Green Lake Hydroelectric Project FERC No. 2818

Pre-Application Document

March 2024

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Acronyms and Abbreviations

ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADLWD	Alaska Department of Labor and Workforce Development
ADNR	Alaska Department of Natural Resources
AHRS	Alaska Heritage Resources Survey
AWC	Anadromous Waters Catalog
CBS	City and Borough of Sitka
CCC	Civilian Conservation Corps
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
DO	dissolved oxygen
El.	elevation
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
ft	feet
HUC	hydrologic unit code
IDF	inflow design flood
ILP	Integrated Licensing Process
IPaC	Information for Planning and Consultation
kW	kilowatt
LiDAR	Light Detection and Ranging
mg/L	milligram per liter
MW	megawatt
MWh	megawatt hour
National Register	National Register of Historic Places
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NSRAA	Northern Southeast Regional Aquaculture Association
NWI	National Wetlands Inventory
NWS	National Weather Service
PAD	Pre-Application Document

PLP	Preliminary Licensing Proposal
Project	Green Lake Hydroelectric Project
PURPA	Public Utility Regulatory Policies Act
SD	Scoping Document
SHPO	State Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WY	Water Year

1.0 Introduction

The City and Borough of Sitka (CBS), Alaska, is the licensee (herein, Applicant or Licensee) of the Green Lake Hydroelectric Project, FERC No. 2818 (Project). The Project is located in southeast Alaska on the west-central portion of Baranof Island. Green Lake is on the Vodopad River, approximately 10 miles southeast of Sitka and 95 miles southwest of Juneau, the capital of Alaska. Green Lake sits at the end of Silver Bay. On April 5, 1979, the Federal Energy Regulatory Commission (FERC) issued the Project its Order Issuing License (Major) for a 50-year license, which expires on March 31, 2029.

CBS's Electric Department provides clean, renewable power to the electrically isolated Baranof Island. Their energy portfolio includes operation and maintenance of the Project. The topography and great distances between population centers in southeastern Alaska limit the feasibility of interconnections; therefore, CBS relies on local hydro power as its primary generation asset. CBS's primary power-generating resources consist of the 18.54-megawatt (MW) Green Lake Hydroelectric Project and the 15.9-MW Blue Lake Hydroelectric Project.

The Licensee is filing with FERC a Notice of Intent (NOI) and this Pre-Application Document (PAD) to relicense the existing Project, generally consisting of the following: (1) a concrete arch dam with a crest length of 461.6 feet and height above foundation of 228.4 feet; (2) an ungated 100-foot-wide overflow spillway cast into the left side of the arch with a crest elevation of 395 feet; (3) a 1,000-acre impoundment (reservoir) with a usable storage capacity of 70,500 acre-feet; (4) a power intake located 141 feet below the dam crest to the right of the spillway; (5) a 1,900-foot-long, 9-foot-diameter, reinforced concrete-lined power tunnel, which bifurcates into two steel-lined penstocks that convey water to the powerhouse; (6) a reinforced concrete powerhouse measuring 78 feet long by 48 feet wide situated at the southeast end of Silver Bay that houses two 9.27-MW turbine-generator units; and (7) approximately 8 miles of transmission line that follows the Green Lake access road to an interconnection at the Blue Lake powerhouse and substation.

The filing of the NOI and PAD initiates the formal relicensing process for the Project. The PAD is intended to be a tool for providing existing engineering, operational, environmental, and socioeconomic information pertaining to the Project that is reasonably available at the time the NOI and PAD are filed. The PAD supplies existing information to help identify and evaluate potential effects on Project area resources resulting from continued Project operation. This evaluation will be documented in the license application to be prepared by the Applicant and filed with FERC in advance of the current license expiration.

In developing this PAD, the Applicant identified an initial group of stakeholders with a potential interest in the upcoming Project relicensing proceedings. In compliance with FERC's regulations governing the content of the PAD, the Applicant contacted appropriate state and federal resource agencies, Tribes, and interested public parties who may be concerned with any potential Project effects on the Project area resources (collectively, Licensing Participants). The Applicant requested that Licensing Participants provide any relevant studies, data, and information related to the Project and ensure accurate contact information. Appendix A contains the consultation record associated with these proactive efforts.

The information contained in this document was assembled based on the requirements set forth in 18 CFR § 5.6(c) and (d) and is organized as follows:

- Section 2 – Process plan and schedule for all pre-application activities, 18 CFR § 5.6(d)(1).
- Section 3 - General description of the Project location, facilities, and operations, 18 CFR § 5.6(d)(2).
- Section 4 – Description of the existing environment and resource impacts, 18 CFR § 5.6(d)(3).
- Section 5 – Preliminary resource issues and potential studies or information gathering needs associated with the issues, 18 CFR § 5.6(d)(4).
- Section 6 – Literature and information sources cited in the descriptions and summaries of existing resource data, 18 CFR § 5.6(c)(2).
- Appendices:
    - Appendix A – Consultation Record
    - Appendix B – FERC 1979 Order Issuing License

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

On March 21, 2024, the Applicant filed the NOI and this PAD 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 relicensing process and sets the schedule for further licensing activities.

2.1 Integrated Licensing Process

The Applicant intends to use FERC's Integrated Licensing Process (ILP) to develop a Project license. The ILP is FERC's default process and provides a predictable, efficient, and timely licensing process with early identification and resolution of necessary studies. Several federal and state agencies have indicated no objections or concerns for using the ILP during initial consultation (Appendix A). Table 2-1 presents a detailed process plan and schedule with an estimated timetable for the balance of the licensing process, based on use of the ILP for this Project.

The process plan might reflect deadlines that fall on weekend days (Saturday or Sunday). Weekend deadlines will default to the following Monday in accordance with FERC regulations. There is potential for one study season for this Project based on initial minimal resource concerns and no proposed changes to Project facilities or operation. This will ultimately be determined, along with any associated modifications to the schedule, collaboratively first with the Licensing Participants and then with FERC during study planning. The process plan and schedule were developed in accordance with the regulations and incorporates the time frames set forth in 18 CFR § § 16.8 and 5.8 and will be regularly updated throughout the relicensing process. Additional information regarding scheduling of events will be provided in subsequent notifications from FERC and the Applicant in accordance with FERC regulations.

Table 2-1. Process Plan and Schedule

Significant Pre-filing Milestones	Responsible Party	Timeframe	Date
File NOI and PAD with FERC and distribute to appropriate federal, state, and interstate resource agencies, Indian tribes, local governments, and members of the public likely to be interested in the proceeding.	Applicant	5 to 5.5 years before license expiration	March 31, 2024
Initial Tribal Consultation Meeting	Applicant	30 days after NOI/PAD submitted	April 30, 2024
Notice of Commencement of Proceeding and Scoping Document (SD) 1 Issued	FERC	60 days after NOI/PAD filed	May 30, 2024
Scoping Meeting/Site Visit	FERC	30 days after SD 1 Issued	June 30, 2024

Significant Pre-filing Milestones	Responsible Party	Timeframe	Date
PAD and SD1 Comments and Study Requests Due	Licensing Participants	60 days after FERC's Notice of Commencement of Proceeding	July 30, 2024
SD2 if needed	FERC	Within 45 days following the deadline for filing scoping comments	September 15, 2024
File Proposed Study Plan	Applicant	Within 45 days of the close of the 60-day comment period	September 15, 2024
Study Plan Meeting(s) (informal resolution of study issues)	Applicant	30 days after the Proposed Study Plan is filed	October 15, 2024
Comments due on Proposed Study Plan	Licensing Participants	90 days after the Proposed Study Plan is filed	December 15, 2024
File Revised Proposed Study Plan	Applicant	30 days after Proposed Study Plan comments are filed	January 15, 2025
Comments due on Revised Proposed Study Plan	Licensing Participants	15 days after Revised Proposed Study Plan is filed	January 31, 2025
FERC issues Study Plan Determination	FERC	30 days after Revised Proposed Study Plan is filed	February 28, 2025
Study Year 1	Applicant		May – October, 2025
File Initial Study Report	Applicant		December 2025
Study Meeting	Applicant		February 2026
Requests for Study Plan Modifications	Licensing Participants		March 2026
Study Year 2 (if needed)*	Applicant		May – August 2026
File updated Study Report (if needed)	Applicant		September 2026
Filing Preliminary Licensing Proposal (PLP)	Applicant		October 2026

Significant Pre-filing Milestones	Responsible Party	Timeframe	Date
Comments due on PLP	Licensing Participants	90 days after PLP filed	
File License Application	Applicant		March 2027

*Based on initial dialogue with agencies, CBS believes that only one study season may be necessary.

2.2 Authorized Agent

The people authorized to act as an agent on behalf of CBS for this Project are the following:

Kord Christianson (Primary Contact)
Project and Regulatory Manager
Electric Department, City and Borough of Sitka
105 Jarvis Street
Sitka, AK 99835
kord.christianson@cityofsitka.org

Mike Schmetzer
Interim Utility Director
Electric Department, City and Borough of Sitka
105 Jarvis Street
Sitka, AK 99835
mike.schmetzer@cityofsitka.org

John Leach
Municipal Administrator
Administration, City and Borough of Sitka
100 Lincoln Street
3rd Floor
Sitka, AK 99835
administrator@cityofsitka.org

2.3 Proposed Communications Protocol

The Applicant is proposing a communication protocol with the intention of facilitating communication and cooperation among the Applicant, federal and state agencies, Indian Tribes, other interested organizations, and members of the public (i.e., Licensing Participants) during the preparation of the license application.

This protocol will govern communications among all Licensing Participants and provide public access to information regarding the consultation activities related to the relicensing of the Project. The protocol also applies to communications made by contractors or consultants on behalf of the Applicant or any of the Licensing Participants. This protocol does not apply to communications solely between Licensing Participants or to any Licensing Participant's internal communications.

The primary means of communication will be meetings (virtual and in person), formal documents, email, and telephone. To establish the Project consultation record, all formal correspondence will be comprehensively documented.

2.3.1 Contact Lists

The licensing process for the Project is open to the general public, and interested parties are encouraged to participate. A contact list, compiled by the Applicant, will be maintained to identify those agencies,

organizations, individuals, and/or groups that have been identified as interested parties or who have requested to be included as Licensing Participants. The contact list will be used to provide notice of any public meetings, as well as notice of the availability of information for public review. The contact list will be updated by the Applicant as additional entities convey interest and actively participate.

After the Applicant 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 http://www.ferc.gov. Once FERC establishes a Service List, any written documents filed with FERC must be served to the Service List.

2.3.2 Document Distribution

The Applicant will distribute, whenever possible, all documents electronically but may distribute hard copies of some documents for convenience or by request. The Applicant will develop an online repository of shared documents available for access to stakeholders.

If possible, the Applicant prefers to receive all documents electronically in an appropriate format. Email electronic documents to Mr. Kord Christianson (kord.christianson@cityofsitka.org) and Ms. Elizabeth Lack (lack@mcmillen.com) at the email addresses provided here. Hard copy documents may be mailed to the Applicant's address provided in Section 2.2. In either case, all documents received will become part of the consultation record and may be made available for distribution.

All formal filings with FERC will be accessible on the FERC eLibrary, the searchable electronic document database (http://elibrary.ferc.gov). Interested parties can register to receive notices of filings made to FERC specific to the Project (P-2818).

2.3.3 Sensitive Information

Certain Project-related documents are considered Critical Energy Infrastructure Information (CEII) and are restricted from public viewing in accordance with Section 388.113 of FERC's regulations (18 CFR § 388.113). This information relates to the design and safety of the dams and appurtenant facilities. Anyone seeking information protected as CEII from FERC must file a CEII request. FERC's website at https://www.ferc.gov/legal/ceii-foia/ceii.asp contains additional details related to CEII. The Applicant will allow limited access to documents designated as privileged material under 18 CFR § 388.112 containing sensitive information regarding specific cultural and/or protected environmental resources to authorized entities.

2.3.4 Meetings

The Applicant recognizes that several agencies, groups, and individuals will want to participate in the licensing process for the Project and will work with all interested parties to develop meeting schedules that include locations and times that accommodate the majority of participants. The Applicant will follow the notification procedures for meetings as mandated by FERC regulations and may schedule additional meetings to enhance the consultation process, as necessary. Meeting agendas and materials will be electronically distributed to Licensing Participants in advance of the meeting. All dialogue between CBS

and the Licensing Participants will be documented as part of the licensing consultation record and filed as part of the license application.

A written summary of matters addressed at all meetings involving the Applicant and Licensing Participants will be prepared by the Applicant and distributed to the Licensing Participants for review promptly following the meeting. Finalized meeting summaries will be distributed to the stakeholder group and filed with FERC as part of the consultation record.

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

This section of the PAD contains specific information regarding the Project location, facilities, and operations, as well as the authorized agent. It provides background information on the existing Project, including its history, operating practices, and operational constraints.

3.1 Project Location

The Project is located in the City and Borough of Sitka, Alaska, on the Vodopad River approximately 10-air-miles southeast of Sitka. The Project site is within Copper River (12) Meridian, Township 56S, Range 65E, Section 29 at Latitude 56.987N and Longitude -135.114W. Figure 3-1 presents a Project location map.

3.2 Project Lands

When the original license application was filed with FERC in September 1977, the proposed Project was located on federal land as part of the Tongass National Forest. In 1978, the State of Alaska selected approximately 5,700 acres of land, including the land on which the Project is located, under Section 6(a) of the Alaska Statehood Act (PL 85-508), which allowed for the State selection of National Forest lands for the purpose of economic development of cities and communities (Exhibit F, CBS 1977). Upon acquisition of the 5,700 acres of land, the State conveyed these lands to CBS by quitclaim deed on March 16, 1979. In this PAD, these lands are referred to as "Conveyed Lands" (Figure 3-2). Given this conveyance, at the time the license was granted on April 5, 1979, the entire Project was located on CBS owned land. The entirety of the approximately 1,465-acre Green Lake Project boundary, referred to as the "FERC Project Boundary" in this PAD, is contained within the 5,700 acres of Conveyed Lands owned by CBS (Figure 3-2).

3.3 Project History

Green Lake was long recognized as a potential hydroelectric power site; however, Blue Lake (FERC No. 2230) was developed first because of its proximity to Sitka. As Blue Lake's capacity reached capacity utilization, Green Lake was selected as CBS's next hydroelectric project with no intent to be used as a water supply facility. A license application for the Project was filed with FERC on September 17, 1977, and was issued on April 5, 1979. Construction mobilization began July 17, 1979. Construction was completed in 1982, and commercial power operations via their two generating units began shortly thereafter in March and April of 1982, respectively. No major construction activities or operational alterations have occurred at the Project since completion in 1982.

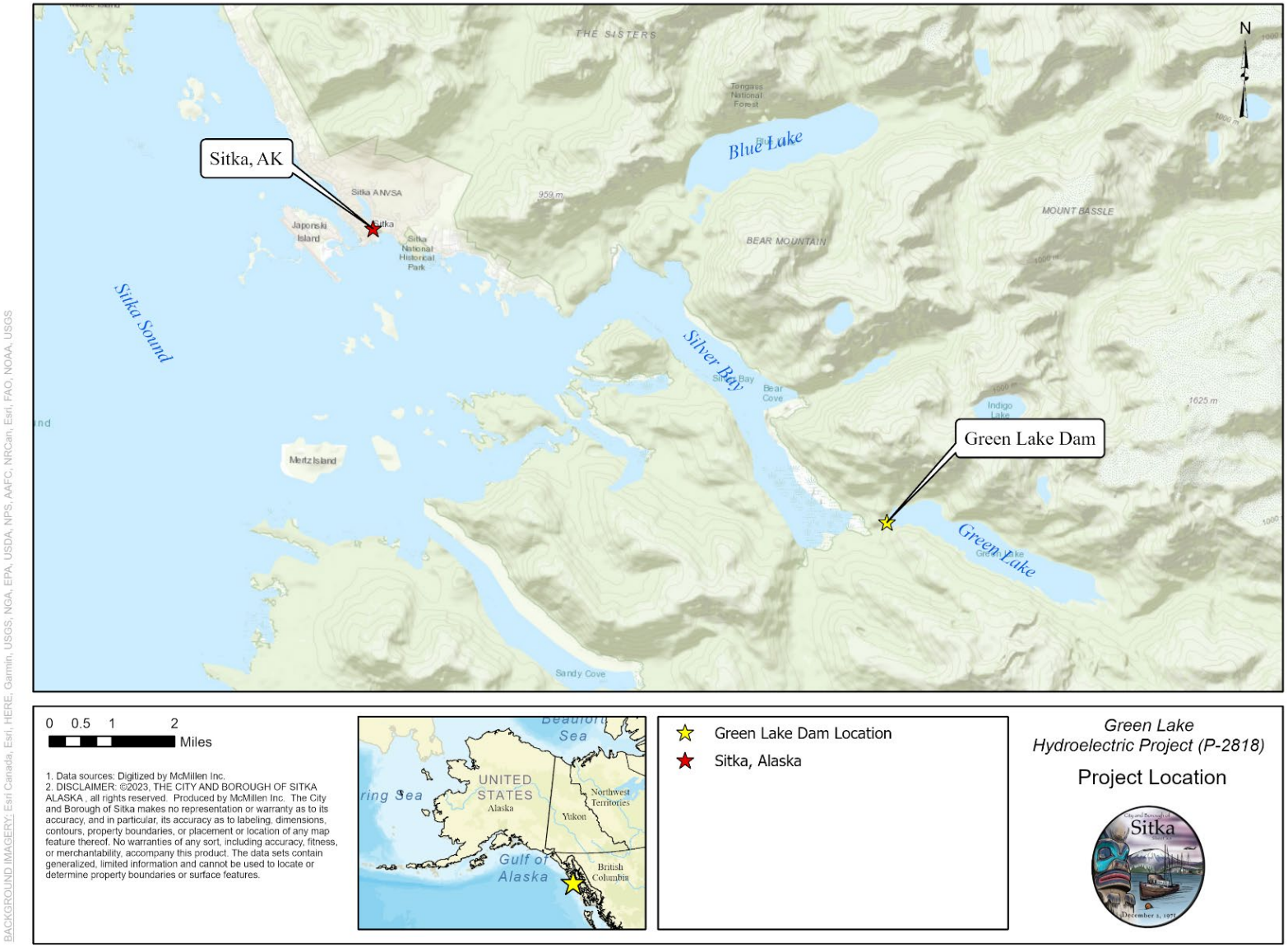


Figure 3-1. Project Location Map

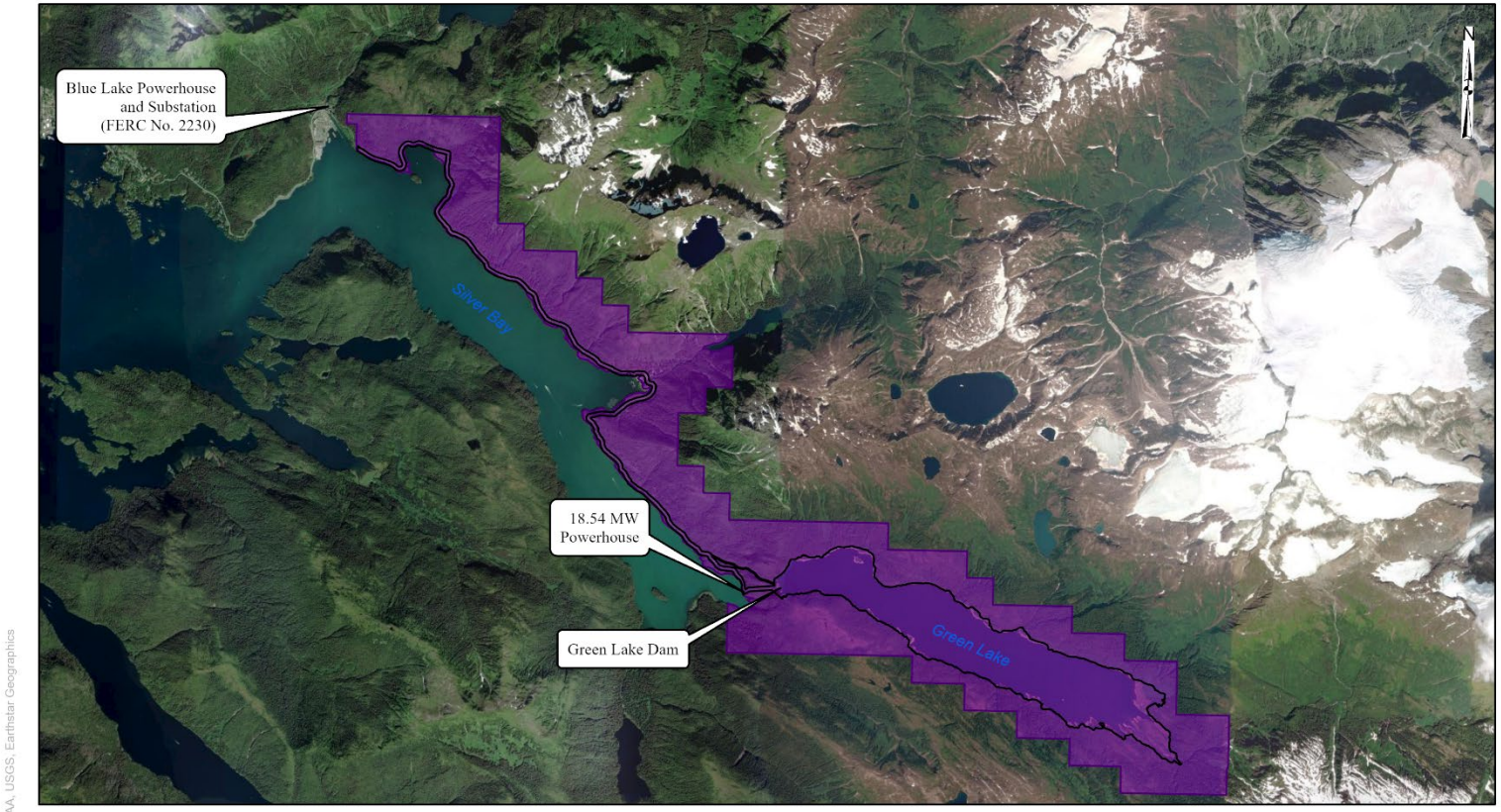


Figure 3-2. Land Ownership Map

3.4 Project Facilities

The current facilities at Green Lake Dam consist of the dam, reservoir, spillway, penstock, powerhouse, and transmission lines. A general Project overview is shown in Figure 3-3.

3.4.1 Concrete Arch Dam

Green Lake Dam is a concrete, double-curvature, variable-radius, arch dam constructed in 1982. The dam raised the level of the existing Green Lake. The crest length is 461.6 feet at elevation (El.) 405.0[1] feet, the height above the foundation is 228.4 feet, and the maximum base thickness is 23 feet. The crest width varies, with a minimum crest width of 6 feet between the spillway and left abutment. The dam is designed to be overtopped during the inflow design flood (IDF).

3.4.2 Spillway

The ungated overflow spillway was integrally cast into the left side of the arch, is 100 feet wide, and has a crest elevation of 395 feet. The spillway ogee is post-tension anchored to the dam crest. Maximum discharge capacity is 12,400 cubic feet per second (cfs) at a reservoir elevation of 405.5 feet. The spillway discharges into a narrow bedrock plunge pool approximately 120 feet from the downstream toe of the dam.

3.4.3 Green Lake

Prior to Project construction in the early 1980s, Green Lake was 1.2 miles long, had a surface area of approximately 180 acres at its natural elevation of about 230 feet, and a maximum depth of 86 feet. Now, Green Lake reservoir is approximately 4 miles long, has an area of approximately 1,000 acres at reservoir El. 395.0 feet, and a maximum gross storage capacity of 88,000 acre-feet at the spillway crest El. 395.0 feet. While the penstock invert elevation is at El. 264 feet, the minimum lake level at which the Project turbines can operate is El. 296 feet, resulting in a usable storage capacity of 70,500 acre-feet. A debris boom is located upstream of the dam to prevent reservoir debris from building up at the face of the dam.

3.4.4 Powerhouse and Intakes

The power intake is 141 feet below the dam crest to the right of the spillway. The intake includes a trash rack and is controlled by a vertical-lift headgate (6 feet, 4 inches by 8 feet) operated with a hydraulic hoist. The water conveyance has a short section of 8-foot-diameter steel penstock with two mechanical couplings to provide access where it exits the dam. There is an initial steel-lined section that transitions to a 1,900-foot-long, 9-foot-diameter, reinforced concrete-lined power tunnel that conveys water downstream to the powerhouse. The tunnel bifurcates into two, steel-lined penstocks immediately upstream of the powerhouse.

[1] Elevations in this document refer to the Mean Lower-Low Water (MLLW) datum at the Sitka, Alaska Tidal Gage #9451600. This is equal to the North American Vertical Datum of 1988 (NAVD88) elevation minus 0.15 meters or 0.4921 feet.

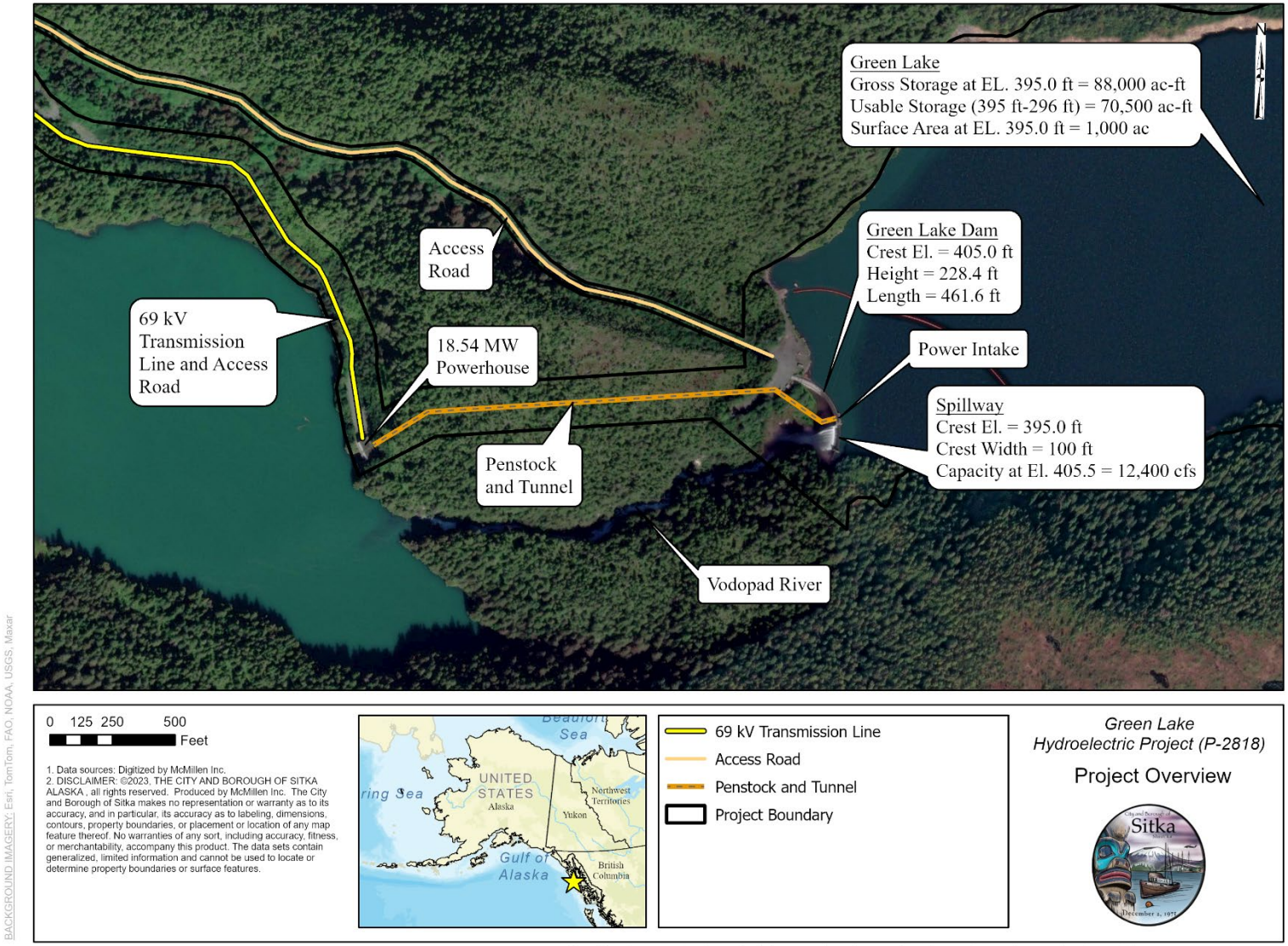


Figure 3-3. Project Overview

The powerhouse is a reinforced-concrete structure located on the cove at the southeast end of Silver Bay (Figure 3-3) and is not an integral component of the main dam structure. The building is 78 feet long by 48 feet wide and houses two vertical Francis turbine-generator units, each with an installed capacity of 9.27 MW (18.54 MW total). The turbines have a capacity of 355 cfs each (710 cfs total) and a rated capacity of 13,300 horsepower at a head of 363 feet (CBS 2023a).

3.4.5 Transmission Lines

From the substation located adjacent to the Green Lake powerhouse, overhead 69 kV transmission lines follow the Green Lake Access Road within a 200-foot-wide easement for approximately 9 miles to an interconnection at the Blue Lake powerhouse and substation (FERC No. 2230). The easement and transmission line location are shown in Figure 3-4[2].

3.4.6 Energy Production

Table 3-1 presents the Project's average generation on a monthly and annual basis from 2016 through 2023. The average annual generation of the Project for this period is 41,474 megawatt hours (MWh).

Table 3-1. Green Lake Project Average Monthly Generation (MWh)

Month	2016	2017	2018	2019	2020	2021	2022	2023	Average
Jan	3,780	4,296	4,501	3,795	6,424	9,903	6,274	5,949	5,615
Feb	5,166	6,481	4,860	1,212	5,018	10,315	3,412	5,279	5,218
Mar	4,745	5,881	1,530	304	4,620	9,829	4,392	5,098	4,550
Apr	3,657	4,066	3,544	2,759	2,401	2,308	5,226	4,945	3,613
May	2,495	4,140	5,247	1,716	317	0	4,013	3,823	2,719
Jun	2,744	2,820	1,476	575	1	0	1,233	3,523	1,547
Jul	4,466	2,106	2,944	1,541	149	125	1,638	834	1,725
Aug	2,307	5,643	8,693	3,302	41	176	3,529	2,482	3,271
Sep	4,661	4,213	6,470	1,707	1,120	47	2,960	794	2,747
Oct	2,513	3,596	22	1,381	2,414	579	7,339	1,826	2,459
Nov	0	3,538	942	5,562	7,428	4,007	4,366	4,028	3,734
Dec	0	5,651	2,987	3,070	8,880	5,046	4,355	4,218	4,276
Annual Total	36,533	52,430	43,216	26,926	38,813	42,336	48,739	42,798	41,474

[2] The existing FERC Project Boundary does not include the point of interconnection at the Blue Lake Project substation, and instead ends approximately a half a mile southeast. This corresponds to the previous extent of the Blue Lake Project Boundary, which has since been modified. CBS is exploring revising the FERC Project Boundary for the Green Lake Project through the relicensing process.

Dependable capacity is not applicable to a small hydroelectric project because projects less than 20 MW do not report to the North American Electric Reliability Corporation. Furthermore, the Project is not interconnected to a grid. No analysis of the ability of the Project to generate during a critical water year has been performed.

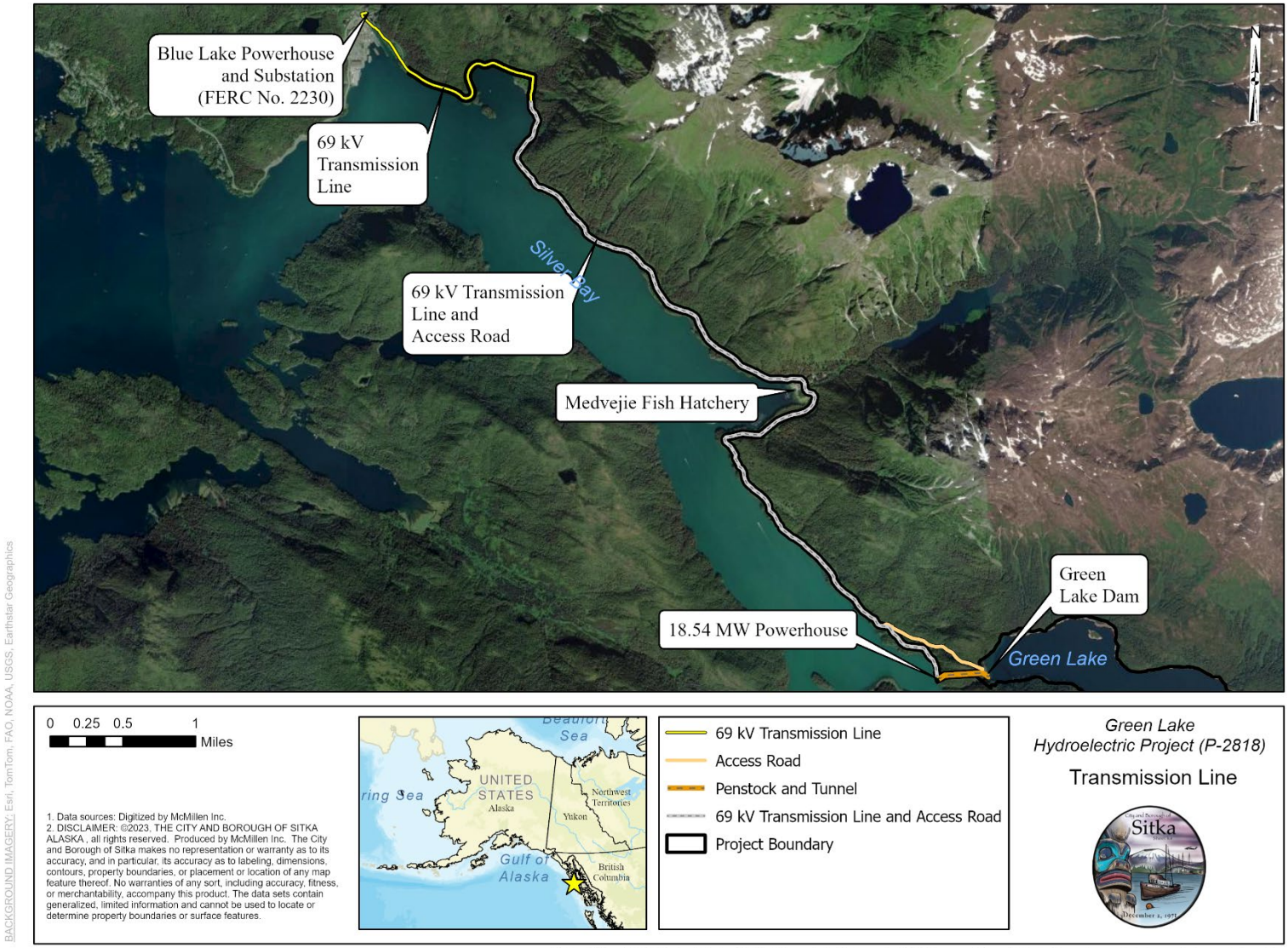


Figure 3-4. Transmission Facilities and Access Road

3.5 Project Operations

The dam is operated in conjunction with the Blue Lake Hydroelectric Project (FERC No. 2230) to meet CBS demand (load). The Blue Lake powerhouse is the control center for CBS's entire electric system, including the Project, and is staffed around the clock. Since the capacity of the Blue Lake Project was increased in late 2014, typical management is for one Green Lake unit to be online at lower load conditions. During high load conditions or when Blue Lake generation is limited, the second Green Lake unit is brought online. Generation is also allocated between the Blue Lake and Green Lake Projects to manage reservoir levels (CBS 2023a).

The Project is operated for power generation with no additional water supply components. Water is released for power generation only; there are no instream flow requirements into the lower Vodopad River. Green Lake reservoir levels are dominated by reservoir inflow from rain and snowmelt and water releases for generation and spill. The Project uses a rule curve to predict the likelihood of spilling each year.

Reservoir inflow is highest in summer and fall due to snowmelt and rainfall. During mid-winter, inflow decreases as the majority of precipitation falls as snow and an upstream snowpack accumulates. Electric loads vary during the year, with the highest demand in winter for heating and summer for seafood processing. The reservoir is gradually drafted over the winter months to meet power demand and has a normal operating range of 100 feet (El. 295 ft to 395 ft; CBS 2023a).

Flow through the power intake is controlled by the turbine wicket gate settings. Maximum discharge through the two units is 355 cfs each at reservoir El. 382.0 (CBS 2023a).

3.5.1 Generation and Outflow Records

Generation records are presented in Section 3.4.6. A summary of spillway outflows is shown in Table 3-2. These spillway outflows generally represent all water in the Vodopad River downstream of Green Lake Dam since penstock outflows through the powerhouse discharge directly to Silver Bay.

Table 3-2. Green Lake Project Average Monthly Spillway Outflow (cfs)

Month	2016	2017	2018	2019	2020	2021	2022	2023	Average
Jan	0	150	0	92	20	0	0	0	33
Feb	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0
Apr	0	0	0	0	0	0	0	0	0
May	362	0	0	0	101	0	0	0	58
Jun	606	219	0	0	1,265	0	339	0	304
Jul	324	521	0	0	1,146	93	358	167	326
Aug	297	510	0	0	1,258	341	248	180	354
Sep	372	775	0	262	778	438	398	533	445
Oct	65	735	0	630	855	328	455	471	442
Nov	605	54	269	950	487	26	114	164	334
Dec	378	128	441	9	324	0	0	122	175
Annual Average	251	258	59	162	520	102	159	137	206

3.5.2 Current License Requirements

FERC issued a major license for the Project by order dated April 5, 1979. The current license expires on March 31, 2029. The license is subject to Articles 1 through 32 in Form L-2 (FERC 1975). In addition to the standard articles, the Project license also includes the following articles summarized in Table 3-3. The full license is included in Appendix B.

Table 3-3. Summary of License Requirements

License Requirement	Summary
Article 33	Consult with ADFG to develop a soil erosion control plan and submit to FERC within 135 days.
Article 34	With recommendations from the Alaska Department of Public Health, take measures to control vectors at the Project.
Article 35	Consult with the ADFG, USFWS, and USFS then within 1 year file a revised Exhibit S.
Article 36	Prior to construction, develop a comprehensive plan for disposing of material excavated from the powerhouse, switchyard, and power tunnel sites.
Article 37	Continue to cooperate with the Alaska State Historic Preservation Officer (SHPO).
Article 38	Install and operate signs, lights, sirens, etc. to warn the public of fluctuations in flow from the Project.

License Requirement	Summary
Article 39	Consult with the Heritage Conservation and Recreation Service of the U.S. Department of the Interior, USFS, and the Alaska Department of Natural Resources to conduct a study to determine the need for any additional recreational development at the Project.
Article 40	Develop and file, in consultation with the USEPA and OSHA, a plan to protect the ambient air quality and monitor air quality at the Project during construction activities.
Article 41	Within nine months, complete a detailed study of the visual resource value of the Vodopad River falls below Green Lake.
Article 42	File Exhibit L drawings showing the final design of the arch dam.
Article 43	File plans and specifications prior to the start of construction.
Article 44	Retain a board of consultants to review the design, specifications, and construction.
Article 45	File and keep up-to-date an emergency action plan.
Article 46	Provide details of the use and occupancy of Project lands and waters.
Article 48	Within 1 year of the commencement of operation, file revised Exhibit F, and "as built" Exhibits J, K, L, and M.
Article 49	Commence construction of the Project within 1 year and complete construction within 5 years.

3.5.3 Compliance History

No history of compliance incidents.

3.6 Current Maintenance Activities

Maintenance activities are generally limited to routine activities necessary for the continued operation of the Project. Project operations staff visit the dam and powerhouse at least twice a week. Maintenance activities are performed based on observations made at the dam. Observations are made based on a checklist, which includes critical features of the Project (CBS 2023a). The Operation and Maintenance Manual contains specific maintenance actions and schedules for all Project features including electro-mechanical and civil components (R.W. Beck and Associates, Inc. 1983).

To date no major modifications have been made to the Project since construction was completed in 1982. Power tunnel rehabilitation was performed in 2021, which included removal, cleaning, and coating of the trash rack, intake gate, and removable penstock section and couplings. In addition, repair of damaged areas of steel and concrete sections of the power tunnel was conducted, as well as cleaning and coating of the water conveyance within the powerhouse.

3.7 Current Net Investment

CBS's net investment (book value) at the Green Lake Hydroelectric Project is $39,103,364 as of December 31, 2023. Construction of the Project was initially financed by a portion of bonds totaling $54,000,000 (for both any electric/water utility project—note that at that time the electric and water utilities were combined) issued in 1979. In addition, a note was issued in 1978 for $8,600,000 for the Green Lake Project. The total Project assets are depreciated each year, so that the total net book value of the asset decreases over the life of the asset. Applying these standard accounting practices, the net book value of the asset at the end of its useful life will approach zero. CBS has depreciated a total of $42,172,584 of Green Lake Hydroelectric Project assets.

3.8 PURPA Benefits

The Applicant is not seeking benefits under Section 210 of Public Utilities Regulatory Policies Act (PURPA) for the Project.

3.9 Proposed Changes to Facilities and Operations

The Applicant is not proposing any changes in operation compared to the current operations described in Section 3.5. The Applicant is also not proposing to construct any new or modify any existing Project facilities.

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

4.1 River Basin Description

4.1.1 General Description of the River Basin

The Vodopad River is located entirely within the City and Borough of Sitka, Alaska, on Baranof Island and is approximately 10.3 miles long from its headwaters to Silver Bay, including Green Lake. It flows roughly 6 miles from its headwaters west to the inlet of Green Lake. Green Lake is approximately 4 miles long at El. 395 feet. At the outlet of the Green Lake Dam, it flows approximately 1,800 feet to Silver Bay, a bay off Sitka Sound in the Gulf of Alaska. The Vodopad River drainage basin (hydrologic unit code (HUC) 190102121101) has a drainage area of approximately 28 square miles (Figure 4-1; USGS 2019). Over its 10.3-mile length, the Vodopad River drops approximately 3,000 feet in elevation.

The headwaters of the Vodopad River begin in the mountains on central Baranof Island where it drops steeply in a northward direction toward the valley. It then flows roughly westerly for the remainder of its course through Green Lake and to Silver Bay. The basin is entirely undeveloped aside from the Project and consists mostly of shrub/scrub alpine habitats and evergreen forest.

The reach of the Vodopad River bypassed by the Project extends approximately 1,800 feet from the base of the Green Lake Dam to Silver Bay. The river drops approximately 221 feet in elevation from the base of Green Lake Dam to Silver Bay and has a high gradient of approximately 14%. Flows to this reach are determined entirely by spillage at the Project, which occurs when the reservoir capacity is full. There is no existing minimum flow requirement for this reach; thus, when the Project is not spilling, flow in this reach is comprised only of runoff from the area downstream of the dam.

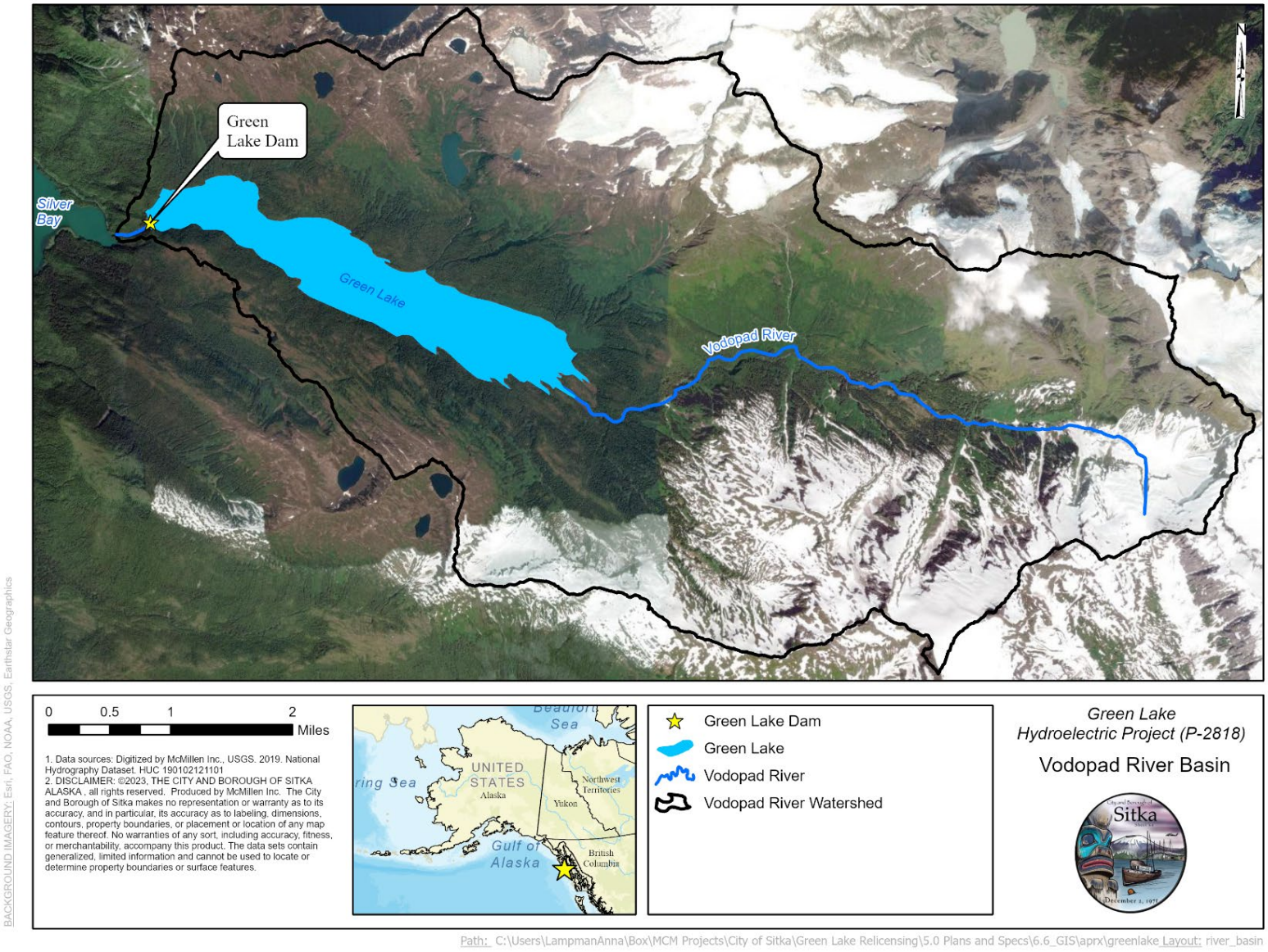


Figure 4-1. Vodopad River Basin

4.1.2 Major Land Cover Types

The Vodopad River watershed is entirely undeveloped, aside from the Project. Approximately 27.7% of the watershed is classified as shrub/scrub, likely due to the presence of alpine habitats in the high-altitude portions of the basin. The next most common land cover types are evergreen forest and barren land. The only land cover type classified as "developed" in the basin is in the area of the Project and accounts for less than 0.1% of the total basin area. Table 4-1 and Figure 4-2 show a breakdown of the various land cover types in the Vodopad River watershed (Dewitz 2021).

Table 4-1. Vodopad River Watershed Land Cover

Land Cover Type	Area (acres)	Total (%)
Shrub/Scrub	5,022.5	27.7
Evergreen Forest	4,283.5	23.6
Barren Land	3,613.6	19.9
Perennial Ice/Snow	2,232.9	12.3
Open Water	1,139.0	6.3
Dwarf Shrub	903.5	5.0
Mixed Forest	715.9	4.0
Deciduous Forest	201.0	1.1
Woody Wetlands	7.2	<0.1
Developed, Low Intensity	2.3	<0.1
Total	18,121.4	100.1

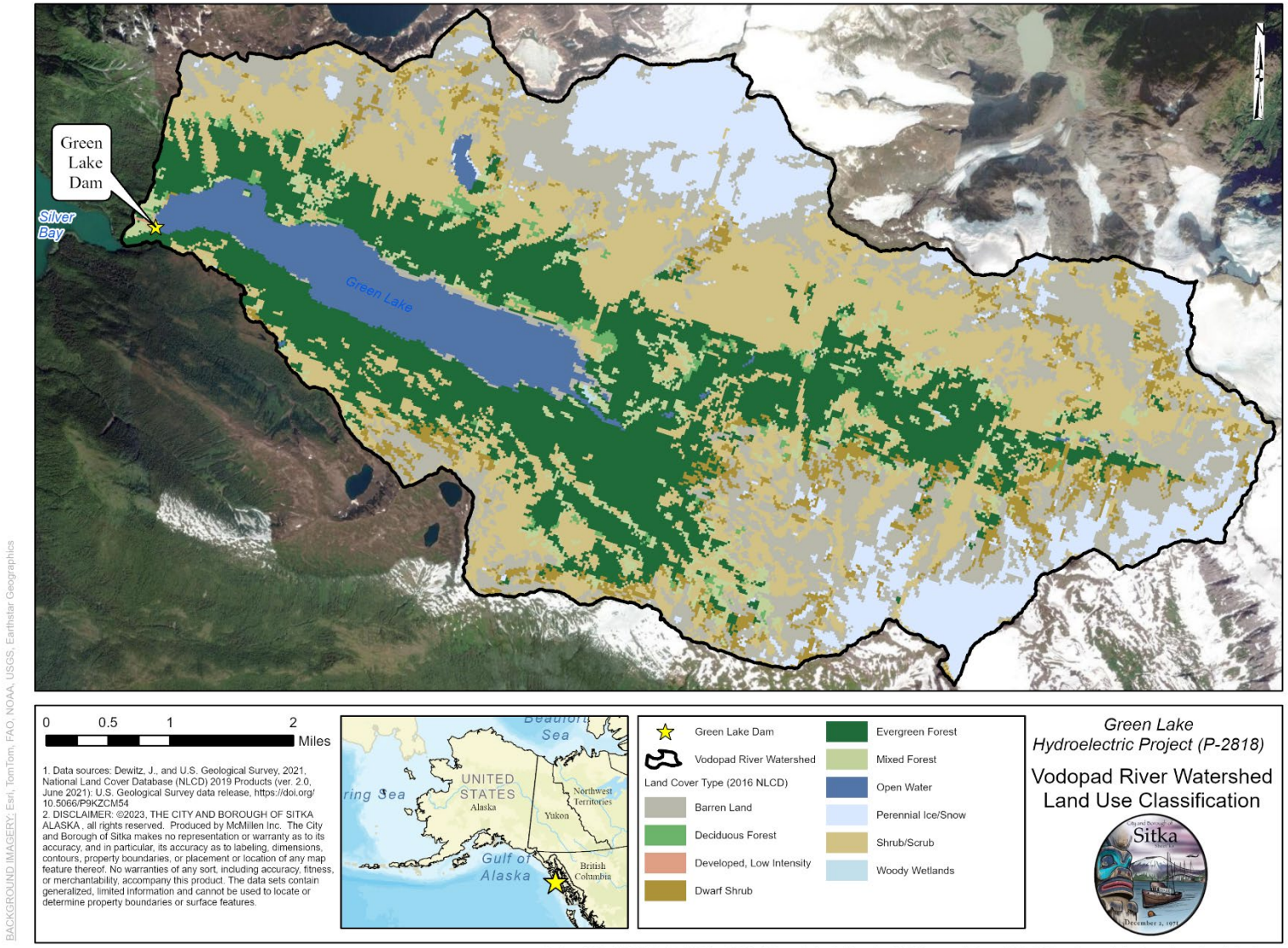


Figure 4-2. Vodopad River Watershed Land Cover Type

The Project access road and transmission corridor extend approximately 9 miles from the Project toward Sitka. Land cover along this corridor is generally defined as developed, low intensity (7.4%) due to the presence of the access road and transmission line right-of-way. Most of the land within the FERC Project Boundary is classified as open water (74.5%), due to the surface area of Green Lake compared to the remainder of the lands within the FERC Project Boundary. The remaining land cover classifications found within the FERC Project Boundary are barren land, forest (evergreen, mixed, and deciduous), shrub/scrub, woody wetlands, and dwarf scrub. Table 4-2 provides a breakdown of the various land cover types found within the FERC Project Boundary. Figure 4-3 through Figure 4-9 (Maps 1 – 7) show land cover types within the FERC Project Boundary (Dewitz 2021).

Table 4-2. Land Cover Within the FERC Project Boundary

Land Cover Type	Area (acres)	Total (%)
Open Water	1,090.5[3]	74.5
Evergreen Forest	113.4	7.7
Developed, Low Intensity	108.7	7.4
Barren Land	63.3	4.3
Mixed Forest	43.2	2.9
Shrub/Scrub	24.1	1.6
Deciduous Forest	15.6	1.1
Woody Wetlands	4.4	0.3
Dwarf Shrub	1.4	0.1
Total	1,464.6	99.9

4.1.3 Major Water Uses, Basin Dams, and Tributary Streams

There are no registered water uses within the Vodopad River basin aside from the Project, which is operating under Water Right Certificate ADL 10007. The water right was issued on June 30, 1987, and allowed for the diversion of 310 cfs from Green Lake, which was an error as the Project's total hydraulic capacity is 710 cfs. CBS filed an amendment to the water right with the Alaska Department of Natural Resource (ADNR) in November 2004 to allow for the diversion of the full 710 cfs. There are no dams on the Vodopad River aside from the Green Lake Dam, which is listed in the U.S. Army Corps of Engineers (USACE) National Inventory of Dams as AK83012. There are no major or named tributaries to the Vodopad River.

[3] This acreage differs slightly from the FERC licensed Green Lake surface area of 1,000 acres. This is due to inclusion in the National Land Cover Database of open waters besides Green Lake, such as streams.

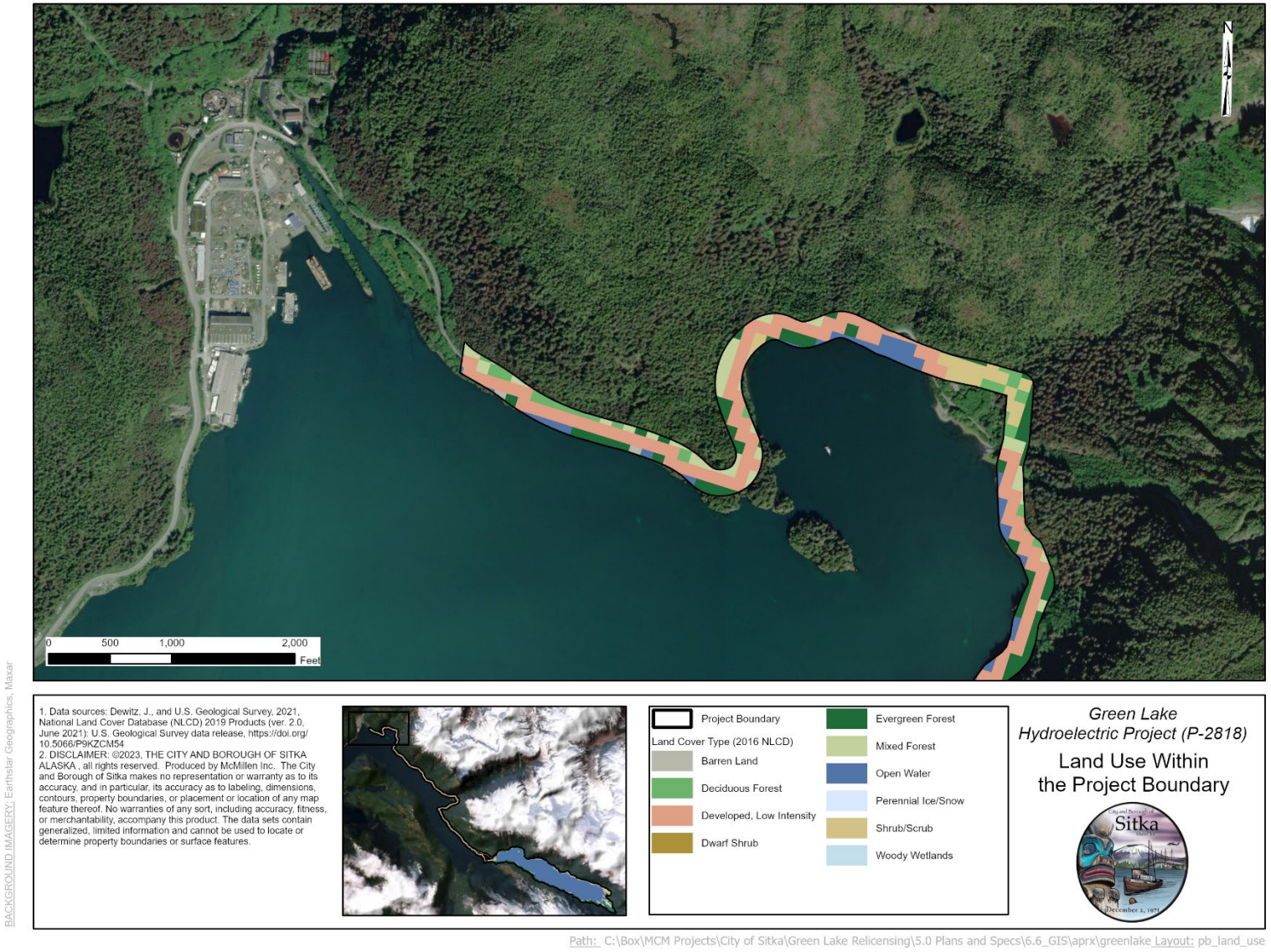


Figure 4-3 (Map 1). Land Cover Within the FERC Project Boundary

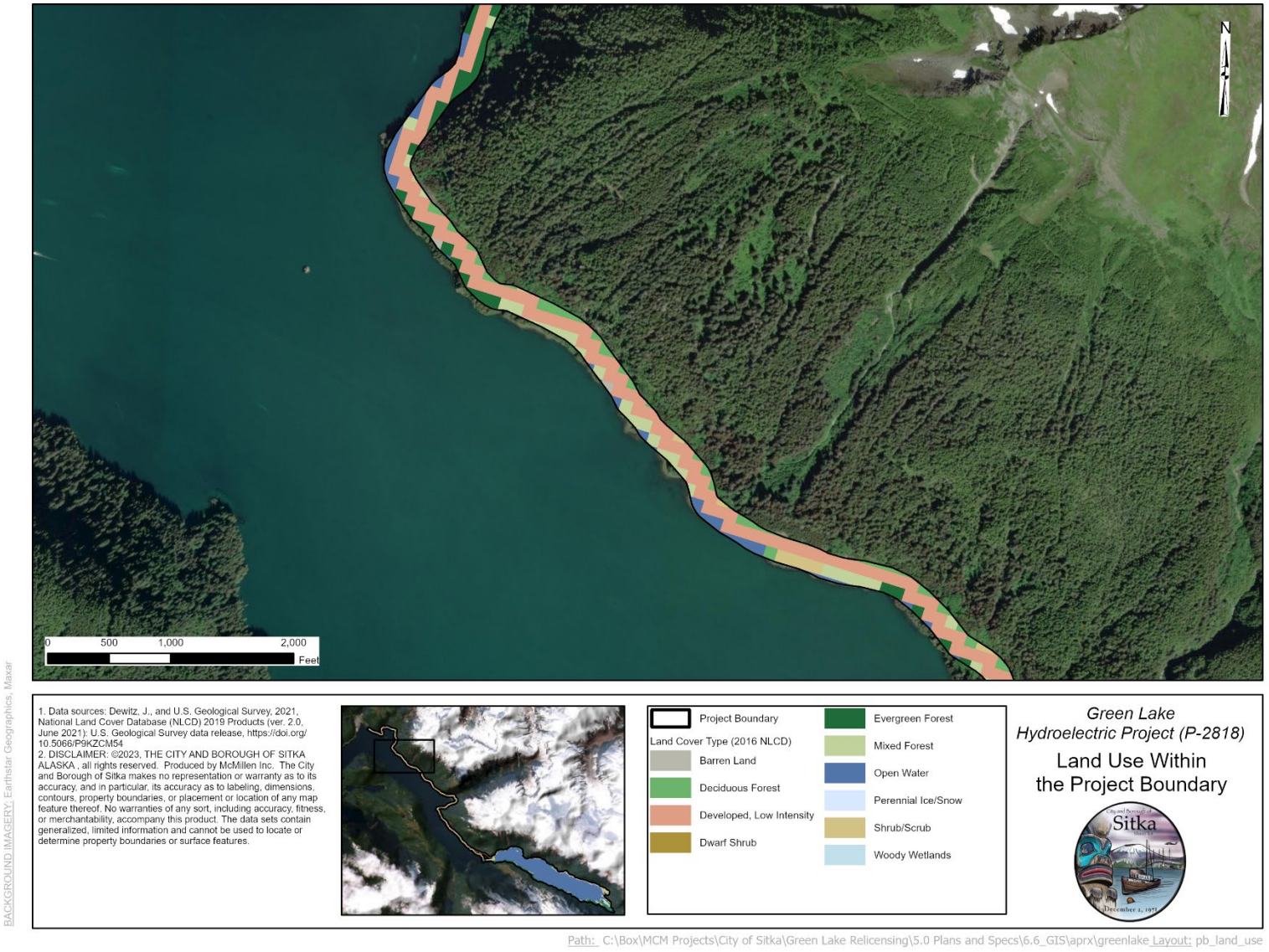


Figure 4-4 (Map 2). Land Cover Within the FERC Project Boundary

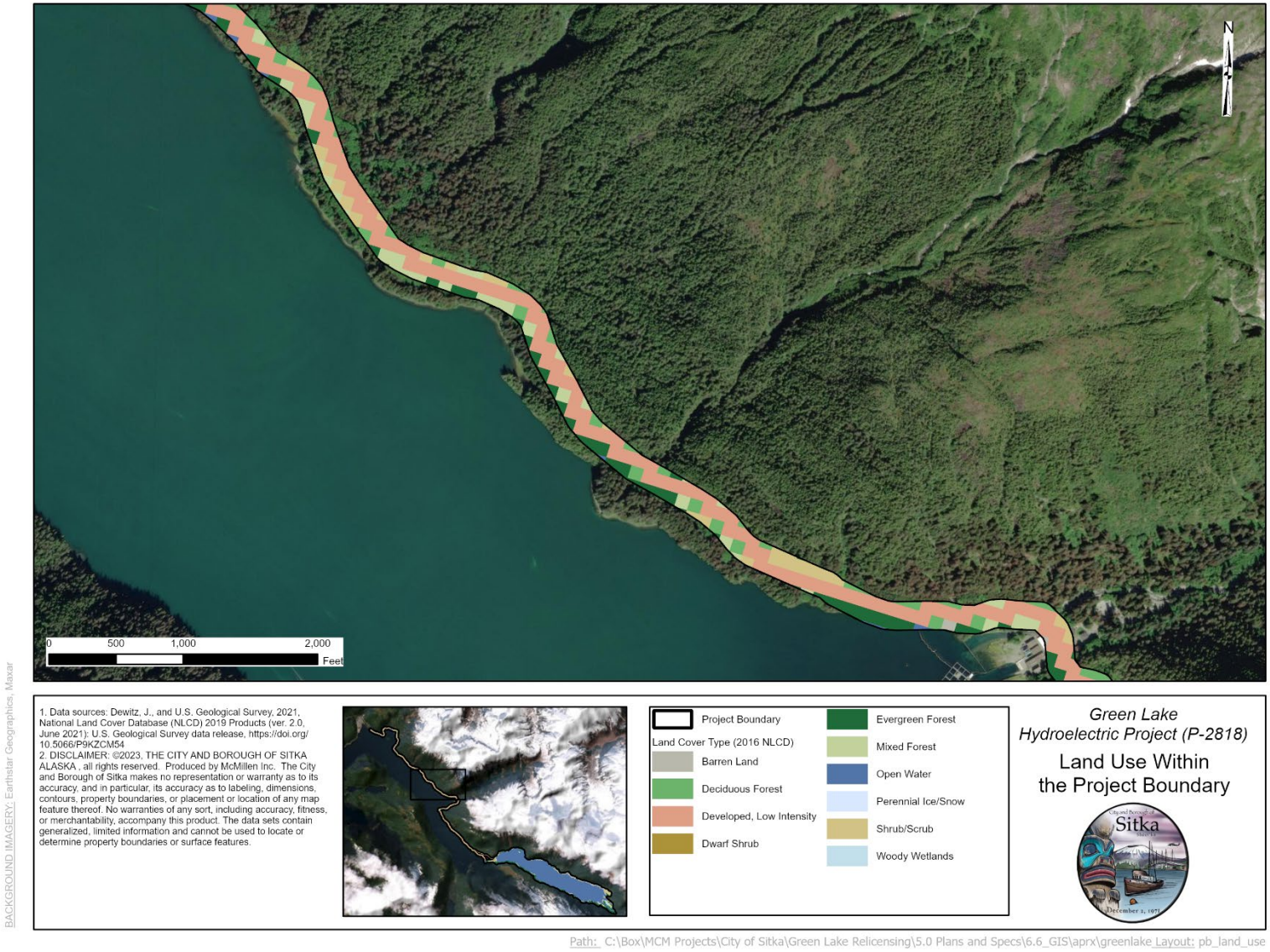


Figure 4-5 (Map 3). Land Cover Within the FERC Project Boundary

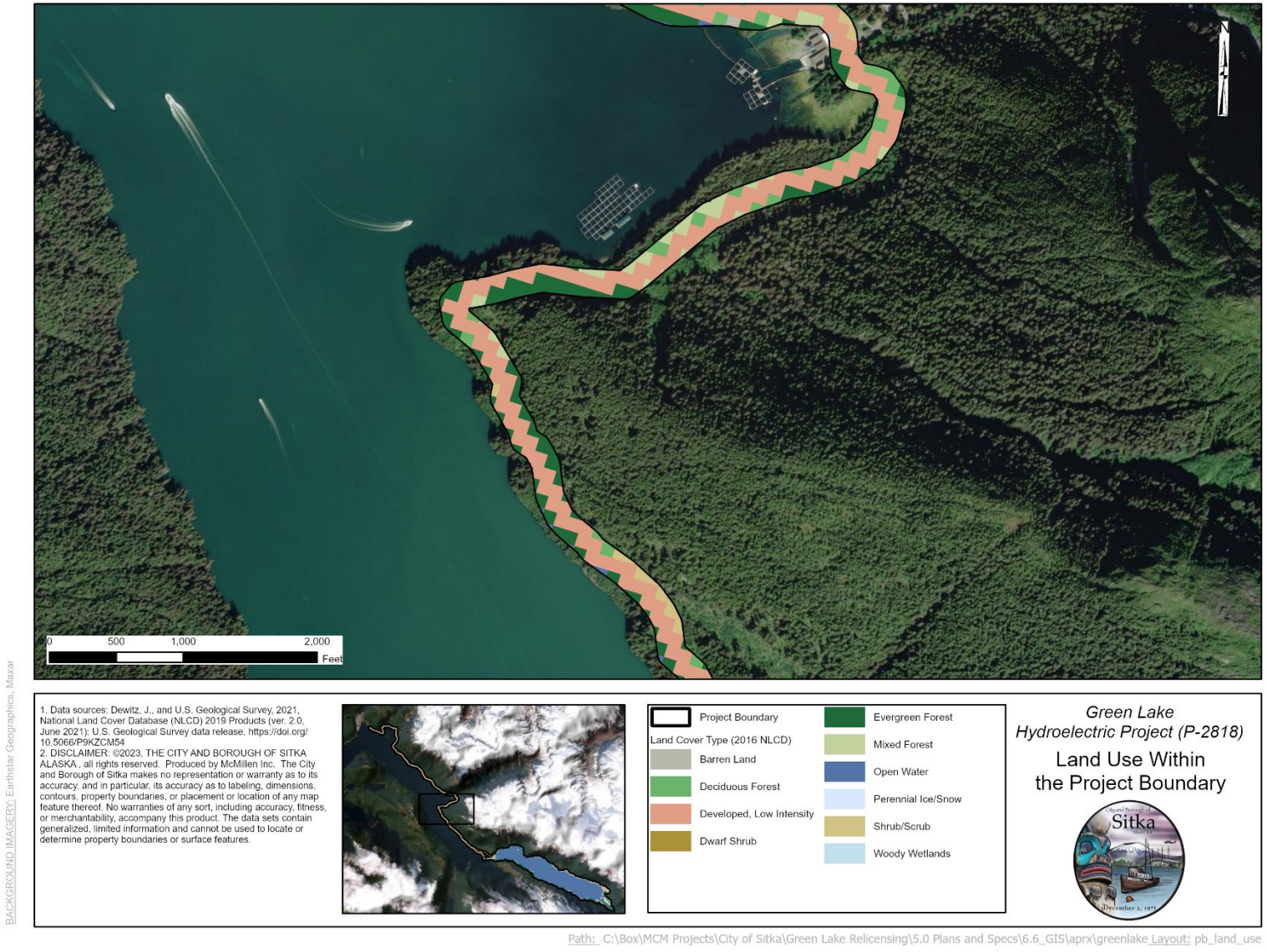


Figure 4-6 (Map 4). Land Cover Within the FERC Project Boundary

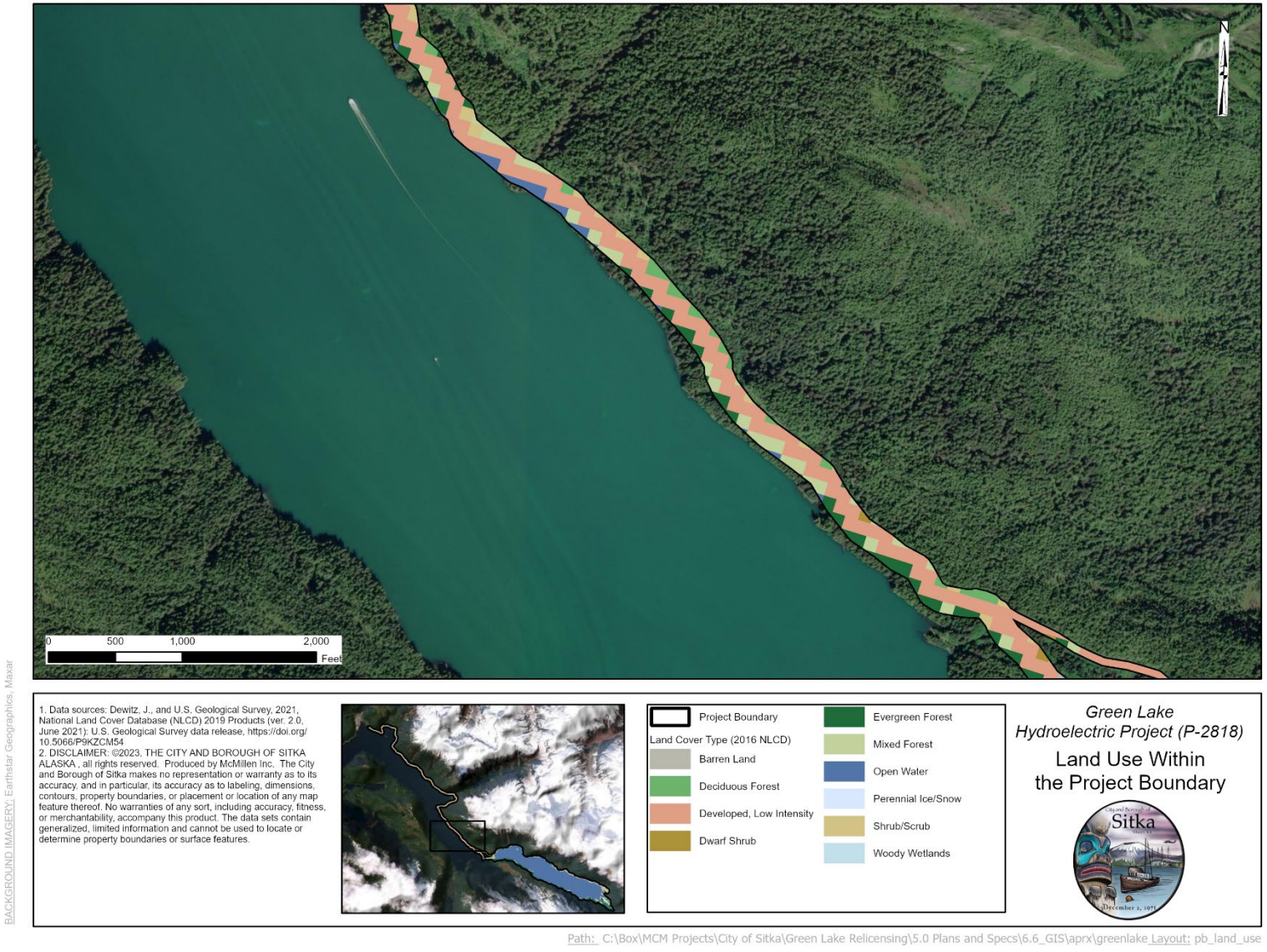


Figure 4-7 (Map 5). Land Cover Within the FERC Project Boundary

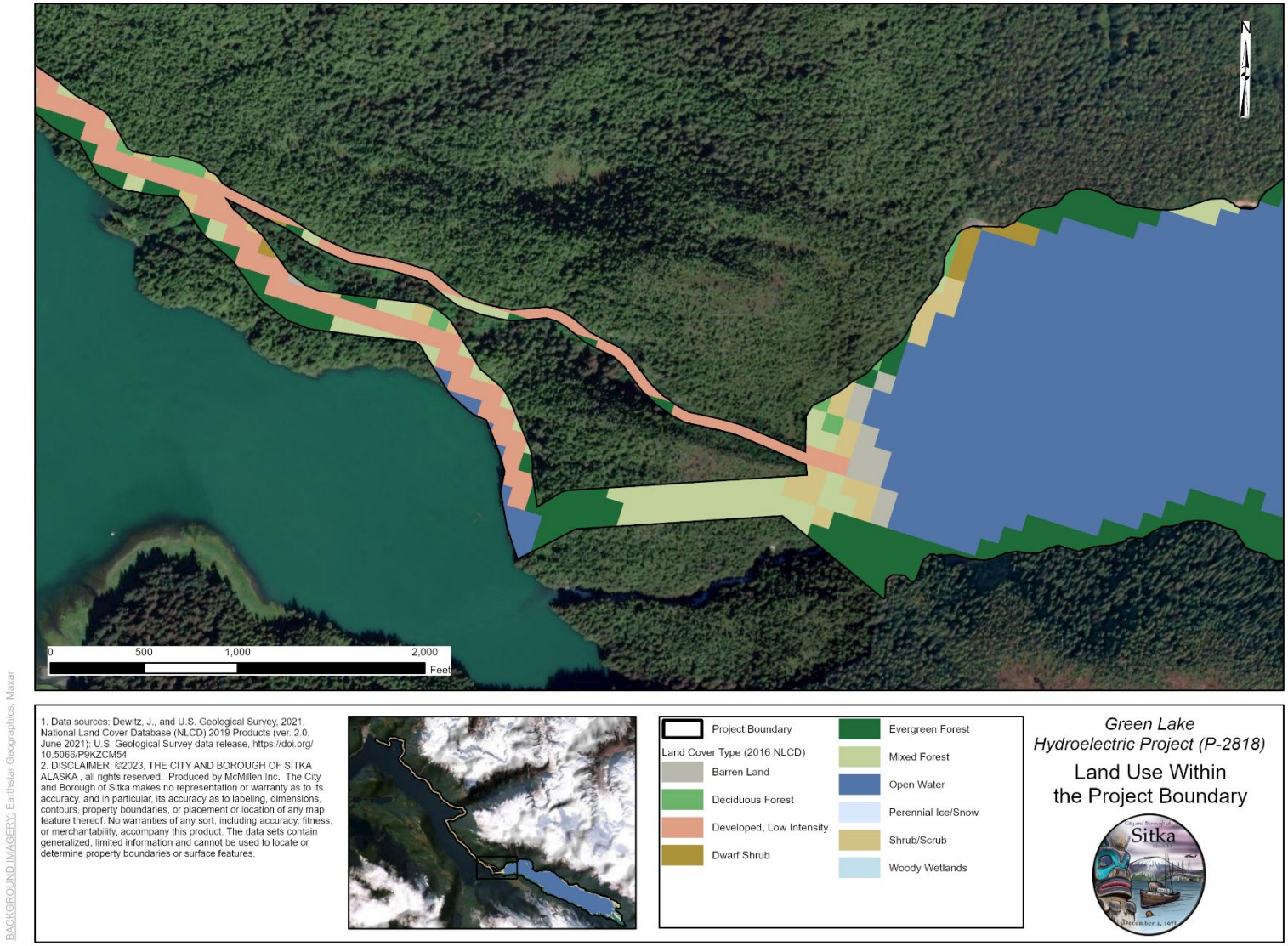


Figure 4-8 (Map 6). Land Cover Within the FERC Project Boundary

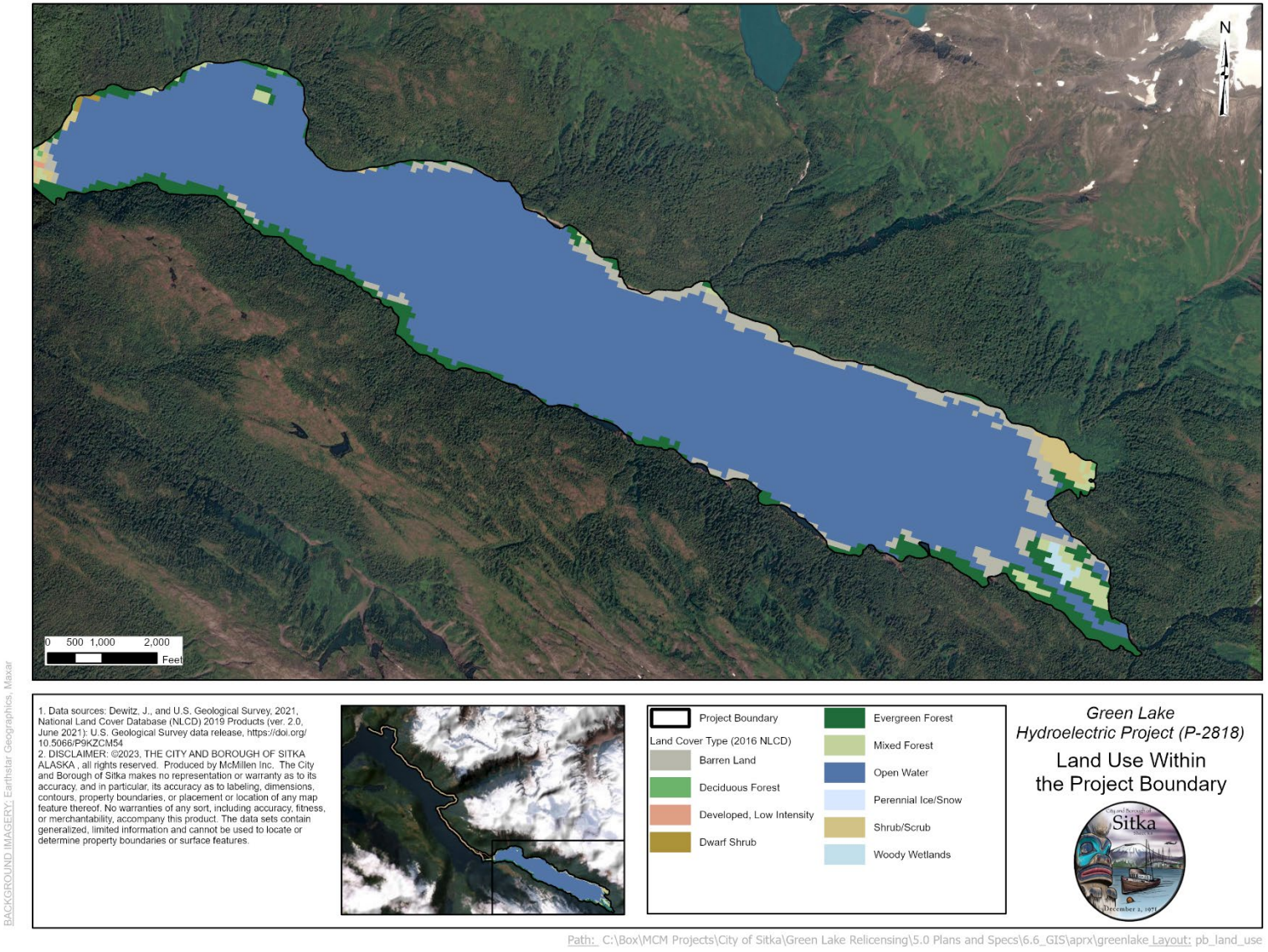


Figure 4-9 (Map 7). Land Cover Within the FERC Project Boundary

4.1.4 Climate

Sitka has a temperate rainforest climate with maritime influence with cool but moderate temperatures and abundant precipitation, in the form of both rain and snowfall. The climate is relatively mild when compared to other parts of Alaksa, due to its location on the ocean. Average summer temperatures range between 53° Fahrenheit (F) and 57° F while average winter temperatures range between 36° F and 37.5° F. Precipitation is typically highest in September and October. Table 4-3 presents a summary of climatic data for the City of Sitka (NWS 2023).

Table 4-3. Monthly Mean Precipitation and Temperature at Sitka Airport from 1991-2020

Month	Total Precipitation Normal (inches)	Mean Max Temperature Normal (°F)	Mean Min Temperature Normal (°F)	Mean Avg Temperature Normal (°F)
January	8.22	40.5	32.4	36.5
February	5.93	41.2	32.1	36.7
March	5.60	42.5	32.5	37.5
April	4.31	48.1	37.2	42.6
May	3.81	53.3	43.0	48.1
June	2.92	57.6	48.3	53.0
July	4.62	60.4	52.5	56.5
August	7.25	61.8	52.9	57.3
September	11.69	57.9	48.5	53.2
October	11.78	50.8	41.9	46.4
November	9.91	44.3	35.8	40.0
December	8.43	41.5	33.4	37.5
Annual	84.47	50.0	40.9	45.4

4.2 Geology, Topography, and Soils

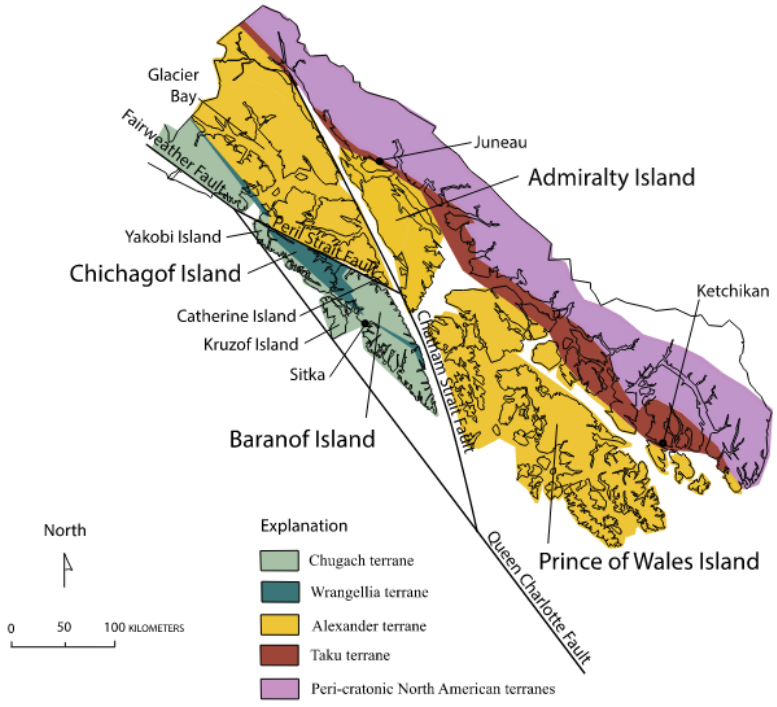
An updated geologic map was published in 2015 by USGS updating the geology of Baranof Island based on fieldwork, petrographic analysis, paleontologic ages, and isotopic ages performed by Karl et al. summarized in their report *Geologic Map of Baranof Island, Southeastern Alaska* (Karl et al. 2015). Historic documents were reviewed to determine any discrepancies between past and present geological reporting and findings, including the *Final Environmental Impact Statement* (FERC 1979) and the *Application for License for the Green Lake Project: Exhibit W, Environmental Report* (CBS 1977). The NRCS Web Soil Survey was used to determine the soil units within the FERC Project Boundary. *Supporting Technical Information Document, Green Lake Project* (CBS 2023a) was reviewed for the latest technical information about the Project and Project vicinity.

4.2.1 Physiographic Setting

Green Lake is located at the head of Silver Bay on Baranof Island of the Alexander Archipelago, in the Chilkat-Baranof Mountains. The Chilkat-Baranof Mountains are located in the Pacific Border Ranges Physiographic Province of the Pacific Mountains. The surrounding mountains reach elevations up to 4,000 feet, and Green Lake sits at approximately 395 feet above Silver Bay (Kleinschmidt Associates 2022). The Green Lake valley was carved by intense glacial erosion, creating the steep sided U-shaped valley (FERC 1979). The Chilkat-Baranof Mountains are dissected by fjords, inlets, and bays, such as the Silver Bay fjord.

4.2.2 Geologic Setting

The rocks of Baranof Island are part of Paleozoic to Early Tertiary oceanic volcanic arc complex that deformed and accreted on the convergent plate boundary of the Pacific and North American plates. As the two plates converged, seafloor rocks that were too light to subduct were compressed against the western edge of North America. These terranes generally consist of highly deformed seafloor volcanic rock and marine sediments. Major faults strike in an orientation roughly perpendicular to convergence. Baranof Island is a part of the Baranof-Chichagof tectonic block bounded by Cenozoic faults, the Fairweather Fault, and the Chatham Strait Fault (Figure 4-10). The Fairweather Fault lies west of Baranof Island and is an active plate-boundary transform fault. The Chatham Strait Fault lies east of Baranof Island and is likely an Oligocene and younger fault (Karl et al. 2015). The Baranof-Chichagof block is bounded to the northwest by the Peril Strait Fault. The Peril Strait and the Chatham Strait faults separate the Baranof-Chichagof block, associated with the Wrangellia and Chugach accreted terranes, from rocks associated with Alexander accreted terrane to the north and east. Wrangellia terrain consists of volcaniclastic rocks, marble, greenstone overlaying amphibolite, calc-silicate, gneiss, and quartzite. Chugach terrane consists of sedimentary and volcanic rocks. The Paleozoic, Mesozoic, and early Tertiary sequences within the Baranof-Chichagof block have sustained periods of metamorphism and are intruded by Mesozoic and Cenozoic plutons (Karl et al. 1988). The rocks are overlain with Quaternary glacial and fluvial deposits.



Source: Karl et al. 2015

Figure 4-10. Generalized tectonostratigraphic terrane map of southeastern Alaska

4.2.3 Bedrock Lithology

The geology in the vicinity of the Project is characterized by the Khaz complex, formerly mapped as the Khaz formation of the Kelp Bay Group, renamed in 2015 (Table 4-4, Figure 4-11 and Figure 4-12; Karl 2015). The Khaz complex is composed of greenstone, greenschist, tuff, graywacke, argillite, chert, limestone, and phyllite in a foliated argillaceous and tuffaceous matrix (Karl et al. 2015).

Greywacke is the dominant bedrock in the Project vicinity accompanied by argillite and phyllite. Greywacke is a low-grade metamorphosed sandstone that has poorly sorted angular grains formed by submarine avalanches. Argillite is metamorphosed sandy or silty shale that exhibits foliation parallel to the original bed. Phyllite is metamorphosed clay shale with a weakly foliated texture (CBS 2017).

Table 4-4. USGS Geology and Lithology in Project Vicinity

Unit Symbol	Unit Name	Age	Lithology		
			1	2	3
Qs	Unconsolidated surficial deposits, undivided	Quaternary	Unconsolidated		Gravel, sand, silt, clay
Toegr	Granitic rocks	Tertiary, early Oligocene and Eocene	Igneous	Plutonic	Granitic/ Dioritic

Unit Symbol	Unit Name	Age	Lithology		
			1	2	3
KJmu	Mafic and ultramafic rocks	Cretaceous to Jurassic or older	Igneous	Plutonic	Ultramafic
Ksg	Sitka Graywacke, undivided	Cretaceous	Metamorphic	Schist	Mica-schist
Kkbm	Khaz Complex	Cretaceous and older	Tectonite	Melange	
KJdg	Diorite and gabbro of southeast Alaska	Cretaceous? And Jurassic	Igneous	Plutonic	Granitic/ Dioritic/ Gabboric
Trvs	Volcanic and sedimentary rocks of Nakwasina Sound	Triassic	Tectonite	Melange	
KTrm	Kelp Bay Group, undivided	Cretaceous to Triassic	Metamorphic	Schist	Mica-schist
g	Glaciers	Holocene	Ice		

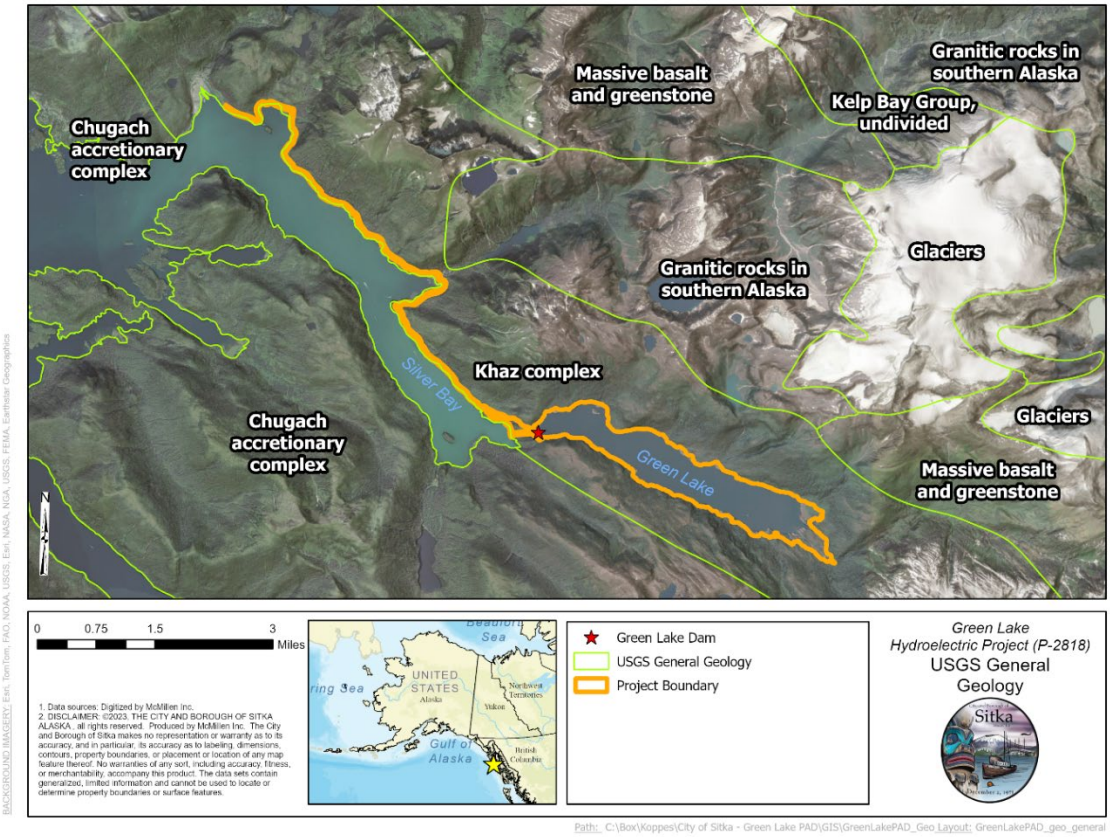


Figure 4-11. General Geology in the Project Vicinity

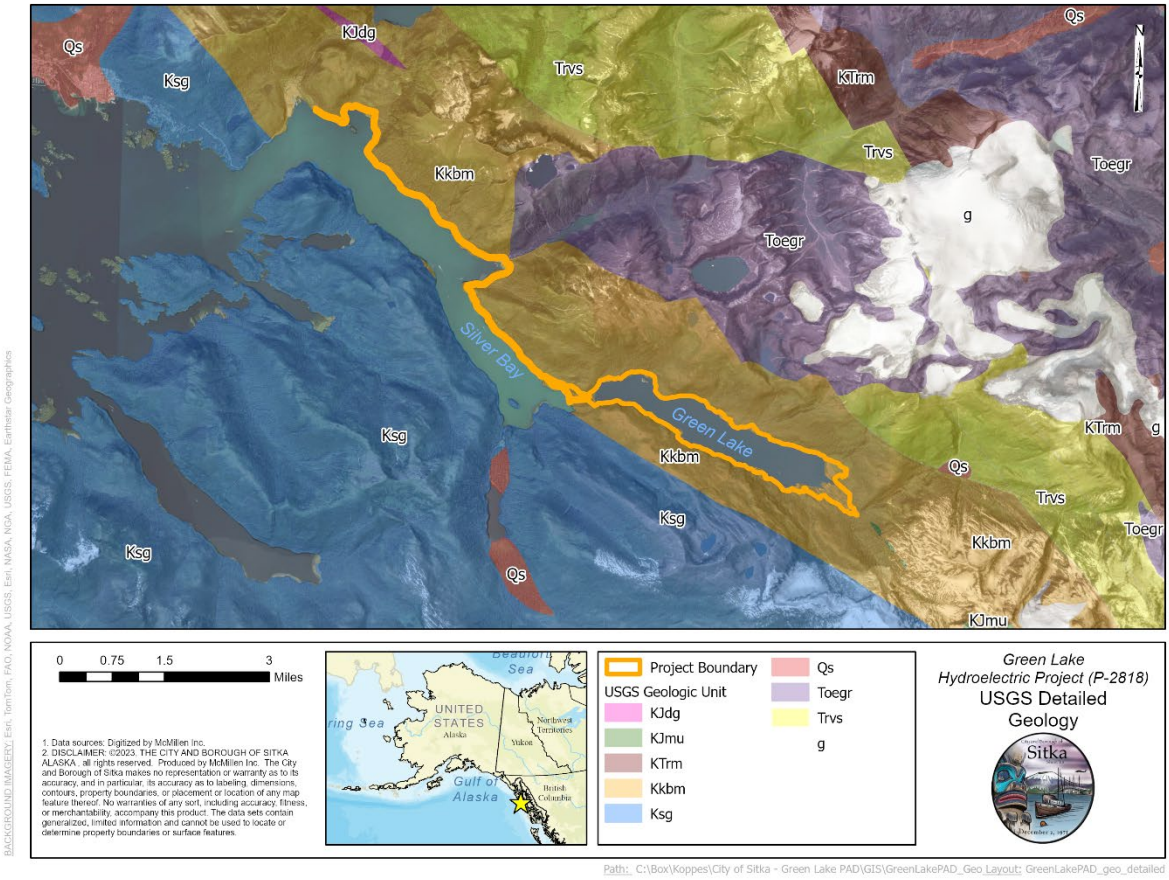


Figure 4-12. Detailed Geology in the Project Vicinity

4.2.4 Glacial Features and Processes

The last glacial retreat is hypothesized to be over 10,000 years ago, in which fjords, cirques and U-shaped valleys were formed on Baranof Island. From 1985 to 2020, glacier-covered area in Alaska decreased by 13% (Roberts-Pierel et al. 2022). Glaciers exist above 3,000 feet to the north, east, and southeast of the Project. These are likely remnant glaciers from the Little Ice Age.

In many areas in southeastern Alaska, melting of the Cordilleran Ice Sheet since the Pleistocene has resulted in surface-uplift in response to unloading and isostatic rebound with Holocene uplift rates varying from 10 to 32 mm/year (Larsen et al. 2004). Continued thinning of tidewater glaciers is resulting in accelerated uplift in some areas. Relative to most of the southeastern Alaskan coast, Baranof Island has experienced a somewhat muted uplift rate (10.3 mm/yr) of 4 meters over the last 7,930 years (Baichtal et al. 2021).

4.2.5 Faulting and Seismicity

The faults closest to the Project are the Silver Bay Fault and the Neva Strait Fault, segments of the Sitka Fault zone also known as the Chichagof-Sitka Fault (Figure 4-13, Table 4-5; CBS 1977). Both faults

trend northwest and are contemporaneous with the Patterson Fault (Karl et al. 2015). The integrity of the bedrock at the dam site had not been impaired by these faults at the time of the original license application in 1977 (CBS 1977) and is determined to still be a viable conclusion at this time.

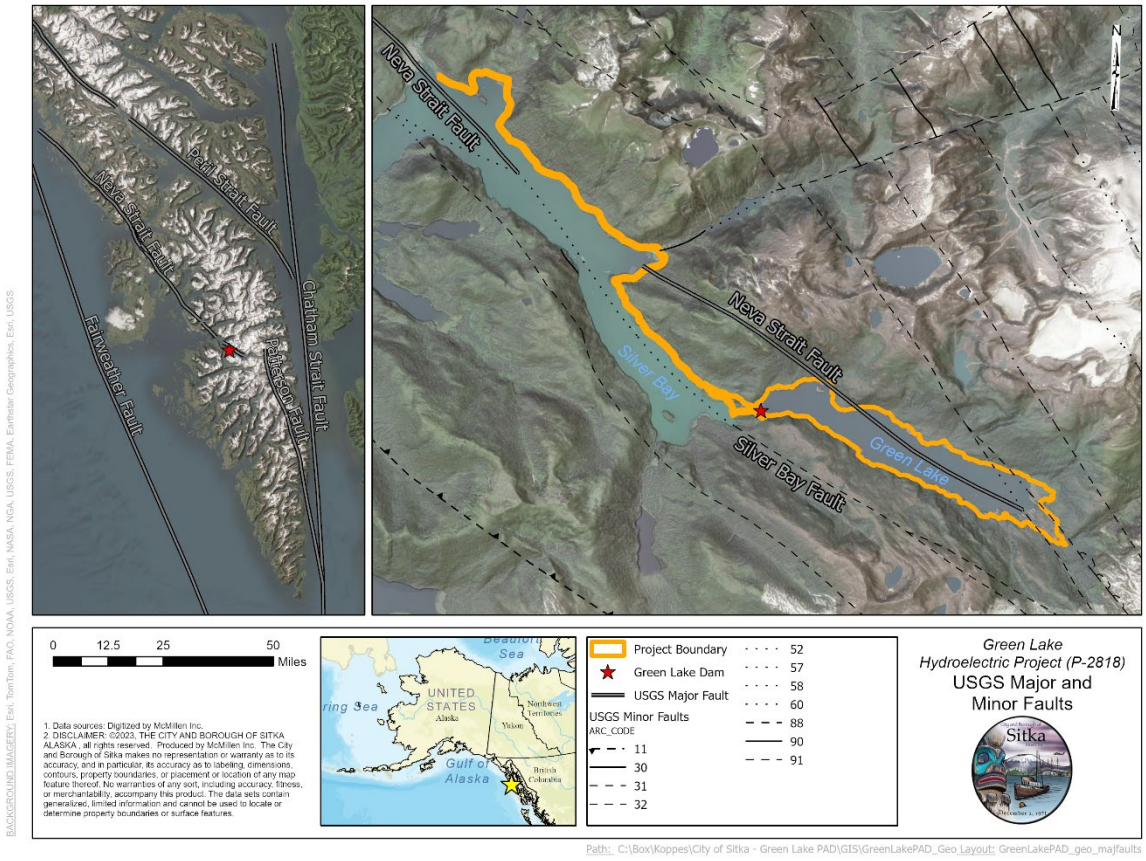


Figure 4-13. Faults in the Project Vicinity

Table 4-5, Minor Faults in the Project Vicinity

ARC_CODE	Definition
11	Thrust fault, location approximate; teeth on right from origin
30	Fault, unknown offset, certain location
31	Fault, unknown offset, approximate location
32	Fault, unknown offset, inferred location
52	Concealed normal fault
57	Concealed right-lateral fault
58	Concealed left-lateral fault
60	Concealed fault of uncertain displacement
88	Right-lateral fault, location approximate
90	Left-lateral fault, location certain
91	Left-lateral fault, location approximate

The immediate Project vicinity is characterized by relatively moderate to high seismic activity (FEMA 2022. Table 4-6 shows a complete list of seismic events greater than Richter magnitude 2.0 within 50 miles of the Project since 1977. Four seismic events greater than magnitude 4.0 were recorded in 1998, 1999, 2011, 2020.

Figure 4-14 shows the location of each listed seismic event and additional events within 100 miles of the Project since 1977 (USGS 2023a).

Table 4-6. Seismic Events within 50 miles of Green Lake Dam since 1977

Map Unit Symbol	Latitude	Longitude	Depth (kilometers)	Magnitude
11/15/2023	57.01017	-136.133	14.95	2.1
9/29/2023	57.3116	-136.229	2.8	2.3
8/28/2023	56.7144	-135.911	7.9	2.2
8/28/2023	56.7951	-135.951	8.4	2.2
8/23/2023	57.105	-135.724	7	2.1
8/12/2023	57.3268	-136.15	5.7	2
6/15/2023	56.6625	-135.137	4	2.1
6/13/2023	57.1296	-135.69	3.3	2.4
5/31/2023	57.0952	-135.732	5.5	2.1
5/31/2023	57.122	-135.724	3.6	2.4
5/30/2023	57.1185	-135.747	6.1	2.2
5/30/2023	57.1147	-135.719	4.9	2.2
1/13/2023	56.6562	-135.993	15.7	3
1/13/2023	56.7464	-136.006	9.2	3.2
1/13/2023	56.6653	-135.944	15.9	3.2

Map Unit Symbol	Latitude	Longitude	Depth (kilometers)	Magnitude
6/13/2022	57.2097	-136.277	11.1	3.4
6/13/2022	57.2792	-136.164	4.4	2
4/12/2022	57.058	-135.684	5.5	2
4/12/2022	57.076	-135.667	6	2.3
4/12/2022	57.062	-135.671	7.5	2.2
4/11/2022	57.0729	-135.71	6.6	2.1
4/11/2022	57.0432	-135.702	6.6	2.7
4/11/2022	57.0754	-135.675	8.5	2
4/11/2022	57.0765	-135.701	3.5	2.3
4/11/2022	57.0959	-135.662	5.3	2.1
4/11/2022	57.0821	-135.636	7.3	2.4
4/11/2022	57.0683	-135.66	8.3	2.2
4/11/2022	57.0887	-135.642	7.7	2.3
4/11/2022	57.1165	-135.589	6.5	2
4/11/2022	57.0093	-135.728	6.8	2
4/3/2022	56.3193	-134.644	13.6	2.2
2/12/2022	56.7542	-135.918	5.6	2.1
2/14/2022	57.2375	-136.149	0.7	2.1
11/23/2020	56.6987	-135.97	18.5	4.2
11/21/2020	57.1256	-135.704	4.6	2.1
11/13/2020	57.231	-136.301	10	2.2
9/11/2020	56.4477	-135.817	17.4	2.2
8/30/2020	57.1002	-135.733	4.7	2.5
8/8/2020	57.0773	-135.736	1.4	2.1
7/24/2020	57.1099	-135.704	3.4	2.1
2/8/2020	57.1251	-135.736	3.5	2.3
1/2/2020	57.1019	-135.759	5.3	3
11/22/2019	57.2366	-136.152	4.3	2.4
10/8/2019	57.1547	-136.272	9	2.3
9/4/2018	56.4352	-135.1	6.3	2.2
12/7/2017	57.2664	-136.155	0.1	2.3
4/5/2017	56.7877	-135.934	18.2	2.2
1/15/2017	57.2949	-136.159	1.9	2.3
1/13/2017	56.5543	-134.478	7.1	2
7/5/2016	56.6643	-135.916	14	3.6
4/29/2016	56.6886	-135.809	14.2	2.3
3/9/2016	57.1313	-136.247	20.3	2.8

Map Unit Symbol	Latitude	Longitude	Depth (kilometers)	Magnitude
12/27/2015	57.002	-136.062	20	2.2
8/21/2014	57.15	-136.362	15.2	2.9
7/21/2014	57.1161	-136.27	15.1	2.7
8/6/2013	56.363	-134.907	10	2.3
2/11/2013	56.2929	-135.424	20	2.4
2/7/2013	57.401	-134.919	8.1	2.4
12/17/2012	57.1974	-136.035	10	2.1
12/6/2012	57.062	-136.215	14.9	2.2
11/24/2012	57.1658	-136.215	3.2	3.1
11/5/2011	56.631	-135.987	10	4.8
4/27/2011	56.508	-134.999	1	2.9
12/8/2010	56.5504	-134.453	8.4	2.8
9/20/2010	56.8598	-134.643	16.6	3.4
2/9/2010	56.7198	-136.094	4.8	2.1
1/8/2009	56.5389	-134.637	18.7	2.9
8/14/2007	56.6038	-135.323	2.2	3.1
5/27/2007	56.308	-134.912	24.2	2.5
9/2/2004	57.0423	-136.152	16.1	2.3
6/22/2002	56.6725	-135.912	20.1	3.5
9/16/2001	56.6519	-135.952	17.9	3.5
2/20/1999	57.2506	-136.158	15	3.3
12/16/1998	56.7713	-135.72	12.4	4.6
9/13/1998	56.5858	-136.097	10	3.7
3/9/1997	56.7122	-135.828	10	3.5
5/4/1993	57.13	-135.458	10	3.6
10/11/1989	57.1525	-136.364	10	4.3
6/13/1982	56.926	-136.025	33	3.8

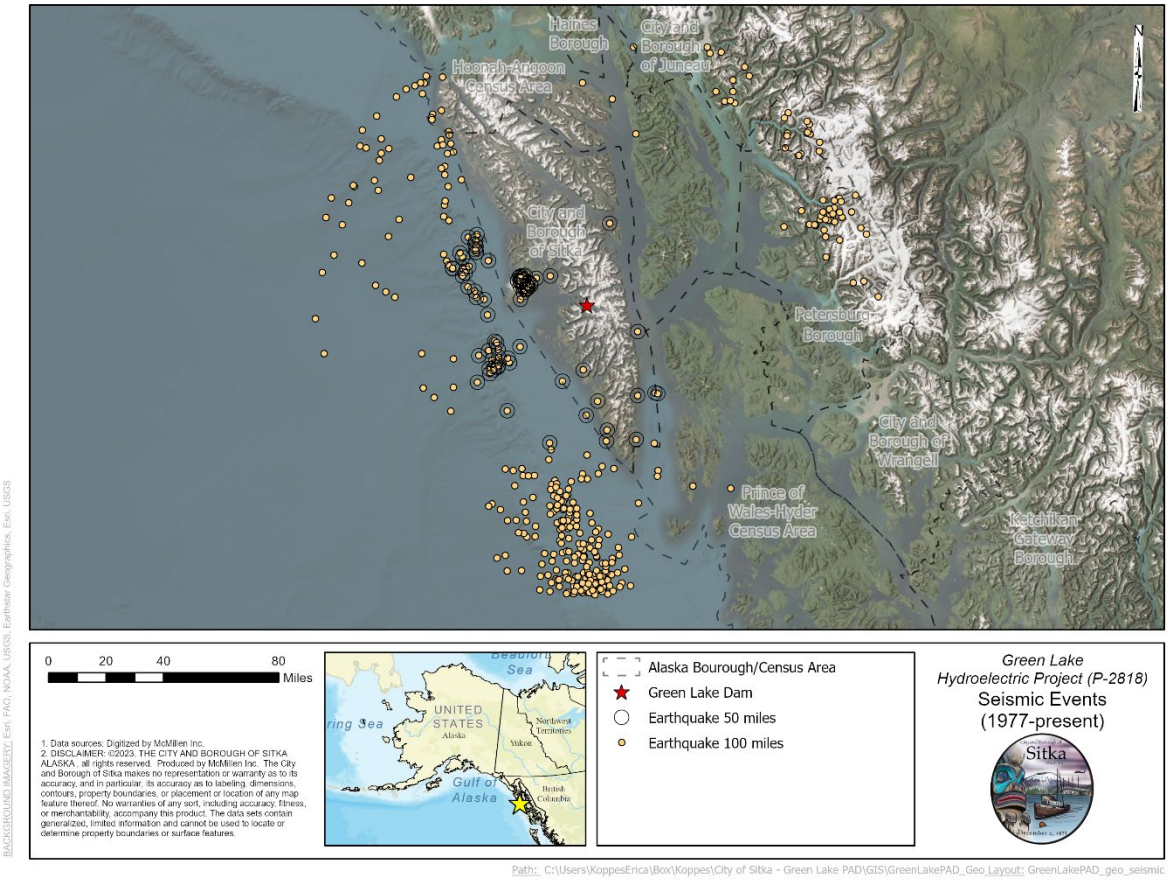


Figure 4-14. Seismic Events within 100 miles of Green Lake Dam since 1977

4.2.6 Soils

Soils in the Project vicinity are itemized in Table 4-7 and shown in Figure 4-15. Major soil types found in the immediate Project vicinity include Tuxekan silt loam and Tuxekan-Tonowek association within Green Lake. The Tuxekan silt loam and Tuxekan-Tonowek association consists of well drained alluvium that are found in flood plains on alluvial fans at elevations of 0 to 660 feet. Tuxekan silt loam is composed of moderately decomposed plant material, silt loam, highly organic silt loam, and extremely gravelly sand. Tuxekan-Tonowek association consists of slightly decomposed plant material, very fine sandy loam, stratified silt loam to sand, and stratified extremely gravelly sand to very cobbly sandy loam (NRCS 2023).

Table 4-7. Soils in the Project Vicinity

Map Unit Symbol	% FERC Project Boundary	Soil Unit Name
3002E	0.4	Entic Cryumbrepts-Tolstoi-Kupreanof association, 76 to 140 percent slopes
3067E	1.0	McGilvery-Mosman-Rock outcrop complex, 76 to 140 percent slopes

Map Unit Symbol	% FERC Project Boundary	Soil Unit Name
3221D	0.0	Kupreanof gravelly silt loam, shallowly incised, 56 to 75 percent slopes
32JE	0.6	Typic Humicryods-McGilvery association, shallowly incised, 76 to 120 percent slopes
*3525E	0.8	Kupreanof-Tolstoi complex, smooth, 76 to 120 percent slopes
*3548E	4.1	Verstovia-McGilvery complex, smooth, 76 to 120 percent slopes
3549E	1.4	Tolstoi-Mosman-McGilvery complex, smooth, 76 to 120 percent slopes
*3551D	2.8	Tolstoi-Mosman complex, smooth, 56 to 75 percent slopes
*3625D	0.3	Kupreanof-Tolstoi complex, broken, 56 to 75 percent slopes
*3635C	0.3	Sitka and Partofshikof soils, subalpine, 36 to 55 percent slopes
*3635D	1.2	Sitka and Partofshikof soils, subalpine, 56 to 75 percent slopes
*3641B	1.1	Kasiana-Kushneahin complex, broken, 6 to 35 percent slopes
3644C	0.7	Partofshikof silt loam, broken, 36 to 55 percent slopes
3648D	1.5	Verstovia-McGilvery complex, broken, 56 to 75 percent slopes
*3649C	1.0	Tolstoi-Mosman-McGilvery complex, broken, 36 to 55 percent slope
3649E	2.7	Tolstoi-Mosman-McGilvery complex, broken, 76 to 12o percent slopes
3653C	0.4	Sitka-Partofshikof complex, 36 to 55 percent slopes
*3659C	3.1	Partofshikof-Sukoi complex, 36 to 55 percent slopes
3659D	0.1	Partofshikof-Sukoi complex, broken, 56 to 75 percent slopes
*3662C	0.8	Mitkof-Tolstoi-Kaikli complex, 36 to 55 percent slopes
*3672B	2.2	Kina-Sukoi association, broken, 6 to 35 percent slopes
*3694C	3.1	Kaikli-St. Nicholas complex, broken, 36 to 55 percent slopes
36KD	0.2	Typic Cryaquods-Typic Humicryods-McGilvery association, broken, 56 to 75 percent slopes
*3779E	0.2	Entic Cryumbrepts, McGilvery, and Rock outcrop soils, ravines, 76 to 140 percent slopes
*5234A	7.6	Tuxekan silt loam, alluvial fans, 0 to 5 percent slopes
*5234B	2.3	Tuxekan silt loam, 6 to 25 percent slopes
52J	1.3	Typic Humicryods, dissected footslopes, 6 to 35 percent slopes
5308A	5.0	Tonowek sandy loam, 0 to 5 percent slopes
*5334A	14.0	Tuxekan silt loam, floodplains, 0 to 5 percent slopes
*5364A	28.2	Tuxekan-Tonowek association, floodplains, 0 to 5 percent slopes
SW	0.5	Water, Saline
UR	0.1	Urbanland
W	10.9	Water
Total	99.9	

*See Section 4.2.7.

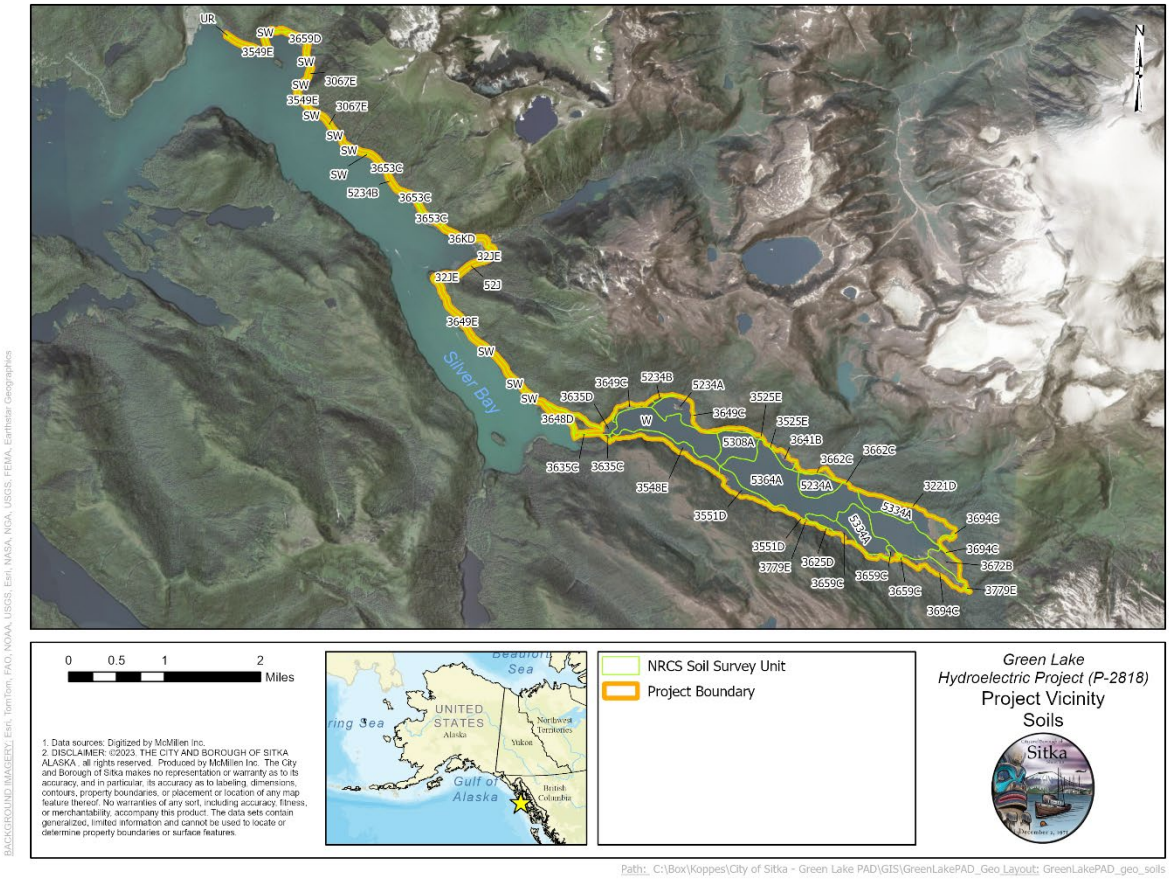


Figure 4-15. Soils in the Project Vicinity

4.2.7 Lake Shorelines

Slope stability of soil units along the Green Lake shoreline can be found in Table 4-7 denoted with an asterisk (*). Figure 4-16 shows the location of soil units and slope stability along the shoreline of Green Lake. Slopes from 0% to 5% exist generally north of the lake. These slopes correspond to the Tuxekan silt loam and Tuxekan-Tonowek association NRCS soil unit. Shoreline slopes are steep ranging from 5% to 60% slopes (USGS 2016). The Vodopad River enters Green Lake at an approximate 3.6% gradient.

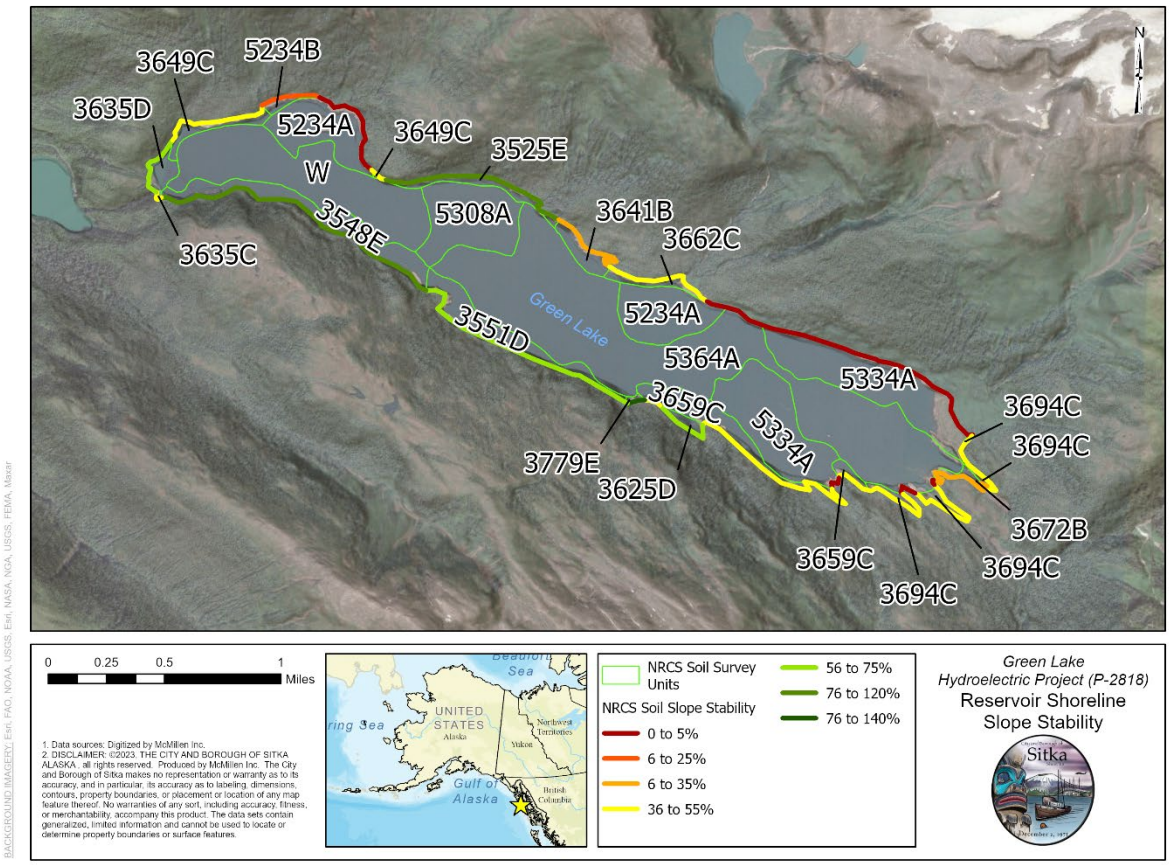


Figure 4-16. Reservoir Shoreline Slope Stability in Project Vicinity

4.3 Water Resources

The Vodopad River flows roughly 6 miles from its headwaters west to the inlet of Green Lake on the west side of Baranof Island. The high runoff period in the basin occurs in late spring, summer, and early fall with the low flow period occurring in winter and early spring. Sitka has a temperate rainforest climate with maritime influence climate with cool but moderate temperatures and abundant precipitation, in the form of both rain and snowfall. Abundant precipitation usually occurs in September and October followed by generally mild winter temperatures. Despite abundant precipitation in early fall, almost 50% of the total annual runoff in the Vodopad basin occurs from May through August due to snowmelt. Only a minor portion of the total runoff comes from glaciers (FERC 1979).

4.3.1 Drainage Area

The Vodopad River has a drainage area of approximately 28 square miles. The Green Lake Dam is located approximately 1,800 feet upstream of the Project powerhouse with the spillway at El. 395 feet, and there are no intervening tributaries to the Vodopad River between the Project dam and where the powerhouse discharges to Silver Bay. Like the other basins draining into Silver Bay, the Vodopad River drainage is relatively short and has a high gradient.

4.3.2 Streamflow, Gage Data, and Flow Statistics

The United States Geological Survey (USGS) operated a streamflow gaging station on the Vodopad River at the present location of the Green Lake Dam (USGS Gage No. 15090000 Green Lake Near Sitka, AK) from August 22, 1915, to September 29, 1925 (USGS 2023b). These data represent unregulated inflows to the Project. In addition to the 1915–1925 data, the USGS also published Water-Year Summaries for this gaging station from 2006 to 2013, which contain monthly average flows based upon daily reservoir elevations and power generation provided to the USGS by CBS. Lastly, CBS logged and provided daily reservoir elevation (ft) and hourly power generation (kW) from Project records and used these data to compute daily Project outflow from 2016 through 2023. The annual and monthly minimum, mean, median, maximum, 10% exceedance and 90% exceedance flows using the 1915 to 1925 data are presented in Table 4-8, the 2006 to 2013 data are presented in Table 4-9, and the 2016 to 2023 data are presented in Table 4-10.

Daily Project outflow data from 2016 through 2023 were used to develop annual and monthly flow duration curves. These curves are presented in Figure 4-17 through Figure 4-21. Annual flow duration curves show that 10% exceedance flows reach 778 cfs, while the 90% flow duration value is 160 cfs. Monthly flow duration curves indicate that streamflow is typically at its highest in the month of October, when median flow is 514 cfs. Streamflow is typically at its lowest in the month of May, when the median flow is 218 cfs.

Table 4-8. Daily Average Streamflow (cfs) at the Outlet of Green Lake (8/22/1915 – 9/29/1925)

Statistic	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Minimum	18	15	10	12	87	172	270	150	120	49	47	25	10
90% Exceedance	23	25	14	20	118	321	364	250	183	155	80	45	35
Median	56	45	40	80	300	508	462	400	400	339	200	87	233
Mean	100	76	49	105	325	519	495	437	522	425	315	140	295
10% Exceedance	191	140	97	176	559	728	684	662	1,000	887	772	275	620
Maximum	1,590	1,210	499	706	1,310	1,160	1,420	1,640	2,300	1,510	1,800	1,290	2,300

Table 4-9. Monthly Average Streamflow (cfs) at the Project (October 1999 – September 2013)

Statistic	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Minimum	79	52	61	80	218	327	194	219	313	212	66	67	52
90% Exceedance	81	53	63	86	223	329	202	223	345	276	94	68	94
Median	143	118	101	172	335	456	454	429	589	596	274	197	273
Mean	137	116	109	164	313	452	422	399	629	572	336	188	320
10% Exceedance	197	198	176	242	383	590	609	595	1,029	815	802	382	599
Maximum	201	219	184	246	394	598	638	599	1,073	844	811	436	1,073

Table 4-10. Daily Average Streamflow (cfs) Based on Project Outflow Records (1/1/2016 – 12/31/2023)

Statistic	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Minimum	0	88	110	0	0	0	0	79	0	0	15	67	0
90% Exceedance	182	186	201	164	0	0	132	200	200	166	133	170	160
Median	291	302	252	239	218	247	349	394	443	514	342	287	286
Mean	320	323	303	233	245	341	416	496	613	607	546	392	403
10% Exceedance	488	598	590	326	332	778	833	982	1,356	1,127	1,301	635	778
Maximum	1,411	667	618	479	1,318	1,223	1,393	3,958	2,695	3,657	5,924	2,165	5,924

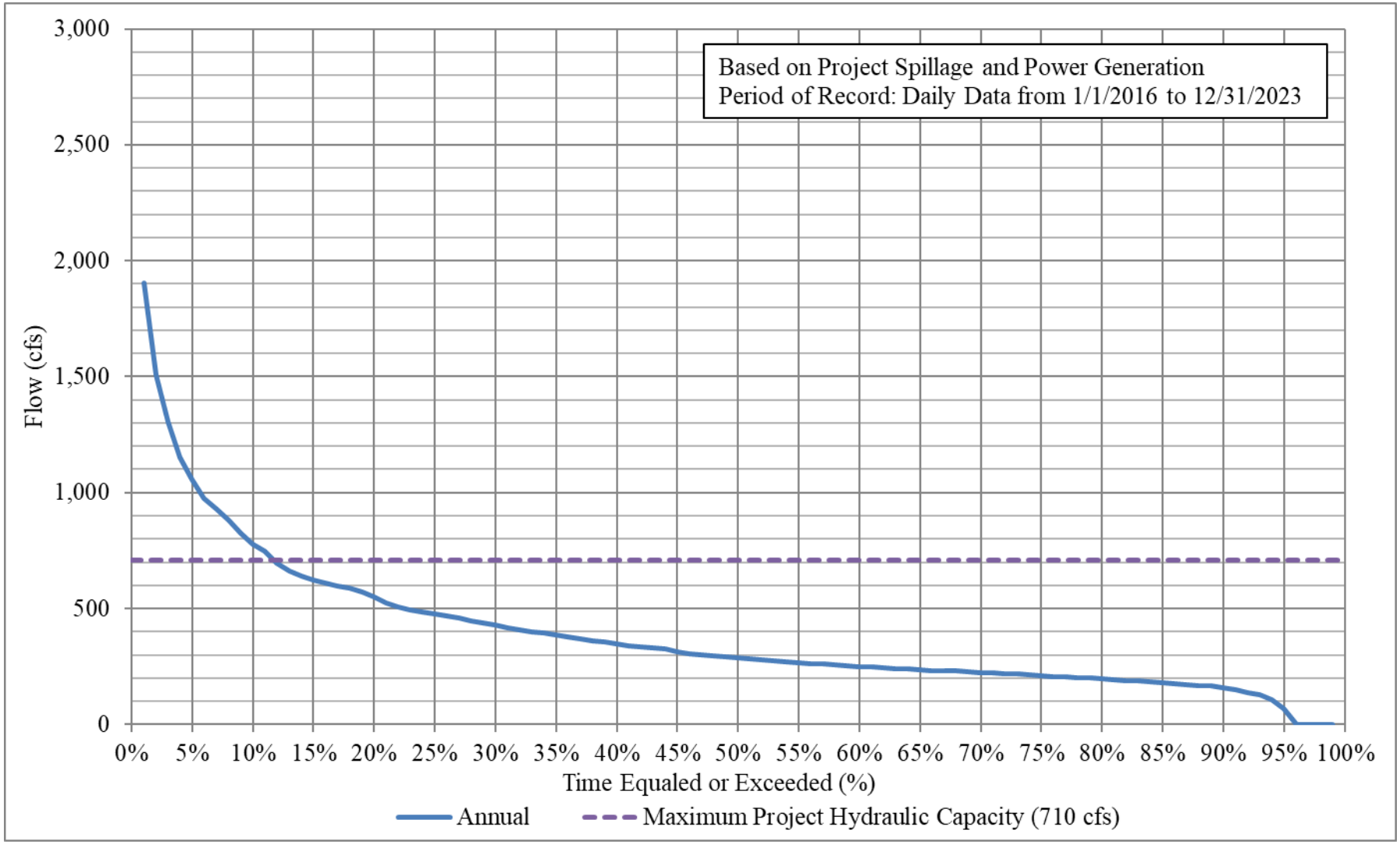


Figure 4-17. Annual Flow Duration Curve (2016 – 2023)

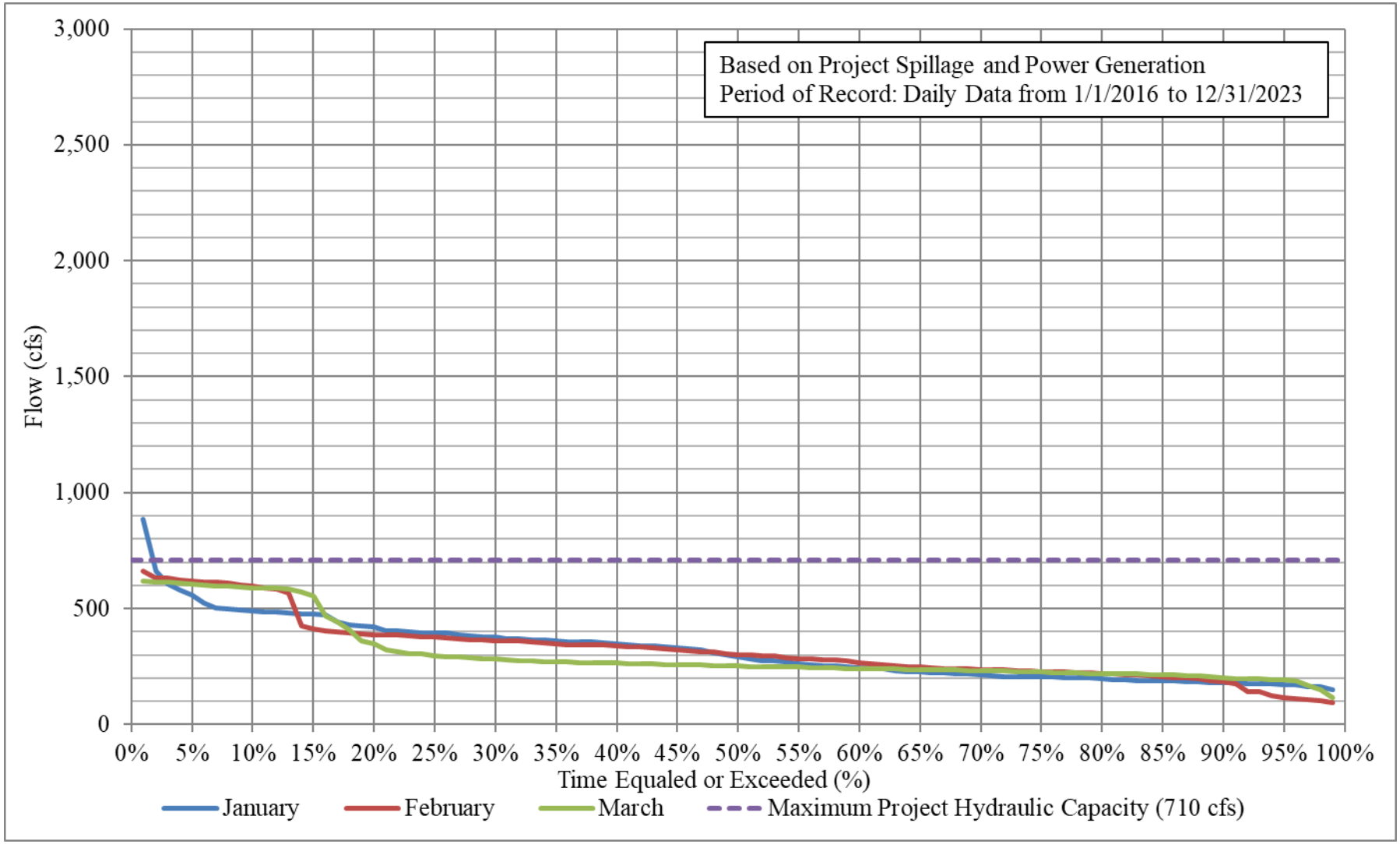


Figure 4-18. January, February, and March Flow Duration Curve (2016 – 2023)

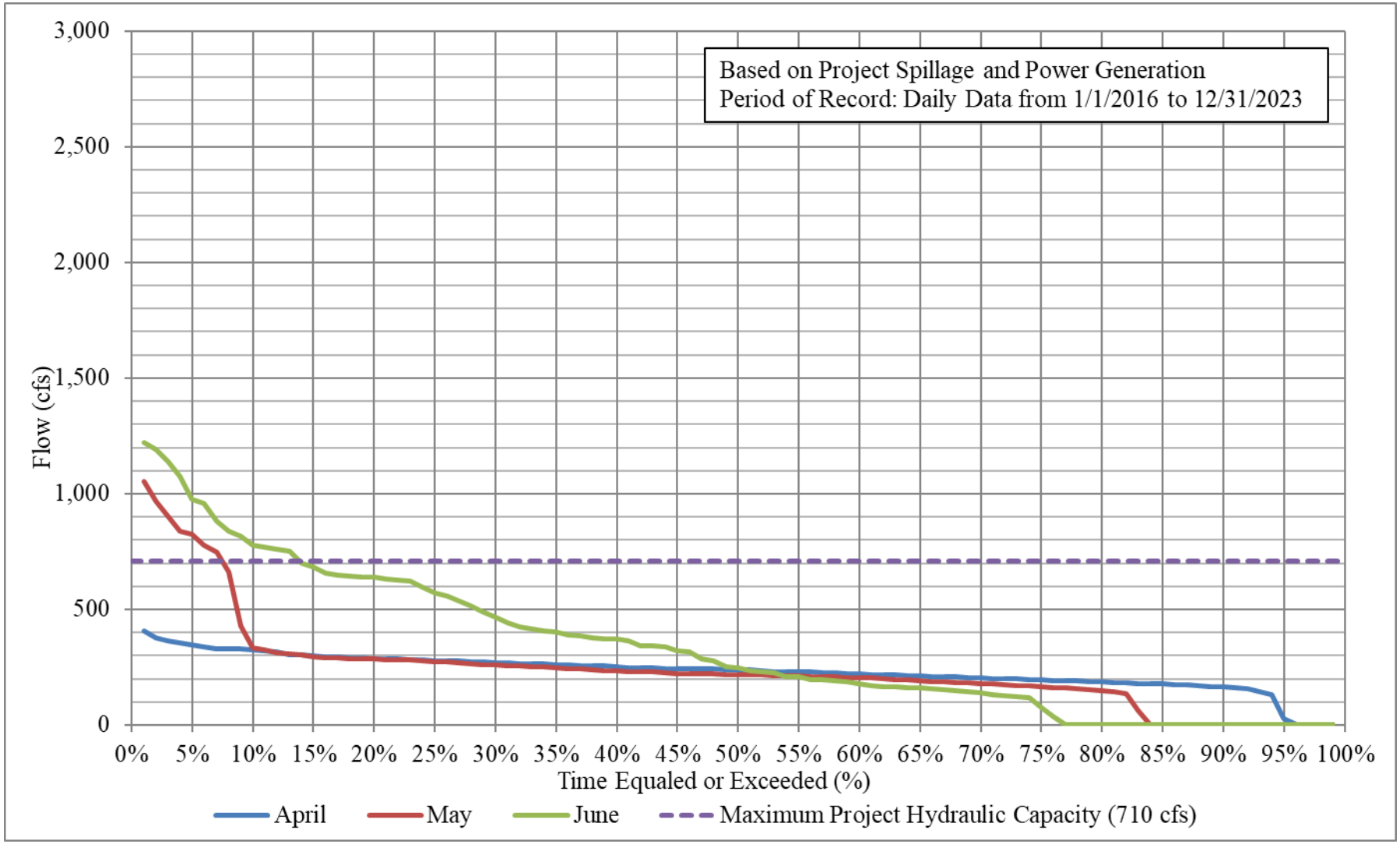


Figure 4-19. April, May, and June Flow Duration Curve (2016 – 2023)

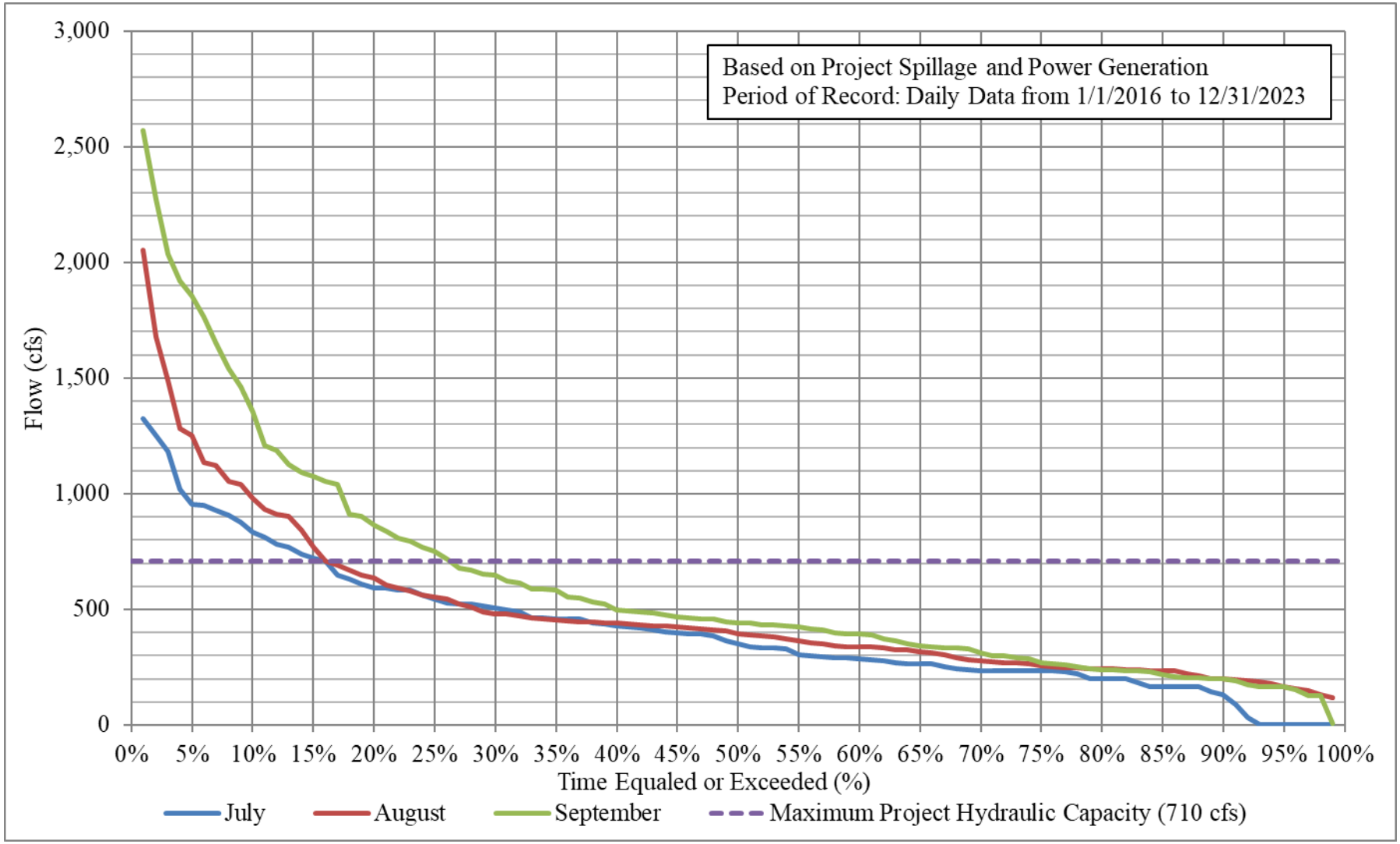


Figure 4-20. July, August, and September Flow Duration Curve (2016 – 2023)

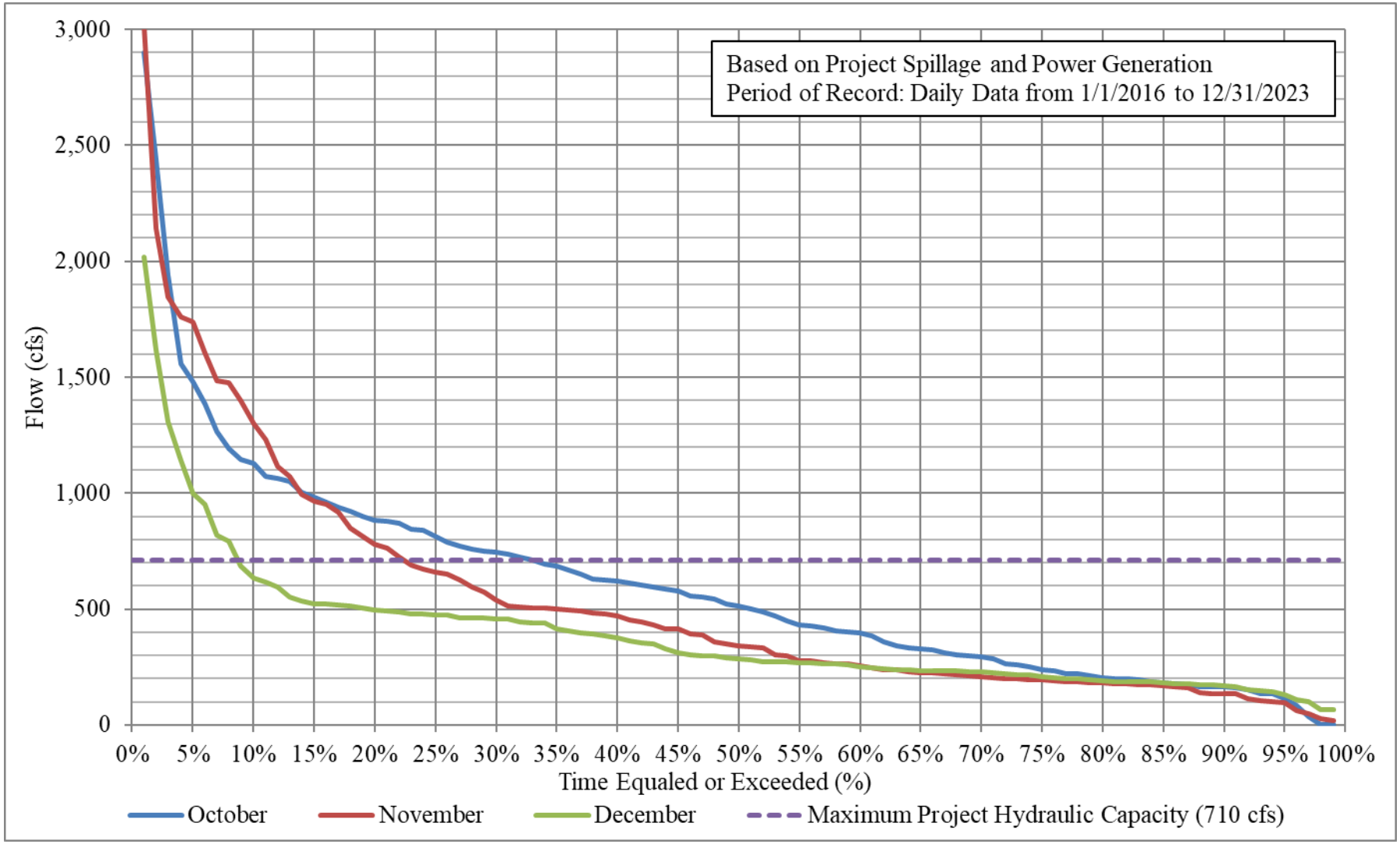


Figure 4-21. October, November, and December Flow Duration Curve (2016 – 2023)

4.3.3 Existing and Proposed Water Uses

The Project is operated for power generation only. Project waters are not used for irrigation, domestic water supply, industrial supply, or any other purposes. There are no instream flow requirements to the Vodopad River downstream of Green Lake Dam. CBS is not proposing any changes to water use at the Project. Green Lake reservoir levels are controlled by reservoir inflows from rain and snowmelt, water releases for generation, and spill. The Project uses a rule curve to predict the likelihood of spilling each year. Figure 4-22 shows the rule curve used by CBS for Green Lake, the actual water levels for Water Year (WY) 2023 (10/1/2022 – 9/30/2023), and Project powerhouse flow (cfs) for WY 2023.

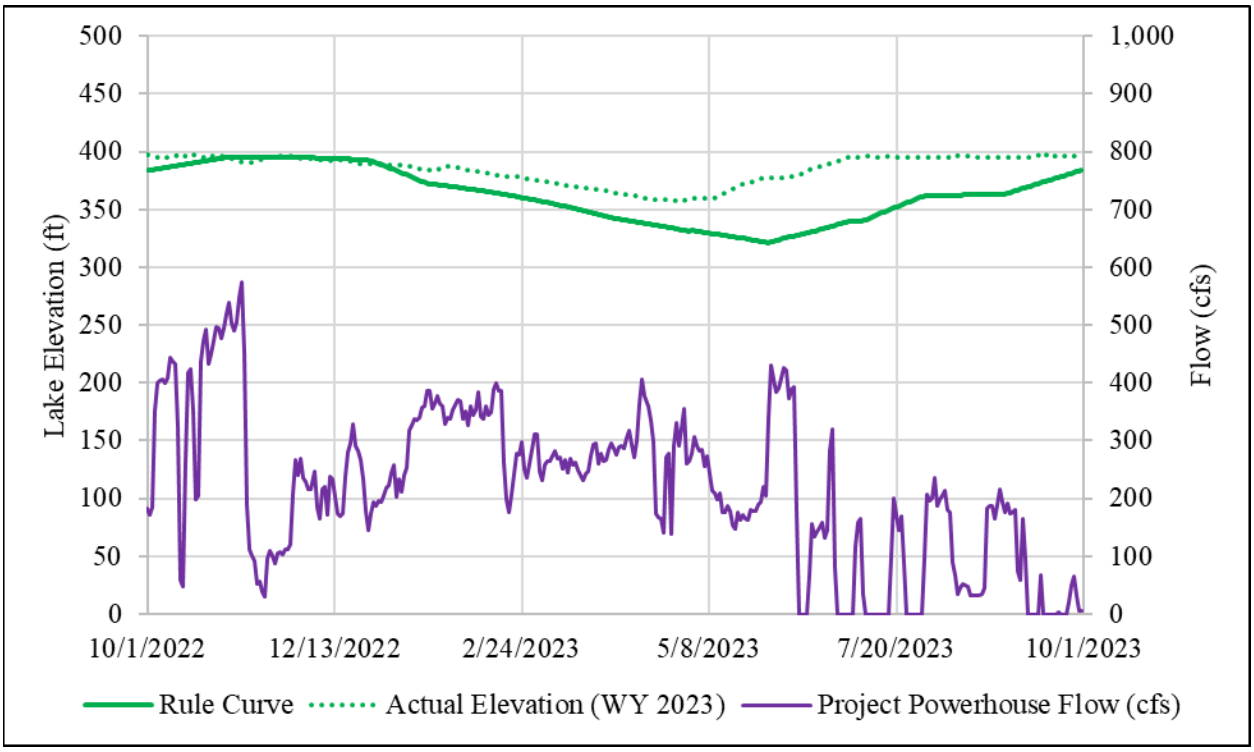


Figure 4-22. Green Lake Rule Curve (CBS 2023b)

4.3.4 Existing Water Rights and Withdrawals

CBS holds all water rights necessary to operate the Project. Currently Green Lake is operating under Water Right Certificate ADL 100007. The water right was issued on June 30, 1987, and allowed for the diversion of 310 cfs from Green Lake, which was an error as the Project's total hydraulic capacity is 710 cfs. CBS filed an amendment to the water right with ADNR in November 2004 to allow for the diversion of the full 710 cfs.

4.3.5 Reservoir Characteristics and Downstream Gradient

Green Lake is a historically natural lake. Prior to the construction of the dam, Green Lake had an average water surface elevation of 230 feet msl. The surface area was approximately 173 acres, the volume was approximately 6,990 acre-feet, and the maximum lake length was approximately 1.2 miles (FERC 1979). Presently, Green Lake extends approximately 4 miles upstream from the Green Lake Dam, has a normal

surface elevation of 395.0 feet msl, and a normal surface area of 1,000 acres. The gross storage capacity of the reservoir is 88,000 acre-ft, with a usable storage capacity of 70,500 acre-feet. Green Lake has a mean depth of 88 feet, maximum depth of 250 feet (ADFG, n.d.), and a shoreline length of approximately 10.5 miles. There is no readily available information on the flushing rate or substrate composition of Green Lake.

The reach of the Vodopad River bypassed by the Project extends approximately 1,800 feet from the base of the Green Lake Dam to Silver Bay. Project outflows from generation discharge directly flow into Silver Bay, while dam seepage and spillage events are the sole source of flows for the portion of the Vodopad River downstream of the Green Lake Dam. This portion of the river consists of a steep gorge characterized by numerous cascading waterfalls, ultimately reaching tidewater. It is a relatively straight, deeply incised bedrock channel, confined by steep bedrock walls, and consists of a step pool channel form. The river drops approximately 221 feet from the base of Green Lake Dam to Silver Bay and has a high gradient of approximately 14%. This reach of the river is discussed further in Sections 4.4.2 and 4.5.1.

4.3.6 Water Quality

The following sections discuss water quality standards and classifications applicable to waterbodies in the Project area. The results from water quality investigations that pertain to the waterbodies in the Project area are also discussed.

4.3.6.1 Federal Clean Water Act

In 1972, the Federal Water Pollution Control Act Amendments established the Clean Water Act (CWA) as the foundation of modern surface water quality protection in the United States. Section 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 in the states. 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 waters of the United States unless a Section 401 water quality certification is issued or certification is waived. States and authorized tribes where the discharge would originate are generally responsible for issuing water quality certifications.

The State of Alaska does not have programs in effect related to the FERC requirements regarding FERC-licensed hydropower projects for compliance with the Federal Power Act 401 Water Quality Certifications. As such, CBS intends to file for a 401 Water Quality Certification Waiver with the State of Alaksa to comply with Section 401 requirements during the FERC relicensing process.

4.3.6.2 State Water Quality Standards

Alaska's water quality standards are established under Administrative Code 18 AAC 70, amended as of November 13, 2022, and overseen by the Alaska Department of Environmental Conservation (ADEC 2022a). 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 the Vodopad River watershed is 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 November 13, 2022 (ADEC 2022a) and (2) Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (ADEC 2022b). Neither Green Lake nor the Vodopad River are included in any of the State of Alaska's Section 305(b) Integrated Reports.

4.3.6.3 Existing Water Quality Data

Existing water quality data collected from Green Lake and the Vodopad River are limited. The State of Alaksa does not maintain any water quality monitoring locations in Green Lake or the Vodopad River. The only available water quality data for Green Lake were collected in 1974 (before the Green Lake Dam was built) and in 1987 (post construction and initiation of operations). Figure 4-23 provides a map of the historic water quality monitoring locations. The results of these two studies are summarized in the sections below.

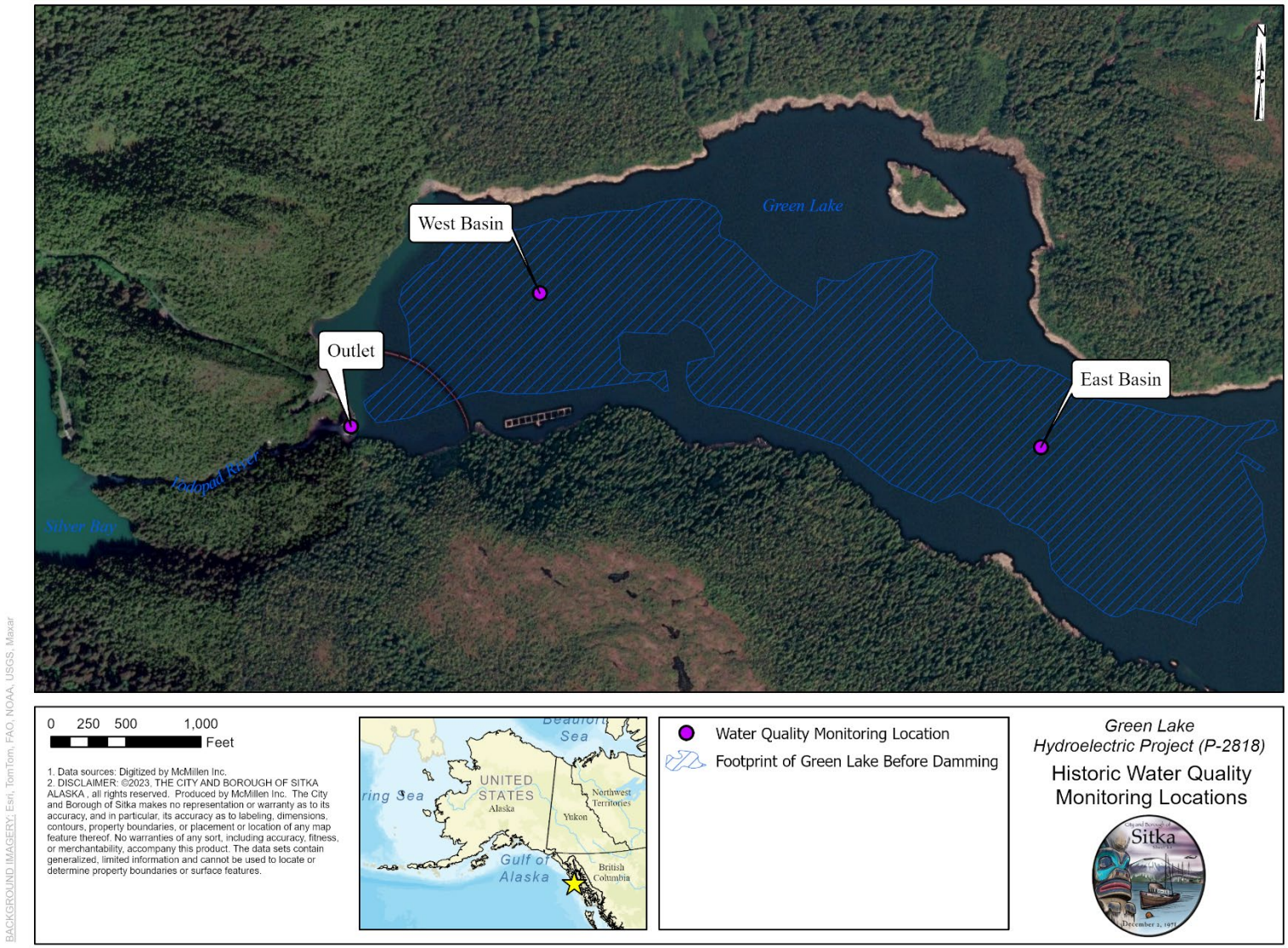
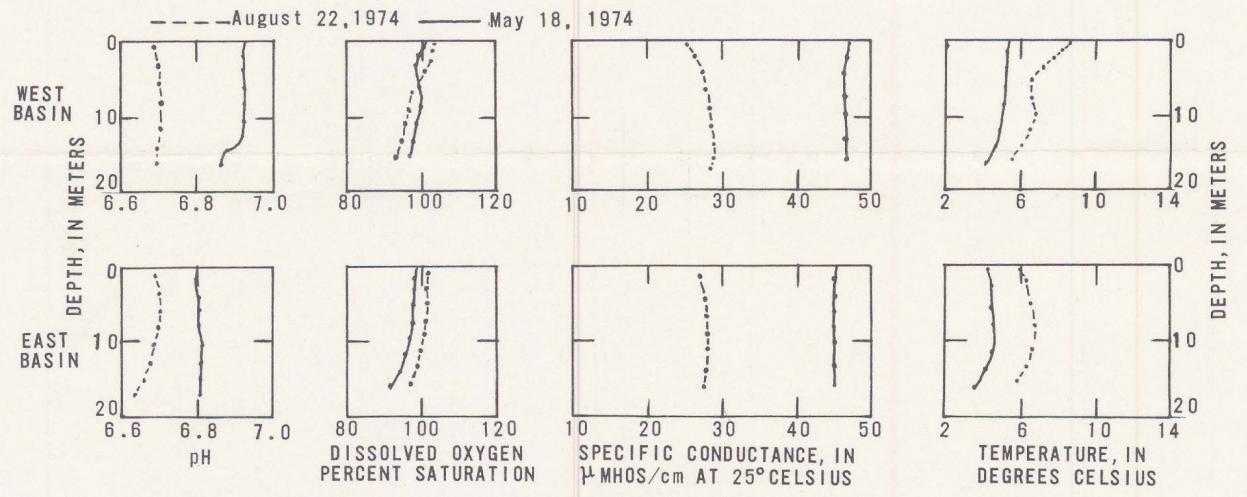


Figure 4-23. Historic Water Quality Monitoring Locations

1974 Water Quality Data

Water quality data were collected in Green Lake by McCoy et al. as part of the USGS report titled *Limnological Investigation of Six Lakes in Southeast Alaska* (McCoy et al. 1976). Data were collected on May 18 and August 22, 1974. Spot water quality measurements of several dissolved gases, dissolved metals, and nutrients were collected at the outlet of the lake (the site of the present-day Green Lake Dam) and approximately 1 mile upstream of the outlet (referred to as the East Basin). Additionally, vertical profiles of pH, dissolved oxygen, specific conductance, and temperature as well as Secchi disk readings were collected at a site approximately 0.5 miles upstream of the outlet (referred to as the West Basin) and in the East Basin.

Stratification was found to be weak at both monitoring locations. Very low specific conductance, chlorophyll *a* concentrations, dissolved solids concentrations, nitrogen, and phosphorus as well as high transparency indicated that Green Lake had low biological productivity (McCoy et al. 1976). Dissolved oxygen in the lake ranged from 12.0 mg/L to 12.5 mg/L between sampling dates (FERC 1979). Additionally, the vertical profiles collected at the two monitoring locations are presented in Figure 4-24 (McCoy et al. 1976). The raw water quality data can also be accessed via the USGS Water Data website as the gage titled Green LK (Middle) NR Sitka AK – 565918135054500.

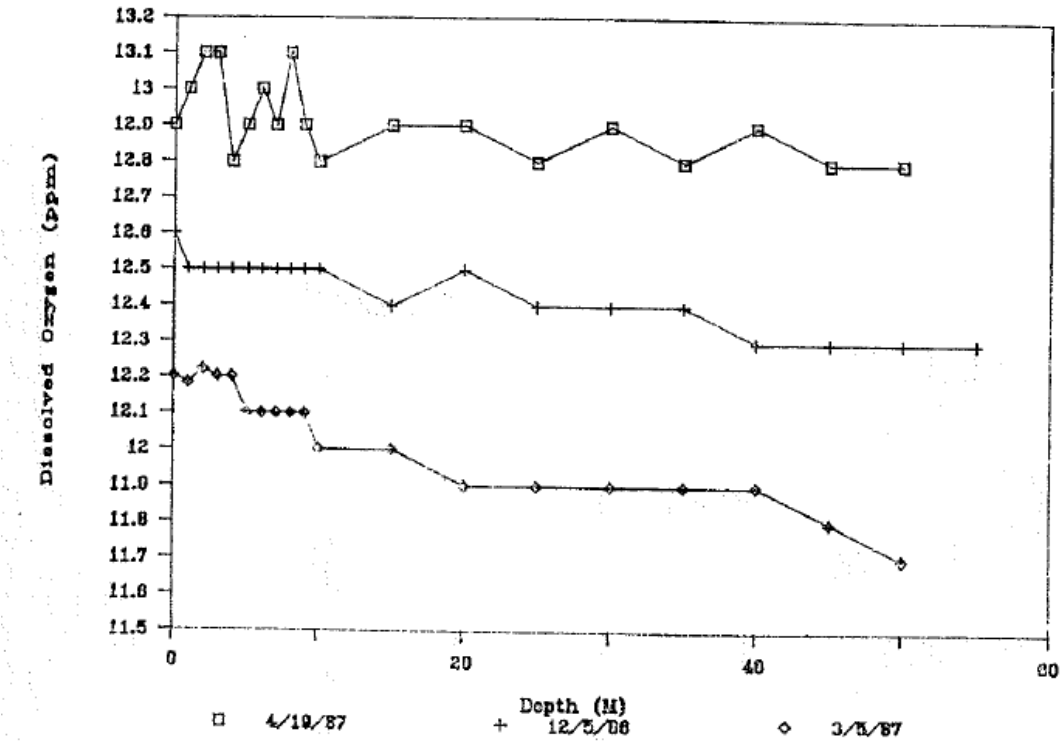


Source: McCoy et al. 1976

Figure 4-24. Green Lake Vertical Profiles

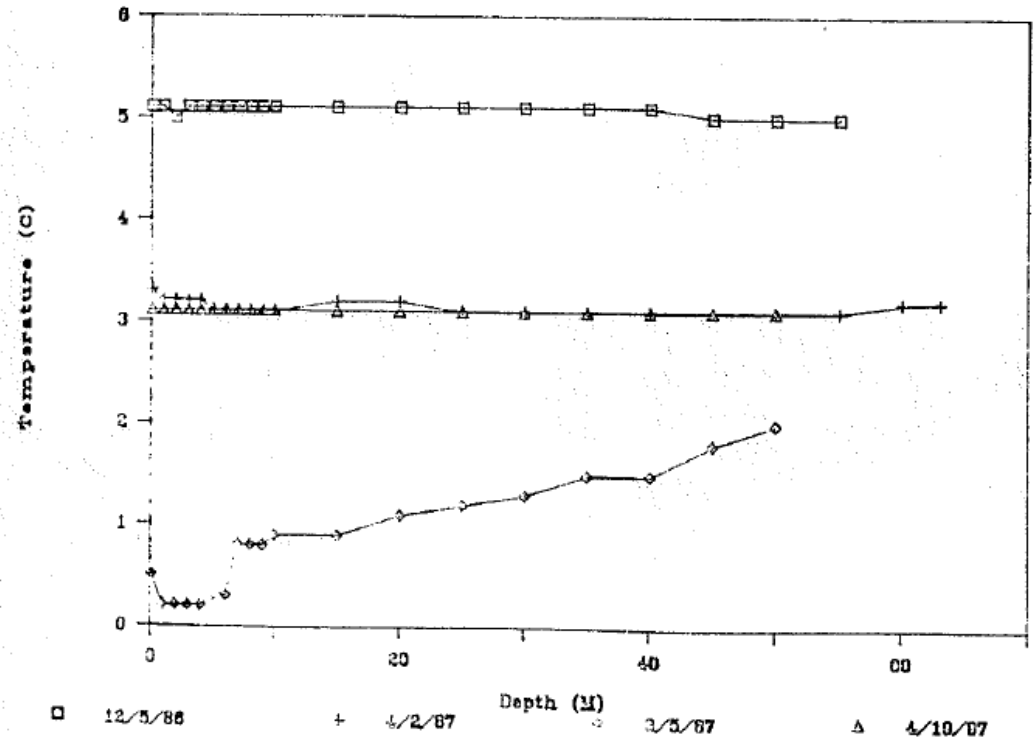
1987 Water Quality Data

Water quality data in Green Lake were collected as part of the *Post Impoundment Study of the Physical Chemical and Biological Characteristics of Green Lake and Spawning Ecology of the Resident Brook Trout (Salvelinus fontinalis) Population* (Arnold et al. 1987). These data were collected from November 1986 through April 1987. Water quality data were collected at the same site known as the West Basin site in the 1974 study (see Figure 4-23). Parameters included inorganic nutrients, metals, dissolved oxygen, Secchi disk measurements, and temperature profiles. Dissolved oxygen was found to be above 11.6 mg/L throughout the water column during three sampling events in December, March, and April. Major thermal stratification was not observed in any of the temperature profiles; though, some minor inverse stratification was evident in March 1987, and water temperatures were less than 6° Celsius in all of the profiles. Figure 4-25 shows the dissolved oxygen profiles that were collected, and Figure 4-26 shows the temperature profiles. Overall, the study concluded that Green Lake remained oligotrophic after the Green Lake Dam was constructed, and concentrations of chemicals and nutrients remained low (Arnold et al. 1987).



Source: Arnold et al. 1987

Figure 4-25. Dissolved Oxygen Profiles from 1987 Study



Source: Arnold et al. 1987

Figure 4-26. Temperature Profiles from 1987 Study

4.3.6.4 Known or Potential Effects

Historic data indicate that water quality in Green Lake was not greatly affected by the construction of the Green Lake Dam or the operation of the Project. All water quality parameters sampled in 1974 (pre-Project) and 1987 (post-Project) met the State of Alaska's water quality standards. It is not anticipated that continued consistent operation of the Project would adversely affect water quality. However, Project-related effects on water resources will be discussed with stakeholders during the study planning phase of the relicensing process.

4.4 Geomorphology

LiDAR-derived elevation surface data for Sitka, developed by the Alaska Division of Geological and Geophysical Surveys, were utilized to summarize the geomorphology of the Vodopad River (Daanen et al. 2020).

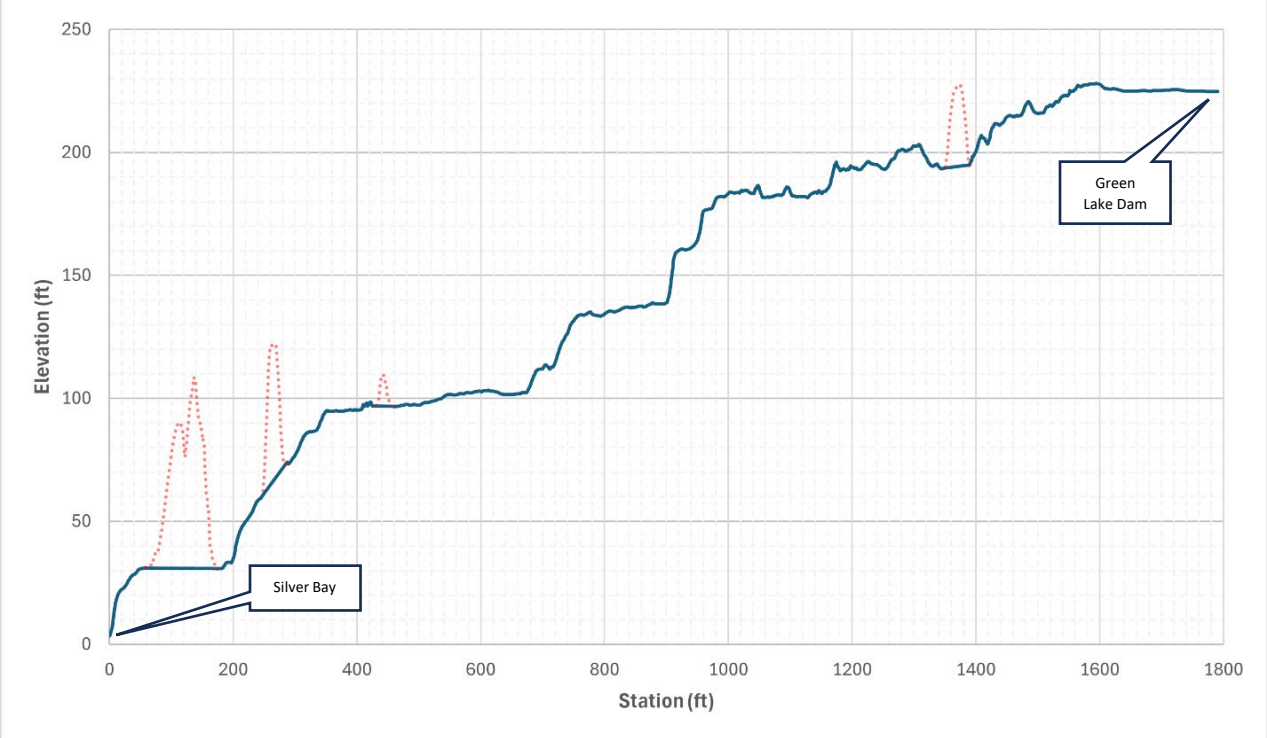
4.4.1 General Geomorphic Setting

The Green Lake valley is a glacially carved, U-shaped valley with steep forested slopes situated southeast of Sitka, Alaska. The Vodopad River cut through the valley as recently as 10,000 years ago. Green Lake is fed by the Vodopad River. An alluvial fan can be seen at the inlet of the Vodopad River depositing glacial debris from ablation of the most recent glacial period. The Vodopad River continues downstream of the Green Lake Dam where it spills into Silver Bay.

4.4.2 Channel Reach Geomorphology

The reach of the Vodopad River bypassed by the Project extends approximately 1,800 feet from the base of the Green Lake Dam to Silver Bay. Dam seepage and spillage events are the sole source of flows for the Vodopad River downstream of the Green Lake Dam. This portion of the river consists of a steep gorge characterized by numerous cascading waterfalls reaching tidewater. It is a relatively straight, deeply incised bedrock channel, confined by steep bedrock walls, and consists of a step pool channel form. The river drops approximately 221 feet from the base of Green Lake Dam to Silver Bay and has a high gradient of approximately 14%. Figure 4-27 shows the Vodopad River profile from Green Lake Dam to Silver Bay. Peaks in the profile, denoted by a red dashed line, are assumed to be errors in the data (Daanen et al. 2020). As seen in the profile, the lower Vodopad River has large cascading segments up to 60 feet in height. A number of these cascades are followed by large pools up to 60 feet long and 40 feet wide. Channel bottom width varies from 10 to 60 feet with narrow segments along the cascades and wider segments in the low gradient pools. This reach of the river is discussed further in Section 4.5.1.

Figure 4-28 shows varying cross-sectional profiles every 100 feet throughout the reach, corresponding with cross-sections shown in Figure 4-29. The variations in channel geometry are typical of steep bedrock channels.



Note: red dashed lines are assumed to be errors in the data
Source: Daanen et al. 2020

Figure 4-27. Vodopad River Profile

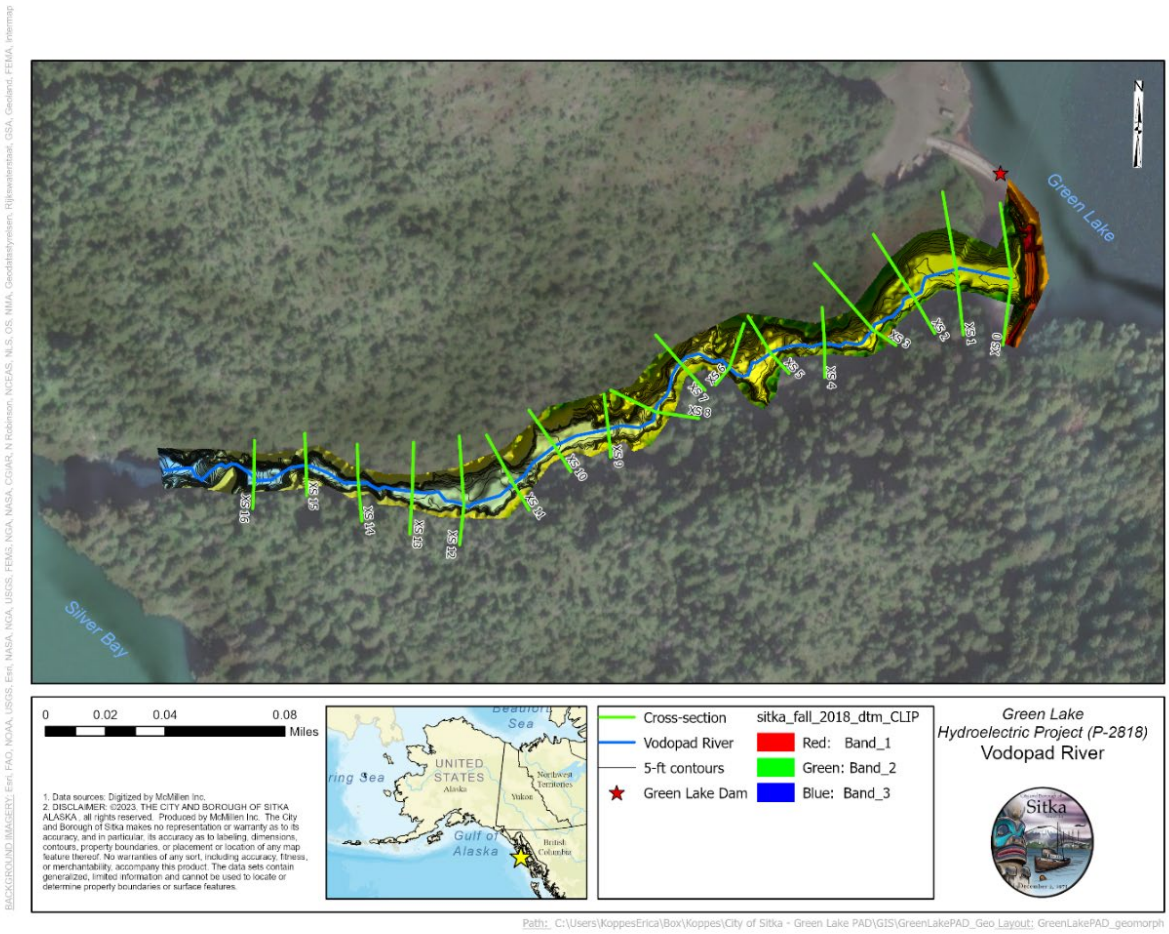


Figure 4-28. Vodopad River downstream of Green Lake Dam

Figure 4-29. Vodopad River cross-sectional profiles (thalweg at station 0)

4.4.3 Sediment Supply and Transport

Sediment supply is limited in the Vodopad River. Any large sediment transported from upstream of the dam is deposited in Green Lake; only very fine suspended sediment is transported down the lake, over the spillway, and into the lower Vodopad River downstream of the dam. Spillage over the dam into the Vodopad River during the maximum flood for Green Lake is 22,600 cfs (CBS 2023a). This flow has enough potential stream power to transport the largest material in the channel to the mouth at Silver Bay.

4.4.4 Channel Migration

Due to confinement of the channel and steep channel slope, significant lateral migration of the channel is not likely to occur outside of minor bank failures and channel widening. Vertical incision is limited by the strength of the bedrock channel, the transport capacity of flows through the corridor, and the size of material in the channel. Constraints on these factors are unclear, but the morphology of the corridor does not suggest rapid rates of vertical incision or knickpoint development.

4.5 Fish and Aquatic Resources

4.5.1 Existing Fish and Aquatic Communities

Five salmonid species inhabit waters in the vicinity of the Project, including Silver Bay (saltwater), tributaries to Silver Bay, the Vodopad River, Green Lake, and the tributaries to Green Lake. Three salmon species and Dolly Varden are anadromous and only inhabit tributaries to Silver Bay during certain life stages. Brook Trout is an introduced freshwater resident species in Green Lake and the upper Vodopad River (Table 4-11).

Table 4-11. Representation of the Fish and Aquatic Community

Common Name	Scientific Name	Native or Introduced Species	Conservation Status	Presence within Project Area
Brook Trout	*Salvelinus fontinalis*	Introduced	None	Reservoir/tributaries (resident)
Dolly Varden	*Salvelinus malma*	Native	None	Silver Bay tributaries (anadromous)
Chum Salmon	*Oncorhynchus keta*	Native	None	Silver Bay tributaries (anadromous)
Coho Salmon	*Oncorhynchus kisutch*	Native	None	Silver Bay tributaries (anadromous)
Pink Salmon	*Oncorhynchus gorbuscha*	Native	None	Silver Bay tributaries (anadromous)

4.5.1.1 Aquatic Habitats

Reservoir and Reservoir Tributary Habitat

There is limited information about habitat characteristics in Green Lake and its tributaries after the construction of the Project. Fisheries data were collected as part of the *Post Impoundment Study of the Physical Chemical and Biological Characteristics of Green Lake and Spawning Ecology of the Resident Brook Trout (Salvelinus fontinalis) Population* (Arnold et al. 1987). The study examined the spawning ecology of Brook Trout by mapping tributary streams, observing spawning, and sampling substrate in three tributaries, all located near the inlet of Green Lake including the Vodopad River. Additionally, all additional tributaries to the lake were surveyed for spawning Brook Trout. Brook Trout spawning was observed in several pools located in the three primary tributaries. Brook Trout were also observed in many of the additional tributary streams around the lake with sufficient water flow and access to pools. The study theorized that more spawning Brook Trout were observed in one tributary or another based on the amount of groundwater upwellings in that stream, as Brook Trout typically prefer to spawn in these upwellings.

In addition to spawning surveys, 47 Brook Trout were collected along the shoreline of Green Lake and in some tributary streams using dip nets, rod and reel, and fish traps. The age of the fish was estimated, their length was measured, and they were weighed (Table 4-12).

Table 4-12. Age, Length, and Weight of Brook Trout in Green Lake

Age Group	Number in Sample	Mean length (mm)	Mean Weight (g)
1+	6	68	3
2+	5	71	3
3+	22	247	168
4+	9	295	260
5+	3	320	329

Source: Arnold et al. 1987

Post-dam growth rates ranged from 3 mm per year for 1+ to 2+ fish to 176 mm per year for 2+ to 3+ fish. The pre-dam growth rate for 1+ to 2+ fish was 48 mm (Table 4-13).

Table 4-13. Growth Rates Between Year Classes of Brook Trout Collected in Green Lake

Age Group	Post-Dam Growth Rate (mm/year)	Pre-Dam Growth Rate (mm/year)
0+ to 1+	60	116
1+ to 2+	3	48
2+ to 3+	176	63
3+ to 4+	48	35
4+ to 5+	25	29

The study concluded that Brook Trout stream spawning habitat was reduced due to the filling of Green Lake and subsequent flooding of the lower portion of these tributaries; however, it also stated that it was not totally lost. Brook Trout in Green Lake showed the ability to adapt to new conditions since the filling of the reservoir by utilizing the spawning habitat in the upper portions of the Vodopad River watershed. Growth rates were better than other studies conducted of Brook Trout in Alaska and other states. Growth rates improved after the dam was constructed for ages 2+ to 4+ but decreased for juveniles between ages 0+ and 2+ and adults between 4+ and 5+. However, 5-year-old fish were found to be larger than before the dam was constructed despite the growth rate decrease. The age composition and growth rates suggest spawning success after Green Lake was impounded and indicated that the loss in spawning habitat has little effect on spawning success (Arnold et al. 1987).

River and Tributary Habitats Downstream of Green Lake Dam

The lower portion of the Vodopad River below the Project extends approximately 1,800 feet from the base of the Green Lake Dam to Silver Bay. Dam seepage and spillage events are the sole source of flows for the Vodopad River downstream of the Green Lake Dam. This portion of the river consists of a steep gorge characterized by numerous cascading waterfalls reaching tidewater. It is a relatively straight, deeply incised bedrock channel, confined by steep bedrock walls, and consists of a step pool channel form. The river drops approximately 221 feet from the base of Green Lake Dam to Silver Bay and has a high gradient of approximately 14%.

The river is blocked to anadromous fish by an impassable fall located at the mouth of the river to Silver Bay (Figure 4-30). No fish have been observed or collected in the Vodopad River between Green Lake Dam and Silver Bay (FERC 1979). There is limited information on the overall habitat in this area, although *An Investigation of the Biotic Communities in the Vicinity of Green Lake, Baranof Island, Alaska* (Hoopes 1977) concluded that the entire gorge is insignificant as wildlife habitat (Hoopes 1977).

Credit: Photo courtesy of K. Christianson (July 2022)

Figure 4-30. Vodopad River looking upstream from Silver Bay

River and Tributary Habitats Along Access Road

While anadromous fish cannot access the Vodopad River, they do utilize several of the nearby tributaries to Silver Bay, some of which are crossed by the Project access road. Five streams mapped and classified in the Anadromous Water Catalog (AWC) by ADFG are located near or crossed by the Green Lake access road (ADFG 2023a). Of those five streams, two are crossed by the access road, and the remaining three are short segments between the access road and Silver Bay, for which the AWC mapped portion of the stream does not cross the access road (Table 4-14; Figure 4-31).

Table 4-14. Anadromous Water Catalog Designated Streams in the Vicinity of the Project Access Road.

AWC Stream #	Name	Length (ft)	Confluence	Species Observations	Life Stage	Crossed by access road?
113-41-10305	Unnamed	400	Silver Bay	Coho Salmon	Rearing	No
113-41-10284	Unnamed	370	Bear Cove	Chum, Coho, Pink Salmon; Dolly Varden	Present, Rearing	No
113-41-10280	South Fork Medvejie Creek	400	Bear Cove	Chum, Coho, Pink Salmon; Dolly Varden	Present, Rearing	Yes
113-41-10270	Unnamed	650	Silver Bay	Chum, Coho, Pink	Present	Yes
113-41-10260	Unnamed	250	Silver Bay	Chum, Coho, Pink	Rearing	No

Source: ADFG 2023a

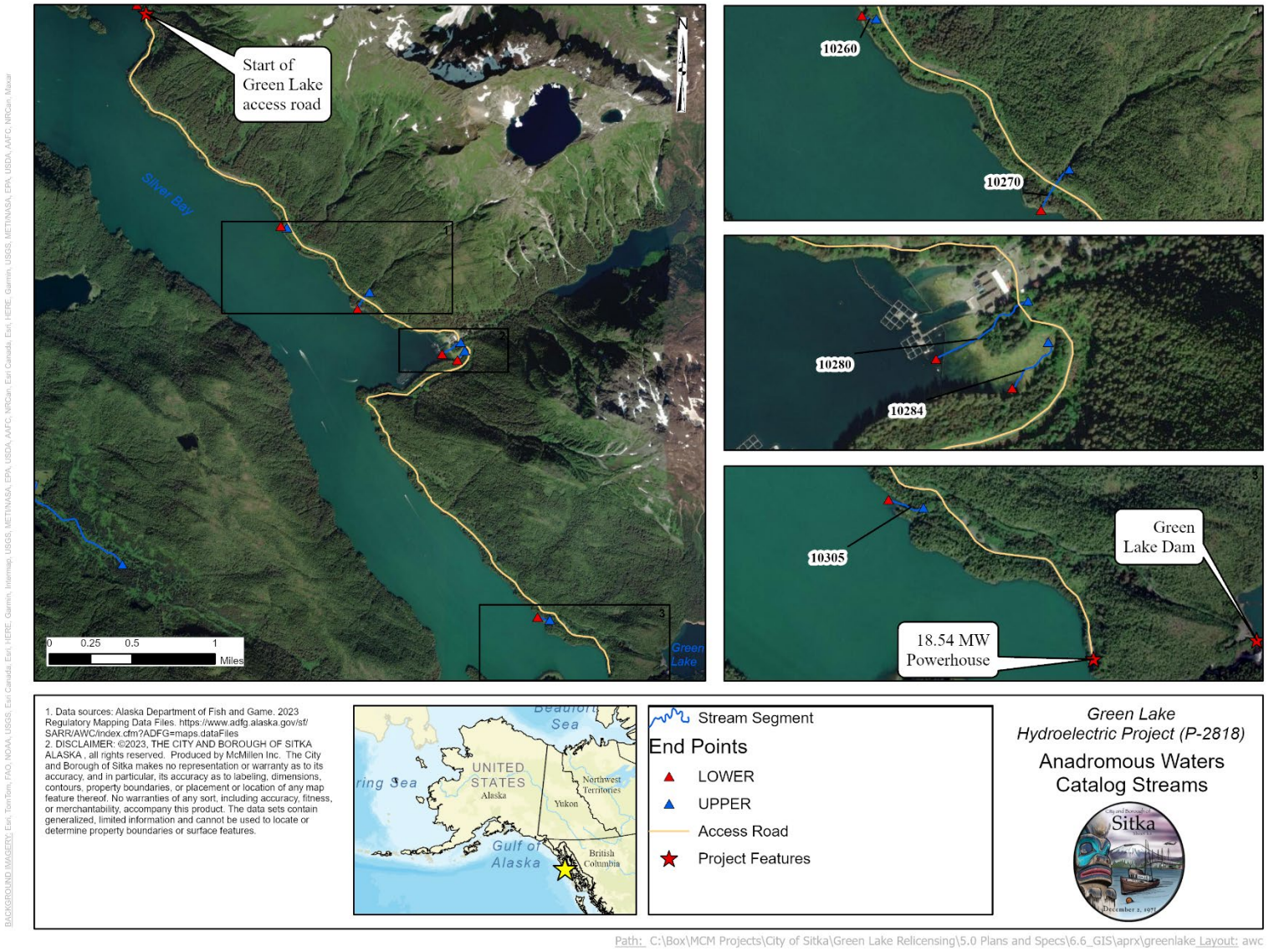


Figure 4-31. Anadromous Waters Catalog Streams

Medvejie Creek and Fish Hatchery

The south fork of Medvejie Creek (AWC Stream Number 113-41-10280) is crossed by the Project access road via a bridge and flows into Bear Cove. The most recent revision to the AWC nomination form was filed in 2021, which updated the path of the creek and provided more details on its characteristics. The creek was surveyed with a backpack electrofisher and GPS. Juvenile Coho Salmon and Dolly Varden were observed in the creek, and the results of the GPS survey are shown in Figure 4-32.

Source: ADFG 2021a

Figure 4-32. Medvejie Creek Nomination Form Survey Results

Medvejie Creek has a permanent weir and surface water intake for use by the adjacent Medvejie Hatchery upstream of the road (ADFG 2021a). Medvejie Hatchery is operated by the Northern Southeast Regional Aquaculture Association (NSRAA). The hatchery produces Chum, Chinook and Coho salmon. A temporary hatchery was built on the site in 1981, and construction of a permanent facility occurred in 1984. Expansion that included additional production capacity of Chinook Salmon occurred in 1987 (NSRAA 2023).

Medvejie has a history of being Alaska's most valuable hatchery Chinook Salmon contributor, both for sport and commercial, especially during recent years of restricted access to inside rearing Chinook stocks of concern in southeast Alaska. During the now heavily restricted spring fisheries, the largest aggregate of open area is in the offshore districts that intercept many Medvejie Chinook. As a result, Medvejie has now become the de facto spring troll target fishery and is of great importance to the fleet (NSRAA 2023).

Medvejie undertook a major expansion of its yearling Chinook program in 1997. This expansion, which involves rearing fry in net pens in Green Lake, more than doubled the hatchery's Chinook production at that time. Pens are constructed each year in Green Lake and fry are transported via truck for summer rearing. While the program has its challenges, it has enabled for a far greater Chinook rearing capacity than the hatchery would otherwise allow due to spatial constraints (NSRAA 2023).

Unnamed Tributary (AWC 113-41-10270)

Another stream that is crossed by the Project access road is unnamed (AWC Stream Number 113-41-10270). This stream is scheduled to be surveyed by ADFG (G. Albrecht, 2023, pers. comm.) to determine if the steep elevation gradient prevents anadromous passage below the road crossing. If this is the case, the AWC will be updated. This is the only stream identified as having a potential barrier to anadromous fish caused by the Green Lake access road. The most recent AWC nomination form was filed in 1983 and does not contain any pertinent information about the availability of aquatic habitat in the stream.

4.5.1.2 Anadromous Fishes

The following anadromous fishes may use the anadromous stream segments that are crossed by the access road.

Chum Salmon, Oncorhynchus keta

Chum Salmon are produced regionally at hatcheries for commercial harvest and consumption of roe. Chum Salmon adults normally ascend streams connected to Silver Bay to spawn from July through early October. They reside in freshwater up to 2 weeks prior to spawning. Spawning adults choose medium sized gravel substrate for spawning. Eggs incubate in the gravel until emerging in late March through early June of the following year. Chum Salmon fry immediately migrate to intertidal areas to rear after emergence. Adults return to spawn 3 to 5 years later. Freshwater rearing habitat is less critical for this salmon species than other salmon species because of the shorter duration needed for the early juvenile life stages (CBS 2010).

Coho Salmon, Oncorhynchus kisutch

Coho Salmon are also an important species produced at regional hatcheries for commercial harvest. Coho Salmon typically begin their spawning migration in late August or early September. Spawning occurs

from early October through mid-November. Coho Salmon prefer small to medium size gravel as spawning habitat. Fry emerge in late April or early May the following year. Juveniles rear in freshwater for 2 years before migrating to saltwater. After 2 to 3 years of ocean rearing, mature adults return to freshwater to spawn (CBS 2010).

Pink Salmon, Oncorhynchus gorbuscha

Pink Salmon are present in the tributaries to Silver Bay. Pink Salmon begin their spawning migration in July and spawn in September. This species prefers small to medium size gravels as spawning habitat. Spawn sites with upwelling aerated freshwater are preferred. Eggs incubate until late March and April of the following year. Juvenile fry immediately move to intertidal habitat after emergence. Developing juveniles slowly move into the open ocean where they grow and mature for 1 year before returning to freshwater to spawn as adults (CBS 2010).

Dolly Varden Trout, Salvelinus malma

Anadromous Dolly Varden Trout enter streams beginning in mid to late July. Dolly Varden Trout follow spawning salmon upstream and feed on deposited eggs. Freshwater presence declines after the Pink and Chum salmon spawning runs end. Dolly Varden spawning adults prefer small to medium sized gravel. Egg incubation lasts up to 6 months. Fry emerge from the gravel in April and May the following year. Juvenile associate with cover such as cobble and boulders to avoid predation while rearing (CBS 2010).

4.5.1.3 Resident Fishes

Brook Trout, Salvelinus fontinalis

Brook Trout is the only species of fish occurring in Green Lake and in the Vodopad River upstream of the reservoir (Hoopes 1977); although, accidental releases of Chinook fry into Green Lake have occurred from the Medvejie Hatchery yearling grow-out program (Brookover et al. 2000). The hatchery began a yearling grow-out program that rears Chinook fry in net pens in Green Lake in 1997 (NSRAA 2023).

Brook Trout were introduced to Green Lake in 1932. The earliest population sampling by ADFG in 1968 collected 37 individuals; the largest individual was 14.6 inches. In 1974, nine individuals were collected (FERC 1979, Hoopes 1977). Prior to impounding Green Lake, the Brook Trout population was estimated to be approximately 1,440 (95% CI = 997-2,082; Hughes 1994). A post-impoundment study concluding in 1987 found that Brook Trout continued to reproduce in the deeper reservoir (Arnold et al. 1987). Arnold et al. also determined growth rates for age-2 and -4 increased, while growth rates for juveniles (ages 0-2) and adults (ages 4-5) decreased since impoundment. Brook Trout do reach considerable size in Green Lake, which is the location of the state record catch in 2012 that weighed 3 pounds and measured 20 inches (ADFG 2023b).

A comprehensive Green Lake Brook Trout population assessment was performed in 1999. The mark-recapture calculated population estimate was approximately 3,300 (SE-900) Brook Trout with a length ≥6.7 inches. In addition, the 1999 study determined that approximately 95% of the Brook Trout occupy depths less than 100 feet (Brookover et al. 2000).

Suitable spawning areas exist in the Vodopad River upstream of Green Lake. A waterfall approximately 2 miles upstream of Green Lake is a natural impediment to further access. Spawning habitat also exists

along the shallow areas with gravel substrate along the shoreline. Brook Trout spawn from late September to November (FERC 1979) when water temperature is between 3° to 9°C (Arnold et al. 1987). Eggs hatch 50 to 100 days after spawning depending on water temperature (Scott and Crossman 1973).

Brook Trout are not native to southeast Alaska. The earliest recorded stocking of Brook Trout in Green Lake occurred in 1932; although, this location may have been stocked prior as many lakes in southeast Alaska were stocked beginning in 1917 (Brookover et al. 2000, FERC 1979). Stocking continued after 1932 but ceased prior to 1978 (FERC 1979, Schmidt 1981). The Brook Trout population in Green Lake supports a small sport fishery. ADFG (2023c) freshwater regulations for Brook Trout allow a catch of 10 per day without a size limit. In addition, fishing for Brook Trout is allowed all year, and the use of bait is unrestricted at Green Lake (ADFG 2023d). Brook Trout are the only non-native fish species residing in Green Lake and are managed for their sportfishing value (ADFG 2002).

4.5.1.4 Macroinvertebrates

Plankton tows in Green Lake during a single May to September period in 1974 yielded three zooplankton taxa: rotifers, cladocerans, and copepods. Rotifers were the most abundant and diverse group. Zooplankton densities ranged from 2,500 to 154,000 organisms per square meter. One blue-green algae and two diatoms comprised the phytoplankton collected, with the highest density being 17,000 individuals per square meter (FERC 1979). Zooplankton diversity in Green Lake was also evaluated as part of the post-impoundment study conducted by Arnold et. al. in 1987. Two plankton tows were taken during the study, on November 11, 1986, and April 24, 1987. The November sample was found to contain more zooplankton numbers than the April sample, with the rotifer *Keratella* being the most frequent than any other zooplankton genera combined. Other genera found in the sample included *Bosmina*, *Diaptomus*, and *Chironomus* (Arnold et. al. 1987).

Information about the composition of the benthic macroinvertebrate community in Green Lake post construction of the dam is not readily available. Stomach content analysis from Brook Trout collected during May to September of 1974 at the inlet of Green Lake yielded fourteen different benthic invertebrates. Fish collected in the lake yielded 10 different benthic macroinvertebrates. The stomach contents included stoneflies (*Plecoptera*), caddisflies (*Trichoptera*), beetles (*Coleoptera*), and *Diptera* flies. Chironomid larvae of genus *Pseudodiamesa* were the dominant insects in the Brook Trout stomachs. No mayflies or stoneflies were identified from the stomachs of fish collected from the lake, and no beetles were identified from the stomach samples of fish collected from the inlet (FERC 1979).

4.5.2 Rare, Threatened, or Endangered Species

No listed rare, threatened, or endangered fish species occur in Project area waters. No critical habitat is designated within the Project (USFWS 2023a).

4.6 Botanical Resources

4.6.1 Vegetation Cover Types

Land cover types in the Project area are discussed in Section 4.1.2. Of those, the vegetated cover types within the FERC Project Boundary include evergreen forest, mixed forest, shrub/scrub, deciduous forest,

and dwarf shrub (Table 4-2, Figure 4-3 through Figure 4-9). The same cover type occurs in the Vodopad River watershed (Table 4-1, Figure 4-2).

4.6.1.1 Upland Habitat Types

In the Vodopad River watershed, shrub/scrub and evergreen forest make up over half (51.3%) of the vegetated cover types (Table 4-1). Shrub/scrub is primarily found in higher elevation alpine habitat and evergreen forest is found on the steep slopes surrounding Green Lake and the steep slopes on the inland side of the access road and transmission line. Other vegetated cover types (dwarf shrub, mixed forest, deciduous forest, and woody wetlands) make up just over 10% of the watershed.

A 1977 investigation of the biotic communities in the vicinity of Green Lake reported that forests in vicinity of Green Lake and Silver Bay are composed primarily of old-growth western hemlock and Sitka spruce (Hoopes 1977). Other tree species reported in area forests include western red cedar, Alaska cedar, subalpine fir, Pacific silver fir, mountain hemlock, and western hemlock (FERC 1979). Understory vegetation in the western hemlock/Sitka spruce forests has been reported as generally composed of blueberry, red huckleberry, bunchberry, rusty menziesia, skunk cabbage, and devils club (Hoopes 1977). A few hardwoods, mostly red alder and occasionally cottonwood, were documented along the Vodopad River during the 1977 investigation, and lodgepole pine, growing mostly as a scrub tree, was found on poorer sites on and adjacent to muskegs (Hoopes 1977). Timberline was reported to be at an elevation of about 2,000 feet.

4.6.1.2 Wetlands Habitat

Wetlands create a transition between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin et al. 1979). Wetlands are classified according to their hydrologic, geomorphic, chemical, and biological characteristics.

Wetlands within the FERC Project Boundary were catalogued and quantified according to the National Wetlands Inventory (NWI; USFWS 2023b). NWI wetland types are based on a system developed by Cowardin et al. (1979). Six wetland types occur within the FERC Project Boundary totaling 1,087.5 acres (Table 4-15; Figure 4-33). The NWI classification considers Green Lake a wetland type (“Lake”), which is why the wetland acreage in the FERC Project Boundary is so high (67.9% of the 1,465-acre FERC Project Boundary). Not including Green Lake, wetlands total 92.4 acres (6.3% of the 1,465-acre FERC Project Boundary) with the most prevalent wetland type Freshwater Forested/Shrub Wetland (50.0 acres). This wetland type is found at the lower elevations of steep slopes along the shoreline of Green Lake and along the access road (Figure 4-33). Other wetland types together total 42.4 acres (2.9% of the FERC Project Boundary).

Table 4-15. Wetland Types and Acreage in the Green Lake FERC Project Boundary

NWI Wetland Type	Area (acres)	Total (%)
Lake	995.2[4]	91.5
Freshwater Forested/Shrub Wetland	50.0	4.6
Freshwater Emergent Wetland	18.9	1.7
Estuarine and Marine Deepwater	16.1	1.5
Riverine	5.7	0.5
Estuarine and Marine Wetland	1.6	0.2
Total	1,087.5	100

4.6.2 Rare, Threatened, or Endangered Species

Rare, threatened, or endangered species are those that are designated as such by the federal Endangered Species Act or by the State of Alaska Determining Endangered Species Statute 16.20.190. No rare, threatened or endangered plant species, or critical habitat for such species occur in the Project area according to an Information for Planning Consultation (IPaC) search (USFWS 2023a).

4.6.3 Vegetation Management

CBS regularly monitors and maintains vegetation along the transmission line and around other Project facilities.

[4] This acreage differs slightly from the FERC licensed Green Lake surface area of 1,000 acres. This is due to errors in the accuracy of the NWI wetlands layer. Data in this table are reported as they appear in the NWI wetlands layer when clipped to the FERC Project Boundary.

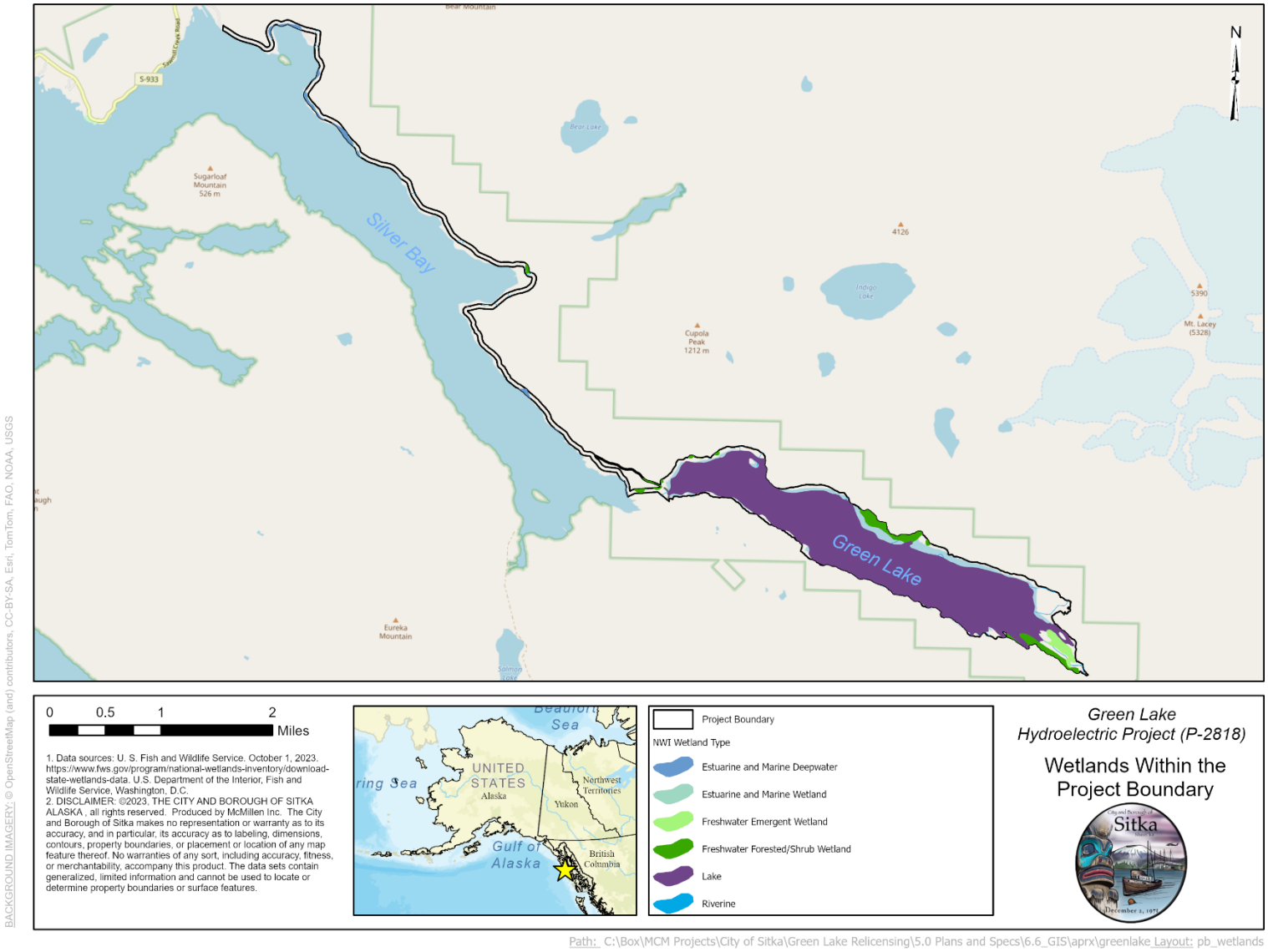


Figure 4-33. NWI Wetland Types within the Project Boundary

4.7 Wildlife Resources

Wildlife in the Project area represent important resources to the local population in terms of hunting, trapping, and wildlife viewing. Generally, the Project area supports typical wildlife species seen in southeast Alaska.

Wildlife studies specific to the Green Lake Project area were conducted for the original license in 1977. More recent wildlife studies were conducted in the nearby Blue Lake area in 2005, 2006, and 2010 for the Blue Lake Project relicensing and expansion (CBS 2010). Blue Lake is located about 6 miles north of Green Lake in a similar setting and at a similar elevation (approximately 425 feet). Based on these similarities and proximity, wildlife species documented at Blue Lake in the early 2000s are likely to also occur in the Green Lake area. Based on a review of these resources, wildlife species known or likely to occur in the Project area are described below.

4.7.1 Large Mammals, Small Mammals, and Furbearers

Large mammals and furbearers that were reported at Green Lake in the 1970s and more recently at Blue Lake in the early 2000s are shown in Table 4-16.

Table 4-16. Large Mammals, Small Mammals, and Furbearers Likely to Occur in the Project Area

Common Name	Scientific Name
Large Mammals	
Brown Bear	*Ursus arctos*
Sitka Black-tailed Deer	*Odocoileus hemionus sitkensis*
Mountain Goat	*Oreamnos americanus*
Small Mammals	
Forest Deer Mouse	*Peromyscus keeni*
Common Shrew	*Sorex cinereus*
Furbearers	
Marten	*Martes americana*
Mink	*Mustela vison*
River Otter	*Lontra canadensis*
Short-tailed Weasel	*Mustela erminea*
Red Squirrel	*Tamiasciurus hudsonicus*

Source: CBS 2010, Hoopes 1977

Brown bear have long been known to inhabit the Green Lake area. Bear tracks were observed in snow fields in high elevations during pre-Project big game surveys in 1977 (Hoopes 1977). Brown bear were observed in the Project area in 1978 (FERC 1979) and during a 2023 site visit. They were also reported as relatively abundant on the slopes above Blue Lake (CBS 2010). Alaska hunting regulations for 2023/2024, Unit 4 (Admiralty-Baranof-Chichagof Islands) allow for hunting of brown bear, except for

Bear Cove in Silver Bay. The Project's access road passes through this area (Bear Cove). Brown bear harvest numbers from 2014 to 2018 on Baranof and Kruzof Islands ranged between 21 and 39 per year (ADFG 2021b). May is the most popular month to harvest brown bear. Black bear do not occur on Baranof Island.

Sitka black-tailed deer have been reported in the Project area. Three deer were observed at the upper end of Green Lake during pre-Project big game surveys in 1977 (Hoopes 1977). Sixty deer were estimated to inhabit the drainage at that time. Silver Bay shoreline provides a good winter range for deer. The nearby Blue Lake watershed was thought to have healthy deer populations based on pellet counts and other survey methods in the early 2000s (CBS 2010). Alaska hunting regulations for 2023/2024, Unit 4 (Admiralty-Baranof-Chichagof Islands) allow for hunting of deer. Deer harvest numbers from 2011 to 2015 on Baranof Island ranged from 1,593 to 3,075 (includes estimated legal and illegal/unrecovered harvest; ADFG 2020). November and December are the most popular months to harvest deer. Significant changes in deer density over time are normal in Unit 4. Periodic declines are attributable to severe winter weather, most importantly deep snow (ADFG 2020). During winter, movement of deer between watersheds appears to be minimal, and the distribution of deer at various elevations is heavily influenced by changing snow depth.

Mountain goats were introduced to Baranof Island in 1923 and now occupy most of the suitable habitat, which includes the high alpine meadows during the summer and lower elevations near timberline in the winter (FERC 1979). A small population was reported at the head of the Vodopad River valley in 1977 (Hoopes 1977), and more recently were reported as "frequently observed" on the slopes above Blue Lake (CBS 2010). Population estimates of mountain goats on Baranof Island from 2011 to 2018 range from 530 to 750 animals (ADFG 2021c). Alaska hunting regulations for 2023/2024, Unit 4 (Admiralty-Baranof-Chichagof Islands) allow for hunting of goats. Harvest numbers from 2013 to 2017 ranged between 16 and 28 per year (average of 22; ADFG 2021c). The Sitka Tribe of Alaska has been allowed a spring harvest of three goats since March 2004 for subsistence and traditional use (CBS 2010).

Two small mammals were documented during wildlife surveys at the Blue Lake area: forest deer mouse and common shrew. Both species are known to be common in southeast Alaska and both are likely to occur in the Green Lake Project area.

Furbearers reported present in the Green Lake drainage in 1977 include short-tailed weasel, mink, marten, and river otter (Hoopes 1977). In the early 2000s, these same species, except short-tailed weasel, were identified during surveys at Blue Lake, along with red squirrel (CBS 2010). Red squirrel was included as a furbearer in the wildlife study report from Blue Lake; although, they are not normally used for fur. Two of these species were introduced to Baranof Island; marten was introduced in 1934 and red squirrel in 1922. Other than the river otter, most of these species inhabit forests and could be found in Project area forests; although, the absence of anadromous fish in Green Lake could limit mink. Among these species, red squirrels are most common followed by marten, while mink were reported as rare in the Blue Lake area in the early 2000s (CBS 2010). The river otter has been reported from Sawmill Creek (CBS 2010).

4.7.2 Birds

Common species of birds that were either observed or believed to occur in the Green Lake watershed and Silver Bay area during 1977 wildlife studies specifically conducted for the original license are presented in Table 4-17. Those bird species that were observed during wildlife studies at Blue Lake in the early

2000s are noted with an asterisk. About one-third (39 of 112) of the species observed or believed to occur in the Green Lake area in 1977 have been documented more recently nearby Blue Lake and are still likely to occur in the Green Lake area today. The 1977 list from Green Lake included many more seabirds and shorebirds than the early 2000s Blue Lake list because Green Lake is about 1/3 mile from Silver Bay and the access road and transmission line follow the shore of Silver Bay, whereas Blue Lake is about 1.5 miles inland from Silver Bay.

Table 4-17. Birds Likely to Occur in the Project Area

Common Name	Scientific Name
Raptors	
Bald eagle*	*Haliaeetus leucocephalus*
Northern saw-whet owl*	*Aegolius acadicus*
Boreal owl	*Aegolius funereus*
Sharp-shinned hawk	*Accipiter striatus*
Marsh hawk	*Circus cyaneus*
Goshawk	*Accipiter gentailis*
Seabirds	
Northern fulmar	*Fulmaris glacialis*
Sooty shearwater	*Puffinus grieseus*
Fork-tailed storm petrel	*Oceanodroma furcate*
Leach's storm petrel	*Oceanodroma leucorhoa*
Marbled murrelet*	*Brachyramphus marmoratus*
Ancient murrelet	*Synthliboramphus antiquus*
Common murre	*Uria aalge*
Pigeon guillemot	*Cepphus columba*
Horned puffin	*Fratercula corniculate*
Tufted puffin	*Lunda cirrhata*
Glaucous-winged gull*	*Larus glaucescens*
Herring gull*	*Larus argentatus*
Glaucous gull	*Larus hyperboreus*
Bonaparte's gull	*Larus philadelphia*
Mew gull	*Larus canus*
Cassin's auklet	*Ptychoramphus aleuticus*
Rhinoceros auklet	*Cerorhinca monocerata*
Parasitic jaeger	*Stercorarius parasiticus*
Black-legged kittiwake	*Rissa tridactyla*

Common Name	Scientific Name
Shorebirds	
Black oystercatcher	*Haematopus bachmani*
Belted kingfisher*	*Ceryle alcyon*
Common snipe*	*Gallinago gallinas*
Spotted sandpiper*	*Acitis macularia*
Least sandpiper	*Calidris minutilla*
Western sandpiper	*Calidris mauri*
Sanderling	*Calidris alba*
Dunlin	*Calidris alpina*
Wandering tattler	*Heteroscelus incanus*
Red phalarope	*Phalaropus fulicarius*
Northern phalarope	*Lobipes lobatus*
Semipalmated plover	*Charadrius semipalmatus*
Black turnstone	*Arenaria melanocephala*
Whimbrel	*Numenius phaeopus*
Greater yellowlegs	*Tringa melanoleuca*
Lesser yellowlegs	*Tringa flavipes*
Waterfowl	
Common loon	*Gavia immer*
Arctic loon	*Gavia arctica*
Red-throated loon	*Gavia stellata*
Western grebe	*Aechmophorus occidentalis*
Double-crested cormorant	*Phalacrocorax auritus*
Pelagic cormorant	*Phalacrocorax pelagicus*
Great blue heron	*Ardea herodias*
Trumpeter swan*	*Cygnus buccinator*
Ring-necked duck*	*Aythya collaris*
Canada goose*	*Branta canadensis*
Mallard*	*Anas platyrhynchos*
Pintail	*Anas acuta*
Green-winged teal	*Anas crecca*
Blue-winged teal	*Anas discors*
American wigeon	*Anas americana*
Northern shoveler	*Anas clypeata*

Common Name	Scientific Name
Greater scaup	*Aythya marila*
Lesser scaup	*Aythya affinis*
Harlequin duck*	*Histrionicus histrionicus*
Common goldeneye	*Bucephala clangula*
Barrow's goldeneye*	*Bucephala islandica*
Bufflehead*	*Bucephala albeola*
Long-tailed duck	*Clangula hyemalis*
White-winged scoter	*Melanitta deglandi*
Surf scoter	*Melanitta perspicillata*
Red-breasted merganser	*Mergus serrator*
Common merganser*	*Mergus merganser*
Songbirds and Woodpeckers	
Wilson's warbler*	*Wilsonia pusilla*
Yellow-rumped warbler*	*Denroica coronata*
Yellow warbler	*Dendroica petechia*
Townsend's warbler	*Dendroica townsendi*
Black-capped chickadee*	*Poecile atricapilla*
Chestnut-backed chickadee	*Parus refescens*
Common raven*	*Corvus corax*
Steller's jay*	*Cyanocitta stelleri*
Northwestern crow*	*Corvus caurinus*
Western flycatcher	*Empidonax difficilis*
Violet-green swallow	*Tachycineta thalassina*
Tree swallow	*Iridoprocne bicolor*
Bank swallow	*Riparia riparia*
Barn swallow	*Hirundo rustica*
Pine grosbeak	*Pinicola enucleator*
Gray-crowned rosy finch	*Leucosticte tephrocotis*
Pine siskins*	*Carduelis pinus*
Red crossbill	*Loxia curvirostra*
Common redpoll*	*Carduelis flammea*
Dark-eyed junco*	*Junco hyemalis*
Orange junco	*Vermivora celata*
Fox sparrow*	*Passerella iliaca*

Common Name	Scientific Name
Song sparrow*	*Melospiza melodia*
Lincoln's sparrow	*Melospiza lincolnii*
Savannah sparrow	*Passerculus sandwichensis*
White-crowned sparrow	*Zonotrichia leucophrys*
Swainson's thrush*	*Catharus ustulatus*
Hermit thrush*	*Catharus guttatus*
Varied thrush*	*Ixoreus naevius*
American robin*	*Turdus migratorius*
Winter wren*	*Troglodytes troglodytes*
Brown creeper*	*Certhia americana*
Cedar waxwing*	*Bombycilla cedrorum*
Golden-crowned kinglet*	*Regulus satrapa*
Ruby-crowned kinglet	*Regulus calendula*
Water pipit	*Anthus spinoletta*
Northern shrike	*Lanius excubitor*
Red-breasted sapsucker*	*Sphyrapicus ruber*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Hairy woodpecker	*Picoides villosus*
Downy woodpecker	*Picoides pubescens*
Northern flicker*	*Colaptes auratus*
Rufous hummingbird*	*Selasphorus rufus*
American dipper*	*Cinclus mexicanus*

*Bird species observed during wildlife studies at Blue Lake in the early 2000s
Source: CBS 2010, Hoopes 1977

4.7.2.1 Raptors

Bald eagles are notably common throughout the Sitka area. No bald eagle nests occur at Green Lake according to the USFWS Bald Eagle Nest Atlas, but seven are located along the Project access road (USFWS 2023c). Bald eagles were the most abundant raptor recorded during surveys at Blue Lake in the early 2000s (CBS 2010). Other raptors that could occur in the Green Lake area, notably in the surrounding forests and/or muskeg, include boreal owl, northern saw-whet owl, goshawk, marsh hawk, and sharp-shinned hawk (Hoopes 1977).

4.7.2.2 Seabirds and Shorebirds

A variety of seabirds and shorebirds are found on Silver Bay. Year-round resident birds include murres, murrelets, guillemots, grebes, cormorants, and loons. Scoters, goldeneye, harlequin, mallard, long-tailed

duck, and bufflehead ducks are also present in Silver Bay on a seasonal basis (Hoopes 1977). The steep shoreline and lack of feeding areas likely limit use.

4.7.2.3 Waterfowl

Southeast Alaska annually supports millions of waterfowl enroute to and from breeding grounds in northern Alaska and Canada. Breeding habitat in the Project area is limited by the steep mountainous terrain, although several species probably use Green Lake to some extent during the ice-free period. In the late 1970s, Canada geese, goldeneye, and mergansers were observed at Green Lake (Hoopes 1977). Other waterfowl that might be present include loons, mallards, green-winged teal, scoters, and bufflehead duck.

4.7.2.4 Songbirds and Woodpeckers

Forty-three species of songbirds were listed as either observed or believed to occur in the Green Lake watershed and Silver Bay area during the 1977 wildlife studies. Of these, 22 were documented at Blue Lake during the early 2000s. At Blue Lake, warblers and chickadees were the most common species observed, followed by ravens and swallows (CBS 2010). These species are also likely to be found at Green Lake.

4.7.3 Marine Mammals

Silver Bay provides suitable habitat for several marine mammal species. Mammal species known or believed to occur in Silver Bay during the 1970s are presented in Table 4-18 (FERC 1979, Hoopes 1977). Marine mammals reported in the waters off Sitka National Historical Park, located on Sitka Sound on the east side of and adjacent to the City of Sitka, are noted with an asterisk (NPS 2023).

Table 4-18. Marine Mammals Known or Believed to Occur in Silver Bay

Common Name	Scientific Name
Stellar (northern) sea lion*	*Eumetopias jubata*
Harbor seal*	*Phoca vitulina*
Northern elephant seal*	*Mirounga angustirostris*
Sea otter*	*Enhydra lutris*
Minke whale	*Balaenoptera acutorostrata*
Sperm whale	*Physeter catodon*
Humpback whale*	*Megaptera nodosa*
Sei whale	*Baleanoptera borealis*
Orca*	*Grampus rectipinna*

Common Name	Scientific Name
Gray whale*	*Eschrichtius gibbosus*
Harbor porpoise*	*Phocoena Phocoena*
Dall porpoise*	*Phocoenoides dalli*
Pacific white-sided dolphin*	*Lagenorhynchus obliquidens*

* Marine mammals reported in the waters off Sitka National Historical Park
Source: Hoopes 1977

Stellar sea lions are abundant along the southeastern coast of Alaska and may be found on occasion in Silver Bay. Sea lions prefer habitat that has extensive shallow water and rocky bottoms with productive sea life (FERC 1979).

Harbor seals were reported as relatively abundant in the 1970s (FERC 1979) and still occur in the area (NPS 2023). Harbor seals are primarily fish eaters and often compete with fishermen. Predation by whales and sharks provides some population control of seals (FERC 1979).

The sea otter is characteristic of the region and is found abundantly in Sitka Sound (NPS 2023). They may occur in Silver Bay. In the 19th century, commercial fur hunters exterminated the sea otter from the coastal waters in the area. Sea otters were reintroduced in the 1960s to the Baranof Island area (FERC 1979).

The whale species listed in Table 4-18 occur in the waters off southeastern Alaska and could occur in Silver Bay. The Pacific white-sided dolphin, harbor porpoise, and Dall porpoise are abundant in inshore waters during the winter and may occur in Silver Bay (FERC 1979). They feed on several species of fish, including herring, cod, flounder, and sardines.

4.7.4 Rare, Threatened, or Endangered Species

Rare, threatened, or endangered species are those that are designated as such by the federal Endangered Species Act (ESA) or by the State of Alaska ‘Determining Endangered Species’ Statute 16.20.190. One avian endangered species designated by the ESA and the State of Alaska could occur near the Project area based on an IPaC search, short-tailed albatross (USFWS 2023a). No critical habitat is designated within the Project area (USFWS 2023a). Short-tailed albatross are wide-ranging across coastal Alaska, primarily in the Aleutian Islands and Bering Sea regions (USFWS 2024). Sub-adults appear to be distributed along the west coast of the United States in oceanic waters and thus have potential to occur in Sitka Sound and Silver Bay near the Project area (USFWS 2024).

4.8 Recreation

The Project and surrounding area offer a wide selection of recreational opportunities. The vast natural areas and inherent beauty of Baranof Island attract locals and travelers from around the world to engage in outdoor activities that include hiking, biking, hunting, fishing, subsistence harvesting, water activities, wildlife viewing, camping/cabins, winter sports, and motorized recreation. Tourism in the Sikta area has seen exponential growth in recent years. For example, the number of cruise ship visitors increased from 200,000 prior to the pandemic to 380,000 in 2022 (Alaska Trails n.d.). CBS estimates up to 560,000

cruise ship arrivals in 2023 and beyond (Alaska Trails n.d.). The influx of cruise ship passengers and independent visitors has led to concerns about overcrowding, damage to trails, and conflicts between user groups, but tourism also provides economic opportunity (Sitka Trail Works 2023). Federal and state agencies, other local entities, and CBS are working together to address recreational opportunities and conflicts on Baranof Island. Specific issues include increased trail demand, trails crossing multiple land jurisdictions, funding, maintenance, and demand for new opportunities such as e-bike use and cabins (Alaska Trails n.d.). CBS has investigated constructing cabins on city-owned land for recreational use. If any habitable structures are built, such as cabins or campgrounds, they would be located above the maximum flood elevation of 25 feet to avoid a change in the hazard rating of Green Lake Dam (it is currently a low hazard dam).

4.8.1 Recreational Facilities and Uses

4.8.1.1 Project Area

Within the FERC Project Boundary, recreational facilities include the following:

- Green Lake: Recreational activities include Brook Trout fishing, boating, hunting, and wildlife viewing. Brook Trout reach considerable size in Green Lake; the state record is from Green Lake in 2012, which weighed 3 pounds and measured 20 inches. Fishing for Brook Trout is allowed year-round in Green Lake. Recreators reach Green Lake via the Green Lake access road or Silver Bay by boat, a landing is located near the powerplant.
- Green Lake Access Road: Recreational activities include hiking, running, biking, and skiing. The 7-mile stretch of Green Lake Road from near Herring Cove to Green Lake is closed to public vehicle traffic, but CBS allows non-motorized public access. The road is gated with an access opening for pedestrians. The access road provides 7 miles (one way) of road access for hiking/biking and is rated as easy to moderate; there are a few small hills along the road and a large hill as the road climbs to Green Lake. Recreators might encounter light traffic due to both the Project and the Medvejie Hatchery staff vehicles.

4.8.1.2 Surrounding Area

In the greater area surrounding the FERC Project Boundary, additional recreational opportunities are widely available. An impressive trail network is available in the Sitka area; 54 trails totaling 76 miles are located on federal, state, and municipal lands. Trail miles by agency is shown in Table 4-19. Sitka Trail Works recently released their draft Sitka Trail Plan, which identifies 13 new potential trails and 11 trail reconstructions (Sitka Trail Works 2023). The plan also includes recommendations for policy, programming, and infrastructure to enhance outdoor recreation in Sitka.

Table 4-19. Trail Miles by Agency in Sitka Area

Agency	Miles of Trail
U.S. Forest Service	50
National Park Service	2.5
Alaska State Parks	6.5
City and Borough of Sitka	16.5
Total	75.5

Source: Sitka Trails 2023

In terms of hunting and fishing opportunities, the Project and surrounding area are within ADFG Game Management Unit 4, which includes Admiralty, Baranof, and Chichagof Islands (ADFG 2023e). The 2023-2024 Alaska Hunting Regulations allow for hunting of brown bear, deer, mountain goat, wolf, and wolverine in Unit 4 (note that wolf and wolverine do not occur on Baranof Island), with the following exceptions relative to the Project:

- The Sitka Road system is closed to big game hunting within a 1/4-mile strip of all state highways.
- The entire Bear Cove shoreline is closed to taking brown bear; this includes the vicinity of the Medvejie Hatchery.

Depending on the time of year, many fishing and shell fishing opportunities exist in the saltwater near the Project area.

4.9 Aesthetic Resources

Aesthetic resources refer to the scenic quality and naturalness of the landscape. The area of interest for aesthetic resources is the FERC Project Boundary and the immediate surrounding area. Information sources for aesthetic resources include a site visit (September 2023) and the Green Lake Alaska Final Environmental Impact Statement (FERC 1979).

4.9.1 Visual Characteristics of Facilities

The Green Lake Project setting is rural in character, with a rugged quality that is not unlike the surrounding environs and most of southeast Alaska. Green Lake is the central feature in an expansive viewshed that includes the lake itself, which is surrounded by rugged mountains with steep, forested slopes. Development is limited to Project facilities including the dam, powerhouse, access road, and powerline (Figure 4-34). The access road and powerline follow the shore of Silver Bay at the base of steep mountainous terrain.

Because of steep terrain, dense forests, and limited access, Green Lake is only visible from a few access sites. Visitors to the Project area that experience the scenic qualities are primarily recreators who arrive via the access road and travel the last 7 miles from the gate on foot or bike, or via Silver Bay by boat. For visitors who reach Green Lake, the view of Green Lake includes the dam and spillway, and the bright orange debris boom on the lake in front of the dam. During certain times of the year when the lake level is

low, the “bathtub ring” (i.e., the exposed shoreline) associated with drawdown is visible. Boaters on Silver Bay have views of the powerplant, access road, and powerline.

Figure 4-34. View of Green Lake from Dam

4.10 Cultural and Tribal Resources

The FERC ILP, under the Federal Power Act (16 USC § 791-828c) and its implementing regulations (18 CFR § 5.6 (d)(3)(x)), require the applicant to describe known cultural or historical resources within the proposed Project and surrounding area. Relicensing is also considered a federal undertaking (36 CFR § 800.16(y)) under Section 106 of the National Historic Preservation Act (NHPA; formerly 16 USC § 470, now 54 USC § 300101 et seq.) and its implementing regulations (36 CFR § 800). Section 106 requires that possible effects of a federal undertaking on historic properties be assessed.

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 (National Register). Traditional cultural properties are a type of historic property eligible for the National Register because of their association with cultural practices or beliefs of a living community (Parker and King 1998).

Since this is a public document, location information for cultural sites is left intentionally vague.

4.10.1 Existing Discovery Measures

Three previous anthropological or archaeological studies have included the Project area. In 1946, Walter Goldschmidt and Theodore Haas (1998) interviewed Sitka Tlingit elders to evaluate Tribal possessory rights in the region based on land use prior to 1884. Their research was republished in book form in 1998. Robert Ackerman (1977) archaeologically investigated the entire Project area when the dam was initially proposed in the late 1970s. He conducted a pedestrian survey along the shorelines of Silver Bay and Green Lake and shovel tested some landforms. He also interviewed local people about history and land use patterns in the Project area. In 2005, Paul Rushmore (2005), with Wrangell Research Associates, interviewed Sitka Tribal members about traditional use of the Sawmill Creek area for relicensing of the Blue Lake Hydroelectric Project, which included traditional use of Herring Cove and Silver Bay.

Adjacent to the Project area, U.S. Forest Service (USFS) archaeologist W. Mark McCallum (2010) visited three mining sites in 2010 to evaluate their eligibility for listing on the National Register prior to mine entrance closure. The Sawmill Creek Road, also adjacent to the Project area, was surveyed and tested in 1983, 1993 (Kell 2012), 2003 (Mobley 2003), and 2009 to 2011 (Kell 2012). Mobley's survey included interviews with people who lived along the road. USFS archaeologist Myra Gilliam documented the Sawmill Creek Campground (SIT-01073) in 2016. In 2017, Aubrey Morrison (Morrison and Yarborough 2017) documented historic structures in Sawmill Cove that were removed during a dock construction project.

Limited additional information about Sitka people's early contact with traders and explorers is available in eighteenth and nineteenth century journals (e.g., De Armond 1978). Russian Missionary Ivan Veniaminov (1984 [1840]), U.S. Census agent Ivan Petrof (1884), and U.S. Navy Lieutenant George Thornton Emmons (1991) described the culture of Sitka and other Tlingit people during the nineteenth century.

Sealaska Corporation did not claim any lands in the Project area as part of the Alaska Native Claims Settlement Act of 1971. From 1988 to 1992, Herb Hope (2000) led interviews and expeditions to identify the route of the Sitka Kiks.ádi Survival March Trail (SIT-00778), whose area includes the mountain ridges overlooking Silver Bay.

4.10.2 Cultural Sites

Ackerman (1977) identified about a dozen standing cabins and cabin ruins, a mining debris scatter, and a 1930s Civilian Conservation Corps (CCC) trail in the Project area that were never assigned Alaska Heritage Resources Survey (AHRS) numbers. Additionally, as the Green Lake Dam's FERC license expires in 2029, it will approach 50 years of age during the proposed license period.

A mine adit and shoring (XPA-00355) lie within the Project area and have not been evaluated for National Register eligibility. Ackerman's (1977) interview with William Hanlon identified a mine shaft, "Robert's Tunnel," dug in 1936, but he was unable to identify the site and determined that it was likely not on the shore of Green Lake. Ethnologist John R. Swanton (1908:453, in Emmons 1991:421) wrote that there was a spirit understood to exist in the persistent winds out of Silver Bay.

4.10.2.1 Sawmill Cove

Most early development of Sawmill Cove has been destroyed by later development (Ackerman 1977), but several sites have been identified. The Sawmill Cove area was initially developed as a Russian mill in 1845, then replaced by an American mill in 1882 (Kell 2012). In 1913, it was the site of W.P. and May Mills' hydroelectric generating station. In 1940, Edward Morke developed the mouth of Sawmill Creek into a farm called Sanitary Dairy, including a road of crushed rock (SIT-00935). He sold the property in 1952 to John and Freda Van Hornin, who renamed the dairy to Blue Lake Farms and operated it until the mid-1950s.

Afterwards, the site was used by the Alaska Lumber and Pulp Company as a mill and hydroelectric power station, including the Alaska Pulp Mill administration building (SIT-00792) and dock remains (SIT-01074). All AHRS sites in Sawmill Cove have been found ineligible for listing on the National Register. Investigations in 1983 and 1993 identified bark-stripped yellow cedar on Sawmill Road; although, no AHRS numbers were assigned (Kell 2012).

4.10.2.2 Silver Bay Village

In 2005, Robert Sam, who was born in 1953, remembered a village site in the Project area; although, he said there were "no smokehouses or anything" (Rushmore 2005:22). It is unclear whether he was remembering an archaeological site or a story of a Silver Bay village. The possible village location was outside Rushmore's (2005) Project area, so it was not surveyed or tested. While Ackerman (1977) identified cabin ruins during the pedestrian survey in that area, he never documented shovel tests that could have identified subsurface archaeological sites.

Petrof (1884:32) reported that 39 Tlingit people lived on Silver Bay in 1880. Although the 1883 and 1891 Coast Pilots, based on information collected sometime between 1865 and 1889, described Silver Bay in some detail, neither source mentions a village on the bay (Coast Pilot 1891, 1883). George Lewis knew of a camp ruin with a smokehouse that an Indigenous man named Laacaeke had used to smoke fish prior to the mid-1940s (Goldschmidt and Haas 1998). Rushmore (2005) suggested the camp was the village referenced by Petrof (1884), and Ackerman (1977) argued that the camp was likely outside the present Project area.

Emmons (1991:104), who lived in Sitka in the late nineteenth century, reported that the King Salmon caught at the head of Silver Bay were twice the size of those in Sitka Harbor. By the mid-twentieth century, local Tlingit people trapped on the shores of Silver Bay and trolled its waters for King Salmon (Goldschmidt and Haas 1998:64), and gold mining and cabins had been developed around the bay.

4.10.3 Tribes that may Attach Cultural Significance to Historic Properties

Indigenous groups that may attach religious or cultural significance to historic properties in the Project vicinity include the Sitka Tribe of Alaska, Shee Atika, Inc., and Sealaska Corporation. Although no traditional cultural properties have been identified in the Project area, the Sitka Kiks.ádi Survival March Trail (SIT-00778) includes the mountain ridge overlooking Silver Bay from the northwest. The site was found ineligible for the National Register in 1996 because investigators could not define an exact route. The Sitka Tribe challenged the finding in court (Hoonah Indian Association v. Morrison 1998) and subsequently nominated the site for listing on the National Register. The nomination is still pending.

4.11 Socioeconomic Resources

4.11.1 Overview

The Project is located in the City and Borough of Sitka Alaska on Baranof Island in southeast Alaska. Land use is almost entirely undeveloped, consisting of mountainous terrain covered with alpine shrub/scrub and barren land, forests, and lakes. The City of Sitka is situated on the northwest side of Baranof Island and has port on the Gulf of Alaksa (CBS 2023c). Green Lake Dam is located approximately 10 miles southeast of the City of Sitka and the entire FERC Project Boundary is situated on lands owned by the City of Sitka. Land uses in the vicinity of the Project are further discussed in Section 4.1.2. As of the 2020 census, Sitka has a population of 8,458, and population density is approximately 3.1 people per square mile (Census 2020). It is the fifth-most populated city in Alaska and the largest city by total area in the United States.

4.11.2 Population Patterns

Table 4-20 shows current and historical population patterns for CBS and for the State of Alaska. The data show that the overall population of Alaska increased by 3.3% from 2010 to 2020, but the population of Sitka decreased by approximately 4.8% during the same time period. The population of Alaska increased by 13.3% from 2000 to 2010, and the population of Sitka increased by only 0.5% during the same period (Census 2000, Census 2010, Census 2020). The decrease in population in Sitka has been attributed to low birth rates and deaths outnumbering births, an aging population, and expensive housing (KCAW 2022).

Table 4-20. Population – 2000, 2010, and 2020

Municipality	2000	2010	2020
Alaska	626,932	710,231	733,391
Percent Change since 2010	--	--	3.3
Percent Change since 2000	--	13.3	17.0
City and Borough of Sitka	8,835	8,881	8,458
Percent Change since 2010	--	--	-4.8
Percent Change since 2000	--	0.5	-4.3

Source: Census 2000, Census 2010, Census 2020

4.11.3 Households/Family Distribution and Income

Household, income, and poverty status data for CBS and the State of Alaska are presented in Table 4-21. The data show that Sitka's household size is similar to the State of Alaska and the United States. Sitka has a higher median household income than both the State of Alaska and the United States. Per capita income between Sitka, the State of Alaska, and the United States were similar. Sitka's medium household income is 108.1% of the State of Alaska and 126.8% of the United States medium household income. Sitka's per capita income is 102.7% of the State of Alaska and 106.6% of the United States per capita income. The percentage of persons in poverty is lower in Sitka than both the State of Alaska and the United State as a whole (Census 2022a, Census 2022b, Census 2022c).

Table 4-21. Income and Poverty, 2022

	City and Borough of Sitka	State of Alaska	United States
Total households	3,459	274,574	125,736,353
Persons per household	2.36	2.67	2.57
Median household income	$95,261	$88,121	$75,149
Per capita income	$43,964	$42,828	$41,261
Persons in poverty	6.9%	11.0%	11.5%

Source: Census 2022a, Census 2022b, Census 2022c

4.11.4 Project Vicinity Employment Sources

Labor force and unemployment rates for CBS and the State of Alaska are presented in Table 4-22. CBS makes up approximately 1.3% of Alaska's total labor force. The 2022 unemployment rate in Sitka was higher than Alaska's overall unemployment rate (Census 2022d).

Table 4-22. Labor Force and Unemployment, 2022

	Labor Force	Unemployment
City and Borough of Sitka	4,617	3.3%
State of Alaska	361,685	2.9%
United States	162,590,221	4.3%

Source: Census 2022d

Industry and occupation statistics for CBS and the State of Alaska are presented in Table 4-23. The most common occupational category in CBS and the State of Alaska is management, business, science, and arts; the second is sales and office. In both CBS and the State of Alaska, educational services, health care, and social assistance is the largest industry sector. The second largest in CBS is retail trade while public administration is second for the State of Alaska (Census 2022d). Table 4-24 shows the largest employers by number of employees in CBS (ADLWD 2022).

Table 4-23. Industry and Occupation for Civilian Population 16 years and over, 2022

	City and Borough of Sitka	Alaska	United States
Occupation			
Management, business, science, and arts occupations	1,786	137,610	69,122,191
Service occupations	699	59,227	26,256,366
Sales and office occupations	993	67,060	32,236,485
Natural resources, construction, and maintenance occupations	482	37,808	13,767,385
Production, transportation, and material moving occupations	427	43,496	21,207,794
Industry			
Agriculture, forestry, fishing and hunting, and mining	285	16,250	2,546,743
Construction	238	25,127	11,213,024
Manufacturing	328	15,265	16,096,892
Wholesale trade	39	4,757	3,502,056
Retail trade	518	36,390	18,073,795
Transportation and warehousing, and utilities	272	29,892	9,779,768
Information	37	6,016	3,137,801
Finance and insurance, and real estate and rental and leasing	159	14,570	10,967,381
Professional, scientific, and management, and administrative and waste management services	210	29,652	20,474,027
Educational services, and health care and social assistance	1,289	84,691	37,480,570
Arts, entertainment, and recreation, and accommodation and food services	328	27,855	14,097,318
Other services, except public administration	234	15,758	7,675,317
Public administration	450	38,978	7,545,529

Source: Census 2022d

Table 4-24. Top Employers in the City and Borough of Sitka

Name	Number of Employees	Type of Business
SEARHC Medical Center	250-499	Hospital
Silver Bay Seafoods	250-499	Seafood wholesaler
Sitka Pioneers Home	100-249	Assisted living
Seafood Producers Co-Op	100-249	Seafood wholesaler
USDA Forest Service	100-249	Government agency
US Coast Guard	100-249	Armed forces
Coast Guard Air Station Sitka	100-249	Armed forces
Sitka Sound Seafoods Inc	100-249	Seafood wholesaler
Allen Marine Inc	100-249	Tourism
Sitka Tribe of Alaska	50-99	Tribe
Alaska Airlines	50-99	Airline
Tongass National Forest-Sitka	50-99	Government agency
AC Value Center	50-99	Grocery store
City & Borough of Sitka	50-99	Municipal

Source: ADLWD 2022

5.0 Preliminary Issues and Study Needs (18 CFR§ 5.6(d)(4))

This section identifies preliminary issues pertaining to the Applicant's continued operation of the Project based on existing resource information summarized in Section 4.0 and initial consultation with Licensing Participants. For the purposes of this PAD, Project issues are any new changes to the natural and human environment attributable to licensing the continued operation of the Project.

Identification of issues is a key step in the relicensing process because any specific concerns or questions arising from the proposed continued Project operations may need to be addressed in the context of the relicensing proceeding. The Applicant has attempted to identify all the issues that have a nexus to licensing continued Project operations. It should be noted that the list of issues is not final. The agencies and other interested parties have not had the opportunity to review this PAD. During the public scoping process, which FERC staff will initiate upon issuing the Notice of Commencement, federal and state resource agencies, Indian Tribes, nongovernmental organizations, and individuals will be invited to participate in refining the resource issues to be analyzed in the Applicant's license application. It is the Applicant's intent to be collaborative throughout the relicensing process.

5.1 Issues Pertaining to the Identified Resources

5.1.1 Geology and Soils Issues

No geology or soils issues are expected. No changes to Project facilities or operations are planned.

5.1.2 Water Resource and Fish Issues

No water resource, including water use, water quality, geomorphology, and fish use/abundance issues are expected to occur as a result of continued Project operations. No changes to Project facilities and operations are planned. Salmon do not occur naturally in Green Lake. The lower portion of the Vodopad River below the Project has a barrier prohibiting anadromous species and a majority of the streams along the Green Lake access road are not anadromous at the road crossing.

5.1.3 Botanical and Wildlife Issues

No botanical or wildlife issues are expected. No changes to Project facilities or operations are planned.

5.1.4 Recreation Issues

Going forward into the new license term, CBS plans to continue to maintain the existing recreation facilities in the FERC Project Boundary (Section 4.8.1.1), and public access to these facilities, as they currently are. Green Lake and the Green Lake access road contribute to recreation opportunities in the greater Sitka area. CBS is currently managing recreation in the Project area, and no recreation issues associated with continued operations of the Project are anticipated.

5.1.5 Aesthetic Resource Issues

No aesthetic issues are expected. No changes to Project facilities or operations are planned.

5.1.6 Cultural and Tribal Resource Issues

The Green Lake Dam itself will reach 50 years of age during the proposed relicensing period and has not been evaluated for National Register eligibility. Although subject to a thorough ethnographic and pedestrian survey, the Project area has not been surveyed since 1977 (Ackerman 1977). The CCC trail has not been formally evaluated for eligibility for the National Register, and all the cabins, cabin ruins, and a historic debris scatter were evaluated over 40 years ago.

Key landforms at the heads of Herring and Bear cove have not been shovel tested to identify subsurface cultural resources, even though they are the locations of several cabins, demonstrating their suitability for settlement. Additionally, several decades later, Robert Sam remembered a village in one of these areas (Rushmore 2005).

A ridgeline associated with the Sitka Kiks.ádi Survival March Trail (SIT-00778) overlooks the Project area. The access road could affect the view from the ridge; however, the area is heavily forested, and trees likely obscure the view of the access road from the ridge. The continued operation of the Project would not cause additional visual impacts, if any, and Herb Hope (2000) argued that the house group that used that region of SIT-00778 did not hike along the ridge but instead walked up the Indian River valley. In any case, no additional work is needed to address impacts to the Sitka Kiks.ádi Survival March Trail (SIT-00778).

5.1.7 Socioeconomic Issues

No socioeconomic issues are expected. No changes to Project facilities or operations are planned. The Project will continue to provide reliable renewable energy to CBS.

5.2 Potential Studies or Information Gathering

There is potential for one study season for this Project based on initial minimal resource concerns and no proposed changes to Project facilities or operation. This will ultimately be determined during the study planning process in consultation with Licensing Participants. CBS will collaborate early and often with FERC regarding this potential for one study season and associated modifications to the schedule.

5.2.1 Geology and Soils Issues

No additional studies or information gathering is recommended.

5.2.2 Water Resource and Fish Issues

No additional studies or information gathering is recommended.

5.2.3 Botanical and Wildlife Issues

No additional studies or information gathering is recommended.

5.2.4 Recreation Issues

CBS plans to maintain the existing recreation facilities in the Green Lake FERC Project Boundary (Section 4.8.1.1), and public access to these facilities, as they currently are. However, CBS has identified several information gathering opportunities to help address the larger recreation demand issues in the greater Sitka area including the following:

CBS will collaborate with other recreation stakeholders in the Sitka area regarding an e-bike use policy. CBS would consider adopting a policy for e-bikes on the Green Lake access road consistent with policies at other recreation facilities.

5.2.5 Aesthetic Resource Issues

No additional studies or information gathering is recommended.

5.2.6 Cultural and Tribal Resource Issues

To address the issues identified in Section 5.1.6, the following recommendations are made for additional survey and testing:

- The cultural resource study plan should include site visits to the CCC trail, cabin ruins, and debris scatter to evaluate these properties' eligibility for the National Register.
- Key landforms at the heads of Herring and Bear cove should be tested to identify any previously unidentified subsurface cultural deposits that could be impacted by continued use of the access road.

5.2.7 Socioeconomic Issues

No additional studies or information gathering is recommended.

5.3 Relevant Comprehensive Plans

Local, state, regional, and federal comprehensive plans relevant to the proposed Project include the following:

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Appendix A. Consultation Record

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Green Lake FERC Relicensing
Consultation Record

Initial Consultation Meetings

Item No.	Stakeholder	Date	Meeting Type	Description
1	Tongass National Forest	9/27/2023	In-person Meeting	Initial consultation with District Ranger Eric Garner
2	Alaska Department of Fish and Game	9/27/2023	In-person/virtual Meeting	Initial consultation with Leah Ellis (online) and Aaron Dupuis (in person)
3	Conservation Society	9/27/2023	In-person Meeting	Initial consultation with Katie Riley
4	Northern Southeast Regional Aquaculture Association	9/27/2023	In-person Meeting	Initial consultation with Adam Olsen and Scott Wagner
5	Sitka Tribe of Alaska	9/27/2023	In-person Meeting	Initial consultation with Anne Davis and Jeff Feldpausch
6	National Marine Fisheries Service	10/30/2023	Virtual Meeting	Initial consultation with Sean McDermott
7	U.S. Fish and Wildlife Service	10/30/2023	Virtual Meeting	Initial consultation with Carol Mahara

Correspondence regarding use of Integrated Licensing Process

From: Sean McDermott - NOAA Federal
To: Lack, Elizabeth
Cc: carol_mahara@fws.gov; leah.ellis@alaska.gov
Subject: Re: Green Lake relicensing process
Date: Tuesday, November 14, 2023 9:44:42 AM
Attachments: image001.png

CAUTION: This email was received from an external source

NMFS does not object to the ILP for the Green Lake Project.
-Sean

On Wed, Nov 8, 2023 at 8:03 AM Lack, Elizabeth <lack@mcmillen.com> wrote:

> Hi,
>
> Thank you for your participation in the initial consultation meetings for the FERC relicensing of the Green Lake hydroelectric project near Sitka. The City and Borough of Sitka is planning to use the Integrated Licensing Process (ILP) to take advantage of defined deadlines for all participants throughout the process. If you agree with the ILP for the Green Lake project, please respond to this email indicating your support for this approach. This information will be included in the PAD.
>
> Thank you!
>
> **Elizabeth Lack**
> Senior Regulatory Specialist
>
> lack@mcmillencorp.com
> (307) 221-9984
> Cheyenne, WY
> mcmillencorp.com
>
> McMillen

--
Sean McDermott

Anchorage Office Supervisor
Habitat Conservation Division
Alaska Region
NOAA Fisheries | U.S. Department of Commerce
222 W. 7th Avenue, Ste 552
PO Box 43
Anchorage, AK 99513
907-271-6354
****
www.fisheries.noaa.gov

From: Mahara, Carol J
To: Lack, Elizabeth; Sean Mcdermott (sean.mcdermott@noaa.gov); leah.ellis@alaska.gov
Subject: RE: [EXTERNAL] Green Lake relicensing process
Date: Wednesday, November 8, 2023 10:50:33 AM
Attachments: image001.png

CAUTION: This email was received from an external source

Hello Elizabeth,

The FWS has no concerns with using the ILP for the Green Lake project.

Thanks,

Carol

Carol Mahara
Fish and Wildlife Biologist
Ecological Services
US Fish and Wildlife Service
4700 BLM Road
Anchorage, AK 99507
carol_mahara@fws.gov
Cell: 907-280-9751

From: Lack, Elizabeth <lack@mcmillen.com>
Sent: Wednesday, November 8, 2023 8:03 AM
To: Mahara, Carol J <carol_mahara@fws.gov>; Sean Mcdermott (sean.mcdermott@noaa.gov) <sean.mcdermott@noaa.gov>; leah.ellis@alaska.gov
Subject: [EXTERNAL] Green Lake relicensing process

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Hi,

Thank you for your participation in the initial consultation meetings for the FERC relicensing of the Green Lake hydroelectric project near Sitka. The City and Borough of Sitka is planning to use the Integrated Licensing Process (ILP) to take advantage of defined deadlines for all

participants throughout the process. If you agree with the ILP for the Green Lake project, please respond to this email indicating your support for this approach. This information will be included in the PAD.

Thank you!

Elizabeth Lack
Senior Regulatory Specialist
-
lack@mcmillencorp.com
(307) 221-9984
Cheyenne, WY
mcmillencorp.com

From: Ellis, Leah M (DFG)
To: Lack, Elizabeth; carol_mahara@fws.gov; Sean Mcdermott (sean.mcdermott@noaa.gov)
Subject: RE: Green Lake relicensing process
Date: Wednesday, November 8, 2023 10:41:32 AM
Attachments: image001.png

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Hi Elizabeth,

ADF&G has no objections to using the ILP for the relicensing process.

Thanks,
Leah

Leah M. Ellis
Statewide FERC Hydropower Coordinator
Alaska Department of Fish & Game – Sport Fish RTS
Anchorage, AK

(907) 267-2404
Leah.ellis@alaska.gov

From: Lack, Elizabeth <lack@mcmillen.com>
Sent: Wednesday, November 8, 2023 8:03 AM
To: carol_mahara@fws.gov; Sean Mcdermott (sean.mcdermott@noaa.gov) <sean.mcdermott@noaa.gov>; Ellis, Leah M (DFG) <leah.ellis@alaska.gov>
Subject: Green Lake relicensing process

CAUTION: This email originated from outside the State of Alaska mail system. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi,

Thank you for your participation in the initial consultation meetings for the FERC relicensing of the Green Lake hydroelectric project near Sitka. The City and Borough of Sitka is planning to use the Integrated Licensing Process (ILP) to take advantage of defined deadlines for all participants throughout the process. If you agree with the ILP for the Green Lake project, please respond to this email indicating your support for this approach. This information will be included in the PAD.

Thank you!

Elizabeth Lack
Senior Regulatory Specialist
-
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Appendix B. FERC 1979 Order Issuing Major License for Green Lake Project

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Charles B. Curtis, Chairman;
Georgiana Sheldon, Matthew Holden, Jr.,
and George R. Hall.

City and Borough of Sitka, Alaska — Project No. 2818

ORDER ISSUING MAJOR LICENSE

(Issued April 5, 1979)

On September 19, 1977, the City and Borough of Sitka, Alaska ("Sitka") filed an application for a major license for the proposed Green Lake Project, FERC No. 2818. The project will be located on the Vodopad River near Sitka, Alaska and will affect lands within the Tongass National Forest.

Public notice of the application for Project No. 2818 was given, but no petitions to intervene, notices of intervention, or protests were filed. The Commission staff prepared draft and final environmental impact statements (EIS) covering the proposed Green Lake Project, publishing notice of the availability of each. In addition, the Secretary forwarded copies of the application and the EIS to relevant federal and state agencies. The draft and final environmental impact statements addressed the concerns raised by commenting agencies. Consequently, we will not restate those comments, except to the extent they are incident to matters in need of further clarification.

The Green Lake Project will be located on Baranof Island, about 10 air miles southeast of Sitka. It will consist of a concrete arch dam near the outlet of Green Lake (a natural water body), the Green Lake reservoir, with an elevation of 390 feet msl, and a power tunnel leading from the dam to a powerhouse containing two generating units with a total installed capacity of 16,500 kW. It will also include a 13.8/69 kV substation adjacent to the powerhouse, an access road and a 69 kV transmission line (each about eight miles long) which will generally parallel the eastern shore of Silver Bay and appurtenant facilities. 1/

1/ The project is more fully described in ordering paragraph B.

Safety of Structures

The Green Lake Project will be located between two fault systems; approximately 15 miles to the east is the north-striking Chatham Strait fault and approximately 17 miles to the west is the northwest-striking Fairweather fault. The Chatham Strait fault may still be active and may be subject to microearthquake activity. Since 1832 more than 73 earthquakes have been felt in the project area; nine of those earthquakes have been of a magnitude of seven or greater on the Richter scale.

Our staff has analyzed the geological conditions at the project site and the preliminary design for the project. The staff reports show that the proposed arch dam would be safe under all normal loading conditions and that the abutments and foundations are adequate to support the dam safely under unusual and extreme loading conditions, including earthquakes. Sitka is currently conducting a final, detailed dynamic analysis of the dam to develop the final design configuration necessary to withstand unusual and extreme loading conditions. Article 42 of this license requires Sitka to file for approval final design drawings and supporting information which will enable our staff to review the safety and adequacy of the final design for the dam.

In addition, Article 44 requires the licensee to retain a board of independent engineering consultants to review the design, specifications, and construction of the project for safety and adequacy and to file with the Commission copies of the board's report prior to or simultaneously with the submission of the final design drawings. Finally, Article 43 requires Sitka to submit its contract drawings and specifications for review before construction begins.

Need for Power and Project Feasibility

Sitka owns and operates Sitka Municipal Utilities, which serves the City and Borough of Sitka on Baranof Island. Sitka is electrically isolated and there are currently no plans to interconnect Sitka's system with other power systems. The topography and great distances between population centers in southeastern Alaska limit the feasibility of interconnections.

For planning purposes, Sitka's long-term growth rate

in energy consumption is six percent. Recently, Sitka has experienced power shortages. As a temporary stop gap, to meet its immediate needs, Sitka has installed 5,500 kW of new, diesel generator units. The proposed hydroelectric project would allow Sitka to meet its projected early 1980 loads with an adequate reserve margin, and to assign the relatively costly-to-operate diesel units to standby status. Continued reliance on diesel generators for other than emergency peaking capability is undesirable from the standpoints of economics, system reliability, and consumption of non-renewable fuel. 2/

The Commission's staff has estimated the annual cost of hydroelectric energy to be produced by Project No. 2818. Based on estimated costs in 1981, the year the project becomes operational, the total project cost will be $48,384,657. Power benefits were estimated using diesel-electric generators as the alternative power source. For this project, diesel units are the most attractive alternative source with respect to reliability, construction costs, and operating and maintenance costs. Using a 50 year amortization period, the annual project power benefits will exceed the estimated annual costs by $2,362,889. Accordingly, we find the proposed project economically and financially feasible.

Environmental Considerations

We have carefully considered the environmental impacts of the proposed project and its alternatives. On the basis of the information contained in the final environmental impact statement (FEIS) 3/ and other material in the record, we believe the beneficial effects to be derived from the Green Lake Project will outweigh the probable adverse effects of the project on the environment. The FEIS discusses in detail the environmental impacts associated with the construction and operation of Project No. 2818. A discussion of the more significant environmental issues

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2/ The Green Lake Project will save the equivalent of approximately 106,500 barrels of oil per year.

3/ FERC/EIS 0006, Green Lake Alaska Project No. 2818, Final Environmental Impact Statement, (issued February 1979).

which require special license conditions follows. 4/

Fisheries:

The project reservoir will inundate all of the spawning habitat accessible to brook trout in the Vodopad River above Green Lake. Sitka states that a stocking program for either brook or rainbow trout, provided in cooperation with the Alaska Department of Fish and Game (ADFG), would mitigage the loss of spawning habitat. To date, however, Sitka and ADFG have not formulated a detailed stocking program or fishery management plan for the reservoir. License Article 35 requires Sitka to file a revised Exhibit S to include a detailed fish management plan for the project reservoir.

Construction of the access road and its bridges could result in the introduction of sediments into Silver Bay and Bear Creek. Siltation caused by road construction could adversely affect the spawning of adult fish and the survival of eggs in Bear Creek. Article 33 requires Sitka to consult and cooperate with ADFG in developing a plan to minimize the quantity of sediments and other potential pollutants that might enter Silver Bay, Bear Creek and the project waters as a result of constructing, operating, or maintaining the project and its works. 5/

4/ In a number of instances, those conditions require Sitka to file plans or other information. The license articles have been tailored to require those filings in sufficient time to allow review before pertinent construction activities commence under Sitka's construction schedule.

5/ On March 19, 1979, the Department of Environmental Conservation of the State of Alaska (ADEC) waived the requirement of a state water quality certificate for the project under Section 401 of the Federal Water Pollution Control Act Amendments of 1972. ADEC reported that "there is no evidence available at this time which suggests that any discharges resulting from the proposed project would have a significant adverse effect on waters of the United States."

Wildlife:

Construction of the proposed access road and transmission line will have some adverse impact on the beach fringe winter range of deer along Silver Bay, and may have adverse effects on eagles which nest nearby. Sitka is taking a number of steps to minimize the adverse effects of access road construction on wildlife. Article 33 requires Sitka to submit a detailed plan for mitigation of any remaining access road impacts on wildlife and for avoidance and mitigation of adverse impacts from the proposed transmission line. Avoidance and mitigation of other wildlife impacts must also be covered in that plan.

Air Quality:

Dust from surface blasting and excavation activities, particulate matter and gases from construction equipment exhausts, and dust from the normal movement of personnel, machinery, and trucks will temporarily reduce the air quality. Sitka will require its contractors to comply with air quality criteria promulgated by the U.S. Environmental Protection Agency and the Occupational Safety and Health Administration. In addition, Article 40 requires licensee to develop, in consultation with those and other agencies, a specific plan to protect air quality and to monitor air quality at the project during construction.

Visual Resources:

The proposed mode of operating Project No. 2818 would eliminate a waterfall on the Vodopad River below Green Lake. Our staff describes the falls as being "visually pleasing and audibly refreshing." Interior and the Forest Service have expressed concern over loss of the falls as a visual resource. The proposed project could be redesigned or altered to provide flows in the natural streambed of the Vodopad River to maintain that visual resource. Sitka has made some preliminary studies of possible alterations and costs, but those are inconclusive.

Article 41 requires Sitka, in consultation with federal and state agencies, to study the extent to which flows in the Vodopad's natural streambed may be necessary or desirable to protect the visual resource value in the immediate area of the waterfalls, including any recommendations for changes to project design or operation and more detailed analysis of the changes and their costs.

Cultural Resources:

The Alaska State Historic Preservation Officer reported that the proposed project would not affect any properties listed or determined eligible for listing in the National Register of Historic Places. An archeological survey was conducted in the project area and no evidence of significant archeological sites was found. Article 37 of the license requires Sitka to provide for protection of any archeological resources that may be discovered during construction.

Recreation:

Exhibit R appears to provide an adequate recreational plan during the initial phase of operation. Adequate information is not currently available to develop reliable estimates of future public use of the project area for recreation. Therefore, an informed decision on the need for future recreational development is not now possible. For this reason, Article 39 requires Sitka to consult with appropriate federal and state agencies, conduct a study to determine the need for any additional recreational development at the project, and report the results to the Commission, with a revised Exhibit R if necessary. 6/

Other Exhibits

Sitka's Exhibit K is approved to the extent that it generally shows the project boundary and location of project works. Article 48 requires Sitka to file a revised Exhibit F conforming with our regulations and, for approval,"as built" Exhibits J, K, L, and M

6/ Under Article 17 of the license, Sitka may be required to install additional recreational facilities that may become necessary or desirable in the future.

to show the project as finally constructed and located.

Transmission Facilities

From a substation adjacent to the powerhouse, project power will travel approximately 8 miles via a 69-kV transmission line to the substation for the Blue Lake Project No. 2230. From the Blue Lake substation the power will travel four miles to the city's load area via the transmission facilities for Project No. 2230.

The four mile existing transmission line from the Blue Lake substation to the city is rated at 34.5 kV. In order to carry the power from Green Lake reliably, the Blue Lake transmission facilities must be upgraded to 69 kV. Ordering paragraph (F) below requires Sitka to file an application to upgrade the Project No. 2230 transmission line.

Comprehensive Development

The Green Lake Project will be located on the Vodopad River which drains a 28.8-square mile area. The project's reservoir will have a gross storage capacity of 90,000 acre-feet and will regulate approximately 95% of the river's flow. Project No. 2818 will use two generating units having a total installed capacity of 16,500 kW. Annually, the project will generate an estimated 64,900,000 kwh of electric energy. Although an additional head of 50 feet could be developed, the average per kilowatt cost of the additional energy produced by that head is not economically justified at this time. 7/ We conclude that the project as conditioned in this order is best adapted to a comprehensive plan of development of the affected waterways.

The Commission orders:

(A) This license is issued under Part I of the Federal Power Act ("Act") to the City and Borough of Sitka, Alaska, for a period of fifty years, effective the first day of the month in which this license is issued, for the construction, operation, and maintenance of the

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7/ Article 9 of the license reserves the necessary authority to require additional generating capacity installed if it becomes economically feasible in the future.

Green Lake Project No. 2818, located on the Vodopad River and affecting lands within the Tongass National Forest, subject to the terms and conditions of the Act, which is incorporated by reference as part of this license, and subject to the regulations as the Commission issues under the provisions of the Act.

(B) Project No. 2818 consists of:

(1) all lands, to the extent of the Licensee's interest in those lands, constituting the project area and enclosed by the project boundary, the project area and boundary being shown and described by certain exhibits which form part of the application for license and are designated and described as:

Exhibit	FERC Drawing No. 2818	Title
J	4	General Project Map
K-1	5	Project Boundary
K-2	6	" "
K-3	7	" "
K-4	8	" "

(2) Project works consisting of:

(a) a double-curvature, concrete arch dam, 210 feet high and 460 feet long at its crest, having a centrally located uncontrolled ogee spillway section 100 feet wide; (b) Green Lake Reservoir, with a surface area of 1,000 acres at normal maximum reservoir elevation of 390 feet msl and a usable storage capacity of 74,000 acre-feet between elevations 390 and 280 msl; (c) a 1,910-foot long power tunnel, varying in diameter from 3 to 11.5 feet, leading from the dam to the powerhouse where it bifurcates into two 5.6-foot-diameter steel-lined sections; (d) an indoor-type, remotely controlled, concrete powerhouse containing two generating units with a total installed capacity of 16,500 kW; (e) a 13.8/69-kV substation located adjacent to the powerhouse; (f) an unpaved access road, approximately 14 feet wide and 8 miles long extending from the end of the Sawmill Creek State Highway to the project site where it divides, with one branch leading to the dam and another to the powerhouse; (g) a 69-kV wood-pole transmission line, approximately 8 miles long, leading from the project powerhouse substation to the Blue Lake powerhouse substation; and (h) appurtenant facilities.

These project works are generally shown and described by the previously mentioned exhibits and more specifically described by the following exhibits:

Exhibit	FERC Drawing No. 2818 -	Title
L-1	9	Dam Plan, Elevation and Section
L-2	10	Power Tunnel, Profile and Sections
L-3	11	Powerhouse and Substation Plans and Sections

Exhibit M: Three typewritten pages of text entitled "General Description of Mechanical, Electrical and Transmission Equipment".

Exhibit R: Nine typewritten pages of text entitled "Recreation Plan" and one map, FERC Drawing No. 2818-12.

(3) All of the structures, fixtures, equipment, facilities or property which may be employed in connection with the project area, as approved by the Commission, and all riparian or other rights, which are necessary or appropriate for the construction, maintenance, or operation of the project.

(C) Exhibits K and L-1, designated and described in paragraph (B) above are approved and made a part of the license only to the extent that they show the general location and layout of the project.

(D) Exhibits J, M, L-2, and L-3, designated in paragraph (B) above, are approved and made a part of the license.

(E) This license is also subject to Articles 1 through 32 set forth in Form L-2 (revised October, 1975), entitled "Terms and Conditions of License for Unconstructed Major Project Affecting Lands of the United States," attached to and made a part of this license. This license is also subject to the following special conditions set forth as additional articles:

Article 33. Within 90 days from the date of issuance of this license, Licensee shall consult and cooperate with the Alaska Department of Fish and Game to develop a plan

to control soil erosion and to minimize the quantity of inorganic sediments, or other potential pollutants resulting from construction, operation, and maintenance of the project and its works that might enter Bear Creek, Green Lake, or Silver Bay. Within 135 days from the date of issuance of this license, the Licensee shall file that plan, including an implementation schedule, with the Commission. The Director, Office of Electric Power Regulation, may require modifications to that plan to minimize erosion, sedimentation, or water pollution.

Article 34. The Licensee shall take such measures as may be necessary for the control of vectors at the project, and shall seek, in this regard, the recommendation of the Alaska Department of Public Health. In the event of the Licensee's failure to undertake effective control measures, the Commission reserves the right to order the Licensee to take appropriate measures for the control of vectors at the project.

Article 35. After consultation with the Alaska Department of Fish and Game, the Fish and Wildlife Service of the U.S. Department of the Interior, and the Forest Service of the U.S. Department of Agriculture, the Licensee shall file, within one year from the date of issuance of this license, a revised Exhibit S for approval, which shall include:

(1) a detailed fish management plan for the project reservoir, including stocking and other measures to protect and enhance the fishery resource;

(2) a detailed plan to avoid or to mitigate expected adverse impacts on wildlife resources in the project area resulting from the construction and operation of project facilities, including the access road and transmission line. Among other things, the plan shall include measures to mitigate any disturbance or loss of the beach fringe winter range of deer along Silver Bay due to the construction of the access road and measures to prevent or minimize electrical shock hazards to raptors in the final design and location of the transmission line;

(3) estimated costs, and the portions to be paid

by the Licensee and any other entities for implementing the fish and wildlife mitigation plans.

Article 36. After consultation with appropriate federal and state agencies, the Licensee shall develop and file with the Commission at least 30 days prior to beginning construction of the powerhouse, switchyard, and power tunnels a comprehensive plan for disposing of material excavated from the sites for those facilities. This plan shall utilize upland disposal sites, not side-casting into Silver Bay, and shall provide that the excavated material be deposited in a manner which reasonably preserves the environmental values of the project area and the disposal sites. The Director, Office of Electric Power Regulation, may require modifications to the plan to preserve those values.

Article 37. The Licensee shall continue to cooperate with the Alaska State Historic Preservation Officer (SHPO). If any previously unrecorded archeological sites are discovered during the course of any construction or development of any project works or other facilities at the project, construction activity in the vicinity shall be halted, a qualified archeologist shall be consulted to determine the significance of the sites, and the Licensee shall consult with the SHPO to develop a mitigation plan for the protection of significant archeological resources. The Licensee shall provide funds in a reasonable amount for any mitigative measures that may be necessary. If the Licensee and the SHPO cannot agree on the amount of money to be expended on archeological work related to the project, the Commission reserves the right to require the Licensee to conduct, at its own expense, any archeological work found necessary.

Article 38. The Licensee shall, to the satisfaction of the Commission's authorized representative, install and operate any signs, lights, sirens or other devices that may reasonably be needed to warn the public of fluctuations in flow from the project and protect the public in its recreational use of project lands and waters.

Article 39. The Licensee shall, in consultation with the Heritage Conservation and Recreation Service of the U.S. Department of the Interior, the Forest Service

of the U.S. Department of Agriculture, and the Alaska Department of Natural Resources, conduct a study to determine the need for any additional recreational development at the project. The study shall include, but not be limited to, a survey extending over the first two complete recreation seasons after commencement of commercial operation of the project to determine: (1) the total number of annual visitors to the project; (2) the types of recreational activities the visitors participate in while at the project; (3) the frequency and duration of visitation; and (4) the mode of travel used by recreationists to reach the project. The Licensee shall submit a report on the study, the first time a required Form 80 is filed after the study is completed. Should the results of the study indicate a need for additional recreational facilities at the project, the Licensee shall at the same time file for approval a revised Exhibit R including the additional recreational facilities that are to be provided and a schedule for their development.

Article 40. Prior to construction, and after consultation with the U.S. Environmental Protection Agency, the Occupational Safety and Health Administration of the U.S. Department of Labor, and any other appropriate federal and state agencies, the Licensee shall develop and file with the Commission a plan to protect the ambient air quality and monitor air quality at the project during construction activities. The Director, Office of Electric Power Regulation, may require modifications to the plan to protect air quality.

Article 41. Within nine months from the date of issuance of this license, the Licensee shall, in consultation and cooperation with the Heritage Conservation and Recreation Service of the U.S. Department of the Interior, the Forest Service of the U.S. Department of Agriculture, the Alaska Department of Natural Resources, and other appropriate federal or state agencies, complete a detailed study of the visual resource value of the Vodopad River falls below Green Lake. That study shall develop in detail, the desirability of protecting that visual resource, any changes in project design or operation that could preserve, or minimize adverse impact on, that visual resource; and the cost of those changes. Within twelve months from the date of issuance of this license, the Licensee shall file a report on the results of that

study. The Commission reserves the right to require modifications of the design or operation of the project to mitigate its impact on the Vodopad River falls.

Article 42. The Licensee shall file, for approval by the Director, Office of Electric Power Regulation, Exhibit L drawings conforming to Section 4.41 of the Commission's regulations and showing the final design of the arch dam. The Exhibit L drawings shall be accompanied by full and detailed information sufficient to provide a full understanding of the final arch dam design and to allow analysis of the safety and adequacy of the dam under unusual and extreme loading conditions. Construction of the dam shall not start before approval of the Exhibit L drawings.

Article 43. The Licensee shall file plans and specifications with the Commission's Regional Engineer in San Francisco, California, and the Director, Office of Electric Power Regulation, prior to start of construction. The Director may require changes in the plans and specifications to assure the safety and adequacy of project works.

Article 44. The Licensee shall retain a Board of three or more qualified, independent engineering consultants to review the design, specifications, and construction of the project works for safety and adequacy. The names and qualifications of the Board members shall be submitted to the Director, Office of Electric Power Regulation, for approval. Among other things, the Board shall assess the geology of the project site and surroundings; the design, specifications, and construction of the dam, spillway, powerhouse, electrical and mechanical equipment involved in water control and emergency power supply; the filling schedule for the reservoir; the construction inspection program; and construction procedures and progress. The Licensee shall submit to the Commission copies of the Board's report on each meeting. Reports reviewing each portion of the project shall be submitted prior to or simultaneously with the submission of the corresponding Exhibit L final design drawings. The Licensee shall also submit a final report of the Board upon completion of the project. The final report shall contain a statement indicating the Board's satisfaction with the construction, safety, and adequacy of the project structures.

Article 45. Licensee shall file with the Commission, implement, and modify when appropriate, an emergency action plan designed to provide an early warning to upstream and downstream inhabitants and property owners if there should be an impending or actual sudden release of water caused by an accident to, or failure of, project works. That plan shall be submitted prior to initial filling of the project reservoir and shall include: instructions to be provided on a continuing basis to operators and attendants for action they are to take in the event of an emergency; detailed and documented plans for notifying law enforcement agents, appropriate Federal, State, and local agencies, operators of water-related facilities, and those residents and owners of properties that could be endangered; actions that would be taken to reduce the inflow to the reservoir, if possible, by limiting the outflow from upstream dams or control structures; and actions to reduce downstream flows by controlling the outflow from dams located on tributaries to the stream on which the project is located. Licensee shall also submit a summary of the study used as a basis for determining the areas that may be affected by an emergency, including criteria and assumptions used. Licensee shall monitor any changes in upstream or downstream conditions which may influence possible flows or affect areas susceptible to damage, and shall promptly make and file with the Commission appropriate changes in the emergency action plan. The Commission reserves the right to require modifications to the plan.

Article 46. In the interests of protecting and enhancing the scenic, recreational, and other environmental values of the project, Licensee: (1) shall supervise and control the use and occupancy of project lands and waters; (2) shall prohibit, without further Commission approval the further use and occupancy of project lands and waters other than as specifically authorized by this license; (3) may authorize, without further Commission approval, the use and occupancy of project lands and waters for landscape plantings and the construction, operation, and maintenance of access roads, power and telephone distribution lines, piers, landings, boat docks, or similar structures and facilities, and embankments, bulkheads, retaining walls, or other similar structures for erosion control to protect the existing shoreline; (4) shall require, where feasible and desirable, the multiple use and occupancy of facilities for access to project lands and waters; and (5) shall ensure to the

satisfaction of the Commission's authorize representative that all authorized uses and occupancies of project lands and waters: (a) are consistent with shoreline aesthetic values, (b) are maintained in a good state of repair, and (c) comply with State and local health and safety regulations. Under item (3) of this article, Licensee may, among other things, institute a program, for issuing permits to a reasonable extent for the authorized types of use and occupancy of project lands and waters. Under appropriate circumstances, permits may be subject to the payment of a fee in a reasonable amount.

Before authorizing the construction of bulkheads or retaining walls, Licensee shall: (a) inspect the site of the proposed construction, (b) determine that the proposed construction is needed, and (c) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site. If an authorized use or occupancy fails to comply with the conditions imposed by the Licensee for the protection of the environmental quality of project lands and waters, the Licensee shall take appropriate action to correct the violations, including, if necessary, cancellation of the authorization and removal of any non-complying structures or facilities. The Licensee's consent to an authorized use or occupancy of project lands and waters shall not, without its express agreement, place upon the Licensee any obligation to construct or maintain any associated facilities.

Article 47. The Licensee shall pay the United States the following annual charge, effective the first day of the month in which this license is issued:

(a) for the purpose of reimbursing the United States for the cost of administration of Part I of the Act, a reasonable annual charge as determined by the Commission in accordance with the provisions of its regulations in effect from time to time. The authorized installed capacity for that purpose is 22,000 horsepower.

(b) for the purpose of recompensing the United States for the use, occupancy and enjoyment of its lands, an amount to be determined later.

Article 48. Within one year following the commencement of operation of the project, the Licensee shall file a revised exhibit F and, for approval, "as built" exhibits J, K, L, and M, conforming to section 4.41 of the Commission's regulations and showing the project as finally constructed and located.

Article 49. The Licensee shall commence the construction of the project within one year of the date of issuance of the license, and, in good faith and with due diligence, shall prosecute and complete construction of the project works within five years of the date of issuance of the license.

(F) This license is also subject to the condition that the Licensee file within 90 days from the date of its issuance an application to upgrade to 69-kV the 34.5-kV transmission line for the Licensee's Blue Lake Project No. 2230.

(G) This order shall become final 30 days from the date of its issuance unless an application for rehearing is filed as provided in Section 313(a) of the Federal Power Act. Failure of the Licensee to file such an application shall constitute acceptance of this license. The acknowledgment of acceptance attached to this license shall be signed for the Licensee and returned to the Commission within 60 days from the date of issuance of this order.

By the Commission.

(S E A L)

Kenneth F. Plumb,
Secretary.

Project No. 2818

IN TESTIMONY of its acknowledgment of acceptance of all provisions, terms, and conditions of the foregoing order, the City and Borough of Sitka, Alaska this 24th day of April, 1979, has caused its corporate name to be signed hereto by _____, its Mayor and its corporate seal to be affixed hereto by _____ its Clerk, pursuant to a resolution by its Council duly adopted on the 24th day of April, 1979, a certified copy of the record of which is attached.

By _____
Mayor

Attest:

Myrtle R Flynn
Clerk

(Executed in Quadruplicate)

Form L-2
(Revised October, 1975)

FEDERAL ENERGY REGULATORY COMMISSION

TERMS AND CONDITIONS OF LICENSE FOR
UNCONSTRUCTED MAJOR PROJECT
AFFECTING LANDS OF THE UNITED STATES

Article 1. The entire project, as described in this order of the Commission, shall be subject to all of the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: Provided, however, That if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval a revised, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. The project works shall be constructed in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, there shall not be made without prior approval of the Commission any substantial alteration or addition not in conformity with the approved plans to any dam or other project works under the license or any substantial use of project lands and waters not authorized herein; and any emergency alteration, addition, or use so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in project works, or in uses of project lands and waters, or divergence from such approved exhibits may be made if such changes will not result in a decrease in efficiency, in a material increase in cost, in an adverse environmental impact, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct.

Upon the completion of the project, or at such other time as the Commission may direct, the Licensee shall submit to the Commission for approval revised exhibits insofar as necessary to show any divergence from or variations in the project area and project boundary as finally located or in the project works as actually constructed when compared with the area and boundary shown and the works described in the license or in the exhibits approved by the Commission, together with a statement in writing setting forth the reasons which in the opinion of the Licensee necessitated or justified variation in or divergence from the approved exhibits. Such revised exhibits shall, if and when approved by the Commission, be made a part of the license under the provisions of Article 2 hereof.

Article 4. The construction, operation, and maintenance of the project and any work incidental to additions or alterations shall be subject to the inspection and supervision of the Regional Engineer, of the Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of the project and for any subsequent alterations to the project. Construction of the project works or any feature or alteration thereof shall not be initiated until the program of inspection for the project works or any such feature thereof has been approved by said representative. The Licensee shall also furnish to said representative such further information as he may require concerning the construction, operation, and maintenance of the project, and of any alteration thereof, and shall notify him of the date upon which work will begin, as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall allow said representative and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may prescribe from time to time for the protection of life, health, or property.

Article 5. The Licensee, within five years from the date of issuance of the license, shall acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for the construction, maintenance, and operation of the project. The Licensee or its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights of occupancy and use; and none of such properties shall be voluntarily sold, leased, transferred, abandoned, or otherwise disposed of without the prior written approval of the Commission, except that the Licensee may lease or otherwise dispose of interests in project lands or property without specific written approval of the Commission pursuant to the then current regulations of the Commission. The provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear; and mortgage or trust deeds or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article.

Article 6. In the event the project is taken over by the United States upon the termination of the license as provided in Section 14 of the Federal Power Act, or is transferred to a new licensee or to a non-power licensee under the provisions of Section 15 of said Act, the Licensee, its successors and assigns shall be responsible for, and shall make good any defect of title to, or of right of occupancy and use in, any of such project property that is necessary or appropriate or valuable and serviceable in the maintenance and operation of the project, and shall pay and discharge, or shall assume responsibility for payment and discharge of, all liens or encumbrances upon the project or project property created by the Licensee or created or incurred after the issuance of the license: Provided, That the provisions of this article are not intended to require the Licensee, for the purpose of transferring the project to the United States or to a new licensee, to acquire any different title to, or right of occupancy and use in, any of such project property than was necessary to acquire for its own purposes as the Licensee.

Article 7. The actual legitimate original cost of the project, and of any addition thereto or betterment thereof, shall be determined by the Commission in accordance with the Federal Power Act and the Commission's Rules and Regulations thereunder.

Article 8. The Licensee shall install and thereafter maintain gages and stream-gaging stations for the purpose of determining the stage and flow of the stream or streams on which the project is located, the amount of water held in and withdrawn from storage, and the effective head on the turbines; shall provide for the required reading of such gages and for the adequate rating of such stations; and shall install and maintain standard meters adequate for the determination of the amount of electric energy generated by the project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission or its authorized representative. The Commission reserves the right, after notice and opportunity for hearing, to require such alterations in the number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, as are necessary to secure adequate determinations. The installation of gages, the rating of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of the project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision, or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient records of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 9. The Licensee shall, after notice and opportunity for hearing, install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so.

Article 10. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other projects or power systems and in such manner as the Commission may direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 11. Whenever the Licensee is directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement, the Licensee shall reimburse the owner of the headwater improvement for such part of the annual charges for interest, maintenance, and depreciation thereof as the Commission shall determine to be equitable, and shall pay to the United States the cost of making such determination as fixed by the Commission. For benefits provided by a storage reservoir or other headwater improvement of the United States, the Licensee shall pay to the Commission the amounts for which it is billed from time to time for such headwater benefits and for the cost of making the determinations pursuant to the then current regulations of the Commission under the Federal Power Act.

Article 12. The operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Commission may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes, and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Commission may prescribe for the purposes hereinbefore mentioned.

Article 13. On the application of any person, association, corporation, Federal agency, State or municipality, the Licensee shall permit such reasonable use of its reservoir or other project properties, including works, lands and water rights, or parts thereof, as may be ordered by the Commission, after notice and opportunity

for hearing, in the interests of comprehensive development of the waterway or waterways involved and the conservation and utilization of the water resources of the region for water supply or for the purposes of steam-electric, irrigation, industrial, municipal or similar uses. The Licensee shall receive reasonable compensation for use of its reservoir or other project properties or parts thereof for such purposes, to include at least full reimbursement for any damages or expenses which the joint use causes the Licensee to incur. Any such compensation shall be fixed by the Commission either by approval of an agreement between the Licensee and the party or parties benefiting or after notice and opportunity for hearing. Applications shall contain information in sufficient detail to afford a full understanding of the proposed use, including satisfactory evidence that the applicant possesses necessary water rights pursuant to applicable State law, or a showing of cause why such evidence cannot concurrently be submitted, and a statement as to the relationship of the proposed use to any State or municipal plans or orders which may have been adopted with respect to the use of such waters.

Article 14. In the construction or maintenance of the project works, the Licensee shall place and maintain suitable structures and devices to reduce to a reasonable degree the liability of contact between its transmission lines and telegraph, telephone and other signal wires or power transmission lines constructed prior to its transmission lines and not owned by the Licensee, and shall also place and maintain suitable structures and devices to reduce to a reasonable degree the liability of any structures or wires falling or obstructing traffic or endangering life. None of the provisions of this article are intended to relieve the Licensee from any responsibility or requirement which may be imposed by any other lawful authority for avoiding or eliminating inductive interference.

Article 15. The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.

Article 16. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of the Licensee's lands and interests in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be reasonably prescribed by the Commission in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 17. The Licensee shall construct, maintain, and operate, or shall arrange for the construction, maintenance, and operation of such reasonable recreational facilities, including modifications thereto, such as access roads, wharves, launching ramps, beaches, picnic and camping areas, sanitary facilities, and utilities, giving consideration to the needs of the physically handicapped, and shall comply with such reasonable modifications of the project, as may be prescribed hereafter by the Commission during the term of this license upon its own motion or upon the recommendation of the Secretary of the Interior or other interested Federal or State agencies, after notice and opportunity for hearing.

Article 18. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and for outdoor recreational purposes, including fishing and hunting: Provided, That the Licensee may reserve from public access such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property.

Article 19. In the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing.

Article 20. The Licensee shall consult with the appropriate State and Federal agencies and, within one year of the date of issuance of this license, shall submit for Commission approval a plan for clearing the reservoir area. Further, the Licensee shall clear and keep clear to an adequate width lands along open conduits and shall dispose of all temporary structures, unused timber, brush, refuse, or other material unnecessary for the purposes of the project which results from the clearing of lands or from the maintenance or alteration of the project works. In addition, all trees along the periphery of project reservoirs which may die during operations of the project shall be removed. Upon approval of the clearing plan all clearing of the lands and disposal of the unnecessary material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission and in accordance with appropriate Federal, State, and local statutes and regulations.

Article 21. Timber on lands of the United States cut, used, or destroyed in the construction and maintenance of the project works, or in the clearing of said lands, shall be paid for, and the resulting slash and debris disposed of, in accordance with the requirements of the agency of the United States having jurisdiction over said lands. Payment for merchantable timber shall be at current stumpage rates, and payment for young growth timber below merchantable size shall be at current damage appraisal values. However, the agency of the United States having jurisdiction may sell or dispose of the merchantable timber to others than the Licensee: Provided, That timber so sold or disposed of shall be cut and removed from the area prior to, or without undue interference with, clearing operations of the Licensee and in coordination with the Licensee's project construction schedules. Such sale or disposal to others shall not relieve the Licensee of responsibility for the clearing and disposal of all slash and debris from project lands.

Article 22. The Licensee shall do everything reasonably within its power, and shall require its employees, contractors, and employees of contractors to do everything reasonably within their power, both independently and upon the request of officers of the agency concerned, to prevent, to make advance preparations for suppression of, and to suppress fires on the lands to be occupied or used under the license. The Licensee shall be liable for and shall pay the costs incurred by the United States in suppressing fires caused from the construction, operation, or maintenance of the project works or of the works appurtenant or accessory thereto under the license.

Article 23. The Licensee shall interpose no objection to, and shall in no way prevent, the use by the agency of the United States having jurisdiction over the lands of the United States affected, or by persons or corporations occupying lands of the United States under permit, of water for fire suppression from any stream, conduit, or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license, or the use by said parties of water for sanitary and domestic purposes from any stream, conduit, or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license.

Article 24. The Licensee shall be liable for injury to, or destruction of, any buildings, bridges, roads, trails, lands, or other property of the United States, occasioned by the construction, maintenance, or operation of the project works or of the works appurtenant or accessory thereto under the license. Arrangements to meet such liability, either by compensation for such injury or destruction, or by reconstruction or repair of damaged property, or otherwise, shall be made with the appropriate department or agency of the United States.

Article 25. The Licensee shall allow any agency of the United States, without charge, to construct or permit to be constructed on, through, and across those project lands which are lands of the United States such conduits, chutes, ditches, railroads, roads, trails, telephone and power lines, and other routes or means of transportation and communication as are not inconsistent with the enjoyment

of said lands by the Licensee for the purposes of the license. This license shall not be construed as conferring upon the Licensee any right of use, occupancy, or enjoyment of the lands of the United States other than for the construction, operation, and maintenance of the project as stated in the license.

Article 26. In the construction and maintenance of the project, the location and standards of roads and trails on lands of the United States and other uses of lands of the United States, including the location and condition of quarries, borrow pits, and spoil disposal areas, shall be subject to the approval of the department or agency of the United States having supervision over the lands involved.

Article 27. The Licensee shall make provision, or shall bear the reasonable cost, as determined by the agency of the United States affected, of making provision for avoiding inductive interference between any project transmission line or other project facility constructed, operated, or maintained under the license, and any radio installation, telephone line, or other communication facility installed or constructed before or after construction of such project transmission line or other project facility and owned, operated, or used by such agency of the United States in administering the lands under its jurisdiction.

Article 28. The Licensee shall make use of the Commission's guidelines and other recognized guidelines for treatment of transmission line rights-of-way, and shall clear such portions of transmission line rights-of-way across lands of the United States as are designated by the officer of the United States in charge of the lands; shall keep the areas so designated clear of new growth, all refuse, and inflammable material to the satisfaction of such officer; shall trim all branches of trees in contact with or liable to contact the transmission lines; shall cut and remove all dead or leaning trees which might fall in contact with the transmission lines; and shall take such other precautions against fire as may be required by such officer. No fires for the burning of waste material shall be set except with the prior written consent of the officer of the United States in charge of the lands as to time and place.

Article 29. The Licensee shall cooperate with the United States in the disposal by the United States, under the Act of July 31, 1947, 61 Stat. 681, as amended (30 U.S.C sec. 601, et seq.), of mineral and vegetative materials from lands of the United States occupied by the project or any part thereof: Provided, That such disposal has been authorized by the Commission and that it does not unreasonably interfere with the occupancy of such lands by the Licensee for the purposes of the license: Provided further, That in the event of disagreement, any question of unreasonable interference shall be determined by the Commission after notice and opportunity for hearing.

Article 30. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without adequate replacement, or shall abandon or discontinue good faith operation of the project or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address of the Licensee or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license. The Commission, after notice and opportunity for hearing, may require the Licensee to remove any or all structures, equipment and power lines within the project boundary and to take any such other action necessary to restore the project waters, lands, and facilities remaining within the project boundary to a condition satisfactory to the United States agency having jurisdiction over its lands or the Commission's authorized representative, as appropriate, or to provide for the continued operation and maintenance of nonpower facilities and fulfill such other obligations under the license as the Commission may prescribe. In addition, the Commission in its discretion, after notice and opportunity for hearing, may also agree to the surrender of the license when the Commission, for the reasons recited herein, deems it to be the intent of the Licensee to surrender the license.

Article 31. The right of the Licensee and of its successors and assigns to use or occupy waters over which the United States has jurisdiction, or lands of the United States under the license, for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless the Licensee has obtained a new license pursuant to the then existing laws and regulations, or an annual license under the terms and conditions of this license.

Article 32. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.