finds should be adopted to obtain maximum overall project benefits.

Informal coordination between the Environmental Resources section of the Alaska District and the Fairbanks field office of the USFWS began in September of 2016. The USFWS does not believe that formal coordination or a Coordination Act Report (CAR) is necessary for the level of impacts currently associated with the proposed project, but reserves the right to elevate their involvement in the event the project changes or new impacts are discovered prior to construction. The project is in compliance with the Fish and Wildlife Coordination Act.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The National Oceanic and Atmospheric Administration, National Marine Fisheries Service works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. Essential fish habitat (EFH) has been described for approximately 1,000 managed species to date. Chinook and Chum salmon are federally managed species and their important habitat in the project are is below the ordinary high water mark of the Chena River. The Alaska Department of Fish and Game (ADF&G) administers the freshwater essential fish habitat through the issuance of Fish Habitat permits. Telephonic coordination with the ADF&G's Fairbanks field office in October 2016 confirmed the proposed activity would not affect freshwater EFH and a Fish Habitat permit would not be required.

The project is in compliance with the Magnuson-Stevens Act.

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED

This Act is not applicable. Ocean disposal of dredged material is not proposed as a part of this project.

MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

Under the Migratory Bird Treaty Act, project construction shall not destroy migratory birds, their active nests, their eggs, or their hatchlings. Monitoring for such would be required by the construction contractor. A buffer zone around active nests or nestling activity would be required during the nesting season. Vegetation removal would be conducted in accordance with the US Fish and Wildlife Service's Timing Recommendations for Land Disturbance and Vegetation Clearing for Interior Alaska; no clearing between 1 May and 15 July.

This project is in compliance with these Acts.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969, AS AMENDED

This Act requires that environmental consequences and project alternatives be considered before a decision is made to implement a Federal project. NEPA established the requirements for preparation of an Environmental Impact Statement (EIS) for projects potentially having significant environmental impacts and an Environmental Assessment (EA) for projects with no significant environmental impacts. This EA has been prepared to address impacts and propose avoidance and minimization steps for the proposed project, as discussed in the CEQ regulations on implementing NEPA (40 CFR 1500 et seq.).

NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

The purpose of the National Historic Preservation Act (NHPA) is to preserve and protect historic and prehistoric resources that may be damaged, destroyed, or made less available by a project. Under this Act, Federal agencies are required to identify cultural or historic resources that may be affected by a project and to consult with the State Historic Preservation Officer (SHPO) and other interested parties when a Federal action may affect cultural resources.
The Area of Potential Effect (APE) has been assessed by the Alaska District archeologist. The Corps has determined that no historic properties will be affected by the proposed activities, and will complete NHPA coordination prior to construction.

RIVER AND HARBOR APPROPRIATION ACT OF 1899
The project is in compliance. The proposed work would not obstruct navigable waters of the United States.

STATE OF ALASKA ANADROMOUS FISH ACT (AS 16.05.871-901) and FISH PASSAGE ACT (AS 16.05.841)
ADFG has the statutory responsibility for protecting freshwater anadromous fish habitat and providing free passage for anadromous and resident fish in fresh water bodies. An individual or government agency notifies and obtains authorization from the ADFG Division of Habitat for activities within or across a stream used by fish if it is determined that such uses or activities could represent an impediment to the efficient passage of resident or anadromous fish. The ADFG may issue a Fish Habitat Permit (FHP).

UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970 (PUBLIC LAW 91-646)
The Preferred Alternative does not require the procurement of private lands for public use. The provisions of this Act do not apply to the project.

WILD AND SCENIC RIVER ACT OF 1968, AS AMENDED
No rivers designated under the Act are in the project area. This Act is not applicable.

EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS
The Preferred Alternative would not result in impacts to wetlands. If wetland impacts are determined to be unavoidable as the project progresses, analyses under Section 404(b)(1) will be performed to determine mitigation requirements to ensure the project is not contrary to the public interest. The EA is in compliance with the goals of this Executive Order (EO).

EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT
The Preferred Alternative would directly support a reduction in hazards and risks associated with floods and would minimize the impact of floods on human safety, health and welfare.

A comment was made during the IEPR suggesting the proposed project could indirectly contribute to the occupation of the base floodplain. Coordination with the Fairbanks North Star Borough Floodplain Administration indicated there would be no change to zoning downstream of the dam as a result of the Dam Safety Modification. The majority of the area below the dam is in Flood Zone X Protected by Levee and there is no indication that would change as a result of the project. Floodplain coordination will be initiated with the Federal Emergency Management Agency to confirm the lack of mapping changes as a result of the project. Absent a change to zoning or floodplain mapping, the proposed project is not expected to directly or indirectly encourage the development of the base floodplain. The study is in compliance.

EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE
EO 12898 requires agencies of the Federal Government to review the effects of their programs and actions on minorities and low-income communities. There are no low-income or minority communities in the project area. The Preferred Alternative would help to ensure the safety of those communities within the study area as well as residents living within the area anticipated to be impacted in the event of a project failure. In addition to ensuring the safety and well-being of residents and their property, implementation of the Preferred Alternative may have a significant beneficial effect on local communities through job creation, increased sale of construction material and other goods necessary to sustain a large construction force for the duration of the project. This project is not expected to have disproportionately high and adverse human health or environmental impacts on minority or low-income populations.

EXECUTIVE ORDER 13045, PROTECTION OF CHILDREN
EO 13045, requires each Federal agency to "identify and assess environmental risks and safety risks [that] may disproportionately affect children" and ensure that its "policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." This project has no environmental or safety risks that may disproportionately affect children. The project is in compliance.

EXECUTIVE ORDER 13653, CLIMATE CHANGE CONSIDERATIONS
EO 13653 requires Federal agencies to review the effect of climate change on their programs. For this project, climate change is likely to affect water management operations of Chena River watershed above the dam. Under present hydrologic and climatologic conditions, the Chena River Lakes Flood Control project is operated to prevent flows from exceeding 12,000 cfs in downtown Fairbanks. Warming temperatures could have the effect of reducing snow accumulation during the winter months and altering precipitation patterns throughout the year. Melting permafrost could open additional seepage pathways under the dam and improve hydraulic conductivity, exacerbating the subsurface condition requiring the remedy discussed in this report. Climate change could increase or decrease the frequency and magnitude of large storm events and increase evapotranspiration from the drainage area above the dam. The effectiveness of the partial barrier wall alternative discussed in this EA will not be compromised by climate change impacts associated with increased evapotranspiration since soil saturation levels are likely to be lower as a result. However, the effectiveness of the dike renovation efforts may be adversely impacted by potential climate change impacts associated with increased frequency and magnitude of large storm events which could result in more extreme high precipitation events which would put more stress on the dam. At present, there is no published or widely accepted projection of climate change related variance in storm event magnitude and frequency in Interior Alaska so per USACE Engineering and Construction Bulletin No. 2014-10, the

design of dike renovation alternatives has been based on historic extreme event climatic conditions. The Chena River Lakes Flood Control Project has man controlled release rates, therefore each alternative for rehabilitation of the embankment would not be directly affected by sea level rise. If storms become stronger, rehabilitation of the embankment would provide more stability for life safety and resource protection with implementation of the project. The project is in compliance.

6.0 AGENCY AND PUBLIC INVOLVEMENT

6.1 Public Involvement

A notice of availability and draft FONSI will be circulated to the public in September 2018. The document will be posted on the Alaska District's Reports and Studies webpage and disseminated to appropriate State, local, and Federal agencies, Tribal organizations, and other interested parties.

The Dam Safety Modification Report (USACE 2018) is classified For Official Use Only (FUOU) and will only be circulated as needed.

6.2 Agency Coordination

A 30 day agency scoping invitation beginning 1 November 2017 was distributed to 17 points of contact at the following agencies to elicit comments regarding the scope of issues addressed in the Environmental Assessment and identify important issues relating to the proposed project:

- Alaska Department of Environmental Conservation, Stormwater and Wetlands
- Alaska Department of Environmental Conservation, Contaminated Sites
- Alaska Department of Environmental Conservation, Drinking Water Program
- Alaska Department of Fish and Game, Habitat Division
- Alaska Department of Natural Resources, Division of Land, Mining, and Water
- Alaska Department of Natural Resources, State Historic Preservation Office
- US Environmental Protection Agency, Aquatic Resources Unit
- National Marine Fisheries Service, Habitat Conservation Division
- US Fish and Wildlife Service, Ecological Services Division

Comments were received from ADEC Stormwater and Wetlands, ADEC Contaminated Sites, and the FNSB Floodplain Administration. Those comments are included as Appendix B.

Informal coordination consisting primarily of phone calls began in September of 2016.

Alaska Department of Fish and Game (ADFG)

A phone call describing the project was placed to ADFG Fairbanks field office on 18 October 2016. Conversation with Jack Winters indicated a fish habitat permit would not be required for the construction of a partial barrier wall.

Alaska Department of Natural Resources, Office of History and Archaeology (ADNR, OHA)

The Corps has made use of online resources offered by this office to study potential impacts of the project and develop a determination of effect, but has not yet sent a letter of determination to the State Historic Preservation Officer as required under Section 106 of the NHPA. Standard practice for the District Archaeologist is to obtain concurrence from the State Historical Preservation Office (SHPO) within a one year window prior to beginning construction.

U.S. Fish and Wildlife Service (USFWS)

The Corps used the USFWS's Information for Planning and Conservation (IPaC) online utility to define an area of interest and generate a species list on 18 September 2018. The species list indicated no species listed under the Endangered Species Act (ESA) were present in the project area and described other resources of concern such as migratory birds and wetlands.

A phone call describing the project was placed to the USFWS Fairbanks field office on 21 November 2016. Conversation with Bob Henzey indicated the USFWS would not have concerns with the project as described and did not believe the preparation of a formal Fish and Wildlife Coordination Act Report would be required for a project with a level of impact as the construction of a partial barrier wall would have. The USFWS was provided with a draft copy of the EA in order to provide early comments.

7.0 PREPARERS AND ACKNOWLEDGEMENTS

Matt Ferguson, biologist, Alaska District Corps of Engineers

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Fairbanks Fish And Wildlife Conservation Office
101 12th Avenue
Room 110
Fairbanks, AK 99701-6237
Phone: (907) 456-0203 Fax: (907) 456-0208

In Reply Refer To: September 18, 2018
Consultation Code: 07CAFB00-2016-SLI-0190
Event Code: 07CAFB00-2018-E-00680
Project Name: Moose Creek Dam Safety Modification

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Fairbanks Fish And Wildlife Conservation Office
101 12th Avenue
Room 110
Fairbanks, AK 99701-6237
(907) 456-0203

Project Summary

Consultation Code: 07CAFB00-2016-SLI-0190

Event Code: 07CAFB00-2018-E-00680

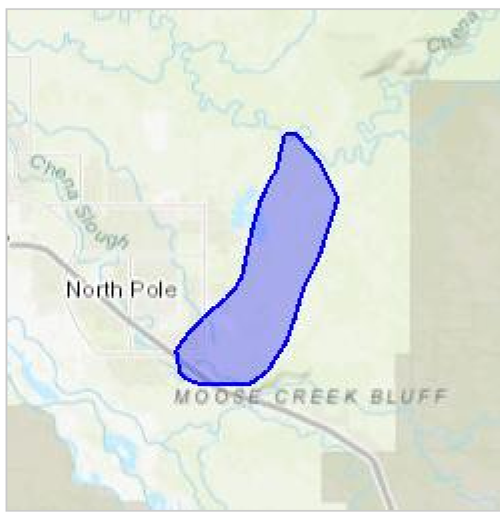
Project Name: Moose Creek Dam Safety Modification

Project Type: DAM

Project Description: Construct partial barrier wall using Trench cutting and Re-mixing Deep (TRD) method in order to reduce flood risk at USACE Chena Flood Control Project

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/64.76070901648538N147.20488529743818W



Counties: Fairbanks North Star, AK

Endangered Species Act Species

There is a total of 0 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

November 1, 2017
Ladies and Gentleman:

Re: Moose Creek Dam Safety Modification
North Pole, Alaska

The US Army Corps of Engineers, Alaska District, proposes to construct a dam safety modification on the Chena Flood Control Project near North Pole, Alaska (Figure 1). The project is needed to reduce dam failure risk associated with geotechnical conditions that pose unacceptable risk to human life, property, and the environment in exceedance of the USACE Tolerable Risk Guidelines (TRG).

The Moose Creek Dam Safety Modification Report (USACE 2016) describes the following three potential failure modes:

- Backward erosion and piping of a continuous fine sand or silty sand layer with vertical exit at the toe of the downstream stability berm
- Backward erosion and piping of a continuous fine sand or silty sand layer with horizontal exit in the South Seepage Collection Channel
- Contact erosion of a continuous fine sand or silty sand layer through open work gravels with horizontal exit in the South Seepage Collection Channel

The District proposes to begin construction no earlier than 2020. The proposed action is intended to present a permanent remedy to the identified failure modes.

The Alaska District's preferred alternative is a mix-in-place cutoff wall. It consists of a mix-in-place partial cutoff wall in Reaches 4, 5, 6, 8 and 9, two quarries, two disposal areas, and seven weirs. The cutoff wall is located on the crest of the dam slightly upstream of the centerline where it extends through the semi-pervious core, is subjacent to the Types II and III fill, and avoids penetrating the select gravel drain.

The centerline cutoff wall would run longitudinally down the center of the existing dam and could affect reaches 4, 5, 6, 8, and 9. A centerline cutoff wall would not require the clearing of any vegetation for the construction of the wall; however, vegetation clearing may be required for the disposal of spoils material and excavation of gravel for construction (Figure 2).

The total volume of spoils requiring disposal is a function of the displacement of dam and foundation material through the injection of grout and is predicted to be 10,000 to 20,000 cubic yards. A total of 375 acres have been designated as possible quarry and disposal areas, but the level of impact to these areas will not be determined until quantities are predicted during subsequent stages of project planning. The quarry and disposal sites north of the Chena River are collocated. The southern quarry is adjacent to Chena Lakes and the southern disposal area lies above the dam, east of the floodway.

The seven weirs would be constructed in the north and south seepage collector channels to more accurately assess and locate seepage. (Figure 3) These channels are man-made features excavated during dam construction in the 1970s. The north seepage collector channel holds a little water in its southern extent, while the south seepage collector channel is usually full of water. High flows in the Chena River can overtop the existing weir at the end of the south seepage collector channel, intermittently connecting the channel to the anadromous Chena River. The weir construction would include earthen berms to confine flow and new connector channel. The berms and new channel would require vegetation clearing, excavation, and filling.

Three temporary access ramps would be constructed to provide construction access to the crest of the dam. The locations of those ramps has not yet been identified.

Resources that have been identified as potentially effected by the construction of the cut off wall, weirs, and attendant features are noise, wetlands, vegetation, migratory birds, soils, hydrology, fish, terrestrial mammals, recreation, land use, socioeconomics, air quality, water quality, floodplain, cultural resources, and climate change. The proposed action is expected to have a less than significant impact on these resources and will be addressed in an Environmental Assessment in compliance with the National Environmental Policy Act. The draft EA is scheduled to be completed by December 1, 2017.

As part of the process for determining the scope of issues to be addressed in the Environmental Assessment and for identifying the important issues related to the proposed action, we request your comments on the above issues and any other issues that you can identify as important. We intend to use your comments to:

- Identify the range of alternatives and impacts and the important issues to be addressed in the Environmental Assessment.
- Identify and eliminate from detailed study the issues which are not important or which have been covered by prior environmental review.
- Identify other environmental review and consultation requirements.

We request your comments by December 1, 2017. If you do not reply by that date, we will assume that you have no comments at this stage of project development. If you have any questions regarding the enclosed, please contact me at 907-753-2711 or by email at matthew.w.ferguson@usace.army.mil.

Respectfully,

Matt Ferguson, Biologist
Environmental Resources Section
USACE, Alaska District
907-753-2711

Moose Creek Dam Location Map

Figure 1. Moose Creek Dam location map

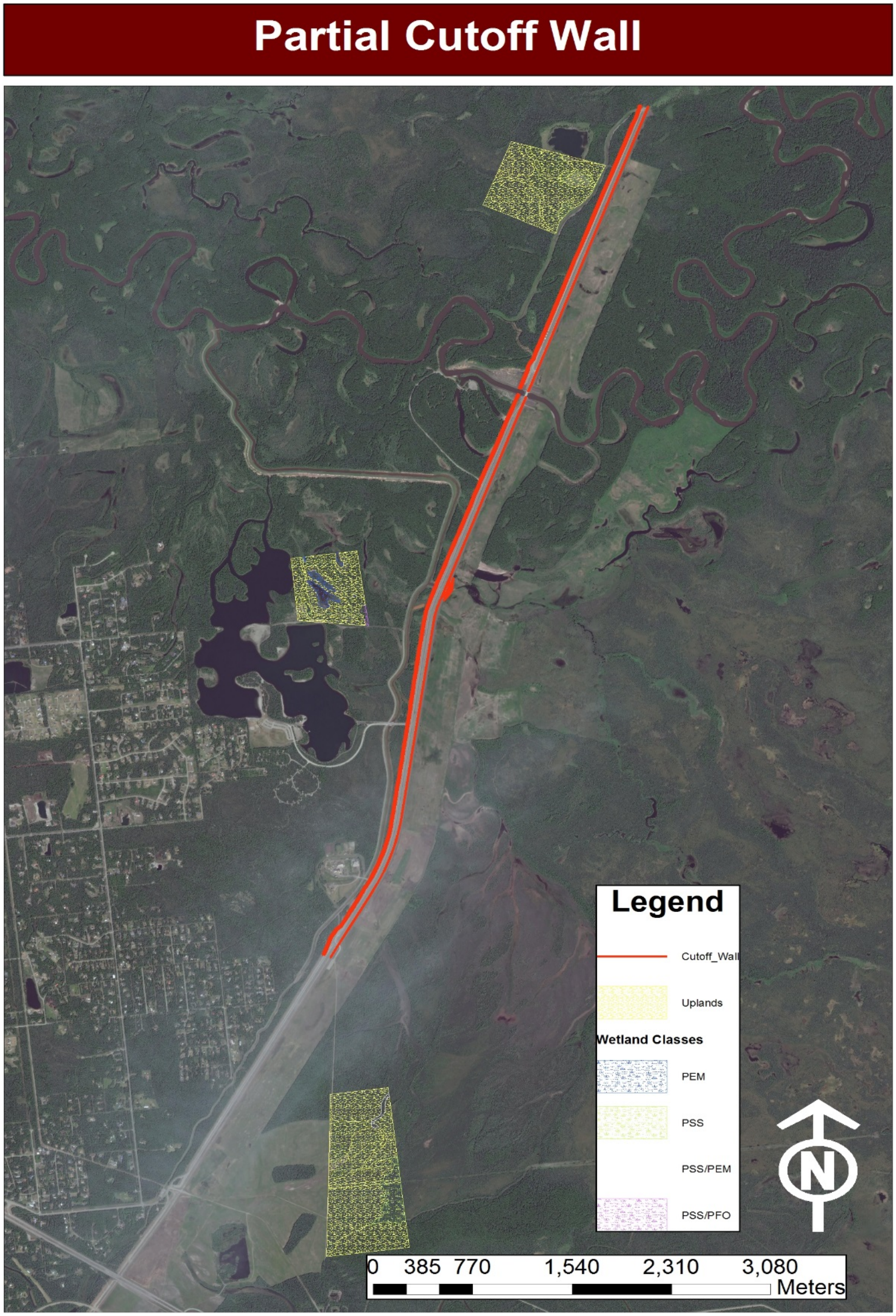

Figure 2. Partial cutoff wall, proposed borrow locations, and disposal site

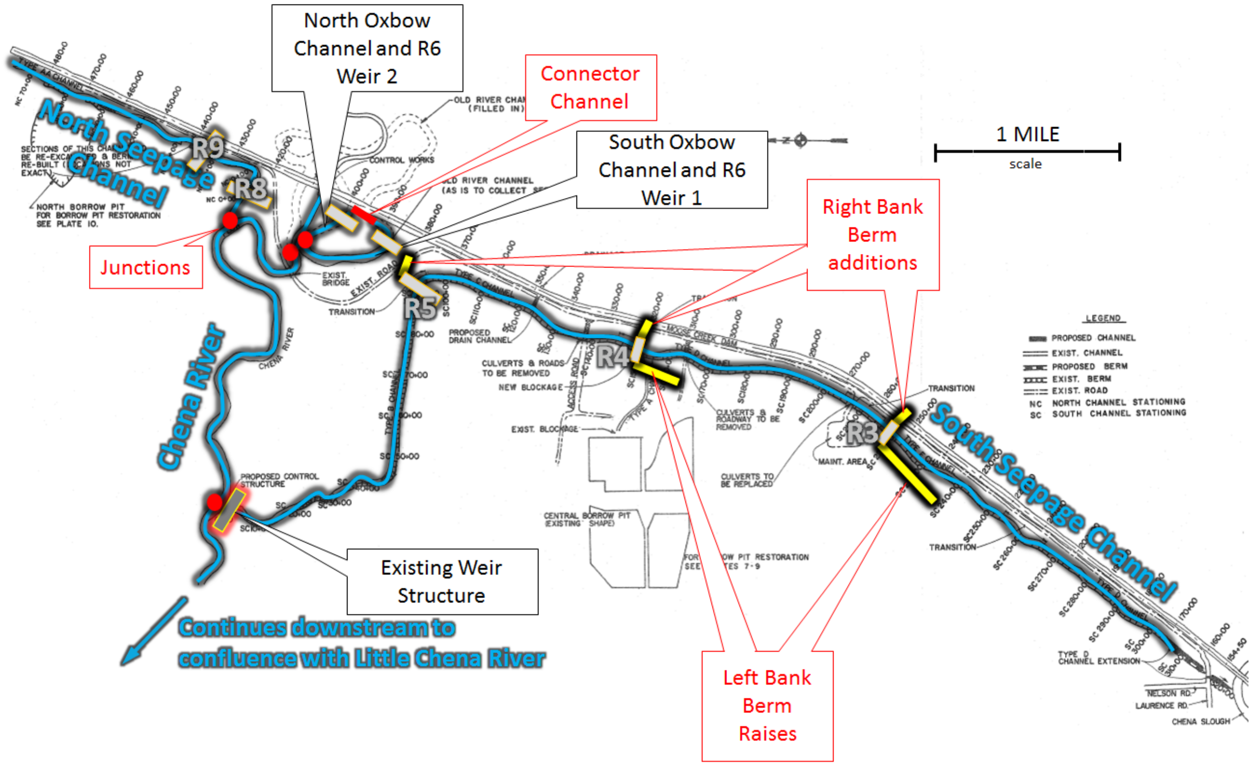

Figure 3. Weir design

From:	Halverson, John E (DEC)
To:	Ferguson, Matthew W CIV USARMY CEPOA (US); Palmer, Charley (DEC)
Cc:	Rypkema, James (DEC); Gilder, Cindy J (DEC); Miller, Christopher C (DEC); Epps, Lewis N CIV USARMY CEPOA (US)
Subject:	[EXTERNAL] RE: Chena Dam
Date:	Wednesday, November 01, 2017 5:18:59 PM

Charley, thanks for forwarding this on.

Matt, we looked it over quickly and don't have any significant comments at this time from DEC's Contaminated Sites Program perspective, but would review the proposed EA.   Thanks

John Halverson
Alaska Dept of Environmental Conservation
Contaminated Sites Program
555 Cordova Street
Anchorage, Alaska 99501

Phone: 907-269-7545

-----Original Message-----
From: Ferguson, Matthew W CIV USARMY CEPOA (US) [mailto:Matthew.W.Ferguson@usace.army.mil]
Sent: Tuesday, October 31, 2017 9:25 AM
To: Palmer, Charley (DEC) <charley.palmer@alaska.gov>
Cc: Rypkema, James (DEC) <james.rypkema@alaska.gov>; Gilder, Cindy J (DEC) <cindy.gilder@alaska.gov>; Halverson, John E (DEC) <john.halverson@alaska.gov>; Miller, Christopher C (DEC) <chris.miller@alaska.gov>; Epps, Lewis N CIV USARMY CEPOA (US) <Lewis.N.Epps@usace.army.mil>
Subject: RE: Chena Dam

Charley,

We haven't done any modeling for this change to our water control manual. I talked with Nathan Epps about the change to the project operation this morning; he doesn't believe the project poses a threat to groundwater due to the surficial nature of sediment impacts.

We have some modeling for the Dam Safety Modification, but they aren't calibrated. If the cutoff wall reaches a continuous aquitard (it might), the area about 1,000' downstream of the dam may become drier near the surface.

Matt f

-----Original Message-----
From: Palmer, Charley (DEC) [mailto:charley.palmer@alaska.gov]
Sent: Monday, October 30, 2017 4:14 PM
To: Ferguson, Matthew W CIV USARMY CEPOA (US) <Matthew.W.Ferguson@usace.army.mil>
Cc: Rypkema, James (DEC) <james.rypkema@alaska.gov>; Gilder, Cindy J (DEC) <cindy.gilder@alaska.gov>; Halverson, John E (DEC) <john.halverson@alaska.gov>; Miller, Christopher C (DEC) <chris.miller@alaska.gov>
Subject: [EXTERNAL] RE: Chena Dam

Matt,

Unfortunately, we don't have a formal groundwater protection program in Alaska. Rather, it is a combination of functions from several programs. However, I'm willing to be a point of contact.

I'm sure you have already, but if not, I would recommend also contacting David Schade, the Chief of the DNR Water Resources Section <BlockedBlockedhttp://dnr.alaska.gov/mlw/water/> .

Also, have you done any modeling/mapping that shows the extent of potential groundwater impacts? And if so, do you have associated maps or data?

--

Charley Palmer, Hydrologist

Alaska DEC Drinking Water Protection

907-269-0292

-----Original Message-----
From: Ferguson, Matthew W CIV USARMY CEPOA (US) [mailto:Matthew.W.Ferguson@usace.army.mil]
Sent: Monday, October 30, 2017 3:56 PM
To: Palmer, Charley (DEC) <charley.palmer@alaska.gov>
Cc: Rypkema, James (DEC) <james.rypkema@alaska.gov>; Gilder, Cindy J (DEC) <cindy.gilder@alaska.gov>; Halverson, John E (DEC) <john.halverson@alaska.gov>; Miller, Christopher C (DEC) <chris.miller@alaska.gov>
Subject: RE: Chena Dam

Thanks for looking at this, Charley.

I haven't heard any objection to the proposed change in our operation, so I plan to write a quick EA and circulate it before next flood season. Would you be an appropriate point of contact at ADEC groundwater protection?

Matt f

-----Original Message-----

From: Palmer, Charley (DEC) [mailto:charley.palmer@alaska.gov <mailto:charley.palmer@alaska.gov>]

Sent: Friday, October 27, 2017 3:28 PM

To: Ferguson, Matthew W CIV USARMY CEPOA (US) <Matthew.W.Ferguson@usace.army.mil <mailto:Matthew.W.Ferguson@usace.army.mil> >

Cc: Rypkema, James (DEC) <james.rypkema@alaska.gov <mailto:james.rypkema@alaska.gov> >; Gilder, Cindy J (DEC) <cindy.gilder@alaska.gov <mailto:cindy.gilder@alaska.gov> >; Halverson, John E (DEC) <john.halverson@alaska.gov <mailto:john.halverson@alaska.gov> >; Miller, Christopher C (DEC) <chris.miller@alaska.gov <mailto:chris.miller@alaska.gov> >

Subject: [EXTERNAL] FW: Chena Dam

Matt,

Thank you for the opportunity to comment with respect to public water system (PWS) sources. Given the location(s) provided, this project is not near an active registered PWS source (see attached "DEC_PWS_Map.jpg").

That said, I've CC'd others at DEC that may be interested in commenting.

* Jim Rypkema, Division of Water (DOW), Storm Water & Wetlands

* Cindy Gilder, DOW, Nonpoint Source Water Pollution Control

* John Halverson, Division of Spill Prevention & Response (SPAR), Contaminated Sites Program

In addition, you may consider prompting Nathan Epps (USACE) to bring this to the attention of other agency hydrologists at out upcoming meeting for the Interagency Hydrology Committee for Alaska <BlockedBlockedBlockedhttps://sites.google.com/site/ihcalaska/home> (IHCA), November 1-2, 2017, in Anchorage.

Regards,

--

Charley Palmer, Hydrologist

Alaska DEC - Division of Environmental Health (EH)

Drinking Water Program

Drinking Water Protection

907-269-0292

-----Original Message-----

From: Ferguson, Matthew W CIV USARMY CEPOA (US) [mailto:Matthew.W.Ferguson@usace.army.mil <mailto:Matthew.W.Ferguson@usace.army.mil>]

Sent: Friday, October 27, 2017 11:33 AM

To: Palmer, Charley (DEC) <charley.palmer@alaska.gov <mailto:charley.palmer@alaska.gov> >

Subject: Chena Dam

Hi Charlie,

Thanks for taking the time to discuss the Corps' plans to alter the Chena Dam operating protocols. I've attached the draft EA I wrote last fall because it has some background information and gives a description of the project features.

The following passage is excerpted from the 2015 Moose Creek Dam Interim Risk Reduction Measures Plan (IRRMP). I don't consider the comingling of water from the Tanana River and Chena River to be a significant concern with respect to fish habitat because the silt laden floodwaters of the Tanana River would have to flow 11 km across the floodway to reach the Chena River. Before the construction of the Dam, Chena Slough provided a much more accessible conduit for Tanana overflow; it's only 2.5 km from the Tanana River. I don't feel the potential genetic mixing is a reasonable concern either since the Tanana and Chena River confluence is only 32 km downriver of the sill.

It is also possible that ADEC is concerned about impacting groundwater, (Lyle/Nelson road area was called out) but I don't think that holds much water (no pun intended). Lowering the sill and allowing Tanana flood waters into the Chena floodway seems like it'd revert the area into a more natural scenario and perhaps improve water quality by depositing a layer of silt and filling interstitial areas in the soil. The floodway area has been deprived of alluvium since the construction of the levee, although I think there's only been a single overtopping event since the dam was completed in 1979

We would like to be released from our commitment to deploy Tiger Dams or build a temporary levee in the event the Tanana River exceeds the 507.1' NAVD88 sill. I don't know where the requirement came from, but the folks around here think it was something we volunteered. Any input you could provide would be greatly appreciated.

Thanks!

"5.2.1.7. Evaluate and Implementation of Lowering the Control Sill Engineering Division evaluated the hydrologic and environmental impacts of lowering the control sill, and the District lowered the sill in the 2010 flood season. The sheet pile control sill was constructed to keep floodwaters from the Tanana River from entering the floodway. The practice prior to the lowering was impounding flood water from the Chena River in the floodway until it reached an elevation of 511.8 feet NAVD88 when it overflowed the control sill into the Tanana River. A hydrologic routing model of the project was used to determine the effects of lowering the sill. The evaluation of lowering the control sill included determining the percent chance of exceedance of the Tanana River entering the floodway at various proposed sill elevations ranging from 511.8 down to 507.1 feet NAVD88. The percent chance of exceedance for the Tanana River entering the floodway with a sill elevation of 507.1 feet NAVD88 is 1% for any year (100 year flood).

Lowering the sill will divert water into the Tanana River earlier in the flood event and will reduce the maximum pool elevation and the duration for floods. This will reduce seepage, reduce the potential for piping, and lower the probability of an uncontrolled release of pool. The smaller volume of water impounded behind the Moose Creek Dam also would reduce consequences of an uncontrolled release. Letter Report 27 provides a revised peak pool stage frequency curve and revised annual maximum pool duration curves. This report also evaluated lowering of the floodway sill to reduce groundwater problems downstream from the Dam. Analysis of the pool of record indicates that the pool elevation for the 1992 flood would have been 4.5 feet lower had the control sill been at an elevation of 507.1 feet NAVD88 instead of the actual elevation of 511.8 feet NAVD88. With the floodway sill lowered to 507.1 feet NAVD88, a significantly larger flood than the 1992 event would be required to reach the 512.7 feet NAVD88 pool elevation recorded during the 1992 event.

Lowering the control sill increased the probability that water from the Tanana River could enter the floodway. Water in the floodway from the Tanana River could affect groundwater in the Lyle/Nelson Road area and fish habitat in the Chena River. These negative impacts were considered as the Alaska District determined the optimum elevation for the sill. Gates, stop logs, and other structures were evaluated as alternatives that could allow evacuation of Chena River flood water and still keep most Tanana River flood events from entering the floodway. Should floodwaters from the Tanana River enter the floodway, an after action site visit will be made to determine if sedimentation of the floodway has occurred. If required, the area will be resurveyed and compared to a previous baseline survey of the floodway. A sedimentation study will be considered during formulation of the long term solutions.

The Alaska District has implemented this Interim Risk Reduction Measure for Moose Creek Dam. This lowered the sill to elevation 507.1 which is the 1% chance exceedance for the Tanana River. A flood on the Tanana River (approximately elevation of 509.1 feet NAVD88) would be required to crest the high point in the floodway and require implementation of Tiger Dams or temporary levee between the embankments for the Richardson highway where the floodway is the narrowest. Letter Report 27 goes into greater details of the effects of permanently lowering the Sill."

Matt Ferguson, Biologist

Environmental Resources Section

USACE, Alaska District

907-753-2711

From: Dewandel, Shannon S (DEC)
To: Ferguson, Matthew W CIV USARMY CEPOA (US)
Subject: [EXTERNAL] RE: Moose Creek Dam safety modification
Date: Thursday, November 02, 2017 11:40:57 AM

Hi Matt,

Not sure if you were aware, contaminated sites (active and unactive) at latitude 64.759570 and longitude -147.218490. Just an fyi on this issue. No other comments.

Thanks,
Shannon

Shannon DeWandel
Stormwater/Wetlands
Dept. Environmental Conservation
555 Cordova Street, Third Floor
Anchorage, AK 99501

(907) 269-0103

-----Original Message-----
From: Ferguson, Matthew W CIV USARMY CEPOA (US) [mailto:Matthew.W.Ferguson@usace.army.mil]
Sent: Wednesday, November 01, 2017 3:17 PM
To: Rypkema, James (DEC) <james.rypkema@alaska.gov>; Dewandel, Shannon S (DEC) <shannon.dewandel@alaska.gov>; Brase, Audra L (DFG) <audra.brase@alaska.gov>; Proulx, Jeanne A (DNR) <jeanne.proulx@alaska.gov>; Smith, Julie A (DNR) <julie.smith@alaska.gov>; Doucet, Jusdi R (DNR) <jusdi.doucet@alaska.gov>; DNR, Parks OHA Review Compliance (DNR sponsored) <oha.revcomp@alaska.gov>; AOOARU.R10@epamail.epa.gov; HCD.Anchorage@noaa.gov; FW7_POANotices@fws.gov; Horne, Taylor C (DOT) <taylor.horne@alaska.gov>; jack.winter@alaska.gov; Palmer, Charley (DEC) <charley.palmer@alaska.gov>; Bradley, Parker T (DFG) <parker.bradley@alaska.gov>; Henszey, Bob <bob_henszey@fws.gov>; smota@fnsb.us; Schade, David W (DNR) <david.w.schade@alaska.gov>
Subject: Moose Creek Dam safety modification

Good afternoon,

The Alaska District is planning to modify the Moose Creek Dam near North Pole, AK in order to reduce the risk of dam failure. The attached letter contains a project description, maps, and a request for comments regarding the environmental impacts of the proposed activity. I wrote a preliminary draft EA last fall, and will be updating it with a few design changes prior to December 1, 2017.

I'm taking this opportunity to solicit comments on the environmental impacts of the project. Please reply to this email or call my desk at 907-753-2711 with questions, comments, or to request additional details.

Thanks!

Matt Ferguson, Biologist
Environmental Resources Section
USACE, Alaska District
907-753-2711

FAIRBANKS NORTH STAR BOROUGH Department of Community Planning
907 Terminal Street ☆ P.O. Box 71267☆ Fairbanks, Alaska 99707-1267 (907) 459-1260 ☆ FAX (907) 205-5169

November 16, 2017

Matthew Ferguson
Environmental Resources Section
USACE, Alaska District
Via Email: Matthew.W.Ferguson@usace.army.mil

RE: Moose Creek Dam Safety Modification

Dear Mr. Ferguson,

Chena Safety Mod Scoping Letter Comments:

The project consists of a mix-in-place partial cutoff wall in Reaches 4, 5, 6, 8, and 9, two quarries, tow disposal areas, and seven weirs.

- Figure 2. Partial cutoff wall, proposed borrow locations, and disposal site
    - The cutoff wall is identified along with uplands and wetlands.
    - The map does not show any borrow locations or disposal sites.
    - Where are the proposed borrow locations and disposal sites?
-

The centerline cutoff wall would run longitudinally down the center of the existing dam and could affect reaches 4, 5, 6, 8, and 9.

- Is the walking path on top of the levee going to remain?

Vegetation clearing may be required for the disposal of spoils material and excavation of gravel for construction.

- Where are the proposed disposal sites?
- Where are the proposed excavation sites?

A total of 375 acres have been designated as possible quarry and disposal areas…

- Where are these locations?

The seven weirs would be constructed in the north and south seepage collector channels to more accurately assess and locate seepage.

- R6 Weir 1 & R6 Weir 2 are located in Flood Zone AE and requires a Floodplain Permit.
- R8 is located in Flood Zone AE and requires a Floodplain Permit.

Items in Italics are from the scope and email.

Three temporary access ramps would be constructed to provide construction of the cut off wall, weirs…The locations of those ramps has not yet been identified.

- Once the temporary access ramps sites are selected, please notify FNSB Flood Plain Administrator to verify that they are not located in the Special Flood Hazard Area.

A Floodplain Permit is required for any development including but not limited to fill, excavation, clearing, grading, etc. in the Special Flood Hazard Area.

Is there anything else to review for this project that answers the above questions?

Email—Floodplain Occupation in Response to Dam Safety Mod Comments:

…Enhancing the integrity of the dam will not have a measureable impact on development in the base floodplain because it will not change the zoning or flood mapping of the affected area.

- Increasing the integrity of the dam will not change the zoning of the affected area.
- Increasing the integrity of the dam may change the flood mapping of the affected area.

Suggesting the reduction of dam failure probability by the construction of a trench in place cutoff wall will increase development of the floodplain, absent a change in flood mapping from the current flood zone X protected by levee status.

- Is this asking if a trench will increase development if it was constructed instead of a cutoff wall?
  - An Engineer or Hydrologist may determine the impacts of a trench vs a cutoff wall with a Hydrology & Hydraulic Report.
- Individuals are going to develop land. Rules and regulations governing that land details how that land may develop.
- People enjoy living along water bodies of all types and most of these areas are in a high risk flood zone.

"…I don't believe many people in the downstream area are particularly concerned with the possibility of dam failure…"

- The property owners the Borough talked with did not appear concerned about a possible dam failure. The Borough has been trying to educate the community about this possibility.

I cannot comment on the remaining sections in the email because I do not have a copy of the Environmental Assessment (EA) to review.

Kind regards,

Nancy Durham, MURP, CFM

Nancy Durham, MURP, CFM
Flood Plain Administrator
Department of Community Planning

Flood Zones Downstream of Moose Creek Dam