PRE-APPLICATION DOCUMENT

VOLUME 1 - PUBLIC

KETCHIKAN LAKES HYDROELECTRIC PROJECT

FERC NO. 420

Submitted by:
Ketchikan Public Utilities Electric Division
1065 Fair Street
Ketchikan, AK 99901

KPU

March 2025

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List of Acronyms

ACS	American Community Survey
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADL	Alaska Division of Lands
ADNR	Alaska Department of Natural Resources
AKNHP	Alaska Natural Heritage Program
Alaska DOT&PF	Alaska Department of Transportation and Public Facilities
ANMHT	Alaska Native Mental Health Trust
ArcGIS Pro	Geographic Information System
AWC	State of Alaska Anadromous Waters Catalog
BLM	United States Bureau of Land Management
C	Celsius
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
DO	dissolved oxygen
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FERC / Commission	Federal Energy Regulatory Commission
FOIA	Freedom of Information Act
FPA	Federal Power Act
ft	feet
GMU	Game Management Unit
HUC	Hydrologic Unit Code
ILP	Integrated Licensing Process
IPaC	Information for Planning and Consultation
ISR	Initial Study Report
KGB	Ketchikan Gateway Borough
KPU / Licensee	Ketchikan Public Utilities
kVA	kilovolt amps
kW	kilowatt
LUD	Land Use Designation
mg/L	milligrams per liter
mL	milliliter
MW	megawatt
NEPA	National Environmental Policy Act
NGO	non-governmental organization

NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric and Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
NWI	National Wetland Inventory
PAD	Pre-Application Document
pdf	portable document format
PURPA	Public Utility Regulatory Policies Act
RM	river mile
ROW	right-of-way
SCADA	supervisory control and data acquisition
SD	Scoping Document
SEAPA	Southeast Alaska Power Agency
SHPO	State Historic Preservation Office
SPD	Study Plan Determination
SSRAA	Southern Southeast Regional Aquaculture Association
TNF	Tongass National Forest
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USR	Updated Study Report
WQC	Water Quality Certification

1.0 Introduction

1.1 Background

The City of Ketchikan, Alaska d/b/a Ketchikan Public Utilities (KPU or Licensee) hereby files with the Federal Energy Regulatory Commission (FERC or Commission) its Pre-Application Document (PAD) for relicensing of the existing 4,200 kilowatt (kW) Ketchikan Lakes Hydroelectric Project (FERC Project No. 420) (Project). The Project is located on Ketchikan Creek and Granite Basin Creek, near the City of Ketchikan, Ketchikan Gateway Borough, Alaska. The Project is owned and operated by KPU and currently provides 12% of KPU's net generation. Unrelated to the FERC license but related to Project operations, the Project also provides 100% of the municipal water supply.

FERC issued a new 30-year license to KPU to operate the Project on August 29, 2000. The license went into effect on August 1, 2000, and will expire on July 31, 2030. KPU intends to file an application for a new license prior to July 31, 2028, two years prior to the license expiration date. This PAD accompanies KPU's Notice of Intent (NOI) to seek a new license for the Project. By filing the NOI and PAD, KPU is initiating the formal start of the FERC licensing process for the Project.

1.2 Purpose of the PAD

The purpose of this PAD is to: (1) describe the existing Project facilities and operations and any proposed changes to the Project facilities and operations; (2) summarize all known information about the existing environment that is relevant to the Project relicensing; and (3) identify known resource issues and potential study needs. This PAD is intended to assist Licensing Participants (LPs) in identifying any other potential resource issues and related information needs, and to develop potential study requests (18 CFR § 5.6(b)). LPs may include federal and state resource agencies, local governments, Indian tribes, Non-Governmental Organizations (NGOs), and any other interested parties.

As specified in 18 Code of Federal Regulations (CFR) § 5.6 (c) and (d), this PAD provides FERC and interested parties with summaries of existing, relevant, and reasonably available information related to the Project that is in KPU's possession as supplemented by a due diligence search. The PAD is a precursor to FERC's Scoping Documents, the environmental analysis section of KPU's License Application, and FERC's Environmental Impact Statement (EIS) or Environmental Assessment (EA) under the National Environmental Policy Act (NEPA). Filing the PAD concurrently with the NOI enables those who plan to participate in the relicensing to familiarize themselves with the Project at the beginning of the proceeding. This familiarity is intended to enhance the scoping process that follows the filing of the PAD.

1.3 PAD Development Process

FERC's regulations require that a Licensee exercise due diligence in obtaining and including existing relevant and reasonably available information about the Project and related resources. To accomplish this, KPU conducted the following activities:

- Reviewed internal files for relevant information regarding the Project and surrounding environment.

- Searched other potential information sources, including peer-reviewed journal articles, reference books, and the internet.

- Reached out to all known federal and state resource agencies, local governments, Indian tribes, and NGOs that may be interested in this relicensing proceeding in December 2024 and conducted one-on-one initial consultation meetings with those organizations that responded. The purpose of these meetings was to provide background information on the upcoming relicensing process, a description of the Project facilities and operations, and a high-level summary of known environmental resources. KPU also asked questions pertaining to each organization's interest in participating in the relicensing process, whether the organization knows of any existing, relevant, and reasonably available information that describes the Project's existing or historical environment, and if the organization is aware of any specific resource issues occurring at or near the Project. This outreach and consultation effort is summarized below in Table 1-1.

Table 1-1. Initial Outreach and Consultation Meetings

Organization	Response?	Meeting Date
Alaska Department of Environmental Conservation (ADEC)	Yes	12/11/2024
Alaska Department of Fish and Game (ADFG)	Yes	12/13/2024
Alaska Department of Natural Resources (ADNR)	No	2/4/2025
Alaska Mental Health Trust	Yes	1/8/2025
Cape Fox Corporation	No	-
Ketchikan Gateway Borough (KGB)	Yes	12/16/2024
Ketchikan Indian Community (KIC)	No	-
Metlakatla Indian Community (MIC)	No	-
National Marine Fisheries Service (NMFS)	Yes	12/09/2024
Organized Village of Saxman	No	-
SEAALASKA	No	-
Southern Southeast Regional Aquaculture Association (SSRAA)	No	-
State Historic Preservation Office (SHPO)	No	-
Tlingit and Haida Tribes	No	-
U.S. Bureau of Land Management (BLM)	Yes	12/16/2024
U.S. Fish and Wildlife Service (USFWS)	Yes	1/10/2025
U.S. Forest Service (USFS)	No	-

1.4 PAD Content

As specified in 18 CFR § 5.6 (c) and (d), this PAD provides FERC and interested parties with summaries of existing, relevant, and reasonably available information related to the Project that is in KPU's possession as supplemented by a due diligence search. KPU is distributing this PAD and NOI simultaneously to federal and state resource agencies, local governments, Indian tribes, NGOs, members of the public, and other parties potentially interested in the relicensing proceeding. The information contained in this document was assembled based on the requirements set forth in 18 CFR § 5.6 and is organized as follows:

- Section 1.0 - Introduction
- Section 2.0 – Process Plan and Schedule, per 18 CFR § 5.6(d)(1)
- Section 3.0 – Project Location, Facilities, and Operations, per 18 CFR § 5.6(d)(2)
- Section 4.0 – Description of the Existing Environment, per 18 CFR § 5.6(d)(3)
- Section 5.0 – Preliminary Issues and Studies List, per 18 CFR § 5.6(d)(3) and (4).
- Appendices

Some information related to this Project and/or the surrounding environment is confidential and protected by federal law. This includes Critical Energy Infrastructure Information (CEII) pursuant to FERC's June 23, 2003, Order No. 630-A, confidential financial information as defined by 18 CFR §388.112, and confidential cultural resources information as defined by 36 CFR § 296.18. All privileged and confidential information relevant to this PAD has been filed separately with FERC as a confidential appendix.

2.0 Process Plan and Schedule (18 CFR § 5.6 (d)(1))

On March 31, 2025, KPU filed this PAD and their NOI to seek a subsequent license for the Project. Pursuant to 18 CFR § 5.3, 5.5, and 5.6, the filing of the NOI and PAD begins the formal relicensing process and sets the schedule for further licensing activities. KPU filed the NOI and PAD well before the filing deadline (July 31, 2025) in order to allow sufficient time for study planning in 2025 and a full study year in 2026.

2.1 Integrated Licensing Process

KPU intends to use FERC's Integrated Licensing Process (ILP) for this relicensing. The ILP is FERC's default process and provides a predictable, efficient, and timely licensing process with early identification and resolution of necessary studies. Table 2-1 presents a detailed process plan and schedule with timeframes and deadlines for the balance of the relicensing process. This schedule might reflect deadlines that fall on weekends (Saturday or Sunday) or federal holidays. All deadlines on weekends or federal holidays will default to the following Monday in accordance with FERC regulations.

There is potential for one study season for this Project based on initial internal perspective, minimal resource concerns voiced during the aforementioned one-on-one LP meetings and no proposed changes to Project facilities or operation. This will ultimately be determined, along with any associated modifications to the schedule, collaboratively with LPs and FERC during study planning. KPU will keep an updated schedule on the Project's relicensing website (www.ketchikanlakesrelicensing.com) for easy reference.

Table 2-1. Process Plan and Schedule

Responsible Party	Milestone[1]	Timeframe	Deadline[2]	18 CFR §
KPU	File NOI and PAD	5 to 5.5 years before license expiration	3/31/2025	5.5 and 5.6
FERC	Initiate Tribal Consultation	Within 30 days of NOI/PAD filing	4/30/2025	5.7
FERC	Issue Notice of NOI/PAD and Scoping Document 1 (SD1)	Within 60 days of NOI/PAD filing	5/30/2025	5.8(a)
FERC	Hold Public Scoping Meeting(s)	Within 30 days of NOI/PAD notice and SD1 issuance	6/29/2025	5.8(b)(3)(viii)
KPU	Hold Site Visit	Concurrent with FERC's Public Scoping Meeting(s)	6/29/2025	5.8(b)(3)(viii)

[1] Some steps in the relicensing process will only be conducted if needed. These are greyed out for easy reference.
[2] These deadlines are based on a NOI and PAD filing date of March 31, 2025.

Responsible Party	Milestone[1]	Timeframe	Deadline[2]	18 CFR §
FERC, KPU, and LPs	File Comments on PAD/SD1 and Study Requests	Within 60 days of NOI/PAD notice and SD1 issuance	7/29/2025	5.9
FERC	Issue SD2 (if needed)	Within 45 days of SD1 comment deadline	9/12/2025	5.10
KPU	File Proposed Study Plan (PSP)	Within 45 days of PAD comment deadline	9/12/2025	5.11(a)
KPU	Hold Initial PSP Meeting	Within 30 days of PSP filing	10/12/2025	5.11(e)
KPU	Hold Additional PSP Meeting(s) (if needed)	Within 90 days of PSP filing	12/11/2025	5.11(e)
FERC and LPs	File Comments on PSP	Within 90 days of PSP filing	12/11/2025	5.12
KPU	File Revised Study Plan (RSP)	Within 30 days of PSP comment deadline	1/10/2026	5.13(a)
LPs	File Comments on RSP	Within 15 days of RSP filing	1/25/2026	5.13(b)
FERC	Issue Study Plan Determination (SPD)	Within 30 days of RSP filing	2/9/2026	5.13(c)
Mandatory Conditioning Authorities[3]	File Notice of Study Dispute (if warranted)	Within 20 days of SPD issuance	3/1/2026	5.14(a)
FERC	Convene Dispute Resolution Panel(s)	Within 20 days of Notice(s) of Study Dispute	3/21/2026	5.14(d)

[3] Mandatory Conditioning Authorities are agencies with authority under Federal Power Act (FPA) Section 4(e), FPA Section 18, or Clean Water Act (CWA) Section 401. For this Project, that includes the U.S. Forest Service (USFS), U.S. Fish and Wilfie Service (USFWS), National Marine Fisheries Service (NMFS), and Alaska Department of Environmental Conservation (ADEC).

Responsible Party	Milestone[1]	Timeframe	Deadline[2]	18 CFR §
KPU	File Comments on Study Dispute(s)	Within 25 days of Notice(s) of Study Dispute	3/26/2026	5.14(i)
FERC and Agency Designee	Select Third Panel Member (for each study dispute)	Within 15 days of Convening the Dispute Resolution Panel(s)	4/5/2026	5.14(d)(3)
Dispute Resolution Panel(s)	Hold Technical Conference	Prior to Engaging in Deliberative Meetings	TBD	5.14(j)
Dispute Resolution Panel(s)	Deliver Findings and Recommendations	Within 50 days of Notice(s) of Study Dispute	4/20/2026	5.14(k)
FERC	Issue Study Dispute Determination	Within 70 days of Notice(s) of Study Dispute	5/10/2026	5.14(l)
KPU	Conduct First Study Season	After SPD issuance	2026	5.15(a)
KPU	File Initial Study Report (ISR)	Within 1 year of SPD issuance	2/9/2027	5.15(c)(1)
KPU	Hold ISR Meeting	Within 15 days of ISR filing	2/24/2027	5.15(c)(2)
KPU	File ISR Meeting Summary	Within 15 days of ISR Meeting	3/11/2027	5.15(c)(3)
FERC and LPs	File Disagreements/ Requests to Amend the Study Plan (if warranted)	Within 30 days of ISR Meeting Summary	4/10/2027	5.15(c)(4)
KPU	File Responses to Disagreements/ Amendment Requests	Within 30 days of ISR Meeting Summary Disagreement(s)	5/10/2027	5.15(c)(5)
FERC	Issue Determination on Disagreements/ Amendments	Within 30 days of Responses	6/9/2027	5.15(c)(6)

Responsible Party	Milestone[1]	Timeframe	Deadline[2]	18 CFR §
KPU	Conduct Second Study Season (if needed)	After First Study Season	2027	5.15(a)
KPU	File Updated Study Report (USR)	Within 2 years of SPD issuance	2/9/2028	5.15(f)
KPU	Hold USR Meeting	Within 15 days of USR filing	2/24/2028	5.15(f)
KPU	File USR Meeting Summary	Within 15 days of USR Meeting	3/10/2028	5.15(f)
FERC and LPs	File Disagreements/ Request to Amend the Study Plan (if warranted)	Within 30 days of ISR Meeting Summary filing	4/9/2028	5.15(f)
KPU	File Responses to Disagreements/ Amendment Requests	Within 30 days of Meeting Summary Disagreement(s) filing	5/9/2028	5.15(f)
FERC	Issue Determination on Disagreements/ Amendments	Within 30 days of Response filing	6/8/2028	5.15(f)
KPU	File Draft License Application (DLA)	No later than 150 days before Final License Application (FLA) deadline	3/3/2028	5.16(a)
FERC and LPs	File Comments on DLA	Within 90 days of DLA filing	6/1/2028	5.16(e)
KPU	File FLA	No later than 2 years before license expiration	7/31/2028	5.17
FERC	Issue New License	Before the current license expires[4]	7/31/2030	

[4] If FERC requires more time to process the license application, then FERC may issue one or more annual licenses for the Project.

2.2 Proposed Communications Protocol

KPU is proposing a communication protocol with the intention of facilitating open communication and collaboration with LPs during the relicensing process. This protocol will govern communications with all LPs and provide public access to information regarding consultation activities related to the relicensing of the Project. This protocol also applies to communications made by consultants on behalf of KPU. This protocol does not apply to communications between LPs or to any LP's internal communications.

2.2.1 Contact Lists

A comprehensive contact list of all interested agencies, organizations, individuals, and/or groups will be compiled and maintained by KPU. The contact list will be used to provide project updates, notify LPs when documents are ready for public review, and to share meeting information and materials, final study plans, reports, etc. The contact list will be updated by KPU, as needed.

After KPU files its license application, FERC will establish an official Service List for those parties who formally intervene in the proceeding. Intervention is a formal, legal process governed by FERC's regulations. Additional information may be found on FERC's website at https://www.ferc.gov/how-intervene. Once FERC establishes a Service List, any written documents filed with FERC must be served to the Service List.

2.2.2 Document Distribution

KPU will distribute all relicensing documents electronically via email using the Contact List. KPU will also maintain a document library on the Project's relicensing website (www.ketchikanlakesrelicensing.com). Hard copies of relicensing documents will be available upon request. All requests for hard copies should be sent to Ms. Jennifer Holstrom (JenniferHolstrom@ketchikan.gov) and should clearly indicate the document name, publication date, and FERC Project No. 420. A reproduction charge and postage costs may be assessed for hard copies requested by the public.

All documents filed with FERC and any documents issued by FERC will also be publicly available through FERC's eLibrary (https://elibrary.ferc.gov/eLibrary/search) by searching under the docket P-420. LPs can eSubscribe with FERC to receive email notifications for this docket if desired.

2.2.3 Sensitive Information

Certain Project-related documents are restricted from public viewing in accordance with FERC regulations. CEII (defined under 18 CFR § 388.113) are materials related to the design and safety of dams and their appurtenant facilities, as well as information that is necessary to protect national security and public safety, are restricted. Anyone seeking CEII information from FERC must file a CEII request. FERC's website at www.ferc.gov/help/how-to/file-ceii.asp contains additional details related to CEII.

Additional restricted materials include Privileged Information associated with protecting sensitive information, such as the location of rare, threatened, or endangered species, and sensitive archaeological or other culturally significant properties. Anyone seeking this information from FERC must file a Freedom of Information Act (FOIA) request. Instructions for FOIA are available on FERC's website at www.ferc.gov/legal/ceii-foia/foia.asp.

2.2.4 Meetings

Proactive effort will be placed on polling LPs for dates and times that work with their respective schedules. KPU will work with LPs to schedule meetings at a time and location (virtual, in person, or hybrid) that accommodates the majority of participants. KPU will follow the notification procedures for meetings as mandated by FERC regulations and may schedule additional meetings to enhance the consultation process, as appropriate. Meeting agendas will be distributed electronically to LPs in advance of each meeting. A written meeting summary will be prepared by KPU and distributed to all meeting participants for review promptly following each meeting. Finalized meeting summaries will be distributed to the LPs and filed with FERC as part of the consultation record.

3.0 Project Location, Facilities, and Operation (18 CFR § 5.6 (d)(2))

Per 18 CFR § 5.6(d)(2), the following sections describe the Project location, facilities, and operations. It provides background information on the existing Project works, including its history, operating practices, and operational constraints.

3.1 Authorized Agents

The following persons are authorized to act as agents for the applicant pursuant to 18 CFR § 5.6(d)(2)(i):

Jennifer Holstrom
Regulatory Compliance Manager
Ketchikan Public Utilities
1065 Fair Street
Ketchikan, AK 99901
Telephone: 907-228-4733
Email: JenniferHolstrom@ketchikan.gov

Cory Warnock
Licensing and Regulatory Discipline Lead
McMillen, Inc.
5771 Applegrove Lane
Ferndale, WA 98248
Telephone: 360-739-0187
Email: warnock@mcmillen.com

3.2 KPU Overview

KPU is a municipally owned utility that is responsible for providing affordable energy to the City of Ketchikan and the Ketchikan Gateway Borough (KGB), located on Revillagigedo Island in Southeast Alaska. In an average year, approximately 97% of the power distributed by KPU is generated by hydroelectric facilities. KPU owns, operates, and maintains three hydroelectric facilities, including:

- Ketchikan Lakes Hydroelectric Project (FERC No. 420) rated at 4.2 megawatts (MW), accounting for 12% of KPU's net generation

- Whitman Lake Hydroelectric Project (FERC No. 11841) rated at 4.6 MW, accounting for 5% of KPU's net generation

- Beaver Falls Hydroelectric Project (FERC No. 1922), which includes the Silvis Development, rated at 7.1 MW and accounts for 30% of KPU's net generation

All of KPU's hydroelectric projects are located on Revillagigedo Island. During times when hydroelectric energy is limited, diesel generation supplements the area's energy needs.

KPU also purchases approximately half of its power from the Southeast Alaska Power Agency (SEAPA). SEAPA owns two remote hydroelectric facilities: Swan Lake Hydroelectric Project (FERC No. 2911) rated at 25 MW and Tyee Lake Hydroelectric Project (FERC No. 3015) rated at 25 MW. The Swan Lake Project is located on Revillagigedo Island, approximately 22 miles from Ketchikan and the Tyee Project is located 62 miles away at the head of Bradfield Canal, approximately 40 miles southeast of Wrangell, AK.

SEAPA is a regional Joint Action Agency of the State of Alaska that in addition to the two hydroelectric facilities, owns 14 miles of submarine cables and 175 miles of overhead transmission lines serving the municipalities of Ketchikan, Wrangell, and Petersburg, Alaska. SEAPA sells its generated power to Ketchikan, Wrangell, and Petersburg as outlined in a 2009 Power Sales Agreement at a whole sale power rate. Ketchikan has primary use of the Swan Lake facility generation and secondary use of the Tyee facility generation, after the communities of Petersburg and Wrangell.

KPU's net generation for each Project and total net generation for 2014-2023, including power purchased from SEAPA, is shown below in Table 3-1. The location of all KPU's hydroelectric projects and SEAPA's hydroelectric projects are shown below in Figure 3-1.

Table 3-1. KPU's Total Net Generation

2014-2023 (10 year average)	Net Generation (kWh)	
Bailey (Diesel)	5,742,452	3%
Ketchikan	21,450,915	12%
Whitman	8,641,212	5%
Beaver Falls	42,049,324	24%
Silvis	12,032,550	7%
Purchased Power (SEAPA)	86,294,259	49%
TOTAL NET GENERATION	176,210,712	100%

2023	Net Generation (kWh)	
Bailey (Diesel)	(817,419)	0%
Ketchikan	22,430,920	12%
Whitman	10,564,197	6%
Beaver Falls	42,504,838	23%
Silvis	11,465,598	6%
Purchased Power (SEAPA)	96,292,625	53%
TOTAL NET GENERATION	182,440,759	100%

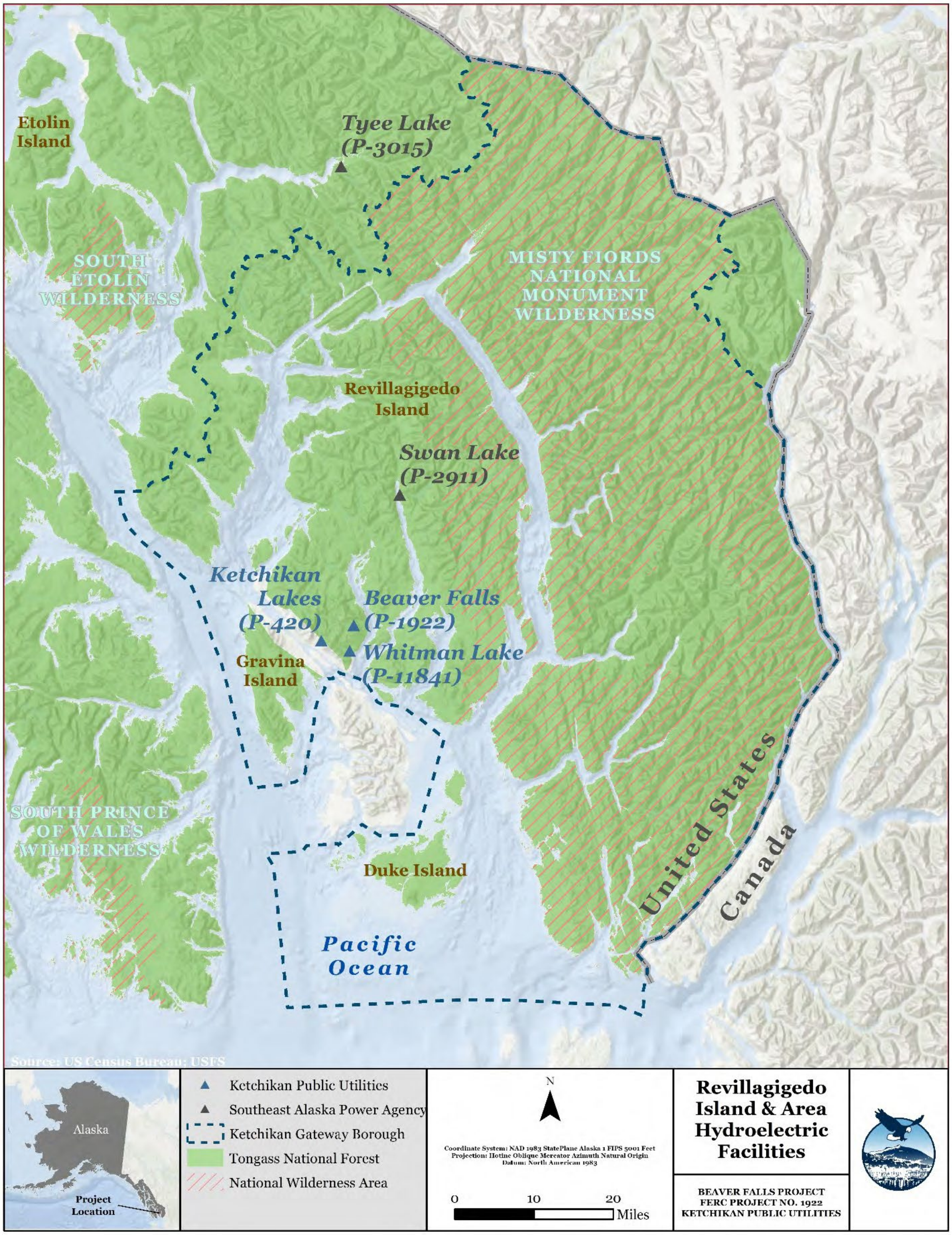

Figure 3-1. KPU and SEAPA Hydroelectric Facilities

3.3 Project Location

The Project is located on Revillagigedo Island in Ketchikan Gateway Borough, Alaska. The Project boundary (Figure 3-2) encompasses the Project facilities described below. The Project boundary occupies approximately 826 acres of federal land within the Tongass National Forest (TNF). Landowners within the Project boundary include KPU, the U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), and the Alaska Native Mental Health Trust (ANMHT). There are no changes proposed to the Project boundary.

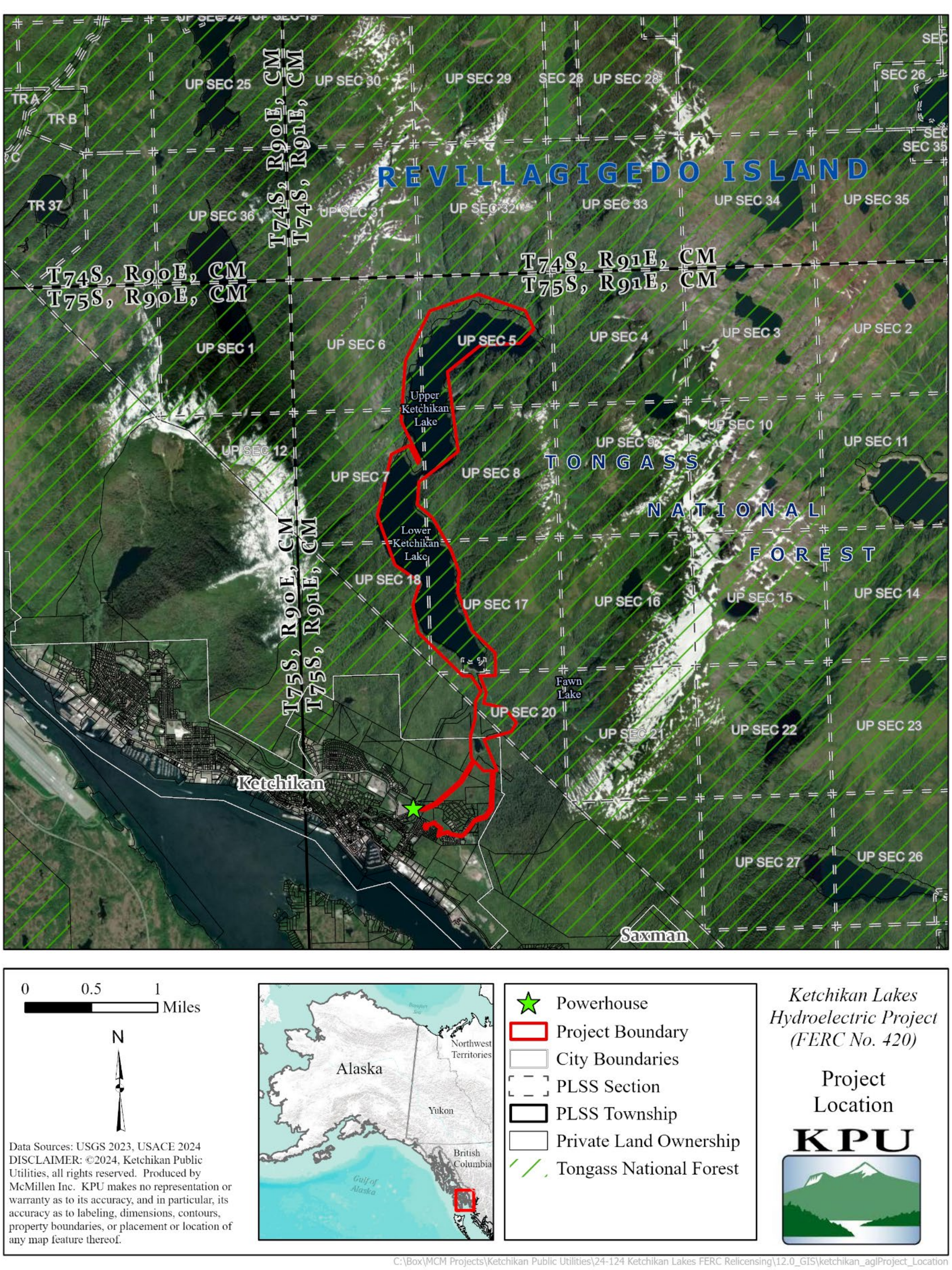

Figure 3-2. Project Location

3.4 Project History

The first use of Ketchikan Creek for hydropower was in 1902 by Watson J. Hill. The powerhouse was located "a short distance below the falls at the Harris Street bridge" and contained a 30 kW generator and water wheel supplied by an open flume about 500 feet long.

In 1903, following the organization of the Citizens Light Power and Water Company (which later became KPU), a log crib dam was constructed on Ketchikan Creek approximately 5,200 feet from tidewater. A wooden flume carried water from the dam to a water wheel and 60 kW generator located in a new powerhouse on the bank of the creek.

3.4.1 First Phase of Development, 1905-1919

The first phase of development of the existing Project was constructed between 1905 and 1919. This consisted of the following:

- The first dam was built at the outlet of Lower Ketchikan Lake, ensuring a more uniform supply of water. The dam was of timber crib construction; a flume and wood stave pipe conveyed water from the lake to a new wood powerhouse with 240 horsepower turbine and 120 kW generator.
- Intake Tunnel 1 was excavated 20 feet below the normal surface of the lake.
- A dam was constructed at the outlet of Upper Ketchikan Lake.
- A new concrete powerhouse was built (the building currently in use) containing two 1000 horsepower turbines with 600 KVA generators. A wood stave pipeline was constructed from Lower Ketchikan Lake to the powerhouse.
- A small dam was constructed on Granite Basin Creek, with a wood stave pipe that allowed flow from Granite Basin Creek to be utilized.

3.4.2 Second Phase of Development, 1921-1925

By 1920, Ketchikan had grown to be Alaska's industrial and commercial leader, home to fleets of trollers and halibut boats, canneries, logging, sawmills and regional mines. It was a thriving city with a population of 2,500 people. Already power demand was exceeding capacity.

Between 1921 and 1925, Citizen's Light & Power embarked on a major expansion of the Ketchikan Lakes Hydroelectric Project, which consisted of:

- Three timber crib dams constructed at the lower end of Ketchikan Lake
- Excavation of a spillway in rock to El. 340 feet
- One timber crib dam at the outlet of Fawn Lake, which raised the surface elevation of Fawn Lake by 6.5 feet to El. 340 feet
- Construction of a small diversion dam on Granite Basin Creek

- Excavation of Intake Tunnel 2 at lower Ketchikan Lake
- Excavation of Tunnels 3-6 at Granite Basin, Fawn Lake, and powerhouse site
- A wooden flume constructed across Granite Basin Ravine
- A 48-inch wood stave penstock built from Intake Tunnel 1 at Ketchikan Lake to Tunnel 5
- Three wood stave penstocks built to convey water from Tunnel 3 to the powerhouse
- Concrete plug and three 36-inch valves at the outlet of Tunnel 3
- A steel bridge erected across Ketchikan Creek to support the three new penstocks
- Lengthening of Ketchikan Powerhouse and installation of Unit 3

3.4.3 Third Phase of Development, 1957

Ketchikan's consumption of electric power continued to rise. By 1953, KPU had exceeded its hydro capacity and diesel generators had to be run continually to meet demand. Also, some of the equipment installed in 1912 and 1913 was in need of rehabilitation and possible replacement.

In 1957, KPU completed a second major expansion of the Ketchikan Lakes project, increasing its capacity to 4200 kW. New and modified Project works consisted of:

- Construction of an access road to Ketchikan Lake, Fawn Lake, and Granite Basin
- Construction of a new timber-core rockfill dam at the outlet of Lower Ketchikan Lake. The 1921 timber crib dams #1 and #3 remained in place and are buried within the fill of the new dam.
- Construction of a concrete gated spillway at Ketchikan Lake
- Excavation of a channel between Upper and Lower Ketchikan Lakes
- Construction of new timber-core rockfill dams at the north and south ends of Fawn Lake
- Erection of a new reinforced concrete intake structure at Fawn Lake
- Construction of new concrete diversion dam on Granite Basin Creek and renovation of the tunnels between Granite Basin and Fawn Lake
- Installation of steel penstock 5 between the Tunnel 3 plug and the Ketchikan Powerhouse (replacing a wood stave pipe)
- Installation of new butterfly valves at the outlet of intake Tunnels 1 and 2
- Renovation of the Ketchikan Powerhouse, including removal of Unit 1 and Unit 2, and installation of Unit 5

3.5 Existing Project Facilities

The Project continues to utilize water from Upper and Lower Ketchikan Lakes and Granite Basin Creek. The existing Project facilities consist of:

1. a 1,130-foot long rockfill dam at the outlet of the natural Ketchikan Lakes, which have a surface area of about 632 acres and a useable storage of 13,800 acre-feet;

2. a concrete diversion dam on Granite Basin Creek;

3. Fawn Lake, a 3.1-acre forebay that discharges into an unnamed tributary to Deer Creek, a tributary of Ketchikan Creek;

4. the Ketchikan Lakes to Fawn Lake conveyance system consisting of a short tunnel section (Tunnels 1 and 2), two 1,800-foot-long above ground pipelines, and a 1,127-foot-long tunnel (Tunnel 5) terminating in Fawn Lake below normal low water level;

5. the Granite Basin Creek diversion to Fawn Lake conveyance system, consisting of a 1,170-foot-long tunnel (Tunnel 6) discharging to a 150-foot long natural channel that empties into Fawn Lake;

6. a 3,473 foot-long power tunnel (Tunnels 3 and 4) with a concrete plug penetrated by three, 36-inch diameter, ductile-iron-pipe penstocks connecting the end of the tunnel to the powerhouse;

7. a concrete powerhouse containing three horizontal Francis turbines directly connected to three 1,400 kW generators, for a total rated capacity of 4,200 kW; and

8. appurtenant facilities.

These Project facilities are shown below in Figure 3-3 and Figure 3-4, and discussed in further detail in subsequent sections.

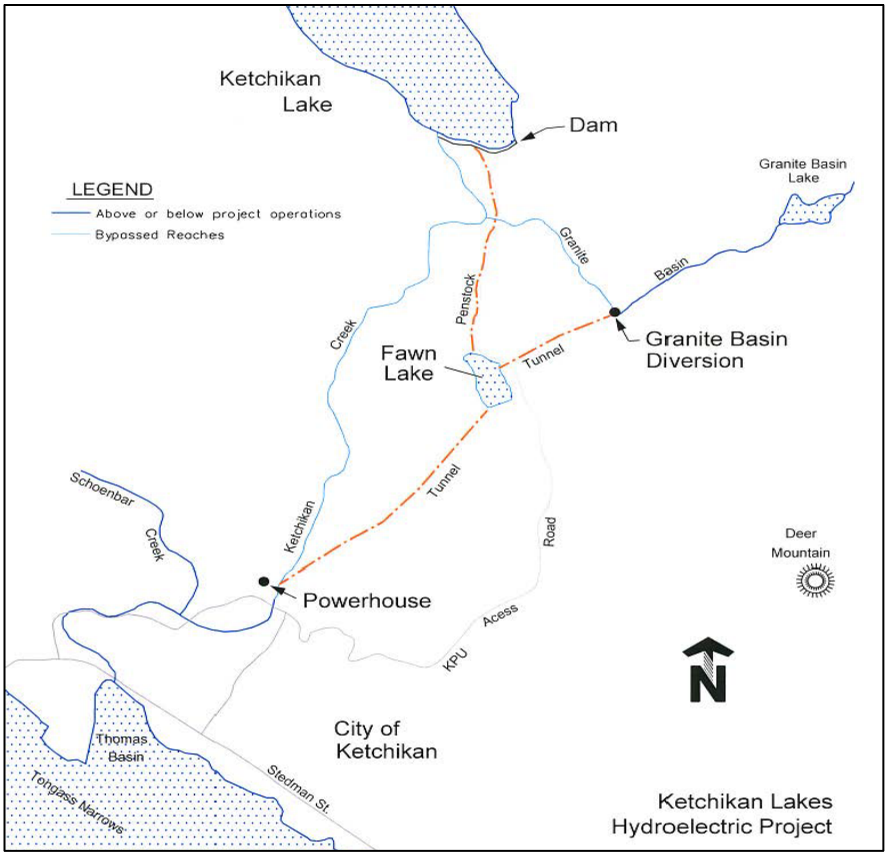

Figure 3-3. Project Layout and Facilities

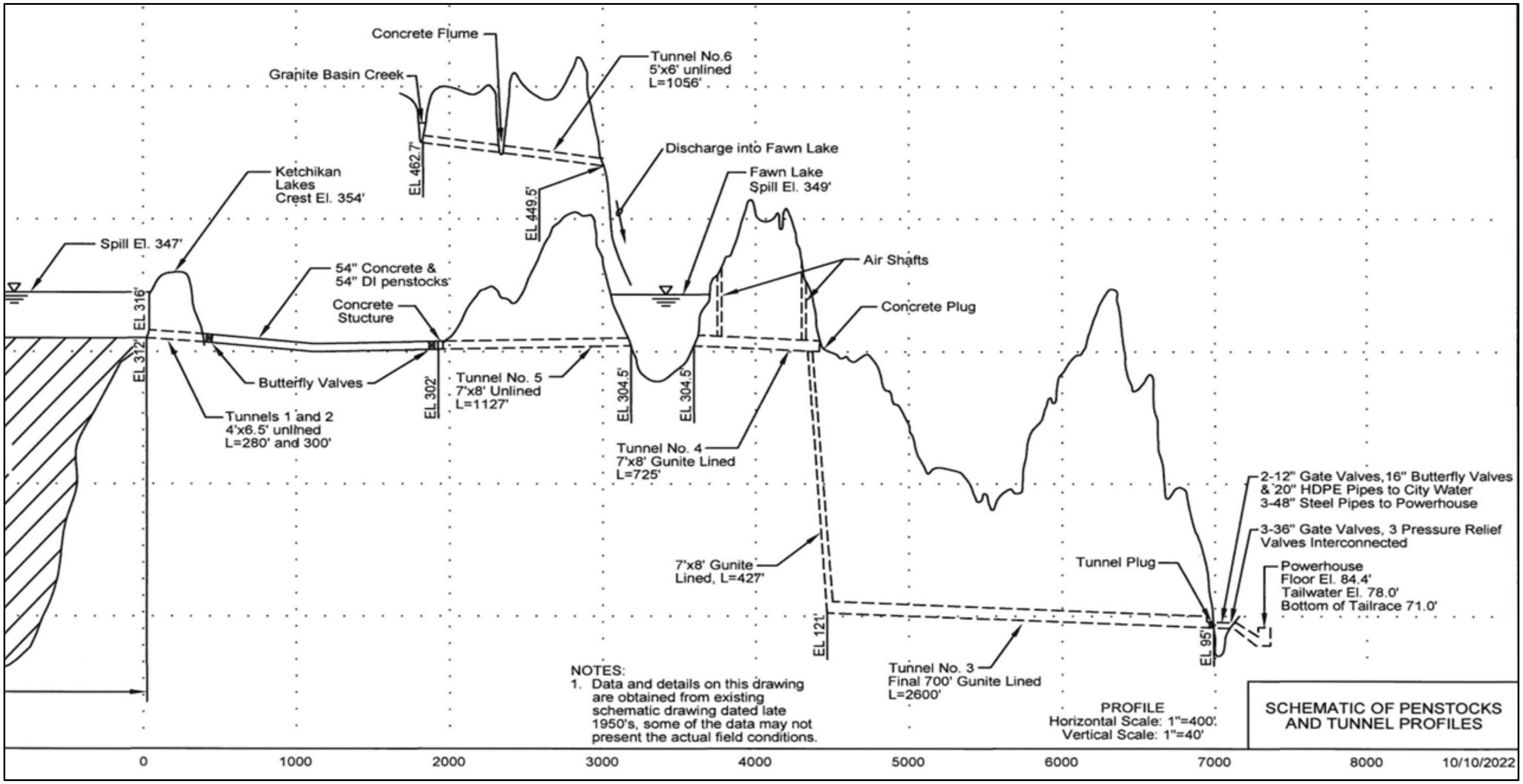

Figure 3-4. Profile View of Penstocks and Tunnels

3.5.1 Ketchikan Lakes Reservoir

Ketchikan Lakes (Figure 3-5) are two tandem lakes interconnected by a short channel that was excavated in 1957 to improve flow from the upper to the lower lake. The upper and lower lakes are nearly equal in surface area.

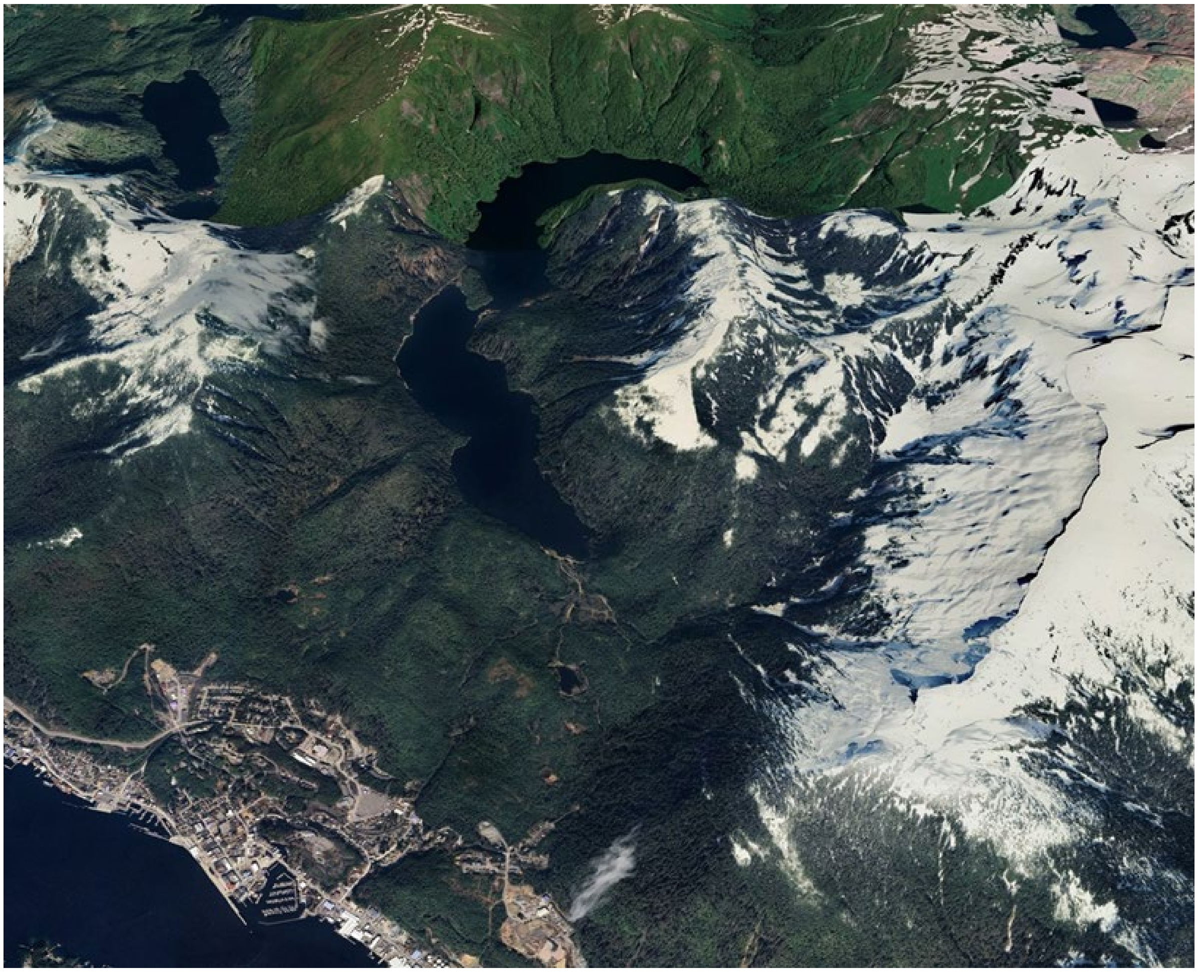

Figure 3-5. Aerial View of Ketchikan Lakes and the City of Ketchikan

A bathymetric survey of Ketchikan Lakes was conducted in 2019 (DOWL 2019); however, much of the lower and upper lakes were deeper than 250 feet, which exceeded what the bathymetric survey equipment of the time could collect. Thus, there is no readily available information about the gross storage volume of the lakes. Characteristics of Ketchikan Lakes are summarized in Table 3-2.

Table 3-2. Ketchikan Lakes Characteristics and Relevant Elevations

Characteristic	Value
Total Surface Area of Both Lakes	632 acres
Dam Crest Elevation	El. 355 feet

Characteristic	Value
Spillway Crest and Normal Maximum Surface Elevation for Both Lakes	El. 348 feet
Normal Minimum Surface Elevation for Both Lakes *(curtailed hydroelectric generation below this point)*	El. 325 feet
Hydroelectric Minimum Surface Elevation for Both Lakes *(no hydroelectric generation below this elevation because the excavated channel between the upper and lower lakes becomes dewatered, but the water supply utility may continue to draw down the lower lake for municipal water supply)*	El. 320 feet
Municipal Water Supply Minimum Surface Elevation for Lower Ketchikan Lake *(cannot draw down the lower lake below this point)*	El. 316 feet
Intake Tunnel Inverts Elevation	El. 312 feet
Useable Storage Volume of Both Lakes	13,800 acre-feet

3.5.2 Ketchikan Lakes Dam and Spillway

Ketchikan Lakes Dam (Figure 3-6) is a 1,130 foot-long rockfill embankment dam with a wooden core wall (Figure 3-7) located at the outlet of Ketchikan Lakes, approximately 2.2 river miles (RM) upstream from the mouth of Ketchikan Creek. The dam crest elevation is El. 355 feet, and the spillway crest elevation is El. 348 feet.

Figure 3-6. Ketchikan Lakes Dam – Upstream View

Figure 3-7. Ketchikan Lakes Dam – Core Wall Construction

The spillway (Figure 3-8) was reconstructed in 1978 to pass the probable maximum flood. The spillway is a concrete crest weir, 103 feet in width. The spillway chute beyond the concrete apron is excavated in bedrock and discharges to Ketchikan Creek.

Figure 3-8. Ketchikan Lakes Dam – Aerial View

3.5.3 Ketchikan Lakes to Fawn Lake Conveyance

Water is conveyed (Figure 3-9) from Ketchikan Lakes through two 4-foot by 6.5-foot unlined rock tunnels under the dam (Tunnels 1 and 2, Figure 3-10), which are 280 feet and 300 feet in length respectively. Inlet inverts to the tunnels are at El. 312 feet, outlets are at El. 307 feet.

Figure 3-9. Intakes at Ketchikan Lakes

Figure 3-10. Tunnels 1 and 2 under Ketchikan Lakes Dam

The downstream ends of the tunnels connect to two above ground penstocks (Figure 3-11). One of the penstocks is a 54-inch ductile iron pipe; the other is a 54-inch concrete cylinder pipe. Both penstocks are about 1,800 feet in length. Both penstocks have butterfly valves at each end.

Figure 3-11. Penstocks Downstream of Ketchikan Lakes Dam

Water is conveyed from the penstocks through Tunnel 5 to Fawn Lake. This tunnel is 1,270 feet long and 7-foot by 8-foot in cross section and the elevation at the tunnel inlet is 302 feet. Tunnel 5 discharges to Fawn Lake at elevation 305.5 feet, which is below Fawn Lake's normal low water level of 325 feet.

3.5.4 Granite Basin Creek Diversion

The Granite Basin Creek Diversion structure (Figure 3-12) is a concrete dam approximately 30 feet long and 12 feet high, with three roller gates which can be used to sluice out the forebay to the diversion, or to control the amount of flow entering the diversion, or to bypass flows around the diversion entrance. The top of the roller gates is at El. 464 feet and is 6 feet below the top of the diversion dam when the gates are fully closed. Flow in excess of the diversion capacity overtops the roller gates. This creates three spillway crests, each 6 feet wide, over the top of the gates.

Figure 3-12. Granite Basin Creek Diversion Dam

3.5.5 Granite Basin Creek to Fawn Lake Conveyance

Water is conveyed from the Granite Basin Creek Diversion to Fawn Lake through Tunnel 6, which is 5-foot by 7-foot in cross section and 1,170 feet long. There is a concrete flume at about the middle of the tunnel, crossing an unnamed channel. Tunnel 6 terminates about 150 feet from Fawn Lake with the water flowing in a natural drainage the rest of the way. The tunnel inlet is at El. 457 feet, and the outlet is at El. 442 feet. There is a trash rack and sluice gate at the tunnel entrance with the invert of the sluice gate 2 feet below the tunnel entrance. This allows removal of rocks and debris stopped by the trash rack.

3.5.6 Fawn Lake Forebay

Fawn Lake is the forebay to the power tunnels (Tunnels 3 and 4) that lead to the powerhouse. Fawn Lake is contained between two rockfill dams. The main dam is approximately 385 feet long and 22 feet high. The smaller dam is approximately 200 feet long and 15 feet high. The crest of both dams is at El. 352 feet, and both dams are rockfill embankment dams with wooden cores. There is a spillway channel, 14 feet wide and 85 feet long, cut in rock at the west end of the north dam. The spillway discharges to Deer Creek, which then drains to Ketchikan Creek. The spillway crest is at El. 348 feet, which is the same as the Ketchikan Lakes spillway crest. Fawn Lake characteristics are shown in Table 3-3.

Table 3-3. Fawn Lake Characteristics and Relevant Elevations

Characteristics	Value
Surface Area	3.1 acres
Dam Crest Elevation	El. 352 feet
Spillway Crest and Maximum Surface Elevation	El. 348 feet
Intake Tunnel Invert and Minimum Surface Elevation	El. 308.5 feet
Useable Storage Volume	27 acre-feet

3.5.7 Fawn Lake Intake and Power Tunnel

Water from the Fawn Lake forebay (Figure 3-13) is conveyed to the powerhouse through Tunnels 3 and 4, which are 7 feet by 8 feet in cross section and 3,473 feet long. There is a tower inlet structure with a manually operated sluice gate at the tunnel entrance. The tunnel inlet invert is at El. 308.5 feet.

Figure 3-13. Fawn Lake Tower Inlet Structure

The two tunnels are on a shallow grade (0.5 percent and 1.0 percent) connected by a 427-foot section in the middle at 42 percent grade. The power tunnel ends about 360 feet east of the powerhouse, on the east bank of Ketchikan Creek and is terminated with a concrete plug. The plug is penetrated by three 36-inch diameter penstocks running to the powerhouse, and two 12-inch diameter municipal water lines which run to the chlorination building (Figure 3-14).

Figure 3-14. Concrete Plug Penetrated by the Penstocks and Municipal Water Lines

Both the powerhouse and chlorination building are on the west side of Ketchikan Creek. The 36-inch lines and the 12-inch lines span Ketchikan Creek on a bridge type structure built specifically for the pipelines. The concrete plug is at El. 95 feet, and the penstocks enter the powerhouse at El. 88 feet (Figure 3-15).

Figure 3-15. Penstocks Entering the Powerhouse

3.5.8 Powerhouse

The powerhouse is located just north of Fair Street in the City of Ketchikan. The building is of concrete construction and is approximately 81 feet by 43 feet in dimension, with about 3,300 square feet total floor space. It is equipped with two overhead track cranes to service the equipment. The Project has a total installed capacity of 4.2 MW with a total maximum hydraulic capacity of 280 cubic feet per second (cfs). The Project consists of three turbine-generator units as shown in Figure 3-16.

Figure 3-16. Turbine-Generator Units

The three units are referred to as Units 3, 4, and 5 (Units 1 and 2 were decommissioned). All three units are identical in power output. Characteristics of the turbines and generators are presented in Table 3-4.

Table 3-4. Turbine-Generator Characteristics

Characteristic	Units 3 and 4	Unit 5
Turbine		
Manufacturer	Pelton Water Wheel Co.	Leffell Turbine
Type	Francis	Francis

Characteristic	Units 3 and 4	Unit 5
Rated Head (ft)	250	250
Rated Power (kW)	1,864	1,864
Minimum Output (kW)	470/513	310
Maximum Rated Hydraulic Capacity (cfs)	104	104
Minimum Hydraulic Capacity (cfs)	33.3 /32.2@30% gate	25.7@26.5% gate
Rated Speed (revolutions per minute)	720	720
Runner Diameter	28 in	28 in
No. of Blades	17	17
Generator		
Manufacturer	General Electric	Ideal Electric
Rated Output (kVA)	1,750	1,750
Power Factor	0.8	0.8
Power Capacity (kW)	1,400	1,400
Voltage (V)	4,160	4,160
Current (A)	243	243
Phase	3	3
Frequency (Hertz)	60	60
Speed (revolutions per minute)	720	720

3.5.9 Tailrace

The tailrace conveys water from the turbine outlets back to Ketchikan Creek. All of the tailrace system is below grade. There are separate tailrace chambers, numbered 3, 4 and 5 (coinciding with turbine numbers) for each turbine. These chambers vary in dimension and length but average 4 feet deep and 8 feet wide. Their lengths are all between 50 to 120 feet and they come together into one larger chamber just outside the south side of the powerhouse.

The larger chamber is about 14 feet wide and 9 feet deep, all below grade. In the chamber, there is a weir upstream of the main outlet to establish minimum tailwater elevation of 72.5 feet. This ensures that the turbine outlets remain submerged. In the large chamber there is a 24-inch diameter outlet to another control box which diverts water to the Deer Mountain Hatchery (Figure 3-17). KPU is required to provide a minimum of 4.5 cfs to the hatchery at all times. The outlet to the hatchery is upstream of the weir, and flow to the hatchery is satisfied before flow goes to the tailrace outfall. Flow to the hatchery can be controlled by the hatchery at the control box.

Figure 3-17. Deer Mountain Hatchery

In addition to the hatchery outlet noted above, there is another 24-inch diameter outlet from the large chamber. This outlet is provided with a sluice gate for control. This outlet is also upstream of the weir. The outlet invert is at the bottom of the chamber. This outlet connects to a 24-inch corrugated metal pipe, which runs about 130 feet to a connection with a 36-inch diameter pipe which crosses under Fair Street and provides water for the small streams running through the City Park adjacent to the hatchery (Figure 3-18). All of this water is returned to Ketchikan Creek through either the outfall about 200 feet south of the Fair Street bridge, or the hatchery outfall which is about 560 feet south of the bridge.

Figure 3-18. City Park

The remaining water that flows over the weir in the large chamber flows through a transition section to a 72-inch corrugated metal pipe which runs 150 feet to the main outfall at Ketchikan Creek. This outfall is about 100 feet north of the Fair Street bridge (Figure 3-19).

Figure 3-19. Tailrace Outfall

There is a flow bypass valve on one of the 36-inch steel penstock lines. This valve is under automatic control which will bypass 35 cfs from the penstock to the large tailrace chamber in the event that all three turbines are shutdown.

3.5.10 Access Roads

The primary Project access road extends from the City of Ketchikan to Fawn Lake and Ketchikan Lakes Dam, with a branch to the Granite Basin Creek Diversion. The access road begins at a controlled gate at the end of Ketchikan Lakes Road, which is a City owned street, up to the gate. The gate is locked to prevent public access and protect the water quality of the municipal water supply.

The total length of the access road is 2.1 miles. The three segments are (1) from the gate to Fawn Lake, 0.9 miles; (2) from Fawn Lake to Ketchikan Lakes dam, 0.8 miles; and (3) the branch to Granite Basin Creek Diversion, 0.4 miles. The branch to Granite Basin Creek Diversion connects with the Fawn Lake - Ketchikan Lakes segment at the crossing of Granite Basin Creek. The roads are unpaved with sufficient grading and earth/rock work to keep them suitable for maintenance and construction vehicles. The branch to Granite Basin Creek Diversion is very rugged.

The primary Project access road is maintained year-round to allow for access to the Project infrastructure. The branch to the Granite Basin Creek Diversion is too rugged to plow and is therefore inaccessible by vehicle when there is snow, which is not often. However, the Granite Basin Creek Diversion is still accessible by foot if need arises.

No access road to the powerhouse is needed because it is located on a city street.

3.6 Current Project Operations

Since the water supply for the City of Ketchikan is taken from the power tunnel just ahead of the powerhouse, the hydroelectric project operating criteria are based on domestic water supply requirements as well as electrical energy production and minimum instream flow. The water supply objective is to maintain adequate pressure in the power tunnel to meet water distribution system needs and to maintain good water quality. This is achieved by maintaining a stable water level in Fawn Lake which avoids turbidity from turbulence in the reservoir.

KPU's dispatchers balance and conserve the KPU system reservoirs to ensure current and forecast electrical loads and water demands are being met, while attempting to minimize the amount of diesel generation needed to supplement hydro generation and avoid spill at each reservoir. The power output from the Ketchikan Powerhouse is normally base-loaded and adjusted manually as KPU has alternative generation units that are more suitable for peaking capacity and load following. There are no fixed rule curves for Ketchikan Lakes project operations.

The Ketchikan Lakes reservoir is operated for hydroelectric generation at El. 325 feet and higher. When the reservoir level falls below El. 325 feet, generation is curtailed to facilitate water transfer from Ketchikan Lakes to Fawn Lake, to ensure adequate quantity and quality of municipal water, and to provide for instream flow releases. Hydroelectric generation may be reduced at a reservoir level greater than El. 325 feet if requested by the municipal water utility. Below El. 320 feet, the excavated channel between Upper and Lower Ketchikan Lakes is dewatered and the remaining water in the upper lake is stranded

3.6.1 Monitored Instrumentation and Alarms

KPU monitors the following instrumentation and alarms:

- Ketchikan Lakes reservoir elevation
- Ketchikan Lakes dam break alarm (calculation based on rapid change in reservoir elevation)
- Fawn Lake reservoir elevation
- Flow from Fawn Lake to Ketchikan Powerhouse (via flow meters on penstocks 3, 4 and 5)
- Ketchikan Creek stream gage rapid rise alarm

3.6.2 Minimum Flow and Ramping Rates

KPU operates the Ketchikan Lakes project in compliance with the minimum flow and ramping rate requirements of the FERC "Order Granting Amendment of License for Articles 405, 407, 409 and 413" issued on May 11, 2009 (see Section 3.7.1 Current License Requirements). These are discharge-based flows, as measured by the ultrasonic flow meters installed on the powerhouse penstocks.

In the event of a power trip, a 30 cfs capacity bypass valve installed on Penstock 3 opens automatically to release water into the powerhouse tailrace, continuing to provide flow to the hatchery, City Park, and Ketchikan Creek.

3.6.3 Flood Operations

There are no spillway gates or reservoir control valves at the Ketchikan Lakes project. During a spill of Ketchikan Lakes, KPU implements the following flood procedures (Table 3-5) which are further described in the project Emergency Action Plan:

Table 3-5. Flood Procedures

Reservoir Elevation	Flood Procedures
> El. 349 ft (2+ feet of spill)	Daily observation of Ketchikan Lakes Dam Operate generating units to maximize water use Mobilize equipment at dam Move and stage utility trucks on both sides of creek
> El. 351 ft* (4+ feet of spill)	Continuous observation of Ketchikan Lakes Dam

* Top of core wall

During a flood, KPU may open the gates at Granite Basin Diversion to maximize water usage from the Ketchikan Lakes.

3.6.4 Routine Maintenance Procedures

Routine maintenance procedures at the Ketchikan Lakes Project (that are not part of the Dam Safety Surveillance and Monitoring Plan) include:

- Annual access road maintenance, including grading, ditching, and repair as necessary
- Annual vegetation removal on the dams, along the pipelines and access road
- Removal of debris collected near dams and spillways
- Cleaning of Granite Basin intake grates; dredging and sluicing as necessary

3.7 Other Project Information

3.7.1 Current License Requirements

By Order dated August 29, 2000, FERC issued a license for the Ketchikan Lakes Hydroelectric Project to KPU. The 30-year license went into effect on August 1, 2000, and expires on July 31, 2030. The license is subject to Standard Articles set forth in Form L-1 (October 1975) entitled "Terms and Conditions of License for Constructed Major Project Affecting Lands of the United States." The license is also subject to additional articles and Section 4(e) conditions summarized below in Table 3-6.

Table 3-6. Summary of Additional License Articles and Conditions

No.	Summary
Additional License Articles	
201	*Annual Charges* – KPU has to pay the United States annual charges for (a) the purpose of reimbursing the United State for the cost of administering Part 1 of the Federal Power Act (FPA), and (b) for the purpose of recompensing the United States for the use, occupancy, and enjoyment of 826 acres of its land.
202	*Revised Exhibit G-1* – KPU had to file a revised Exhibit G-1 showing the accurate location of existing non-public, project facility access road locations.
203	*Drawings* – KPU had to file three sets of aperture cards of the approved drawings.
204	*Headwater Benefits* – If the Project was directly benefitted by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license, and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, KPU must reimburse the owner of the headwater improvement for those benefits.
401	*Oily Water Separator* – KPU shall continue to operate and maintain the existing oily water separator installed in the powerhouse to remove all oil from water before it is discharged into the Project tailrace.
402	*Seepage Monitoring* – KPU had to monitor the seepage that occurs from the Ketchikan Lakes Dam and the Granite Basin Creek Diversion, as required by USFS Condition No. 113. If future repairs would reduce seepage, then KPU must maintain through some other means an amount of flow equal to the amount of the seepage flows measured during the first 2 years of seepage monitoring.
403	*Ketchikan Creek Flow Monitoring Upstream of the Tailrace*– KPU had to conduct flow monitoring for 5 years just upstream of the tailrace to measure seasonal variability of flows in the bypassed reach of Ketchikan Creek.

No.	Summary
404	*Ketchikan Creek Temperature Study Downstream of the Tailrace* – KPU had to conduct a water temperature modeling study to identify the effect of project operations and facilities on water temperatures in Ketchikan Creek downstream of the project tailrace.
405	*Minimum Flow Releases* – KPU must release a minimum of 47 cfs from the powerhouse into the tailrace, except in the event plant power trip or for the purposes of protecting the municipal water supply, when the flow may be reduced to 35 cfs. This flow may be temporarily modified if required by operation emergencies beyond the control of KPU, and for short periods upon agreement amongst KPU, ADFG, USFWS, and NMFS. If the flow is modified, then KPU must notify FERC as soon as possible, but no later than 10 days after each such incident.
406	*Minimum Hatchery Flows* – KPU must provide a minimum flow of 4.5 cfs to the Dear Mountain Hatchery. Similar notification requirements apply for temporary flow modifications.
407	*Ramping Rates* – KPU must limit ramping rates to obtain specific maximum stage changes in Ketchikan Creek downstream from the tailrace. Similar notification requirements apply for temporary ramping rate modifications.
408	*Fawn Lake Water Level Monitoring* – KPU must monitor water levels in Fawn Lake. Water level data must be integrated on a real time basis into the Project supervisory control and data acquisition (SCADA) system located at KPU's Central Control and Dispatch Center to allow greater lead times for making flow ramping decisions.
409	*Ketchikan Creek Flow Monitoring Downstream of the Tailrace* – KPU must monitor the minimum flow releases required by Article 405 and the ramping rates required by Article 407.
410	*Fisheries Habitat Enhancement Plan* – KPU had to (1) remove the 5-foot barrier on Ketchikan Creek, (2) improve access to (but not passage through) the Shoenbar Creek culvert, (3) enhance 2,000 square feet of salmonid rearing habitat, and (4) extend the existing fish ladder on Ketchikan Creek.
411	*Ketchikan Lakes Fishery Study* – If Ketchikan Lakes is opened to public recreation access, then KPU must conduct fishery studies in Ketchikan Lakes.
412	*Agency Access* – KPU must permit state and federal fish and wildlife agency personnel to have access to Project lands.
413	*Annual Meetings* – KPU must hold annual meetings with state and federal fish and wildlife agency personnel and the USFS.
414	*Cultural Resource Protection* – If any archeological or historic sites are discovered during Project operations or construction, and prior to any construction activities that are not routine maintenance, KPU must develop a cultural resources management plan.

No.	Summary
415	*Existing Recreational Use* – KPU must continue to allow hikers to use USFS trails, including Deer Mountain Trail.
416	*Recreation Implementation Plan* – If KPU constructs a water treatment facility that allows for the removal of the existing public access restrictions, then KPU must develop a recreation plan.
417	*Use and Occupancy* – KPU may grant permission for certain types of use and occupancy of Project lands and waters.
USFS Section 4(e) Conditions	
103	*Approval of Changes After Initial Construction* – KPU must get written approval from the USFS prior to making any substantive changes to Project facilities or operations.
104	*Annual Consultation* – KPU must consult with the USFS annually regarding measures needed to ensure protection and development of the natural resource values of the Project area.
110	*Cultural Resource Protection* – Prior to any construction activities that are not routine maintenance, KPU must develop a cultural resources management plan.
111	*Ketchikan Lakes Fishery Study* – If Ketchikan Lakes is opened to public recreation access, then KPU must conduct fishery studies in Ketchikan Lakes and Granite Basin Creek.
112	*Stage and Flow Monitoring* – KPU must monitor the stage and flow in the streams that the Project is located, the amount of water held in and withdrawn from Ketchikan Lakes, and the effective head on the turbines.
113	*Seepage Monitoring* – KPU had to monitor the seepage that occurs from the Ketchikan Lakes Dam and the Granite Basin Creek Diversion. If future repairs would reduce seepage, then KPU must maintain through some other means an amount of flow equal to the amount of the seepage flows measured historically.
114	*KPU Fish and Wildlife Facilities* – KPU must make reasonable modifications to the Project facilities and operations for the conservation and development of fish and wildlife resources as directed by FERC, the Secretary of Agriculture, or ADFG.
115	*USFS Fish and Wildlife Facilities* – KPU must permit the USFS, at their own expense, to make any reasonable modifications to Project facilities that they see fit for the conservation and development of fish and wildlife resources.
116	*Erosion Control Plan* – Before conducting any land clearing or land disturbing activities on USFS lands, KPU must develop an erosion control plan.
117	*Visual Resource Protection* – Before conducting any land clearing or land disturbing activities on USFS lands, KPU must develop a visual resources protection plan.

No.	Summary
118	*Recreation Implementation Plan* – If KPU constructs a water treatment facility that allows for the removal of the existing public access restrictions, then KPU must develop a recreation plan.
119	*Sensitive Plant and Habitat Plan* – Before conducting any land clearing or land disturbing activities on USFS lands, KPU must develop a sensitive plant and habitat plan.
120	*USFS Access* – KPU must allow the USFS to use the access road.
121	*Access Road Easement* – KPU had to obtain an easement so that the USFS and general public could use the portion of the access road that is not located on USFS land.
122	*Project Boundary Modification* – KPU had to file a revised Exhibit G-1 showing the accurate location of existing non-public, project facility access road locations.
123	*Right to Use USFS Lands* – KPU's right to use USFS land will cease at the end of the license period, unless KPU has obtained a new license.
124	*Solid Waste and Wastewater Plan* – Before conducting any land clearing or land disturbing activities on USFS lands, KPU must develop a solid waste and wastewater plan.
125	*Hazardous Substance Plan* – Before conducting any land clearing or land disturbing activities on USFS lands, KPU must develop a hazardous substance plan.
126	*Implementation of USFS Conditions* – KPU had to wait to implement the USFS conditions until the USFS completed the requirements under 36 CFR Part 215.

On May 11, 2009, FERC issued an order amending the specific license articles as described below.

- Article 405 – reduce the minimum emergency flow to 30 cfs instead of 35 cfs
- Article 407 – define ramping rate limits in terms of plant discharge (see Table 3-7 below) instead of stage changes in Ketchikan Creek downstream from the tailrace
- Article 409 – measure ramping rates and minimum flow releases with ultrasonic flow meters installed on the powerhouse penstocks instead of using the gaging station on Ketchikan Creek below the tailrace
- Article 413 – consult with the fish and wildlife agencies annually to determine if an annual project review meeting is needed instead of automatically having a project review meeting every year

Table 3-7. Ramping Rate Schedule and Rule Curves

RAMPING RATE SCHEDULE			RULE CURVE A	
Month	Daylight	Night	Powerhouse Discharge (cfs)	Max. Change Flow Rate (cfs/hour)
January	B	B	47-65	15
February 1 - 27	B	B	65-85	20
February 28 - March 31	15 max*	B	85-110	25
April	15 max*	B	110-140	30
May	15 max*	B	140-172	32
June	A	A	172-205	34
July	A	A	205-242	36
August	A	A	242-280	38
September 1-15	A	A	280-320	40
September 16-30	B	B	RULE CURVE B	
October	B	B	47-85	35
November	B	B	85-140	55
December	B	B	140-205	65
* 15 cfs/hr maximum flow change, except 30 cfs/hr for water quantity/quality reasons			205-280	75
			>280	80

The Project does not have a Water Quality Certificate from the State of Alaska. KPU applied to the ADEC for water quality certification on May 30, 1997. Since the ADEC did not act on the request within 1 year, the Project's Water Quality Certificate is deemed waived.

The Project has a USFS Special Use Permit for the Ketchikan Lakes area (dated 1956) and for the Granite Basin area (dated 1964). In addition, USFS Section 4(e) conditions are included in the FERC license as described above.

3.7.2 Compliance History

KPU has a sound compliance history and is unaware of any violations that have occurred at the Project over the course of the current license. Inspections are conducted at the Project by FERC's Portland Regional Office on a regular basis. KPU completes all necessary corrective actions to address comments and recommendations arising from FERC inspections in a timely manner.

3.7.3 Project Generation and Outflows

The Water Utility uses 4.5-9.5 million gallons of water per day, taken from the tunnel just ahead of powerhouse. The remaining water is conveyed through the powerhouse and into the tailrace. Average monthly and annual generation and outflows for the Project from 2019 – 2023 are provided below in Table 3-8 and Table 3-9 respectively.

Table 3-8. Average Monthly and Annual Generation in kilowatt-hours (2019-2023)

Month	2019	2020	2021	2022	2023
Jan	2,473,151	2,120,926	2,504,623	1,489,640	1,974,255
Feb	1,714,817	1,922,261	1,232,172	2,157,310	2,515,814
Mar	713,581	1,800,651	1,702,801	2,306,700	1,385,743
Apr	979,102	1,206,265	1,677,992	1,551,213	1,183,874
May	1,036,445	2,068,723	2,018,266	1,714,864	2,309,990
June	1,121,254	2,435,802	2,647,918	1,781,659	2,248,945
July	1,406,876	2,184,559	1,244,709	1,369,681	1,363,463
Aug	1,673,208	2,440,889	1,960,609	1,477,428	1,097,615
Sep	1,416,005	2,085,315	2,051,796	1,565,164	1,545,155
Oct	2,536,662	1,033,151	2,318,455	1,903,964	1,877,450
Nov	2,616,803	2,222,355	1,911,357	1,806,706	2,228,741
Dec	2,128,050	2,681,309	1,950,533	958,824	2,699,875
Annual	**19,815,954**	**24,202,206**	**23,221,231**	**20,083,153**	**22,430,920**

Table 3-9. Average Monthly and Annual Outflows in cfs (2019-2023)

Month	2019	2020	2021	2022	2023
Jan	204	173	183	116	158
Feb	157	160	106	194	240
Mar	59	144	135	193	108
Apr	80	100	139	130	91
May	79	161	157	136	178
June	87	206	228	144	182
July	108	175	94	103	105
Aug	133	202	158	113	82
Sep	113	175	176	125	125
Oct	212	80	196	155	150

Month	2019	2020	2021	2022	2023
Nov	229	179	160	150	190
Dec	169	208	161	73	230
Annual	**136**	**164**	**158**	**136**	**153**

3.7.4 Current Net Investment

Operations and maintenance costs for the Project are approximately $550,000 per year. This does not include the original construction costs and should not be interpreted as the fair market value of the Project.

3.8 Proposed Changes to Project Facilities and Operations

KPU is currently considering one infrastructural change, one operational change, and one administrative change for the Project as described below.

- Currently there is no low-level outlet for the Project; therefore, KPU is considering the addition of a low-level outlet for dam safety purposes. Conceptually this would be the addition of a new valve on one of the penstocks just below Ketchikan Lakes Dam. The purpose of this valve would be to release water from Ketchikan Lakes into Ketchikan Creek in a controlled fashion when needed to prevent uncontrolled spill events. Further engineering is required to determine if this is something that KPU will propose in the license application. KPU is currently investigating the potential of incorporating this valve into the relicensing and will be as proactive as possible in notifying FERC and stakeholders of their decision.

- Article 407 of the FERC license defines ramping rates for the Project. Per the 2009 License Amendment, these ramping rates are defined in terms of plant discharge (see Table 3-7 in Section 3.7.1). As written, Article 407 does not distinguish between downramping and upramping. Since downstream environmental impacts are most commonly associated with downramping rates, KPU would like to refine Article 407 accordingly so that it only applies to downramping. This potential operational change would provide greater operational flexibility for KPU without detrimentally impacting the aquatic environment and will be discussed with the appropriate stakeholders and regulatory agencies during relicensing.

- Articles 405 and 407 of the FERC license define minimum flow releases and ramping rates for the Project, respectively. Any time flows fall below the required minimum flow releases, or any time the defined ramping rates are exceeded, KPU is required to notify ADFG, USFWS, and NMFS within 72 hours and FERC within 10 days. This notification is required for every incident, no matter the magnitude of the deviation or the duration of the deviation. These notification requirements have resulted in numerous notifications from KPU each year, many times for relatively minor deviations, which has resulted in an unforeseen administrative burden on not only KPU, but also FERC staff and the other regulatory agencies. KPU would therefore like to coordinate with FERC staff and the other regulatory agencies to define new mutually agreeable notification requirements that keep everyone informed without unnecessary notification processes.

3.9 PURPA Benefits

KPU is not seeking benefits under Section 210 of the Public Utility Regulatory Policies Act (PURPA) for the Project.

3.10 References

Ketchikan Public Utilities (KPU). (1998). *Ketchikan Lakes Hydroelectric Project, Final Application for Hydropower License.* City of Ketchikan. June 1998.

KPU. (2024). *Ketchikan Lakes Hydroelectric Project, Supporting Technical Information Document.* City of Ketchikan. May 2024.

Federal Energy Regulatory Commission (FERC). (2000). *Order Issuing Major New License, Project No. 420.* August 2000.

FERC. (2009). *Order Granting Amendment of License for Articles 405, 407, 409 and 413.* May 2009.

U.S. Forest Service (USFS). (1956). *Special Use Permit, Ketchikan Lakes.* August 1956.

USFS. (1964). *Special Use Permit, Granite Basin.* August 1964.

4.0 Description of Existing Environment and Resources Impacts (18 CFR § 5.6 (d)(3))

4.1 General Description of the River Basin (18 CFR § 5.6 (d)(3)(xiii))

4.1.1 Basin Overview

Ketchikan Creek, located on Revillagigedo Island in Ketchikan, Alaska, flows approximately 7 RM from its headwaters near John Mountain to its confluence with Tongass Narrows (Figure 4-1). Ketchikan Creek has a drainage area of approximately 14.1 square miles (United States Geological Survey (USGS) 2023). The creek drops approximately 2,000 feet along its course from its headwaters to sea level. From its headwaters, Ketchikan Creek flows in a generally southerly direction. It passes through Upper and Lower Ketchikan Lakes, which have a combined length of approximately 3.5 miles, which is approximately 50 percent of the total length of Ketchikan Creek. The portions of Ketchikan Creek above and below Ketchikan Lakes are characterized by steep terrain and contain numerous cascades and waterfalls. The creek then passes through the city limits of Ketchikan, where it is flanked by historic Creek Street as a piling-perched boardwalk.

There are two named tributaries, Granite Basin Creek and Schoenbar Creek (Figure 4-1) that flow into Ketchikan Creek. Water from both Ketchikan Lakes and Granite Basin Creek is used by the Project, as described in Section 3.5 and 3.6. Granite Basin Creek flows approximately 2.8 RM from its headwater near Northbird Peak, passing through Granite Basin, to its confluence with Ketchikan Creek. The Project's diversion structure, which diverts water from Granite Basin Creek to Fawn Lake, is located approximately 0.4 miles upstream of Granite Basin Creek's confluence with Ketchikan Creek (Figure 4-1). Schoenbar Creek drains the southwest portion of the Ketchikan Creek basin and joins Ketchikan Creek approximately 1,400 feet downstream of the Project tailrace. In addition to the two primary tributaries, there are numerous small unnamed tributaries that flow into Ketchikan Lakes and Creek, some of which only flow seasonally in response to snowmelt and rainfall runoff.

The only dams/diversions in the basin are associated with the Project (Table 4-1 and Figure 4-1) (USACE 2024). Ketchikan Lakes Dam impounds Ketchikan Lakes, Granite Basin Creek Diversion is used to divert water to Fawn Lake, and the Fawn Lake Dams (South and North) contain Fawn Lake, which serves as the Project forebay. More information about these dams is provided in Section 3.5.

Table 4-1. Ketchikan Creek Basin Dams

Dam Name	NID No.	Location
Ketchikan Lakes Dam	AK00006	Ketchikan Creek, 2.2 RM upstream of confluence with Tongass Narrows
Granite Basin Creek Diversion	AK00142	Granite Basin Creek, 0.4 RM upstream of confluence with Ketchikan Creek
Fawn Lake Dam South	AK00037S001	South side of Fawn Lake
Fawn Lake Dam North	AK00037	North side of Fawn Lake

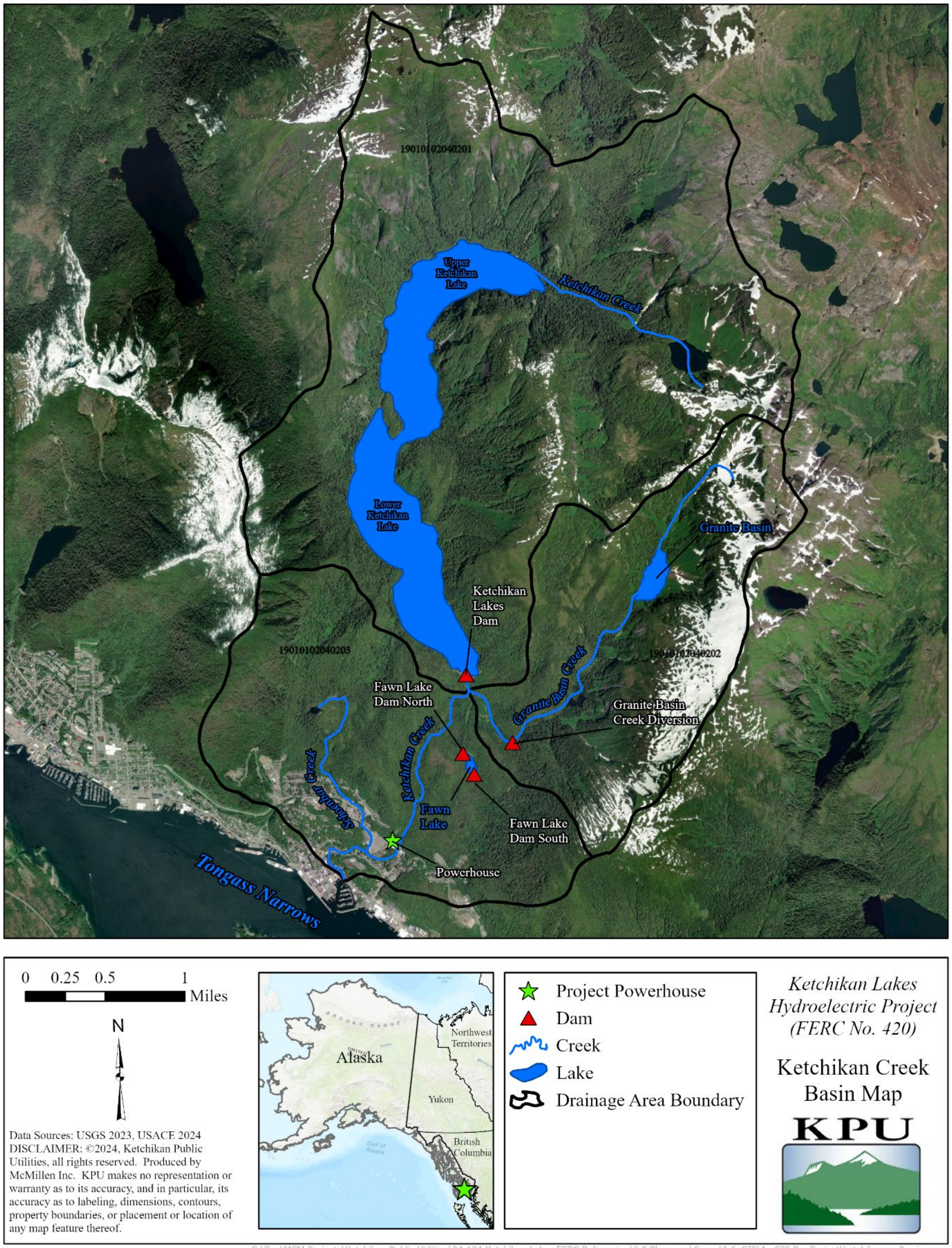

Figure 4-1. Ketchikan Creek Basin Map

4.1.2 Major Land Uses

The Ketchikan Creek basin is primarily composed of undeveloped evergreen forest and alpine shrub-scrub habitat (Figure 4-2). Approximately 40.6% of the basin is categorized as evergreen forest followed by shrub/scrub (26.7%) and mixed forest (11.6 %). There is very little developed land in the basin, with all developed land cover types totaling less than 5%. The only developed portions of land in the basin are concentrated at the mouth of Ketchikan Creek, where the City of Ketchikan flanks the creek and Tongass Narrows. Developed, low intensity is the most abundant developed land cover type at 2.7% of the basin area. Table 4-2 provides a breakdown of the various land cover classifications in the Ketchikan Creek basin.

Table 4-2. Ketchikan Creek Basin Land Cover

Land Cover Type	Area (acres)	Total (%)
Evergreen Forest	3,658	40.6
Shrub/Scrub	2,404	26.7
Mixed Forest	1,050	11.6
Open Water	645	7.1
Deciduous Forest	546	6.1
Dwarf Shrub	256	2.8
Developed, Low Intensity	240	2.7
Barren Land	181	2.0
Developed, Open Space	14	0.2
Developed, Medium Intensity	11	0.1
Perennial Ice/Snow	8	0.1
Grassland/Herbaceous	3	<0.1
Woody Wetlands	3	<0.1
Developed, High Intensity	2	<0.1

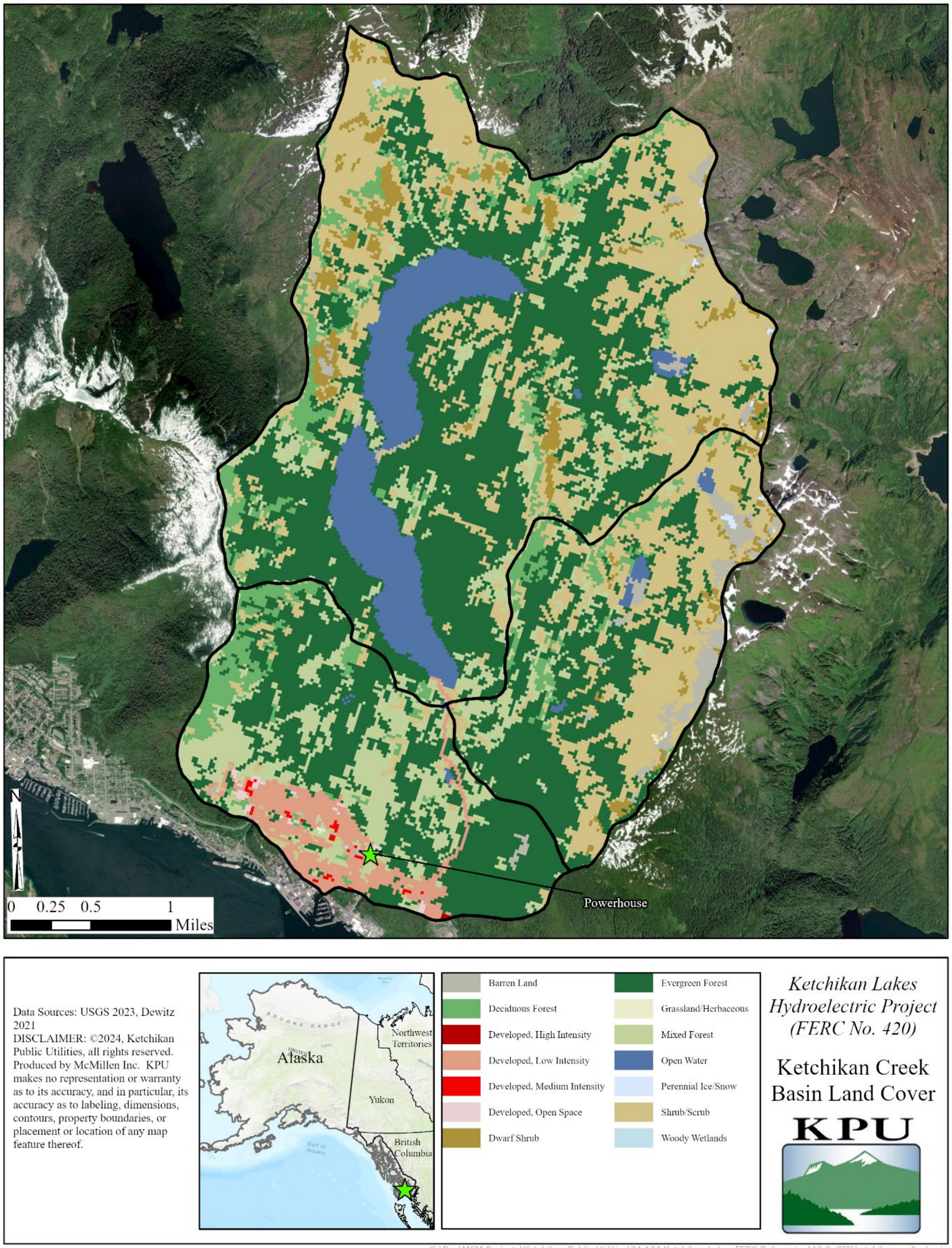

Figure 4-2. Ketchikan Creek Basin Land Cover

The Project is located at Ketchikan Lakes Dam, where the Ketchikan Creek flows into the Tongass Narrows. Open Water is the most prevalent land cover type (69%) followed by Evergreen Forest (18.6%) and mixed forest (5.6%). The Evergreen Forrest habitat type is found primarily in portions of the FERC Project Boundary that are on sides of mountains. The open water portions contain the Upper and Lower Ketchikan Lakes (Figure 4-3). Table 4-3 provides a breakdown of the various land cover classifications within the FERC Project Boundary.

Table 4-3. Land Cover within the Project Boundary

Land Cover Type	Area (Acres)	Percentage
Barren Land	2.283	0.27%
Deciduous Forest	4.254	0.50%
Developed, High Intensity	0.340	0.04%
Developed, Low Intensity	16.574	1.95%
Evergreen Forest	158.164	18.60%
Mixed Forest	47.303	5.57%
Open Water	586.917	69.02%
Shrub/Scrub	34.351	4.04%
Total	**850.187**	**100.00%**

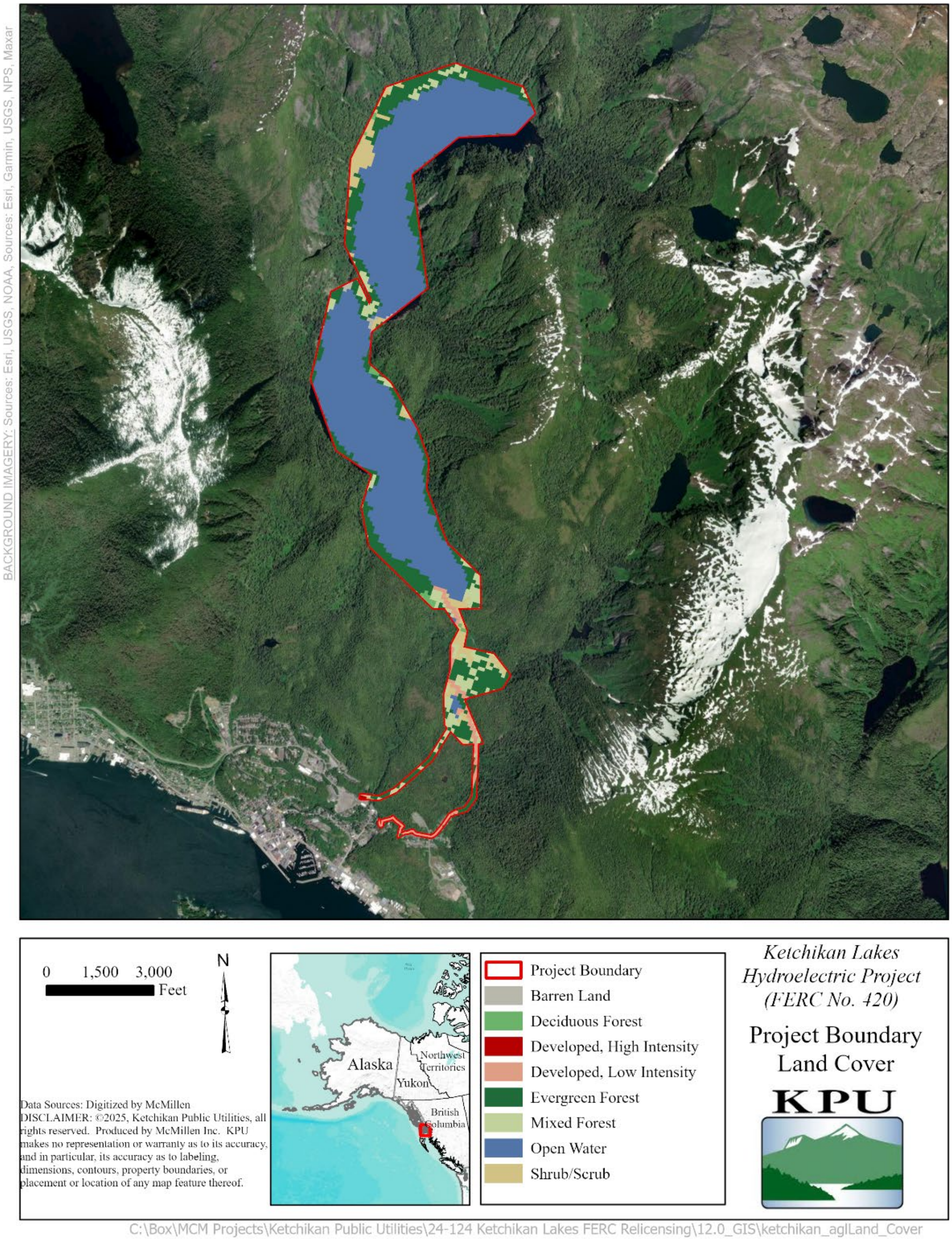

Figure 4-3. Land Cover within the FERC Project Boundary

4.1.3 Major Water Uses

KPU utilizes a majority of the water in the Ketchikan Creek basin for hydroelectric power production and municipal water supply. KPU's municipal water supply is the only consumptive use of water in the basin and ranges from 2.3 million gallons per day (MGD) (3.5 cfs) to 7.4 MGD (11.5 cfs). The Southern Southeast Regional Aquaculture Association (SSRAA) operates the Deer Mountain Fish Hatchery and the Ketchikan Creek Fishway downstream of the Project. Approximately 2.5 cfs is provided to the fish hatchery by the Project. All water uses associated with hydroelectric power production, fish hatchery operation, and fishway operation are non-consumptive and are eventually returned to Ketchikan Creek and empty to Tongass Narrows. A description of the Project's tailrace is included in Section 3.5.10 and a description of existing and proposed water uses and water rights is further discussed in Section 4.33 and 4.3.4.

4.1.4 Climate

Ketchikan's climate is classified as marine and is characterized by relatively narrow temperature ranges and relatively heavy precipitation amounts. Monthly mean total precipitation and air temperature from 1991 through 2020 at the weather monitoring station in Ketchikan (Ketchikan 10N) are provided in Table 4-4. The annual mean temperature in Ketchikan is 45.6 degrees Fahrenheit (°F). The lowest mean monthly temperature is 34.6 °F in January and the highest mean monthly temperature is 58.9 °F in August. Monthly mean total precipitation ranges from 5.5 inches in May to 13.12 inches in November according to the National Oceanic and Atmospheric and Administration (NOAA 2024).

Table 4-4. Monthly Mean Precipitation and Temperature at Ketchikan 10N from 1991 – 2020 (NOAA 2024)

Month	Total Precipitation Normal (inches)	Mean Max Temp Normal (°F)	Mean Min Temp Normal (°F)	Mean Avg Temp Normal (°F)
January	11.67	38.1	31	34.6
February	7.8	40.7	31.7	36.2
March	7.49	43.9	32.2	38.1
April	7.33	49.9	36.4	43.2
May	5.5	57.5	42.2	49.9
June	4.73	62.5	47.9	55.2
July	5.19	65.3	51.8	58.6
August	8.01	65.2	52.5	58.9
September	10.2	59	47.6	53.3
October	12.93	51.1	40.6	45.9
November	13.12	42.5	35.1	38.8
December	10.77	37.9	31.7	34.8
Annual	**104.74**	**51.1**	**40.1**	**45.6**

4.1.5 References

Dewitz, J., and U.S. Geological Survey. (2021). *National Land Cover Database (NLCD) 2019 Products* (ver. 2.0, June 2021).

National Oceanic Atmospheric Administration (NOAA). (2024). *NOAA Online Weather Data for Ketchikan 10N*. Available at: https://www.weather.gov/wrh/Climate?wfo=ajk. (Accessed August 29, 2024).

United States Army Corps of Engineers (USACE). (2024). *National Inventory of Dams*. Washington, DC. Federal Emergency Management Agency.

United States Geological Survey (USGS). (2023). *National Geospatial Program, 20231220, USGS National Hydrography Dataset Best Resolution (NHD) for Hydrological Unit (HU) 8 – 19010102*. (published 20231220) FileGDB: U.S. Geological Survey.

4.2 Geology and Soils (18 CFR § 5.6 (d)(3)(ii))

4.2.1 Topography

The topography of the Ketchikan Lakes area is dominated by rugged, mountainous terrain, with numerous lakes, wetlands and streams. This region is shaped by steep slopes, severe elevation changes, and deep valleys, which were primarily formed by glacial activity during the Pleistocene era (Hamilton et al. 1993). The higher elevations are characterized by forested ridges and alpine peaks, while the lower areas, particularly those surrounding the lakes and valleys, feature gentler slopes that support extensive wetland and riparian ecosystems (Brabets et. 2000). The area’s many lakes, including Ketchikan Lake, are typically found in glacially carved depressions (Figure 4-4).

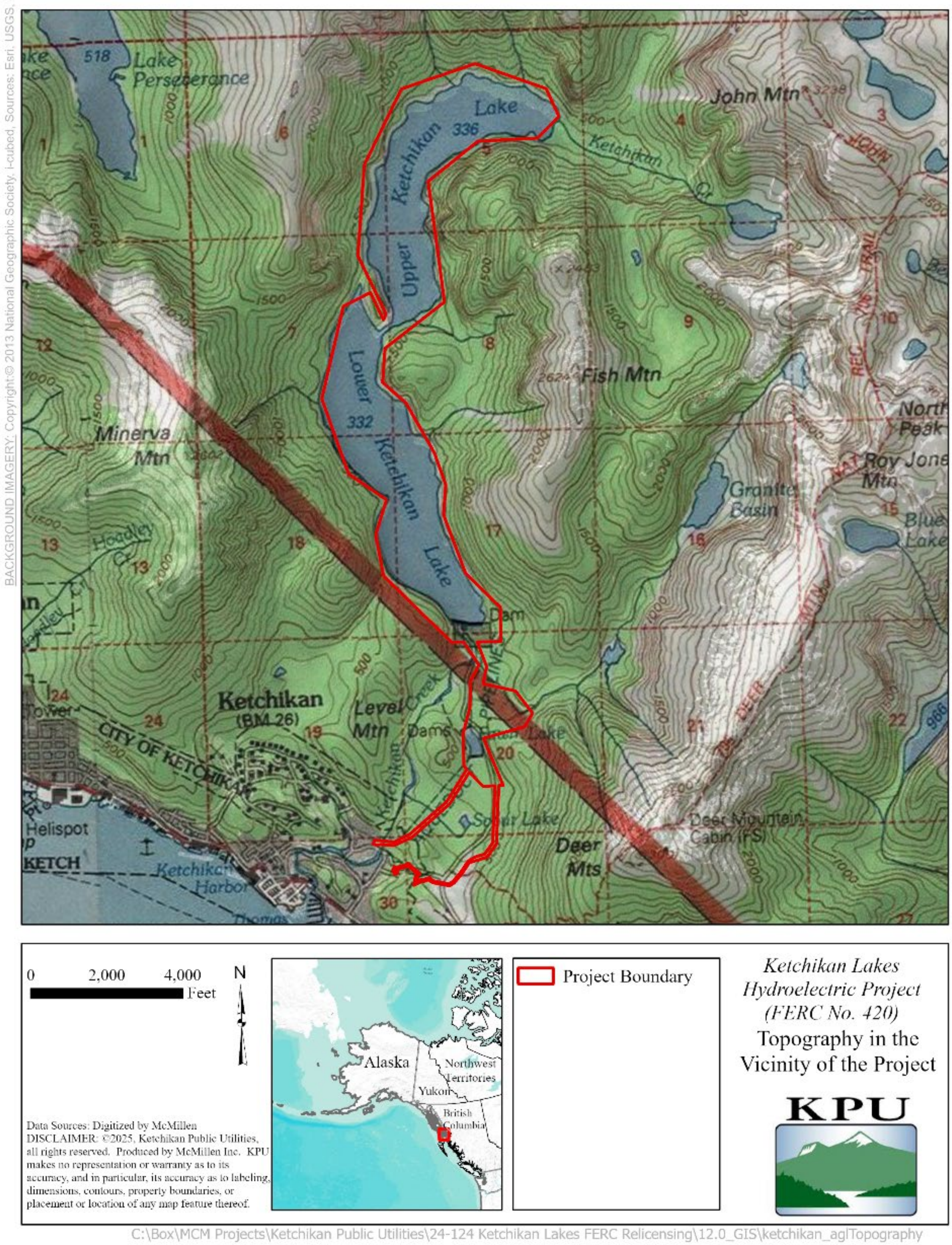

Figure 4-4. Topography in the Project Vicinity

4.2.2 Bedrock Geology

The bedrock lithology located at the Project facilities are primarily composed of granodiorite and metasedimentary rocks. The dominant rock type is schist, with subordinate intercalations of graphite-bearing phyllite (R&M Engineering 1995). The schist is typically greenish-gray to silver in color.

During the late Mesozoic to early Tertiary period, the region of the Project area was characterized by the intrusion of significant granitic and gabbroic crystalline rocks (KPU 1992). Structurally, these crystalline rocks are found in the form of dikes, sills, stocks, plutons, and large batholiths. The majority of these intrusions consist of rocks ranging from diorite to granodiorite. Additionally, during the Tertiary period, a later phase of lamprophyre dikes was emplaced, although their genetic relationship to the granitic rocks remains unclear (KPU 1992). A series of calc-alkaline dies are also present, with their genetic connection to the other intrusions yet to be determined.

Geologic processes within and surrounding the Project area are further controlled by the interaction and deformation of several local faults in the region. Southeastern Alaska lies within the tectonically active circum-pacific belt, which is one of the most seismically active regions of the United States (R&M Engineering 1995). The present seismicity of southeast Alaska and northwest British Columbia is controlled by the Pacific Plate abutting with the North American Plate.

No evidence of faulting during or since Pleistocene time has been found within the immediate Ketchikan area. Ketchikan was placed in Seismic Zone 2 by Lemke, 1975, where magnitudes of the largest expected earthquake are between 4.5 to 6.0 on the Richter scale. The three most significant earthquakes in Ketchikan (July 30, 1972; November 17, 1956; and August 22, 1949) had epicenters located along the Fairweather Queen Charlotte Islands offshore fault system. The August 1949 earthquake caused a 2-foot high seiche wave at Ward Lake, located 5 miles northwest of Ketchikan (R&M Engineering 1995).

4.2.3 Surficial Geology

The surficial geology of the Ketchikan Lakes area has been shaped by glacial activity during the Pleistocene, which has left a complex landscape of moraine deposits, outwash plains and glacially carved lakes and valleys. The region is part of the larger Coast Range, which was heavily glaciated during the last ice age. As glaciers advanced and retreated, they deposited a variety of sediment materials, including fine-grained silts, sands and gravels which form the outwash plains and valley fills found throughout the area (Brabets et al. 2000). Glacial moraines are common in the Ketchikan Lakes area marking the extent of ice sheets. The landscape is further influenced by the presence of proglacial lakes. Additionally, landslides and debris flows, initiated by the region's steep topography and heavy precipitation, have contributed to further modification of the surface geology (Figure 4-5).

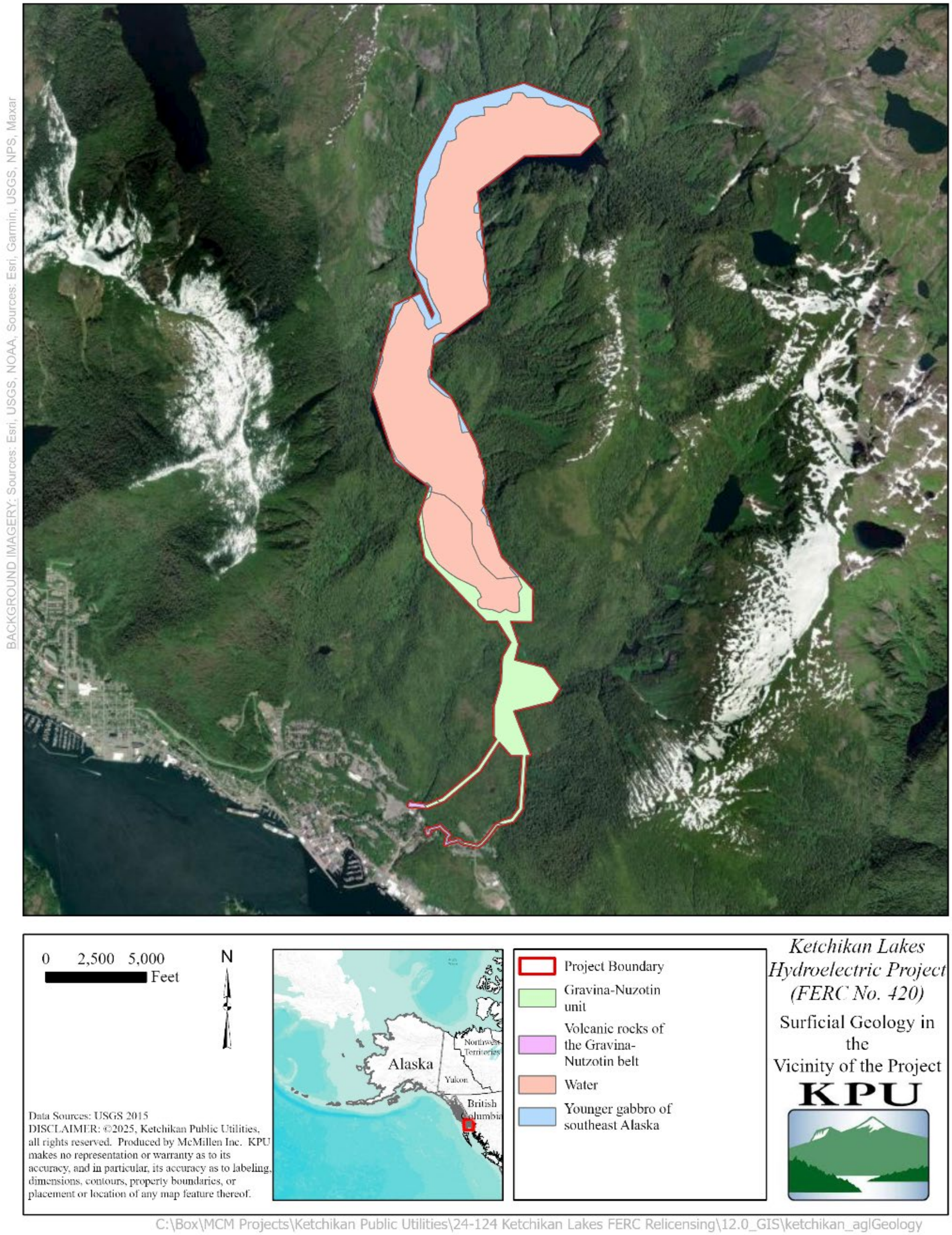

Figure 4-5. Surficial Geology in the Project Vicinity

4.2.4 Soils

Soils in the Project area are primarily characterized by their high organic content and variable texture. According to the Natural Resources Conservation Service (NRCS) soil survey, the dominant soil types are Spodosols and Histosols (USDA 2014). The presence of these soil types contributes to the area's characteristic wetland ecosystems. The soils in this region are generally well-drained in upland areas but may become more saturated and poorly drained in low-lying wetlands. A breakdown of soil types found within the Project Boundary is included in Table 4-5. An USDA NRCS Soil Survey Map and map and key are provided in Figure 4-6.

Table 4-5. Soils within the FERC Project Boundary

Description	Total (Acres)	Percentage
Alexander Archipelago - Gulf of Alaska Coast - Maritime Upland - Glaciated Hills and Plains	23.9	2.81%
Alexander Archipelago - Gulf of Alaska Coast - Maritime Upland - Rounded Mountains	27.7	3.26%
Kaikli mucky peat, 35-60 percent slope	30.6	3.60%
Rock outcrop	25.4	2.99%
Shakan-McGilvery association 60-150 percent slopes	20.7	2.44%
Tokeen gravelly sandy loam, 35-60 percent slope	57.4	6.74%
Tokeen gravelly sandy loam, 60-75 percent slope	33.0	3.89%
Tokeen gravelly sandy loam, 75-100 percent slope	32.5	3.82%
Tonowek and Tuxekan Soils, 0-15 percent slope	15.7	1.85%
Vixen-Traitors complex, 75-100 percent slope	4.5	0.53%
Water	578.9	68.06%
Total	**850.2**	**100.00%**

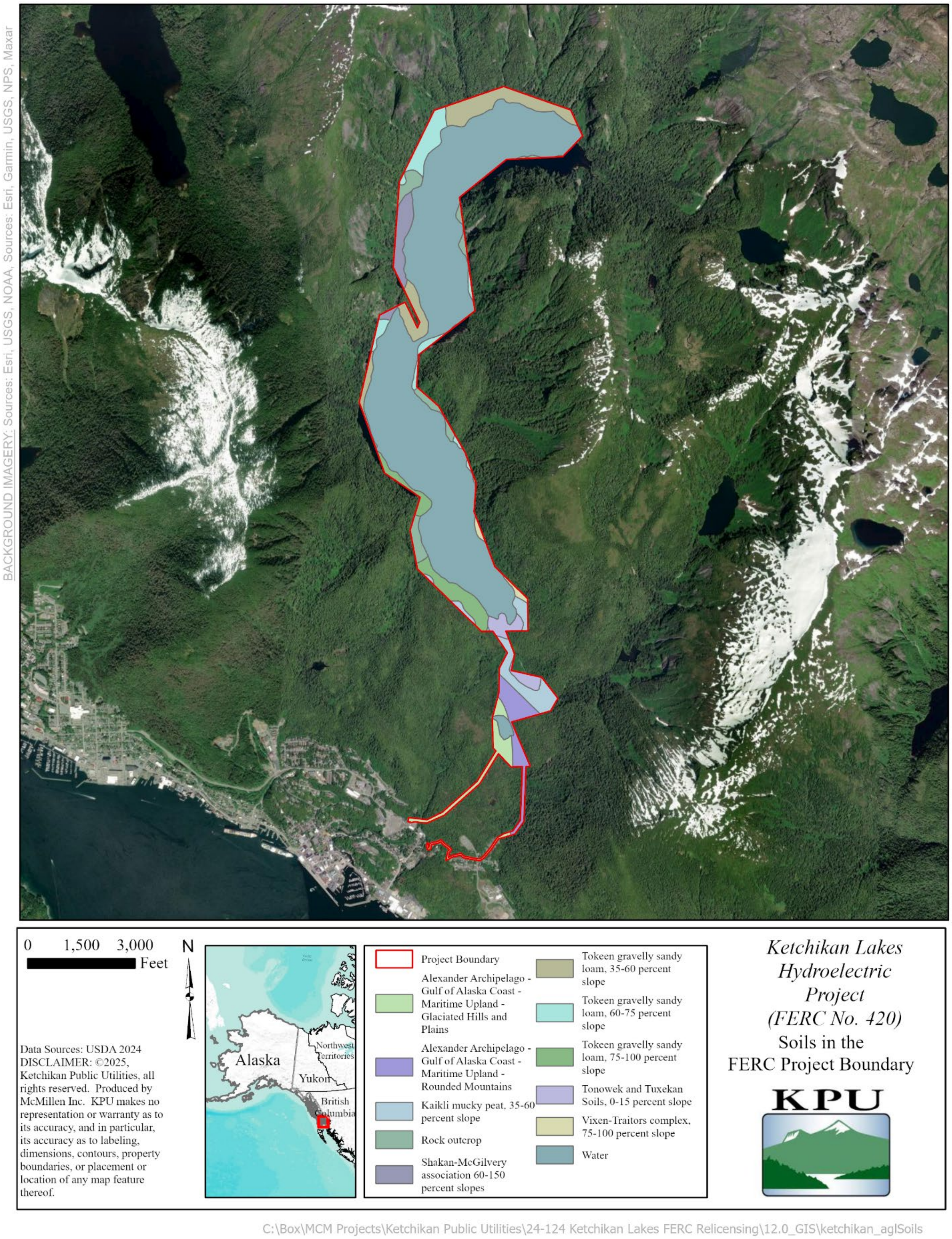

Figure 4-6. Soils within the FERC Project Boundary

4.2.4.1 Ketchikan Lakes

In the Ketchikan Lakes area, the predominant soil types include both Spodosols and Histosols. Spodosols, found in upland areas with coniferous forests, are acidic soils with a distinct spodic horizon, enriched in iron, aluminum, and organic matter, typical of areas with high rainfall. These soils are well-drained but can be shallow and nutrient poor. In contrast, Histosols are found in the wetter, lowland areas of the regions, particularly around the lakes and wetlands, where organic material accumulates in waterlogged conditions. These soils are saturated for much of the year and support wetland vegetation.

4.2.4.2 Granite Basin Creek

Similarly, the soils around Granite Basin Creek are also dominated by Spodosols and Histosols, although the local variation in topography and hydrology creates more distinct soil patterns. The region's soils are generally acidic and nutrient-poor, but their high organic content supports vegetation in dense forests and wetlands.

4.2.5 Reservoir Shoreline and Streambank Conditions

The shoreline along Ketchikan Lake and other smaller lakes are characterized by steep, rocky banks and scattered moraine deposits from past glaciations (Hamilton 1993). In these areas, the lack of extensive flat land and the presence of unstable glacial deposits contribute to natural erosion, particularly in locations where vegetation is sparse. The streambanks along the area's numerous rivers and creeks, which feed into lakes, exhibit conditions ranging from stable, vegetated banks with thick riparian zones to more vulnerable areas with sedimentary deposits are prone to erosion (Brabets et al. 2000). These riparian areas, where present, help mitigate erosion, however the heavy rainfall typical of the region (averaging up to 160 inches annually) leads to high runoff and occasional bank instability particularly during spring melt or after heavy storms. The reservoir shorelines are exposed during periods of increased drawdown.

4.2.6 References

Brabets, T.P., Sand, R.S., Walvoord, M. A. (2000). *Geology and Hydrology of the Ketchikan and Wrangell Areas, Southeastern Alaska*. U.S. Geological Survey Professional Paper 1632.

Hamilton, T.D., Weddle, T.K., & Kaufman, D.S. (1993). *The Glacial and Geologic History of the Ketchikan area, Southeastern Alaska.* Alaska Division of Geological & Geophysical Surveys Bulletin 206.

R&M Engineering – Ketchikan, Inc. (1995). *Ketchikan Lakes and Silvis Lakes, Rockslide Potential and Slope Stability Geotechnical Review.* November 1995.

United States Department of Agriculture (USDA). (2014). *Custom Soil Resource Report for Ketchikan Area, Alaska.* Natural Resources Conservation Service. October 2014.

United States Department of Agriculture, Natural Resources Conservation Service. (n.d.). *Web soil survey*. U.S. Department of Agriculture. Retrieved January 2025, from https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

U.S. Geological Survey. (2015). *Geologic map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340.* U.S. Department of the Interior. https://pubs.usgs.gov/publication/sim3340

4.3 Water Resources (18 CFR § 5.6 (d)(3)(iii))

4.3.1 Drainage Area

Inflow to the Project comes from both Ketchikan Lake (Hydrologic Unit Code (HUC) 19010102040201) and Granite Basin Creek (HUC 19010102040202) (shown in Figure 4-1 in Section 4.1.1). The drainage area at Ketchikan Lake Dam is approximately 8.3 square miles and the drainage area at the Granite Basin Creek outlet at Ketchikan Creek is approximately 2.9 square miles (USGS 2023). The Granite Basin Creek Diversion is located approximately 2,200 feet upstream of Granite Basin Creek's outlet at Ketchikan Creek. Thus, the drainage area of Granite Basin Creek at the diversion to Fawn Lake is approximately 2.3 square miles (Jacobs 2022) and the total contributing drainage area to the Project is approximately 10.6 square miles. There is a small area that drains directly to Fawn Lake, however the water contribution from this area is likely negligible.

The drainage area of Ketchikan Creek where it enters Tongass Narrows is approximately 14.1 square miles (USGS 2023), indicating the contributing drainage area of Ketchikan Creek not diverted through the Project is approximately 3.5 square miles, which includes the portion of Granite Basin Creek downstream of the diversion to Fawn Lake and the portion of Ketchikan Creek downstream of Ketchikan Dam.

4.3.2 Stream Flow, Gage Data, and Flow Statistics

4.3.2.1 Inflows and Powerplant Flows

The topography of Ketchikan Lakes is such that many small streams flow into the lake as opposed to a primary channel. Therefore, a stream gaging record does not exist to quantify inflows to Ketchikan Lakes. In addition, historical stream gaging data is not available within the Granite Creek basin. However, as a part of KPU's previous relicensing studies, the USFS estimated monthly inflows for the Ketchikan Lakes and Granite Creek watersheds. Table 4-6 provides a summary of these estimated inflow data in comparison to power plant flows for the Project from 2014-2024. The period of lowest mean inflows occurs in March (52 cfs), while maximum mean inflows happen in October (276 cfs). The range of monthly power plant flows is less variable with minimum and maximum monthly mean plant flows in July (112 cfs) and November (174 cfs), respectively. Over the recent 11-year record (2014-2024), minimum monthly plants flows have dropped to 52 cfs in August, while maximum monthly plant flows have reached 242 cfs in February. A monthly flow duration curve of the 2014-2024 generation data vs. estimated inflow data is provided in Figure 4-7.

Table 4-6. Monthly Mean River Flow Estimates and KPU Power Plant Data from 2014-2024 (KPU 1998)

Month	Mean Ketchikan Lakes Inflow Estimate (cfs)	Mean Granite Creek Inflow Estimate (cfs)	Total Mean Inflow Estimate (cfs)	Mean Power Plant Flows (cfs)	Minimum / Maximum Power Plant Flows (cfs)
January	69.6	16.35	86	160	88 / 221
February	55.8	17.99	74	166	106 / 242

Month	Mean Ketchikan Lakes Inflow Estimate (cfs)	Mean Granite Creek Inflow Estimate (cfs)	Total Mean Inflow Estimate (cfs)	Mean Power Plant Flows (cfs)	Minimum / Maximum Power Plant Flows (cfs)
March	38.9	12.85	52	136	59 / 217
April	57.3	18.63	76	134	80 /188
May	127.9	62.02	190	140	79 /194
June	166.2	75.35	242	148	87 /228
July	119.7	58.79	179	112	63 / 175
August	116.6	49.79	166	131	52 / 202
September	138.8	55.03	194	132	53 / 196
October	201.6	74.22	276	152	53 / 225
November	131.8	47.77	180	174	80 / 229
December	77.0	22.83	100	162	73 / 208
Annual	**119.4**	**45.12**	**165**	**146**	**52 / 242**

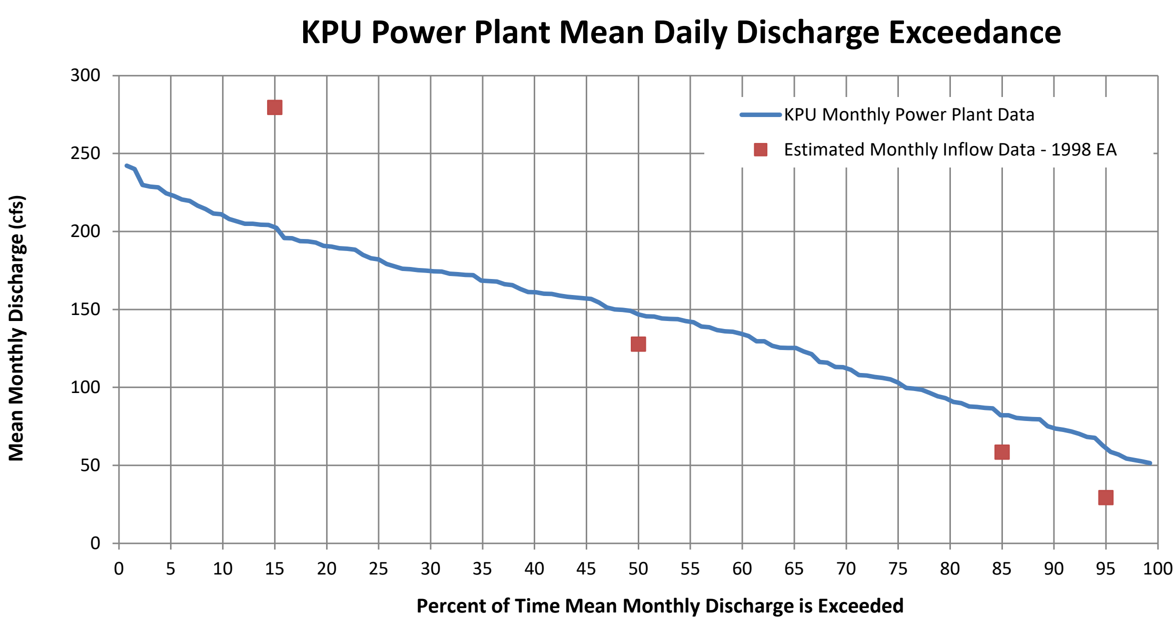

Figure 4-7. Ketchikan Lakes Estimated Inflow and Power Plant Mean Monthly Discharge Exceedances (2014-2024)

4.3.2.2 Bypass Reach Flows

Flows into the bypass reach are influenced from four sources: 1) Ketchikan Lakes dam seepage; 2) spill events; 3) Granite Creek (diversion dam seepage or non-diversion periods); and 4) Scout Creek, an undeveloped watershed. Scout Creek and seepage from the dams at Ketchikan Lakes and Granite Creek serve as the primary source of baseflows to the bypass reach, with spill and non-diversion periods occurring intermittently. Therefore, FERC Article 403 of the current operating license required KPU to "…*conduct flow monitoring for five years just upstream of the tailrace to measure seasonal variability of the flows in the bypassed reach of Ketchikan Creek*." A summary of the 2005-2009 discharge monitoring results is provided in Table 4-7. The 5-year record shows that mean monthly bypass flows range from 11 cfs in May up to 50 cfs in November with a mean annual discharge of 27 cfs. Monthly minimum bypass flows were 0.5 cfs in May 2005, while maximum monthly bypass flows peaked at 162 cfs in November of 2005.

Table 4-7. Monthly Mean Bypass Flows for the Ketchikan Creek Bypass Reach 2005-2009.

Month	Mean Ketchikan Creek Bypass Flows (cfs)	Minimum / Maximum Ketchikan Creek Bypass Flows (cfs)
January	26	13 / 41
February	19	9.1 / 39
March	18	3.6 / 36
April	28	10 / 21
May	11	0.5 / 27
June	13	1.1 / 41
July	40	5.7 / 121
August	34	3.7 / 121
September	34	18 / 61
October	36	21 / 62
November	50	14 / 162
December	26	6.2 / 45
Annual	**27**	**0.5 / 162**

4.3.2.3 Dam Seepage Flows

FERC Article 402 of the current operating license required KPU to "…*to monitor the seepage that occurs from the Ketchikan Lakes dam and the Granite Creek diversion…lf future repairs would reduce seepage, the licensee shall maintain through some other means an amount of flow equal to the amount of the seepage flows measured during the first 2 years of seepage monitoring.*" Seepage monitoring occurred from July 30, 2003 – December 31, 2006 to meet the FERC licensing condition (KPU, 2007). A summary of the 2003

– 2006 seepage monitoring results is provided in Table 4-8. The 3+ year record shows that mean annual seepage flows are 0.38 cfs and 0.069 cfs downstream of the Ketchikan Lakes dam and Granite Creek diversion structure.

Table 4-8. Summary of Measured Seepage/Leakage (KPU 2007)

Monitoring Period	Ketchikan Lakes Reservoir	Granite Basin Diversion
7/30/2003 to 7/31/2005	0.44 cfs	0.073 cfs
8/1/2005 to 12/31/2006	0.31 cfs	0.061 cfs
Average Discharge for the two monitoring periods 7/30/2003 to 12/31/2006	0.38 cfs	0.069 cfs

4.3.3 Existing and Proposed Water Uses

The majority of the water diverted through the Project is used for hydroelectric power production, however it is also used for municipal water supply. As described in Section 3.0, water is conveyed from Fawn Lake via a dual-purpose raw water and power tunnel to its end point 360 feet east of the Project powerhouse on the east bank of Ketchikan Creek which is terminated by a concrete plug. The plug is penetrated by three penstocks running to the powerhouse and two municipal water lines which run to the chlorination building. Water that is used for hydropower generation at the powerhouse is not also used for municipal water supply and vice versa. After the termination of the shared raw water/power tunnel, the hydropower and municipal water supply systems are separate.

Water that is discharged from the powerhouse is used to maintain minimum flow requirements downstream of the Project tailrace for the protection of fish resources. A minimum flow of 47 cfs is maintained downstream of the Project except in the event of a plant power trip or for the purpose of protecting water supply, when the minimum flow may be reduced to 30 cfs. The minimum flow includes flows diverted to the City Park and Deer Mountain Fish Hatchery across the street from the powerhouse in addition to the flow returned directly to Ketchikan Creek.

4.3.4 Existing Water Rights and Withdrawals

The first record of water right certificates and deeds are documented within Exhibit E of the 1927 FERC License Application and summarized in Table 4-9 (KPU, 2025). Under the assumption that the 1905 claim was updated in 1908 to allow for dam construction and the 1920 claim on "Deer Creek" (currently known as Scout Creek) has been abandoned, the Ketchikan Lakes Project has an historical claim of 275 cfs/day for public water supply and power production. Currently, the hydroelectric infrastructure of the Project has a maximum hydraulic capacity of 280 cfs while the municipal water supply diverts water volumes ranging from 2.3 million gallons per day (MGD) (3.5 cfs) to 7.4 MGD (11.5 cfs). KPU holds Water Right ADL

48794 for 81,395,500 gallons per day for "electric power generation" (126 cfs) and 6,725,100 gallons per day (10.4 cfs) for "public water supply" (ADNR 2024a). The water right certificate describes Ketchikan Lakes, the rockfill dam and water intake structures as the only water source. Currently, KPU does not have an approved water right on Granite Creek, despite the diversion of these waters for beneficial use prior to 1939. Based on the need to add Granite Creek as a Project water source as well as the water volume discrepancy between ADL 48794 (~136 cfs) and recent (2014-2024) Project diversions up to 297 cfs/day, ADL 48794 should be updated and amended.

There are no other water rights or withdrawals on Ketchikan Creek or Granite Basin Creek upstream of the Project. Downstream of the Project, the SSRAA holds Water Right ADL 43930 for 1,615,790 gallons per day (2.5 cfs) for the Deer Mountain Fish Hatchery and Water Right ADL 43932 for 5.0 cfs for the Ketchikan Creek Fishway (ADNR 2024b and ADNR 2024c). Continued operation and maintenance of the Project under a new license will not impact SSRAA's downstream water rights.

Table 4-9. Water Right Claims from Exhibit E of the 1927 FERC License Application for Citizens Light, Power and Water Company (KPU 2025)

Date	Claimant	Description	Volume (cfs)
4/14/1903	John W. Stedman	"water right location on Ketchikan Creek…, claiming 3,000 miners inches^ of water, with necessary rights of way privileges for furnishing and maintaining a supply of water to the citizens of Ketchikan."	78
10/9/1905	J.C. Barber	"water right location on Ketchikan Creek…, claiming 6,000 miners inches^ for the use of Citizens Light, Power and Water Company to be used by said Citizens Light, Power and Water Company for industrial, power, domestic and other purposes."	156
5/16/1908	J.C. Barber	"water right location at the head of Ketchikan Creek and outlet of Ketchikan Lake…, claiming 6,000 miners inches^ for the use of Citizens Light, Power and Water Company to be used for industrial, power, domestic and other purposes; also claiming the right for said company to construct a dam at the mouth of Ketchikan Lake for the purpose of storing the waters of said lake and regulating and controlling their flow."	156*
7/24/1912	Citizens Light, Power and Water Company	"water right location on branch of Ketchikan Creek, now known as Granite Basin Creek, claiming the right to use water to the amount of 2,000 cu. ft. per minute and such excess that the stream may produce, with the necessary right of way for the construction and operation of a pipe line conveying	33

		the water from said location to the power house of Citizens Light, Power and Water Company, and to use said water for power and other purposes."	
6/11/1920	Citizens Light, Power and Water Company	"water right location and dam site location, by Citizens Light, Power and Water Company , covering 500 cu. ft. per minute and such excess as may be available at the outlet of Fawn Lake – about two thirds of a mile northeast of the power house of Citizens Light, Power and Water Company of Ketchikan – for the purposes of using said water in connection with its power lines and pipe lines serving the city of Ketchikan and adjacent territory. Claiming also a right of way for necessary pipe to convey said water."	8.3
6/11/1920	Citizens Light, Power and Water Company	"water right location and dam site location, of Citizens Light, Power and Water Company claiming 500 cu. ft. per minute and such excess amount as may exist in a small stream, known as Beaver Lake stream, designated herein as Deer Creek, located about one half mile northeast of the power house of Citizens Light, Power and Water Company, together with a right of way for the construction of pipe lines necessary to convey said water."	8.3**
Total			**275**

^1 cfs = 38.4 miners inches

**assumed to be an amended claim to include the construction of a dam*

***diversions and development within this subbasin (now called Scout Creek) never occurred*

4.3.5 Reservoir Characteristics

A bathymetric survey of Ketchikan Lakes was conducted in 2019 (DOWL 2019); however, much of the lower and upper lakes were deeper than 250 feet, which exceeded what the bathymetric survey equipment of the time could collect. Thus, there is no readily available information about the gross storage volume of the lakes. Characteristics of Ketchikan Lakes are summarized in Table 3-2.

Full descriptions of Ketchikan Lakes and Fawn Lake are included in Section 3.5.1 and Section 3.5.6. The Granite Basin Creek Diversion structure does not create an appreciable reservoir and serves only to divert water from Granite Basin Creek to Fawn Lake.

A bathymetric survey of Ketchikan Lakes was conducted in 2019 (DOWL 2019), however much of the lower and upper lakes were deeper than 250 feet, which exceeded what the bathymetric survey equipment could collect. Thus, there is no readily available information about the gross storage volume, maximum depth, mean depth, or flushing rate. The substrate composition of Ketchikan Lakes is discussed in Section 4.2.

4.3.6 Downstream Gradient

The Ketchikan Creek bypass reach has a 252-foot decrease in elevation over 1.34 miles for an average gradient of 3.6%. However, an anadromous fish barrier restricts access for migrating salmon to the lower 0.24 miles of Ketchikan Creek bypass reach. The Project tailrace discharges to Ketchikan Creek approximately 0.75 RM upstream the confluence with Tongass Narrows. The Project has a tailwater elevation of approximately 72.5 feet, indicating an average channel gradient of 1.8 %. The Ketchikan Creek Fishway is located approximately 0.5 RM downstream of the Project tailrace discharge and serves to assist salmon migrate upstream past a series of falls/cascades in lower Ketchikan Creek. The aquatic habitat characteristics of Ketchikan Creek downstream of the Project are further discussed in Section 4.4.2.3.

4.3.7 Water Quality

The following sections discuss water quality standards and classifications applicable to waterbodies in the vicinity of the Project. Results from relevant water quality investigations that pertain to the waterbodies associated with the Project area are also discussed.

4.3.7.1 Federal Clean Water Act

In 1972, the Federal Water Pollution Control Act Amendments established the CWA as the foundation of modern surface water quality protection in the United States. Sections 303 and 305 of the Act guide the national program on water quality. Sections 303(a) through 303(c) discuss the process by which all states are to adopt and periodically review water quality standards. Section 305(b) directs states to periodically prepare a report that assesses the quality of waters of the state. Section 401 of the CWA states that a federal agency may not issue a permit or license to conduct any activity that may result in any discharge to water of the United States unless a Section 401 Water Quality Certification (WQC) is issued, or certification is waived. States and authorized Tribes where the discharge would originate are generally responsible for issuing water quality certifications.

4.3.7.2 State Water Quality Standards

Alaska’s water quality standards are established under Administrative Code 18 AAC 70, amended as of April 26, 2024, and overseen by the Alaska Department of Environmental Conservation (ADEC 2024). The standards established by ADEC must be approved by the U.S. Environmental Protection Agency (EPA) to comply with regulations under the federal CWA. Based on ADEC regulations, water quality within all freshwater bodies in the state are protected by water quality criteria for the following fresh water designated water use classes and subclasses:

- Water supply (drinking water, agricultural, aquaculture, industrial)
- Water recreation (contact and secondary recreation)
- Growth and propagation of fish, shellfish, other aquatic life, and wildlife

Alaska Water Quality Standards identify acceptable levels for designated use for categories of pollutants, including pH, temperature, turbidity, fecal coliform bacteria, dissolved oxygen (DO), nutrients, sediment, metals, and toxic substances. Water quality criteria for designated water use classes are provided in two documents: (1) 18 AAC 70 Water Quality Standards, amended as of April 26, 2024 (ADEC 2024) and (2)

Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (ADEC 2022). Neither Ketchikan Creek, Granite Basin Creek, nor Ketchikan Lakes are listed as impaired on the State of Alaska's Section 303(d) of the CWA lists.

4.3.7.3 Existing Water Quality Data

Ketchikan Public Utilities Water Quality Studies (1989 – 1995)

Historical water quality data have been summarized in a pilot study by KPU (1990) and their DRAFT EA (1998) based on water samples collected from 1989-1995 (KPU, 1996). Data from this period shows that Ketchikan Lakes has low hardness (3.1-42.7 milligrams per liter (mg/L) CaCO3) and conductivity (16-25 umhos/cm). Based on 15 sapling events per year from 1993-1994, and three seasons of sampling in 1990, mean pH values were slightly acidic at 6.0 and 6.29 respectively, but within the EPA criteria for a freshwater drinking source. Maximum daily turbidity values from both studies ranged from 0.59 nephelometric turbidity units (NTU) to 1.30 NTU with total and fecal coliform samples (n=14) meeting EPA's surface water limit of < 100 total coliforms/100 milliliters (ml) during the 1993-1995 study period.

Nutrient sampling between 1990-1994 indicate low concentrations of nitrate (<0.03 - <0.5 mg/L) , nitrite (<0.1 mg/L), and total phosphorus (<0.03 to 0.38 mg/L). Similarly, metals from both studies were sampled during the same 1990-1994 period and were typically below detection limits or well within EPA criteria. The exception to this trend was copper and zinc which the EA described as having "…the potential to pose limitations to sensitive salmonids…" (KPU, 1998). However, the data tables do not specify if the copper and zinc samples were total or dissolved fractions. Therefore, the exceedance of copper and zinc criteria from these data are not conclusive. Table 4-10 provides a summary of water quality results from these sampling efforts.

Table 4-10. Water Quality Results from KPU Municipal Water Supply Sampling (KPU 1998)

Results from Water Quality Sampling, Ketchikan Municipal Water Supply

		18 AAC70	02/20/90	6/08/90 a*	6/08/90 b*	6/08/90 c*	6/29/90 a	6/29/90 b	6/29/90 c	02-05-91	4/08/91 **	05/01/91	1/25/93 *	04-28-93	12-22-93
Aluminum	ug/l		94												
Antimony	ug/l														
Arsenic	ug/l	50(D);100(I)	<2							<1		<1	1		
Barium	ug/l	1000(D)	3							<1		<2	3		
Beryllium	ug/l	11(A);100(I)													
Cadmium	ug/l	10(D);0.4(S)	<2							<0.1		<0.1	<0.1		
Chromium	ug/l	50(D);100(A)	<3							<1		<1	<1		
Copper	ug/l	1000(D);1.8(S)		753	1410	198	1760	272	1150						
Fluoride	mg/l		0.06							<0.5		<0.5	<0.4		
Iron	ug/l	300(D);1000(A)		88	36	36	89	45	48					<100	
Lead	ug/l	50(D);52(S)	<2	<25	<25	<25	<25	<25	<25	<1	33.3	<1	2		
Mercury	ug/l	2(D);0.5(A)	<0.2							0.6		<0.6	<0.2		
Nickel	ug/l														
Nitrate-N	mg/l	10(D)	<0.03							<0.5		<0.5	<0.1		
Nitrite	mg/l												<0.1		
Total Phosphorus-P	mg/l			<0.03	<0.03	0.38	<0.03	<0.03	<0.03					0.14	
Selenium	ug/l	10(D)	<2							<2		<2	<2		
Silver	ug/l	50(D)	<7							<0.2		<0.2	<0.2		
Thallium	ug/l														
Zinc	ug/l	5000(D);9(S)		48	594	31	53	14	39						
Hardness	mg/l			27.6	42.7	36.9	10.3	5.7	12.3					12	
Calcium	mg/l			0.798	0.924	0.858	0.863	0.902	0.923					3.2	
Magnesium	mg/l													0.97	
Silica as SiO_2	mg/l													0.648	
Alkalinity as $CaCO_3$	mg/l	>20												6	
Chloride	mg/l	250(D)												5.2	
Nitrates	mg/l											0.5		0	<0.1
Sulfate	mg/l	250(D)												1	
Total Cyanide	mg/l	0.005													
pH	S.U.	6-8.5(Ai)												4.91***	
		6.5-8.5 (Aiii and Bi)													
Conductivity	umhos/cm													25	

EPA Quality Criteria for Water 1976

D - Domestic *Treated Water A - Aquatic Organisms ***Sampling Error Suspected

I - Irrigation **Bailey Powerhouse S - Salmonids

Ketchikan Creeks Stormwater Quality Assessments-ADEC Data (2013 – 2014, 2018, 2023 – 2024)

As a part of a stormwater monitoring program, ADEC has overseen three distinct water quality sampling efforts since 2013 (ARRI, 2014 and ADEC, 2018 and ADEC, 2024). The primary goal was to assess potential impacts to the water quality of Ketchikan Creek from stormwater runoff and compare the results to ADEC criteria. The Ketchikan Creek stormwater monitoring program established 4 sampling stations shown below in Figure 4-8: 1) an upstream reference station not impacted by urban runoff (KC-01); 2) a middle sampling point downstream of the Project tailrace and upstream of a stormwater outfall pipe (KC-02); 3) a stormwater drainpipe from a residential area (KC-OUT); and 4) a lower sampling station downstream of KC-OUT (KC-04). Given that the Project affected waters are on the upstream edge of urban impacts, only data from sites KC-01 and KC-02 are being summarized (Table 4-11).

In general, the results from these sampling efforts are similar to the KPU studies described above. Hardness (3.1-28 mg/L $CaCO_3$) and conductivity (11-92.7 umhos/cm) values are low at both stations, with the reference station (KC-01) having slightly elevated values in comparison to KC-02 (downstream of the tailrace). Mean pH values at both stations were close to neutral at 6.8, with one KC-02 pH measurement (6.28) in June of 2023 below the ADEC criteria of 6.5. DO data in 2023 hovered near 100% saturation at both KC-01 and KC-02, easily meeting ADEC criteria with DO concentrations ranging from 10.1 to 12.5 mg/L. Maximum water temperatures never exceeded the 20°C criteria at either station, but the secondary criteria of 13°C and 15°C were exceeded for parts of the summer and early fall. Indicators of water clarity are excellent at both sites with turbidity values ranging from 0.2 NTU to 2.3 NTU and settleable solids below detection limits (<0.1 - < 0.2 mg/L).

Nutrient sampling from 2013-2023 continued to indicate low concentrations. Concentrations of nitrogen-based compounds ranged from 0.054 - 0.2 mg/L for total nitrate+nitrite and <0.005 to 0.111 mg/L for ammonia. Dissolved phosphorus ranged from <0.001 to 0.0037 mg/L, with total phosphorus and orthophosphate below detection limits. Metals sampled during the 2013-2023 period were typically below detection limits (Cadmium, Chromium) or well within ADEC criteria (Lead, Zinc). The exception to this trend was copper, in which one sample at KC-02 had a concentration of 3.34 ug/L in May of 2013. All other copper samples at KC-02 (n= 11) were well within ADEC criteria, ranging from 0.16 - 0.90 ug/L and a mean dissolved copper concentration of 0.35 ug/L.

Figure 4-8. Map of ADEC's Water Quality Monitoring Stations for the Ketchikan Creek Stormwater Monitoring Program

Table 4-11. 2013-2023 ADEC Water Quality Monitoring Results

Analyte	Units	KC-01 Range (Average)	No. of Samples	KC-02 Range (Average)	No. of Samples	ADEC Criteria
Alkalinity, Total	mg/L	<1 - 22 (12)	7	2 - 7 (3.9)	10	> 20 *(except if natural levels are less)*
Ammonia, Total	mg/L	<0.005 - 0.052 (0.030)	10	<0.02 - 0.111 (0.057)	11	**Acute: 0.885 - 32 **Chronic: 0.486 - 6.67
Cadmium, Dissolved	ug/L	<0.05 (MDL)	7	<0.05 (MDL)	9	*Acute KC01: 0.2 - 0.5 *Chronic KC01: 0.114 - 0.314 *Acute KC02: 0.05 - 0.14 *Chronic KC02: 0.038 - 0.100
Calcium, Dissolved	mg/L	3.1 - 7.1 (5.2)	7	0.86 - 2.7 (1.36)	8	
Chromium, Dissolved	ug/L	<0.1 - < 0.2 (MDL)	7	<0.1 - < 0.2 (MDL)	9	*Acute KC01: 4.7 - 6.2 *Chronic KC01: 7.8 - 16.9 *Acute KC02: 3.5 - 4.5 *Chronic KC02: 3.6 - 7.1
Copper, Dissolved	ug/L	0.45 - 1.16 (0.76)	9	<0.2 - 3.34 (0.65)	12	*Acute KC01: 1.6 - 4.4 *Chronic KC01: 1.5 - 3.8 *Acute KC02: 0.6 - 1.4 *Chronic KC02: 0.6 - 1.4
Dissolved oxygen (DO)	% sat.	100.1 - 101.2 (100.6)	4^	99.6 - 102 (100.9)	4^	
Dissolved oxygen (DO)	mg/L	10.54 - 12.5 (11.55)	5^	10.11 - 12.19 (11.29)	5^	7 - 17
Flow	cfs	0.79 - 25.37 (11.6)	3	65.03 - 190.66 (121.3)	3	
Hardness, Ca, Mg	mg/L	9.3 - 28 (16.2)	10	3.1 - 8.1 (4.6)	11	
Lead, Dissolved	ug/L	<0.05 - 0.107 (0.085)	10	<0.05 - 0.12 (MDL)	12	*Acute KC01: 3.0 - 10.3 *Chronic KC01: 0.028 - 0.182 *Acute KC02: 0.6 - 2.5 *Chronic KC02: 0.003 - 0.021
Magnesium, Dissolved	mg/L	0.37 - 0.66 (0.50)	7	0.21 - 0.29 (0.25)	8	
Nitrate + Nitrite, Total	mg/L	0.068 - 0.2 (0.115)	6	0.054 - 0.091 (0.073)	6	10
Organic carbon, Dissolved	mg/L	1.1 - 6.2 (2.86)	9	0.97 - 2.9 (1.53)	10	
Orthophosphate, Dissolved	mg/L	<0.001 - 0.004 (MDL)	3	<0.001 - <0.005 (MDL)	3	
Orthophosphate, Total	mg/L	<0.005 (MDL)	2	<0.005 (MDL)	3	
pH	--	6.58 - 7.09 (6.88)	5^	6.28 - 7.5 (6.82)	5^	6.5 - 8.5
Phosphorus, Dissolved	mg/L	<0.001 - 0.0034 (0.003)	4	<0.001 - 0.0037 (0.003)	8	
Phosphorus, Total	mg/L	<0.005 (MDL)	4	<0.005 - 0.006 (MDL)	8	
Settleable solids	mL/L	<0.1 - <0.2 (MDL)	10	<0.1 - <0.2 (MDL)	11	
Sodium, Dissolved	mg/L	1.41 - 2.11 (1.73)	5	0.81 - 0.99 (0.87)	5	
Specific conductance	uS/cm	18 - 92.7 (47.8)	12	11 - 29.9 (18.8)	12	
Temperature, water	deg C	5.9 - 15.1 (10.3)	10	6.7 - 18.1 (10.6)	12	Daily Maximum 20 °C Daily Max. 13 °C *(spawning/incubation)* Daily Max. 15 °C *(migration/rearing)*
Turbidity	NTU	0.2025 - 2.26 (1.11)	11	0.295 - 1.9 (1.07)	11	
Zinc, Dissolved	ug/L	0.74 - 4.34 (1.91)	10	<0.5 - 8.51 (1.86)	12	*Acute KC01: 13.2 - 32.9 *Chronic KC01: 13.5 - 33.9 *Acute KC02: 5.3 - 11.8 *Chronic KC02: 5.4 - 12.0

MDL = less than method detection limit

***Ammonia criteria in freshwater based on pH and temperature-dependent calculations*

**Dissolved metal criteria in freshwater based on hardness-dependent calculations*

^ Only data from 2023 dataset provided

Ketchikan Creek Watershed Water Temperature Study (Article 404) (2002)

Historical water temperature data are available from a detailed water temperature study conducted in support of Article 404 following the issuance of a new license on August 29, 2000 (KPU, 2006). Table 4-12 provides a summary of the monitoring stations assessed during the study program. Results indicate that Ketchikan Lakes at the west intake (T14b) is the warmest monitoring station of Project conveyed waters within the study area, reaching a maximum hourly temperature of 18.2°C in August of 2002, well below the ADEC criteria of 20°C. However, T14b intermittently exceeds the supplemental criteria of 13°C during the months of June-September, and 15°C in July-August. For the entire study period, T14b had a mean temperature value of 12.9°C (KPU, 2006). Figure 4-9 provides a summary of maximum hourly water temperatures at all the Ketchikan Lakes study sites, indicating that the intake stations have lower maximum monthly temperatures than at the surface. Overall, temperatures decrease as water is conveyed downstream through the Project, primarily due to the cooling effect of two tributaries, Granite Creek and Scout Creek. Figure 4-9 provides a summary of the maximum hourly temperatures by month for relevant lake and creek study stations in an upstream progression, while Figure 4-10 provides a time series of hourly temperature data at the west intake (T14b) and tailrace (T2).

Table 4-12. Water Temperature Monitoring Location Details in the Ketchikan Lakes Watershed for License Article 404 (KPU, 2006)

Logger	Waterbody	Location
T1	Ketchikan Creek	Below powerhouse tailrace in Ketchikan Creek (T2+T3 flows)
T2	KPU powerhouse	In powerhouse tailrace
T3	Ketchikan Creek	Above powerhouse tailrace in Ketchikan Creek (bypassed reach)
T4	Ketchikan Creek	Below Scout Creek confluence
T5	Ketchikan Creek	Above Scout Creek confluence
T6	Scout Creek	At mouth (confluence with Ketchikan Creek)
T7	Ketchikan Creek	Below Granite Creek confluence
T8	Ketchikan Creek	Above Granite Creek confluence
T9	Granite Creek	Granite Creek at diversion- logger was stolen
T10	Granite Creek	Granite Creek Diversion
T11	Fawn Lake	Inflow from Granite Creek diversion
T12	Fawn Lake	Outflow to powerhouse
T13	Fawn Lake	Inflow from Ketchikan Lakes
T14a	Ketchikan Lake	Near surface above West intake
T14b	Ketchikan Lake	Near lake bottom at West intake entrance
T15a	Ketchikan Lake	Near surface above East Intake
T15b	Ketchikan Lake	Near lake bottom at East intake entrance
T16	Ketchikan Lake	Near surface midway between shore and max lake depth (326 ft)
T17	Ketchikan Lake	Near lake bottom (197 ft) at T16 location

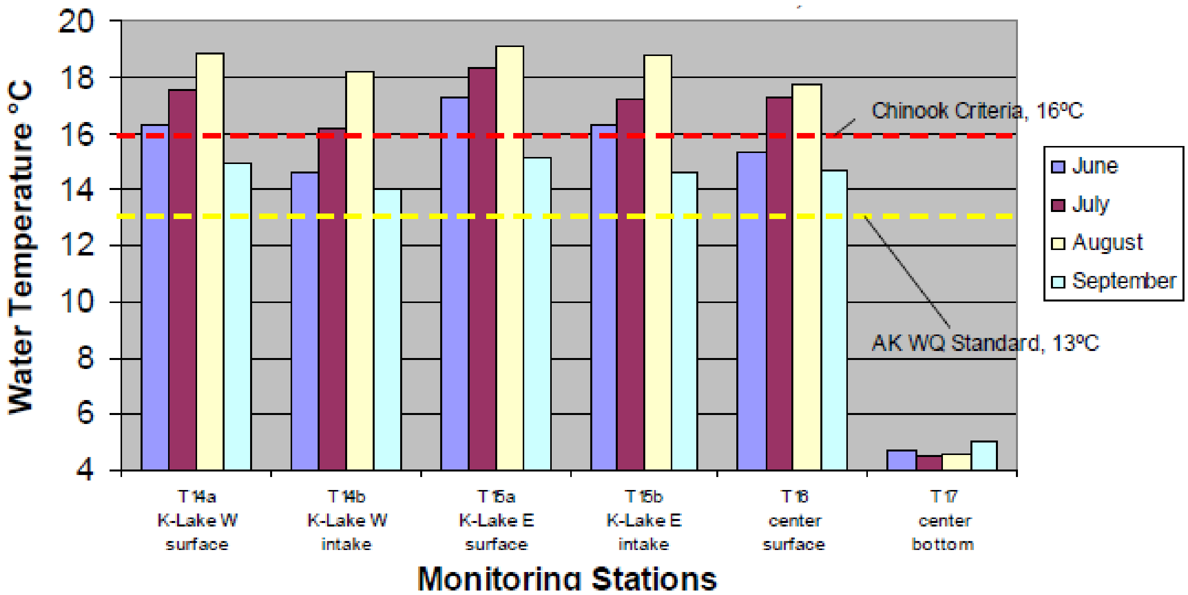

Figure 4-9. Maximum Hourly Temperatures per Month, Ketchikan Lakes Monitoring Stations (KPU, 2006)

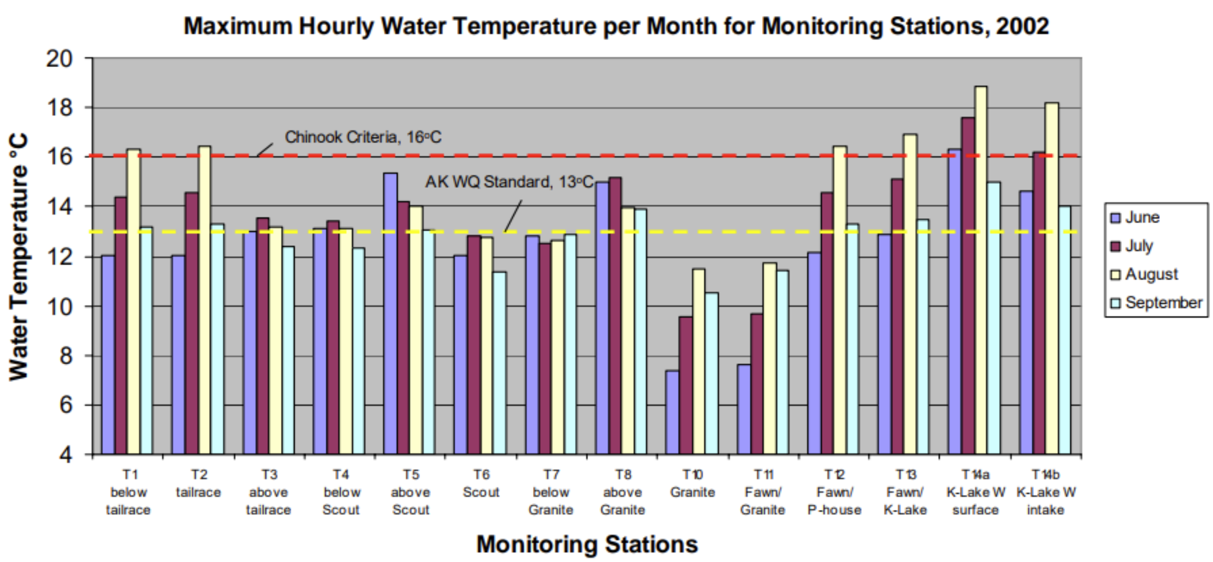

Figure 4-10. Maximum Hourly Temperatures per Month, Ketchikan Lakes Hydroelectric Project Monitoring Stations (KPU, 2006)

SSRAA/Deer Mountain Hatchery Water Temperature Monitoring

Historical water temperature data are also available from SSRAA's Deer Mountain Hatchery (SSRAA, 2025). On a daily basis, hatchery staff collect a single *in-situ* measurement of water temperature at approximately 1pm. This sampling time was chosen to approximate the mean daily temperature of the hatchery's receiving water supplied via the Project tailrace. Table 4-13 provides a monthly range of these daily monitoring efforts from April 1, 2015 through July 3, 2022. The 8 years of data reveal that ADEC's maximum temperature criteria of 20°C is exceeded for two days in June of 2016 (20.3°C; 20.5°C) and one day in July of 2018 (20.1°C). As expected, daily maximum temperatures approach 20°C during the summer months of June, July, and August. However, in 2017 and 2019 through June of 2022, daily maximum summer temperatures were substantially less than 20°C, ranging from 12.3°C to 17.5°C.

Table 4-13. Monthly Range of Daily Water Temperatures Supplied to the Deer Mountain Hatchery from the Project Tailrace (SSRAA, 2025)

Month	2015		2016		2017		2018		2019		2020		2021		2022	
	Min/Max °C		Min/Max °C		Min/Max °C		Min/Max °C		Min/Max °C		Min/Max °C		Min/Max °C		Min/Max °C	
Jan	--	--	3.2	4.9	2.0	4.1	3.0	4.2	3.0	5.2	2.4	5.0	3.3	4.5	1.4	3.3
Feb	--	--	4.2	4.9	2.3	3.3	2.2	3.4	2.7	4.0	2.5	3.4	1.8	3.8	2.8	3.7
Mar	--	--	4.5	4.9	1.4	3.0	2.1	3.3	2.2	4.2	2.4	3.5	2.2	3.2	2.8	4.0
Apr	4.4	6.2	5.1	7.1	2.4	5.1	2.7	6.1	3.8	6.9	2.3	4.6	2.7	5.9	3.5	6.0
May	5.2	14.2	6.1	12.2	4.1	9.2	4.5	10.5	6.1	11.7	4.1	9.3	3.4	8.1	4.2	9.3
Jun	9.9	15.9	8.6	20.5	7.0	12.3	7.6	14.1	8.7	13.6	6.1	12.6	5.8	14.3	7.4	13.3
Jul	11.8	19.9	10.6	15.8	9.8	14.0	12.2	20.1	11.7	15.6	10.5	14.1	10.2	15.8	13.7*	14.5*
Aug	11.8	16.5	14.2	19.9	11.0	15.4	12.6	19.8	10.9	17.5	11.1	14.3	12.1	16.3		
Sep	9.4	13.7	10.4	16.8	10.5	13.8	11.8	15.5	11.0	14.8	11.1	15.4	9.4	14.4		
Oct	8.7	11.0	7.9	11.8	7.2	12.0	7.8	13.0	7.7	11.4	7.3	12.3	6.8	9.9		
Nov	6.1	8.8	6.2	8.2	4.7	7.8	6.2	8.4	6.3	8.3	4.1	7.7	4.6	7.0		
Dec	4.6	5.8	4.0	6.4	3.9	5.2	4.0	6.6	4.3	6.3	3.9	5.3	2.0	5.5		

exceeds ADEC criteria of 20 °C

**water temperature data through July 3, 2022*

Figure 4-11 provides a comparison mean monthly water temperatures from 1970-2002 and 2015-2022 (KPU, 2006 and SSRA, 2025). For both monitoring periods, monthly average water temperatures are typically highest in the month of August (n =26). The exception to this trend occurred in July of 1979, 1981, 1983, 1995, 1998, 2015 and in September of 1976 and 2020. The general trend of these historical data reveal that average monthly temperatures in the summer can approach and intermittently exceed 16°C, with August of 2016 and 2018 representing the peak mean monthly temperatures of these two data records (16.7°C and 17.0 °C, respectively).

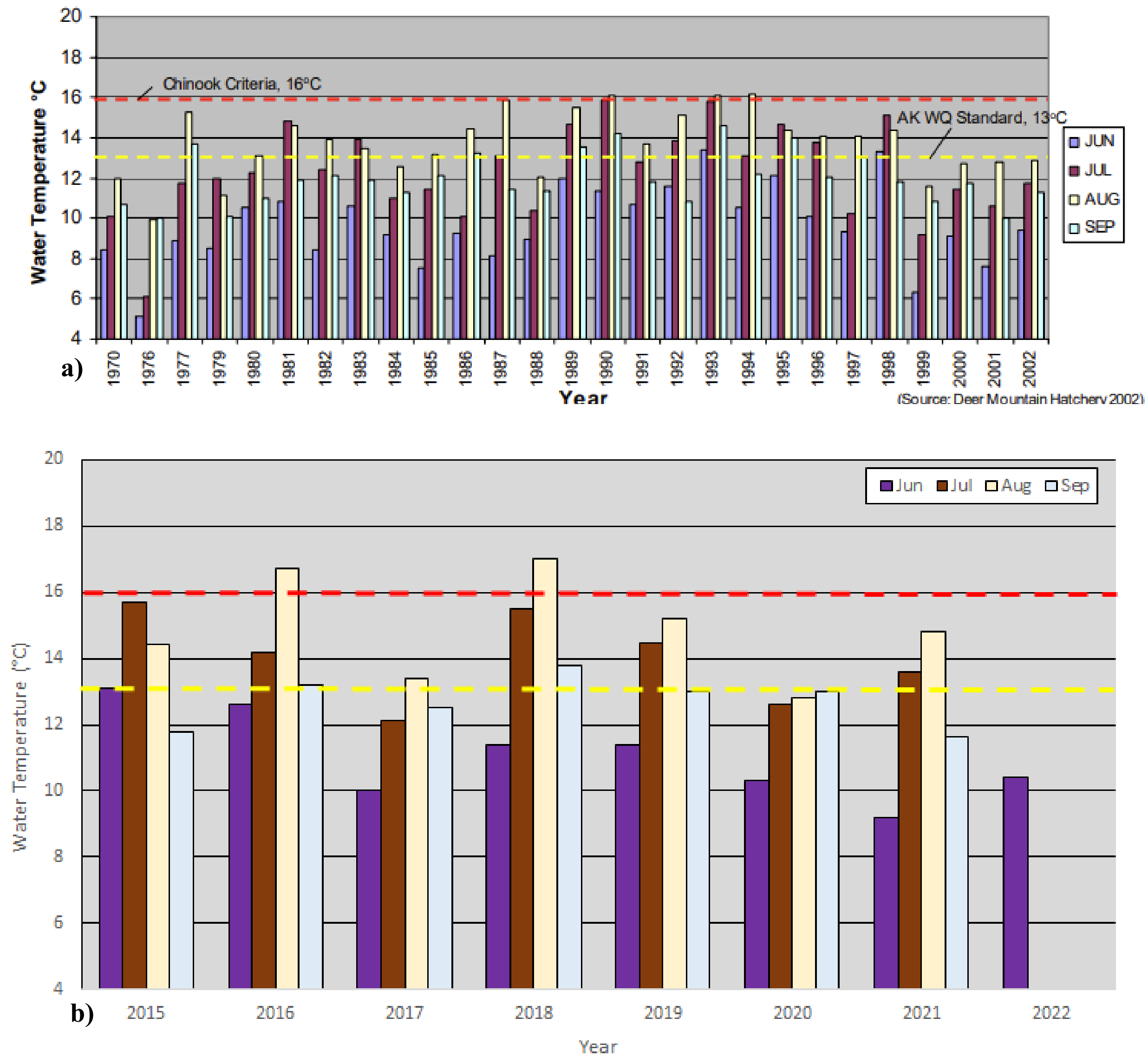

Figure 4-11. Monthly Mean Temperatures of Project Tailrace Water Measured at the Deer Mountain Hatchery Monitoring Station: a) 1970-2002; b) 2015-2022

4.3.8 References

Alaska Department of Environmental Conservation (ADEC). (2018). *Waterbody Field Report Ketchikan Creek, Ketchikan, Alaska.* Prepared by G. Augat. 16 pp. Available at: https://dec.alaska.gov/water/water-quality/nonpoint-source-control/water-quality-resources/reports (Accessed November 21, 2024).

ADEC. (2022). *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances*. Available at: https://www.epa.gov/system/files/documents/2023-05/akwqs-toxics-manual.pdf (Accessed November 21, 2024).

ADEC. (2024). *18 AAC 70 Water Quality Standards*. Available at: https://dec.alaska.gov/water/water-quality/ (Accessed November 21, 2024).

Alaska Department of Natural Resources (ADNR). (2024a). *Case, Land and Water Information*. Natural Resources. Land Administration System. Available at: https://dnr.alaska.gov/projects/las/#filetype/ADL/filenumber/48794/searchtype/water (Accessed November 20, 2024)

ADNR. (2024b). *Case, Land and Water Information*. Natural Resources. Land Administration System. Available at: https://dnr.alaska.gov/projects/las/#filetype/ADL/filenumber/43930/searchtype/water (Accessed November 20, 2024)

ADNR. (2024c). *Case, Land and Water Information*. Natural Resources. Land Administration System. Available at: https://dnr.alaska.gov/projects/las/#filetype/ADL/filenumber/43932/searchtype/water (Accessed November 20, 2024)

Aquatic Restoration & Research Institute (ARRI). (2014). *Ketchikan Creeks: Stormwater Quality Assessment.* Jensen, L.R, J. C. Davis, and G. A. Davis. August 2014. 66 pp. Available at: https://dec.alaska.gov/media/16765/ketchikan-creeks-2014-adec.pdf (Accessed November 20, 2024)

DOWL Engineering. (2019). *Ketchikan Lakes Bathymetric Map*.

Jacobs. (2022). *Ketchikan Creek Watershed Control Plan*. Ketchikan Public Utilities.

Ketchikan Public Utilities (KPU). (1990). *Ketchikan and Fawn Lakes Water Treatment Plant Pilot Study.* Prepared by for Ketchikan Public Utilities by CH2MHILL. January 1990.

Ketchikan Public Utilities (KPU). (1996). *Water Quality Analytical Results from 5/24/89 through 2/13/95.* Ketchikan, AK. 80 pp.

Ketchikan Public Utilities (KPU). (1998). *Ketchikan Lakes Hydroelectric Project Volume II. Draft Applicant Prepared Environmental Assessment for Hydropower License.* City of Ketchikan, Alaska. Acting By and Through Ketchikan Public Utilities. June 30, 1998. FERC Project No, 420-000 Alaska. State Review No. AK9608-09J. 138 pp.

Ketchikan Public Utilities (KPU). (2006). *Ketchikan Creek Watershed: Water Temperature Study for the Ketchikan Lakes Hydroelectric Project.* FERC Project No, 420-000-Alaska (State Review No. AK9608-09J). Prepared for: Ketchikan Public Utilities. Prepared by: OtterTail Environmental, Inc. October 2006. 42 pp.

Ketchikan Public Utilities (KPU). (2025). *Citizens Light, Power and Water Company. Application for License, Water Power Permit. Exhibit "E".* Scanned document available from KPU archives as 1927 FERC license application - Exhibit E property and water rights.pdf. 3 pp

Southern Southeast Regional Aquaculture Association (SSRA) 2003. Water Temperature data provided to Ed Fleming of OtterTail Environmental, Inc. by Jerry Guthrie, Hatchery Manager of Deer Mountain Hatchery.

Southern Southeast Regional Aquaculture Association (SSRA) 2025. Water Temperature data provided to Jenny Holstrom of Ketchikan Public Utilities by Matt Allen, Whitman Lake/Deer Mountain Hatchery Manager.

United States Geological Survey (USGS). (2023). *National Geospatial Program, 20231220, USGS National Hydrography Dataset Best Resolution (NHD) for Hydrological Unit (HU) 8 – 19010102*. (published 20231220) FileGDB: U.S. Geological Survey.

4.4 Fish and Aquatic Resources (18 CFR § 5.6 (d)(3)(iv))

4.4.1 Existing Aquatic Habitat

At the time of the previous relicensing effort, a comprehensive review and compilation of available literature was undertaken (KPU 1998). Ketchikan Creek was divided into six reaches beginning at the mouth of Ketchikan Creek (located at Thomas Basin within the Tongass Narrows) and terminating at the Ketchikan Lakes Dam (Figure 4-12). Other areas were also defined and included three reaches in Granite Basin Creek, and Ketchikan Lakes. For this effort, we will reference the reaches previously defined. However, because in some instances aquatic habitat and fish use are similar to adjacent reaches, some reaches have been combined within our discussion.

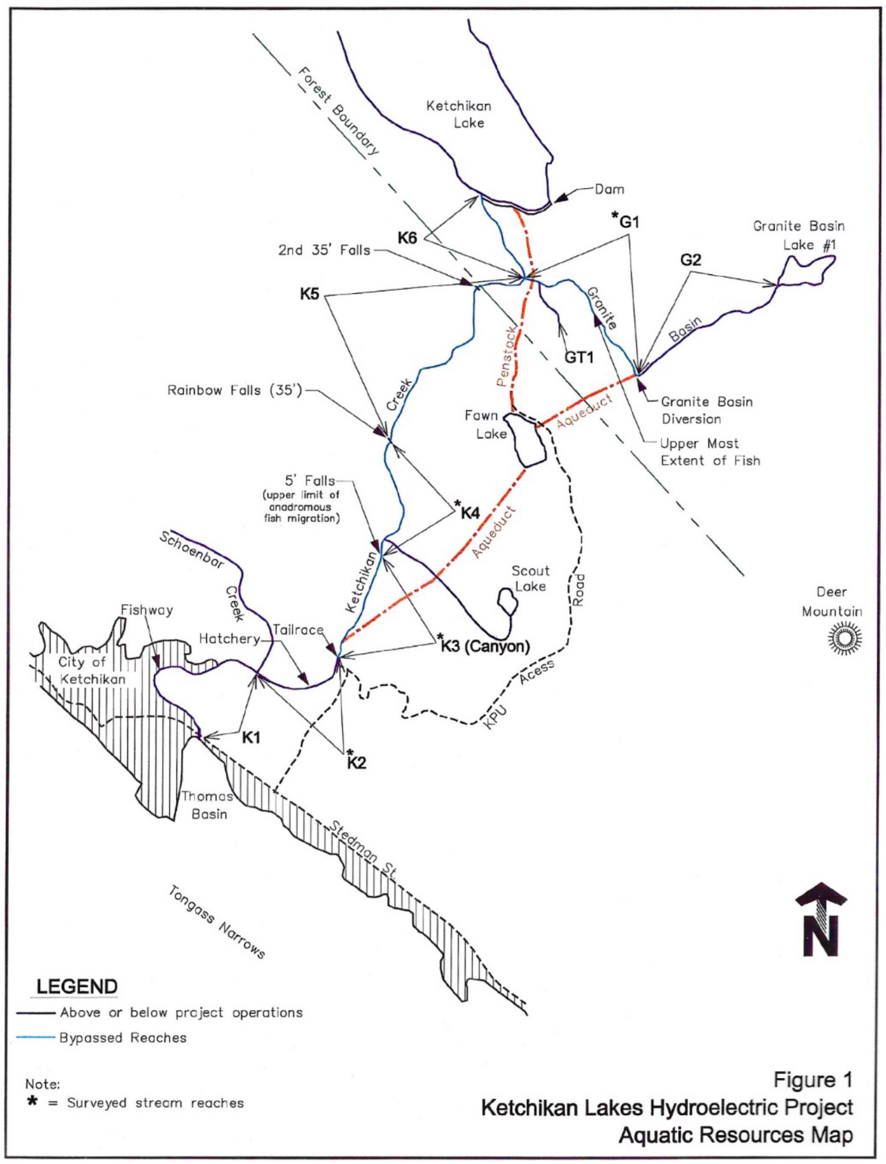

Figure 4-12. Ketchikan Lakes project area, including reach designations and project infrastructure. Reproduced from KPU (1998).

Other relevant literature includes escapement surveys by ADFG, and entries into the State of Alaska Anadromous Waters Catalog (AWC). However, it must be noted that much of the available information and literature predates 1998, with little recent information available. Information to describe aquatic habitat in Ketchikan Creek and Granite Basin Creek are summarized in Table 4-14.

Table 4-14. Summary of aquatic habitat parameters in Ketchikan and Granite Basin creeks, August and September 1997. Reaches K1 and K5-K6 were not surveyed.

Attribute	Metric	Reach Identification					Overall		
		K1	K2	K3	K4	G1	Avg.	Min.	Max.
Reach	Channel Type	---	LC1	MC3	MC2	MC1	---	---	---
	Length (ft.)	---	1,378	1,284	1,855	2,400	1,729	1,284	2,400
Stream Gradient	Percent	---	1	5	2	2	3	1	5
Fastwater Habitat	Average Length (ft.)	---	689	172	183	170	303	170	689
	Average Width (ft.)	---	73	20	36	17	36	17	73
	Average Depth (ft.)	---	2.2	0.9	0.6	0.5	1.0	0.5	2.2
Pool Habitat	Average Length (ft.)	---	---	71	82	53	69	53	82
	Average Residual Depth (ft.)	---	---	1.2	1.2	1.4	1.3	1.2	1.4
	Pool/riffle Number Ratio	---	0.0	0.8	1.0	1.1	0.7	0.0	1.1
	Pool/Fastwater Lengths Ratio	---	0.0	0.5	0.5	0.3	0.3	0.0	0.5
Substrate	Dominant Substrate	---	SC	BR	LC	BR	---	---	---
Habitat Complexity	Large Woody Debris (LWD/mile)	---	23	350	413	290	269	23	413

Notes: BR=Bedrock; LC=Large Cobble; SC=Small Cobble

4.4.1.1 Ketchikan Lakes

The Ketchikan Lakes watershed consists of two lakes: an upper and lower lake. Collectively, the two lakes are approximately 640 acres with the upper lake depth estimated to exceed 200 feet. Lake substrate consists primarily of bedrock and talus, with some muck at depths (ADFG 1995 personal communication as cited in KPU 1998). Both lakes were classified as oligotrophic with water temperatures strongly influenced by seasonal air temperatures (KPU 1998). Based on surveys, ADFG concluded that the primary inlet to the lakes contained good spawning habitat.

Outflow from Ketchikan Lakes is primarily diverted through penstocks, which flow to Fawn Lake. Fawn Lake also receives flows from the Granite Basin Creek Diversion. Collectively, water from Fawn Lake flows through a power tunnel to the powerhouse for hydroelectric generation and chlorination plant for municipal use (Figure 4-12). The only other means of outflow from the lakes is intermittent spill events where water flows downstream through the historic Ketchikan Creek channel, which typically occurs about two to three times per year (KPU personal communication, Jennifer Holstrom).

4.4.1.2 Granite Basin Creek

Granite Basin Creek is the outlet for the first Granite Basin Lake. Granite Basin Creek enters Ketchikan Creek upstream from the second 35-foot waterfall which separates reaches K5 and K6 (Figure 4-12). Granite Basin Creek was divided into two individual reaches, which were separated by the Granite Basin Diversion where water is diverted into Fawn Lake. The downstream reach (G1) extends upstream from the confluence to the diversion, and the second reach (G2) extends upstream from the diversion to the first Granite Basin Lake. Granite Basin Creek aquatic habitat attributes are summarized in Table 4-14.

Reach G1 was further subdivided into two smaller reaches, designated as G1a and G1b. Reach G1a is 1,352 feet in length and begins at the confluence and terminates at a natural fish barrier. Reach G1a consists primarily of bedrock but includes areas of suitable spawning substrates. Reach G1b extends upstream from the barrier to the Granite Basin Diversion. A fourth reach within Granite Basin included a small tributary that enters G1a on the left bank, just upstream from where the penstocks cross Granite Basin Creek (Figure 4-12). This unnamed tributary was not formally surveyed for aquatic habitat.

4.4.1.3 Ketchikan Creek

Reaches K1 and K2: Mouth to the Powerhouse Tailrace - Reach K1 of Ketchikan Creek is 2,659 feet long and extends from the mouth to the confluence with Schoenbar Creek. During surveys by KPU in 1997 and 1998, Reach 1 was not formally surveyed for aquatic habitat. Reach K2 extends upstream from Schoenbar Creek to the KPU powerhouse tailrace and is about 1,378 feet long (Figure 4-12). Aquatic habitat for K2 is summarized in Table 4-14. While no anadromous barriers exist within this section of Ketchikan Creek, a fishway was constructed in 1957, which is 1,355 downstream from the Schoenbar Creek confluence. The fishway was constructed to facilitate improved passage conditions at a natural cascade/falls, with the primary purpose of improving passage to the Deer Mountain Hatchery (KPU 1998). Following construction, fish ascending the fishway were often observed falling back downstream through a cascade due to poor ladder exit conditions. In 2002, the City of Ketchikan filed its Ketchikan Lakes Fisheries Habitat Enhancement Plan pursuant to FERC Article 410, which identified four measures to be implemented by the City. One of those measures included the construction of a ladder extension to improve anadromous salmonid passage, and in 2003 the fishway was extended approximately 45 feet. A subsequent site inspection by participating resource agencies concluded that the revision was successful and fulfilled the requirements of FERC Article 410 (Fleming 2004).

Schoenbar Creek, which was historically an important salmon spawning area (KPU 1998), designates the separation between Reaches K1 and K2 (Figure 4-12). In 1997, KPU observed fish pooling at the confluence of Schoenbar Creek and concluded that a poorly installed culvert impeded salmon passage into that waterway. Article 410 of the FERC document identified improvements to the culvert entrance as an improvement measure, which were subsequently dropped by the resource agencies because the Alaska Department of Transportation planned to either remove or improve the culvert. Subsequently, the City of Ketchikan completed a $3.8 million project to rehabilitate the culvert in 2024, including the installation of fish baffles, and the grading and filling of voids at the entrance to facilitate fish passage into Schoenbar

Creek. It should be noted, however, that Schoenbar Creek is not part of the Project area, and as such, it is not addressed in detail here. However, the Alaska AWC identifies Coho Salmon, Pink Salmon, and Cutthroat Trout presence in Schoenbar Creek and its tributaries.

A third improvement measure identified in Article 410 of the FERC document, and included in the Ketchikan Lakes Fisheries Habitat Enhancement Plan was to improve fish rearing habitat within Reaches K1 and K2. The measure called for the placement of large bolder clusters to create lower velocity resting locations for migrating adult salmonids, as well as rearing habitat for juveniles. The rock structures were installed in 2003, and a subsequent site inspection by participating resource agencies concluded that the revision was successful and fulfilled the requirements of FERC Article 410 (Fleming 2004).

Collectively, only Reaches K1 and K2 within Ketchikan Creek are hydraulically regulated, which includes minimum flow requirements and defined ramping rates (see Section 3.0 for details). For this reason, we have combined the two reaches and addressed them collectively. During the surveys conducted by KPU in 1997 and 1998, Reach K1 was not surveyed but it was concluded that this reach provided suitable spawning substrate (KPU 1998).

Reach K3: Powerhouse Tailrace to Five-foot falls - Reach K3 extends from the KPU powerhouse tailrace to a five-foot waterfall that was identified by KPU (1998) as being an anadromous fish migration barrier during the 1997-1998 surveys (Figure 4-12). Aquatic habitat for this reach is summarized in Table 4-14. This reach is 1,284 feet long, and the waterfall was identified as an anadromous barrier because of a cascade that hits a bedrock wall, angles 90 degrees, and then drops approximately five feet. Furthermore, KPU (1998) concluded that there was an inadequate takeoff pool necessary for anadromous salmon to navigate the falls. In addition to the physical characteristics of the falls, at the time this reach was surveyed, a large old growth timber was present that also contributed to passage limitations. The fourth improvement measure identified in Article 410 of the FERC document, and included in the Ketchikan Lakes Fisheries Habitat Enhancement Plan, called for the removal of the large old growth timber, and if necessary, the removal of rock structures as needed to facilitate passage. In July of 2002, the old growth timber was removed. A subsequent assessment concluded that removal efforts were successful, and the falls were passable to Steelhead and Coho due to bedload shift (Fleming 2004). Another assessment the following spring, identified two new temporary barriers downstream from the five-foot falls (i.e., a debris slide and a new fallen log), but it was determined that in the absence of these new barriers, the five-foot falls was passable to Steelhead. It should also be noted that unconfirmed anecdotal information from local fishermen suggests that historically Steelhead may have been able to navigate the falls prior to the presence of the old growth timber, and migrate upstream to Rainbow Falls, a 35-foot waterfall (KPU 1998) approximately 1,855ft. further upstream.

Reach K3 of Ketchikan Creek is unregulated. That is, there are no minimum flow requirements or restrictions on ramping rates. Flows within this reach are dependent on localized accretion, infrequent spill events from Ketchikan Lakes and flows from Granite Basin and Scout Creeks. Flows from Granite Basin Creek are regulated at the Granite Basin Diversion, which can divert none, some, or all of the water from the creek to Fawn Lake for use in hydroelectric generation and municipal water use (see Section 3.5.4 for details). Non-diverted water flows down the natural stream channel and enters Ketchikan Creek in Reach K6. Unregulated water from Scout Lake flows to Ketchikan Creek via Scout Creek, and enters Ketchikan Creek in Reach K4, upstream from the five-foot falls. During the period of 2006 to 2009, stream discharge measured upstream of the powerhouse tailrace varied from 0.8 cfs (February 27, 2006) to 1,464 cfs (August 13, 2008).

Reach K3 habitat differs from the other anadromous reaches in that it is confined within steep bedrock walls, and within a narrow channel averaging about 20 feet wide devoid of floodplain. The gradient is about 5% and the dominant substrate is bedrock, with extremely limited spawning habitat (KPU 1998).

Reach K4: Five-foot Falls to Rainbow Falls - As discussed above, KPU (1998) identified the five-foot falls as a migration barrier to anadromous salmon, and therefore, identified Reach K4 as a non-anadromous reach. This reach extends upstream from the five-foot falls to the 35-foot tall Rainbow Falls and is 1,855 feet in length. Within this reach gradient is about two percent and the dominant substrate is large cobble, providing much better spawning and rearing habitat relative to Reach K3 (KPU 1998). Aquatic habitat for this reach is summarized in Table 4-14.

Flows within the lower 334 feet of this reach (the location of Scout Creek confluence) are dependent on infrequent spill events from Ketchikan Lake, flows from Granite Basin and Scout Creeks, and accretion from rainfall within the watershed. As such, flows are similar to observations at the gaging station upstream from the powerhouse tailrace. During the period of 2006 to 2009, stream discharge measured upstream from the powerhouse tailrace varied from 0.8 cfs (February 27, 2006) to 1,464 cfs (August 13, 2008). Upstream from the Scout Creek confluence, flows are much reduced because more than half of the flows to the bypass reach originate from Scout Lake (KPU 1998). Also, inflow from Granite Basin Creek varies depending on the amount of water diverted from that stream into Fawn Lake for use in hydroelectric generation and municipal water use.

Reaches K5 and K6: Rainbow Falls to Ketchikan Lakes - Because no aquatic habitat and no formal fisheries data were collected by KPU (1998) in reaches K5 and K6 of Ketchikan Creek, we have combined and discussed these two reaches collectively. Reach K5 extends upstream from Rainbow Falls to the Granite Basin Creek confluence and includes a second 35-foot waterfall near the upper extent of this reach (Figure 4-12). Infrequent spill events from Ketchikan Lake, flows emanating from Granite Basin Creek, and accretion from rainfall within the watershed contribute to overall flow within this portion of Ketchikan Creek. As discussed previously, flows from Granite Basin Creek are to some extent diverted into Fawn Lake, and as such, flows within Reach K5 are much reduced relative to Reach K4, which receives inflow from Scout Creek. Reach K6 extends from the confluence of Granite Basin Creek to Ketchikan Lake and flows within this reach result when spill events occur, with some inflow due to rainfall.

4.4.2 Existing Aquatic Community

Many fish species native to Alaska occur in the vicinity of the Project (Table 4-15). This section provides a summary of native and non-native fish species that occur in the Ketchikan Creek watershed, and includes all five salmon species, Steelhead, Dolly Varden, Rainbow Trout, and Coastal Cutthroat Trout. All anadromous salmon spawn in Ketchikan Creek with the exception of Sockeye Salmon, which are believed to wander or stray into the stream temporarily but do not spawn in the stream (ADFG 2024; Joe Giefer personal communication). The most abundant adult returns are Pink and Coho Salmon.

4.4.2.1 Ketchikan Lakes

Fish species present in Ketchikan Lakes include Cutthroat Trout, non-native Brook Trout, Three-spine Stickleback, and cottus spp. (Table 4-15; KPU 1998). Brook Trout were introduced to the lakes by the U.S. Forest Service in 1931, with a release of 5,000 fingerlings from the Yes Bay Hatchery. During the 1997 KPU survey, they observed fish rising in Fawn Lake, which is a man-made lake. Through recent conversations with KPU staff, it was hypothesized that fish move both down and upstream through the penstocks from Ketchikan to Fawn lakes (KPU 1998).

Table 4-15. Fish species occurrence within the Ketchikan Lakes Project area.

Species	Ketchikan Creek Reaches				Ketchikan Lakes	Scout Creek	Granite Basin Creek
	K1/K2	K3	K4	K5/K6			
Native							
Coho Salmon (*Oncorhynchus kisutch*)	X	X					
Sockeye Salmon (*O. nerka*)	X	X					
Pink Salmon (*O. gorbuscha*)	X	X					
Chum Salmon (*O. keta*)	X	X					
Dolly Varden (*Salvelinus malma*)	X	X					
Steelhead (*O. mykiss*)	X	X					
Rainbow Trout (*O. mykiss*)	X	X	X			X	
Coastal Cutthroat Trout (*O. clarkii*)	X	X	X		X	X	
Stickleback (*Gasterosteus aculeatus*)					X		
Sculpin (*Cottus spp.*)					X		
Non-Native							
Chinook Salmon (*O. tshawytscha*)	X	X					
Brook Trout (*S. fontinalis*)		X	X	X	X		X

Notes: Chinook and summer run Coho Salmon are not native to Ketchikan Creek, and the populations are maintained by the Deer Mountain Hatchery. Fall run Coho Salmon are native to Ketchikan Creek. Brook Trout were introduced in 1931 by the U.S. Forest Service into Ketchikan Lakes, with 5,000 fingerlings being introduced into the lake from the Yes Bay Hatchery.

4.4.2.2 Granite Basin Creek

Snorkel and trapping surveys identified only Brook Trout residing in sub-reach G1a; the other reaches (G1b and G2) did not contain any fish (KPU 1998) (Table 4-16). Large numbers of Brook Trout fry were observed in the unnamed tributary to Granite Basin Creek, which was confirmed through minnow trapping. KPU concluded that this small tributary was an important spawning stream for Brook Trout and was likely a recruitment source for lower Granite Basin Creek (KPU 1998).

Table 4-16. Presence and relative abundance of fish species observed within the Ketchikan Lakes project area during September 1997 and April 1998 (KPU 1998).

Reach ID	Species	Snorkel Data (fish/acre)				Minnow Trapping <300 mm
		Fast water		Slow water		
		<300 mm	>300 mm	<300 mm	>300 mm	
K1	NA	ND	ND	ND	ND	ND
K2	Chinook	66	18	---	---	6
	Coho	931	30	---	---	14
	Sockeye	0	18	---	---	0
	Pink	0	2,283	---	---	0
	Chum	0	24	---	---	0
	Dolly Varden	48	12	---	---	0
	Steelhead/Rainbow	240	0	---	---	24
	Cutthroat Trout	12	0	---	---	1
	Brook Trout	0	0	---	---	0
K3	Chinook	0	0	42 (0)	0	6 (1)
	Coho	114	0	354 (0)	71	28 (1)
	Sockeye	0	0	0 (0)	35	0 (0)
	Pink	0	2,083	0 (0)	4,243	0 (0)
	Chum	0	0	0 (0)	71	0 (0)
	Dolly Varden	152	0	389 (35)	71	0 (0)
	Steelhead/Rainbow	417	0	636 (813)	0	34 (5)
	Cutthroat Trout	0	0	0 (0)	0	6 (0)
	Brook Trout	0	0	24 (0)	0	0 (0)
K4	Steelhead/Rainbow	0	0	82	0	19
	Cutthroat Trout	0	0	37	0	22
	Brook Trout	0	0	74	0	1
K5	Brook Trout	---	---	67	0	---

Reach ID	Species	Snorkel Data (fish/acre)				Minnow Trapping <300 mm
		Fast water		Slow water		
		<300 mm	>300 mm	<300 mm	>300 mm	
K6	Brook Trout	---	---	3	0	2
G1a	Brook Trout	34	0	453	0	46
G1b	Brook Trout	0	0	0	0	0
G2	Brook Trout	---	---	0	0	0
G1	Brook Trout	---	---	---	---	48

Notes: Numbers in parentheses indicate snorkel and trap data collected on April 19, 1998. Within Reach K4, most Rainbow and Cutthroat Trout exhibited signs of hybridization, and therefore classification was based on dominant phenotype. Reaches K5 and K6 were not formally sampled, instead snorkeling and trapping occurred in ideal habitat. As such fish numbers represent total observations, not fish per acre. Reach G1, which extends upstream from the confluence of Granite Basin Creek to the Granite Basin Diversion was split into two parts; G1a is the downstream portion that extends from the confluence of Granite Basin Creek and Ketchikan Creek upstream to a migration barrier, and G1b includes the reach from the natural barrier to the diversion.

4.4.2.3 Ketchikan Creek

Reaches K1 and K2: Mouth to the Powerhouse Tailrace

During the period of 1978 to 1995, ADFG conducted escapement surveys using foot and snorkel methods to describe relative abundance. Those surveys documented Chinook, Coho, Sockeye, Pink, and Chum Salmon, as well as Steelhead in the anadromous section of Ketchikan Creek (i.e., Reaches K1-K3). Pink Salmon were the most abundant species, with maximum yearly counts ranging from 850 to 40,000 fish, with a mean escapement of 11,390 fish (KPU 1998; Table 4-17). Relatively small numbers of Chinook, Coho, Sockeye, and Chum Salmon were observed by ADFG (mean annual counts of 213, 294, 10, and 2, respectively). However, it should be noted that the ADFG surveys were timed to coincide with the Pink Salmon spawning period, and observations of other species were incidental and not comprehensive.

Table 4-17. Summary of adult escapement for Chinook, Coho, Sockeye, Pink, and Chum Salmon and Steelhead in Ketchikan Creek, 1978-1998

Count	Adult Salmon Counts					Steelhead	
	Chinook	Coho	Sockeye	Pink	Chum	Adults	Redds
Minimum	1	2	1	850	1	0	0
Maximum	1,353	1,400	23	40,000	6	48	28
Average	213	294	10	11,390	2	17	5

Notes: Adult salmon counts (undefined locations) were conducted by the Alaska Department of Fish and Game during the period of 1978 to 1995 and were timed to coincide primarily with the Pink Salmon spawning period. As such, counts of other species were incidental and were not comprehensive. Those data were cited as ADFG (1996) in KPU (1998), but there is no corresponding reference in the literature section, and the reference appears to be personal communication. Adult Steelhead spawning surveys were conducted by ADFG for the period of 1995-1996 (foot surveys) and 1997-1998 (snorkel surveys) in Reaches K1 and K2 of Ketchikan Creek. KPU also conducted a single snorkel survey of Reach K3 on April 19, 1998, but did not observe any adult Steelhead or redds.

Juvenile surveys by KPU in Reach K2 included snorkel surveys and sampling using minnow traps. Two size ranges were used to broadly classify fish into categories that likely represent juvenile (i.e., <300 mm) and adult (i.e., >300mm) anadromous and resident salmonids. It is quite possible that some salmonids less that 300mm like Cutthroat Trout, Rainbow Trout, Dolly Varden, and Brook Trout may be adult resident forms. However, those fish greater than 300mm are all likely mature adults. In addition to the anadromous salmonids identified above by ADFG, KPU documented the presence of Dolly Varden, Rainbow Trout, and Cutthroat Trout in Reach K2 (Table 4-16).

In 2013, minnow trapping data were collected in Ketchikan Creek, which included enumeration by species, fish weight and length, condition factor, and Catch Per Unit Trap (CPUT) (Jensen et al. 2014). The sampling occurred upstream from the Harris Street Bridge in Reach K1 where they captured juvenile Coho Salmon (n=15), Dolly Varden (n=1), and Cutthroat Trout (n=not reported). While this sampling was only a cursory stormwater assessment of fish presence, results from the 2013 sampling effort comport with results from the KPU study (KPU 1998).

Reach K3: Powerhouse Tailrace to Five-foot falls

Fish species present in Reach K3 included all five anadromous species (i.e., Chinook, Coho, Sockeye, Pink, and Chum Salmon), as well as resident Dolly Varden, Steelhead/Rainbow, Cutthroat Trout, and Brook Trout (Table 4-15; Table 4-16; and Table 4-17). At the time of the KPU surveys, adult Pink, Sockeye, Chum, and Coho salmon were observed in Reach K3, with Pink Salmon being the most abundant fish species (Table 4-16). During a reconnaissance survey in April 1997, an adult steelhead was observed attempting to ascend the five-foot falls unsuccessfully.

Reach K4: Five-foot Falls to Rainbow Falls

During the surveys conducted by KPU in 1997, only resident fish species were observed and included Rainbow, Cutthroat, and Brook Trout (Table 4-16). KPU noted that while not abundant, these species were reproducing successfully. They also noted that fish were very small and attributed that observation to reduced food availability due to unproductive oligotrophic water, fishing pressure targeting larger fish, or a combination of the two. They also observed that most Rainbow and Cutthroat Trout in this reach showed evidence of hybridization, which is not uncommon for these species. Additional snorkel surveys in lower Scout Creek also showed signs of Rainbow/Cutthroat Trout hybridization but noted that upper portions of Scout Creek and the lake contained pure strains of Cutthroat, suggesting Scout Lake is the primary recruitment source for Cutthroat Trout remaining in Ketchikan Creek.

Reaches K5 and K6: Rainbow Falls to Ketchikan Lakes

While no formal fishery surveys were conducted within this portion of Ketchikan Creek, qualitative snorkel surveys and trapping of optimum habitat were conducted between the second 35-foot falls and Granite Basin Creek (Reach K5), and within optimum habitats of Reach K6. During those surveys, only Brook Trout were observed (Table 4-15 and Table 4-16). KPU suggested that while not being sampled, the lower section of Reach K5 (Rainbow Falls upstream to the second 35-foot waterfall) likely contained Brook Trout and potentially Rainbow and Cutthroat Trout because those two species were also observed in Reach K4, although this was not confirmed.

4.4.3 Native and Non-Native Fish Species within the Ketchikan Lakes Project

There are approximately 12 species of fish that have been documented in the vicinity of the Ketchikan Lakes Project (Table 4-15). The fish community consists of both native and non-native fish species within the Ketchikan Creek watershed. For each of the native species, a NatureServe Network Program rank was provided. A designation of an "S" equals a subnational rank assigned and maintained by state, territory, provincial or tribal NatureServe Network program (NatureServe 2024). The fish species were then ranked 1-5 to provide an indication of status based primarily on the risk of extirpation and such factors as distribution, number or trends in populations, known occurrences and other threats to the species of interest. The following rankings were defined as:

S1=Critically Imperiled— At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

S2=Imperiled— At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

S3=Vulnerable— At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

S4=Apparently Secure— At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

S5= Secure— At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

There are no ESA-listed fish species or fish stocks of concern noted by ADFG in the Ketchikan Creek watershed (ADFG 2024a). The following sections summarize life history and periodicity for the fish species present in the vicinity of the Ketchikan Lake Project. The life history and periodicity descriptions of native fish species presented by Groot and Margolis (1991) and ADFG species profiles (ADFG 2024) were utilized to help populate this section.

4.4.3.1 Native Fish Species

Coho Salmon (State Conservation Rank S5)

Fall run Coho Salmon are native to Ketchikan Creek and are present in reaches K1 through K3 (Table 4-15). The Five-Foot Falls is the upstream migration barrier for Coho Salmon. Life history and periodicity for Coho Salmon are presented in Table 4-18.

Table 4-18. Summary of General Life History and Periodicity attributes of Coho Salmon

<table>
<tr><th>Attribute</th><th colspan="13">Description</th></tr>
<tr><td>Growth</td><td colspan="13">Coho Salmon mature at 3-6 years of age with some small immature salmon returning at age 2. Most Coho Salmon mature at age-4 in southeastern Alaska (Sandercock 1991). Adult Coho Salmon average about 24 to 30 inches in length and weigh about 8-12 pounds (ADFG 2024b). Average fecundity of Coho Salmon reported in SE Alaska is about 4,510 eggs (Sandercock 1991).</td></tr>
<tr><td>Life Cycle Timing</td><td colspan="13">Adult Coho Salmon migrate back to Ketchikan Creek from August to late November with spawning occurring in mid-August to end of December (see periodicity below). The incubation period begins mid-August as fertilized eggs and continues through the winter until fry emergence is complete in April. Juvenile Coho Salmon may live in freshwater for several years and likely occur year-round in Ketchikan Creek. Coho Salmon generally spend 1-2 years in the ocean, but some have been known to spend 3-years in saltwater (Sandercock 1991).</td></tr>
<tr><td>Habitat Use</td><td colspan="13">Adult Coho Salmon typically spend 1-3 years in the ocean before they return to spawn in natal streams like Ketchikan Creek. Prior to spawning, adult Coho Salmon rest and mature in pools generally selecting low gradient riffle type habitat with cobble and gravel substrate for building the redd. Fertilized eggs are buried within the redd and will incubate through the winter until fry emerge in the spring. Fry seek low velocity shallow water habitats often using gravel and cobble for cover. Stream margins, side channels and backwater areas are typical juvenile Coho Salmon habitat (Sandercock 1991). As they grow and become larger (parr), juvenile Coho Salmon move into deeper water preferring pools but will also select riffle habitat. As stream temperatures decline in winter, juvenile Coho Salmon hide in coarse substrate and deeper pools with large woody debris emerging from cover at night. In spring, with increasing stream temperature and discharge juvenile Coho Salmon may emigrate to the ocean or remain in freshwater another year.</td></tr>
<tr><td>Diet</td><td colspan="13">Juvenile Coho feed on aquatic insects but have been known to feed on terrestrial insects and other small fish including salmonid fry (Sandercock 1991). Juvenile Coho Salmon smolts continue to feed on aquatic insects in the marine environment. As they get larger, they become more piscivorous feeding on smelt, sand lance, herring, anchovy, and crab larvae.</td></tr>
<tr><td>Abundance</td><td colspan="13">Adult Coho Salmon escapement over the 12 years of evaluation averaged about 294 fish with a maximum count of 1,400 fish. The number of salmon produced in Ketchikan Creek are large enough to make the creek a regionally important base for commercial and sport salmon fisheries (KPU 1998).</td></tr>
<tr><td rowspan="3">Periodicity</td><td>Life Stage</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr>
<tr><td>Adult Migration</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td></td></tr>
<tr><td>Spawning</td><td>xx</td><td></td><td></td><td></td><td></td><td></td><td></td><td>xx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td></tr>
</table>

Attribute	Description												
	Incubation	xxxx	xxxx	xxxx	xxxx				xx	xxxx	xxxx	xxxx	xxxx
	Rearing	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

Notes: Periodicity reproduced from KPU (1998) based on ADFG professional judgement. An "x" indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

Pink Salmon (State Conservation Rank S5)

Pink Salmon are native to Ketchikan Creek and are present in reaches K1 through K3 (Table 4-15). The Five-Foot Falls is the upstream migration barrier for Pink Salmon (KPU 1998). Pink Salmon have been the most abundant anadromous salmon observed in Ketchikan Creek (Table 4-17). Life history and periodicity for Pink Salmon are presented in Table 4-19.

Table 4-19. Summary of General Life History and Periodicity attributes of Pink Salmon

Attribute	Description
Growth	Pink Salmon mature after 18 months within the marine environment, after which time they return to the estuary of their natal stream. Mature adults typically weigh 3 to 5.5 pounds and are 20-25" in length (ADFG 2024c). Average fecundity of Pink Salmon reported in SE Alaska (Sashin Creek) is about 1,950 eggs/female (Heard 1991).
Life Cycle Timing	Adult Pink Salmon migration back to Ketchikan Creek begins in July and goes through September, with spawning occurring from mid-July to the end of December (see periodicity below). The incubation period begins mid-July as fertilized eggs and continues through the winter until fry emergence is complete by the end of April. Once emerged, and after achieving neutral buoyancy, fry rapidly migrate downstream near the surface, and primarily at night (Heard 1991). The Pink Salmon life cycle spans two years, with genetically distinct even and odd year populations, which do not interbreed (ADFG 2024c).
Habitat Use	Once returning adults reach the estuary of their natal stream, they mill about for four to six weeks, where both males and females undergo a morphological transformation. Pink Salmon generally spawn in areas with clean, course gravel with some large cobbles, with moderate to high flows (0.3-1.0 m/s), and typically at depths of 30-100 cm (Heard 1991). Fertilized eggs are buried within the redd and will incubate through the winter until fry emerge in the spring. After emergence, fry remain within the natal stream for a brief period before migrating to the estuary, typically within one to two nights once migration begins.
Diet	Pink Salmon fry typically do not feed within short coastal streams such as Ketchikan Creek due to their brief residency and migration period (Heard 1991). Once the fry enter the estuary, they begin to feed on plankton, larval fishes, and occasionally

Attribute	Description											
	aquatic insects. As they mature, their diet consists of plankton, small fish, squid, and occasionally aquatic insects (ADFG 2024c).											
Abundance	Pink Salmon are the most abundant anadromous species in Ketchikan Creek. Adult escapement over the 12 years of evaluation averaged about 11,390 fish with minimum and maximum counts of 850 and 40,000 fish, respectively.											
Periodicity	**Life Stage**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
	Adult Migration							xxxx	xxxx	xxxx			
	Spawning							xx	xxxx	xxxx	xxxx	xxxx	xxxx
	Incubation	xxxx	xxxx	xxxx	xxxx			xx	xxxx	xxxx	xxxx	xxxx	xxxx
	Rearing			xx	xxxx	xxx							

Notes: Periodicity reproduced from KPU (1998) based on ADFG professional judgement. An "x" indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

Chum Salmon (State Conservation Rank S5)

Chum Salmon are native to Ketchikan Creek and are present in reaches K1 through K3 (Table 4-16). The Five-Foot Falls is the upstream migration barrier for Chum Salmon (KPU 1998). Life history and periodicity for Chum Salmon are presented in Table 4-20.

Table 4-20. Summary of General Life History and Periodicity attributes of Chum Salmon

Attribute	Description
Growth	Chum Salmon typically mature after 3 to 5 years within the marine environment (Salo 1991) and reach an average weight of 10 to 13 pounds, and average 24 to 28 inches in length with males typically larger than females (ADFG 2024d). The homing tendency of Chum Salmon is strong, typically spawning within the stream where they were spawned, and often near the site of spawning (Salo 1991; ADFG 2024d). Average fecundity of Chum Salmon reported in North America ranged from about 2,100 to 3,600 eggs/female, with females in small streams being less fecund than in larger systems.
Life Cycle Timing	Adult Chum Salmon migration back to Ketchikan Creek begins mid-July and goes through September, with spawning occurring from the beginning of August to the end of October (see periodicity below). The incubation period begins in August as fertilized eggs and continues through the winter until fry emergence is complete by the third week of April. After emergence, juveniles begin their downstream migration to the marine environment within days or weeks (ADFG 2024d). The Chum Salmon life cycle

Attribute	Description
	typically spans three to five years, with four-year-old fish being the dominant age-class (Salo 1991).
Habitat Use	Adult Chum Salmon typically spend 3 to 5 years in the ocean before they return to spawn in natal streams like Ketchikan Creek, with 4-year-old fish typically the dominant age-class. However, age composition varies as a function of latitude, with northern populations consisting of a higher proportion of four- and five-year-old fish relative to southern populations (Salo 1991). Chum Salmon usually approach the estuaries at a rapid rate, with migration rates reported as ranging between 14 to 80 km/day (Salo 1991). Within the estuary, Chum Salmon typically mill about for several days before migrating into the stream (Salo 1991). Chum Salmon prefer to spawn in small to medium side channels with low flows that are spring fed, but will spawn in a broad range of conditions, including in the mouths of rivers below the hide-tide line (ADFG 2024d). Typical spawning substrate is a gravel mixture ranging in size from about 0.5 cm in diameter to less than 15 cm. Flows typically average about 0.5 m/s and at depths of about 27 cm (Salo 1991). Fertilized eggs are buried within the redd and will incubate through the winter until fry emerge in the spring. After emergence, fry remain within the natal stream for only a brief period.
Diet	During downstream migration, fry begin to feed primarily on insect larvae, but diet appears to be dependent on the length of migration and the size of the fry (Salo 1991; ADFG 2024d). Once fry enter the marine environment, they remain near shore for several months feeding on young herring, crustaceans, and terrestrial insects. After migration into the open ocean, they feed on copepods, tunicates, mollusks, and various fish species (ADFG 2024d).
Abundance	Chum Salmon are not abundant in Ketchikan Creek. Adult escapement over the 12 years of evaluation averaged about 2 fish with minimum and maximum counts of 1 and 6 fish, respectively.

Periodicity	**Life Stage**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
	Adult Migration							xx	xxxx	xxxx			
	Spawning								xxxx	xxxx	xxxx		
	Incubation	xxxx	xxxx	xxxx	xxx				xxxx	xxxx	xxxx	xxxx	xxxx
	Rearing		xx	xxxx	xxxx	xxxx							

Notes: Periodicity reproduced from KPU (1998) based on ADFG professional judgement. An "x" indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

Dolly Varden (Unranked)

Dolly Varden are native to Ketchikan Creek and are present in reaches K1 through K3 (Table 4-15). The Five-Foot Falls is the upstream migration barrier for Dolly Varden. Life history and periodicity of Dolly Varden are presented in Table 4-21.

Table 4-21. Summary of General Life History and Periodicity attributes of Dolly Varden

<table>
<tr><th>Attribute</th><th>Description</th></tr>
<tr><td>Growth</td><td>Slow growth is common for Dolly Varden in Alaska maturing in 5–6 years at a length of 12–16 inches (southern form). Freshwater-resident forms mature earlier at age 2–4 and at a much smaller length (3–6 inches). Southern form Dolly Varden rarely live longer than 8 years, reaching sizes of up to 28 inches and 10 pounds. ADFG (2024e) noted that fecundity is typically about 600-6,000 eggs/female and varies based on size and location.</td></tr>
<tr><td>Life Cycle Timing</td><td>Adult Dolly Varden migration depends on life history form, likely beginning near the time of spawning which occurs from June through September (see periodicity below). The incubation period begins in June as fertilized eggs and continues until fry emerge in April. Dolly Varden may rear in freshwater habitats their entire life or emigrate to coastal marine areas at 2-4 years of age (ADFG 2024e). Time spent in marine environments varies with southern forms feeding in the Ocean during the summer and returning to spawn and overwinter in freshwater systems.</td></tr>
<tr><td>Habitat Use</td><td>As noted by ADFG (2024e), Dolly Varden in the Ocean range from near-shore habitats to the open ocean. Dolly Varden spawn in streambed gravels where fry eventually emerge and disperse into low velocity habitats along the stream margin. Juvenile fish rear 2-4 years in freshwater making good use of deep pools for feeding and resting. During that period some juvenile fish may emigrate to marine environments as smolts where they feed and grow until they return to spawn or overwinter in freshwater lakes and streams.</td></tr>
<tr><td>Diet</td><td>Dolly Varden feed on a variety of food items including aquatic insects, amphipods, fry and young of other salmonids as well as salmon eggs. Sea-run Dolly Varden are known to follow salmon into rivers in order to feed on salmon eggs.</td></tr>
<tr><td>Abundance</td><td>Abundance of Dolly Varden in reaches of Ketchikan Creek (K2-K3) varied from about 12 to 389 fish/acre in fast-and-slow water habitat types. Dolly Varden were most abundant in slow-water habitat types in reach K3 of Ketchikan Creek. Large Dolly Varden (i.e., >300mm) were observed in reaches K2 and K3 of Ketchikan Creek. No Dolly Varden were observed in reaches K4 through K6 of Ketchikan Creek or in Granite Basin Creek.</td></tr>
<tr><td>Periodicity</td><td><table>
<tr><th>Life Stage</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td>Adult Migration</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
</table>

Attribute	Description												
	Spawning						xxxx	xxxx	xxxx	xxxx			
	Incubation	xxxx	xxxx	xxxx	xxxx		xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
	Rearing	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

Notes: Periodicity reproduced from KPU (1998) based on ADFG professional judgement. An "x" indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

Rainbow Trout/Steelhead (State Conservation Rank S4)

Both Rainbow Trout and Steelhead (collectively O. mykiss) are native to the Ketchikan Creek watershed. Adult O. mykiss have been observed in reaches K1–K3, with the Five-Foot Falls being an upstream migration barrier for adult passage. Juvenile O. mykiss have been observed in Reaches K1-K4 (to Rainbow Falls) and occur in the lower portion of Scout Creek. Periodicity for Steelhead and Rainbow Trout are presented in Table 4-22.

Table 4-22. Summary of General Life History and Periodicity attributes of Rainbow Trout/Steelhead

Attribute	Description
Growth	Steelhead and Rainbow Trout are the same species, with different life-histories. Steelhead typically spend 3 years in the freshwater environment, and between 1 to 4 years in the marine environment. However, typical marine residence is 2 to 3 years. Adult Steelhead can reach lengths of 45 inches and weigh up to 55 pounds (ADFG 2024f). Rainbow Trout reside their entire lives in freshwater, with perhaps occasional forays into estuarine or near-shore marine waters. Rainbow Trout growth is variable, and is dependent on factors such as water temperature, water chemistry, and food supply (Wydoski and Whitney 2003). In small streams, Rainbow Trout males typically become sexually mature a year before females, with a typical spawning age of 2 or 3 years. Rainbow Trout as old as 11 years have been observed spawning (ADFG 2024f). Fecundity of Steelhead and Rainbow Trout is highly variable and is dependent on the size of the female, with egg deposition ranging between 200 to 8,000 eggs/female.
Life Cycle Timing	Adult Steelhead migration back to Ketchikan Creek begins mid-January and goes through June, with spawning occurring from mid-February to the end of May (see periodicity below). The incubation period begins mid-February as fertilized eggs and continues until fry emergence is complete by the end of August. Both Steelhead and Rainbow Trout juveniles rear year-round in Ketchikan Creek. Rainbow Trout periodicity varies from Steelhead only in that incubation occurs through the third week of July, and there is not a defined migration period. Both Steelhead and Rainbow Trout spawning begins once daily water temperatures reach 6 to 9℃ (ADFG 2024f).
Habitat Use	Both Rainbow Trout and Steelhead are iteroparous and can spawn more than once (ADFG 2024f). When water temperatures rise in late winter or early spring, adult

<table>
<tr><th>Attribute</th><th colspan="13">Description</th></tr>
<tr><td></td><td colspan="13">Rainbow Trout and Steelhead seek shallow gravel riffles with moderate stream flow. Spawning occurs in the spring from late March through early July as daily water temperatures reach 6 – 9° C. Fertilized eggs are buried within the redd and will incubate until emergence, which in Ketchikan Creek is late July for Rainbow Trout, and the end of August for Steelhead. After hatching, fry may take several weeks before emerging from the gravel. After emergence, juvenile Steelhead and Rainbow Trout reside along stream margins. Steelhead juveniles typically spend 2 to 5 years rearing in freshwater before entering the marine environment, and Rainbow Trout spend their entire life cycle in freshwater.</td></tr>
<tr><td>Diet</td><td colspan="13">As juveniles, both life-forms feed on similar food items, which include crustaceans, plant material, and aquatic insects and larvae. As they mature, their diet includes fish, salmon carcasses, eggs, and occasionally small mammals. After smoltification and once they’ve entered the marine environment, Steelhead feed on squid, amphipods, as well as other fish (ADFG 2024f).</td></tr>
<tr><td>Abundance</td><td colspan="13">Steelhead are not abundant in Ketchikan Creek. Adult escapement over the 12 years of evaluation averaged about 17 fish with minimum and maximum counts of 0 and 48 fish, respectively. For the same period of evaluation, Steelhead redd counts averaged 5 redds, with minimum and maximum counts of 0 and 28 redds, respectively. While Rainbow Trout are present within the Ketchikan Creek watershed, an estimate of population size has not been assessed. However, localized populations are self-sustaining.</td></tr>
<tr><td rowspan="5">Periodicity</td><td>Life Stage</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr>
<tr><td>Adult Migration</td><td>xx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Spawning</td><td></td><td>xx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Incubation</td><td></td><td>xx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Rearing</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td></tr>
</table>

Notes: Periodicity above is for Steelhead and is reproduced from KPU (1998) based on ADFG professional judgement. Rainbow Trout periodicity varies from Steelhead where no adult migration is defined, and incubation ends the third week of July. An “x” indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

Coastal Cutthroat Trout (State Conservation Rank S4)

Coastal Cutthroat Trout are native to the Ketchikan Creek watershed and occur in Ketchikan Creek, Ketchikan Lakes and Scout Creek. Cutthroat Trout have not been observed reaches K5 and K6 upstream from Rainbow Falls. Life history and periodicity for Coastal Cutthroat Trout are presented in Table 4-23

Table 4-23. Summary of General Life History and Periodicity attributes of Coastal Cutthroat Trout

Attribute	Description
Growth	Cutthroat Trout can exhibit slow growth and live up to 12 years. Maturity is generally reached at 3-7 years of age (ADFG 2024g). Cutthroat Trout life history varies from freshwater-residents living in small ponds, streams and large landlocked lakes to sea-run forms. Given the diversity of available habitats (i.e., lakes, streams, and marine), multiple life history forms may occur within the Ketchikan Creek watershed. As noted by ADFG (2024g), adult forms can vary in length from 6-16 inches (resident); migratory marine fish up to 18 inches; and lakes forms that can exceed 24 inches. Juvenile Cutthroat Trout are generally 1-6 inches in length. ADFG (2024g) noted that fecundity is typically about 1,000 eggs/female although this can vary with female size and location.
Life Cycle Timing	Adult Cutthroat Trout migrations for the different life history forms likely begin near the time of spawning which occurs from April to early June (see periodicity below). The incubation period begins in April as fertilized eggs and continues through the spring and early summer until fry emergence. Cutthroat Trout may rear in freshwater habitats their entire life or emigrate to coastal marine areas at 3-4 years of age (ADFG 2024g). Time spent in marine environments may vary from a few days to over 100 days before returning to natal streams.
Habitat Use	Habitat use ranges from streams and lakes to estuaries and marine shoreline environments (ADFG 2024g). Stream-type resident forms typically spend the entire year within relatively small sections of a stream. Resident stream dwelling fish can be observed in both slow- and fast-water habitat types but tend to select deep pools with cover such as large woody debris and undercut banks. Females build redds in gravel beds in streams while others may select upwelling areas in lakes. Fertilized eggs are buried and incubate until emergence. After emergence from the gravel, fry disperse into more ideal rearing habitats such as ponds, lakes, and backwater areas. As juveniles grow larger, Cutthroat Trout can be found in deeper slow water habitat types like pools, although they may still be observed in fast water habitat types. As stream temperatures decline in winter, juveniles use different cover and coarse substrates for resting and concealment.
Diet	Cutthroat Trout have a varied diet depending on size and location. Cutthroat Trout feed opportunistically on aquatic and terrestrial insects as well as consuming other fish including sticklebacks, salmonid eggs, and gastropods (ADFG 2024g).
Abundance	Abundance of Cutthroat Trout in reaches of Ketchikan Creek (K2-K4) varied from about 12 to 37 fish/acre in fast-and-slow water habitat types. Cutthroat Trout were most abundant in slow-water habitat types in reach K4 of Ketchikan Creek. No fish greater than 300 mm in length were observed in any reaches of Ketchikan Creek. No

Attribute	Description
	Cutthroat Trout were observed in reaches K5 and K6 of Ketchikan Creek or in Granite Basin Creek.

Attribute	Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Periodicity	Adult Migration												
	Spawning				xxxx	xxxx	x						
	Incubation				xxxx	xxxx	xxxx	xxxx	xxxx				
	Rearing	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

Notes: Periodicity reproduced from ADFG (2024g). An "x" indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

4.4.3.2 Nonnative Fish Species

Chinook Salmon

Chinook Salmon are not native to Ketchikan Creek but are present in reaches K1 through K3 of the stream. The five-foot Falls is the current upstream migration barrier for Chinook Salmon natural production. The Chinook Salmon population in Ketchikan Creek is supported by Deer Mountain Hatchery releases. Unuk and Chickamin rivers are the ancestral stocks of Chinook Salmon reared at Deer Mountain Hatchery (KPU 1998; SSRAA 2024). Unuk and Chickamin river stocks are both considered as fish stocks of concern designated in 2017 and 2021, respectively. The Deer Mountain Hatchery releases approximately 100,000 juvenile Chinook Salmon to Ketchikan Creek. Chinook Salmon returning to Deer Mountain Hatchery are hatchery-produced and ascend a fish ladder from Ketchikan Creek to a small holding area in the hatchery. Periodicity and life history of Chinook Salmon are presented in Table 4-24.

Table 4-24. Summary of General Life History and Periodicity attributes of Chinook Salmon

Attribute	Description
Growth	Chinook Salmon mature at 3-5 years of age before returning to their natal streams. Chinook Salmon spawn in Ketchikan Creek while others return and volunteer to Deer Mountain Hatchery via a fish ladder from Ketchikan Creek to the hatchery. Fish returning average about 36 inches in length and often exceed 30 pounds (ADFG 2024h). Deer Mountain Hatchery releases both juvenile subyearlings (e.g. zero-check) and yearling smolts to Ketchikan Creek.
Life Cycle Timing	Adult Chinook Salmon migrate back to Ketchikan Creek from May to mid-September with spawning occurring from July to nearly the end of September (see periodicity below). The incubation period begins in July and continues through the winter until fry emergence is complete in April. Juvenile Chinook Salmon rear year-round in Ketchikan Creek until they emigrate to ocean as smolts in the spring and summer.

<table>
<tr><th>Attribute</th><th colspan="13">Description</th></tr>
<tr><td>Habitat Use</td><td colspan="13">Adult Chinook Salmon typically spend 1-3 years in the ocean before they return to spawn in natal streams like Ketchikan Creek. Prior to spawning, adult Chinook Salmon rest and mature in pools generally selecting low gradient riffle type habitat for spawning (Bjornn and Reiser 1991; Cooney and Holzer 2006). Females build redds in cobble substrates where fertilized eggs are buried and incubate until emergence. Fry seek low velocity shallow water habitats along stream margins where overhanging vegetation and woody debris provide important cover. As they grow and become larger (parr), juvenile Chinook Salmon move into deeper water preferring pool and run type habitats. As stream temperatures decline in winter, juvenile Chinook Salmon hide in coarse substrate emerging at night and resting in low velocity areas. In spring, with increasing stream temperature and discharge juvenile Chinook Salmon emigrate to the ocean (Healy 1991). Chinook Salmon typically spend 1-3 years in the ocean before they return to spawn in natal streams like Ketchikan Creek.</td></tr>
<tr><td>Diet</td><td colspan="13">Juvenile Chinook Salmon in fresh water initially feed on plankton and later feed on insects. In the ocean, they feed on a variety of organisms including herring, pilchard, sandlance, squid, and crustaceans (Delaney 2008). Salmon grow rapidly in the ocean and often double their weight during a single summer season.</td></tr>
<tr><td>Abundance</td><td colspan="13">Adult Chinook Salmon escapement over the 12 years of evaluation averaged about 213 fish with a maximum count of 1,353 fish.</td></tr>
<tr><td rowspan="5">Periodicity</td><td>Life Stage</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr>
<tr><td>Adult Migration</td><td></td><td></td><td></td><td></td><td>xxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xx</td><td></td><td></td><td></td></tr>
<tr><td>Spawning</td><td></td><td></td><td></td><td></td><td></td><td></td><td>xxxx</td><td>xxxx</td><td>xxx</td><td></td><td></td><td></td></tr>
<tr><td>Incubation</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td></td><td></td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td></tr>
<tr><td>Rearing</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td></tr>
</table>

Notes: Periodicity reproduced from KPU (1998) based on ADFG professional judgement. An "x" indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

Brook Trout

Brook Trout are not native to Ketchikan Creek watershed or the state of Alaska. Brook Trout have been observed in Ketchikan Creek, Ketchikan Lake, and Great Basin Creek (Table 4-15). Periodicity and life history of Brook Trout are presented in Table 4-25.

Table 4-25. Summary of General Life History and Periodicity attributes of Brook Trout

Attribute	Description
Growth	Brook Trout populations in several Southeast Alaska lakes have been evaluated in recent years (ADFG 2024i). The maximum age of fish sampled was 9 years with the

<table>
<tr><th>Attribute</th><th colspan="13">Description</th></tr>
<tr><td></td><td colspan="13">majority of individuals younger than 5 years. The maximum length of fish sampled was 14.9 inches (ADFG 2024i). Fecundity of female Brook Trout is approximately 300-600 eggs/female.</td></tr>
<tr><td>Life Cycle Timing</td><td colspan="13">Brook Trout often occur in cold mountain streams and lakes (Ficke et al 2009). Adult migration to spawning areas in Ketchikan Creek are unknown but presumably occur prior to and during the initial period of spawning. The incubation period begins in October as fertilized eggs and continues through the winter until fry emergence in spring sometime around April. Brook Trout rear in freshwater habitats their entire life or emigrate to lakes within the watershed.</td></tr>
<tr><td>Habitat Use</td><td colspan="13">Habitat use includes both streams and lakes (ADFG 2024i). Stream-type resident forms typically spend the entire year within relatively small sections of a stream. Resident stream dwelling fish can be observed in both slow- and fast-water habitat types but tend to select deep pools with cover such as large woody debris and undercut banks. Females typically build redds in gravel beds within streams, but they can also spawn in lakes over a variety of substrates (ADFG 2024i). Fertilized eggs are buried and develop until emergence. Fry disperse into more ideal shallow rearing habitats where they begin to feed. As juveniles grow larger, Brook Trout can be found in deeper slow water habitat types like pools although they may still be observed in fast-water habitat types. As stream temperatures decline in winter, juveniles use different cover and coarse substrates for resting and concealment.</td></tr>
<tr><td>Diet</td><td colspan="13">An analysis done on the stomach contents of Brook Trout in lakes indicates they eat everything available, including aquatic and terrestrial insects, zooplankton, snails, and leeches (ADFG 2024i).</td></tr>
<tr><td>Abundance</td><td colspan="13">Populations of Brook Trout sampled in various lakes ranged from an estimated 3,200 fish (32 fish/acre) in Green Lake (1,000 acres) to approximately 500 fish (50 fish/acre) in Thimbleberry Lake (10 acres) (ADFG 2024i). We assume that fish densities in Ketchikan Lake fall within this reported range. Brook Trout densities reported for Ketchikan Creek ranged from 3 to 74 fish/acre. In Great Basin Creek, fish densities ranged from 34 to 453 fish/acre.</td></tr>
<tr><td rowspan="5">Periodicity</td><td>Life Stage</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr>
<tr><td>Adult Migration</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Spawning</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>xxxx</td><td>xxxx</td><td></td></tr>
<tr><td>Incubation</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td></td><td></td><td></td><td></td><td></td><td>xxxx</td><td>xxxx</td><td>xxxx</td></tr>
<tr><td>Rearing</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td><td>xxxx</td></tr>
</table>

Notes: Periodicity from ADFG (2024i). An “x” indicates a week within the month that adult migration, spawning, incubation and rearing occurs.

4.4.4 Deer Mountain Fish Hatchery

The Southern Southeast Regional Aquaculture Association (SSRAA) operates seven production salmon hatcheries in southern Southeast Alaska (SSRAA 2024). Those seven hatcheries include: Neets Bay Hatchery, Whitman Lake Hatchery, Burnett Inlet Hatchery, Klawock River Hatchery, Port Saint Nicholas Hatchery, Deer Mountain Hatchery, and Crystal Lake Hatchery.

The SSRAA was issued a private non-profit (PNP) Hatchery Permit #49 to operate Deer Mountain Hatchery in 2017. The Deer Mountain Hatchery, located in the City of Ketchikan, functions primarily as a satellite freshwater rearing site for Whitman Lake Hatchery producing Chinook salmon smolts for release at the hatchery in Ketchikan Creek and at Carroll Inlet. The Deer Mountain Hatchery also acts as a rearing site for fall coho fry from Whitman Lake Hatchery that are transported and released at remote sites. Deer Mountain Hatchery is an alternate broodstock collection site for the Whitman Lake Hatchery Chickamin River Chinook. The hatchery also stocks triploid trout in Carlanna Lake and Harriet Hunt Lake as a cooperative agreement with Sport Fish Division of Fish and Game (SSRAA 2024).

4.4.5 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined in the Magnuson-Stevens Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”. For the purpose of interpreting the definition of essential fish habitat: “waters” includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle.

Essential Fish Habitat (EFH) descriptions and maps were based on the best available scientific information. The EFH maps show freshwater and marine salmon EFH. The freshwater EFH is based on the ADFG’s *Catalog of Waters Important Waters for the Spawning, Rearing, or Migration of Anadromous Fishes-Southeastern Region (Johnson and Daigneault 2008).* Johnson and Daigneault (2008) published the catalog with an effective date of June 2, 2008. Essential Fish Habitat mapped in the Ketchikan Creek watershed based on Johnson and Daigneault (2008) contains streams referenced in Table 4-26. Stream listed include Ketchikan Creek, Schoenbar Creek, and unnamed tributaries to Schoenbar Creek. In Table 4-26, the first line contains the water body number, information about the location of the mouth of the water body, and the known anadromous fish species and life stages present at the mouth of water body. The second line lists the water body name (if known) and location information for the upper point, and the known anadromous fish species and life stages present at the upper point. Essential Fish Habitat for marine areas has not been included here and is beyond the scope and project boundaries for the Ketchikan Lakes Project.

Table 4-26. List of important waters referenced in Johnson and Daigneault (2008) for Ketchikan Creek watershed

Water Body Number/Name	Map Sheet	Latitude	Longitude	Legal	Species and Life Stage
101-47-10250 Ketchikan Creek	Ketchikan B-5	55.34181 N	131.64030 W	C075S091 E30	CHp, COp, Kp, Pp, Sp, CTp, SHp
	Ketchikan B-5	55.35731 N	131.62173 W	C075S091 E20	CHp, COp, Kp, Pp, CTp, SHp
101-47-10250-2007 Schoenbar Creek	Ketchikan B-5	55.34435 N	131.63571 W	C075S091 E30	COp, CTp
	Ketchikan B-5	55.35846 N	131.64169 W	C075S091 E19	COp
101-47-10250-2007-3009 Trib. to Schoenbar Creek	Ketchikan B-5	55.35413 N	131.64106 W	C075S091 E19	COr
	Ketchikan B-5	55.35481 N	131.64428 W	C075S091 E19	COr
101-47-10250-2007-3013 Trib. to Schoenbar Creek	Ketchikan B-5	55.35446 N	131.64058 W	C075S091 E19	COr, CTr
	Ketchikan B-5	55.35562 N	131.64257 W	C075S091 E19	COr, CTr
101-47-10250-2007-3015 Trib. to Schoenbar Creek	Ketchikan B-5	55.35807 N	131.64128 W	C075S091 E19	COp
	Ketchikan B-5	55.35679 N	131.64641 W	C075S091 E19	COp

Notes: Upper Case Species Codes-K=Chinook Salmon; CH=Chum Salmon; CO=Coho Salmon; P=Pink Salmon; CT=Cutthroat Trout; SH=Steelhead Trout; S=Sockeye Salmon. Lower Case Life Stage Codes-m=migration; p=present; r=rearing; s=spawning.

4.4.6 References

Alaska Department of Fish and Game (ADFG) . (2024a). *Special Status Species.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=specialstatus.main (Accessed: December 20, 2024).

ADFG. (2024b). *Coho Salmon species profile.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=cohosalmon.main (Accessed: December 19, 2024).

ADFG. (2024c). *Pink Salmon species profile.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=pinksalmon.main (Accessed: December 19, 2024).

ADFG. (2024d). *Chum Salmon species profile.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=chumsalmon.main (Accessed: December 18, 2024).

ADFG. (2024e). *Dolly Varden species profile.* Available at: https://www.adfg.alaska.gov/index.cfm?adfg=dollyvarden.main (Accessed: December 18, 2024).

ADFG. (2024f). *Steelhead and Rainbow Trout species profile.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=steelhead.main (Accessed: December 20, 2024).

ADFG. (2024g). *Coastal Cutthroat Trout species profile.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=cutthroat.main (Accessed: December 18, 2024).

ADFG. (2024h). *Chinook Salmon species profile.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=chinook.main (Accessed: December 20, 2024).

ADFG. (2024i). *Brook Trout species profile.* Available at: https://www.ADFG.alaska.gov/static/education/wns/brook_trout.pdf (Accessed: December 12, 2024).

Bjornn, T.C. and Reiser, D.W. (1991). 'Habitat requirements of salmonids in streams', in W.R. Meehan (ed.) *Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats*. Bethesda, MD: American Fisheries Society, Special Publication No. 19, pp. 83-138.

Burgner, R.L. (1991). 'Life history of sockeye salmon (*Oncorhynchus nerka*)', in C. Groot and L. Margolis (eds.), *Pacific salmon life histories.* Vancouver, BC: UBC Press, pp. 1-119.

Cooney, T. and Holzer, D. (2006). 'Appendix C: Interior Columbia Basin stream type Chinook salmon and steelhead populations: habitat intrinsic potential analysis', in Interior Columbia Basin Technical Recovery Team (ICTRT), (ed.) *Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs, Review Draft* (2007). Available at: https://docs.cbfwl.org/NOAA/ICTRT200703.pdf (Accessed January 3, 2025).

Delaney, K. (2008). *Chinook Salmon species profile.* Alaska Department of Fish and Game. Available at: https://www.adfg.alaska.gov/static/education/wns/chinook_salmon.pdf (Accessed: December 18, 2024).

Ficke, A.D., Peterson, D.P. and Janowsky, W.A. (2009). *Brook Trout (Salvelinus fontinalis): a technical conservation assessment.* USDA Forest Service, Rocky Mountain Region. Available at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5199583.pdf (Accessed: December 19, 2024).

Fleming, E. (2004). Letter to Magalie R. Salas, Office of the Secretary, Federal Energy Regulatory Commission, February 26, 2004, 'Regarding: Ketchikan Lakes Hydroelectric Project, FERC Project No. 420, Fisheries Habitat Enhancement Mitigation Status Report'. Littleton, CO: OtterTail Environmental Inc., pp. 1-3.

Groot, C. and Margolis, L. (1991). *Pacific salmon life histories.* Vancouver, BC: University of British Columbia Press.

Halupka, K. C., Bryant, M. D., Willson, M. F. and Everest, F. H. (2000). *Biological characteristics and population status of anadromous salmon in Southeast Alaska.*. Portland, OR: USDA, Forest Service, Pacific Northwest Research Station, Gen. Tech. Rep. PNW-GTR-468.

Healey, M. C. (1991). 'Life history of Chinook salmon (*Oncorhynchus tshawytscha*)', in Groot, C. and Margolis, L. (eds.), *Pacific salmon life histories*. Vancouver, BC: UBC Press, pp. 311-393.

Heard, W. R. (1991). 'Life history of pink salmon (*Oncorhynchus gorbuscha*)', in Groot, C. and Margolis, L. (eds.), *Pacific salmon life histories*. Vancouver, BC: UBC Press, pp. 119-231.

Jensen, L.R., Davis, J.C. and Davis, G.A. (2014.) *Ketchikan Creeks: Stormwater quality assessment*, Talkeetna, AK: Aquatic Restoration and Research Institute. Available at: https://dec.alaska.gov/media/16765/ketchikan-creeks-2014-adec.pdf (Accessed: January 7, 2025).

Johnson, J. and Daigneault, M. (2008). *Catalog of waters important for spawning, rearing, or migration of anadromous fishes-Southeastern Region, Effective June 2, 2008.* Special Publication No. 08-06. Anchorage, AK: Alaska Department of Fish and Game, pp. 1-482.

Ketchikan Public Utilities (KPU). (1998). *Aquatic resources study for the Ketchikan Lakes hydroelectric project* (FERC Project No. 420; State Review No. AK9608-09J). Ketchikan, AK: Ketchikan Public Utilities, pp. 1.1-5.2, plus appendices.

NatureServe. (2024). NatureServe Network Biodiversity Location Data for Alaska fishes accessed through NatureServe Explorer [web application]. Arlington, Virginia: NatureServe. Available at: https://explorer.natureserve.org/ (Accessed: December 19, 2024).

Salo, E. O. (1991) 'Life history of chum salmon (*Oncorhynchus keta*)', in C. Groot and L. Margolis (eds.), *Pacific salmon life histories.* Vancouver, BC: UBC Press, pp. 231-311.

Sandercock, F. K. (1991). 'Life history of coho salmon (*Oncorhynchus Kisutch*)', in C. Groot and L. Margolis (eds.), *Pacific salmon life histories.* Vancouver, BC: UBC Press, pp. 395-447.

Southern Southeast Regional Aquaculture Association (SSRAA) . (2024). *2024 Annual Management Plan.* Available at: https://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/annual_management_plans/2024_amp_ssraa.pdf (Accessed December 10, 2024).

Wydoski, R.S. and Whitney, R.R. (2003). *Inland Fishes of Washington, Second Edition.* Seattle, WA: University of Washington Press, pp. 73-78.

4.5 Wildlife and Botanical Resources (18 CFR § 5.6 (d)(3)(v))

4.5.1 Regional Setting

Cool summers, mild winters, and high precipitation amounts distributed throughout the year create a stable environment for coastal temperate rainforests to develop trees with advanced age, many more than 300 years old and some as old as 1000 years. Wind disturbance is the primary cause of trees falling, creating openings that generate new tree growth. This produces, over time, a diverse and structurally sound overstory and highly productive understory, leading to a terrestrial ecosystem of niches for many animals, including at least 53 species of mammals, 231 birds, and five species of amphibians and reptiles (ADFG 2006). McDonald and Cook 2007 report 82 species of mammals and eight amphibians known to occur, or to have occurred in Southeast Alaska. The dominant habitat type in the project vicinity below 2,000 feet elevation is temperate rainforest consisting of Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), and red cedar (*Thuja plicata)*. Lower elevation habitats include stands of red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera trichocarpa*) along major rivers and riparian areas and muskegs (ADFG 2023). See sections 4.5.2 and 4.6 for a more detailed description of vegetation communities. Narrow topography, geographic isolation, and complex ecology of the area result in a high number of endemic species in Southeast Alaska and the Tongass National Forest (Tongass National Forest, 2014). The Project vicinity is located on Revillagigedo Island, which, by nature of being an Island, maintains even greater geographic isolation than other parts of mainland Southeast Alaska, further limiting species diversity.

Upper and Lower Ketchikan Lakes and the surrounding watershed are explicitly protected from unauthorized public access per the July 27, 1939, Act of Congress (H.R. 2413). Prohibited public access limits the transfer of invasive species as well as impacts on sensitive wildlife and plant species.

The FERC Project boundary encompasses both upper and lower Ketchikan Lakes, man-made Fawn Lake, and small reaches of Ketchikan and Granite Creeks, the tunnel right-of-way (ROW) as well as the access road and its associated 100-foot ROW. Much of the land in the Project area lies in the Tongass National Forest, with some owned by BLM, Alaska Mental Health Trust and KPU. Tongass National Forest is managed according to the prescriptive instructions in the Land and Resource Management Plan (2016). The project vicinity for the purposes of this analysis is defined by the Ketchikan Watershed area. See Figure 4-13.

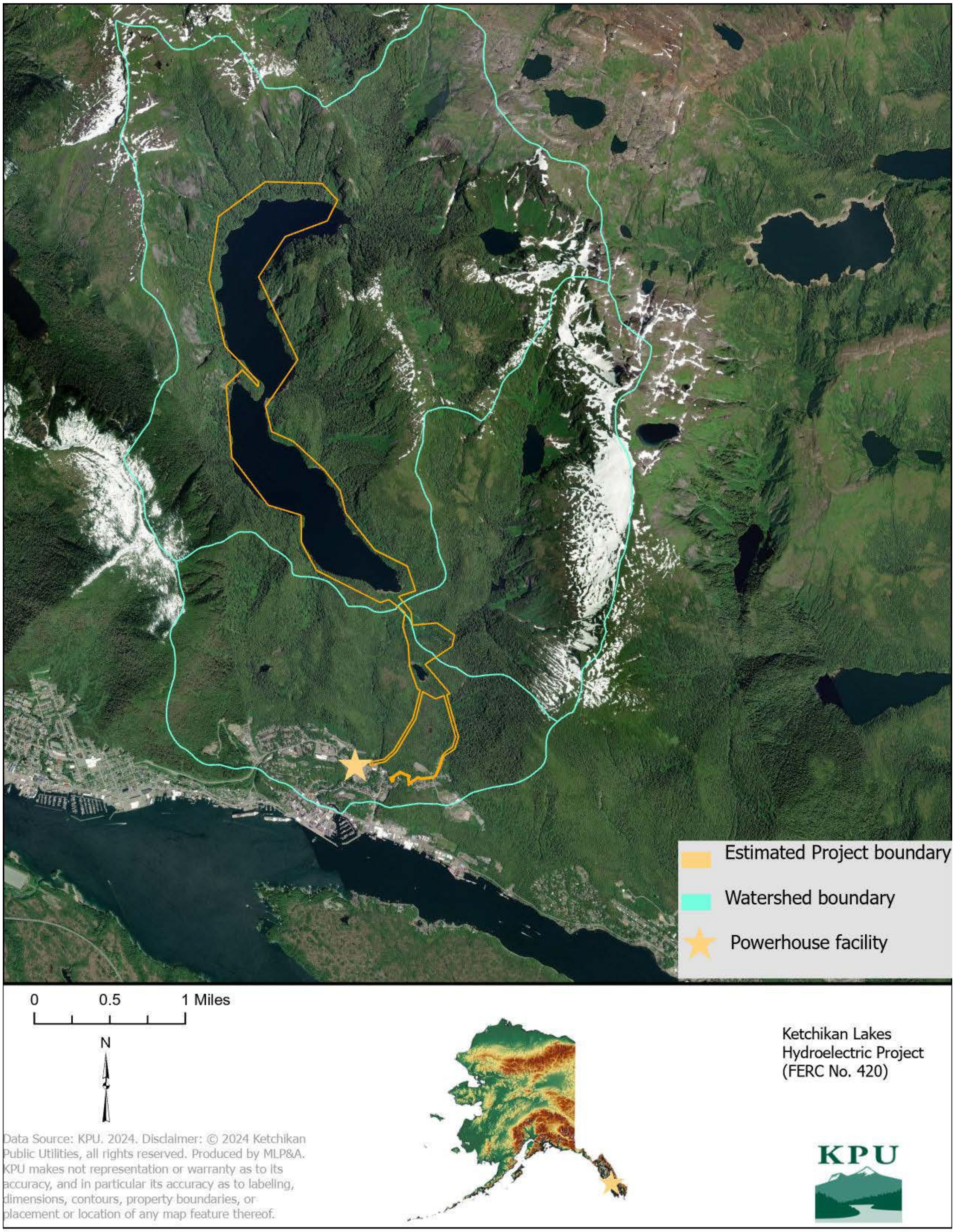

Figure 4-13. Project Area and Vicinity

4.5.2 Upland Botanical Resources

Plants are estimated to make up about two percent of the resources used by communities along coastal and major rivers, according to ADFG's Our Wealth Maintained: A Strategy for Conserving Alaska's Diverse Wildlife and Fish Resources (2006). The same report noted that the Tlingit and Haida peoples of the Alexander Archipelago traditionally subsisted on various mammals, birds, fish, seaweed, and other plants, and some still do so today. No quantitative subsistence plant and berry harvest data for the Ketchikan area could be found.

The Project boundary includes water bodies surrounded by steep slopes. Vegetation classes within the Project boundary were quantified using USFS Ketchikan Misty Fjords Existing Vegetation data (2023), clipped to the Project boundary using ArcGIS Pro. This data shows four main cover types: broadleaf forest, conifer forest, mixed forest, and herbaceous (Table 4-27). Conifer forest is the dominant cover type within the project boundary at about 12 percent (USFS 2023).

Seventy-five percent of the total Project area is water. Within the vegetated cover types, there are 11 Vegetation Types; four of which are dominant: red cedar, Sitka spruce, Sitka spruce-western hemlock, and western hemlock (Table 4-27). Other Vegetation Type classes each contribute less than one percent to the overall vegetation. Those include forested peatland, mixed conifer, mountain hemlock mix, red alder, Sitka spruce-red alder, subalpine mountain mix, wet herbaceous, and yellow cedar (USFS 2023).

Also included within the project area is an access road with a 100-foot ROW. The access road and ROW are potential areas of transfer for invasive species.

Table 4-27. Vegetation Type Classes Within the Project Boundary (USFS 2023)

Vegetation Cover	Vegetation Type	Acres	Percent of Vegetated Cover	Percent total Project Area
Conifer Forest	Mixed Conifer	2.82	1.25	.2
Broadleaf Forest	Red Alder	15.71	7.01	1.8
Conifer Forest	Red Cedar	32.06	14.31	3.7
Conifer Forest	Sitka Spruce	18.31	8.17	2.6
Mixed Forest	Sitka Spruce-Red Alder	8.96	4.00	1.1
Conifer Forest	Sitka Spruce-Western Hemlock	50.75	22.65	5.9
Conifer Forest	Western Hemlock	87.71	39.15	8.7
Herbaceous	Wet Herbaceous	4.47	1.99	.6
Conifer Forest	Yellow Cedar	2.84	1.26	3
Water	Water	618	0	73
Non-Vegetated	Barren	1.8	0	0.2
Non-Vegetated	Developed	2.9	0	0.3

4.5.2.1 Invasive Plant Species

Upper and Lower Ketchikan Lakes are the sole water source for the City of Ketchikan, and public access is strictly prohibited throughout the watershed. This isolation can limit disturbance to rare, threatened, endangered, and sensitive species if they are present and help limit the spread of invasive plant species. Table 4-28 lists invasive plant species within the Project site boundary, with their spatial distribution displayed in Figure 4-14 as listed by the Alaska Natural Heritage Program (AKNHP) (AKNHP 2024b).

Table 4-28. Invasive Plant Species Within the Project Site Boundary

Common Name	Scientific Name
orange hawkweed	*Hieracium aurantiacum L.*
oxeye daisy	*Leucanthemum vulgare Lam.*

Most of the more aggressive invasive plant species are located in the developed area below the Project site but within the vicinity (Table 4-29). Obligate wetland invasive plant species are Pale yellow iris (*Iris pseudacorus L) and* reed canary grass (*Phalaris arundinacea L.).* According to the *Selected Invasive Plants of Alaska* (2004), the road and right-of-way could impact existing vegetation, particularly the potential for introducing invasive plant species.

Table 4-29. Invasive Plant Species in the Vicinity of the Project Site (AKNHP 2024b)

Common Name	Scientific Name
colonial bentgrass	*Agrostis capillaris L.*
sweet vernalgrass	*Anthoxanthum odoratum L.*
big chickweed	*Cerastium fontanum Baumg. ssp. vulgare (Hartm.) Greuter & Burdet*
purple foxglove	*Digitalis purpurea L.*
Japanese knotweed	*Fallopia japonica (Houtt.) Ronse Decr.*
English ivy	*Hedera helix L.*
orange hawkweed	*Hieracium aurantiacum L.*
common velvetgrass	*Holcus lanatus L.*
Pale yellow iris	*Iris pseudacorus L.*
Hairy cat's ear	*Hypochaeris radicata L.*
common nipplewort	*Lapsana communis L.*
oxeye daisy	*Leucanthemum vulgare Lam.*
Italian ryegrass	*Lolium multiflorum Lam.*
reed canary grass	*Phalaris arundinacea L. (cultivar)*
Timothy	*Phleum pratense L.*
common plantain	*Plantago major L.*

Common Name	Scientific Name
annual bluegrass	*Poa annua L.*
spreading bluegrass or Kentucky bluegrass	*Poa pratensis L. ssp. irrigata (Lindm.) H. Lindb. or Poa pratensis L. ssp. pratensis*
rough bluegrass	*Poa trivialis L.*
creeping buttercup	*Ranunculus repens L.*
curly dock	*Rumex crispus L.*
European mountain ash	*Sorbus aucuparia L.*
common dandelion	*Taraxacum officinale F.H. Wigg.*
white clover	*Trifolium repens L.*

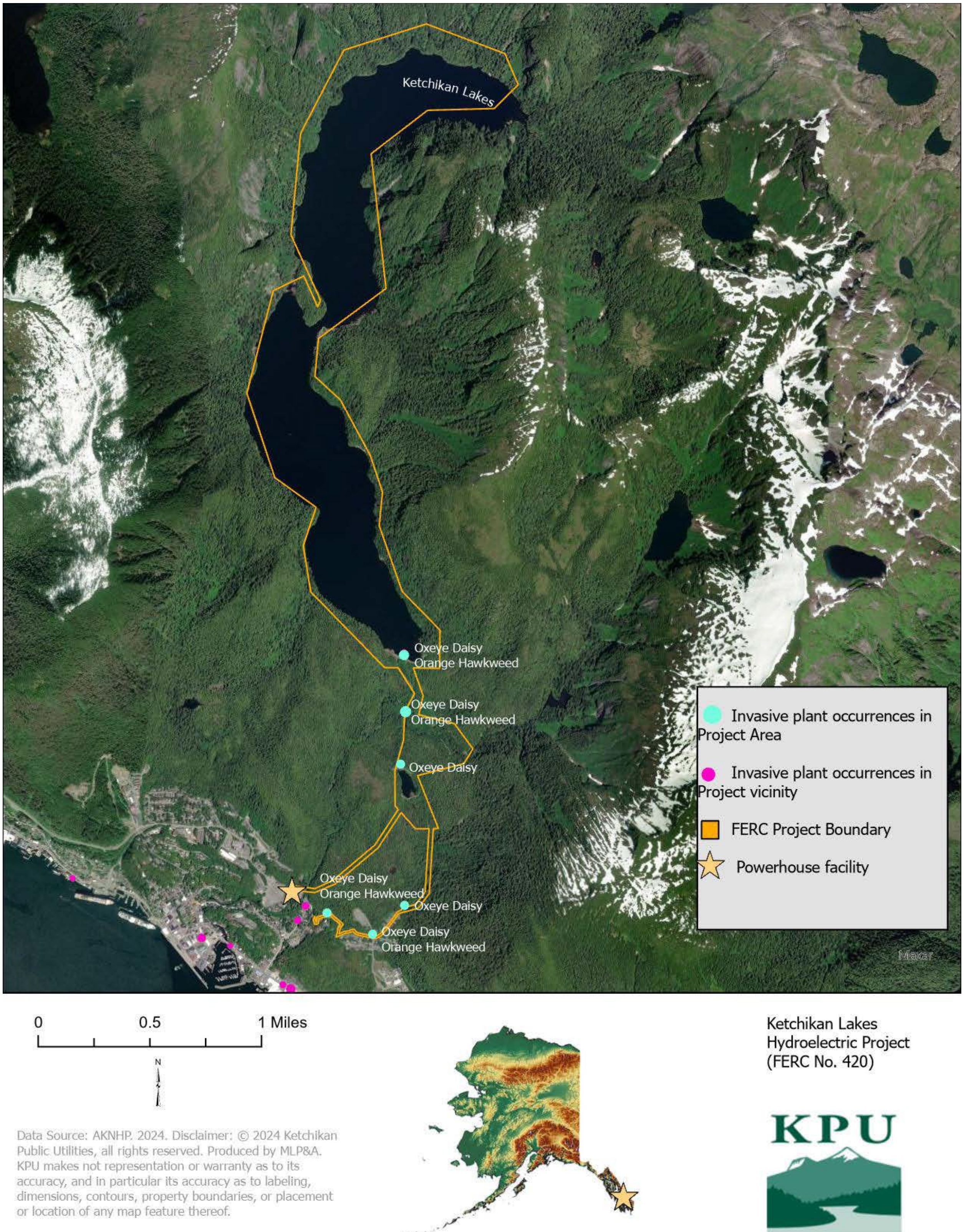

Figure 4-14. Invasive Plant Occurrences Project Area and Vicinity (AKNHP 2024b)

4.5.3 Terrestrial Wildlife Resources

4.5.3.1 Large Mammals

Large mammals in the Project area include the Sitka black-tailed deer (*Odocoileus hemionus sitkensisa*), black bear (*Ursus americanus*), mountain goat (*Oreamnos americanus*), and Alexander Archipelago wolf (*Canis lupus ligoni*) (ADFG 2024). The Project vicinity occurs in Game Management Unit (GMU) 1A.

An important prey species for black bears and wolves, the Sitka black-tailed deer is native to much of the Tongass National Forest and Southeast Alaska. Winter severity and depth of snow control deer population numbers. Sitka black-tailed deer forage in summer for herbaceous vegetation, green woody plants, and evergreen forbs to survive the winter. Sitka black-tailed deer rely on old-growth forest overstory for snow protection and reduction in overwintering (ADFG 2021). A series of mild winters since 2013 have allowed deer numbers to increase, with recent harvest numbers reflecting this abundance. (Dorendorf 2023). Hunting for Sitka black-tailed deer by permit is allowed in the Project Vicinity, in GMU 1a.

Black bears are found throughout the Tongass National Forest and the Project vicinity. Black bears move between low-elevation foraging areas in the spring, and higher-elevation forested areas in alpine and subalpine areas in the winter (ADFG 2024). True black bear density in GMU 1a is not known since density estimate studies in Southeast Alaska have not been conducted, although a density of 0.58/mile2 is suggested as possibly appropriate (Dorendorf 2020). In the Project vicinity, the black bear is often associated with scavenging in unsecured garbage cans and dumpsters. Hunting for black bear by permit is allowed in the Project vicinity, in GMU 1a.

In Alaska, mountain Goats are found primarily in the Chugach and Wrangell Mountains, with a small, isolated population in the Talkeetna Mountains (ADFG 2024). Mountain goats were introduced to Revillagigedo Island in 1983 and have now established a permanent population (ADFG 2024). Coastal goats have altitudinal migrations from summer in subalpine and alpine zones to winter below the tree line in forested areas. Heavy snow influences mountain goat winter forage, regulating mountain goat population numbers from year to year. Hunting for mountain goat by permit is allowed in the Project vicinity in GMU 1a.

The Alexander Archipelago wolf is a subspecies of grey wolf restricted and endemic to Southeast Alaska and morphologically and genetically distinct from other interior populations (ADFG 2012). The Alexander Archipelago wolf has the highest density of all Alaskan wolves due to the high-density prey source of Sitka black-tailed deer (ADFG 2024, Dorendorf 2021). Alexander Archipelago wolves also prey on mountain goats, small mammals, and salmon. On Revillagigedo Island, studies have shown that pack sizes range from 2 to 12 wolves, usually containing one breeding pair and offspring (UFWS 2015). Attempts to list the Alexander Archipelago wolf under the Endangered Species Act (ESA) have been made for decades, the most recent in 2023, and the US Fish and Wildlife Service determined that listing was not warranted at that time (USFWS 2023). Wolves may be harvested with either a hunting or trapping license in GMU 1a.

4.5.3.2 Small Mammals and Furbearers

Furbearing small mammals located in GMU 1a and likely to occur in the Project vicinity include American Marten (*Martes americana*) (considered the most sought-after species for trapping in Southeast Alaska), river otters (*Lontra canadensis),* beaver (*Castor canadensis)*, mink (*Neogale vison*), short-tailed weasel (*Mustela erminea*), ermine (*Mustela erminea*), and red squirrel (*Sciurus vulgaris*). Lynx (*Lynx canadensis*) and Red fox (*Vulpes vulpes*) are rare but also found in GMU 1a (Dorendorf 2019).

Other small mammals and rodents that are likely to occur in the Project vicinity are shown in Table 4-30.

Table 4-30. Common Small Mammals in the Project vicinity (ADFG 2024)

Common Name	Scientific Name
Muskrat	*Ondatra zibethicus*
Revillagigedo Island meadow jumping mouse	*Zapus hudsonius*
Northern flying squirrel	*Glaucomys sabrinus*
Southern red backed vole	*Myodes gapperi*
Long tailed vole	*Microtus longicaudus*
Montane shrew	*Sorex monticolus*
Glacier bay marmot	*Marmota caligata*
Silver haired bat	*Lasionycteris noctivagans*
Little brown bat	*Myotis lucifugus*

4.5.3.3 Birds

Southeast Alaska has approximately 231 bird species (ADFG 2006), and both migratory and non-migratory birds use Revillagigedo Island and the Project vicinity for mating, nesting, travel, and feeding. Habitat in the Project vicinity includes shrub and understory, muskegs, and mixed coniferous forests (KPU 1998).

The 2024 Audubon Bird Checklist for the Ketchikan area and the Project vicinity lists the species in Table 4-31 as common bird species occurring at some point in the season in the Project vicinity. Many other birds occur Frequently on the Audubon Bird Checklist.

Table 4-31. Common Bird species in the Project Vicinity

Common Name	Scientific Name
Common Murre	*Uria aalge*
Marbled Murrelet	*Brachyramphus marmoratus*
Pigeon Guillemot	*Cepphus columba*
Chestnut-backed Chickadee	*Poecile rufescens*
Pelagic Cormorant	*Phalacrocorax pelagicus*
Pine Siskin	*Spinus pinus*
Pacific-slope Flycatcher	*Empidonax difficilis*
Bonaparte’s Gull	*Chroicocephalus philadelphia*
Glaucous-winged Gull	*Larus glaucescens*
Herring Gull	*Larus argentatus*
Short-billed Gull	*Larus brachyrhynchus*
Rufous Hummingbird	*Selasphorus rufus*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*

Common Name	Scientific Name
Steller's Jay	*Cyanocitta stelleri*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Pacific Loon	*Gavia pacifica*
Dunlin	*Calidris alpina arcticola*
Greater Yellowlegs	*Tringa melanoleuca*
Least Sandpiper	*Calidris minutilla*
Red-necked Phalarope	*Phalaropus lobatus*
Western Sandpiper	*Calidris mauri*
Dark-eyed Junco - Oregon subspecies	*Junco hyemalis*
Fox Sparrow	*Passerella iliaca*
Lincoln's Sparrow	*Melospiza lincolnii*
American Wigeon	*Anas americana*
Bufflehead	*Bucephala albeola*
Canada Goose	*Branta canadensis*
Common Merganser	*Mergus merganser*
Greater Scaup	*Aythya marila*
Green-winged Teal	*Anas crecca*
Long-tailed Duck	*Clangula hyemalis*
Mallard	*Anas platyrhynchos*
Surf Scoter	*Melanitta perspicillata*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
American Pipit	*Anthus rubescens*
Orange-crowned Warbler	*Oreothlypis celata*
Townsend's Warbler	*Setophaga townsendi*
Red-breasted Sapsucker	*Sphyrapicus ruber*
Pacific Wren	*Troglodytes pacificus*
Bald Eagle	*Haliaeetus leucocephalus*

In 1917, The Alaska Territorial Legislature imposed a bounty on bald eagles due to claims of excessive predation on salmon. The claims of eagle predation on salmon were largely discounted, but the bounty system lasted for 36 years and led to the killing of a confirmed 120,195 birds and likely many more. When Alaska gained statehood in 1959, bald eagles in Alaska came under the Bald Eagle Protection Act of 1940, making it illegal to kill or possess an eagle, dead or alive, or to possess any part of an eagle, including feathers (ADFG 2024). In 2007, the Bald Eagle was removed from the list of threatened and endangered species. The Tongass National Forest, including the Project vicinity, is home to the world's largest population of bald eagles (Audubon 2024a). The salmon-rich streams and mild climate of the temperate rainforest ecosystem provide diverse and abundant habitat for the bald eagle (ADFG 2024).

Bald Eagles are still protected under the Protection Act of 1940, providing criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part (including feathers), nest, or egg thereof." Take is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb".

4.5.3.4 Amphibians

Up to eight species of amphibians are reported in Southeast Alaska (McDonald and Cook 2007). The roughskin newt (*Taricha granulosa*) and western toad (*Anaxyrus boreas*) have been observed on Revillagigedo Island based on historic specimens and on ADFG range maps (Macdonald and Cook 2007, ADFG 2024). The roughskin newt is generally terrestrial after metamorphosis occurs but does return to aquatic habitats during breeding season or during dry weather. On land, the species uses cover near aquatic habitat for breeding, including forests, woodlands, grasslands, in the open or under rocks, logs, and detritus (ADFG 2024). Western toads have a wide habitat range and can be found from sea level to high mountain elevations, usually in open, non-forested areas near water. Mostly on land, they enter water to breed in lakes, ponds, and other calm waters (ADFG 2024).

Habitat for the Columbia spotted frog (*Rana luteiventris)* and northwest salamander (*Ambystoma gracile*) also exist, although their presence on Revillagigedo Island has not been documented (ADFG 2024).

4.5.3.5 Invasive Animal Species

Invasive animal species are defined by Executive Order 13112 as "non-native (or alien) to the ecosystem under consideration and, whose introduction causes or is likely to cause economic or environmental harm or harm to human health."

Although the Project is located in a geographically isolated area with a low human population, harsh climate, and remoteness that should limit invasive wildlife species, the Project vicinity is near a port with high-volume marine traffic, making it vulnerable to invasive species. AKNHP identified the following invasive wildlife species in the Project vicinity as of 2024. The Rock Pigeon (*Columba livia*) is a locally common resident in Ketchikan, where it occurs in the hundreds and nests along the waterfront in buildings and on pilings under buildings. The Rock Pigeon is found strictly near human settlements and is yet to be recorded away from the immediate vicinity of the Ketchikan or Metlakatla road systems (AKNHP 2024).

Pacific chorus frog (*Pseudacris regilla*) (also known as Pacific tree frog) was initially introduced in the 1960s to Ward Lake, only a few miles from the Project study area (AKNHP 2024). The Alaska Herpetological Society 1992 states the population at this site appears stable and, as of 1992, has not spread to other areas of the island.

The Norway rat (*Rattus norvegicus*) has established breeding populations in Ketchikan. Norway rats are believed to be native to Asia. Beginning in the Middle Ages, they spread to Europe and are now in most major human settlements. (AKNHP 2024, ADFG 2024).

4.5.4 References

Alaska Center for Conservation Science. (2023). *Alaska Rare Plants Occurrences database*., University of Alaska, Anchorage. (Accessed: 15 November 2024)

Alaska Center for Conservation Science. (2023). *Plant Species and Ecosystems of Conservation Concern – Alaska Center for Conservation Science*. [online] Alaska.edu. Available at: https://accs.uaa.alaska.edu/vegetation/conservation-concern/ (Accessed 17 December 2024).

Alaska Department of Fish and Game (ADFG). (2012). *Status of Wolves in Southeast*. [online] Available at: https://www.ADFG.alaska.gov/static/species/speciesinfo/wolf/pdfs/alexander_archipelago_wolf_status_10-11-12.pdf. (Accessed 17 November 2024).

ADFG. (2019). *Alaska's Animals, Alaska Department of Fish and Game*. [online] Alaska.gov. Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=animals.main (Accessed 18 November 2024).

Alaska Herpetological Society. (2024). Available at: https://www.akherpsociety.org/pacific-chorus-frog. (Accessed November 20, 2024).

Alaska Native Heritage Program (AKNHP). (2024a). (2024). *Correspondence*. Julie Polasik.

AKNHP. (2024b.) (2024). *Alaska Exotic Plant Information Clearinghouse database.* Available at: https://accs.uaa.alaska.edu/invasive-species/non-native-plants/. Alaska Center for Conservation Science, University of Alaska, Anchorage. (Accessed November 11, 2024)

Audubon Society. (2015). *Old-Growth Trees in Tongass National Forest*. [online] Audubon. Available at: https://www.audubon.org/conservation/old-growth-trees-tongass-national-forest. (Accessed 20 November 2024).

Audubon Society. (2019). *Ketchikan*. [online] Available at: https://ak.audubon.org/southeast-alaska-birding-trail/ketchikan (Accessed 19 November 2024).

Cook, J.A., Dawson, N.G. and MacDonald, S.O. (2006). Conservation of highly fragmented systems: The north temperate Alexander Archipelago. *Biological Conservation*, (133), pp.1–15.

Dorendorf, R. (2019). *Furbearer management report and plan: Game Management Unit 1A: Report period 1 July 2012–30 June 2017, and plan period 1 July 2017–30 June 2022*. Juneau, AK: Alaska Department of Fish and Game. Species Management Report and Plan ADF&G/DWC/SMR&P-2019-7.

Dorendorf, R. (2020). *Black bear management report and plan: Game Management Unit 1A: Report period 1 July 2013–30 June 2018, and plan period 1 July 2018–30 June 2023*. Juneau, AK: Alaska Department of Fish and Game. Species Management Report and Plan ADF&G/DWC/SMR&P-2020-27.

Dorendorf, R. (2021). *Wolf management report and plan: Game Management Unit 1A: Report period 1 July 2015–30 June 2020, and plan period 1 July 2020–30 June 2025*. Juneau, AK: Alaska Department of Fish and Game. Species Management Report and Plan ADF&G/DWC/SMR&P-2021-35.

Dorendorf, R. (2023). *Deer management report and plan: Game Management Unit 1A: Report period 1 July 2016–30 June 2021, and plan period 1 July 2021–30 June 2026*. Juneau, AK: Alaska

Department of Fish and Game. Species Management Report and Plan ADF&G/DWC/SMR&P-2023-10.

H.R. 2413. (1939) 76th U.S. Congress. *For the Protection of the Water Supply of the City of Ketchikan*. Chapter 389, Public No. 240 Available at: https://maint.loc.gov/law/help/statutes-at-large/76th-congress/session-1/c76s1ch389.pdf (Accessed 15 November 2024).

Ketchikan Public Utility (KPU). (1992). *Application for New License for the Beaver Falls Hydroelectric Project: FERC Project No. 1922*. Supplementary Technical Information.

KPU. (1998). *Final Environmental Assessment for Hydropower License*. Ketchikan, AK. State Review No AK9608-09J.

Klinkhart, E.G., E.G. and Schoen, J.W. (1977). *Fish and Wildlife Resource Inventory of Southeastern Alaska*. U.S. Government Printing Office.

MacDonald, S.O. and Cook, J.A. (2007). Mammals and Amphibians of Southeast Alaska. *Museum of Southwestern Biology*, Special Volume (Publication No. 8).

Shepherd, M., Huette, T. and Snyder, J.M. (2004). *Selected Invasive Plants of Alaska*. U.S. Forest Service, Alaska Region.

U.S. Fish and Wildlife Service (USFWS). (2015). *Species Status Assessment for the Alexander Archipelago Wolf (Canis lupus ligoni)*. Alaska Region, Anchorage, Alaska

USFWS. (2023). *U.S. Fish and Wildlife Service Finds Listing of Alexander Archipelago wolf under the Endangered Species Act Not Warranted | U.S. Fish & Wildlife Service*. [online] FWS.gov. Available at: https://www.fws.gov/press-release/2023-08/us-fish-and-wildlife-service-finds-listing-alexander-archipelago-wolf-under (Accessed 17 November 2024).

USFWS. (2023). *Species Status Assessment Report for the Alexander Archipelago Wolf (Canis lupus ligoni) Version 2.1*. Alaska Region, Anchorage, Alaska.

U.S. Forest Service (USFS). (2006). Selected Invasive Plants of Alaska.

USFS. (2014). *Tongass Land Management Plan Monitoring & Evaluation Report*. [online] Usda.gov. Available at: https://www.fs.usda.gov/detail/tongass/landmanagement/planning/?cid=stelprd3856205 [Accessed Nov. 2024].

USFS. (2023). *Ketchikan Misty Fjords Existing Vegetation Map*. Alaska Region Geospatial Program.

USDA National Invasive Species Information Center (1999). *Executive Order 13112 - Invasive Species | National Invasive Species Information Center*. [online] Available at: https://www.invasivespeciesinfo.gov/executive-order-13112#details--section-1-definitions (Accessed 19 November 2024).

4.6 Wetlands, Riparian, and Littoral Habitat (18 CFR § 5.6 (d)(3)(vi))

4.6.1 Wetland, Littoral, and Riparian Habitat

Riparian and Littoral areas are zones of interaction between aquatic and terrestrial environments associated with streamsides (riparian), lakeshores (littoral), and floodplains. These zones are often characterized by high species diversity and are associated with wetlands. Wetlands are ecosystems depending on recurrent or constant, shallow inundation or saturation at or near the surface of the substrate and exhibiting physical, chemical, and biological features including hydric soil properties and hydrophytic vegetation (National Research Council, 1995 p. 55).

Wetlands within the Project area were quantified according to the National Wetland Inventory (NWI) (USFWS 2024), based on a system developed by Cowardin et al. (1979). Wetland acres were calculated by clipping the georeferenced Project boundary to the NWI Mapper layer using ArcGIS Pro.

Five wetland types occur within the FERC Project Boundary, totaling approximately 640 acres (See Table 4-32). The total Project Boundary is approximately 850 acres, and of this, approximately 580 acres (68% of the total Project area and 91% of Project area wetlands) are designated by NWI as limnetic lake wetland type. Limnetic lake wetlands are classed as Lacustrine and are deepwater (greater than 8 feet) habitats that are permanently flooded (USFWS 2024).

The remaining wetlands equal approximately 9% of the total Project area. See Table 4-32 and Figure 4-15.

Table 4-32. Wetland Types and Acres Project area (USFWS 2024)

NWI Wetland Type/Code	Class	Acres	% Total Wetland	%Total Area
Lake, Limnetic (L1UBHh)	Lacustrine	580	91.2	68
Lake, Littoral (L2USC)	Lacustrine	21	4	
Freshwater Forested/Shrub Wetland (PFO4/SS4B, PFO4B, PSS1A, PSS1B)	Palustrine	29	5	
Freshwater Pond (PUBH, PUSC)	Palustrine	7.6	1	
Riverine (R5UBH)	Riverine	2.5	0.4	

4.6.1.1 Freshwater Forested/Shrub Wetlands

Freshwater Forested/Shrub Wetlands occur in 5% (see Table 4-32) of the wetlands present in the Project area. This Palustrine system includes nontidal wetlands dominated by trees, shrubs, persistent emergents, and emergent mosses. The class is Forested, dominated by stunted evergreens and is seasonally saturated (USFWS 2024). Freshwater Forested/Shrub Wetlands are mapped throughout the southern portion of the Project area (see Figure 4-15).

4.6.1.2 Littoral Lake Wetlands

Littoral Lake wetlands occur in 2.45% (see Table 4-32) of the wetlands present in the Project area. Littoral wetlands are classed as Lacustrine. The Littoral system extends from the shore to a depth of approximately 8 feet below low water, or to the maximum extent of the nonpersistent emergent if these grow at depths greater than 8 feet. Littoral systems are seasonally flooded, lack trees, shrubs, persistent emergent, and emergent mosses or lichens with greater than 30% areal coverage and must be greater than 20 acres in size. Littoral wetlands are mapped on the southern end and eastern side of Ketchikan Lakes (see Figure 4-15).

4.6.1.3 Freshwater Pond Wetlands

Freshwater Pond (1% of wetlands) wetlands (see Table 4-32) are mapped at man-made Fawn Lake and an unnamed pond north of Fawn Lake. Freshwater ponds are described as Palustrine systems dominated by trees, shrubs, persistent emergent, emergent mosses or lichens and include areas less than 20 acres, water depth in the deepest part of the basin less than 8 feet at low water (USFWS 2024).

4.6.1.4 Riverine Wetlands

Riverine wetlands are mapped in less than 0.5% (see Table 4-32) of Project area wetlands and occur in the Ketchikan Creek and Granite Creek riparian areas (see Figure 4-15).

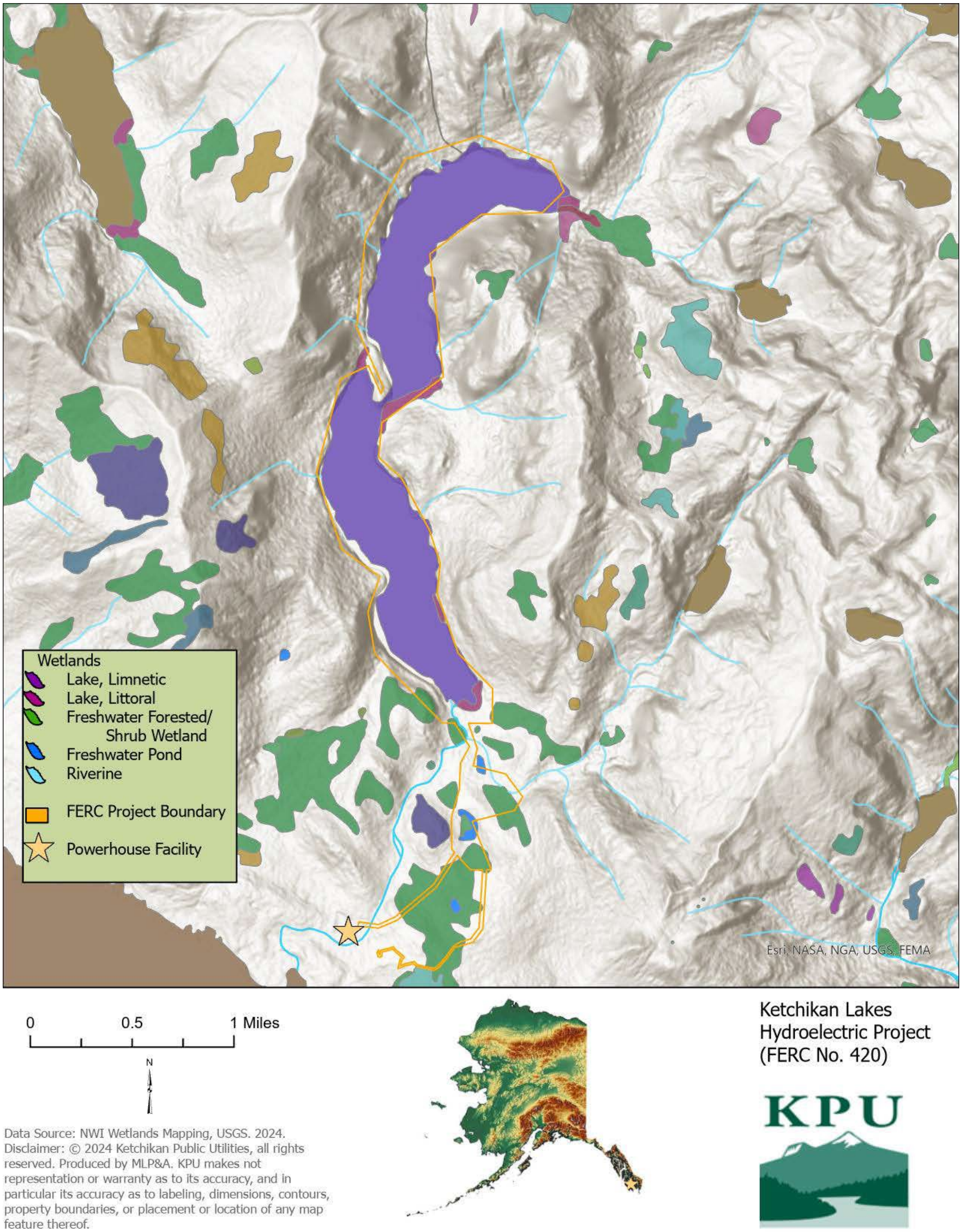

Figure 4-15. Wetland Types in the Project Area (USFWS 2024)

4.6.1.5 Plant and animal species in the wetland, littoral, and riparian habitat

Wildlife Species

Wildlife species within the littoral and riparian habitat include species directly associated with these habitats (Table 4-33) as well as other species such that use these areas for prey sources and water. Voles, for example, are a primary food source for weasels, martens, foxes, all owls, inland breeding gulls, and others (ADFG 2006). Wetlands are critical ecosystems for many species. Waterfowl and waterbirds require wetlands and many species of songbirds and feed in wetland habitats (ADFG 2006). Raptors and owls frequently hunt in wetland habitat (ADFG 2006). Many species of berries and seeds grow in or near wetlands, a food source for birds and small mammals. Some amphibians may spend their entire lives in wetlands, while others use wetlands for breeding only (ADGF 2006).

Table 4-33. Animal Species Associated with Southeast Alaska Freshwater Wetland Areas (ADFG 2006)

Common Name	Scientific Name
Revillagigedo Island meadow jumping mouse	*Zapus hudsonius*
Montane shrew	*Sorex monticolus*
Roughkin newt	*Taricha granulosa*
Western Toad	*Anaxyrus boreas*

Plant Species

The 1998 EA for FERC relicensing noted vegetation present in wetlands in the Project areas. Muskeg areas contain plant species such as bog cranberry, sedge, and marsh violet. Forested wetland species include Shore Pine, lodgepole pine, and yellow cedar. Littoral area species include burweed, pondweed, and aquatic buttercup (KPU 1998).

Typical plant species composing wetland, littoral and riparian habitat of the Project area have been characterized in the USDA Soil Survey (Soil Survey Staff, 2024) as plant species correlated to the soil types within these zones and occur below in Table 4-34.

Table 4-34. Common Plant Species in Wetland, Littoral, and Riparian Habitat

Common Name	Scientific Name	Project Area (KPU 1998)
Salmonberry	*Rubus spectabilis*	
Blueberry	*Vaccinium alaskaense*	
Huckleberry	*Vaccinium parvifolium*	
Deer Cabbage	*Nephrophyllidium crista-galli*	
Devils Club	*Oplopanax horridus*	
Black Current	*Ribes spp.*	
Marshmarigold	*Caltha palustris*	
Thimbleberry	*Rubus parviflorus*	

Common Name	Scientific Name	Project Area (KPU 1998)
Sphagnum moss	*Sphagnum spp.*	
Rusty Menziesiz	*Menziesia ferruginea*	
Western Red Cedar	*Thuja plicata*	Single stand SE of Ketchikan dam
Western Hemlock- Sitka Spruce	*Tsuga heterophylla- Picea sitchensis*	Dominates slopes around Upper Ketchikan Lakes and uplands in southern part of project area
Red Alder	*Alnus rubra*	less steep valley and alluvial bottoms in southern part of Project Area.

4.6.2 Invasive Species

Invasive plant species identified by the Alaska Exotic Plant Information Clearinghouse database (occurring AKNHP 2024a) within the Project area wetlands are listed in Table 4-35 determined by overlaying the AKNHP clearinghouse dataset with NWI wetland dataset in ArcGIS Pro.

Table 4-35. Invasive Plant Occurrences Project Area Wetlands

Common Name	Scientific Name
Orange hawkweed	Hieracium aurantiacum
Oxeye daisy	Leucanthemum vulgare

4.6.3 References

Adamus, P.R. et al. (2015) Manual for Wetland Ecosystem Services Protocol for Southeast Alaska (WESPAK-SE).

Alaska Department of Fish and Game (ADFG). (2006). Our Wealth Maintained: A strategy for Conserving Alaska's Diverse Wildlife and Fish Resources. Alaska Department of Fish and Game, Juneau, Alaska. Appendix 5.3AKNHP (Alaska Natural Heritage Program). 2024a.

Alaska Exotic Plant Information Clearinghouse database (https://accs.uaa.alaska.edu/invasive-species/non-native-plants/). Alaska Center for Conservation Science, University of Alaska, Anchorage. (Accessed November 11, 2024).

Alaska Natural Heritage Program (AKNHP). (2024). Alaska Rare Plants Occurrences database (https://accs.uaa.alaska.edu/vegetation/conservation-concern/). Alaska Center for Conservation Science, University of Alaska, Anchorage. Accessed November 15, 2024.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. (1979). Classification of Wetlands and Deepwater Habitats of the United States. Performed for U.S. Department of the Interior Fish and Wildlife Service. FWS/OBS-79/31.

Ketchikan Public Utilities (KPU). (1998). Final Environmental Assessment for Hydropower License. State Review No AK9608-09J.

National Research Council. (1995). Wetlands: Characteristics and Boundaries. Washington, DC: The National Academies Press. https://doi.org/10.17226/4766.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online. (Accessed November 2024).

U.S. Fish and Wildlife Service (USFWS). (2024). National Wetlands Inventory Wetlands Mapper. National Wetlands Inventory (usgs.gov). (Accessed November 2024).

4.7 Rare, Threatened, and Endangered Species (18 CFR § 5.6 (d)(3)(vii))

4.7.1 Overview

Threatened and endangered species have specific legal meaning under the Federal ESA. The State of Alaska has specific legal language and lists for threatened and endangered species, ‘Determining Endangered Species’ Statute 16.20.190. Rare is not a legal term, rather, it is a colloquial term used to describe species with small population size, limited geographic range, and/or species found in few specialized habitats (Jones et al 2002).

Much of the Project area lies in the Tongass National Forest. Upper and Lower Ketchikan Lakes are the sole water supply for the city of Ketchikan and public access is restricted. The limited access to much of the project area can help limit habitat damage and loss of species of conservation concern.

4.7.2 Federally Listed Species

The ESA is implemented by two federal agencies depending on species: the US Fish and Wildlife Service (USFWS), for terrestrial and freshwater species as well as marine mammals or the NMFS, for marine species (ADFG 2024). These agencies consider a species **endangered** if it is in danger of extinction throughout all or a significant portion of its range. A species is considered **threatened** if it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range (ADFG 2024).

The State of Alaska maintains a list of endangered species under Alaska Statute 16.20.190, based on inclusion criteria approved by the ADFG Commissioner.

Many species that are threatened or endangered in other parts of the United States thrive in Alaska. Geographical isolation, relatively recent growth in population, limited development, small agricultural industry, and conservative laws on introducing and importing exotic animals all contribute to these relatively favorable conditions (ADFG 2024).

4.7.2.1 Wildlife and Botanical

Wildlife

In the Project vicinity, the short-tailed albatross (USFWS 2024), an avian species designated as endangered by the ESA and the State of Alaska, could occur based on an Information for Planning and Consultation search. No critical habitat is designated within the Project area (USFWS 2024). The short-tailed albatross was once the most common albatross in the North Pacific but was hunted to near extinction in the early 1900s. A volcanic eruption near their only breeding colony in 1930 led to concern of extinction. However, juveniles at sea returned to the breeding colony, and the species is recovering slowly (ADFG 2024). Range maps indicate the short-tailed albatross is wide-ranging across coastal Alaska, from the Bering Sea through the Aleutian chain and the Gulf of Alaska (USFWS 2024).

After receiving a petition to list the Alexander Archipelago wolf on the Federal ESA, on August 23, 2023 the U.S. Fish and Wildlife Service issued a decision not to list the Alexander Archipelago wolf (USFWS 2023).

The Western Toad is listed as Near Threatened by the International Union for Conservation of Nature and Natural Resources (ADFG 2024). Possible threats include fungal and bacterial infections and prolonged periods of dry weather (ADFG 2024).

Botanical

According to the Alaska Rare Plant Guide (2013), the rank calculator is used to assign preliminary conservation status to biophysical settings and plant associations. The system "sums weighted values for factors related to rarity, trends, and threats." Rankings of 1 or 2 are the rarest and are critically imperiled or imperiled, while ranks of 4 and 5 are apparently secure and secure. This conservation ranking system evaluates species based on a number of factors and serves as a guide for understanding species that may or may not be included on State or Federal endangered species lists. Table 4-36 lists each.

Rankings with S1 are critically imperiled, with an extremely high risk of extirpation on the state level. Rankings of G1 are critically imperiled with an extremely high risk of extirpation on a global scale. There are no G1 plants in the project site or vicinity, however, there are several ranked as S1. S2 is imperiled at high risk of extirpation at the state level. G2 is imperiled and at high risk of extirpation on the global scale. Those with ranks of S3 are rare within the state and at moderate risk of extirpation. Those ranked as G3 are vulnerable and at moderate risk of extinction. Plants with ranks of S4 are apparently secure, are uncommon within the state, and maybe a long-term conservation concern. Those plants with ranks of G4 are apparently secure but uncommon, with some cause for concern because of declines or other factors. Plants with ranks of S5 are secure, widespread throughout the state, and not at risk of extirpation. Those plants ranked as G5 are secure, widespread, and abundant (Nawrocki 2013).

Table 4-36. Species within the project vicinity ranked by conservation status to determine their rarity within the State of Alaska and globally (AKNHP 2024)

Common Name	Scientific Name	State Rank	Global Rank	Habitat
watershield	*Brasenia schreberi*	S1	G5	submerged aquatic
povery oatgrass	*Danthonia spicata*	S1	G5	upland
Western quillwort	*Isoetes occidentalis*	S3S4	G4G5	submerged aquatic
wire grass	*Juncus tenuis*	S2	G5	moist to wet soils
Dortmann's cardinalflower	*Lobelia dortmanna*	S1S2	G4G5	wetland
twinberry honeysuckle	*Lonicera involucrata*	S3S4	G5	upland
club moss	*Lycopodiella inundata*	S3S4	G5	wetland
Western saxifrage	*Micranthes occidentalis*	S1	G5	shaded bank
alpine saxifrage	*Micranthes tolmiei*	S2S3	G5	alpine upland

Common Name	Scientific Name	State Rank	Global Rank	Habitat
Lewis' monkeyflower	*Mimulus lewisii*	S2S3	G5	ephemeral stream
toothed surfgrass	*Phyllospadix serrulatus*	S3S4	G4	intertidal zone
round-leaved orchid	*Platanthera orbiculata*	S3S4	G5	seawater
Fowler's knotweed	*Polygonum fowleri spp. fowleri*	S3S4	G5	marsh
birds foot buttercup	*Ranunculus orthorhynchus var. orthorhynchus*	S3	G5T5	upland
Pacific yew	*Taxus brevifolia*	S3	G5	upland
three-leaf foamflower	*Tiarella trifoliata var. laciniata*	S3	G5T5	moist soils

Table 4-37. Rare plant species potentially in Project area (AKNHP 2024)

Common Name	Scientific Name	State Rank	Global Rank	Habitat
round-leaved orchid	*Platanthera orbiculata*	S3S4	G5	wet woods, bogs
Western saxifrage	*Micranthes occidentalis*	S1	G5	shaded bank
toothed surfgrass	*Phyllospadix serrulatus*	S3S4	G4	intertidal zone
wire grass	*Juncus tenuis*	S2	G5	moist to wet soils
three-leaf foamflower	*Tiarella trifoliata var. laciniata*	S3	G5T5	moist soils

According to the Alaska Rare Vascular Plant List (2024), no federally listed threatened or endangered plant species exist in the project area or vicinity. However, that source indicates two species within the project vicinity on the BLM Watch List and one on the USFS list. The BLM Watch List plants are not considered sensitive, and the sensitive species policy does not apply. However, the species may be added to the Sensitive list if new information concerning threats and species biology, or statewide trends, warrant listing. Path rush or poverty rush, *Juncus tenuis*, is a perennial that tends to grow in moist soils that are occasionally wet, but well-draining. Toothed surfgrass (*Phyllospadix serrulatus*) is an aquatic plant that tends to live in the intertidal zone and provides habitat for marine macroinvertebrates. This plant has potentially been found within the project vicinity (See Table 4-37 and Figure 4-16). Lesser roundleaved orchid (*Platanthera orbiculate*) is noted by the USFS but is not classified as nationally threatened or endangered.

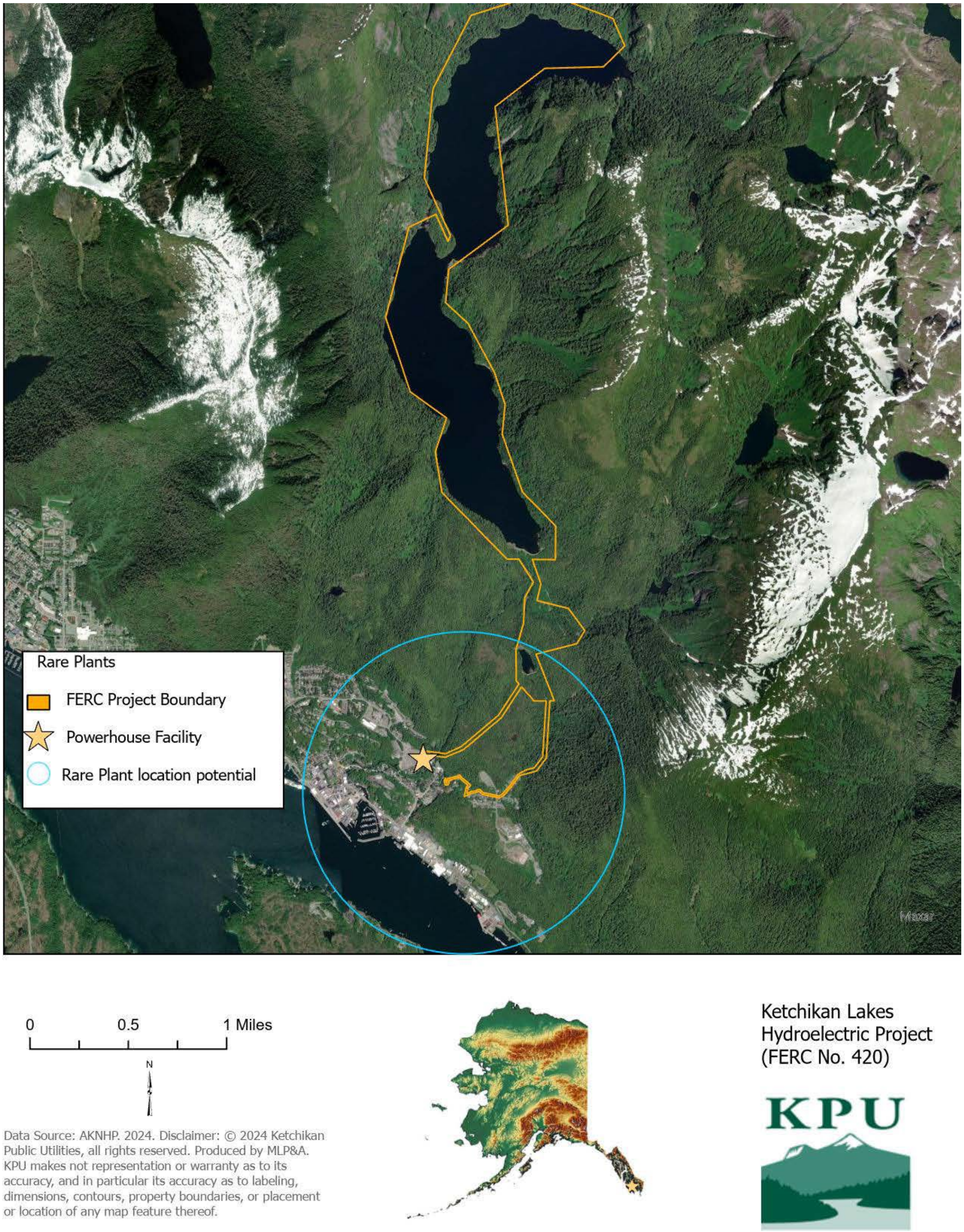

Figure 4-16. Rare Plant Occurrences Project Vicinity

4.7.2.2 Aquatic

According to the ADFG Special Status Species listing, no species of fish within the Ketchikan Creek watershed are identified as being Federally listed as Threatened or Endangered according to the ESA (ADFG 2025a).

4.7.3 State Listed Species

4.7.3.1 Wildlife and Botanical

Wildlife

The State of Alaska maintains a list of Endangered wildlife species under Alaska Statute 16.20.190; the State of Alaska does not maintain a list of Threatened species. There are currently five state-listed wildlife species, one of which is the Short-tailed Albatross. No Critical Habitat for the Short-tailed albatross is designated within the Project area (ADFG 2024).

Botanical

According to the AKNHP, there are no state-listed threatened or endangered plant species in the Project area or vicinity.

4.7.3.2 Aquatic

According to the ADFG Special Status Species listing, no native species of fish within the Ketchikan Creek watershed are identified as being a species of concern (ADFG 2025b). The ADFG defines Yield, Management, and Conservation Concerns, which are described below:

- A stock of Yield Concern is defined as "a concern arising from a chronic inability, despite the use of specific management measures, to maintain specific yields, or harvestable surpluses, above a stock's escapement needs; a Yield Concern is less severe than a Management Concern" (5 AAC 39.222(f)(42)).

- A stock of Management Concern is defined as a concern arising from a chronic inability, despite the use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, OEG, or other specified management objectives for the fishery; a Management Concern is not as severe as a Conservation Concern. (5 AAC 39.222(f)(21)).

- A stock of Conservation Concern is defined as a concern arising from a chronic inability, despite the use of specific management measures, to maintain escapements for a stock above a sustained escapement threshold (SET); a Conservation Concern is more severe than a Management Concern. (5 AAC 39.222(f)(6)).

The non-native hatchery population of Chinook Salmon in Ketchikan Creek is supported by Deer Mountain Hatchery releases. Unuk and Chickamin rivers are the ancestral stocks of Chinook Salmon reared at Deer Mountain Hatchery (KPU 1998; SSRAA 2024). Unuk and Chickamin river stocks are both considered as fish stocks of Management Concern designated in 2017 and 2021, respectively. Because they are a hatchery brood used in the watershed, it is unclear whether the designation of concern still applies.

4.7.4 Critical and Special Habitats

4.7.4.1 Wildlife and Botanical

No Critical or special habitats are designated for the Project area for terrestrial resources.

4.7.4.2 Aquatic

According to the ADFG, the Ketchikan Creek watershed is not identified as a Critical Habitat Area (ADFG 2025c). Essential Fish Habitat has been designated for portions of Ketchikan Creek watershed (see Section 4.4.5).

4.7.5 References

Alaska Center for Conservation Science (2024). *Alaska Rare Plants Occurrences database*. [online] Alaska.edu. Available at: https://accs.uaa.alaska.edu/vegetation/conservation-concern/ (Accessed 15 November 2024).

Alaska Department of Fish and Game (ADFG). (2024). Alaska's Animals, Alaska Department of Fish and Game. [online] Alaska.gov. Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=animals.main (Accessed 18 November 2024).

ADFG. (2025a). *Federally Listed Threatened and Endangered Species in Alaska*. Available at: https://www.adfg.alaska.gov/index.cfm?adfg=wildlifediversity.esalisted (Accessed: January 13, 2025).

ADFG. (2025b). *State of Alaska Special Status Species*. Available at: https://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.akfishstocks (Accessed: January 13, 2025).

ADFG. (2025c). *Special Area Regulations*. Available at: https://www.adfg.alaska.gov/index.cfm?adfg=habitatregulations.critical (Accessed: January 13, 2025).

Federal Register (2023). Notification of Findings. 88 FR 57388

Nawrocki, T., J. Fulkerson, and M. Carlson. (2013). *Alaska Rare Plant Field Guide*. Anchorage: Alaska Natural Heritage Program, University of Alaska

U.S. Army Corps of Engineers (USACE). 2018. *National Wetland Plant List, Alaska*. https://www.poa.usace.army.mil/Portals/34/docs/regulatory/2018AKNWPL.pdf (Accessed 8 December 2024).

4.8 Recreation and Land Use (18 CFR § 5.6 (d)(3)(viii))

4.8.1 Regionally or Nationally Important Recreation Areas

4.8.1.1 Misty Fjords National Monument Wilderness

Misty Fjords National Monument Wilderness (Misty Fjords Wilderness) is the largest wilderness area in the Tongass National Forest. It is managed by the Forest Service to preserve the undeveloped character of the coastal rainforest ecosystem. The area offers thirteen public recreation cabins, five shelters, and ten trails. Misty Fjords Wilderness encompasses the eastern portion of Revillagigedo Island, Behm Canal, and much of the land between the Unuk River and Behm and Portland Canals. The Misty Fjords Wilderness boundary is more than 15 miles east of the Ketchikan Lakes watershed.

4.8.1.2 Totem Poles

Ketchikan has the world's largest collection of standing totem poles distributed mostly throughout four parks and cultural centers: Totem Bight State Historical Park (Alaska State Parks), Totem Heritage Center (City of Ketchikan), Saxman Totem Park (City of Saxman), and Potlatch Park (privately owned). Ketchikan is a major cruise ship stop, bringing sometimes more than 1,000,000 visitors annually. Totem poles are a popular attraction for many visitors.

4.8.1.3 National Recreation Trails

Two National Recreation Trails are present in the area: The Naha River National Recreation Trail and the Deer Mountain National Recreation Trail (Deer Mountain Trail). The Naha River Trail is 5.8 miles long with a combination of boardwalk and natural tread. The trail follows the Naha River to connects Naha Bay to Jordan and Heckman Lakes. The Naha River Trail is far from the project area, roughly 23 miles north of Ketchikan. The Deer Mountain Trail follows the eastern ridgeline perimeter of the project area watershed and is one of the most visited trails in Ketchikan due to its proximity to the city center and relatively short access to panoramic alpine views. The Deer Mountain Trail is described in detail in Section 4.8.3.1.

4.8.2 Recreation Facilities and Use at the Project

Public access is not allowed in the KPU watershed and there are no recreation facilities at the project. The lands surrounding the project area set were set aside as a municipal watershed via a 1939 executive order from President Woodrow Wilson and an enactment of Congress (House Resolution No. 2413, July 27, 1939). This act is still in effect today and limits any use of the lands that could degrade water quality. In accordance with the act, the City of Ketchikan maintains a no trespassing ordinance (Ketchikan Municipal Code Chapter 11.20.020) for the KPU watershed.

The Deer Mountain Trail is the only established trail within the managed watershed, and there are only a few short segments at high elevations that cross over the watershed boundary along the ridgeline of the eastern most edge of the watershed. While the watershed is closed to recreational uses to protect water quality, these short segments of the Deer Mountain Trail that overlap with the watershed boundaries are over 5,000 feet away from Fawn Lake and have no effect on water quality. The trailhead parking lot is also situated outside the watershed boundary near the intersection of Nordstrom Drive and Ketchikan Lakes Road.

4.8.3 Recreational Opportunities in the Vicinity of the Project

Popular recreational activities in the Ketchikan area include hiking, hunting, fishing, and visiting cultural and historic interpretive sites. Figure 4-17 through Figure 4-20 show the locations of trailheads, trails, and other parks and recreation facilities in the greater Ketchikan area, including those managed by USFS, Alaska State Parks, Ketchikan Gateway Borough (KGB), the City of Ketchikan, the City of Saxman, and Alaska Department of Transportation & Public Facilities (Alaska DOT&PF). Maps are sourced from KGB (https://www.kgbak.us/DocumentCenter/View/5530/Rec-Maps).

Figure 4-17. Ketchikan Area Recreation Sites, North

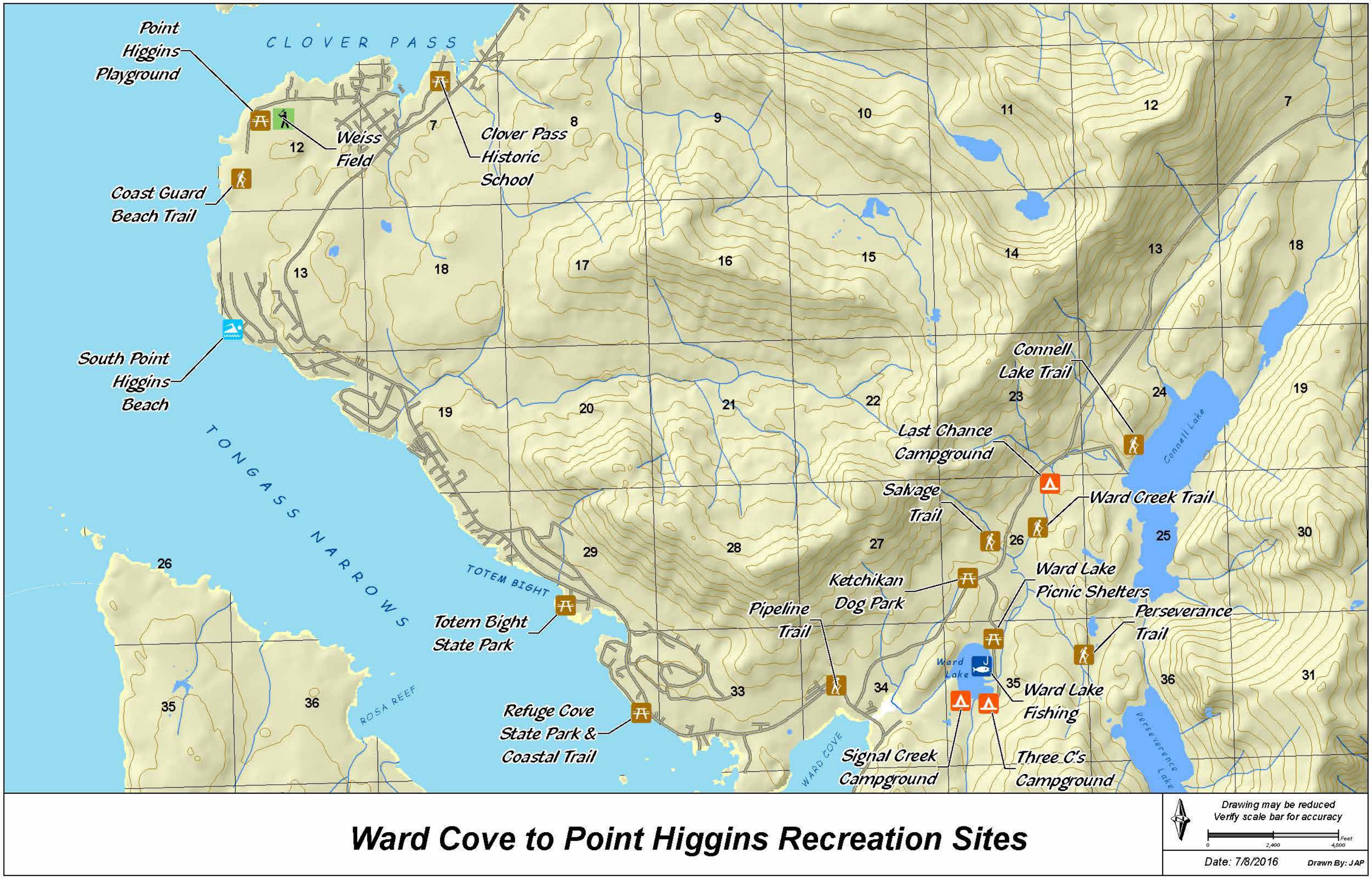

Figure 4-18. Ketchikan Area Recreation Sites, Ward Cove

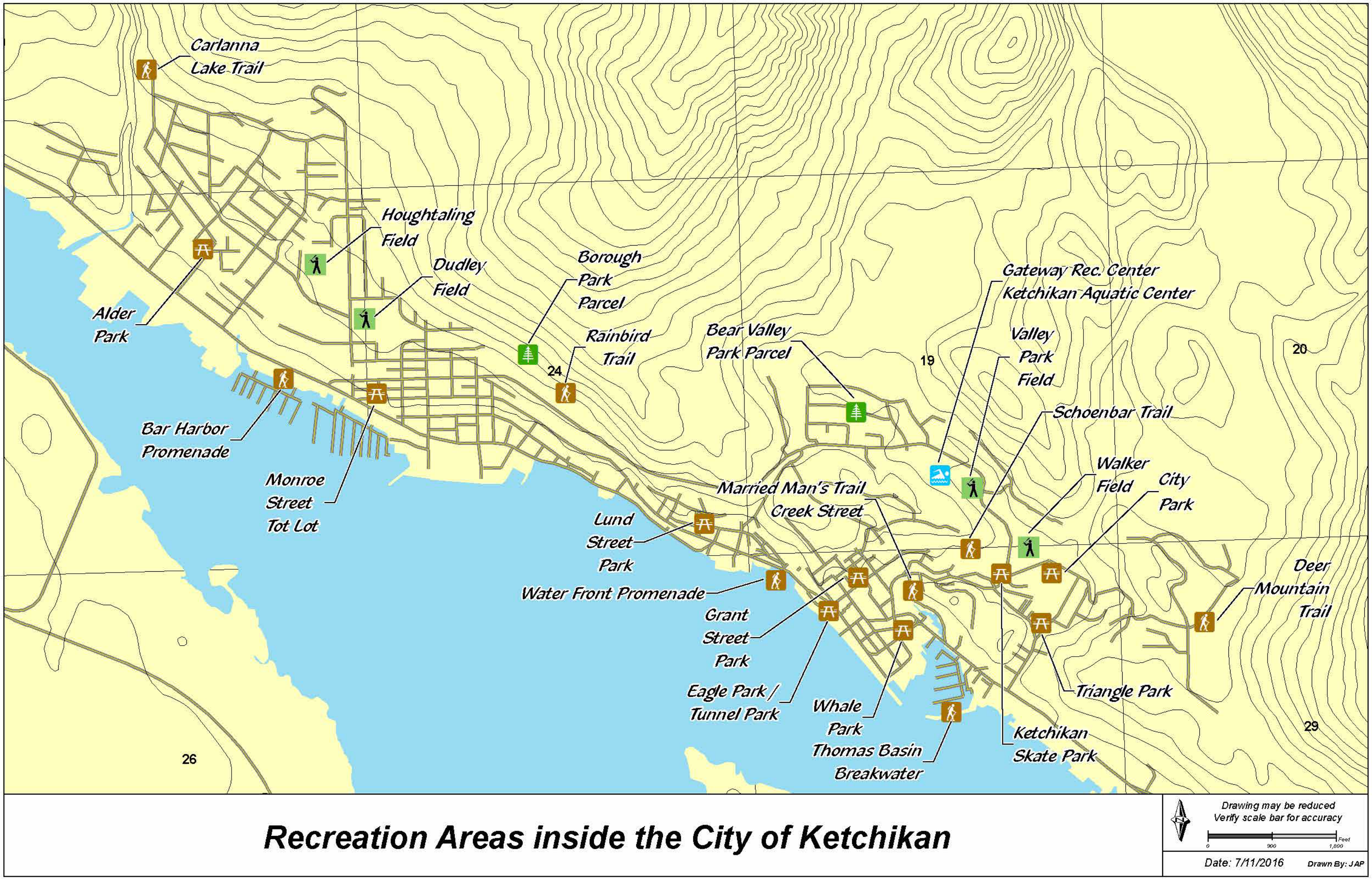

Figure 4-19. Ketchikan Area Recreation Sites, City of Ketchikan

Figure 4-20. Ketchikan Area Recreation Sites, South

4.8.3.1 US Forest Service Ketchikan-Misty Fjords Ranger District

The Forest Services' Ketchikan-Misty Fjords Ranger District manages multiple recreation facilities within the Borough boundary including trails, trailheads, recreational cabins, and dispersed recreation areas. Most of the KPU Ketchikan Lakes watershed acreage is within this ranger district.

USFS Recreation Areas

Most USFS recreation sites on Revillagigedo Island are remote, not on the road system, and generally undeveloped. Nearby Forest Service recreation areas on the road system or accessed from the road system include: Lower Silvis Lake Picnic Site, Deer Mountain Shelter Site, Ward Lake Recreation Area (includes several campgrounds, day-use facilities, and trails), Connell Lake Recreation Area, and Last Chance Recreation Area.

USFS Trails Near Project Area

Table 4-38 through Table 4-41 describe the four main USFS developed trails whose viewsheds include the project area watershed.

Table 4-38. Deer Mountain Trail Description

Trail	Deer Mountain Trail
Length	2.75mi (one way), 3.5hrs (one way)
Elevation Gain	2,600'
Difficulty	Most difficult
Access	Ketchikan Lakes Road and Nordstrom Drive. Trailhead Parking lot.
Description	Trail climbs steeply from parking lot through dense forest. Switchbacks take hikers to the Deer Mountain summit. Most of the trail is narrow, natural tread, with some brief sections of gravel, boardwalk, or wooden stairs. Scenic overlooks at first and second miles along trail. Deer Mountain Shelter located near the summit. Trail continues 10.5mi along the Deer Mountain to Silvis Lakes traverse. Deer Mountain is one of the most popular trails in the Ketchikan area for locals and tourists. The Forest Service estimates 365 day hikers and 99 overnight hikers per year use the trail (Jacobs, 2022).

Table 4-39. Deer Mountain to Silvis Lake Traverse Description

Trail	Deer Mountain to Silvis Lakes Traverse
Length	13.75mi (one way), 1-2 days (one way)
Elevation Gain	3,000'
Difficulty	Most difficult
Access	Deer Mountain Trailhead or Silvis Lakes Trailhead (13 miles south of Ketchikan at end of South Tongass Highway).

Trail	Deer Mountain to Silvis Lakes Traverse
Description	From Deer Mountain summit, the traverse continues along the left fork for 2 miles to the Blue Lake Shelter. Trail is marked, but with little visible tread wear, beyond Blue Lake, John Mountain, and the trail to Upper Silvis Lake. Mahoney Mountain and John Mountain summits can be accessed via this traverse.

Table 4-40. Dude Mountain Trail Description

Trail	Dude Mountain Trail
Length	1.5mi (one way), 2 hours (one way)
Elevation Gain	1,500’
Difficulty	Most difficult
Access	From Ketchikan, take North Tongass Highway 6 miles to Revilla Road junction. Follow (right) Revilla Road 6 miles to Brown Mountain Road. Trailhead 3 miles at end of the road.
Description	Trail begins in a recently harvested timber unit and quickly gains elevation while travelling through a dense forest, open muskeg, and alpine meadows. The first mile of trail includes some gravel and boardwalk that is in disrepair. Beyond here, the trail is unimproved.

Table 4-41. Minerva Mountain Trail Description

Trail	Minerva Mountain Trail
Length	6.5mi (one way), 8 hours (one way)
Elevation Gain	2,600’
Difficulty	Most difficult
Access	Trailhead for Perseverance and Carlanna Lake Trails.
Description	Trail to Minerva Mountain begins 2.25 miles up the Perseverance Trail before Perseverance Lake. The trail utilizes some boardwalk then traverses a large muskeg. Nearby summits include Ward Mountain, Minerva Mountain, Juno Mountain.

4.8.3.2 Ketchikan Gateway Borough Parks & Recreation Facilities:

The KGB manages multiple recreation assets through its areawide parks and recreation powers. KGB recreation assets include urban and pocket parks (City Park, Alder Park, Whale Park, and Eagle/Tunnel Park); public beaches (Rotary, Mountain Point, and South Point Higgins Beaches); multiple playgrounds; four trails (Carlanna Lake Trail, Rainbird Trail, Schoenbar Trail, and Married Man’s Trail); and various recreation lands, parcels and greenbelts. Park and recreation facility development is guided by the Borough's Comprehensive Plan and the Parks and Playgrounds Master Plan.

Adjacent to the KPU Electric headquarters, the Ketchikan Lakes Hydro Project powerhouse, and Ketchikan Creek is KGB's City Park and Totem Heritage Playground. City Park features a fountain and system of ponds, with water sourced from the KPU water supply, once used by the hatchery for fish rearing.

4.8.3.3 Alaska State Parks

Alaska's Department of Natural Resources-State Parks operates eight parks within the Borough. Three of these parks are situated on the Ketchikan road system on Revillagigedo Island: Refuge Cove State Recreation Site, Settler's Cove State Recreation Site, and Totem Bight State Historical Park. These parks are popular and well-developed day- and multi-day use destinations for the community and visitors.

State Parks also manages more remote, undeveloped sites off the road system: Betton Island State Marine Park, Black Sands Beach State Marine Park (Gravina Island), Dall Bay State Marine Park (Gravina Island), Grant Island State Marine Park, and Grindall Island State Marine Park.

4.8.3.4 Alaska Department of Transportation & Public Facilities

The State of Alaska DOT&PF also operates two trails within their rights-of-way: Joe C. Williams Senior Coastal Trail and the separated bike and pedestrian path along North Tongass Highway from Refuge Cove State Recreation Site to Whipple Creek.

4.8.3.5 City of Ketchikan

The City of Ketchikan staff a museum director responsible for the Museum Department, including the Totem Heritage Museum located across Ketchikan Creek from the KPU Electric powerhouse. The Museum is part of the Park District that includes City Park, Schoenbar Trail, the Fish Hatchery, and the Totem Park Triangle Playground.

4.8.3.6 City of Saxman

The City of Saxman is approximately 3 miles south of Ketchikan along the Tongass Highway and owns and operates the Saxman Cultural Park in the city center.

4.8.4 Land Use and Management

4.8.4.1 Land Owners

The watershed land area is owned primarily by the USFS as part of the Tongass National Forest Ketchikan-Misty Fjords Ranger District. Along the access road, from the end of the public ROW to the Lower Lake, the access road passes through the following ownership: an Alaska Mental Health Trust parcel within the City Limits, a roughly 10-acre City of Ketchikan KPU parcel around Scout Lake, BLM parcels encompassing Fawn Lake, and USFS property encompassing the Lower Ketchikan Lake and watershed, with the exception of the City-owned dam.

4.8.4.2 Watershed Management & Access and Use Restrictions

Through the 1939 Act of Congress (see Section 4.8.2.), KPU was given the authority to control activities and access to the watershed. Aside from the water system infrastructure within the watershed, the watershed is undeveloped. The steep slopes and rugged mountainous terrain provide natural protection from human activity while fencing, gates, a trespass ordinance and prominent signage help KPU prevent unwanted trespass and contamination of the city's water source.

KPU restricts access to the Ketchikan Lakes Road to KPU staff and emergency service vehicles via two locked gates and signage (see Section 4.9.5.). Fawn Lake is surrounded and protected by a chain-link fencing topped with barbed wire.

KPU employees patrol the watershed area regularly to monitor for trespassing. The KPU authority to protect the watershed is thus exercised through a Watershed Control Plan (2021), the City's trespass ordinance, and a USFS Municipal Watershed land use designation in the Tongass National Forest Plan. All three management tools prioritize the protection of the watershed by the landowners. The City of Ketchikan, USFS and the BLM confirmed during the last Watershed Control Plan update that each agency is committed to protecting the KPU watershed per the 1939 Act of Congress for watershed protection.

4.8.4.3 Tongass National Forest Land Use Designation

Municipal Watershed Land Use Designation

The TNF is managed under the 2016 Tongass National Forest Land and Resource Management Plan (Forest Plan). The Forest Plan includes management prescriptions for 18 unique Land Use Designations (LUDs). The Project area situated within the TNF is encompassed by the Municipal Watershed management prescription. The Municipal Watershed LUD emphasizes providing protection of municipal water supplies for certain incorporated cities and boroughs, including Ketchikan. According to the Forest Plan the Goals, Objectives, and Desired Conditions of the Municipal Watershed LUD are:

- **Goals:** To maintain these watersheds as municipal water supply reserves, in a manner that meets provisions of the Safe Drinking Water Act and State of Alaska Drinking Water Regulations and Water Quality Standards, in accordance with Forest Service Manual 2542 and 36 CFR § 251.9.

- **Objectives:** Limit most management activities to the protection and maintenance of natural resources. Consult with ADEC and affected municipalities prior to authorizing activities that are likely to cause pollution.

- **Desired Condition:** Lands managed as Municipal Watersheds are generally in a natural condition. Facilities or structures to provide municipal water supplies may be present. Uses or activities that could adversely affect water quality or supply do not occur. These watersheds provide municipal water that meets State of Alaska Drinking Water Regulations and Water Quality Standards.

Management prescriptions for the Municipal Watershed LUD specific to recreation and tourism are covered in Section 4.8.5.

4.8.5 Current Recreation Management and Planning in the Project Area

4.8.5.1 Recreation Management in the Tongass Forest Plan

Municipal Watershed Recreation & Tourism Management Prescription

Recreation and tourism management prescriptions for Municipal Watershed Land Use Designations favor protecting water quality and provide for limiting recreational uses, access, and recreation-related special uses and development when incompatible with the purpose of the watershed. Specific prescriptions from the Forest Plan are:

Recreation Management and Operation

A. Provide only for those activities and recreation use levels that can be accommodated without detriment to water quality and flow.
B. Issue appropriate orders for regulating public use within the watershed, in cooperation with the municipality.
C. Designation of motorized routes for off-highway vehicles in Municipal Watersheds is generally not allowed. Designation may only occur where documented local traditional use has occurred and the route does not degrade water quality or flow.
D. Conduct watershed analysis (Appendix C) and consult with ADEC and affected municipalities prior to authorizing activities that are likely to cause pollution.

Recreation Special Uses

E. Major and minor developments are generally not consistent with objectives for this LUD. Proposals for development will require scrutiny of the magnitude and scope of the project to see if they meet LUD objectives. Refer to the Recreation and Tourism Forest-wide Standards and Guidelines.
F. Conduct watershed analysis (Appendix C) and consult with ADEC and affected municipalities prior to authorizing activities that are likely to cause pollution.

Recreation Opportunity Spectrum Classifications

The USFS uses the Recreation Opportunity Spectrum (ROS) to help identify, quantify, and describe the types of recreation settings a forest provides. The ROS system places different combinations of interacting activities, settings, and experience expectations along a continuum from highly primitive environments to highly modified environments. Figure 4-21 shows a map of the ROS Classes applied to the area during the 1997 Forest Plan: Semi-Primitive Non-Motorized, Roaded Natural, and Roaded Modified. Table 4-42 illustrates standards and guidelines for setting indicators associated with each of these three ROS Classes.

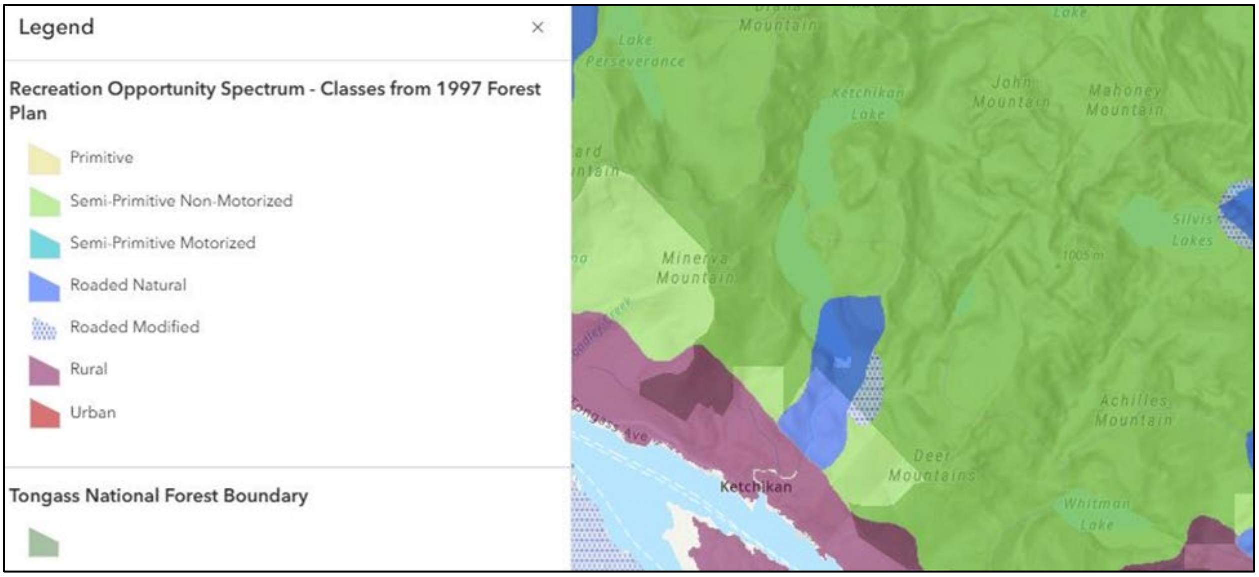

Figure 4-21. Map of Project Area ROS Classes from 1997 Forest Plan

Table 4-42. Project Area ROS Class Standards and Guidelines

Setting Indicators	Semi-Primitive Non-Motorized	Roaded Natural	Roaded Modified
	ROS Class Standards & Guidelines		
Scenic Quality	Minimum "High" SIO. Existing Scenic Integrity "Very High."	Typically "Moderate" SIO, not to fall below "Low." "High" to "Very High" Existing Scenic Integrity.	"Very Low" SIO or higher. Soften effects of very low conditions in foreground of sensitive travel routes.
Access	Non-motorized cross-country travel and travel on non-motorized trails is typical.	All forms of access and travel modes may occur.	All forms of access and travel modes may occur.
Remoteness	Nearby sights or sounds of human activity are rare, but distant sights or sounds may occur.	Remoteness from urban conditions and high concentrations of other people is important. Low concentrations of human sights and sounds in a backcountry-roaded setting are preferred.	Remoteness is of little importance. Low to moderate concentrations of human sights and sounds preferred.

Setting Indicators	Semi-Primitive Non-Motorized	Roaded Natural	Roaded Modified
	ROS Class Standards & Guidelines		
Visitor Management	On-site regimentation and controls are rare.	On-site regimentation and controls are few.	On-site regimentation and controls are obvious.
On-site Recreation Development	Facilities and structures generally don't exceed Development Scale II.	Facilities and structures generally don't exceed Development Scale II.	Facilities and structures generally don't exceed Development Scale III.
Social Encounters	<10 encounters with other parties per day during at least 80% of primary use season.	<20 encounters with other parties per day during at least 80% of primary use season.	<20 encounters with other parties per day during at least 80% of primary use season.
Visitor Impacts	Visitor-caused impacts are rare and usually not long-lasting.	Visitor-caused impacts are noticeable.	Visitor-caused impacts are noticeable but not degrading to basic resource elements.

4.8.5.2 Previously Identified Recreation Issues in Existing Plans

Continued Access Control

Human recreational activity in the watershed can introduce contaminants into the water supply by spreading pathogens and increasing water turbidity. The Tongass Forest Plan and Watershed Control Plan emphasize the need to continue to protect water quality by prohibiting public access to and recreational activities within the watershed.

Deer Mountain Trail Maintenance & Improvements

According to the 2023 Tongass Sustainable Trails Strategy (Trails Strategy), improved maintenance of the Deer Mountain Trail is the top priority for trails in the Ketchikan/Misty-Fjords Ranger District. This strategy recommends focusing efforts specifically on signage and tread improvement. The Trails Strategy describes the challenging conditions of the trail, including its steepness, sustained climbing, rough and slippery tread, and proneness to inclement weather and poor visibility. Due to its proximity to Ketchikan and relatively short distance to the alpine, it is perhaps the most popular alpine trail, but has also been the site of numerous accidents. Maintenance improvements are recommended by the Trails Strategy to improve visitor safety and reduce incidents.

Signage needs include (1) signage to dissuade users from following game trails away from the main path, (2) highly visible wayfinding and confidence markers in the alpine zone along the Deer Mountain to Silvis Lakes Traverse, and (3) additional signage to educate users about the dangers of taking shortcuts in the steep and cliffy terrain.

Recommended tread improvements are rebuilding or modifying trail structures (stairs, boardwalks, puncheon, turnpike, ditches, etc.), tread hardening, and improving drainage.

The Trails Strategy does note that the District applied for funding for Deer Mountain Trail through Legacy Road and Trail funds from the Bipartisan Infrastructure Law, but the status of the funding is unknown.

4.8.6 Shoreline Management and Buffer Zones

No shoreline management or buffer zones are established in the Watershed Control Plan or the Tongass Forest Plan.

4.8.7 Protected River Segments

There are no designated National Wild, Scenic, or Recreational Rivers or otherwise protected river segments within or near the project area.

4.8.8 References

Alaska Trails. (2023). *Tongass Sustainable Trails Strategy, Ketchikan Ranger District*. [online] www.alaska-trails.org. Available at: https://www.alaska-trails.org/_files/ugd/bd3ef8_b8e925c123d6480d9ade1e6db4d699c9.pdf [Accessed Nov. 2024].

Jacobs. (2022). *Ketchikan Creek Watershed Control Plan*. Ketchikan Public Utilities.

Ketchikan Gateway Borough. (2023). *Parks and Playgrounds Master Plan.* Prepared by Corvus Design for Ketchikan Gateway Borough Public Works Department, 344 Front Street, Ketchikan, AK 99901.

U.S. Forest Service (USFS). (2013). *Ketchikan Area Trails Guide.* Alaska Region Tongass National Forest R10-RG-210.

USFS. (2016). *Land and Resource Management Plan*. Alaska Region Tongass National Forest R10-MB-769j.

4.9 Aesthetic Resources (18 CFR § 5.6 (d)(3)(ix)

4.9.1 Existing Regional Visual Character

The visual quality of Ketchikan, Revillagigedo Island and the surrounding TNF is defined by contrast between the spectacular natural landscape and unique built environment. The natural landscape features include narrow sea passages, steep and rugged topography, heavily forested hillsides, large old growth coniferous forest, and exposed alpine ridges above the timberline. The built environment includes urban development along the shoreline with ports, piers, ships, roads, and historic and modern buildings. The juxtaposition of a shoreline settlement confined along the coast, against a backdrop of pristine verticality of steep mountains and tall evergreen trees gives the area a unique visual character. Scenery is comprehensive with views that simultaneously include water, sky, vegetation, mountains, buildings, and roads. In this area the seas, forests, and mountains meet the sky. The mild maritime climate and high humidity contribute to a dynamic atmosphere. Views seem to constantly change in depth as clouds descend and part and fog rolls in and lifts.

4.9.2 Visual Character of Project Lands and Waters

The visual character of the project lands and waters are characterized by the spectacular and varied natural terrain within the watershed basin, the relatively mature and undisturbed natural aesthetic, the age of project infrastructure, old and dense western hemlock forests that obstruct views of the lakes, and stunning views of the watershed that can be had from hard-to-reach alpine ridges and trails along the perimeter of the watershed.

The lake basin is a microcosm of the spectacular scenic variety of the area. The flat expansive lake contrasts beautifully with the sheer exposed cliff faces and vertical conifers along the steep mountainsides that surround the watershed. The landscape around the project area includes a combination of dense mature forest, walkable alpine ridges and meadows, and jagged exposed peaks. 3,000 ft-elevation peaks connected by ridgeline tower above the landscape and surround the watershed. Small lakes, such as Granite Basin, lie in cirques in the alpine and sub-alpine zones at higher elevations.

The natural features of the mature spruce and hemlock forest, lakes and lakeshore, and steep mountains are the dominant scenery from both lake level and alpine viewpoints. The project age contributes to this natural and undisturbed aesthetic. The trees immediately around the lake and project infrastructure are mature and blend seamlessly into the surrounding forest, adding visual consistency between the project and the natural landscape. The dam and project infrastructure (dam, road, tunnels, and fencing) have a minimal visual presence from alpine viewpoints. There are few large clearings and other visible human development is minimal or obscured from many perspectives.

Seen up close, some project infrastructure such as the dam and the tunnels have a historic quality to them as they are visibly aged and weathered from more than a century in the elements. See photos in Section 4.9.5.

From a distance as seen from alpine viewpoints, the project features that are most visually apparent or contrasting with the surrounding natural settings are: the float rope barrier in front of the Lower Ketchikan Lake dam, the angular and linear road clearing, the fence separating Fawn Lake and the road (again for its linear quality), and the more recently cleared area (between the road and Granite Creek) where deciduous trees and shrubs grow in an earlier stage of forest succession. See views from Deer Mountain in Section 4.9.5.

Apart from the City of Ketchikan a mile to the southwest, the project is surrounded by undeveloped National Forest property. Due to the thick vegetation along the trail and road, views tend to be upward towards the slopes, cliffs, and peaks above.

Panoramic views are challenging to access for the public. Alpine ridgelines along the perimeter of the watershed offer stunning views but require a steep and strenuous hike. The shortest and most popular alpine hike in the area, the Deer Mountain Trail, is still rated “most difficult” in the USFS Tongass National Forest Trails Guide.

4.9.3 Viewpoints, Visually Sensitive Areas, and Other Scenic Attractions

The principal locations from which a significant number of people would view the Project area and Project facilities are from the City of Ketchikan, from the Deer Mountain Trail, and from the Tongass Narrows section of the Alaska Marine Highway. The peaks surrounding the Ketchikan Creek watershed form the major vertical visual backdrop for the City of Ketchikan. Deer Mountain (3,001 ft elevation) is directly east of Ketchikan. Its tundra-covered ridgeline above the timberline and its forested west face are prominently visible from the City. Minerva Mountain (2,602 ft) is directly north of town. Its timber-covered peak is also visible from town. The northern peaks around the watershed (Dude, Brown, and Diana Mountains) are also around 3,000 feet elevation and above the timberline. They are not visible from the City of Ketchikan but may be visible from surrounding waterways. Residents, boat passengers on the marine highway, and tourist navigating around Ketchikan’s roads are likely to view these components of the Project area and watershed, weather permitting.

The powerhouse and substation at the south end of the penstocks are the only project facilities visible from within the city limits by the public. City Park is located directly across Fair Street. These facilities are visible from within the park when looking north from most vantages (see Figure 4-22). No other Project facilities are visible to the public from the City; the southern end of the penstocks are obscured by heavy vegetation and the rest of the facilities are screened by more than a mile of hills and forest between publicly accessible vantage points and the Lower Lake. Other opportunities to view Project facilities are limited to employees or land managers who have access to the project site via Ketchikan Lakes Road or those members of the public who are able and willing to hike into the alpine.

The Tongass Forest Plan employs the USFS Scenery Management System to identify key locations from which people are known to view the forest and areas that are sensitive to visual alteration. Viewsheds from key viewpoints are assessed for existing scenic integrity and to ensure projects are consistent with established scenery objectives. Those routes and use areas from which scenery will be emphasized, based on the quality of scenery, are designated as Visual Priority Routes and Use Areas (VPRs). For the purposes of planning, areas within the viewshed of designated VPRs may be considered Visually Sensitive. A Visually Sensitive Area (VSA) is considered sensitive enough to visual alteration to warrant special consideration in planning for projects that may alter scenic views. Visually sensitive areas may include viewsheds visible from nearby communities, travel corridors, public use areas, and any other priority viewpoints such as designated VPRs.

Appendix F of the 2016 Forest Plan identifies six terrestrial VPRs whose viewsheds include the Ketchikan Lakes Project area and watershed: (1) the City of Ketchikan, (2) Deer Mountain Trail, (3) Deer Mountain Recreational Cabin, (4) Silvis Lake Trail (via the Deer Mountain to Silvis Lakes Traverse), (5) Dude Mountain/Brown Mountain Alpine Trail, and (6) mountains and alpine areas around the watershed (specifically Dispersed Recreation Areas in the mountains and alpine areas between Ketchikan, Ward Lake-Harriet Hunt Lake Road, and George Inlet). Viewsheds from these VPRs include nearly the entire project area and watershed, suggesting that the entire area be considered visually sensitive or a scenic attraction. “Mountain ranges and alpine area” with viewsheds containing Upper and/or Lower Ketchikan Lakes likely include these trails and peaks not explicitly mentioned in Appendix F: Minerva Mountain and Trail, John Mountain and Spur Trail, Mahoney Mountain and Spur Trail, Juno and Ward Mountains, Diana Mountain, and Fish Mountain.

Descriptions of these trails and recreation areas can be found in Sections 4.8.2 and 4.8.3.

The dam site at lake level offers a spectacular view of the lower lake, surrounding mountains, forested hillsides, and open sky. However, due to public access limitations from Ketchikan Lakes Road, the Deer Mountain Trail and other trails along alpine ridgelines around the watershed are the only areas from which the public is likely to view the lakes.

Appendix F of the Forest Plan also lists marine travel routes and saltwater use areas as VPRs from which the Ketchikan Lakes Project area and watershed can be viewed. Primary VPRs of interest include the Revillagigedo Channel and Tongass Narrows sections of the Alaska Marine Highway.

4.9.4 Federal and Local Visual Resource Planning Objectives

The USFS Ketchikan-Misty Fjords Ranger District, via the 2016 Forest Plan, is the only agency actively managing and planning for visual resources.

4.9.4.1 USFS Scenery Management System

Since 1995 the USFS has used the Scenery Management System (SMS) to address the amount of visible impact created by man-made activities on National Forest lands. This system of analysis is used to determine the relative value and importance of scenic qualities in a forest. The SMS follows guidance published in Landscape Aesthetics: A Handbook for Scenery Management. This Handbook and SMS were integrated into the Tongass during the 2008 Forest Plan update and is used currently.

4.9.4.2 Municipal Watershed Scenic Integrity Objective

Based on the SMS, the 2008 and 2016 Forest Plan adopt Scenic Integrity Objectives (SIOs) that provide direction and objectives for landscapes within each Land Use Designation (LUD). The long-term directive is to manage a forest such that the future scenic condition maintains a scenic integrity level that is at least as high as the adopted SIO for that area. The Project area on USFS land is within the Municipal Watershed LUD management prescription. According to the Forest Plan, the Scenery Integrity Objective (SIO) is “Low” for the foreground, middle-ground and background of viewsheds as seen from the VPRs. Despite the Project being entirely within a Municipal Watershed LUD (typically assigned a “High” SIO), the Forest Plan applies a Low SIO to renewable energy sites according to the Scenery standard set by the 2012 Planning Rule’s Renewable Energy Direction. Under this direction, the management approach to scenery expects "…that renewable energy sites may dominate the seen area, and are designed with consideration for existing form, line, color and texture found in the characteristic landscape…", and "…that the responsible official will determine if a viewshed analysis is needed for renewable energy site development…".

From Deer Mountain Trail and Cabin VPR and most of the alpine perimeter of the watershed, the visible Project area is entirely within the middle-ground distance zone of between 0.5-5 miles from the key viewpoints. An exception is a portion of the western perimeter and ridgeline between Minerva Mountain and Diana Mountain which offers foreground views (within 0.5 miles of the viewpoint) of the lower Ketchikan Lake portion of the Project area.

4.9.5 Project Photos

4.9.5.1 Views from City Park

Figure 4-22. Project Powerhouse and Substation Facilities Visible from City Park Looking North Across Fair Street (Photos: Bryant Wright)

4.9.5.2 Views from Ketchikan Lakes Road

Figure 4-23. First Gate (Photo: Bryant Wright)

Figure 4-24. Second Gate (Photo: Bryant Wright)

Figure 4-25. Municipal Ordinance Posted Behind Second Gate (Photo: Bryant Wright)

Figure 4-26. Fawn Lake East Perimeter Fence (Photo: Bryant Wright)

Figure 4-27. Fawn Lake North Perimeter Fence (Photo: Bryant Wright)

4.9.5.3 Views from Ketchikan Lakes Dam

Figure 4-28. View of Ketchikan Lakes from the Dam, Northeast (Photo: Bryant Wright)

Figure 4-29. View of Ketchikan Lakes from the Dam, Northwest (Photo: Bryant Wright)

Figure 4-30. Spillway (Photo: Bryant Wright)

Figure 4-31. Penstocks (Photo: Bryant Wright)

4.9.5.4 Views from Deer Mountain Trail

Figure 4-32. Deer Mountain Trailhead (Photo: Bryant Wright)

Figure 4-33. Beginning of Deer Mountain Trail using Turnpike Construction (Photo: Kenneth Lund, AllTrails.com)

Figure 4-34. Trail Junction Sign on Deer Mountain Trail (Photo: Kenneth Lund, AllTrails.com)

Figure 4-35. View of Lower Ketchikan Lake and Ketchikan from Deer Mountain (Photo: E. Sok, AllTrails.com)

4.9.5.5 Views from Other USFS Recreational Areas

Figure 4-36. View of Upper Ketchikan Lake from Dude Mountain Trail (Photo: Steven Harrison, LivingAlaska.com)

Figure 4-37. View of Deer Mountain Summit and City of Ketchikan from Tongass Narrows (Photo: Leila Kheiry, KRBD Radio)

4.9.6 References

Jacobs. (2022). *Ketchikan Creek Watershed Control Plan*. Ketchikan Public Utilities.

U.S. Forest Service (USFS). (1996). *Landscape Aesthetics: A Handbook for Scenery Management.* Alaska Forest Service Agriculture Handbook Number 701.

USFS. (2016). *Land and Resource Management Plan*. Alaska Region Tongass National Forest R10-MB-769j.

4.10 Cultural Resources (18 CFR § 5.6 (d)(3)(x))

FERC, under the Federal Power Act (16 United States Code (USC) § 791-828c) and its implementing regulations (18 CFR § 5.6 (d)(3)(x)), requires applicants to identify any known cultural resources directly impacted by the project and in the surrounding area. They must describe existing discovery measures, identify any historic or archaeological sites in a defined area of potential effects (APE), and list any "Indian tribes" that may attach religious or cultural significance to properties in the vicinity.

The relicensing process is also a Federal undertaking subject to Section 106 of the National Historic Preservation Act (NHPA; 54 USC § 300101 et seq.) and its implementing regulations (36 CFR § 800). The goal of Section 106 is to take into account the effects of undertakings on historic properties. Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP).

Based on the current knowledge of the Project, the proposed APE includes the lands enclosed by the proposed FERC project boundary and lands or properties outside the project boundary where project operation or other project-related activities may cause changes in the character or use of historic properties, if any historic properties exist. This includes a "direct" APE for archaeological and historical sites and:

> …a different APE (indirect) for aboveground resources subject to visual, audible, vibratory, or atmospheric effects and a survey corridor which should be large enough to accommodate for minor route modifications which can be utilized to avoid or minimize impacts on historic properties or other sensitive resources (FERC 2017:13).

4.10.1 Cultural Context

4.10.1.1 Archaeological Context

To date, archaeological surveys in southeastern Alaska have recorded several thousand sites. A large percentage of these are shell middens, although numerous other types of precontact and historic resources are known (Autrey 1992).

Moss (1998) refined the sequence for northern Northwest Coast history into an Early Period (10,000 to 5000 B.P.), a Middle Period (5000 to 1500 B.P.), and a Late Period (1500 B.P. to contact). Davis (1990) split the cultural sequence into a Paleomarine tradition (11,000–6500 B.P.), a Transitional stage (6500–5000 B.P.), and a Developmental Northwest Coast stage (5000 B.P. to European contact). The Developmental stage was further divided into the early (c. 5000–2600 B.P.), middle (c. 2600–1000 B.P.), and late (c. 1000–contact) periods.

Early Period (c. 10,000 to 5000 B.P.)

Any late Pleistocene sites would currently be under water (Carlson and Baichtal 2015). In the early Holocene, southeast Alaska was relatively warm (Baichtal et al. 2021).

Moss' (1998) Early Period and Davis' (1990) Paleomarine tradition are characterized by a well-developed microblade industry with wedge-shaped microblade cores, few or no bifacial tools, and an economy based on coastal marine subsistence. Roberts (1982:16) interprets the wide variety of material types at the early Holocene Irish Creek site (PET-00160) as indicating "early cultural interaction with other geographic areas." Davis (1990:198–199) argues that the time between 6500 and 5000 B.P. was a transitional stage as people adapted to a changing environment, seen in shifting economic and settlement strategies. By the end of the period, northwest coast people had shifted from highly mobile to sedentary lifestyles (Brown 2016).

Most early Holocene sites in southeast Alaska have been identified in the vicinity of Prince of Wales Island as a result of paleoshoreline modeling (Carlson and Baichtal 2015). The sites include microblade, flake, bifacial, and burin technology.

Middle Period (5000 to 1500 B.P.)

Moss' (1998) Middle Period and Davis' (1990) early and middle Developmental stages sites have extensive shell deposits and are often associated with wood-stake fishing weirs. Middle Period artifact assemblages include slate points and other ground stone materials, bone harpoons and points, and shell beads.

Davis (1990) differentiates the early and middle Developmental stages by the middle period containing composite toggling harpoons, and small flaked stone points, while these artifacts are absent from the early period. Davis' (1990) Middle Developmental period also includes a greater focus on unilaterally barbed harpoons, ground stone knives, and heavy hand mauls. All these artifact types increase in abundance during the Late period. That is to say, the shift in technology is gradual, and Moss lumps the change while Davis splits it.

Moss et al. (2016:118) argue that the decrease of obsidian and other non-local materials over time at the Coffman Cove site (PET-00067) could be due to increased sedentism, with obsidian and quartz absent and chipped stone technology uncommon by Component IV (c. 2000–1000 B.P.). Clark (1979:7) argues that, based on morphology of polished slate tools from the Coffman Cove site (PET-00067), from c. 4000 to 3000 B.P., southeast Alaska was part of "a long coastal sphere of communication stretching from southern British Columbia as far north as the Kodiak zone of southwestern Alaska."

Cultural connections along the Pacific Coast continued late into the period, with a ground slate fishtail point recovered from the Sarkar Cove Entrance (CRG-00164), dating to 1740 +/- 240 B.P. (Campbell 1984). The dating is consistent with the end of the florescence of chipped fishtail points to the west on the coast, between c. 2400 B.P. and as late as 1700 B.P. (Maschner 2008).

Late Period (1500 B.P. to Contact)

Moss' (1998) Late Period, which is usually identified with the ethnographic cultures of the region, is similar to Davis' (1990) late Developmental Northwest Coast stage, characterized by the presence of shell midden deposits, ground stone and bone technology, human burials, and the establishment of large settlements or winter villages, specialized camps, and fortifications. Late Period artifacts include copper tools, stone bowls, ground stone knives, mauls, harpoons with lashing, and increased use of obsidian (Davis 1990).

After the Middle period, chipped stone technology continued to decline in abundance (Andrew et al. 1992; Davis 1985; De Laguna et al. 1964:183; Moss 1989; Moss et al. 2016). Grinding a medial ridge on slate points may develop early in the Late Period (De Laguna et al. 1964; Moss et al. 2016).

Other diagnostic points are few. Shouldered, chipped stone points have been recovered from SIT-00228, a probable Tlingit fort dating c. 1000 B.P. (Mobley 2003). De Laguna et al. (1964:130) reported triangular/leaf-shaped chert blades from Old Town (YAK-00007).

4.10.1.2 Ethnography

By the 1880s, Tlingit society is recorded as being split into tribes, clans, and nobles, common people, and slaves (Emmons 1991). Tlingit occupied winter villages and seasonal subsistence camps. Usually, each tribe had only one winter village. Summer houses were smaller than winter houses, built on the ground without any excavation, and could double as a smokehouse. Temporary structures included lean-tos. Additional structures included steam baths (Grinev 2005:36).

Trade between coastal people was permitted for individuals, but trade rights with interior peoples were hereditary to chiefs (Emmons 1991:55). Potlaches were prominent prestige ceremonies where the opposite moiety would be presented with lavish gifts after a minimum four-day festival (Grinev 2005:45, 64). Warfare and conflict between clans and kwaans also occurred.

Tlingit traveled in canoes carved from tree trunks. Subsistence focused on salmon taken in dams, in traps, by spear, by hook, with harpoons, or with nets (Emmons 1991:55; Grinev 2005:35). Fur seal, halibut, eulachon, bear, wolf, fox, and other furbearers were taken primarily in spring (Emmons 1991:55). Hunting gear, for both marine and terrestrial game, included traps and snares, bows and arrows, spears, slings, daggers, clubs, and harpoons (Grinev 2005:35).

The Tlingit name for Ketchikan and Pennock Island is Kichxaan, meaning “near the eagle’s wing” (Thornton 2012:194, 173). Ketchikan Creek and the original winter village share the name. It refers to a founder’s name but also how the water at the mouth of Ketchikan Creek is calm from every direction.

A Tongass legend says that, a long time ago, Tongass people travelled over the sea and reached the coast where they came to populate (Goldschmidt and Haas 1998:9). The direction of travel was not specified. The Tongass Gasnax.adi clan is under the Raven moiety, and the Eagle/Wolf side was the Dakl’aweidi and Teikweidi clans (Thornton 2012:172). The Eagle/Wolf moiety originated from the Nass River area.

4.10.1.3 Russian Period

Tlingit peoples’ first contacts with non-Indigenous people may have come as early as contacts with Chinese or Japanese ships prior to the sixteenth century (Grinev 2005:92). However, a more probable first contact may have been the Spanish in the sixteenth century.

The first recorded explorations were by Russians in the early eighteenth century, culminating with Shelikhov establishing the first Russian colony in the Americas on Kodiak in 1784 (Grinev 2005:92, 94, 98-99). By the late eighteenth century, English, American, and French traders were active in southeast Alaska, although the French presence was insignificant. Most early trade occurred at Yakutat, Sitka, and Lituya Bay, away from Tongass territory. Americans were the main Tlingit fur trade partners by the 1790s, but trade quantity remained low (Grinev 2005:113, 116, 134). Between 1795 and 1801, trade significantly increased, and the Americans continued to trade as smugglers in Russian territory into the early nineteenth century.

Also in the late 1700s, Haida people invaded Tongass territory on Prince of Wales Island (references in Campbell 1989:125). The Tongass were displaced and eventually came to settle near Ketchikan. In one telling, Tongass people originated on the mainland but later moved to Prince of Wales Island (Thornton 2012:171). The Haida displaced them, and they moved to Annette Island, then Tongass Island, and finally arriving at Ketchikan late in history. In another telling, Village Island and Cat Island were occupied prior to Tongass Island (Goldschmidt and Haas 1998:82-83). Tongass people displaced the NexA'di Tlingit, the Eagle phratry of Sanya and Xetl Kwans, who owned the area where Ketchikan sits today (Emmons n.d.:2, 3, in Campbell 1989:120, 122).

Russians came to be most active in the southern Alexander Archipelago in the 1830s (Grinev 2005:175). At the time, Russian ships patrolled the waters for foreign smugglers. The ships were based out of Tongass Bay and Dionisievskii Redoubt, which was established in 1833. In 1839, the Hudson's Bay Company leased Russian land in southeast Alaska and transformed the redoubt into Fort Stikine (Grinev 2005:194). Conflict with Taku Tlingit quickly erupted, but relations with non-Russian outsiders could be cordial: In 1834, 20 Tongass people were employed as sailors on the American brig Bolivar Liberator (Grinev 2005:225).

Russian Priest Ivan Veniaminov recorded approximately 150 Tongass Tlingit in 1835, while the 1839 Russian census recorded 315 (Petroff 1884:35-36, 38). In 1861, Lieutenant Wehrman, a Russian Navy man, recorded 333 Tongass people. Overall, there was little change in the Tongass population until the American period.

4.10.1.4 American Period

After the sale of Alaska to the United States in 1867, the American military occupied southeast Alaska in an attempt to quell Tlingit unrest, including bombings of Kake, Angoon, Wrangell, and Yakutat villages (Thornton 2012:116–133).

By 1880, Ketchikan Village had solidified. Petroff (1884:32) recorded 174 Tlingit and 273 total people in Ketchikan that year. In 1883, "three Indian houses" were noted at the mouth of Fish Creek, which would come to be named Ketchikan Creek (Coast Pilot 1883:80).

A cannery was established at Ketchikan in 1887 (Orth 1967:511). The village and cannery were noted in the 1891 Coast Pilot (1891:100), when already the community was known as a location to dock. Still, the population did not boom until c. 1900, when it rose to 450 (U.S. Census 1893, 1900), likely as a result of the community becoming a supply center during the Gold Rush as a port of entry for ships entering Alaska (ACHP n.d.; Orth 1967:511). Even after the Gold Rush, Ketchikan continued to grow as a fishing community centered on salmon canneries, increasing by about 1,000 people every subsequent year until 1970, when growth slowed and the population stabilized (U.S. Census 1930, 1973, 1981). By the mid-twentieth century, the salmon runs fell in quantity and the economy shifted to a new pulp mill and the timber industry (ACHP n.d.). The primary economic driver in Ketchikan today is tourism.

4.10.2 Project History

The most detailed histories of the Project are from Campbell (1997:6–9) and KPU (2024). A summarized history is provided below.

Permission to construct the water and power plant was granted in 1902, and it came to be owned by Citizen Light, Water and Power Company (CLW&P Co.) the following year. The project provided all of Ketchikan's drinking water and water used for power generation for decades afterward. In 1905 – 1907, the first dam was built at the outlet of Ketchikan Lake (Figure 4-38). The dam was of timber crib construction, 4 feet high and 110 feet long. A 3-foot by 3-foot by 3,300-foot flume and wood stave pipe 28 inches in diameter and 400 feet long conveyed water from the lake to a new wood powerhouse with 240 HP turbine and 120 kW generator (Figure 4-39). In 1909, the existing intake tunnel No. 1 was excavated 20 feet below the normal surface of the lake.

Figure 4-38. Dam at the Outlet of Ketchikan Lake, Constructed in 1905-1906.

Figure 4-39. 1912 Photograph of the Powerhouse Constructed in 1907 and the Tramway to Ketchikan Lakes

Between 1911 and 1912, a new powerhouse, a dam at the Upper Ketchikan Lake outlet, and a tramway were constructed (see Figure 4-39). In 1916, a 1,650-foot long and 30-inch diameter wood stave pipe was added in Granite Creek to allow additional flow from that creek to be utilized.

In the first half of the 1920s, CLW&P Co. expanded storage capacity and doubled power output by constructing three rock-filled cribbed dams and an additional tunnel and dam south of Ketchikan Lake (Figure 4-40). A dam was also constructed at Fawn Lake, raising the level of the lake by 6.5 feet. A steel bridge was built across Ketchikan Creek in 1924, and in 1925, the Ketchikan Powerhouse was expanded (Figure 4-41).

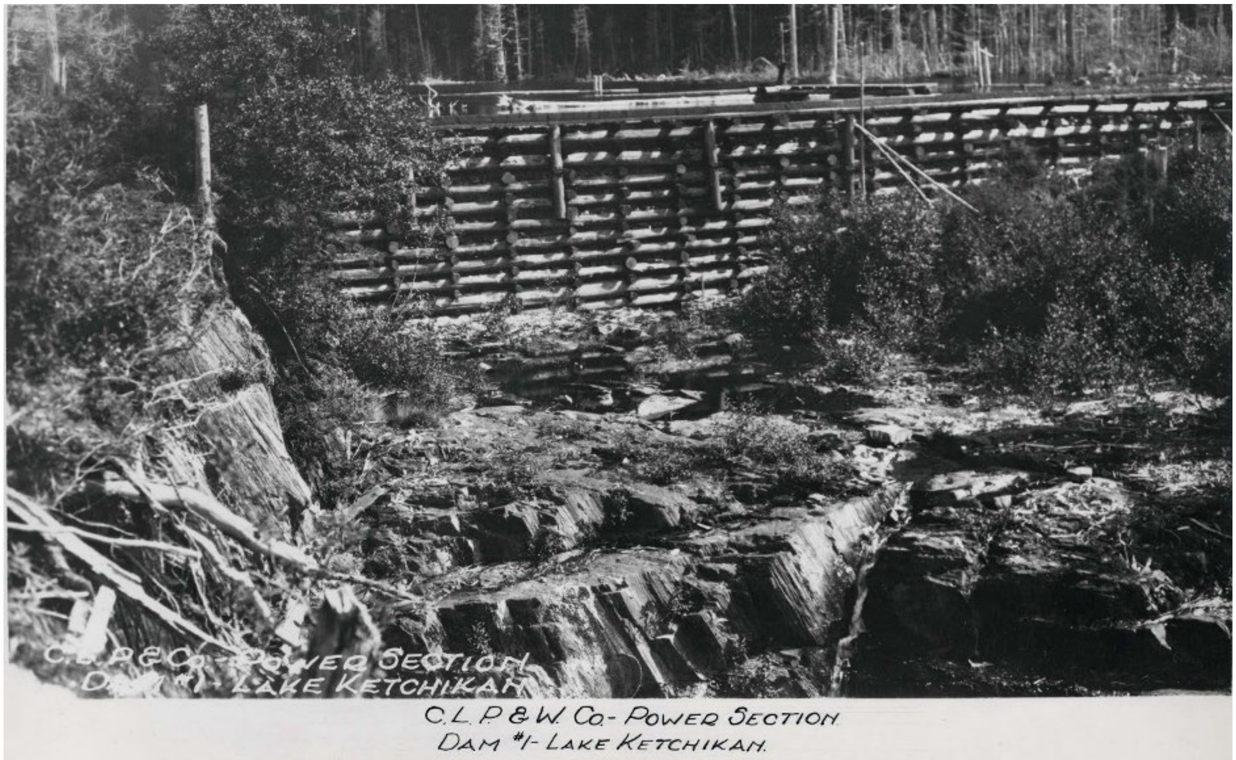

Figure 4-40. Ketchikan Lakes Dam #1, 1926

Figure 4-41. Ketchikan Powerhouse, 1926

At the time, these upgrades made the project the largest hydroelectric project in Alaska. The City of Ketchikan purchased the project in 1935 and became the first American city to own and operate their water, electric, and telephone utilities. The final purchase price was $954,970 (Kiffer 2007).

A major expansion phase of the Ketchikan Lakes project occurred in 1957, as electricity demands continued to rise with Ketchikan's growing population. During this time, an access road to Ketchikan Lake, Fawn Lake, and Granite Basin was built. A new 1,163-foot timber-core rockfill dam was constructed on top of the earlier timber crib dams at Ketchikan Lake (Dam #1 and Dam #3) (Figure 4-42). A channel was also excavated between Upper and Lower Ketchikan Lakes. At Fawn Lake, new timber-core rockfill dams were built at both the north and south ends of the lake, a new intake structure that housed gauging and control equipment was built, and two tunnels between Fawn Lake and Granite Basin were renovated.

The Ketchikan powerhouse was also renovated at this time. Units 1 and 2 were removed, and Unit 5 was added. A 36-inch steel penstock (Penstock 5) was installed to serve the new unit. Two years later, in 1959, the adjacent Penstocks 3 and 4 (formerly 44-inch diameter wood stave pipes) were both replaced with 36-inch steel pipe on new reinforced concrete supports.

Figure 4-42. Newly Completed Ketchikan Lakes Dam and Penstocks 1 and 2, c. 1958

The timber penstock crossing at Granite Basin Creek was replaced with a new concrete bridge structure constructed in early 1975.

From its construction in 1957, the Ketchikan Lakes spillway consisted of a gate controlled weir structure containing 13 reinforced concrete piers and wooden slide gates, with reinforced concrete sidewalls separating the spillway from the dam embankment. A wooden bridge spanned the spillway. However, in response to new FERC requirements, during March and April of 1978, the entire Ketchikan Lakes spillway structure was removed, and a new spillway was constructed in its place.

As constructed in 1912, the tailrace passed into three buried wooden flumes. In 1980, a portion of the Unit 4 tailrace flume caved in and was repaired. In the summer of 1983, a new buried tailrace was constructed.

In 1985, the wood stave pipe of Penstock No. 1 was demolished, and a new 54-inch concrete cylinder pipe was installed on new reinforced concrete supports along the same alignment. In 1997, the 54-inch wood stave Penstock 2 was replaced with a new 54-inch ductile iron pipe installed on new concrete supports along the same alignment (Figure 4-43).

Figure 4-43. Ductile Iron Penstock 2, 2022.

In 1997, the 1920's-era wooden flume spanning the ravine between the two segments of Tunnel No. 6 was replaced with a grated concrete structure in fill. A steep road built to facilitate construction is maintained to provide maintenance access for KPU.

4.10.3 Previous Cultural Resource Surveys

Chris R. Campbell (1997) surveyed the Project area for FERC relicensing in the late 1990s. Survey included pedestrian survey and soil probing up to 1,000 feet away from the two-mile-long road and the two-mile-long trail/tramway following Ketchikan Creek. Campbell (1997:1) indicates that a total of four miles were surveyed, which may indicate that pedestrian survey was meandering.

4.10.4 Previously Reported AHRS Sites

There are five previously reported sites in the Alaska Heritage Resources Survey (AHRS). The AHRS is a restricted database, and information about site inventory may be restricted pursuant to AS 40.25.120(a)(4), Alaska State Parks Policy and Procedure No. 50200.

Campbell (1997) identified all previously reported sites, and all but two are associated with Project infrastructure:

- The tramway (KET-00519) was constructed in 1911 to facilitate construction of the Project and continued to be used during maintenance until the construction of the road in 1957 (Campbell 1997). Components included dimensional lumber, logs, trestles, and track over decking. The track was 25 gauge and spanned 6,930 feet.

- The transmission line (KET-00520) was constructed of cedar poles with brown ceramic insulators. Campbell noted that it was not maintained and that the line sagged near the ground.

- A penstock (KET-00521) of 12-inch wood stave water pipe was constructed by 1913. In 1997, the feature, that once spanned 7,100 feet, was in very poor condition.

- An adit (KET-00522) was excavated into a slope and was once blocked by a timber door. The Project used to store dynamite and tools inside.

- A stone fish trap (KET-00523) includes a deep pool and reroutes the creek at a 45-degree angle. Nearby are a bark-stripped cedar with adze marks.

Although Campbell (1997) did not discuss them, the modern Project powerhouse and substation were both constructed by 1965. Neither did Campbell (1997) evaluate any of the Projects' many previous dams on Ketchikan Creek and the Ketchikan Lake outlet, the remains of which still exist.

4.10.5 References

Advisory Council on Historic Preservation (ACHP). (n.d.) Ketchikan, Alaska. Electronic document, https://www.achp.gov/preserve-america/community/ketchikan-alaska, accessed October 2024.

Ackerman, R. E., T. D. Hamilton, and R. Stuckenrath. 1979. Early Culture Complexes on the Northern Northwest Coast. Canadian Journal of Archaeology 3:195–208.

Alaska Department of Fish and Game (ADFG). (n.d.a.) Ketchikan Management Area. Electronic document, https://www.adfg.alaska.gov/index.cfm?adfg=ByAreaSoutheastKetchikan.main, accessed October 2024.

ADFG. (n.d.b.) Ketchikan Wildlife Viewing Guide: Alaska Coastal Wildlife Viewing Trail. 3 pp.

Andrew, William, Traci Fitka, Val Hoffman, Don Sturgeon. (1992). Archaeological Analysis of the Excavations at Starrigavan Bay, 49 SIT 229. Project SEEK, Starrigavan Excavation and Education Cooperative.

Autrey, John T. (editor). (1992). Draft 2, Research Design/Predictive Model Format for R-10. Manuscript on file, Tongass National Forest, Sitka.

Baichtal, James F., Alia J. Lesnek, Risa J. Carlson, Nicholas S. Schmuck, Jane L. Smith, Dennis J. Landwehr, and Jason P. Briner. (2021). Late Pleistocene and Early Holocene Sea-Level History and Glacial Retreat Interpreted from Shell-Bearing Marine Deposits of Southeastern Alaska, USA. Geosphere 17(6):1590–1615.

Brown, Thomas Jay. (2016). Demography and the Evolution of Logistic Organization on the Northern Northwest Coast between 11,000 and 5,000 cal BP. Master's thesis, Portland State University, Department of Anthropology.

Campbell, Chris Rabich. (1984). Preliminary Report Describing Results of a Test Excavation at CRG-164, Sarkar Cove Entrance, Prince of Wales Island, Southeast Alaska. U.S. Forest Service, Tongass National Forest, Ketchikan, Alaska.

Campbell, Chris Rabich. (1989). A Study of Matrilineal Descent from the Perspective of the Tlingit NexA'di Eagles. Arctic 42(2):119-127.

Campbell, Chris Rabich. (1997). Archaeological Survey of Ketchikan Creek and the Ketchikan Lake Area, Ketchikan, Alaska, for the Federal Energy Regulatory Commission Relicensing Project No. 420. Prepared for Ketchikan Public Utilities, Ketchikan, Alaska.

Carlson, Risa J., and James F. Baichtal. (2015). A Predictive Model for Locating Early Holocene Archaeological Sites Based on Raised Shell-Bearing Strata in Southeast Alaska, USA. Geoarchaeology: An International Journal 30:120–138.

Clark, Gerald H. (1979). A Brief Preliminary Comparison of Polished Slate from Two Southeast Alaskan Coastal Middens. Manuscript on file with the Office of History and Archaeology, Anchorage, Alaska.

Coast Pilot. (1883). Coast from Dixon Entrance to Yakutat Bay with the Inland Passage.

1891 Coast from Dixon Entrance to Yakutat Bay with the Inland Passage. Third edition.

Davis, Stanley D. (1985). Test Excavation of the Starrigavan Site, 49 SIT 229, Baranof Island Alaska. U.S. Forest Service, Tongass National Forest, Sitka, Alaska.

Davis, Stanley D. (1990). Prehistory of Southeast Alaska. In Northwest Coast, edited by Wayne Suttles, pp. 197–202. Handbook of North American Indians, Vol. 7, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D. C.

Davis, Stanley D., Jon M. Erlandson, Richard G. Holloway, Ricky Ray Lightfoot, Madonna L. Moss, and Douglas N. Swanston. (1984). The Hidden Falls Site, Baranof Island, Alaska. Edited by Stanley D. Davis. U.S. Forest Service, Tongass National Forest, Sitka, Alaska.

De Laguna, Frederica, Francis A. Riddell, Donald F. McGeein, Kenneth S. Lane, J. Arther Freed, and Carolyn Osbourne. (1964). Archaeology of the Yakutat Bay Area, Alaska. Smithsonian Institution Bureau of American Ethnology Bulletin 192. U.S. Government Printing Office, Washington D.C.

Emmons, George Thornton. (1991). The Tlingit Indians, Edited with Additions by Frederica de Laguna and a Biography by Jean Low. University of Washington Press, Seattle and London, and American Museum of Natural History, New York.

Goldschmidt, Walter R., and Theodore H. Haas. (1998). Haa Aani, Our Land: Tlingit and Haida Land Rights and Use, edited and introduced by Thomas F. Thornton. Sealaska Heritage Foundation, Juneau, Alaska.

Grinev, Andrei Val'terovich. (2005). The Tlingit Indians in Russian America, 1741–1867. Trans. Richard L. Bland and Katerina G. Solovjova. University of Nebraska Press, Lincoln.

Ketchikan Public Utilities. (2024). Ketchikan Lakes Hydroelectric Project, FERC No. 420. Supporting Technical Information (STI) Document. Ketchikan Public Utilities, Ketchikan.

Kiffer, Dave. (2007). KPU: Ketchikan's Home Grown Utility Water, Power and Telephone for more than 7 Decades. Online resource: http://www.sitnews.us/Kiffer/KPU/121907_kpu.html. Accessed on December 7, 2024.

Lemke, Richard W. (1975). Reconnaissance Engineering Geology of the Ketchikan Area, Alaska, with Emphasis on Evaluation of Earthquake and Other Geologic Hazards. United States Department of the Interior Geological Survey, Open-file report 75-250.

Machner, Herbert D.G. (2008). Fishtails, Ancestors, and Old Islanders: Chirikof Island, the Alaska Peninsula, and the Dynamics of Western Alaska Prehistory. Alaska Journal of Anthropology 6(1&2):171–183.

Mobley, Charles M. (2003). Sawmill Creek Road Upgrade, Sitka, Baranof Island, Alaska: Cultural Resource Investigations. Prepared for USKH, Inc. and Alaska Department of Transportation and Public Facilities, Juneau, Alaska.

Mobley, Charles M. (2018). Archaeological Excavation at the Yatuk Creek Terrace Site (CRG-717), Prince of Wales Island, Southeast Alaska.

Moss, Madonna L. (1989). The Antiquity of Tlingit Settlement on Admiralty Island, Southeast Alaska. American Antiquity 54(3):534–543.

Moss, Madonna L. (1998). Northern Northwest Coast Regional Overview. In The Origins, Development, and Spread of Prehistoric North Pacific-Bering Sea Maritime Cultures, edited by Allen McCartney and William Workman. Arctic Anthropology 35(1).

Moss, Madonna, Justin M. Hayes, Peter M. Bowers, and Douglas Reger. (2016). The Archaeology of Coffman Cove: 5500 Years of Settlement in the Heart of Southeast Alaska. University of Oregon Anthropological Paper No. 72. University of Oregon Museum of Natural and Cultural History and the Department of Anthropology, University of Oregon, Eugene.

Orth, Donald J. (1967). Dictionary of Alaska Place Names. Geological Survey Professional Paper 567. Reprinted 1971 with minor revisions. U.S. Government Printing Office, Washington D.C.

Parker, P.L., and T.K. King. (1998). Guidelines for documenting and evaluating traditional cultural properties. National Register Bulletin 38. U.S. Department of the Interior, National Park Service, National Register, History and Education, National Register of Historic Places. Washington, DC.

Petroff, Ivan. (1884). Report on the Population, Industries, and Resources of Alaska. 10th Census. U. S. Government Printing Office, Washington, D. C.

Roberts, Larry D. (1982). Southeastern Archaeology in Light of the Irish Creek Site. U.S. Forest Service, Stikine Area, Petersburg, Alaska. Paper presented at the 9th Annual Alaska Anthropological Conference, Fairbanks, Alaska.

Thornton, Thomas F. (Ed.). (2012). Haa Leek'w Has Aani Saax'u: Our Grandparents Names on the Land. Sealaska Heritage Institute.

U.S. Census. (1893). Report on the Population and Resources of Alaska at the Eleventh Census:

U.S. Census. (1890). Department of the Interior Census Office.

U.S. Census. (1900). Table 5: Population of States and Territories by Minor Civil Divisions: 1890 and 1900 – Continued. Electronic document, https://live.laborstats.alaska.gov/cen/histpdfs/1900inhab.pdf

U.S. Census. (1930). Alaska. Electronic document, https://live.laborstats.alaska.gov/cen/histpdfs/1930ak.pdf

U.S. Census. (1973). 1970 Census of Population, Volume 1, Characteristics of the Population, Part 3, Alaska. Department of Commerce, Bureau of the Census. Electronic document, https://live.laborstats.alaska.gov/cen/histpdfs/1970char.pdf

U.S. Census. (1981). 1980 Census of Population, Volume 1, Characteristics of the Population, Part 3, Alaska. Department of Commerce, Bureau of the Census. Electronic document, https://live.laborstats.alaska.gov/cen/histpdfs/1980det.pdf

Wilson, F.H., Hults, C.P., Mull, C.G., and Karl, S.M., comps. (2015). Geologic Map of Alaska: U.S. Geological Survey Scientific Investigations Map 3340, 197 p., 2 sheets, scale 1:1,584,000. Electronic document, http://dx.doi.org/10.3133/sim3340.

4.11 Socioeconomic Resources (18 CFR § 5.6 (d)(3)(xi))

4.11.1 Overview

The Project is located in the Ketchikan Gateway Borough in southeast Alaska, along the Tongass Narrows. The hydroelectric dam is situated on Ketchikan Creek in the city of Ketchikan, Alaska. The Ketchikan Lakes Hydroelectric Project occupies lands within the Tongass National Forest, land managed by the BLM and Alaska Mental Health Trust, and land within the corporate limit of the City of Ketchikan. Land use adjacent to the Project is almost entirely undeveloped, consisting of mountainous terrain covered with alpine shrub/scrub and barren land, forests, and lakes primarily owned by state and federal agencies. Land uses in the vicinity of the Project are further discussed in Section 4.1.2. As of the 2020 census, Ketchikan Gateway Borough has a population of 13,948 and the population density is approximately 2.1 people per square mile (Census 2020). The Project is northeast of the City of Ketchikan, the primary population center of the Borough.

4.11.2 Population Patterns

Table 4-43 shows current and historical population patterns for Ketchikan Gateway Borough and for the State of Alaska. The data shows that the overall population of Alaska increased by 3.3 percent from 2010 to 2020, while the population of Ketchikan Gateway Borough increased by approximately the same amount; 3.5 percent during the same time period. The population of Alaska increased by 17.0 percent from 2000 to 2020, but the population of Ketchikan Gateway Borough decreased by only 0.9 percent during the same period (Census 2000; Census 2010; Census 2020).

Table 4-43. Population – 2000, 2010, 2020 (Census 2000, Census 2010, Census 2020)

Municipality	2000	2010	2020
Alaska	626,932	710,231	733,391
% Change since 2010	--	--	3.3
% Change since 2000	--	13.3	17.0
Ketchikan Gateway Borough	14,070	13,477	13,948
% Change since 2010	--	--	3.5
% Change since 2000	--	-4.2	-.9

The majority of the Borough population identifies as White (75.5%) alone or in combination with one or more races (Census, 2023 American Community Survey) which is a majority population. The following information in Table 4-44 and Figure 4-44 provides the percent minority by census tract. American Indian and Alaska Native is the most prominent minority population, with 21.6% of Ketchikan Gateway Borough residents identifying along or in combination with one or more races.

Table 4-44. Total Minority Population, (Census 2023, ACS)

	State	Ketchikan Gateway Borough	Census Tract 000101 – Ward Cove/ Clover Pass	Census Tract 000102 – Outer Ketchikan	Census Tract 000200 – Newtown	Census Tract 000300 – Downtown Ketchikan	Census Tract 000400 – Saxman/ Mountain Point
Total Minority %	40.43	36.47	19.77	5.47	49.36	43.73	26.81

Figure 4-44. Census Tracts for the Ketchikan Gateway Borough

4.11.3 Household/Family Distribution and Income

Household, income, and poverty status data for Ketchikan Gateway Borough and the State of Alaska are presented in Table 4-45. The data show that Ketchikan's household size is similar to the State of Alaska and the United States. Ketchikan Gateway Borough has a higher median household income than both the State of Alaska and the United States. Per capita income between Ketchikan Gateway Borough, the State of Alaska, and the United States were similar. The percentage of persons in poverty is lower in Ketchikan Gateway Borough than both the State of Alaska and the United State as a whole (Census 2023, American Community Survey (ACS)).

Table 4-45. Income and Poverty, 2023 (Census 2023, ACS)

	Ketchikan Gateway Borough	State of Alaska	United States
Total households	5,621	276,852	131,332,360
Persons per household	2.41	2.54	2.49
Median household income	89,155	86,631	77,719
Percentage of state	102.9%	--	89.7%
Percentage of US	114.7%	111.5%	--
Per capita income	46,608	44,928	43,313
Percentage of state	103.7%	--	92.9%
Percentage of US	107.6%	103.7%	--
Persons in poverty	9.5%	10.4%	12.5%

4.11.4 Project Vicinity Employment Sources

Labor force and unemployment rates for Ketchikan Gateway Borough and the State of Alaska are presented in Table 4-46. Ketchikan Gateway Borough makes up approximately 2.0% of Alaska's total labor force. The 2023 unemployment rate in Ketchikan Gateway Borough was less than Alaska's overall unemployment rate (Census 2023, ACS).

Table 4-46. Labor Force and Unemployment, 2023 (Census 2023, ACS)

	Labor Force	Unemployment (%)
Ketchikan Gateway Borough	11,357	3.5%
State of Alaska	577,598	4.8%
United States	271,122,729	4.3%

Industry and occupation statistics for Ketchikan Gateway Borough and the State of Alaska are presented in Table 4-47. The most common occupational category in Ketchikan Gateway Borough and the State of Alaska is management, business, science, and arts and the second is sales and office. In both Ketchikan

Gateway Borough and the State of Alaska, educational services, health care, and social assistance is the largest industry sector. The second largest in Ketchikan Gateway Borough is transportation and warehousing and utilities, while public administration was second for the State of Alaska (Census 2023, ACS). Table 4-48 shows the largest employers by number of employees in Ketchikan Gateway Borough (ADLWD 2023).

Table 4-47. Industry and Occupation for Civilian Population 16 Years and Over, 2023 (Census 2023, ACS)

	Ketchikan Gateway Borough	State of Alaska	United States
Occupation			
Management, business, science, and arts occupations	2,542	142,374	70,919,638
Service occupations	1,309	57,588	26,983,243
Sales and office occupations	1,313	64,165	31,425,450
Natural resources, construction, and maintenance occupations	814	37,630	13,849,501
Production, transportation, and material moving occupations	908	43,703	21,169,161
Industry			
Agriculture, forestry, fishing and hunting, and mining	344	18,392	2,568,128
Construction	477	25,277	11,365,506
Manufacturing	297	14,639	16,271,926
Wholesale trade	102	7,846	3,340,218
Retail trade	683	35,568	17,465,488
Transportation and warehousing, and utilities	731	27,648	9,884,522
Information	61	5,288	3,054,393
Finance and insurance, and real estate and rental and leasing	315	10,269	10,878,803
Professional, scientific, and management, and administrative and waste management services	395	29,860	20,998,610
Educational services, and health care and social assistance	1,743	87,856	38,561,546
Arts, entertainment, and recreation, and accommodation and food services	730	28,349	14,492,950
Other services, except public administration	328	15,792	7,832,146
Public administration	680	38,676	7,632,757

Table 4-48. Top Employers in the Ketchikan Gateway Borough (ADLWD 2023)

Name	Number of Employees	Type of Business
Alaska General Seafoods	250-499	Seafood Product Preparation and Packaging
City of Ketchikan City Hall	250-499	Executive, Legislative, and Other General Governmental Support
E C Phillips & Son Inc	100-249	Seafood Product Preparation and Packaging
Ketchikan Human Resources	100-249	Administration of Human Resource Programs
Ketchikan Indian Corp	100-249	Offices of Physicians
Ketchikan Infant Learning Program	100-249	Social Advocacy Organizations
Kic	100-249	Offices of Dentists
Peacehealth Ketchikan Med Ctr	250-499	General Medical and Surgical Hospitals
Trident Seafoods	250-499	Grocery and Related Product Merchant Wholesalers
Vigor Alaska	100-249	Ship and Boat Building

4.11.5 References

U.S. Census Bureau. (2023). American Community Survey 5-Year Estimates, 2023. Retrieved from https://data.census.gov/table?q=acs&y=2023.

4.12 Tribal Resources (18 CFR § 5.6 (d)(3)(xii))

Section 106 requires federal agencies to consult with interested Native American tribes that attach religious or cultural significance to historic or archaeological properties in the vicinity., including tribes that may still have ancestral affiliations to a place. KPU, as the designated non-federal representative for day-to-day NHPA Section 106 consultation, will consult with potentially affected Native American tribes and agencies during the Project relicensing.

At the time of Euroamerican contact, the Ketchikan area was situated within the territory of the Tongass (Tan-ta kwan) Tlingit, which included the southern portion of Revillagigedo Island; Annette, Gravina, and Duke Islands; and the area around the mouth of Portland Canal (de Laguna 1990:204). Cape Fox Natives founded Saxman, a village two and one-half miles south of Ketchikan, in 1894 (Roppel 1998:10-11). Early in the historic period, the Saxman Tlingit claimed all of Revillagigedo Island.

By the 1880s, Tlingit society is recorded as being split into tribes, clans, and nobles, common people, and slaves (Emmons 1991). Tlingit occupied winter villages and seasonal subsistence camps. Usually, each tribe had only one winter village. Summer houses were smaller than winter houses, built on the ground without any excavation, and could double as a smokehouse. Temporary structures included lean-tos. Additional structures included steam baths (Grinev 2005:36).

Trade between coastal people was permitted for individuals, but trade rights with interior peoples were hereditary to chiefs (Emmons 1991:55). Potlaches were prominent prestige ceremonies where the opposite moiety would be presented with lavish gifts after a minimum four-day festival (Grinev 2005:45, 64). Warfare and conflict between clans and kwaans also occurred.

Tlingit traveled in canoes carved from tree trunks. Subsistence focused on salmon taken in dams, in traps, by spear, by hook, with harpoons, or with nets (Emmons 1991:55; Grinev 2005:35). Fur seal, halibut, eulachon, bear, wolf, fox, and other furbearers were taken primarily in spring (Emmons 1991:55). Hunting gear, for both marine and terrestrial game, included traps and snares, bows and arrows, spears, slings, daggers, clubs, and harpoons (Grinev 2005:35).

The Tlingit name for Ketchikan and Pennock Island is Kichxaan, meaning "near the eagle's wing" (Thornton 2012:194, 173). Ketchikan Creek and the original winter village share the name. It refers to a founder's name but also how the water at the mouth of Ketchikan Creek is calm from every direction.

A Tongass legend says that, a long time ago, Tongass people travelled over the sea and reached the coast where they came to populate (Goldschmidt and Haas 1998:9). The direction of travel was not specified. The Tongass Gasnax.adi clan is under the Raven moiety, and the Eagle/Wolf side was the Dakl'aweidi and Teikweidi clans (Thornton 2012:172). The Eagle/Wolf moiety originated from the Nass River area.

Although ethnographic accounts mention a number of localities used by the Tlingit in the Ketchikan area, few precontact period archaeological sites have been officially recorded in the AHRS. However, much of the area has not been intensively inventoried, and the possibility of locating additional sites should not be ruled out. The few known prehistoric sites in the Ketchikan area are along the coast.

Indigenous groups that may attach religious or cultural significance to historic properties in the Project vicinity include the Ketchikan Indian Corporation, Central Council of the Tlingit and Haida Indian Tribes of Alaska, and Sealaska Corporation. No traditional cultural properties have been identified in the Project vicinity. Traditional cultural properties are a type of historic property eligible for the NRHP because of their association with cultural practices or beliefs of a living community (Parker and King 1998).

4.12.1 References

De Laguna, Frederica. (1990). Tlingit. In *Northwest Coast*, edited by Wayne Suttles, pp. 203–228. *Handbook of North American Indians, Vol. 7*, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D. C.

Grinev, Andrei Val'terovich. (2005). The Tlingit Indians in Russian America, 1741–1867. Trans. Richard L. Bland and Katerina G. Solovjova. University of Nebraska Press, Lincoln.

Parker, P.L., and T.K. King. (1998). Guidelines for documenting and evaluating traditional cultural properties. National Register Bulletin 38. U.S. Department of the Interior, National Park Service, National Register, History and Education, National Register of Historic Places. Washington, DC.

Thornton, Thomas F. (Ed.). (2012). Haa Leek'w Has Aani Saax'u: Our Grandparents Names on the Land. Sealaska Heritage Institute.

5.0 Preliminary Issues and Studies List (18 CFR § 5.6 (d)(4))

5.1 Issues Pertaining to the Identified Resources (18 CFR § 5.6 (d)(4)(i))

The following is a list of preliminary issues KPU has identified based on available information and research, as well as information received from interested parties as part of early outreach and consultation efforts.

During the previous relicensing, KPU conducted various studies and potential impacts were reviewed and assessed by FERC, federal and state agencies, Indian tribes, and other LPs. As a result, the Project's existing license includes protection, enhancement, and mitigation measures that were implemented to address Project effects such as minimum instream flows and ramping rates. KPU is considering relatively minor modifications to existing Project facilities and operations as described in Section 3.8. This includes one non-capacity infrastructural change (the potential addition of a low-level outlet for dam safety purposes) and one operational change (continuing to apply the current ramping rates to downramping, but not upramping). KPU therefore anticipates minimal project-related issues and study needs associated with the current licensing proceeding.

During the public scoping process that begins with FERC's Public Scoping Meeting (estimated for June 2025), LPs will have the opportunity to provide input and refine the resource issues to be analyzed in KPU's license application.

5.1.1 Geology and Soils

There are no known issues related to geology and soils associated with ongoing Project operations. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on geology and soils.

5.1.2 Water Resources

There are no known issues related to water resources associated with ongoing Project operations. The current FERC license already includes minimum instream flows and downramping rates for the Project below the powerhouse to protect fish habitat, and the existing data summarized in Section 4.3.7.3 indicate a system with excellent water quality. In addition, the watershed has restricted access and the use of Project waters as a source of municipal drinking water ensures that the monitoring and detection of changes to water quality will continue. Finally, a detailed water temperature study in support of current license Article 404 shows that water temperatures decrease as intake waters are conveyed through Project infrastructure and returned to Ketchikan Creek via the tailrace.

The proposed changes to Project infrastructure and operations are unlikely to have a negative impact on water resources. The addition of a low-level outlet would reduce the magnitude, duration, and frequency of spill events; however, there is no indication that this would be considered a negative impact given the infrequent occurrence of spill events currently. In addition, applying the existing ramping rates to just downramping but not upramping would result in fewer notification requirements, but it would be unlikely to have any negative environmental impacts.

5.1.3 Fish and Aquatic Resources

There are no known issues related to fish and aquatic resources associated with ongoing Project operations. The current FERC license already includes minimum instream flows and downramping rates for the Project below the powerhouse to protect fish habitat. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on fish and aquatic resources. Applying the existing ramping rates to just downramping but not upramping would result in fewer notification requirements, but it would be unlikely to have any negative environmental impacts.

5.1.4 Wildlife and Botanical Resources

5.1.4.1 Wildlife Resources

There are no known issues related to wildlife resources associated with ongoing Project operations. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on wildlife resources.

5.1.4.2 Botanical Resources

There are no known issues related to botanical resources associated with ongoing Project operations. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on botanical resources.

5.1.5 Wetlands, Riparian, and Littoral Habitat

There are no known issues related to wetlands, riparian, or littoral habitat associated with ongoing Project operations. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on wetlands, riparian, or littoral habitat.

5.1.6 Rare, Threatened, and Endangered Species

5.1.6.1 Fish and Aquatic Resources

There are no ESA-listed fish species or fish stocks of concern noted by ADFG in the Ketchikan Creek watershed (ADFG 2024).

5.1.6.2 Wildlife Resources

The Short-tailed albatross is the only wildlife species identified on the federal and state threatened or endangered list as potentially occurring in the Project area. However, there is no critical habitat for the Short-tailed Albatross in the Project area. Therefore, continued operation of the Project is not anticipated to negatively affect this species.

5.1.6.3 Botanical Resource

There are no known issues related to rare, threatened, or endangered botanical species that may exist within the Project boundary. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on botanical resources.

5.1.7 Recreation and Land Use

There are no known issues related to recreation and land use that are associated with ongoing Project operations. Municipal code prohibits public access to the watershed to protect the water quality of the public water supply. However, it should be noted that this is an impact of the water supply project, not the hydroelectric project. In addition, there appear to be sufficient recreational opportunities in the surrounding area, including the nearby Deer Mountain Trail, and there are no proposed changes to Project infrastructure or operations that would negatively impact that recreational use.

5.1.8 Aesthetic Resources

There are no known issues related to aesthetic resources that are associated with ongoing Project operations. Municipal code prevents access to the watershed to protect the water quality of the municipal water supply. As a result, most of the Project infrastructure is not visible to the general public. Ketchikan Lakes and Ketchikan Lakes Dam are visible from specific viewpoints along the nearby Deer Mountain Trail; however, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on aesthetic resources.

5.1.9 Cultural Resources

During her 1997 relicensing survey, Campbell identified five cultural sites in the Project area, but none of them appeared to be vulnerable to direct, indirect, or cumulative effects resulting from the Project. However, the proposed changes to Project infrastructure may impact historic resources.

5.1.10 Socioeconomic Resources

There are no known issues related to socioeconomic resources that are associated with ongoing Project operations. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on socioeconomic resources.

5.1.11 Tribal Resources

There are no known issues related to Tribal resources that are associated with ongoing Project operations. In addition, the proposed changes to Project infrastructure and operations are unlikely to have a negative impact on Tribal resources.

5.2 Potential Studies or Information Gathering (18 CFR § 5.6 (d)(4)(ii))

Based on the known data gaps and resource issues identified above, KPU is currently proposing that the following studies be conducted as part of relicensing.

- Section 106 Eligibility Assessment – The purpose of this study would be to evaluate the eligibility of Project infrastructure for listing on the National Register of Historic Places (NRHP). It would include a historic resources survey and desktop analysis.

- Section 106 Effects Analysis – The purpose of this study would be to determine if the continued operation of the Project or the proposed changes to Project infrastructure and operations would have any negative effects on known historic properties.

5.3 Relevant Comprehensive Waterway Plans (18 CFR § 5.6 (d)(4)(iii))

Section 10(a)(2)(A) of the FPA, 16 U.S.C. section 803 (a)(2)(A), requires FERC 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. On April 27, 1988, the Commission issued Order No. 481-A, revising Order No. 481, issued October 26, 1987, establishing that the Commission will accord FPA section 10(a)(2)(A) comprehensive plan status to any Federal or state plan that: (1) is a comprehensive study of one of more of the beneficial uses of the waterway or waterways; (2) specifies the standards, the data, and the methodology used; and (3) is filed with the Secretary of the Commission.

The FERC currently lists 99 comprehensive plans for the State of Alaska (FERC 2018). The following 21 comprehensive plans pertain to the area within the Project vicinity:

- Alaska Administrative Code. 2012. 5 AAC § 39.222 Policy for the Management of Sustainable Salmon Fisheries. Juneau, Alaska.
- Alaska Administrative Code. 2003. 5 AAC § 75.222 Policy for the Management of Sustainable Wild Trout Fisheries. Juneau, Alaska.
- Alaska Department of Fish and Game. 2006. Management Plan for Invasive Northern Pike in Alaska. Anchorage, Alaska. 2006.
- Alaska Department of Fish and Game. 1998. Prince of Wales Island Area Plan. Anchorage, Alaska. October 1998.
- Alaska Department of Fish and Game. 2011. Alaska Anadromous Waters Catalog - Southeastern Region. Anchorage, Alaska. June 1, 2011.
- Alaska Department of Fish and Game. U.S. Fish and Wildlife Service. 2007. Black Oystercatcher (Haematopus bachmani) Conservation Action Plan. Anchorage, Alaska. April 2007.
- Alaska Department of Natural Resources. Alaska's Outdoor Legacy: Statewide Comprehensive Outdoor Recreation Plan (SCORP): 2009-2014. Anchorage, Alaska.
- Alaska Department of Natural Resources. 2000. Central/Southern Southeast Area Plan. Anchorage, Alaska. November 2000.
- U.S. Forest Service. 2016. Tongass National Forest Land and Resource Management Plan. Department of Agriculture, Ketchikan, Alaska. December 2016.
- National Marine Fisheries Service. 1991. Final Recovery Plan for the Humpback Whale. Silver Spring, Maryland. November 1991.
- National Marine Fisheries Service. 2007. Conservation Plan for the Eastern Pacific Stock of Northern Fur Seal (Callorhinus ursinus). National Marine Fisheries Service, Juneau, Alaska. December 2007.

- National Marine Fisheries Service. 2008. Recovery Plan for Southern Resident Killer Whales. Seattle, Washington. January 2008.
- National Marine Fisheries Service. 2008. Recovery Plan for the Steller Sea Lion: Eastern and Western Distinct Population Segments (Eumetopias jubatus). National Marine Fisheries Service, Juneau, Alaska. March 2008.
- National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.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.
- U.S. Fish and Wildlife Service, et al. 2008. Alaska Shorebird Conservation Plan. Version II. Anchorage, Alaska. November 2008.
- U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. Anchorage, Alaska. 2009.
- U.S. Fish and Wildlife Service. 2005. Regional Seabird Conservation Plan. Pacific Region, Portland, Oregon. January 2005.
- U.S. Fish and Wildlife Service. 2002. Steller's Eider (Polysticta stelleri) Recovery Plan. Fairbanks, Alaska. September 2002.
- U.S. Fish and Wildlife Service. 1996. Spectacled Eider (Somateria fischeri) Recovery Plan. Anchorage, Alaska. August 1996.
- U.S. Fish and Wildlife Service. 1994. Conservation Plan for the Pacific Walrus in Alaska. Anchorage, Alaska. June 1994.
- U.S. Fish and Wildlife Service. 1994. Conservation Plan for the Sea Otter in Alaska. Anchorage, Alaska. June 1994.

5.4 Relevant Resources Management Plans (18 CFR § 5.6 (d)(4)(iv))

In addition to the comprehensive plans listed above, some agencies have developed resource management plans to help guide their actions regarding specific resources of jurisdiction. The resource management plans listed below may be relevant to the Project and may be useful in the relicensing proceeding for characterizing desired conditions.

- Alaska Department of Fish and Game. Black Bear Management Report. July 2007 – June 2010.
- Alaska Department of Fish and Game. Wolf Management Report and Plan, Game Management Unit 1A. Report Period 1 July 2010–30 June 2015, and Plan Period 1 July 2015–30 June 2020. Division of Wildlife Conservation. Juneau, Alaska. 2018.
- Alaska Department of Fish and Game. Alaska Wildlife Action Plan. 2015.

- Alaska Department of Fish and Game. 2018 Spring Troll Fishery Management Plan. Regional Information Report No. 1J18-07. 2018.

- Alaska Department of Natural Resources. Southeast State Forest Management Plan. Division of Forestry. February 2016.

- Ketchikan Gateway Borough. 2009. Ketchikan Gateway Borough Comprehensive Plan 2020. Ketchikan Gateway Borough Department of Planning & Community Development. April 1, 2009.

- U.S. Department of the Interior. Bureau of Land Management. East Alaska Resource Management Plan. 2010.

- U.S. Forest Service. 2011. Ketchikan-Misty Fiords Outfitter and Guide Management Plan. June 2011.

- U.S. Forest Service. 2016. Land and Resource Management Plan. Tongass National Forest. December 2016.

5.5 References

Alaska Department of Fish and Game (ADFG). (2024). *Special Status Species.* Available at: https://www.ADFG.alaska.gov/index.cfm?ADFG=specialstatus.main (Accessed: December 20, 2024).

English, D.B.K. et. al. (2002). *Forest Service National Visitor Use Monitoring Process: Research Method Documentation.* USDA Forest Service Southern Research Station General Technical Report SRS-57.

Federal Energy Regulatory Commission (FERC). 2024. List of Comprehensive Plans. Available online: https://www.ferc.gov/media/comprehensive-plans. Accessed January 2, 2025.

Hill, N.R. and J. Spencer. (2020). *National scenery management system inventory mapping protocols.* Developed by USDA Forest Service, Enterprise Program for USDA Forest Service Washington Office, Chief Landscape Architect. July 2020.

U.S. Forest Service (USFS). (2024). *Draft Recreation and Tourism Resource Assessment: Tongass National Forest Plan Revision*. Alaska Region Tongass National Forest. December 2024.

USFS. (2024). *Draft Scenic Resource Assessment: Tongass National Forest Plan Revision.* Alaska Region Tongass National Forest. November 2024.