ENVIRONMENTAL ASSESSMENT

FOR HYDROPOWER LICENSE

Salmon Creek and Annex Creek Hydroelectric Project—FERC Project No. 2307-078

Alaska

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
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ACRONYMS AND ABBREVIATIONS

AEL&P	Alaska Electric Light and Power Company
AIR	Additional Information Request
Alaska DEC	Alaska Department of Environmental Conservation
Alaska DFG	Alaska Department of Fish and Game
Alaska DNR	Alaska Department of Natural Resources
Alaska SHPO	Alaska State Historic Preservation Officer
APE	area of potential effect
Applicant	Alaska Electric Light and Power Company
ºC	degrees Celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DIPAC	Douglas Island Pink and Chum, Inc.
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ºF	degrees Fahrenheit
Forest Service	U.S. Forest Service
FPA	Federal Power Act
FR	Federal Register
FWS	United States Fish and Wildlife Service
GWh	Gigawatt-hour
HPMP	Historic Properties Management Plan
Interior	United States Department of the Interior
IPaC	Information, Planning and Conservation System
kV	kilovolt
kW	kilowatt
LUD	Forest Service Land Use Designation
mm	millimeters
MSL	mean sea level
MW	megawatt
MWh	megawatt-hour
National Forest	Tongass National Forest
National Register	National Register of Historic Places
NFS	National Forest System
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service

NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetland Inventory
Project	Salmon Creek and Annex Creek Hydroelectric Project
PA	Programmatic Agreement
RM	River Mile
SD1	Scoping Document 1
SIO	Scenic Integrity Objective
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

Proposed Action

On August 31, 2016, the Alaska Electric Light and Power Company (AEL&P) filed an application for a new license to continue operating and maintaining the existing 10.58-megawatt (MW) Salmon Creek and Annex Creek Hydroelectric Project (Salmon Creek and Annex Creek Project or project) located on Salmon Creek and Annex Creek, in the City and Borough of Juneau, Alaska. The project currently occupies 648.45 acres of federal land within the Tongass National Forest administered by the U.S. Department of Agriculture, Forest Service (Forest Service).

Project Description and Operation

The project includes two developments in separate watersheds: the Salmon Creek Development and the Annex Creek Development. Only the Annex Creek Development is located on federal land.

Salmon Creek Development

The Salmon Creek Development includes a 186-foot-high, 648-foot long, dam with ten 5-foot-wide spillways. The dam impounds the 165-acre Salmon Creek Reservoir. Upstream of the dam is a 1,500-foot-long canal that is periodically used to divert water from tributary streams into Salmon Creek Reservoir. A 10-foot-wide, 11-foot-high intake structure with trashracks diverts water from the reservoir into a 3-foot-diameter conduit that conveys flow from the dam to the project valvehouse, located immediately downstream. A 4,290-foot-long, 3.3- to- 2-foot-diameter penstock conveys flow from the valvehouse to a decommissioned Upper Powerhouse[1] where it connects to an 11,303-foot-long, 3.5-foot-diameter penstock that narrows to a 2.5-foot-diameter penstock before entering the Lower Powerhouse. Flows diverted to the powerhouse bypass 2.8 miles of Salmon Creek, which empties into the Gastineau Channel.

The 57-foot-long, 44-foot-wide, 32-foot-high Lower Powerhouse contains a 6.9-MW impulse turbine. The maximum plant capacity at full reservoir is 6,700 kilowatts (kW) and the hydraulic capacity of the turbine ranges from a minimum of 17 cfs to a maximum of 105 cfs. The turbine discharges into an 8-foot by 4-foot buried, reinforced concrete tailrace and then through a series of box culverts before entering a pond adjacent to the Douglas Island Pink and Chum, Inc., (DIPAC) hatchery. The City and Borough of Juneau diverts water from the tailrace for its municipal water system and the hatchery

[1] The Upper Powerhouse was decommissioned by a Commission order amending the license on March 17, 1998 (82 FERC ¶62,180 (1998)). The two turbines and generators were removed but the powerhouse was retained for storage purposes.

uses the remaining water for its hatchery operations. A high pressure tap on the penstock can be used to provide water to the City and Borough of Juneau facility by way of a water control pick up valve and to the DIPAC hatchery by way of a pressure-reducing system when the turbine is offline.

No primary transmission lines are included as part of the Salmon Creek Development. A 12.47-kilovolt (kV), 300-foot-long cable from the Lower Powerhouse ties into AEL&P's distribution system in an adjacent switchyard located outside of the project boundary.

A 2-mile-long unpaved access road leads from the Lower Powerhouse to the decommissioned Upper Powerhouse. The dam is accessible by helicopter or a 1.5-mile-long foot trail that originates at the Upper Powerhouse. The foot trail and the access road together comprise the Salmon Creek Trail which has an information trailhead kiosk and adjacent parking lot near the Lower Powerhouse. The foot trail, kiosk, and parking lot are the only project recreation facilities at the Salmon Creek Development.

The Salmon Creek Development is operated as a storage project that regulates natural flows from the Salmon Creek watershed to provide a continuous year-round flow to the powerhouse. The development draws on the available reservoir storage during the low flow winter months to reach a normal minimum pool elevation of 1,094.85 feet mean sea level (MSL) by May and capture flows between May and November to refill the reservoir to a normal reservoir elevation of 1,174 feet MSL, resulting in a normal annual reservoir fluctuation of 80 feet. During the winter in an average water year, flows to the powerhouse are regulated to provide a base load of 2 MW. The unit is taken off-line each May for annual maintenance for 1 to 2 weeks. After the annual maintenance is completed and as the snow pack melts, the unit's load is increased to 4 MW and uses as much flow as possible while maintaining a maximum elevation of 1,174.85 feet MSL for safe operation of the dam. The unit typically continues to operate at a 4 MW capacity until freezing temperatures arrive in late fall. The average annual energy generation (1985 to 2015) of the Salmon Creek Development was 26.8 gigawatt-hours (GWh).

During flood events when the reservoir is at maximum pool elevation, flows are released from the reservoir into the 2.8-mile-long Salmon Creek bypassed reach through a 36-inch diameter low level outlet below the dam. The existing Reservoir Outlet Release Plan regulates the timing, volume, and rate of flow releases from the low-level outlet to minimize flow fluctuations in Salmon Creek. In addition, the current license requires up to a maximum of 3 cubic feet per second (cfs) of flow to be released from a 6-inch tap off the penstock located at the base of the dam to maintain a minimum flow of 9 cfs in the lower bypassed reach.[2] The existing Stream Flow Monitoring Plan includes

[2] The lower Salmon Creek bypassed reach is a 0.3-mile reach of Salmon Creek that

procedures for maintaining and calibrating the existing gage located about 0.3 mile upstream from the mouth of Salmon Creek and reporting deviations from the minimum flow requirements.

Annex Creek Development

The Annex Creek Development uses two dams to impound the 164-acre Upper Annex Lake: a 20-foot-high, 118-foot-long main dam and a 6-foot-high, 61-foot-long saddle dam. The main dam has a 57-foot-wide spillway that discharges flows in excess of those needed for generation into the 25-acre Lower Annex Lake via a 0.15-mile-long outlet stream. A lake tap intake on Upper Annex Lake diverts water through a 1,433-foot-long power tunnel that narrows from 8 feet wide and 8 feet high at the intake to a 6.5-foot-diameter tunnel at the project valvehouse. From the valvehouse, flow is conveyed through a 7,097-foot-long, 3.5-foot diameter penstock that narrows to a 2.8-foot-diameter before it bifurcates at the powerhouse. Flow diverted to the powerhouse bypasses Lower Annex Lake and the 2.5 mile-long Annex Creek.

The 67-foot-long, 48-foot-wide, 40-foot-high powerhouse contains two impulse turbine units with a total installed capacity of 3.675 MW. The maximum plant capacity at full reservoir is 3,600 kW and the maximum hydraulic capacity of the plant is 76.8 cfs. Each unit has minimum and maximum hydraulic capacities of 10 cfs and 38.4 cfs, respectively. The tailrace discharges flows from the powerhouse over a weir into Taku Inlet.

A 12.5-mile-long, 23-kV transmission line conveys the development's power to Alaska Industrial Development and Export Authority's Thane substation. While the majority of the transmission line is overhead, a 1.3-mile-long portion of the line is buried along the top of Sheep Mountain.

There are no access roads or recreational facilities at the Annex Creek Development. The project is accessed only by air or boat. The penstock serves as a trail between the powerhouse and lakes for maintenance and operation activities.

The Annex Creek Development is operated as a storage project that regulates flows from the Annex Creek watershed to provide a continuous year-round flow to the powerhouse sufficient to meet a firm base-load of 3.5 MW. The development draws on the available reservoir storage during the low flow winter months to reach a normal minimum pool elevation of 740 feet MSL by May and capture flows between May and November to refill the reservoir to normal reservoir elevation of 844.3 feet MSL, resulting in a normal annual reservoir fluctuation of about 100 feet. From 1985 to 2015,

extends from a barrier falls that blocks anadromous fish passage downstream to the mouth of Salmon Creek.

the Annex Creek Development has had an average annual energy generation of 27.1 GWh and is operated at 3,500 kW continuously throughout the year, except for short periods of time when one of the units is down for scheduled maintenance or the transmission line is out of service.

During a typical year, the lake fills by the end of September and excess water is spilled into Lower Annex Lake which discharges to the 2.5-mile Annex Creek bypassed reach. There are no minimum flow requirements in the current license for the bypassed reach.

Proposed Facility Modifications

No changes to project facilities are proposed. All of the above-mentioned facilities, with the exception of the Salmon Creek Trailhead parking lot, are included within the project boundary. AEL&P proposes to incorporate the 0.25-acre Salmon Creek Trailhead parking lot within the project boundary.

Proposed Environmental Measures

AEL&P proposes several environmental measures to protect or enhance aquatic, recreational, and cultural resources, including:

- Continue to release up to a maximum of 3 cfs from the base of the Salmon Creek dam to maintain a minimum flow of 9 cfs as measured at AEL&P's existing gage site in the lower Salmon Creek bypassed reach to protect aquatic habitat for anadromous salmonids;
- Continue to implement the Streamflow Monitoring Plan to document compliance with minimum instream flow requirements in Salmon Creek;
- Continue to implement the Reservoir Outlet Release Plan which includes provisions to limit the timing, volume, and rate of flows discharged from the low-level outlet at Salmon Creek dam during annual valve testing and seasonal reservoir drawdowns;
- Replace the Salmon Creek Trailhead kiosk and update the kiosk information (e.g., to reflect new landownership of the area);
- Update the Salmon Creek Trail information pamphlet and provide it online;
- Improve the upper portion of the Salmon Creek Trail by removing vegetation and clearing windfalls and boulders from the trail, replacing or repairing bridges, stabilizing eroded sections of the trail, and adding trail markers;
- Continue to maintain the Salmon Creek Trail and information kiosk;
- Assess the condition of the Salmon Creek trail every 6 years in conjunction with its Form 80 recreation use reporting cycle;
- Continue to maintain the 0.25-acre Salmon Creek Trailhead parking lot; and

- Implement the Historic Properties Management Plan (HPMP) filed with the application to protect cultural resources found at both Salmon Creek and Annex Creek developments.

Alternatives Considered

This environmental assessment (EA) considers the following alternatives: (1) AEL&P's proposal, as outlined above; (2) AEL&P's proposal with staff modifications, (staff alternative); and (3) no action, meaning continued operation under the terms of the current license.

Staff Alternative

The staff-recommended alternative includes all of the Forest Service's preliminary 4(e) conditions filed on July 7, 2017, which pertain solely to the Annex Creek Development, and AEL&P's proposed environmental measures, as outlined above with the following modifications and additional measures:

- Develop an Invasive Plant Management Plan as required by the Forest Service and apply the measures and protocols to all project lands to minimize the introduction and spread of invasive plants during any future land-disturbing activities, such as trail maintenance;
- Follow Environmental Protection Agency (EPA) label instructions when applying herbicides and pesticides and prohibit their use within 500 feet of sensitive amphibian species habitat as required by the Forest Service and apply these protocols when applying herbicides and pesticides on all project lands;
- Install a directional sign at the intersection of the Salmon Creek Trail and an existing maintenance trail to direct hikers to the main trail;
- File a report with the Commission on the 6-year Salmon Creek Trail assessment results along with any recommendations for necessary trail improvements; and
- Revise the proposed HPMP to (1) clarify the types of operation and maintenance activities that would, or would not, have the potential to adversely affect historic properties, and how such work would be done to prevent adverse effects to historic properties; (2) provide more detail regarding the treatment of human remains and inadvertent discovery of cultural resources; and (3) clarify consultation procedures.

Public Involvement and Areas of Concern

Before filing its license application, AEL&P conducted pre-filing consultation under the Traditional Licensing Process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to

encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission.

AEL&P filed its relicense application on August 31, 2016. On March 9, 2017, staff issued a notice accepting the license application and distributed a scoping document to interested parties, soliciting comments, recommendations, and information on the project. On April 18, 2017, staff issued a notice that the application was ready for environmental analysis and requested comments, recommendations, and terms and conditions.

The primary issues associated with relicensing the project are protecting aquatic resources, invasive plant species control, enhancing recreational facilities, and protecting cultural resources.

Staff Alternative

Aquatic Resources

AEL&P releases up to a maximum of 3 cfs from the base of the Salmon Creek dam to maintain a minimum flow of 9 cfs, in the lower Salmon Creek bypassed reach (a 0.3-mile reach extending from a natural anadromous fish barrier downstream to its mouth at Gastineau Channel). Streamflow records indicate that a flow of 9 cfs is maintained through accretion alone except during some periods of low winter flows, when AEL&P releases up to 3 cfs to maintain the 9 cfs minimum flow. Continuing the releases would protect aquatic habitat in the bypassed reach for brook trout and anadromous salmonids during periods of low accretion flow. Continuing to implement Streamflow Monitoring Plan would document compliance with minimum flow requirements, enable AEL&P to quickly respond to any potential minimum flow deviations, and implement corrective actions to ensure the protection of aquatic resources in the bypassed reach. Continuing to implement the Reservoir Outlet Release Plan would protect aquatic resources by minimizing the potential scour of salmonid spawning habitat in the lower bypassed reach when lowering Salmon Creek reservoir.

Terrestrial Resources

No new construction or operation changes are proposed or recommended that would alter existing terrestrial resources at either the Annex Creek or Salmon Creek developments. Developing an Invasive Plant Management Plan as required by the Forest Service and recommended by staff would minimize the introduction and spread of invasive plants during routine project maintenance activities including maintaining brush along Salmon Creek Trail. Restricting herbicide and pesticide use on all project lands to avoid sensitive species habitat and be consistent with EPA label instructions would protect sensitive amphibian species.

Threatened and Endangered Species

According to the U.S. Fish and Wildlife Service's Information, Planning and Conservation System database, there are no federally listed threatened, endangered, or candidate species, nor are there any critical habitats in the project area for either development. Therefore, continued project operation would have no effect on threatened or endangered species or critical habitats.

Recreation, Land Use, and Aesthetic Resources

The Annex Creek Development, with the exception of portions of the project transmission line, is located within the Tongass National Forest which supports backcountry recreation, including hunting and fishing. The Annex Creek Development has no recreational facilities and receives little use due to its remote location and difficult access. The Forest Service's "Semi-Remote Recreation" Land Use Designation (LUD) for the area in which the Annex Creek Development is located, has a Scenic Integrity Objective (SIO) of "moderate" which calls for design activities to be subordinate to the surrounding landscape character. Although existing project facilities contrast slightly with the surrounding environment, the project footprint is small in comparison to the vast surrounding natural landscape and therefore remains subordinate to the overall viewshed character. AEL&P does not propose, nor has any entity recommended, any recreational or visual enhancements to the Annex Creek Development area.

The Salmon Creek Development provides recreational access to Salmon Creek Reservoir by way of the 3.5-mile-long Salmon Creek Trail, which comprises two segments: a 2-mile-long lower segment that consists of the gravel project access road that is open to the public for foot or bicycle access, and a connecting 1.5-mile-long upper segment which is a foot trail. Due to heavy use, portions of the upper segment have become degraded. AEL&P's proposed trail improvements would enhance public safety and the recreation experience. Adding a directional sign at the intersection of the upper trail and maintenance trail as recommended by staff would encourage hikers on the main trial to the reservoir and limit resource damage to surrounding habitats. AEL&P's proposals to replace the Salmon Creek trailhead kiosk, update the information provided on the kiosk, and update the Salmon Creek Trail pamphlet and provide it on-line would further enhance recreation by providing recreational users with current information on recreational opportunities in the project area. Because heavy recreational use of the Salmon Creek Trail makes it susceptible to erosion and resource damage, especially in the steep upper portion, conducting a trail assessment at 6-year intervals as proposed by AEL&P would help to ensure that the trail is adequately maintained, any associated resource damage is minimized, and hikers can continue to use the trail safely. However, it is not clear how AEL&P intends to follow up on the assessment results. Filing a report

with the Commission that includes the assessment results and any recommendations for trail improvements would ensure future trail use needs are considered.

AEL&P currently maintains the parking lot at the Salmon Creek Trailhead, which is heavily used by visitors using the Salmon Creek Trail to reach Salmon Dam and Reservoir; therefore, because the trailhead parking lot is accommodating project-induced use, it should be included within the project boundary.

Cultural Resources

Continued project operation and maintenance could adversely affect contributing elements associated with the National Register-eligible Annex Creek and Salmon Creek Historic Districts. AEL&P's HPMP lacks sufficient detail for: (1) identifying the types of operation and maintenance activities that would, or would not, have the potential to adversely affect historic properties, and how such work would be done to prevent adverse effects to historic properties; (2) treating any newly discovered human remains and cultural resources; and (3) consulting with the Forest Service, Native Alaskan tribes, and Alaska SHPO on inadvertent discoveries and operation and maintenance activities that could adversely affect historic properties. Revising AEL&P's HPMP to include these details would improve implementation of the HPMP and better protect historic properties.

No-Action Alternative

Under the no-action alternative, AEL&P would continue to operate the project as it currently does. Environmental conditions would remain the same, and no enhancement of environmental resources would occur.

Conclusions

Based on our analysis, we recommend licensing the project as proposed by AEL&P, with some staff modifications and additional measures.

In section 4.2 of the EA, *Comparison of Alternatives*, we estimate the likely cost of alternative power for each of the four alternatives identified above. Our analysis shows that during the first year of operation under the no-action alternative, project power would cost $3,391,617 or $62.96 per megawatt-hour (MWh) less than the likely alternative cost of power. Under the proposed action alternative, project power would cost $3,384,287 or $62.82/MWh less than the likely alternative cost of power. Under the staff alternative, project power would cost $3,356,967, or $62.31/MWh less than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative because: (1) the project would continue to provide a dependable source of electrical energy for the region (53,873

MWh annually); (2) the 10.58 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by AEL&P, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

We conclude that issuing a new license for the project, with the environmental measures we recommend, would not be a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

Salmon Creek and Annex Creek Hydroelectric Project
FERC Project No. 2307-078—Alaska

1.0 INTRODUCTION

1.1 APPLICATION

On August 31, 2016, Alaska Electric Light and Power Company (AEL&P) filed an application for a new license for the existing Salmon Creek and Annex Creek Hydroelectric Project (project).

As shown in figure 1, the 10.58-megawatt (MW) project is located on Salmon Creek and Annex Creek within the City and Borough of Juneau, Alaska. The project occupies 648.45 acres of federal lands within the Tongass National Forest (National Forest) administered by the U.S. Forest Service (Forest Service). The project generates an average of about 54.1 gigawatt-hours (GWh) of energy annually. AEL&P proposes no new capacity or modifications to project operation, but does propose to provide various recreational trail enhancements at the Salmon Creek Development and include the Salmon Creek powerhouse parking lot within the project boundary. Under AEL&P's proposal, the project boundary would expand by about 0.25 acres to encompass a total of 1,037.01 acres of land.

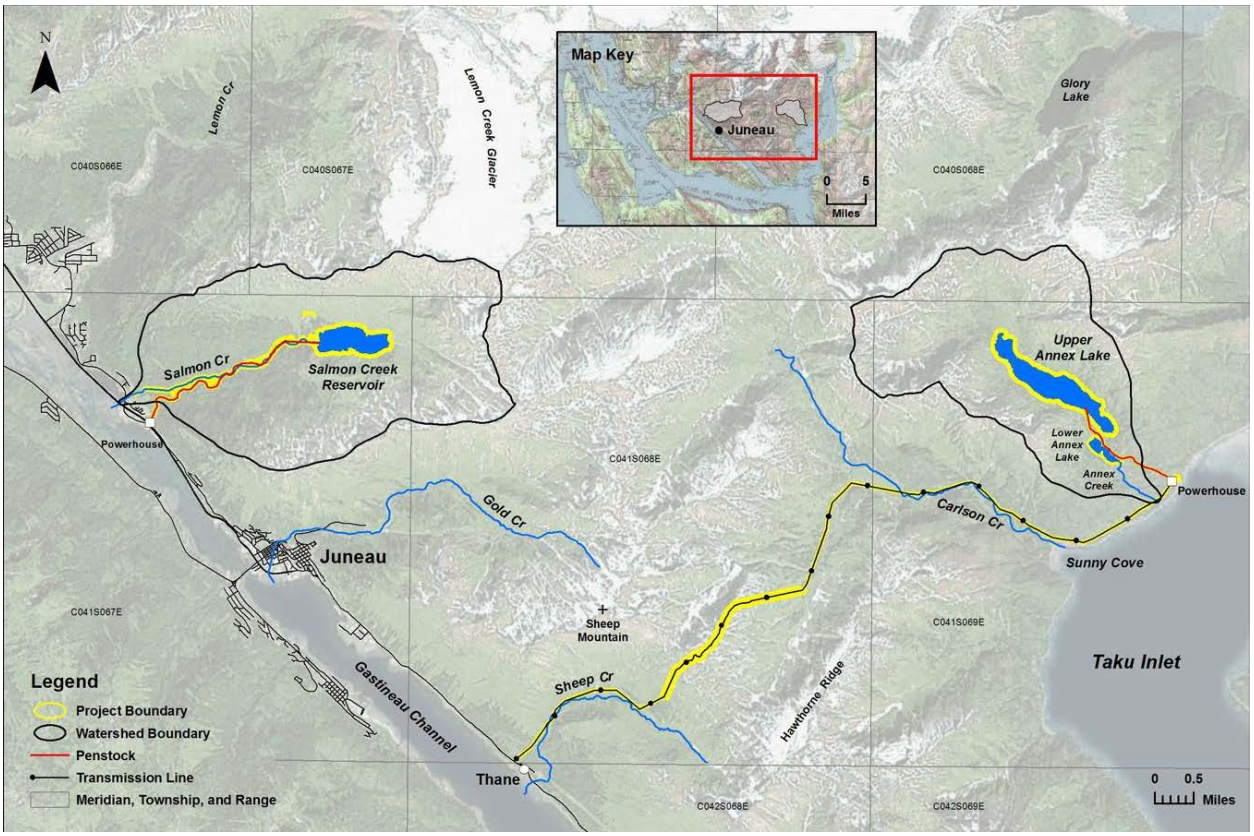

Figure 1. Location of Salmon Creek and Annex Creek Project Facilities (source: staff).

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Salmon Creek and Annex Creek Project is to continue to provide a source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to AEL&P for the Salmon Creek and Annex Creek Project and what conditions should be placed on any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing a new license for the Salmon Creek and Annex Creek Project would allow AEL&P to generate electricity at the project for the term of a new license, making electric power from a renewable resource available to its customers.

This environmental assessment (EA) assesses the effects associated with operation of the project, alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a new license, and if so, recommends terms and conditions to become a part of any license issued.

In this EA, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by AEL&P, and (2) as proposed by AEL&P with our recommended measures, which include the Forest Service's mandatory conditions (staff alternative). We also consider the effects of the no-action alternative. The primary issues associated with relicensing the project are protecting aquatic resources, enhancing recreational facilities, controlling invasive plant species, and protecting cultural resources.

1.2.2 Need for Power

The Salmon Creek and Annex Creek Project provides hydroelectric generation to meet part of AEL&P's power requirements, resource diversity, and capacity needs. The project has an installed capacity of 10.58 MW and generates approximately 54 GWh per year.

To assess the need for power, staff looked at the needs in the operating region in which the project is located. According to Alaska Energy Authority's Southeast Alaska Integrated Resource Plan, between 2015 and 2024 annual energy consumption could increase from 441,237 to 461,494 megawatt-hours, and peak demand could increase from 85.4 to 89.3 MW (Alaska Energy Authority 2011).

The Juneau area has an isolated electric system and hydropower serves as the major source of energy for the area. AEL&P owns, operates and maintains the majority of the hydropower resources serving the Juneau area including the Gold Creek, Salmon Creek and Annex Creek, and Lake Dorothy projects. AEL&P purchases power generated from Alaska Industrial Development and Export Authority's Snettisham hydroelectric project – which accounts for roughly three-quarters of Juneau area hydro capacity – through a lease agreement under which AEL&P is also responsible for maintenance of the project (Alaska Energy Authority 2016). The Annex Creek and Salmon Creek Hydroelectric Project developments are operated as base load units and provide about 8 percent of the area's need. The Lake Dorothy and Snettisham projects make up the majority of the AEL&P's hydropower capacity assets and provide firm and interruptible power when available. When Snettisham is offline, AEL&P's fossil fuel-fired generators are used as a backup (Alaska Energy Authority 2016).

We conclude that power from the Annex Creek and Salmon Creek Project would continue to help meet a need for power in the City and Borough of Juneau in both the short and long-term.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Salmon Creek and Annex Creek Project is subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the Interior (Interior). Neither the Secretary of Commerce nor the Secretary of the Interior filed Section 18 fishway prescriptions.

1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. The Forest Service filed preliminary conditions on July 10, 2017, pursuant to section 4(e) of the FPA. These preliminary conditions pertain solely to the Annex Creek Development and are described under section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*.

1.3.1.3 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

No 10(j) recommendations were filed for the Salmon Creek and Annex Creek Project.

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. On August 23, 2016, AEL&P applied to the Alaska Department of Environmental Conservation (Alaska DEC) for 401 water quality certification or waiver for the Salmon Creek and Annex Creek Project. By letter dated September 15, 2017, the Alaska DEC waived its right to issue a Certificate of Reasonable Assurance for licensing the Salmon Creek and Annex Creek Project, in accordance with section 401 of the CWA.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

On August 17, 2017, staff accessed the U.S. Fish and Wildlife Service's (FWS) Information, Planning, and Conservation (IPaC) System to determine federally listed species that occur in the project vicinity. According to the IPaC database, there are no threatened, endangered, or candidate species, or critical habitats, in the project area for either development. Therefore, we conclude that continued operation of the project would have no effect on federally listed species or critical habitats.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

On July 7, 2011, by operation of Alaska State law, the federally-approved Alaska Coastal Zone Management Program expired, resulting in a withdrawal from participation in the CZMA's National Coastal Management Program. The CZMA federal consistency provision section 307, no longer applies in Alaska.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic

properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register.

Operation and maintenance of the project has the potential to adversely affect National Register-eligible contributing elements associated with the Annex Creek and Salmon Creek Hydroelectric Historic Districts.[3] To meet the requirements of section 106, the Commission intends to execute a Programmatic Agreement (PA), the terms of which would ensure that AEL&P addresses any potential adverse effects to historic properties identified within the project's area of potential effect (APE) through the implementation of a HPMP.

On August 31, 2016, AEL&P filed a HPMP with the Commission as well as with the other consulting parties, including the Alaska State Historic Preservation Officer (Alaska SHPO). On August 3, 2017, and August 14, 2017, the Forest Service and Alaska SHPO filed comments on the HPMP. Both the Forest Service and Alaska SHPO requested that the HPMP be modified to clarify consultation and treatment protocols. As discussed later, we recommend that the HPMP be revised as requested by the Forest Service and Alaska SHPO. We intend to issue a PA stipulating that AEL&P must file a revised final HPMP for approval within six months after license issuance to address these consultation and treatment concerns.

1.3.6 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) on all actions that may adversely affect Essential Fish Habitat (EFH). Salmon EFH includes all "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (50 CFR 600.10). In Alaska, freshwater habitat for the salmon fisheries in Alaska includes all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in the state. Salmon Creek provides EFH for chum, coho, and pink salmon.

Following review of the licensee's application, we have determined that there would be no adverse effect on EFH. Therefore, no further consultation under the Magnuson-Stevens Fishery Conservation and Management Act is required. In section 3.3.2, *Aquatic Resources*, we more fully discuss EFH.

1.4 PUBLIC REVIEW AND COMMENT

[3] The Annex Creek and Salmon Creek Hydroelectric Historic District includes 10 and 7 National Register-eligible contributing elements, respectively.

The Commission's regulations (18 CFR, sections 5.1–5.16) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document (SD1) was distributed to interested agencies and others on March 9, 2017. The Forest Service was the only entity to file comments (April 17, 2017).

1.4.2 Interventions

On March 9, 2017, the Commission issued a public notice in the *Federal Register* accepting the application for filing and setting May 8, 2017, as the deadline for filing motions to intervene and protest. The following entities filed motions to intervene:

Commenting Entity	Date Filed
Forest Service	March 21, 2017
Alaska Department of Natural Resources (Alaska DNR)	March 21, 2017

1.4.3 Comments on the Application

A notice requesting conditions and recommendations was issued on April 18, 2017. The following entities commented:

Commenting Entity	Date Filed
U.S. Department of the Interior (Interior)	June 13, 2017
Forest Service	July 10, 2017

AEL&P did not file reply comments.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection,

mitigation, or enhancement measures would be implemented. We use this alternative as the baseline environmental condition for comparison with other alternatives.

2.1.1 Existing Project Facilities and Operation

The project consists of two developments in separate watersheds: the Salmon Creek Development and the Annex Creek Development. Only the Annex Creek Development is located on federal land.

Salmon Creek Development

The Salmon Creek Development includes a 186-foot-high, 648-foot long, dam with ten 5-foot-wide spillways. The dam impounds the 165-acre Salmon Creek Reservoir. Upstream of the dam is a 1,500-foot-long canal which is periodically used to divert water from tributary streams into Salmon Creek Reservoir. A 10-foot-wide, 11-foot-high intake structure with trashracks diverts water from the reservoir into a 3-foot-diameter conduit that conveys flow from the dam to the project valvehouse, located immediately downstream. A 4,290-foot-long, 3.3- to- 2-foot-diameter penstock conveys flow from the valvehouse to the decommissioned Upper Powerhouse[4] where it connects to an 11,303-foot-long, 3.5-foot-diameter penstock that narrows to a 2.5-foot-diameter penstock immediately before entering the Lower Powerhouse.

The 57-foot-long, 44-foot-wide, 32-foot-high Lower Powerhouse contains a 6.9-MW impulse turbine. The maximum plant capacity at full reservoir is 6,700 kilowatts (kW) and the hydraulic capacity of the turbine is ranges from a minimum of 17 cfs to a maximum of 105 cfs. The turbine discharges into an 8-foot by 4-foot buried, reinforced concrete tailrace and then through a series of box culverts before entering a pond adjacent to the Douglas Island Pink and Chum, Inc., (DIPAC) hatchery. The City and Borough of Juneau diverts water from the tailrace for its municipal water system and the hatchery uses the remaining water for its hatchery operations. A high pressure tap on the penstock can be used to provide water to the City and Borough of Juneau facility by way of a water control pick-up valve and to the DIPAC hatchery by way of a pressure-reducing system when the turbine is offline.

No primary transmission lines are included as part of the Salmon Creek Development. An underground 12.47-kilovolt (kV), 300-foot-long cable, ties into AEL&P's distribution system in the adjacent switchyard which is located outside of the project boundary.

[4] The Upper Powerhouse was decommissioned by a Commission order amending the license on March 17, 1998 (82 FERC ¶62,180 (1998)). The two turbines and generators were removed but the powerhouse was retained for storage purposes.

A 2-mile-long unpaved access road leads from the Lower Powerhouse area to the decommissioned Upper Powerhouse. The dam is accessible by helicopter or a 1.5-mile hiking trail that originates at the Upper Powerhouse.

The Salmon Creek Development is operated as a storage project that regulates natural flows from the Salmon Creek watershed to provide a continuous year-round flow to the powerhouse. The development draws on the available reservoir storage during the low flow winter months to reach a normal minimum pool elevation of 1,094.85 feet mean sea level (MSL) by May and capture flows between May and November to refill the reservoir to normal reservoir elevation of 1,174 feet MSL, resulting in a normal annual reservoir fluctuation of 80 feet. During the winter in an average water year, flows to the powerhouse are regulated to provide a base load of 2 MW. The unit is taken off-line in May for annual maintenance for 1 to 2 weeks. After annual maintenance is completed and as the snow pack melts, the unit load is increased to 4 MW and uses as much flow as possible while maintaining a maximum elevation of 1,174.85 feet MSL for safe operation of the dam. The unit typically continues to produce 4 MW until freezing temperatures arrive in late fall. The average annual energy generation (1985 to 2015) of the Salmon Creek Development was 26.8 gigawatt-hours (GWh).

During flood events when the reservoir is at maximum pool elevation, flows are released from the reservoir into the 2.8-mile-long Salmon Creek bypassed reach[5] through a 36-inch diameter low level outlet below the dam. In addition, the current license requires up to a maximum of 3 cubic feet per second (cfs) of flow to be released from a 6-inch tap off the penstock located at the base of the dam to maintain a minimum flow of 9 cfs in the lower 0.3-mile of the bypassed reach.

The maximum plant capacity for the Salmon Creek Development at full reservoir is 6,700 kilowatts (kW) and the maximum hydraulic capacity of the turbine is 105 cfs. The minimum hydraulic capacity is 17 cfs.

The current project boundary for the Salmon Creek Development encompasses the following: (1) the Salmon Creek Reservoir within the 200-foot contour, (2) the dam and spillway, (3) two helicopter pads; (4) the intake structure, (5) the intake conduit, (6) the valvehouse, (7) a portion (about 700 feet) of the diversion canal, (8) the upper and lower penstocks, (9) a gravel access road and vehicle bridge leading to the decommissioned Upper Powerhouse, (10) the decommissioned Upper Powerhouse; (11) the Lower Powerhouse, (12) the 300-foot-long, 12.47-kV transmission cable; (13) the buried tailrace, (14) the stream gage and staff gage, (15) the DIPAC pressure-reducing system,

[5] The Salmon Creek bypassed reach extends 2.8 miles from the base of Salmon Creek Dam to the mouth of Salmon Creek at Gastineau Channel. The lower Salmon Creek bypassed reach is a 0.3-mile reach of Salmon Creek that extends from a barrier falls that blocks anadromous fish passage downstream to the mouth of Salmon Creek.

(16) the City and Borough of Juneau Water Control Pickup Valve, (17) the USGS gage and the staff gage, (18) the Alaska DFG-controlled bypass valve to Twin Lakes; (19) the 100-foot-wide Salmon Creek Trail corridor leading from the decommissioned powerhouse area to Salmon Creek Dam, and (20) the Salmon Creek Trailhead and kiosk. The box culverts, the DIPAC hatchery, City and Borough of Juneau water control facilities, the powerhouse parking lot, and switchyard are not included within the project boundary.

Annex Creek Development

The Annex Creek Development utilizes two dams to impound the 164-acre Upper Annex Lake: a 20-foot-high, 118-foot-long main dam and a 6-foot-high, 61-foot-long saddle dam. The main dam has a 57-foot-wide spillway that discharges flows in excess of those needed for generation into the 25-acre Lower Annex Lake via a 0.15-mile-long outlet stream. A lake tap intake on Upper Annex Lake diverts water through a 1,433-foot-long power tunnel that narrows from 8-feet-wide and 8-feet-high at the intake to a 6.5-foot-diameter tunnel at the project valvehouse. From the valvehouse, flow is conveyed through a 7,097-foot-long, 3.5-foot diameter penstock that narrows to a 2.8-foot-diameter before it bifurcates at the powerhouse.

The 67-foot-long, 48-foot-wide, 40-foot-high powerhouse contains two impulse turbine units with a total installed capacity of 3.675 MW. The maximum plant capacity at full reservoir is 3,600 kilowatts (kW) and the maximum hydraulic capacity of the plant is 76.8 cfs. Each unit has a minimum and maximum hydraulic capacities of 10 cfs and 38.4 cfs, respectively. The tailrace discharges flows from the powerhouse over a weir into Taku Inlet.

A 12.5-mile-long, 23-kV transmission line conveys power to Alaska Industrial Development and Export Authority's Thane substation. While the majority of the transmission line is overhead, a 1.3-mile-long portion of the line is buried along the top of Sheep Mountain.

There are no roads at the Annex Creek Development. The project site is accessed only via air or boat. The penstock serves as a trail between the powerhouse and lakes for maintenance and operations activities.

Appurtenant facilities at the development include buildings to house the operator and crew with connecting boardwalks, storage and workshop buildings, and water and wastewater treatment systems.

The Annex Creek Development is operated as a storage project that regulates natural flows from the Annex Creek watershed to provide a continuous year-round flow to the powerhouse sufficient to meet a firm base-load of 3.5 MW. The development

draws on the available reservoir storage during the low flow winter months to reach a normal minimum pool elevation of 740 feet MSL by May and capture flows between May and November to refill the reservoir to normal reservoir elevation of 844.3 feet MSL, resulting in a normal annual reservoir fluctuation of about 100 feet. From 1985 to 2015, the Annex Creek Development has had an average annual energy generation of 27.1 GWh and is operated at 3,500 kW continuously throughout the year, except for short periods of time when one of the units is down for scheduled maintenance or the transmission line is out of service.

During a typical year, the lake fills by the end of September and excess water is spilled into Lower Annex Lake which discharges to the 2.5-mile Annex Creek bypassed reach. There are no minimum flow requirements in the current license for the bypassed reach.

The current project boundary for the Annex Creek Development includes: (1) the Upper Annex Lake within the 200-foot contour; (2) the Lower Annex Lake within the 100-foot contour, (2) Annex Creek Dam and spillway, (3) the intake, (4) the power tunnel, (5) the valvehouse, (6) the penstock, (7) the powerhouse, (8) the tailrace, and (9) the entire 12.5-mile-long transmission line corridor with a 100-foot-wide width except for an approximately 2-mile middle portion which has a 500-foot width. The Thane substation is not included within the project boundary.

2.1.2 Project Safety

The project has been operating for more than 28 years under the existing license and during this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the project has been inspected and evaluated every 5 years by an independent consultant and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, Commission staff would evaluate the continued adequacy of the proposed project facilities under a new license. Special articles would be included in any license issued, as appropriate. Commission staff would continue to inspect the project during the new license term to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.3 Existing Environmental Measures

AEL&P releases up to a maximum flow of 3 cfs from the base of Salmon Creek Dam into the bypassed reach[6] to maintain a streamflow of 9 cfs at the USGS gage to protect aquatic resources, monitors these flows through its Streamflow Monitoring Plan, and limits maximum discharge and maximum rate of discharge during annual valve testing and seasonal reservoir drawdown. AEL&P further consults with the Alaska SHPO and Forest Service on an as-needed, case by case, basis before conducting any land-clearing or land-disturbing activities not previously authorized by the license to ensure the protection of previously-undiscovered cultural resources, and operates and maintains a visitor information, registration, and parking area at the Salmon Creek trailhead and trails leading to Salmon Creek Reservoir.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities and Operation

AEL&P does not propose any modifications to project facilities or operations.

2.2.2 Proposed Environmental Measures

AEL&P proposes the following environmental measures to protect or enhance aquatic, recreational, and cultural resources:

- Continue to release up to a maximum of 3 cfs from the base of the Salmon Creek dam to maintain a minimum flow of 9 cfs as measured at AEL&P's existing gage site in the lower Salmon Creek bypassed reach to protect aquatic habitat for anadromous salmonids;
- Continue to implement its Streamflow Monitoring Plan to document compliance with minimum instream flow requirements in Salmon Creek;
- Continue to implement the Reservoir Outlet Release Plan with provisions to limit the timing, volume, and rate of flows discharged from the low-level outlet at Salmon Creek dam during annual valve testing and seasonal reservoir drawdowns.
- Replace the Salmon Creek trailhead kiosk and update the kiosk information (e.g., to reflect changes in land ownership in the area);
- Update the Salmon Creek Trail informational pamphlet and provide it on-line;
- Improve the upper portion of the Salmon Creek Trail by removing vegetation and clearing windfalls and boulders from the trail, replacing or repairing bridges, stabilizing eroded sections of the trail, and adding trail markers;

[6] The Salmon Creek bypassed reach extends 2.8 miles from the base of Salmon Creek dam to the mouth of Salmon Creek at Gastineau Channel. The lower Salmon Creek bypassed reach is a 0.3-mile reach of Salmon Creek that extends from a barrier falls that blocks anadromous fish passage downstream to the mouth of Salmon Creek.

- Continue annual maintenance of the Salmon Creek Trail and informational kiosk;
- Assess the condition of the Salmon Creek trail every 6 years in conjunction with the Form 80 recreation use reporting cycle;
- Continue to maintain the 0.25-acre Salmon Creek Trailhead parking lot; and
- Implement the HPMP filed with the application to protect cultural resources found at both Salmon Creek and Annex Creek developments.

2.2.3 Proposed Modifications to Project Boundary

AEL&P proposes to modify the project boundary to add about 0.25 acre of land associated with the Salmon Creek Trailhead parking lot, which would bring the total project acreage to 1,037.01.

2.2.4 Modifications to Applicant's Proposal – Mandatory Conditions

The following mandatory conditions have been provided and are evaluated as part of the applicant's proposal.

Section 4(e) Land Management Conditions

The Forest Service filed 17 preliminary conditions under section 4(e) of the FPA for the Annex Creek Development. Conditions 1 through 11, 13 through 15, and 17 are administrative or legal in nature and not environmental measures. We, therefore, do not analyze these administrative conditions in the EA.

The administrative conditions are as follows: (condition 1) obtain a Forest Service special use authorization within one year of any license issued by the Commission for the project; (condition 2) obtain written approval from the Forest Service for all final design plans for project components that the Forest Service deems as affecting or potentially affecting National Forest System (NFS) lands and resources; (condition 3) obtain written approval from the Forest Service prior to making any changes in any constructed project features or facilities, or in the uses of project lands and waters the Forest Service deems as affecting or potentially affecting NFS lands; (condition 4) consult annually with the Forest Service with regard to measures needed to ensure protection and use of the NFS lands and resources affected by the project (representatives from the Alaska Department of Fish and Game, interested tribes, other agency representatives, and other interested parties concerned with operation of the project may attend the meeting); (condition 5) maintain all project improvements and premises on NFS lands to standards of repair, orderliness, neatness, sanitation, and safety acceptable to the Forest Service; (condition 6) comply with the regulations of the Department of Agriculture and all Federal, State, borough, and municipal laws, ordinances, or regulations in regard to the area or operations covered by any license issued for the project, to the extent those laws, ordinances or regulations are not preempted by federal law; (condition 7) file a

restoration plan, approved by the Forest Service, at least one year in advance of the proposed application for license surrender; (condition 8) grant Forest Service the right to use or permit others to use any part of the licensed area on NFS lands for any purpose, provided such use does not interfere with the rights and privileges authorized by this license or the FPA; (condition 9) indemnify the United States from licensee actions or omissions; (condition 10) affirms duty of AEL&P to protect the land, property, and interests of the United States from damage arising from the construction, maintenance, or operation of the project works or the works that are appurtenant or accessory; (condition 11) identify and report all known or observed hazardous conditions on or directly affecting NFS lands within the project boundary that would affect the improvements, resources, or pose a risk of injury to individuals; (condition 14) reserves the right of the Forest Service to, after notice and opportunity for comment, require changes in the project and its operation through revision of the Section 4(e) conditions to accomplish protection and use of NFS lands and resources; (condition 15) avoid disturbance to all public land survey monuments, private property corners, and forest boundary markers; and (condition 17) precludes AEL&P from commencing implementation of habitat or ground disturbing activities on NFS lands pending completion of the project-level pre-decisional administrative review process for occupancy or use of NFS Lands and Resources.

Conditions 12 and 16 are environmental conditions that are analyzed in this EA.

- Condition 12 prohibits AEL&P from using herbicides to control undesirable woody and herbaceous vegetation, aquatic plants, and prohibits the use of pesticides to control undesirable insects, rodents, non-native fish, etc., on NFS lands without the prior written approval of the Forest Service.

- Condition 16 stipulates that within one year of license issuance, should it be granted, or prior to any ground-disturbing activity, AEL&P shall file with the Commission an Invasive Plant Management Plan that is approved by the Forest Service.

2.3 STAFF ALTERNATIVE

The staff alternative includes AEL&P's proposed measures, the Forest Service's 4(e) conditions and the following staff recommended modifications and additional measures:

- Develop an Invasive Species Management Plan as required by the Forest Service and apply the measures and protocols to all project lands to minimize the introduction and spread of invasive plants during any future land-disturbing activities, such as trail maintenance;

- Follow U.S. Environmental Protection Agency (EPA) label instructions when applying herbicides and pesticides and prohibit their use within 500 feet of sensitive amphibian species habitat as required by the Forest Service and apply these limitations to all project lands;
- Install a directional sign at the intersection of the Salmon Creek Trail and an existing maintenance trail to direct hikers to the main trail;
- Document completion of all recreational enhancements at the Salmon Creek Development with photographs or as-built drawings;
- File a report with the Commission, prepared in consultation with the National Park Service and Alaska Department of Natural Resources (Alaska DNR), Division of Parks and Outdoor Recreation, on the 6-year Salmon Creek Trail assessment results along with any recommendations for necessary trail improvements; and
- Revise AEL&P's HPMP to (1) clarify the types of operation and maintenance activities that would, or would not, have the potential to adversely affect historic properties, and how such work would be done to prevent adverse effects to historic properties; (2) provide more detail regarding the treatment of human remains and inadvertent discovery of cultural resources; and (3) clarify consultation procedures.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

We considered several alternatives to AEL&P's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are: (1) issuing a non-power license, (2) federal government takeover of the project, and (3) retiring the project.

2.5.1 Issuing a Non-power License

A non-power license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider issuing a non-power license a realistic alternative to relicensing in this circumstance.

2.5.2 Federal Government Takeover of the Project

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. While that

fact alone would not preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

2.5.3 Retiring the Project

Project retirement could be accomplished with or without dam removal. Either alterative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. There would be significant costs involved with decommissioning the project and removing any project facilities. The project provides a viable and safe source of power to the region. With decommissioning, the project would no longer be authorized to generate power. Thus, dam removal is not a reasonable alternative to relicensing the project with appropriate protection, mitigation, and enhancement measures.

The second project retirement alternative would involve retaining the dams and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the services supplied by the project are needed, a source of replacement service would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity, (2) an explanation of the scope of our cumulative effects analysis, and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*.[7]

[7] Unless noted otherwise, the sources of our information are the license application (AEL&P, 2016a).

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Salmon Creek and Annex Creek Project consists of two separate developments, each within a different river basin. The Salmon Creek Development is located within the Salmon Creek basin and the Annex Creek Development is located within the Annex Creek basin.

Annex Creek is located in a remote, heavily-forested, mountainous area of the Tongass National Forest about 11 miles east of Juneau. The Annex Creek basin encompasses about 6.2 square miles and ranges in elevation from 0 to 4,170 feet MSL. Upper Annex Lake is fed by multiple small snowmelt streams along the length of its steep shoreline. The primary tributary stream to Upper Annex Lake is Upper Annex Creek which flows into the northwest corner of the lake. Annex Creek flows over very steep terrain directly into Taku Inlet. There is no glacial input to the basin. Lower Annex Lake receives input from Upper Annex Lake and from a very small stream that enters the lake at its northwest corner. Other than the existing hydroelectric facility, there is no development in the vicinity of Annex Creek and recreational use in the immediate area is very light because of the remote location and difficult access. Aside from forestry management, power production is the dominant land and water use within the basin.

The Salmon Creek basin is located about 3 miles northwest of downtown Juneau and occupies an area of approximately 11 square miles ranging in elevation from 0 to 4,935 feet MSL. The lower portion of Salmon Creek crosses a moderately developed area within the City and Borough of Juneau, while the upper portion occupies rugged, heavily-forested, mountainous terrain on land owned by the State of Alaska. A small area of the upper basin is covered by glaciers. Approximately 5.2 square miles of the basin contribute inflow to Salmon Creek Reservoir which is formed by the project dam on Salmon Creek. Two streams of approximately equal size enter the east end of Salmon Creek Reservoir. One of these streams originates in high elevation snow fields and flow northwesterly for approximately 1.0 mile before entering the reservoir. The other stream originates in the mountains northeast of the reservoir and flows southwesterly for about 1.2 miles into the reservoir. Below the dam, the Salmon Creek flows for 2.8 miles down moderately high-gradient terrain before emptying into Gastineau Channel. There are a number of small tributaries to the lower portion of Salmon Creek, the largest being the South Fork of Salmon Creek (South Fork) which joins Salmon Creek about 0.8 mile downstream of the dam. A 3-acre flooded area created by a landslide is located about 1,000 feet downstream from the confluence of Salmon Creek and the South Fork. A waterfall is located about 0.3 mile upstream of the mouth of Salmon Creek and blocks upstream fish passage.[8] The portion of Salmon Creek below the impassable falls flows

[8] Although the license application indicates the length of the Salmon Creek reach from the first impassable barrier falls to its mouth is about 0.25-mile, staff estimates and other information in the record indicates that the length of this reach is closer to 0.3 mile.

through a commercial area on the outskirts of Juneau and has been substantially altered by roadways and other development. Two major bridges cross Salmon Creek in this segment.

A series of water use agreements have allocated portions of Salmon Creek discharge for (1) preservation of minimum instream flow in lower Salmon Creek for maintaining fish habitat, (2) DIPAC fish hatchery operation at the mouth of Salmon Creek, and (3) drinking water for the City and Borough of Juneau. There is also a small diversion located on the lower portion of Salmon Creek upstream of the barrier falls that, until the 1990s, was used occasionally for short periods by Alaska DFG and the City and Borough of Juneau to fill Twin Lakes—two small lakes located within an Alaska DNR park located northwest of the project boundary where Salmon Creek enters Gastineau Channel. The facility remains but is no longer in use.

The climate of the Salmon Creek and Annex Creek basins is typical of southeastern Alaska with relatively mild temperatures (an average of 44.8 degrees Fahrenheit) (NOAA 2016) in relation to other regions of Alaska and considerable precipitation, the amount of which is influenced by local topography. Precipitation at sea level in the Salmon Creek Basin is about 90 inches yearly, with an average of 54 clear days. Precipitation in the Annex Creek Basin at sea level is 20 percent greater, although it has more clear days (an average of 94 days yearly). Precipitation in the higher elevations is much heavier in both basins usually in the form of snow and winter temperatures are much lower. The Carlson Creek basin, which is traversed by portions of the transmission line, receives about twice the amount of precipitation as the Juneau area, mostly as snowfall (Johnson 1962).

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing NEPA (40 CFR, section 1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we have determined that no resources would be cumulatively affected by the continued operation of the project.

3.3 PROPOSED ACTION AND ALTERNATIVES

In this section, we discuss the effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. Based on this, we have determined that geology and soils, aquatic, terrestrial, threatened and endangered species, cultural, recreation, and aesthetic resources may be affected by the proposed action and action alternatives. We have not identified any substantive issues related to socioeconomics associated with the proposed action, and therefore, this resource is not assessed in the EA. Land use and aesthetic resources are addressed in the recreation section. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

Annex Creek

The Annex Creek Development is located at the natural outlet to Upper Annex Lake. Although there is no specific information on their origin or composition, ice sheets and glaciers have left unconsolidated sediments of glacial till and glacial outwash (USFS 2008a). Other than areas in the mountains above Thane near the route of the transmission line, there are no mineral occurrences identified by U.S. Geological Survey (USGS) in the development vicinity (USGS 2003).

While site-specific soil information is unavailable, the Forest Service has classified over 100 soil types in the Tongass National Forest, of which the Annex Creek Component is a part (Forest Service 2008a). Throughout Southeast Alaska, the parent materials for soil genesis are volcanic ash; glacial deposits; hillslope, stream, and uplifted marine sediments; rock; and deposits of decomposed plant materials (Forest Service 2008a).

Salmon Creek

The Salmon Creek Development is located within a steep glaciated valley northwest of the Juneau city center. It is underlain by amphibolite metamorphic rocks and the greenschist rocks—argillite, slate, and phyllite—of the Juneau Gold Belt. Similar to the Annex Creek, no specific information on the unconsolidated sediments is reported in the Salmon Creek Component. However, throughout the region, ice sheets and glaciers have left unconsolidated sediments of glacial till and glacial outwash (USFS 2008a).

Mapping and surveying has been conducted for only approximately the lower 3,000 feet of the Salmon Creek Development. The soils adjacent to Salmon Creek in this area are Kuprean of gravelly silt loam and "Be" series soils of very gravelly sand, which are derived from modern alluvial and older delta deposits (Schoephorster and Furbush 1974; AEL&P 1985).

3.3.1.2 Environmental Effects

Since project operations would not change, erosion patterns will continue as they do under existing conditions and would be minor. AEL&P, however, proposes several improvements to the Salmon Creek Trail at the Salmon Creek Development that would result in very minor land-disturbing activities, which could cause some localized soil erosion. Routine maintenance could also create some localized, minor disturbance to soils. AEL&P does not propose, nor has any entity recommended, erosion control measures at the project.

Our Analysis

The localized nature of the recreation improvements and maintenance activities will limit both the generation and transport of eroded soil. Therefore, any resulting erosion or sedimentation would be insignificant and not require special erosion control measures.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity

Annex Creek Basin

AEL&P developed a synthetic flow duration curve for inflow to the Annex Creek basin based on 31 years of monthly streamflow records (August 1916 to December 1920 and October 1946 to September 1973) from Sheep Creek located near Juneau (USGS Gauge No. 15048000) (figure 2). During this period, the average monthly inflow to Upper Annex Lake was estimated at 68 cfs and ranged from a minimum of 0 cfs to a maximum of 280 cfs. Generally, minimum water surface elevations for Upper Annex Lake occur in April or May. Increased snowmelt during the summer months results in peak water surface elevations occurring during September or October. During winter months, the water surface elevations decrease as power withdrawals exceed inflow.

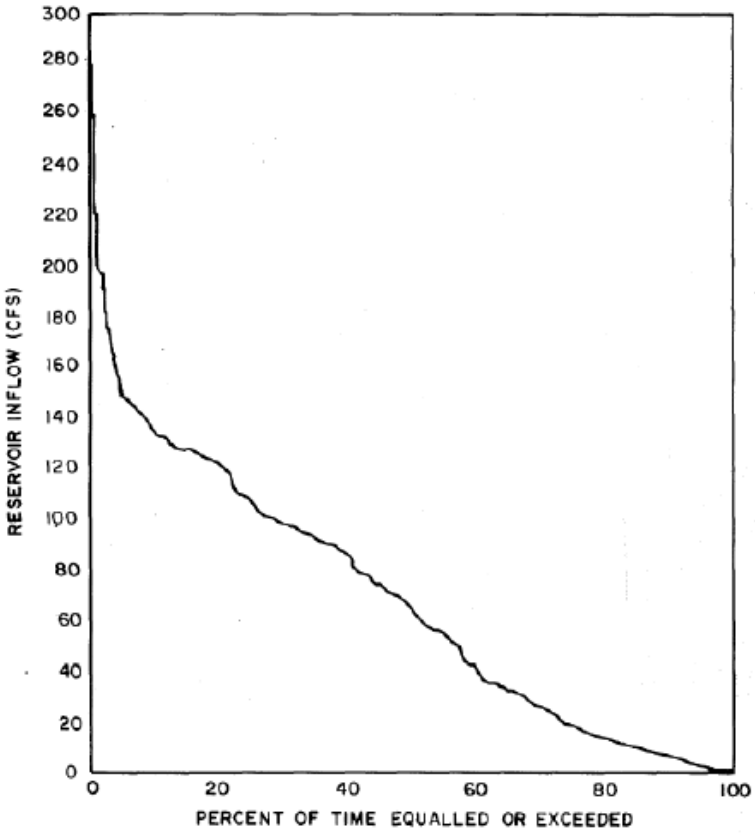

Figure 2. Flow duration curve of inflow to Upper Annex Lake for the period 1916 to 1920 and 1946 to 1973 (Source: AEL&P 2016a).

From June 2012 to October 2014, AEL&P monitored discharges in Annex Creek at a gage installed at the outlet of Lower Annex Lake. The discharge at this monitoring location represented the combined flow of spill from the Upper Annex Lake spillway and any accretion downstream of the dam. The daily average discharge during this period ranged from 0.2 cfs to 345 cfs (figure 3).[9] Generally, the highest discharges occurred during the summer and fall months and lowest discharges occurred during winter and spring months.

[9] AEL&P noted that winter streamflow data collection was problematic during this period because of snowfall and that flow data recorded in the summer of 2012 was affected by the transmission line being out of service for three months. These factors resulted in an abnormal project operating scenario where the lake filled in early summer and started spilling.

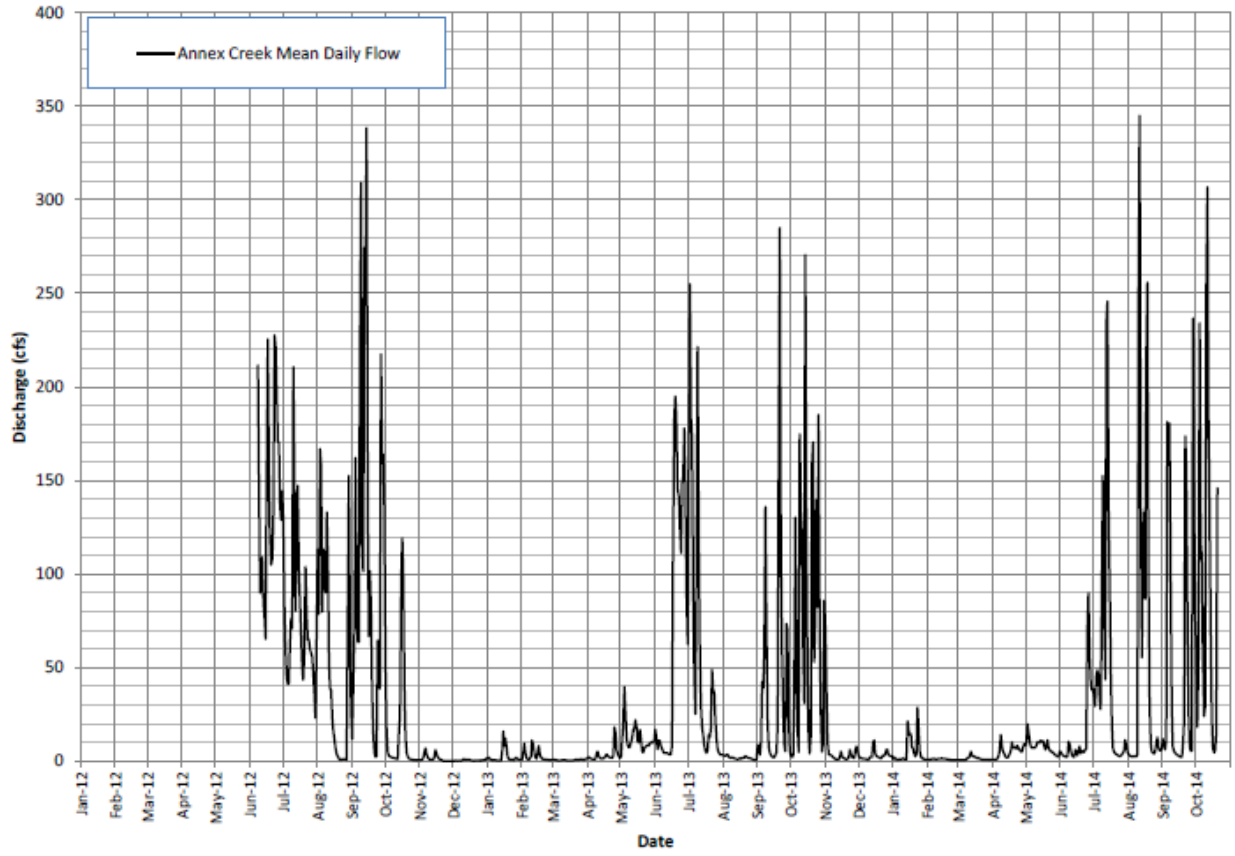

Figure 3. Annex Creek mean daily flow for the period June 2012 to October 2014 (Source: AEL&P 2016a).

Salmon Creek Basin

The average monthly unregulated stream flows measured in Salmon Creek at the outlet of Salmon Lake from July 1911 through October 1912 ranged from about 5 to 129 cfs (figure 4). In 1980, synthetically-derived average monthly inflows to Salmon Creek Reservoir were developed for a 22 year period (January 1940 to December 1961) based on data from nearby Sheep Creek and correlation with precipitation records in Juneau. During this period, the average unregulated monthly inflow to Salmon Creek Reservoir was estimated at 63 cfs, with a minimum average monthly inflow of 0 cfs and a maximum average monthly inflow of 227 cfs.

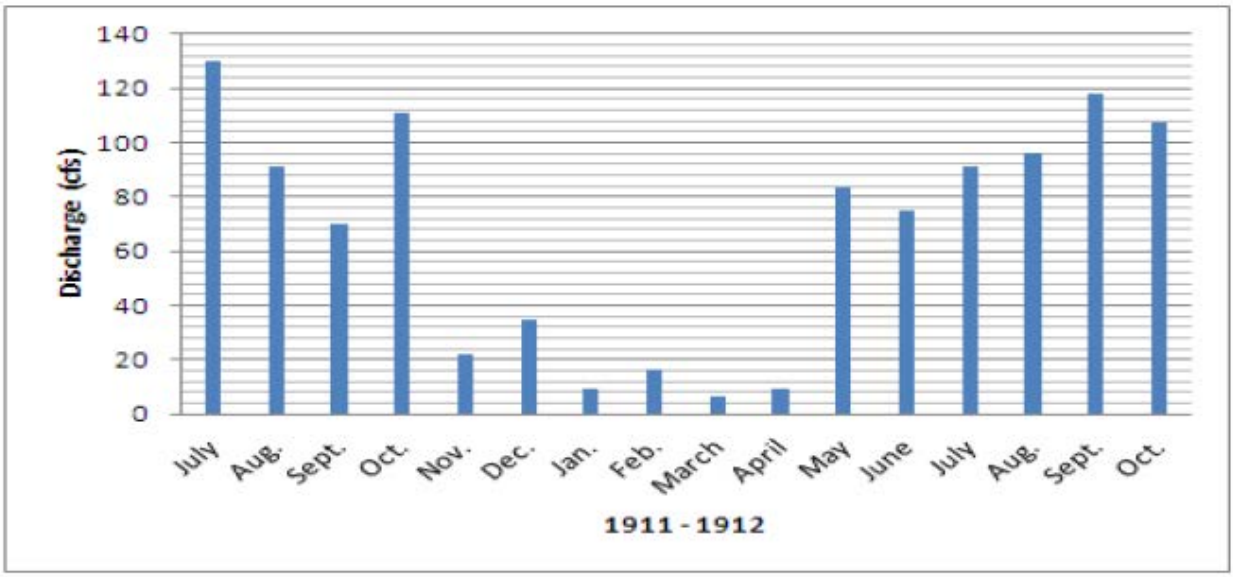

Figure 4. Unregulated average monthly inflow to Salmon Creek for the period July 1911 to October 1912 (Source: AEL&P 2016a).

Mean annual streamflows measured in the lower Salmon Creek bypassed reach (about 0.3-mile upstream from the mouth of Salmon Creek) at USGS Gage No. 15051010 from 1991 to 2014 ranged from 26.9 to 61.9 cfs (table 1). Daily mean streamflow from 1991 to 2014 ranged from a minimum of about 3.5 cfs to a maximum of about 1,100 cfs (figures 5 and 6).

Table 1. Mean annual flow in the Salmon Creek bypassed reach, 1991-2014 (Source: AEL&P 2016a).

Calendar Year	Streamflow (cfs)	Calendar Year	Streamflow (cfs)
1991	51.5	2003	26.9
1992	44.8	2004	33.8
1993	38.6	2005	61.9
1994	35.4	2006	39.1
1995	28.1	2007	38.6
1996	31.3	2008	44.5
1997	38.2	2009	34.3
1998	36.7	2010	32.2
1999	46.6	2011	40.3
2000	35.3	2012	41.5
2001	32.5	2013	42.3*
2002	39.3	2014	40.6*

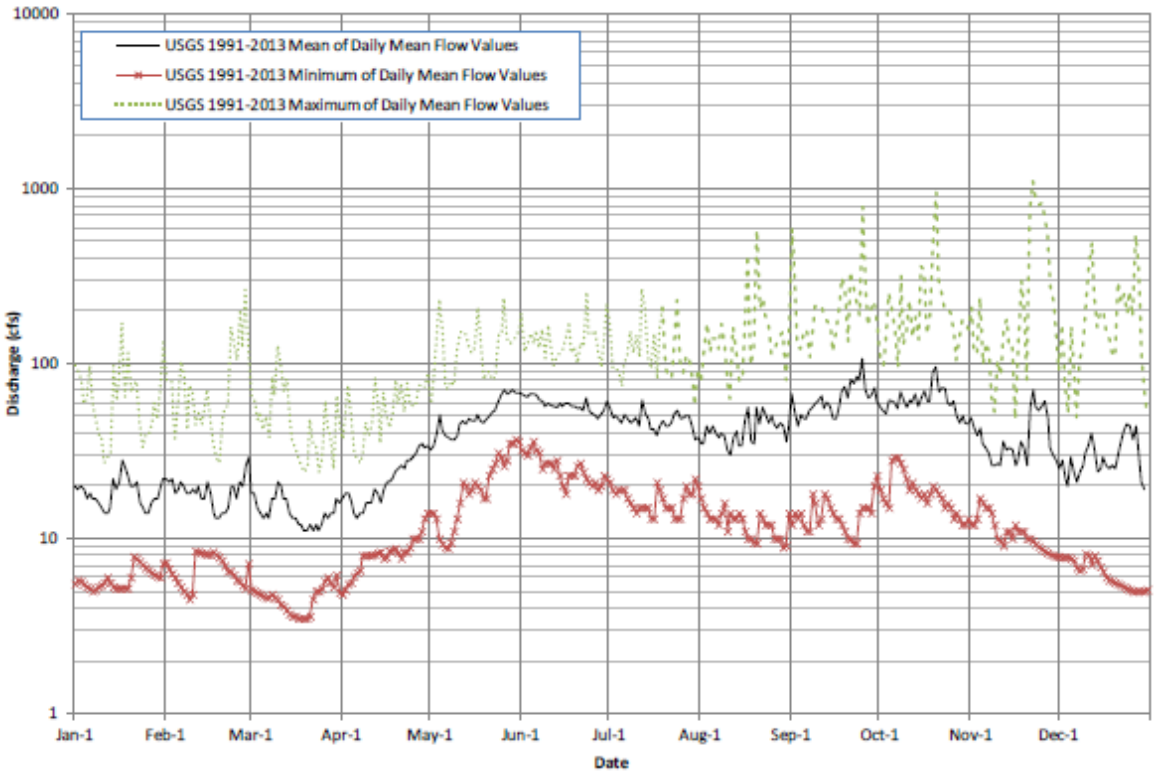

Figure 5. Average daily mean, minimum daily mean, and maximum daily mean flow in Salmon Creek bypassed reach for the period 1991 to 2013 (Source: AEL&P 2016a).

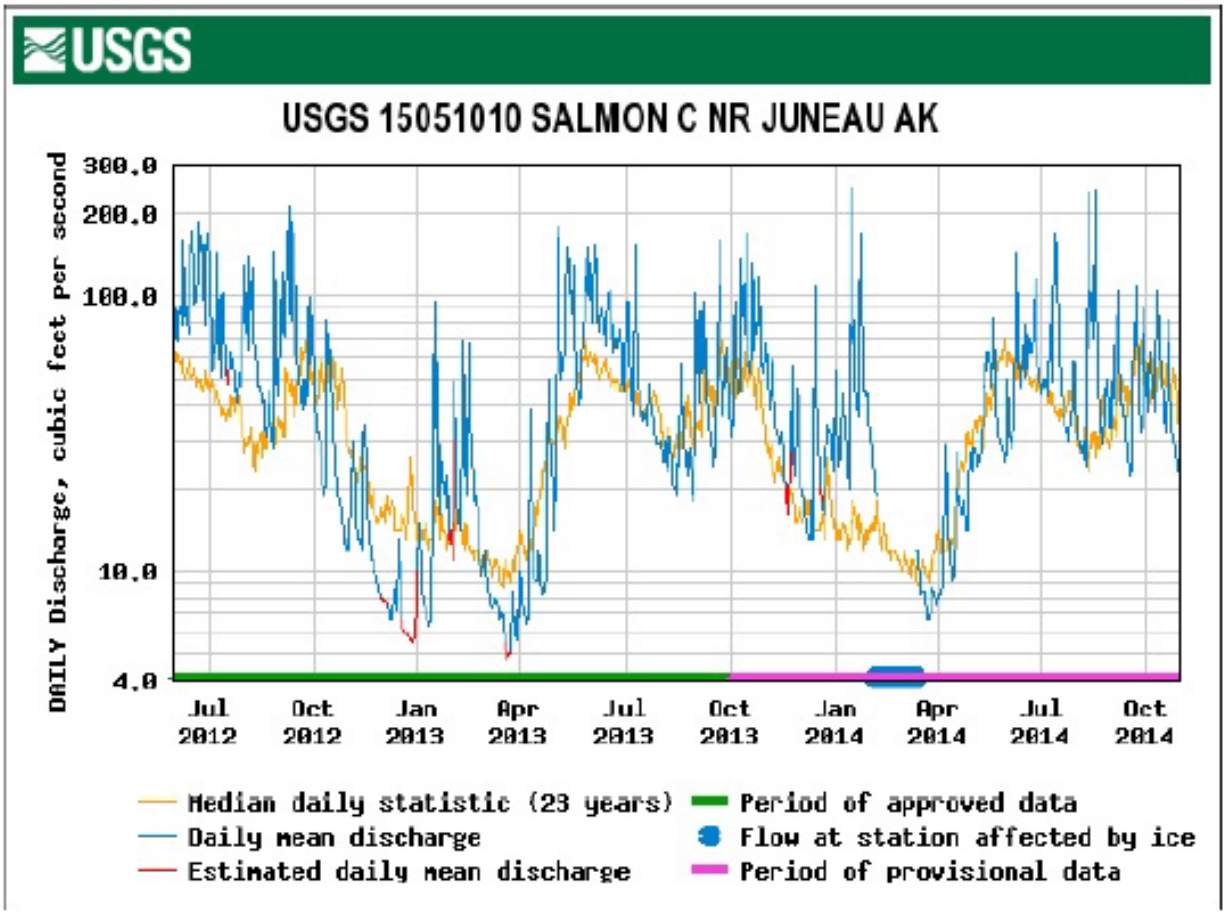

Figure 6. Salmon Creek mean daily flow for the period June 2012 to October 2014 (Source: AEL&P, 2016a).

Water Use

In 1987, the Alaska DNR issued AEL&P amended water use permits that provide AEL&P the right to appropriate 70 cfs to the Salmon Creek powerhouse and the right to appropriate 50 cfs to either the existing Salmon Creek powerhouse or the now decommissioned Salmon Creek Upper Powerhouse. Another water use permit provides AEL&P the right to appropriate an additional 55 cfs.

Currently, AEL&P discharges, as necessary, up to a maximum of 3 cfs from a 6-inch tap off the penstock to augment natural inflows downstream of the dam in order to maintain a minimum instream flow of 9 cfs as measured at the licensee's gage located immediately below the first impassable barrier falls on the lower Salmon Creek bypassed

reach.[10] This minimum flow requirement is intended to sustain aquatic resources in the Salmon Creek bypassed reach.

In addition to AEL&P's power generation and instream flow requirements, the Salmon Creek basin supports a number of other water uses. The City and Borough of Juneau has water rights to withdraw up to 3.8 million gallons a day (5.9 cfs) from the project tailrace to provide supplemental drinking water to the area. This water is conveyed from the tailrace into a wet well and then pumped to the Salmon Creek chlorine contact tank. Because of water quality issues with its Gold Creek water source, the City and Borough of Juneau is considering increasing its reliance on Salmon Creek as a municipal drinking water source in the future. Up to 10 cfs of water from the project tailrace is allocated to DIPAC's Macauley Salmon Hatchery after the water outfalls to a pond adjacent to the hatchery facility.

To help manage interests in the Salmon Creek basin, AEL&P, DIPAC, and the City and Borough of Juneau entered into a Tri-Party Agreement governing the use of water in Salmon Creek on October 21, 1986. This Tri-Party Agreement was renewed and updated on July 7, 2016. The July 2016 agreement provides for an anticipated continuous flow of 22 cfs in the Salmon Creek bypassed reach and project tailrace to balance instream flow needs (3 cfs), fisheries enhancement use by the hatchery (9 cfs), and water supply needs of the City and Borough of Juneau (10 cfs). It also includes a provision to deliver water from the penstock to DIPAC through a hatchery bypass tap and pressure reduction system if the Salmon Creek turbine is off-line.

Water Quality

Annex Creek

The lack of development in the Annex Creek basin likely results in good water quality in Annex Creek. Further, the lack of glacial input and high precipitation in the basin results in extremely clear water in both Upper and Lower Annex Lakes. AEL&P recorded water temperature from June, 2012 to August, 2014 in the Annex Creek bypassed reach near the outlet of Lower Annex Lake. Annual maximum daily temperatures in the bypassed reach ranged from 14.0 to 19.2°C (57.2 to 66.6°F) and closely resembled peak air temperatures (table 2). Temperature trends for the two years of fall data were very consistent and indicated that in mid to late October, stream temperature values steadily decreased until air temperatures were near freezing. In the winter, Annex Creek bypassed reach temperatures remained stable near 0°C (32°F) as the sampling location was covered by ice.

[10] In December 2015, the license was amended to change the stream flow gage for the Salmon Creek Development from a USGS-operated gage to a licensee-operated gage.

Table 2. Summary of water temperature data collected in the Annex Creek bypassed reach (Source: AEL&P, 2016a).

Gage Location	Monitoring Period	Min Temp (°C)	Max Temp (°C)	Mean Temp (°C)
Annex Creek	Jun 8-Dec 31, 2012	0.0	14.0	5.6
	Jan 1-Dec 31, 2013	0.0	19.2	4.8
	Jan 1-Aug 7, 2014	0.0	17.1	3.9

Salmon Creek

Water quality samples were collected in the Salmon Creek bypassed reach in August 1950, November 1966, March and June 1968, and February 1973. During these sample events, water temperature ranged from 1.1 to 6.0°C (34 to 42.8°F), pH ranged from 6.8 to 7.4, and total hardness ranged from 20 to 29 mg/L. Dissolved oxygen was only measured at two sample locations on February 22, 1973 and ranged from 13 to 14 mg/L.

AEL&P measured water temperatures in the Salmon Creek bypassed reach and a major tributary to the Salmon Creek bypassed reach (South Fork of Salmon Creek) from June 2012 to August 2014 and at the USGS Gage No. 15051010 location in the lower Salmon Creek bypassed reach from March to December 2013. Temperatures ranged from 0 to 12°C at all sample locations (table 3). Average water temperatures ranged from 3.3°C (37.9°F) in the South Fork to 5.8°C (42.4°F) in the lower Salmon Creek bypassed reach at the USGS gage. Starting in mid to late October, all temperature monitoring stations in Salmon Creek had similar temperature values that steadily decreased until air temperatures were near freezing. Winter temperatures in the South Fork and Salmon Creek bypassed reach varied between 0.0°C (32°F) and 3.5°C (38.3°F), and appeared to be directly influenced by air temperatures.

Table 3. Summary of water temperature data collected in the Salmon Creek bypassed reach and the South Fork of Salmon Creek (Source: AEL&P 2016a, as modified by staff).

Gage Location	Monitoring Period	Min Temp (°C)	Max Temp (°C)	Mean Temp (°C)
Salmon Creek Bypassed Reach (North Fork Salmon Creek)	Jun 6-Dec 31, 2012	0.0	8.7	4.9
	Jan 1-Dec 31, 2013	0.0	10.6	4.4
	Jan 1-Aug 12, 2014	0.0	10.5	4.2
South Fork Salmon Creek	Jun 6-Dec 31, 2012	0.0	8.2	3.5
	Jan 1-Dec 31, 2013	0.0	11.3	3.5
	Jan 1-Aug 12, 2014	0.0	11.4	3.3
Lower Salmon Creek Bypassed Reach (at Gage Location)	Mar 5-Sep 30, 2013	0.0	12.0	5.8

Salmon Creek Reservoir

In 1972 and 1973, the USGS conducted seasonal water quality sampling at various depths within Salmon Creek Reservoir to measure water temperature, dissolved oxygen, pH, nutrients, metals, and other conventional water quality parameters. During this period, dissolved oxygen ranged from 7 to 14 mg/l, water temperature ranged from 0 to 10.5°C (32 to 50.9°F), and pH ranged from 6.7 to 8.

In 2012 and 2013, AEL&P recorded monthly water temperature data at 4-hour intervals from June to October at various depths ranging from 0.2 to 44 meters (0.7 to 144 feet) in Salmon Creek Reservoir (figure 7). Overall, reservoir water temperatures ranged from about 4.2°C (39.6°F) at the bottom (44 m) to about 18.2°C (64.8°F) at the surface (0.2 m). The maximum temperature difference between surface (0.2 m) and bottom (44 m) was 10.6°C (19.1°F) in August 2013. Generally, the water temperature profiles indicate that lake stratification occurred by mid-June of each year. In August 2013, a thermocline was evident with a sharp decrease in water temperatures beginning at about 9 meters below the surface. In mid-August, reservoir turnover occurred resulting in the mixing of bottom and surface waters and similar temperatures throughout the water column.

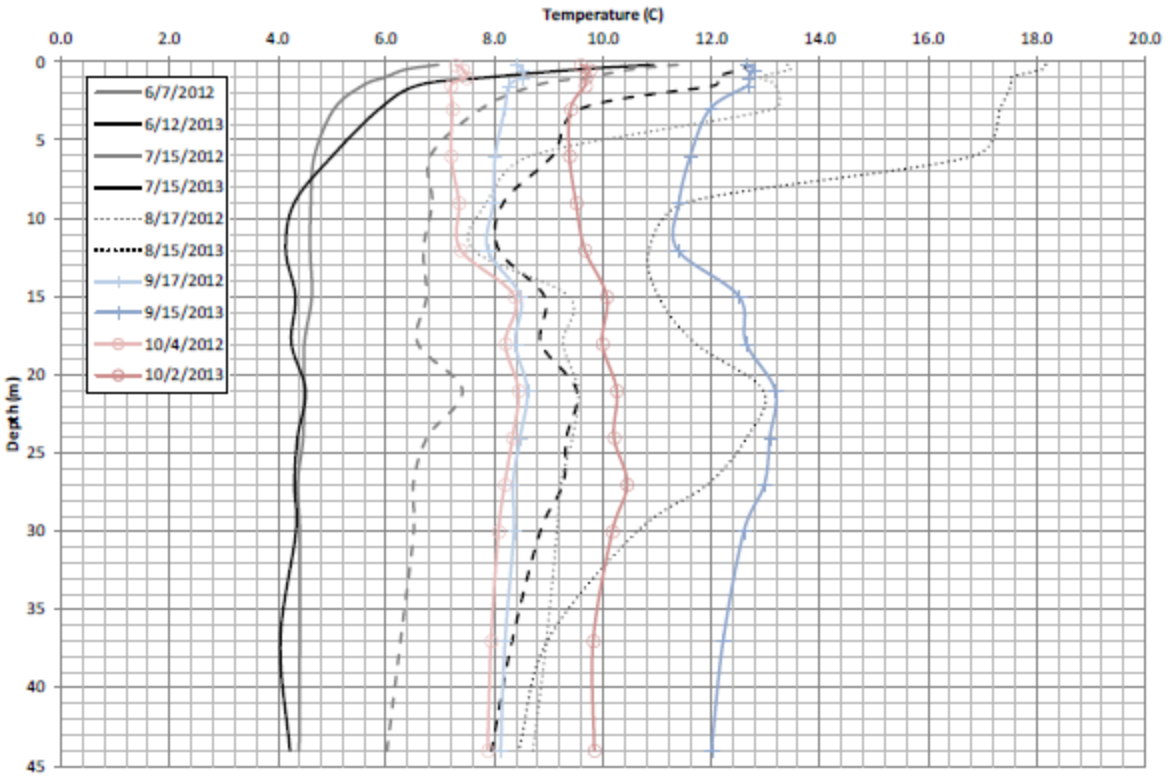

Figure 7. Mean daily water temperature profiles in Salmon Creek Reservoir (Source: AEL&P, 2016a).

Fisheries Resources

Upper Annex Lake

Aquatic habitat in Upper Annex Lake is limited by a very steep shoreline abutting mountain slopes on most sides of the lake. Rock slides and avalanche debris probably provide cover and contribute to habitat diversity along the steep shoreline. At the northern end of the lake, an inlet stream has created an extended alluvial fan, providing some littoral habitat. However, during winter drawdown of the reservoir, much of this littoral habitat becomes unavailable to fish. Other smaller and steeper mountain streams contribute to the lake around the perimeter.

The non-native eastern brook trout is the only fish species known to occur in Upper Annex Lake. The introduction of eastern brook trout into Upper Annex Lake occurred in 1917 when 60,000 brook trout fingerlings were stocked by the Gastineau Mining Company. It is unknown if any other fish species inhabited Upper Annex Lake prior to the 1917 stocking. Because of limited fish population surveys, the population density, age and growth characteristics, and general life history of brook trout in the lake are also unknown. In general, eastern brook trout typically spawn in the fall during

October and November, and lacustrine populations of brook trout spawn in shallow gravel areas of a lake or its tributary streams (Behnke, 2002; Scott and Crossman, 1973). Because Upper Annex Lake is annually drawn down (up to 139 feet) during the typical winter incubation period, resulting in the dewatering of most of the suitable habitat areas in the body of the lake, it is expected that successful spawning is predominately occurring within perennial tributary streams. Regardless of the spawning strategy, brook trout in Upper Annex Lake have maintained a self-sustaining population for the nearly 100 years of project operation.

In 2012, AEL&P conducted fish surveys in Upper Annex Lake using hook and line sampling and baited fish traps. Hook and line sampling for about 3 man-hours yielded a total of three eastern brook trout ranging in length from 198 to 308 millimeters (mm) (7.8 to 12.1 inches) (AEL&P 2012). The baited fish traps yielded no fish; however, several brook trout fry were observed adjacent to the shoreline.

Lower Annex Lake

Aquatic habitat in Lower Annex Lake is limited by its small size and the seasonal lack of inflow resulting from project operation. When Upper Annex Lake is drawn down below the spillway elevation, all of the inflow from Upper Annex Lake is diverted for project operation. Under those conditions, there is no major source of inflow to Lower Annex Lake. The northern lobe of the lake provides deep water habitat and receives inflows from the main inlet stream as well as some smaller mountainside streams. The southern lobe of the lake is primarily comprised of shallow water habitat, with some areas dewatering during low water levels. Aquatic habitat is more varied in the northern lobe, including abundant littoral habitat adjacent to the inlet and other shoreline areas.

The only known fish species to occur in Lower Annex Lake is the non-native eastern brook trout. Eastern brook trout were introduced to the lake in 1917 when 28,000 juveniles were stocked. Similar to Upper Annex Lake, there is no historical information regarding fish presence prior to construction of the project. Further, because of limited fish surveys in the lake, the population size, age and growth characteristics, and general life history of brook trout in Lower Annex Lake is unknown.

In 2012, AEL&P conducted fish surveys in Lower Annex Lake using a variety of methods. Surveys using minnow traps yielded two juvenile brook trout with lengths of 78 and 88 mm (3 and 3.5 inches). Hook and line sampling for about 4 hours yielded 11 brook trout ranging in size from 205 to 330 mm (8 to 13 inches). All fish captured by hook and line sampling were caught at the north end of the lake adjacent to the inlet stream and it was apparent that fish were concentrating at the confluence of the inlet and the lake. Shoreline electrofishing for about 30 minutes along the shallow, south end of the lake yielded five brook trout ranging in size from 42 to 240 mm (1.6 to 9.4 inches). Based on the very limited fish survey data, fish density in Lower Annex Lake appears to

be substantially higher than in Upper Annex Lake. Overall, Lower Annex Lake probably supports a self-sustaining population of brook trout; however, it is not known whether the trout are descendants of the original stocking or are the result of emigration of brook trout out of Upper Annex Lake through the short connecting stream.

Annex Creek

Because of the lack of suitable fish habitat and difficulty in accessing the stream, no fish surveys have been conducted in Annex Creek. However, it is expected that eastern brook trout originating from Lower Annex Lake inhabit some portions of Annex Creek. Aquatic habitat in the 0.5-mile reach of Annex Creek from south end of Lower Annex Lake to its mouth at Taku Inlet is characterized as very high gradient and incised, with several waterfalls, including one located just above tidewater, which blocks access to anadromous fish species.

Salmon Creek Reservoir

Aquatic habitat in Salmon Creek Reservoir is limited by the very steep shorelines along the reservoir, although areas of rock slides and avalanche debris likely provide some areas of suitable habitat. A shallow alluvial fan at the east end of the reservoir likely provides the most suitable habitat for fish.

Eastern brook trout is the only fish species known to inhabit the Salmon Creek Reservoir. There is no known historical information regarding presence or absence of native fish species in upper Salmon Creek prior to dam construction in 1914. In 1917, 60,000 eastern brook trout fingerlings originating from Colorado were stocked in the reservoir, and in 1927 an additional 13,150 brook trout were stocked (Schmidt 1977; AEL&P 1982). The latter stocking was apparently successful, creating a self-sustaining brook trout population and a sport fishery that began in the 1930s and has continued to the present. A voluntary creel census in 1960 indicated a catch of 1.6 fish-per-hour (Schmidt 1977).

A fish study conducted by Schmidt (1977) in Salmon Creek Reservoir, estimated the population of adult and subadult brook trout to be about 1,250 individuals and concluded that growth rates and fish condition were within the normal range for the species. The majority of fish collected ranged in length from 230 to 239 mm (9.0 to 9.4 inches) and were five to six years old (figure 8). In most cases, brook trout were caught at depths of less than 20 feet and in rocky shoreline habitat. The diet of brook trout collected during the study consisted almost entirely of aquatic insects that predominately included caddis fly larvae and Diptera larvae (e.g., midges, biting flies, etc.) (Schmidt 1977). No other fish species were observed during the study.

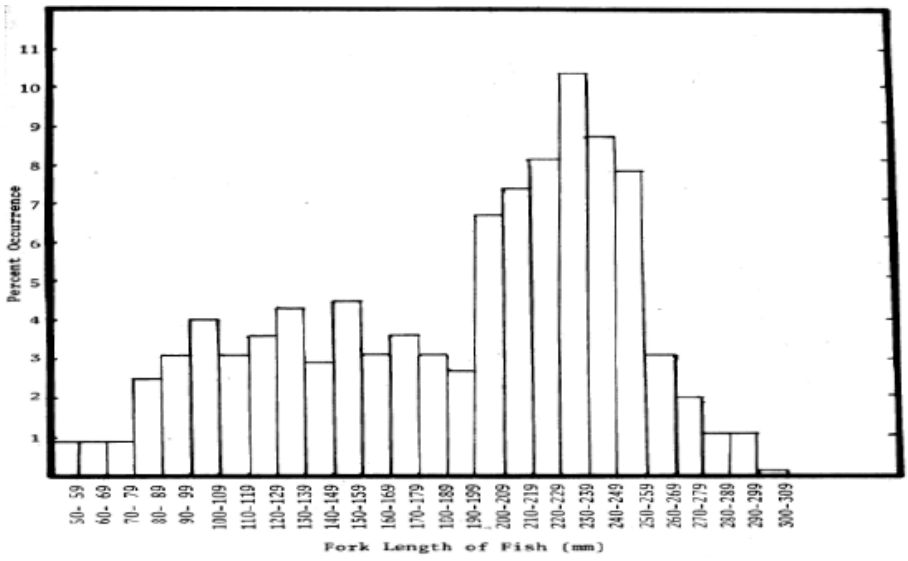

Figure 8. Length frequency of brook trout collected in Salmon Creek Reservoir in 1977 (Source: AEL&P 2016a).

In 2012, AEL&P conducted fish surveys in Salmon Creek Reservoir using hook and line sampling. The survey yield a total of 56 brook trout resulting in a catch rate of 6 fish-per-hour (AEL&P 2012). A length-frequency analysis of the fish collected during the survey indicated that 33 percent of the fish were in the 240 to 249 mm (9.5 to 9.8 inch) length range with another 21 percent in the 250 to 259 mm (9.8 to 10.2 inch) range (figure 9). Observations of habitat use in 2012 indicated the highest catches of trout occurred on the shallow alluvial fan area of the inlet stream.

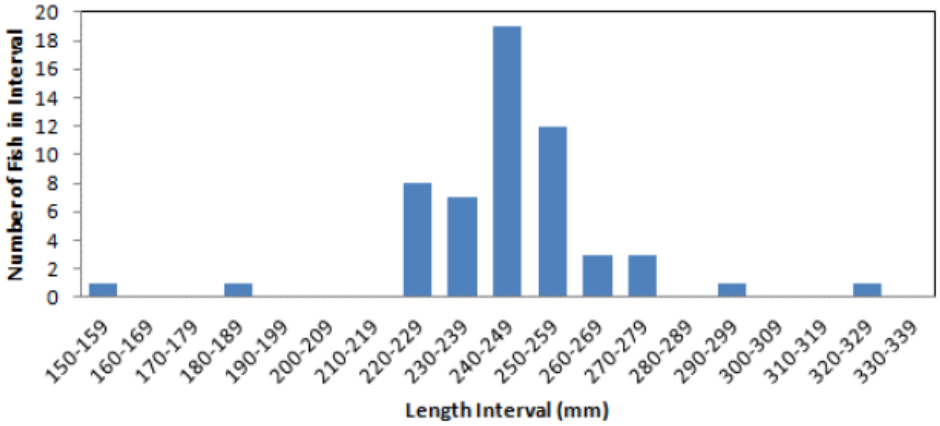

Figure 9. Length frequency of eastern brook trout collected in Salmon Creek Reservoir in 2012 (Source: AEL&P 2016a).

Salmon Creek

Salmon Creek flows approximately three miles from the outlet of Salmon Creek Reservoir to salt water at Gastineau Channel, dropping about 1,100 feet in elevation. A large tributary, the South Fork of Salmon Creek (South Fork), joins the Salmon Creek bypassed reach about 0.8 mile downstream from the reservoir. A waterfall blocks upstream fish passage approximately 0.3 mile upstream from salt water. Upstream of the waterfall, the stream is generally comprised of cascades and riffles. Some reaches of the stream have a slightly reduced gradient providing potential fish habitat, with limited sections of riffle-run-pool sequences. A flooded pond area, created by a landslide, occurs about 1,000 feet downstream from the confluence of the Salmon Creek bypassed reach and the South Fork. This large pond is approximately 0.3 acre in size with depths up to 8 feet and provides a unique habitat type within the Salmon Creek basin. Instream woody debris is abundant and provides cover and hydraulic conditions that cause the formation of small pools and breaks up the stream into small segments, limiting the extent of larger pools and runs. Varying gradients define the primary substrate type in different areas. Some reaches are dominated by gravel and cobble while higher gradient sections are characterized by coarser substrate materials. Slow water areas are generally limited to backwaters and side channels created by woody debris and likely change from year to year.

The lower portion of Salmon Creek bypassed reach, downstream from the impassable falls, flows for about 0.3 mile through a commercial area on the outskirts of Juneau. The gradient in this short stream reach is substantially less than in areas farther upstream. Generally, aquatic habitat consists of riffles and runs with large gravel, cobble, and boulder substrate. However, portions of the stream have been substantially altered to accommodate roadways and other development.

The only fish species known to occur in the Salmon Creek bypassed reach above the impassable barrier falls is eastern brook trout, although Dolly Varden have been reported in past fish surveys.[11] In 2012, AEL&P conducted fish surveys at four sample locations in Salmon Creek using electrofishing and minnow traps. The survey yield a total of 33 brook trout ranging in size from 30 to 220 mm (1.2 to 8.7 inches).

The lower 0.3-mile of Salmon Creek historically supported runs of anadromous chum, pink, and coho salmon and Dolly Varden. Escapement records from 1940 to 1980 indicate that chum salmon runs numbering up to 2,500 fish dominated in the 1950s and 1960s. Pink salmon runs dominated in the 1970s with numbers up to 3,700 fish.

[11] Because Dolly Varden were not collected during the 2012 fish survey, it is unknown whether Dolly Varden were present in the past and have since been displaced by brook trout, or whether the original reports were a result of erroneous species identification.

Numbers of coho salmon and Dolly Varden were consistently low throughout the period of record. Some limited rearing area for juvenile salmon and Dolly Varden is present in pools below the falls and within slow water areas downstream. Observations in early August 2012 indicated that chum salmon, probably of hatchery origin, were present in substantial numbers in Salmon Creek from the mouth up to the falls.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with the NMFS on actions that may adversely affect EFH. Salmon EFH includes all "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (50 CFR 600.10). The lower 0.3 mile of the Salmon Creek bypassed reach, from the barrier falls to its mouth, provides EFH for coho salmon, pink salmon, and chum salmon (Alaska DFG, 2017).

3.3.2.2 Environmental Effects

Annex Creek Development

Operation Effects on Aquatic Resources

AEL&P is not proposing and no one recommended any changes to project operation that would affect the existing aquatic resources at the Annex Creek Development.

Our Analysis

As discussed in section 3.3.2.1, *Affected Environment*, the Annex Creek bypassed reach is predominately comprised of an incised, high gradient channel with several waterfalls and likely provides little suitable habitat for non-native eastern brook trout. Further, a waterfall at the mouth of Annex Creek blocks anadromous salmonids from entering the stream channel. Similarly, both Upper Annex Lake and Lower Annex Lake provide limited aquatic habitat but continue to support a self-sustaining population of eastern brook trout under existing project operations. Therefore, we would expect that the continued operation of the project would not affect aquatic resources in the Annex Creek Development.

Salmon Creek Development

Bypassed Reach Minimum Flows

Project operations affect the natural flow regime in the Salmon Creek bypassed reach. To protect aquatic habitat and the fish community in the bypassed reach, AEL&P

proposes to continue to maintain a minimum flow of 9 cfs in the bypassed reach at a gage located below the first impassable barrier falls on lower Salmon Creek by releasing a flow of up to a maximum of 3 cfs from the base of the dam into the bypassed reach.

To ensure minimum flows are maintained in the lower bypassed reach, AEL&P proposes to continue to implement its Streamflow Monitoring Plan which includes provisions to maintain and calibrate a streamflow gage; transfer flow data in real-time to the Supervisory Control and Data Acquisition (SCADA) system; provide flow, stage, and calibration details to the resource agencies and the public; and provide a report to the Commission, within 30 days, if a deviation of the minimum flow occurs.

Our Analysis

In the final license application, AEL&P indicates that a 9 cfs minimum flow requirement at the gage location was established in 1986 in consultation with resource agencies and after reviewing low flow winter conditions at the USGS gage in Salmon Creek. The purpose of establishing this minimum flow was to protect habitat for anadromous salmonids in the lower Salmon Creek bypassed reach below the impassible barrier falls, while supporting flows needed for the salmon hatchery.

Based on the most recent 10 years of available flow records (January 2006 to October 2016) from the USGS Gage No. 15051010 located in the lower Salmon Creek bypassed reach, daily average flows less than 9 cfs occurred in approximately 12 percent of days and, in all cases, these low flows in the bypassed reach occurred during late fall and winter months. Mean monthly flows in winter for this streamflow period[12] ranged from 11 cfs in March to 21 cfs in April.

Based on the records of both natural and regulated streamflows to Salmon Creek discussed in section 3.3.2.1, *Affected Environment*, a minimum flow of 9 cfs is within the range of flow conditions experienced during the typical winter low flow period and releases up to 3 cfs are generally sufficient to maintain this minimum flow and ensure suitable habitat conditions for salmonids in the lower bypassed reach during project operation. Therefore, we do not expect a change in existing habitat conditions by continuing AEL&P's practice of releasing up to 3 cfs to maintain a target minimum flow of 9 cfs in the lower 0.3-mile of the bypassed reach. Continuing to maintain a stream gage that is capable of continuously monitoring flow in real-time to the AEL&P's SCADA system would enable AEL&P to quickly respond to any potential minimum flow deviations and implement corrective actions to ensure the protection of aquatic resources in the bypassed reach. Filing a report with the Commission within 30 days of any

[12] Mean monthly discharge was based on the period January 1, 2006 to September 30, 2016 because only partial flow data was available for October 2016.

deviations from minimum flow requirements would enable the Commission to ensure that AEL&P is implementing actions to correct any deviations or incidents and prevent them from recurring.

Reservoir Outlet Release Plan

Rapid flow changes in the Salmon Creek bypassed reach can occur during the seasonal drawdown of the reservoir to prevent spilling and during annual testing of the butterfly valve and low-level-outlet valve.[13] To limit the volume and rate of flows discharged during these events and minimize the effects on salmonid spawning habitat in the lower bypassed reach, AEL&P notifies Alaska DFG and Alaska DEC personnel prior to the testing of the butterfly valve and outlet valve , schedules reservoir releases during periods of high run-off and when the inflow exceeds the hydraulic capacity of the Salmon Creek powerhouse, restricts the annual valve testing to the period of mid-May through June, and identifies the maximum discharge and maximum rate of discharge as a percentage of full open of the butterfly valve according to the following procedure:

Reservoir Elevation (feet USCD)	Butterfly Valve (% Open)
>1,140	25
1,145	50
1,150	75
1,155	100
1,140[a]	50
<1,140[b]	0

Note: Prior to opening the butterfly valve, the low-level outlet valve is fully opened.
[a]After the reservoir elevation decreases from 1,155 feet to 1,140 feet, the butterfly valve opening is decreased from 100 to 50 percent to ensure the reservoir elevation continues to fall.
[b]If the reservoir elevation continues to fall below 1,140 feet after a low-level outlet release event, the butterfly valve will be closed.

These actions are defined in its Reservoir Outlet Release Plan, which AEL&P proposes to continue to implement over the next license period.

Our Analysis

[13] Flows discharged during reservoir drawdown and valve testing are released directly into Salmon Creek bypassed reach below the dam through a 36-inch diameter low level discharge pipe, referred to as the low level outlet.

Continuing to implement the measures outlined in the Reservoir Outlet Release Plan would continue to protect aquatic habitat in Salmon Creek. Restricting the rate and timing of discharge activities that could cause abrupt changes in flow in the bypassed reach as proposed by AEL&P would minimize the potential scour of salmonid spawning habitat in the lower bypassed reach while ensuring the safety and stability of Salmon Creek Dam. Conducting the annual valve testing from mid-May through June would avoid any adverse effects of abrupt flow changes on spawning salmon in the lower 0.3-mile of the bypassed reach. Notifying the agencies prior to any planned testing of the low level outlet would enable the agencies to be kept appraised of activities that could affect aquatic resources in project waters.

Essential Fish Habitat

As discussed above, AEL&P is proposing to continue to implement several environmental measures to protect aquatic resources including EFH for chum, coho, and pink salmon in the lower Salmon Creek bypassed reach. These measures include: releasing up to 3 cfs from the Salmon Creek Dam to maintain a minimum flow of 9 cfs in the lower bypassed reach; implementing its Streamflow Monitoring Plan; and, implementing its Reservoir Outlet Release plan.

Our Analysis

Implementing the minimum flow releases and Streamflow Monitoring Plan would ensure that adequate flow levels continue to be maintained and documented to support salmonid EFH for spawning and rearing in the bypassed reach, continuing to implement the Reservoir Outlet Release Plan would ensure that annual valve testing is conducted outside of the salmonid spawning season and would protect salmon EFH in the lower bypassed reach from abrupt changes in flow and potential scouring of spawning and rearing areas.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Vegetation

The habitats included in the two developments are similar in that both include reservoirs surrounded by peaks with barren rocky and alpine tundra and dwarf shrub habitats, transitioning to alpine low shrub, and then to hemlock-Sitka spruce forest. . Species present in the alpine plant community are crowberry, heather, blueberry, willow, nagoonberry, salmonberry, and alpine azalea. Some needleleaf forests grow in the bottom of high elevation drainages. Vegetation at lower elevations closer to the coast is comprised of needleleaf, broadleaf, and mixed forests; and tall shrub swamps, low shrub

bogs, wet graminoid herbaceous communities, and wet forb herbaceous communities on wet sites. The western hemlock-Sitka spruce forest generally has an understory of shrubs such as alder, willow, salmonberry, blueberry, devilsclub; and ground cover that includes deer cabbage, skunk cabbage, bunchberry, ferns, moss and lichens. .

AEL&P conducted botanical surveys for the Annex Creek Development in 2012, 2013, and 2014, specifically focusing on plant species identified as sensitive, rare, or species of concern by the Forest Service or the Alaska State Natural Heritage Program. No sensitive species were found in any of the survey years.

The 2012 survey identified 10 non-native species: common dandelion, big chickweed, white clover, common plantain, annual bluegrass, Kentucky bluegrass, rough bluegrass, common sheep sorrel, creeping buttercup, and germander speedwell. All of these, except one, were located near the grounds of the Annex Creek powerhouse. Creeping buttercup was observed on the bank of Carlson Creek. All species observed were considered very weakly to modestly invasive. None of the species observed during the survey appear on the Tongass National Forest's list of actively controlled invasive species. Each non-native species observed near the Annex Creek powerhouse comprised of less than three percent of the facility yard. The creeping buttercup observed along the transmission line corridor was on the shore of a meander bend where Carlson Creek is spanned by the line. No non-native species were identified during the 2013 survey. Non-native species were observed at two locations during the 2014 survey, both of which showed signs of human disturbance. The populations of these species are currently small and the species are rated only modestly to weakly invasive. All non-native species observed in the 2014 study area were documented previously in the Annex Creek powerhouse yard.

Surveys were not conducted at the Salmon Creek Development because of its similarity to Annex Creek. However, the Alaska Exotic Plants Information Clearing House identifies 22 species of non-native plants in the vicinity of the Salmon Creek Development, most of which rate as weakly to modestly invasive; the Japanese knotweed is considered highly invasive in this area.

Wetlands

The National Wetland Inventory (NWI) mapping effort conducted by FWS identified four wetland types in the Annex Creek watershed and along the transmission line alignment: lake, freshwater emergent wetland, freshwater forested/shrub wetland, and freshwater shrub-scrub wetland.

There are 14,044 feet of riparian and littoral habitat on Salmon Creek Reservoir and approximately 15,840 feet along Salmon Creek, from the dam to Gastineau Channel. Shoreline habitats on Salmon Creek Reservoir consist mainly of medium-tall shrub

communities with some areas of forest. Riparian habitats along Salmon Creek are predominantly forested with some medium to tall shrubs. These communities would include the species found in the Annex Creek Development: salmonberry, green alder, devilsclub, Barclay's willow, Sitka willow, and common ladyfern; and hemlock, Sitka spruce, rusty menziesia, Alaska blueberry, devilsclub, common ladyfern, and claspleaf twistedstalk in the medium-tall shrub and forested communities, respectively (USDA, 2017).

Wildlife

A minimum of 37 species of mammals may inhabit the Annex Creek and Salmon Creek developments, including: mountain goats, black and brown bears, snowshoe hare, Canada lynx, Sitka black-tailed deer, coyotes, gray wolves, common porcupine, and species of bats and small mammals. Moose are uncommon, but may be present in the project area.

In addition, there are at least 120 bird species that may occur in the vicinity of the Annex Creek and Salmon Creek developments. Their occurrence varies from year-round residents, such as the bald eagle and chestnut-backed chickadee, to migratory birds that breed in the area, such as spotted sandpipers and tree swallows, to migrants that pass through in the spring and fall, or winter in southeast Alaska, such as some Canada geese. Forested habitats likely provide breeding and foraging opportunities for hawks, falcons, and owls. A northern saw-whet owl was recorded during the survey of breeding birds in nearby Limestone Inlet Research Natural Area. Bald eagles, which are common in southeast Alaska, could nest in suitable trees near streams that have anadromous fish runs, such as Carlson Creek. However, to-date, no eagle nests have been reported in the project area. The project reservoirs and lakes could provide breeding and foraging habitat for water birds such as diving ducks and loons and shorebirds such as the spotted sandpiper. Because of the steep, rocky shorelines around Upper Annex Lake, suitable habitat is limited. Birds such as ptarmigan, rosy finch, golden-crowned sparrow, and cliff-dwelling raptors could use alpine tundra and low shrub habitats at higher elevations in the project area.

The same wildlife species may inhabit the riparian and littoral zones in the Annex Creek Development have the potential to reside in the Salmon Creek Development: bank-nesting birds such as dippers and harlequin ducks; forested and shrubby (e.g., alder and willow) riparian habitats could be home to orange-crowned, Wilson's, and yellow-rumped warblers; dark-eyed juncos; ruby-crowned kinglets; alder flycatchers; fox sparrows; and hermit thrushes. Where cottonwoods occur in riparian areas there could be yellow warblers, warbling vireos, and red-breasted sapsuckers. Stands of large trees near streams could be home to the varied thrush, Steller's jay, chestnut-backed chickadee, golden-crowned kinglet, brown creeper, pine siskin, common redpole, pine grosbeak, and white-winged and red crossbills. Mammals such as Sitka black-tailed deer, brown and

black bears, wolves and coyotes, marten, mink, ermine, river otters, beavers, other small mammals could forage for browse, berries, and prey or just use the stream habitats as a travel corridor. Amphibians could be present including the long-toed salamander, roughskin newt, western toad, wood frog, and Columbia spotted frog.

3.3.3.2 Environmental Effects

AEL&P proposes to continue to operate the project as it has done under the previous license. AEL&P would continue to annually clear brush from around project facilities as part of normal operations and maintenance activities. No changes to project facilities are proposed. Because there would be no changes from current practices, AEL&P concludes there would be no direct, indirect or cumulative adverse effects on wildlife and vegetation. Therefore, AEL&P does not propose environmental mitigation measures for these resources. AEL&P concludes that the populations of non-native plant species observed during the botanical surveys at Annex Creek are currently small and the species are rated only modestly to weakly invasive, suggesting eradication of these populations near the powerhouse would still be feasible. However, AEL&P did not propose any measures to address invasive species.

In their 4(e) conditions, the Forest Service included requirements for restricting the use of herbicides and pesticides (condition 12) and developing an Invasive Plant Management Plan (condition 16) for project lands on the national forest. Under these conditions, AEL&P would be prohibited from using herbicides and pesticides to control undesirable woody and herbaceous vegetation, aquatic plants, or undesirable insects, rodents, non-native fish, etc., respectively, on NFS lands without the prior written approval of the Forest Service. Further, pesticide use would be excluded from NFS lands within 500 feet of known locations of rough-skinned newt, western toad, or known locations of Forest Service Special Status or culturally significant plant populations. Application of pesticides would be required to be consistent with Forest Service riparian conservation objectives. Additionally, AEL&P would be required to use on NFS lands only those materials registered by EPA for the specific purpose planned and to strictly follow label instructions in the preparation and application of pesticides and disposal of excess materials and containers.

The Forest Service's required Invasive Plant Management Plan would include, at a minimum, the following provisions:

- Identify methods for prevention and control of noxious weeds. Treatment of existing infestations of highest priority weeds would be initiated immediately upon approval of the Invasive Plant Management Plan by the Commission;

- Develop a monitoring program to evaluate the effectiveness of invasive plant control measures; and

- Develop procedures for identification of additional measures that AEL&P would implement if monitoring reveals that invasive plant control is not successful or does not meet intended objectives.

Our Analysis

Because there would be no changes to existing project facilities or operations we do not expect any significant changes in habitats surrounding the project or the wildlife they support. Disturbance of vegetation and wildlife from routine maintenance activities would continue to be temporary, localized and minor.

Routine maintenance activities could introduce invasive species, which could spread to surrounding habitats, resulting in the competition with native vegetation and reducing the quality of wildlife habitat. Defining and implementing best management practices to prevent the spread and control of invasive species in an Invasive Plant Management Plan as required by the Forest Service would minimize these potential effects.

Some herbicides and pesticides easily spread through waterways and are toxic to amphibians. Restricting herbicide and pesticide near wetlands and following approved labels would protect sensitive amphibian species such as the rough-skinned newt, wood frog, western toad and the Columbia spotted frog. Applying these activities to all project lands would protect species at both developments, not just those on the national forest.

3.3.4 Threatened and Endangered Species

In its final license application, AEL&P states that the American wolverine (*Gulo gulo*) and the Kittlitz's murrelet (*Brachyramphus brevirostris*) has the potential to occur in the project vicinity. The American wolverine is proposed as threatened in several contiguous states in the western United States,[14] but not in Alaska. Kittlitz's murrelet is a candidate species and is not currently protected under the ESA. On August 17, 2017, staff accessed FWS's IPaC System to determine which federally listed species might occur in the project vicinity. According to the IPaC database, there are no threatened, endangered, candidate species, or critical habitats, in the project area for either development (FWS, 2017). Therefore, continued project operation would not affect any federally listed species.

[14] The American wolverine (*Gulo gulo luscus*) was proposed as threatened on August 13, 2014. *Federal Register* 79(156): 47522-47545.

3.3.5 Recreation, Land Use and Aesthetic Resources

3.3.5.1 Affected Environment

Annex Creek Development

The Annex Creek Development is located on Taku Inlet and, with the exception of portions of the transmission line, is within the Tongass National Forest. NFS land within and adjacent to the project boundary is identified by the Tongass National Forest Land and Resource Management Plan (Forest Plan) as a Semi-Remote Recreation Land Use Designation (LUD which calls for the area to be managed to provide users with an opportunity to experience a "moderate degree of independence, closeness to nature, and self-reliance…." (Forest Service 2016). Areas in Semi Remote Recreation LUDs are characterized by "generally unmodified natural environments where ecological processes and natural conditions are only minimally affected by past or current human uses or activities." Some areas offer motorized opportunities while others allow only non-motorized use. Facilities or structures in Semi-Remote Recreation LUDs should be minimal but occasionally may be larger in scale if they are "rustic in appearance or in harmony with the natural setting" (Forest Service 2016).

Taku Inlet is heavily used as a commercial fishing area between May and September with most of the use being concentrated south of the powerhouse area. Shallow tidal flats near the powerhouse make this area unsuitable for fishing or anchoring boats or float planes. There are no recreational facilities associated with the project along Taku Inlet and recreational use of project lands is light due to difficult access and the project's remote location, although between May and September a significant amount of air traffic occurs over the Annex Creek Development carrying tourists to visit nearby glaciers. Hunting for bear takes place in Carlson Creek Valley and for mountain goat in the Sheep Creek basin, areas that are traversed by the transmission line.

Taku Inlet is designated in the Forest Plan as a Visual Priority Route because it is accessible by small boats and mid-sized tourist boats touring Stephens Passage. Some areas within the National Forest that are visible from the Visual Priority Route are identified in the Forest Plan as a Scenic Viewshed LUD and must meet specific guidelines to maintain the scenic integrity of the viewshed. The extent of the Scenic Viewshed LUD, however, stops just south of the Annex Creek Development, outside of the project boundary. The Forest Plan, however, identifies scenic integrity objectives (SIOs) for the Semi-Remote Recreation LUD where Annex Creek facilities are located. At Annex Creek, SIOs are "moderate" which means design activities are to be subordinate to the landscape character of the area. Guidelines for a moderate SIO call for facility design and maintenance to keep vegetation clearing to a minimum and within close proximity of the project site, emphasizing enhancement of views from recreational

facilities, and selecting material and colors that blend with those in natural settings. The plan also provides for exceptions for non-conforming developments.

Salmon Creek Development

The Salmon Creek Development is primarily located on lands managed by the State of Alaska with smaller portions located on lands owned by the City and Borough of Juneau and a few other private landholders. Salmon Creek Reservoir is used as a municipal drinking water source for the City and Borough of Juneau and therefore certain activities such as camping or motorized vehicle use near the shoreline and gas-propelled motorized boating on the reservoir are prohibited for the public. The reservoir is adjacent to the Juneau Ice Field and is flown over multiple times a day by sightseers in helicopters. Salmon Creek Reservoir also contains an eastern brook trout fishery that is managed by Alaska DFG.

The lower end of the Salmon Creek Development is adjacent to Egan Drive, a four-lane highway that runs along the east shore of Gastineau Channel, and therefore is easily accessible from the Juneau road system. A variety of commercial uses surround this area including DIPAC's salmon hatchery operation. The 3.5-mile-long, AEL&P-maintained Salmon Creek Trail provides public access to project dam and reservoir. The trail begins just north of the Lower Power House as the 2-mile-long gravel project access road, accessible only to authorized vehicles or to public foot or bicycle traffic. The access road portion of the trail ends at the decommissioned Upper Powerhouse. At this point, a 1.5-mile-long foot trail (upper trail) begins that provides dam and reservoir.

The upper trail is steep in locations and presents a strenuous hike. AEL&P has provided, and continues to maintain, stairs in some of the steeper locations. These stairs were replaced in 2012 and are in good condition. AEL&P maintains a parking area, and an interpretive kiosk at the Salmon Creek Trailhead located at the start of the access road portion of the Salmon Creek Trail. The kiosk is old and rotting and some of the maps on the kiosk are outdated because they show federal land that is now owned by the State of Alaska or the City and Borough of Juneau (personal communication between Christy Yearous, Vice President, Generation, AEL&P and Suzanne Novak, Outdoor Recreation Planner, FERC, Washington, DC, August 29, 2017). In addition to the kiosk information, AEL&P provides an information pamphlet for visitors that is available at its office in Juneau.

The Salmon Creek Trail receives significant use by area residents and visitors. To better understand how these facilities are used, AEL&P conducted a video survey of trail users between June and October 2012 for a minimum of 6 days per month and for a minimum of 4 hours each day, including weekdays and weekends. A total of 395 visits were recorded during this time period. The highest usage occurred in July with 135 people using the Salmon Creek Trail during 38 hours within an 8-day period. Average

weekend use more than doubled average weekday use. The trail is also used throughout the winter for cross country skiing and hiking and the hill at the bottom of the trail is used for sledding. Overall, winter use levels are lower than summer use levels due to limited daylight and additional snowpack.

AEL&P also conducted an on-line trail user survey between February 20 and August 31, 2014, to determine what areas of the trail are being used as well as the purposes for the visits. A total of 187 responses were received, with all but one person residing in Juneau. Survey results show that both the access road and the upper portion of the Salmon Creek Trail are frequently used. Of the 187 people surveyed, 145 responded that they used the trail 5 or more times a month during the summer season, with 132 (70 percent) indicating that their end destination was Salmon Creek Dam. The survey also showed that the majority of trial users (94 percent) were satisfied or very satisfied with the conditions of the lower trail (access road) but only 58 percent were satisfied or very satisfied with the condition of the upper trail.

In May 2014, AEL&P conducted a trail condition assessment and found that the upper trail was in need of additional maintenance and repair due to large rocks, boulders and blown down trees within the trail and several areas that are badly eroded or prone to flooding. In addition, AEL&P found that several foot bridges along the upper portion of the trail needed to be either repaired or replaced because of broken handrails, rotted planks and/or damaged supports. Trail markers were also found to be needed in braided areas of the upper portion of the Salmon Creek Trail to point hikers in the right direction.

3.3.5.2 Environmental Effects

Annex Creek Development

AEL&P does not propose, nor has any entity recommended, any specific measures to enhance recreation or visual resources in the area.

Our Analysis

Recreation is expected to continue to be light due to the remote location and difficult access. No changes in project operation or facilities are proposed that would alter existing recreation. Therefore, relicensing the project would not likely affect recreation at the Annex Creek development and no measures to enhance recreation appear to be needed.

Because the project is located outside of the Tongass National Forest's Scenic Viewshed LUD, it would not significantly affect visual resources within the National Forest. Since no land-disturbing or land-clearing activities are proposed, other than continuing routine yearly removal of vegetation around existing project facilities, project

activities would be consistent with the Forest Service's guidelines for an SIO of "moderate" for the Semi-Remote Recreation LUD. Routine maintenance activities would be conducted close to project facilities thereby keeping the visual footprint of the project small and subordinate to the overall character of the landscape.

Salmon Creek Development

AEL&P's trail survey results show that 42 percent of those surveyed were not satisfied with the condition of the upper trail. To address recreationists' concerns and to better accommodate recreational use of the project area, AEL&P proposes to brush the trail (remove vegetation) and clear boulders and windfalls from the trail, replace or repair trail bridges, repair a section of flooded trail, install a logwall to stabilize a portion of the trail subject to erosion, and add trail markers. To ensure that the public has access to accurate and complete information on recreational opportunities in the project area, AEL&P proposes to replace the Salmon Creek Trailhead kiosk, update the kiosk information (e.g., reflect changes in land ownership), and update the Salmon Creek Trail informational pamphlet and provide it to the public on-line. AEL&P further proposes to continue to maintain the parking lot at the Salmon Creek trailhead and bring it into the project boundary (AEL&P 2016c). AEL&P would maintain all project recreational facilities (the Salmon Creek Trail, trailhead kiosk, and trailhead parking lot) and improvements on a yearly basis and conduct trail assessments every 6 years to coincide with the Form 80 reporting cycle.

Interior supports all of AEL&P's proposed recreational enhancements for the Salmon Creek Development as well as the proposed 6-year trail assessments assuming that the first assessment would occur in 2020 to coincide with the next Form 80, which is due to the Commission on April 1, 2021. In addition to AEL&P's proposed trail enhancements, Interior recommends that AEL&P install a directional sign at the intersection of the Salmon Creek Trail and an existing maintenance trail, where hikers sometimes get confused and wander off the designated trail (personal communication between Cassie Thomas, Alaska Coordinator, Hydropower Assistance Program, National Park Service, Anchorage, Alaska and Suzanne Novak, Outdoor Recreation Planner, FERC, Washington, DC, August 9, 2017).

The project dam and reservoir, as well as the decommissioned Upper Powerhouse and portions of the penstock, would continue to be visible to hikers using the Salmon Creek Trail and the powerhouse and associated facilities would continue to be visible to those parking at the Salmon Creek Trailhead. AEL&P does not propose, nor has any entity recommended, measures to specifically enhance visual quality at the Salmon Creek Development.

Our Analysis

Given the significant use of the Salmon Creek Trail, implementing AEL&P's proposed trail upgrades and other recreational enhancements would enhance recreation opportunities by improving public safety and enjoyment of the Salmon Creek Trail, enhancing the visual quality of the trail, and providing more easily-accessible and accurate information about recreation opportunities in the project area. Adding a directional trail sign at the intersection of the upper portion of the Salmon Creek trail and an existing maintenance trail, as recommended by Interior, would more clearly delineate the appropriate route for hikers to the project reservoir and potentially reduce production and use of secondary trails that could adversely affect surrounding wildlife habitats. Filing documentation of completed recreational enhancements, including the directional sign, in the form of photographs, as-built drawings, or other methods that clearly demonstrate the measures have been adequately completed would facilitate Commission oversight of the license.

Because the Salmon Creek Trailhead parking lot accommodates project-induced recreation use in that it is a popular means for recreationists to access dam and reservoir, it should be included within the project boundary. Because heavy recreational use of the Salmon Creek Trail makes it susceptible to possible erosion and resource damage, especially in the steep upper portion, conducting a trail assessment at 6-year intervals would help to ensure that the trail is maintained so that resource damage is minimized and hikers can continue to use the trail safely. While the periodic trail assessments would help AEL&P determine any problems that might need addressing, it is not clear how AEL&P intends to follow up on the assessment results. Filing a report with the Commission, prepared in consultation with the National Park Service and the Alaska DNR, Division of Parks and Outdoor Recreation, that provides the assessment results and any recommendations for trail improvements would ensure that recreation needs are accommodated.

Although hikers along the Salmon Creek Trail would continue to see project facilities, this would likely not be a negative impact since the dam and reservoir serve as destinations for most hikers using the trail, indicating that these users are interested in seeing project facilities. The powerhouse and associated facilities are in an area that is highly developed and so would continue to provide minimal visual contrast to the surrounding environment. AEL&P's proposed recreational enhancements of the Salmon Creek Trail would improve visual quality of the trail by removing debris and repairing or replacing degraded portions.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Section 106 of the NHPA requires that the Commission evaluate the potential effects on properties listed or eligible for listing in the National Register. Such properties listed or eligible for listing in the National Register are called historic properties. In this document, we also use the term "cultural resources" for properties that have not been evaluated for eligibility for listing in the National Register. Cultural resources represent things, structures, places, or archeological sites that can be either prehistoric or historic in origin. In most cases, cultural resources less than 50 years old are not considered historic. Section 106 also requires that the Commission seek concurrence with the SHPO on any finding involving effects or no effects to historic properties, and allow the Advisory Council on Historic Preservation (Council) an opportunity to comment on any finding of effects to historic properties. If Native American (i.e., aboriginal) properties have been identified, section 106 also requires that the Commission consult with interested Indian tribes that might attach religious or cultural significance to such properties.

Area of Potential Effect

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a proposed new license within a project's APE. The APE is determined in consultation with the SHPO and is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.

The APE for the Annex Creek Development totals about 680 acres and encompasses all of the FERC project boundary with the exception of the shoreline buffer zone around Upper and Lower Annex lakes due to the steepness around the lakes rendering them inaccessible. It was also determined that there was very little possibility of archaeological sites occurring in these zones. All lands within the APE also lie within the Tongass National Forest.

The APE for the Salmon Creek Development totals about 1,036 acres and encompasses all of the FERC project boundary with the exception of a diversion ditch located on the northern shore of Salmon Creek Reservoir and the shoreline buffer zone around the reservoir due to steepness and inaccessibly. As with the Annex Creek Development, there was very little possibility of finding archaeological sites in these areas.

The Alaska SHPO concurred with the developments' APE on July 17, 2015 (see email correspondence from S. duVall to M. Pipkin, Walking Dog Archaeology in Appendix A of HPMP, filed on August 31, 2016).

Culture Historic Context:[15]Aboriginal Settlement

The project area lies within rugged mountainous terrain in Southeastern Alaska between Taku Inlet and Gastineau Channel, and generally falls within the Northwest Coast culture area. The natural landscape in and around the project area prior to Euro-American settlement was comprised of dense forests of spruce, hemlock, and yellow cedar with an understory of bushes, some of which were rich in berries. Access across the rugged mountain interior was through the local rivers which drained to the coastline. The earliest occupation in the region began with the migration of Eurasian populations who entered Alaska at the end of the Pleistocene some 11,000 years ago. These early groups were adapted to a coastal environment exploiting resources from the Pacific Ocean. For the most part, they were seafaring hunters who manufactured stone (lithic) tools from an early Alaskan Northwest Coast microblade tradition. One of the earliest archaeological sites representing this tradition is Glacier Bay which lies about 31 miles west of Juneau and is dated to about 10,180 years before present. From about 6,500 to 4,000 years ago, the lithic technology in and around Southeast Alaska changed from chipped stone tools to tools made most from ground stone. These ground stone tools are characteristic of the early Tlingit culture that emerged in the region for the last 1,000 years before Euro-American contact. The Tlingit culture included large winter villages containing large wood-plank structures later known as clan houses. Oral tradition suggests that the Tlingit peoples originated from parts of the interior and Tsimshian Peninsula, entering the project area about 750 to 300 years ago. The extraction of salmon, although significant much earlier, became increasingly important, especially to those groups living further inland from the Pacific Ocean. Overall, peoples of the Tlingit culture were expert salmon and halibut fishermen and whalers who built seaworthy crafts that could span along the wide stretches of ocean and inland water ways surrounding the islands of Southeastern Alaska. They were also master craftsmen producing a myriad of wooden products, including eating utensils, boxes, masks, and exquisite carvings, totems, and textiles. Tlingit societies also became increasingly complex over the millennia, containing kinship institutions which levied laws over their territories and warfare on their foes, producing a nobility, trader/artisan class, commoners, and slaves.

Ethnographic Context: Aboriginal Occupation

Prior to Euro-American contact, the project area in and around Annex Creek falls within the traditional territory of the Taku Kwaan Tlingit. The Taku KwannTlingit, like their ancestors before, lived in large winter villages and in smaller fishing and hunting settlements along Taku Inlet during the warmer months. A reported village site was located on Carlson Creek on the north shore of Sunny Cove. The project area in and around Salmon Creek Falls is within the traditional territory of the Auk Kwaan Tlingit. Overall, the federally recognized Douglas Indian Association, Central Council of Tlingit

[15] The culture historic context is from Pipkin 2012, 2015, and 2016.

and Haida Indian Tribes of Alaska, and Angoon Community Association are the modern descendants of the Tlingit who lived in and around the Annex Creek and Salmon Creek developments. Historic structures dating to the turn of the twentieth century, such as a cabin and smokehouse, near the developments' APE where built by Native Alaskans associated with these Tlingit groups.

Culture Historic Context: Euro-American Occupation

The abundance of fur-bearing animals throughout Southeast Alaska attracted Russian, British, and American hunters by the turn of the eighteenth century. Russian sailing vessels out of Sitka or mainland Russia would dominate the inland waterways, forcing Native Alaskans further inland, and where much of their native hunting and fishing expertise was forcibly exploited by the Russians to dispatch the valued fur-bearing animals for the international market. Shortly after Alaska was purchased by the United States in 1867, gold was discovered in the vicinity of Juneau at Windham Bay and Powers Creek. In 1880, placer and lode gold deposits were discovered in Gold Creek in what is now modern Juneau, setting off a massive gold rush to the area (known as the Juneau Goldbelt), which enabled permanent settlement to the region where gold prospecting and mining flourished up into the 1940s. To facilitate the mining and milling industry, electric power was generated through a half dozen hydropower generating facilities around the Juneau region (including the Annex Creek and Salmon Creek developments), between 1893 and 1916. AEL&P was established in 1894 to distribute electricity to the burgeoning local business and residences associated with the mining industry center around Juneau. A significant local business also developed at this time with the canning of salmon, where initially local Native Alaskans were hired. By the 1890s, the cannery industry, much of which was localized around Juneau, employed thousands of workers, using both Native Alaskans, and later Chinese laborers from San Francisco and Seattle. Sunny Cove Cannery, which is within the Annex Creek Development's APE, was built in 1900 at the mouth of Sunny Cove. It employed both Native Alaskans and Chinese workers and produced 250 cases of salmon each day. Native Alaskans and Euro-Americans were also employed as fisherman. Early success at the cannery was short-lived, however, and it closed in 1904. In the summer of 1912 through 1915, the Gastineau Mining Company commenced with the construction of the Salmon Creek Development and then with the Annex Creek Development. By 1936, all of the mining companies and their associated hydropower generating facilities were consolidated under one amalgamation called the Alaska Juneau Gold Mining Company, or AJ Industries. As AEL&P continued to develop, it purchased more electric power from AJ Industries. At the beginning of U.S. involvement in World War II, "none-essential" mining activity was forced to close, including the gold operations in and around the Juneau area, which, in turn, ended much of the operation associated with AJ Industries. As a consequence, AEL&P was able to purchase both the Annex Creek and Salmon Creek developments after World War II.

Archaeological and Architectural Investigations

AEL&P, through their contractor Walking Dog Archaeology, conducted archaeological and architectural archival searches and surveys within the Annex Creek and Salmon Creek developments' APE in 2008 and 2015 (AEL&P 2016a and 2016b). The archaeological survey included areas around the dams and project facilities. The transmission line corridor was also examined by a helicopter overflight, and landings were made by the helicopter at transmission line shacks where the ground around the shacks was inspected by foot. Shorelines of the developments' lakes and reservoirs were also inspected by helicopter overflights. As mentioned previously, the shoreline buffer zones around the lakes and reservoirs were not surveyed by foot due to the steepness of the slopes in these particular areas, and where not considered as places where archeological sites would occur. Walking Dog Archaeology also conducted additional survey work in 2015 around the Sunny Cove Cannery with representatives from the Douglas Indian Association. Architectural surveys were also done at the Annex Creek Development in 2008, and again in 2015 with the Salmon Creek Development. All project facilities associated with the developments were assessed architecturally for their characteristics and historic significance.

Pre-Contact and Archaeological Resources and TCPs Located with the APE

No pre-contact aboriginal archaeological sites or TCPs were located within the Annex Creek Development or Salmon Creek Development.

Architectural Resources Located within the APE

Two historic districts have been established within the project's APE. The first is the Annex Creek Hydroelectric Complex Historic District (JUN-1097), and the second one is the Salmon Creek Hydroelectric Complex Historic District (JUN-1118). The Annex Creek Hydroelectric Complex Historic District was determined eligible for the National Register in 2012, and the Salmon Creek Hydroelectric Complex Historic District was determined eligible in 2015 (Pipkin 2012 and 2015c). The Alaska SHPO concurred with the National Register-eligibility of both historic districts in letters dated June 30, 2010, March 27, 2012, and December 15, 2015 (See appendix A in AEL&P's HPMP, filed on August 31, 2016).

Both the Annex Creek and Salmon Creek developments are also part of the larger Juneau Goldbelt Hydroelectric Power Development Historic District (JUN-1116) which accounts for a number of hydroelectric facilities built in the Juneau region during the turn and early twentieth century. Although this larger historic district is eligible for the National Register, it is still thematic in scope as the broader area for the historic district has not been officially defined (Pipkin 2010).

The Annex Creek Development contains 16 elements, of which 10 are contributing elements to the historic district, and the remaining 6 are non-contributing. The 10 contributing elements for the Annex Creek Development Historic District include the: (1) Annex Creek hydroelectric plant; (2) Annex Creek tunnel; (3) Annex Creek penstock pipeline; (4) Annex Creek penstock pipeline bridge; (5) Annex Creek blacksmith/carpentry shop; (6) Annex Creek caretaker's house; (7) Annex Creek employee's house; (8) Annex Creek Camp 2 line shack; (9) Annex Creek Camp 4 line shack; and (10); Annex Creek power line. Non-contributing elements include the Annex Creek dam, valve house, dock, cable aerial tramway, locomotive-driven tracked tramway, and Camp 6 line shack.

The Salmon Creek Development contains 18 elements, of which 7 are contributing elements to the historic district, and the remaining 11 are non-contributing. The 7 contributing elements for the Salmon Creek Development Historic District include the: (1) Salmon Creek powerhouse no. 1; (2) Salmon Creek powerhouse no. 2; (3) Salmon Creek Dam; (4) Salmon Creek Dam tunnel; (5) lower penstock pipelines; (6) upper penstock pipelines; and (7) Salmon Creek Reservoir. Non-contributing elements include the Alaska Gastineau mine worker's house I and II, aerial tramway, flume, material transportation system, and lower construction camp/powerhouse no. 1 complex.

The Sunny Cove Cannery (JUN-916), which is located within the Annex Creek Development's APE, was determined not eligible for the National Register as the cannery does not contain any above ground structures or related artifacts. Only a few piling stubs and some disarticulated wood timbers remain.

A reported Alaska Native-owned cabin (built in 1946) in the vicinity of the mouth of Carlson Creek, and within the Annex Creek Development's APE, was not located during the 2015 field season by Walking Dog archaeologists.

3.3.6.2 Environmental Effects

Historic Properties Management Plan

In accordance with the *Advisory Council and Commission's Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects*, and to resolve potential project-related adverse effects to existing and future historic properties, AEL&P developed a HPMP.[16] The HPMP includes measures for the

[16] On February 29, 2016, AEL&P filed a draft HPMP with the Commission. On August 31, 2016, AEL&P filed a revised HPMP (dated August 2016), addressing comments from the Commission and others that it had received as of August 31, 2016. On July 5, 2017, Commission staff issued a draft PA with the attached revised August

management of existing contributing elements of the historic district associated with the Annex Creek and Salmon Creek developments, and other archaeological or historical resources identified within the two developments' APE. AEL&P's HPMP also includes protocols for consulting with the Alaska SHPO, Forest Service, and Native Alaskan tribes, in determining National Register eligibilities for any newly discovered cultural resources, determining project-related adverse effects on those properties considered eligible for the National Register, and resolving such effects. AEL&P's HPMP also provides additional procedures and protocols for: (1) unanticipated discovery of historic properties; (2) treatment of human remains; (3) emergency responses; (4) training of personnel for identifying historic properties and in the preservation requirements for them; and (5) periodic review and revision of the HPMP.

In a letter filed August 3, 2017, the Forest Service recommended several editorial changes to the HPMP. The Forest Service emphasized that making such changes would improve, as well as clarify various aspects of the document. The Forest Service also recommended an annual review of the HPMP by all parties that sign the PA.

In a letter filed on August 14, 2017, the Alaska SHPO also recommended similar editorial changes to the HPMP. The Alaska SHPO also recommended that the HPMP: (1) state that in the event that reconstruction or rehabilitation work is conducted on any eligible/contributing project features, that the work be done by a qualified professional; (2) define and place more specific parameters on "in kind" replacement work and add more detail on the types of activities involving such replacement work; (3) provide more detail in the treatment of human remains and inadvertent discovery sections; (4) provide more detail on the annual consultation meetings; (5) be more consistent with specific parameters and timetables with associated memorandums of agreements and the associated PA which would implement the HPMP; and (6) note the importance of professional expertise in treating and handling of all historic properties.

Our Analysis

AEL&P's HPMP provides a general process and set of procedures and protocols for addressing any potential adverse effect to historic properties for the term of a new license. However, implementing the modifications recommended by the Forest Service and Alaska SHPO would improve implementation of the HPMP and protection of historic properties by providing greater clarity: (1) on the procedures for evaluating project effects on newly discovered historic properties and human remains; (2) on those specific operation and maintenance activities that would have the potential to result in adverse

2016 HPMP for review and comment. On August 3, 2017 and August 14, 2017, respectively, the Forest Service and Alaska SHPO filed comments on the revised HPMP.

effects to historic properties; and (3) on consultation procedures. These improvements would assist Commission oversight of the HPMP.

Commission staff proposes to execute a PA that would stipulate AEL&P, in consultation with the Forest Service and Alaska SHPO, would file for Commission approval a revised HPMP within 6 months of license issuance. The PA would also stipulate that during the interim period between license issuance and Commission approval of the revised HPMP, AEL&P would consult with the Alaska SHPO and other consulting parties, accordingly, involving any specific action that might affect a historic property. With execution of the PA, and implementation of a HPMP, any potential project-related adverse effect to historic properties would be adequately resolved for the term of a new license.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Salmon Creek and Annex Creek Projects' uses of the Salmon Creek and Annex Creek for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[17] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation, and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e. for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only

[17] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

Table 4 summarizes the assumptions and economic information we use in our analysis. This information was provided by AEL&P in its license application. We found the AEL&P values to be reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes, net investment (the total investment in power plant facilities remaining to be depreciated), relicensing cost, normal operation and maintenance cost, and commission fees.

Table 4. Parameters for economic analysis of the Salmon Creek and Annex Creek Project (source: AEL&P 2016a, as modified by staff).

Parameter	Value
Period of analysis (years)	30
Federal income tax rate	34
Net investment, $ [a]	7,463,943
Relicensing cost, $ [b]	1,000,000
Operation and maintenance, $/year [c]	880,200
Commission fees, $/year [d]	38,100
Annual Power Value ($/MWh) [e]	110.6

[a] Net investment (plant and transmission line) in the Annex Creek/Salmon Creek Project; actuals through December 2015.
[b] Relicensing costs include the administrative, legal/study, and other expenses to date.
[c] Existing plant operation and maintenance includes operation and maintenance related to environmental measures associated with the current license minus FERC fees.
[d] Commission fees are based on statements of annual charges received from the Commission for federal lands and administrative charges based on authorized capacity.
[e] Average Annual power value in megawatt-hours (MWh) provided by AEL&P

As currently operated, the Salmon Creek and Annex Creek Project has an installed capacity of 10.58 MW and generates an average of 53,873 MWh annually.

4.2 COMPARISON OF ALTERNATIVES

Table 5 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power

and total project cost for each of the alternatives considered in this EA: no-action, AEL&P's proposal, and staff alternative.

Table 5. Summary of the annual cost of alternative power and annual project cost for the four alternatives for the Salmon Creek and Annex Creek Project (source: staff).

	No Action	**AEL&P's Proposal**	**Staff Alternative**
Installed Capacity (MW)	10.582	10.582	10.582
Average Annual Generation (MWh)[a]	53,873	53,873	53,873
Annual cost of alternative power ($/MWh)[b]	$7,229,757 134.2	$7,229,757 134.2	$7,229,757 134.2
Annual project cost ($/MWh)	$3,831,540 71.12	$3,840,850 71.29	$3,843,990 71.35
Difference between the cost of alternative power and project cost ($/MWh)	$3,398,217 63.08	$3,388,907 62.91	$3,385,767 62.85

[a] Average generation for 1985-2015
[b] According to AEL&P, the alternative source of power would be the lost value of Lake Dorothy surplus generation.

4.2.1 No-action Alternative

Under the no-action alternative, the project would continue to operate as it does now. The project would have an installed capacity of 10.58 MW, and generate an average of 53,873 MWh of electricity annually. The average annual cost of alternative power would be $7,229,757, or about $134.2/MWh. The average annual project cost would be $3,838,140, or about $71.24/MWh; this value accounts for the value of lost generation from providing the minimum flow in Salmon Creek. Overall, the project would produce power at a cost that is $3,398,217, or $63.08/MWh, less than the cost of alternative power.

4.2.2 AEL&P's Proposal

AEL&P's proposed environmental measures are presented in Table 6. Under AEL&P's proposal, the project would continue to have the same installed capacity of 10.58 MW, and generate an average of approximately 53,873 MWh of electricity annually. The annualized cost of the environmental measures in the Proposed Action Alternative over a 30-year license term is $7,331.

The average annual cost of alternative power would be $7,229,757, or $134.2/MWh. The average annual project cost would be $3,838,870 or $71.26/MWh. Overall, the project would produce power at a cost that is $3,390,887, or $62.94/MWh, less than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative includes the same development proposal as AEL&P and, therefore, would have the same capacity and energy attributes. Table 6 shows the staff recommended additions and modifications to AEL&P's proposed environmental protection and enhancement measures, and the estimated cost of each, which includes the Forest Service preliminary 4(e) conditions.

Based on a total installed capacity of 10.58 MW and an average annual generation of 53,873 MWh of electricity annually, accounting for the energy generation lost when providing the minimum instream flow, the average annual cost of alternative power would be $7,229,757, or $134.2/MWh. The average annual project cost would be $3,848,155, or $71.43/MWh. Overall, the project would produce power at a cost that is $3,381,602, or $62.77/MWh, less than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 6 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 6. Cost of mitigation and enhancement measures considered in assessing the environmental effects of the continued operation of the Salmon Creek and Annex Creek Project (source: staff).

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)
Aquatic Resources				
1. Continue to release up to 3 cfs from Salmon Creek Dam to maintain 9 cfs at the licensee's gage located in the lower bypassed reach.	AEL&P, Staff	$0	$0[a]	$0
2. Continue to implement the Streamflow Monitoring Plan	AEL&P, Staff	$0	$0[a]	$0
3. Continue to implement the Reservoir Outlet Release Plan	AEL&P, Staff	$0	$0[a]	$0
Terrestrial Resources				
1. Develop an Invasive Plant Management Plan that applies to all project lands	Forest Service, Staff	$5,000	$0	$453
2. Restrict use of herbicides and pesticides on all project lands	Forest Service, Staff	$0	$0	$0
Recreation, Land Use, and Aesthetic Resources				
1. Salmon Creek Trail improvements	AEL&P, Staff	$50,000	$0	$4,533
2. Trailhead kiosk improvements	AEL&P, Staff	$10,000	$0	$907
3. New pamphlet	AEL&P, Staff	$ 2,000	$0	$181
4. Directional trail sign	Interior, Staff	$ 50	$0	$5
5. Trail condition assessment (first assessment in 2020, then every 6 years thereafter)	AEL&P, Staff	$300 (initial assessment in 2020	$50 ($300 every 6 years)	$60

Enhancement/Mitigation Measure	Entity	Capital Cost (2016$)	Annual Cost (2016$)	Levelized Annual Cost (2016$)
6. Trail & kiosk maintenance	AEL&P, Staff	$0	$2,500	$1,650
7. Documentation of completion of trail and kiosk improvements in the form of as-built drawings or photographs	Staff	$300	$0	$27
8. Prepare and file with the Commission, a report on each trail assessment, in consultation with the NPS and Alaska DNR	Staff	$0	$333.33($2,000 every 6 years)	$220
Cultural Resources				
1. Implement the HPMP	AEL&P	$0	$3000	$1,980
2. Within 6 months after license issuance, file for Commission approval a revised HPMP	Staff, Forest Service, Alaska SHPO	$5,000	$3000	$2,433
[a] The cost of this measure is included in the annual operation and maintenance cost				

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a hydropower project, we consider the water quality, fish and wildlife, recreation, cultural, and other non-developmental values of the involved waterway equally with its electric energy and other developmental values. In deciding whether, and under what conditions a hydropower project should be licensed, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing the waterway. We weigh the costs and benefits of our recommended alternative against other

proposed measures. This section contains the basis for, and a summary of, our recommendations for relicensing the Salmon Creek and Annex Creek Project.

Recommended Alternative

Based on our independent review and evaluation of the environmental and economic effects of the proposed action, the proposed action with additional staff-recommended measures, and no action, we recommend the proposed action with the additional staff-recommended measures as the preferred alternative. This alternative includes the applicant's proposed measures, the Forest Service's mandatory conditions, and some staff modifications and additional measures.

We recommend the staff alternative because: (1) issuing a new license would allow AEL&P to continue operating the project as a beneficial and dependable source of electric energy; (2) the 10.58 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; and (3) the recommended environmental measures would protect aquatic, terrestrial, recreation, and cultural resources.

Measures Proposed by AEL&P

Based on our environmental analysis of AEL&P's proposal, as discussed in section 3, and the costs discussed in section 4, we conclude that the following environmental measures proposed by AEL&P would protect and enhance environmental resources and would be worth the cost. Therefore, we recommend including these measures in any license issued for the project.

- Continue to release up to a maximum of 3 cfs from the base of the Salmon Creek dam to maintain a minimum flow of 9 cfs as measured at AEL&P's existing gage site in the lower Salmon Creek bypassed reach to protect aquatic habitat for anadromous salmonids;
- Continue to implement the Streamflow Monitoring Plan to document compliance with minimum instream flow requirements in Salmon Creek; ;
- Continue to implement the Reservoir Outlet Release Plan to limit the timing, volume, and rate of flows discharged from the low-level outlet at Salmon Creek dam during annual valve testing and seasonal reservoir drawdowns;
- Replace the Salmon Creek Trailhead kiosk and update the information provided on the kiosk;
- Provide the Salmon Creek Trail informational pamphlet on-line;
- Improve the upper portion of the Salmon Creek Trail by clearing vegetation, boulders, and windfalls from the trail; replacing or repairing foot bridges crossing

the trail; repairing a section of flooded trail; installing a log wall to stabilize a portion of the trail subject to erosion; and adding trail markers;
- Continue annual maintenance of the Salmon Creek Trail and informational kiosk;
- Assess the condition of the trail condition every 6 years in conjunction with the Form 80 recreation use reporting cycle;
- Include the 0.25-acre parking lot at the Salmon Creek Powerhouse within the project boundary and maintain the lot to serve hikers that use the Salmon Creek Trail; and
- Implement the HPMP filed with the application to protect cultural resources found at both Salmon Creek and Annex Creek developments.

Additional Staff-Recommended Measures

We recommend the measures described above, and the following modifications and additional staff-recommended measures:

- Develop an Invasive Species Management Plan as required by the Forest Service and apply the measures and protocols to all project lands to minimize the introduction and spread of invasive plants during any future land-disturbing activities, such as trail maintenance;
- Follow EPA label instructions when applying herbicides and pesticides and prohibit their use within 500 feet of sensitive amphibian species habitat as required by the Forest Service and apply these limitations to all project lands;
- Document the completion of recreational enhancements at the Salmon Creek Development.
- File a report with the Commission, prepared in consultation with the National Park Service and the Alaska DNR, Division of Parks and Outdoor Recreation, on the 6-year Salmon Creek Trail assessment results along with any recommendations for necessary trail improvements;
- Install a directional sign at the intersection of the upper Salmon Creek trail with an existing maintenance trail to direct hikers to the main trail;
- Revise the proposed HPMP to: (1) clarify the types of operation and maintenance activities that would, or would not, have the potential to adversely affect historic properties, and how such work would be done to prevent adverse effects to historic properties; (2) provide more detail regarding the treatment of human remains and inadvertent discovery of cultural resources; (3) clarify consultation procedures.

Below, we discuss the basis for our additional staff recommended measures.

Invasive Species Management Plan

Both the Annex Creek and Salmon Creek developments have infestations of weak to modestly invasive plant species. In section 3.3.3.2, *Environmental Effects*, our analysis indicates that developing an Invasive Species Management Plan as required by the Forest Service would benefit surround habitats by defining measures that would minimize the introduction and spread of invasive plant species, particularly during future operation and maintenance activities. Requiring that any application of herbicides and pesticides follows EPA labeled instructions and prohibiting their use entirely within 500 feet of sensitive amphibian species habitat, as stipulated by Forest Service condition 12, would ensure the protection of sensitive amphibian species and other environmental resources. Applying these practices to all project lands would have similar benefits as those on NFS lands. We estimate that the annual levelized cost to develop the Invasive Species Management Plan and restricting the use of herbicides and pesticides and applying these practices to all project lands would have an annual levelized cost of $453. We conclude that the benefits to native vegetation would justify their cost.

Salmon Creek Development Recreational Enhancements

The Salmon Creek Trail receives significant use throughout the year and is in need of some repair and enhancements due to such use. To address recreational needs in the area, AEL&P proposes to upgrade the trail (adding trail markers, repairing or replacing foot bridges, and stabilizing eroding sections) and the Salmon Creek Trailhead kiosk (replace the kiosk and updating available information). To monitor and address recreation needs on the trail through the life of the license, AEL&P proposes to conduct trail assessments at 6-year intervals in conjunction with the Form 80 reporting cycle, as discussed in section 3.3.5.2, *Environmental Effects*. The National Park Service recommends that, in addition to trail markers proposed as part of the trail enhancements, AEL&P install a directional sign at the intersection of the upper Salmon Creek Trail with an existing maintenance trail where hikers sometimes get confused and stray from of the appropriate trail.

As discussed in section 3.3.5.2, we recommend installing the directional sign because it would reduce the potential for resource damage and for hikers to become lost. Adding a directional sign would have an annual levelized cost of $5. We find that the benefits to the environment and enjoyment of the recreating public to be worth the cost. To facilitate Commission administration of the license, we recommend that AEL&P document the completion of the Salmon Creek trail improvements by filing photographs, as-built drawings, or other methods, provided that the documentation clearly demonstrates the measures have been adequately completed. Trail improvements should be completed within 1 year of issuance of any license.

The significant recreational use of the Salmon Creek Trail, combined with its steep terrain in the upper portion, makes it susceptible to erosion and possible resource or trail facility damage. AEL&P's proposal to conduct a trail condition assessment every 6

years, in conjunction with the Form 80 assessment, would allow for a more comprehensive examination of trail-related needs by taking into consideration any resource or facility damage that needs addressing. It is not clear, however, what AEL&P proposes to do with the assessment results. As discussed in *Our Analysis* in section 3.3.5.2, filing a report with the Commission, prepared in consultation with the National Park Service and Alaska DNR, Division of Parks and Outdoor Recreation, that includes the assessment results and any recommendations for trail improvements would ensure that the Salmon Creek Trail adequately meets future recreational needs. We estimate that preparing a report at 6-year intervals that coincide with the FERC Form 80 assessments, would have an annualized cost of $60. Providing these results would assist AEL&P and the Commission in identifying project recreation needs in the future. We find the benefits of this effort to be worth the cost.

Revise the HPMP

The Forest Service and Alaska SHPO recommended revising AEL&P's HPMP to include additional detail and clarify: (1) the types of operation and maintenance activities that would, or would not have the potential to adversely affect historic properties, and how such work would be done to prevent adverse effects to historic properties; (2) the treatment of human remains and inadvertent discovery of cultural resources; and (3) consultation procedures between the FS, involved Native Alaskan tribes, and Alaska SHPO. Revising the HPMP accordingly would improve implementation of the HPMP and protection of historic properties. Revising the HPMP, in consultation with the Forest Service and Alaska SHPO, would have an annual levelized cost of $2,433. We find that the benefits provided by the additional clarity would be worth the cost.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Minor, temporary localized erosion and sedimentation could occur during trail improvement and maintenance activities. Temporary disturbance to recreationists using the Salmon Creek Trail could occur during trail rehabilitation.

5.3 SUMMARY OF SECTION 10(J) RECOMMENDATIONS AND 4(e) CONDITIONS

5.3.1 Fish and Wildlife Agency Recommendations

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

No recommendations were received by the Commission.

5.3.2 Land Management Agencies' Section 4(e) Conditions

Of the Forest Service's 17 preliminary conditions, we consider 15 of the conditions in whole (conditions 1-11, 13-15, and 17) to be administrative or legal in nature and not specific environmental measures. We therefore do not analyze these conditions in this EA. Table 7 summarizes our conclusions with respect to the two final 4(e) conditions that we consider to be environmental measures. We include in the staff alternative all 17 conditions as specified by the agency.

Table 7. Forest Service preliminary section 4(e) conditions for the Salmon Creek and Annex Creek Project.

Condition	Annualized Cost	Adopted?
No. 12: Pesticide and Herbicide Use Restrictions	$0	Yes
No. 16: Invasive Plant Management Plan	$7,053	Yes

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C., § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 11 comprehensive plans that are applicable to the Salmon Creek and Annex Creek Project, located in Alaska. No inconsistencies were found.

Alaska Administrative Code. 2012. 5 AAC section 39.222. Policy for the management of sustainable salmon fisheries. Juneau, Alaska.

Alaska Administrative Code. 2003. 5 AAC section 75.222. Policy for the management of sustainable wild trout fisheries. Juneau, Alaska.

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Alaska Department of Natural Resources. 2000. Central/Southern Southeast Area Plan. Anchorage, Alaska. November 2000.

Forest Service. 2016. Tongass National Forest Land and Resource Management Plan. Department of Agriculture, Ketchikan, Alaska. December 2016.

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U.S. Fish and Wildlife Service et al. 2008. Alaska Shorebird Conservation Plan. Anchorage, Alaska. Version II. Anchorage, Alaska. November 2008.

U.S. Fish and Wildlife Service. 2005. Regional Seabird Conservation Plan. Pacific Region, Portland, Oregon. January 2005.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.

6. 0 FINDING OF NO SIGNIFICANT IMPACT

Continued operation of the Salmon Creek and Annex Creek Project, with our recommended measures, would have the following short-term effects: minor, localized erosion from land-disturbing activities associated with the Salmon Creek Trail repair and project maintenance activities; and temporary disturbance to recreationists using the Salmon Creek Trail during trail rehabilitation. Continued operation of the project would not have any long-term effects.

On the basis of our independent analysis, we find that issuance of a license for the Salmon Creek and Annex Creek Hydroelectric Project, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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