

PRE-APPLICATION DOCUMENT

GREEN LAKE HYDROELECTRIC PROJECT (MINOR) NEW LICENSE EXISTING DAM FERC No. 7189



Prepared for:

**Green Lake Water Power Company
Ellsworth, Maine**

Prepared by:

Kleinschmidt

Pittsfield, Maine
www.KleinschmidtGroup.com

March 29, 2019

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FERC PROJECT NO. 7189**

**GREEN LAKE WATER POWER COMPANY
ELLSWORTH, MAINE**

PRE-APPLICATION DOCUMENT

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DEFINITIONS OF TERMS, ACRONYMS, AND ABBREVIATIONS

APE	Area of Potential Effect as pertaining to Section 106 of the National Historic Preservation Act
Applicant	Green Lake Water Power Company
BIA	Bureau of Indian Affairs
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
DEA	Draft Environmental Assessment
DLA	Draft License Application
DO	dissolved oxygen
DOI	U.S. Department of Interior
DSSMP	Dam Safety Surveillance and Monitoring Program and Report
EA	Environmental Assessment
EAP	Emergency Action Plan
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EL	Elevation
ESA	Endangered Species Act
FEA	Final Environmental Assessment
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FLA	Final License Application
FOIA	Freedom of Information Act
FPA	Federal Power Act
GIS	Geographic Information Systems
GLNFH	Green Lake National Fish Hatchery
GLWP	Green Lake Water Power Company, the Applicant
GWh	Gigawatt-hour (equals one thousand megawatt-hours)
Hp	Horsepower
Hz	hertz (cycles per second)
HPMP	Historic Properties Management Plan
ILP	Integrated Licensing Process
Impoundment	Water stored in a reservoir, or the act or characteristic of storing water
Installed Capacity	The nameplate MW rating of a generator or group of generators

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Interested Parties	The broad group of individuals and entities that have an interest in a proceeding
kV	Kilovolts
KVA	Kilovolt amps
kW	kilowatt
kWh	kilowatt-hour
License Application	Application for New License submitted to FERC no less than two years in advance of expiration of an existing license. See DLA
Licensee	Green Lake Water Power Company
MDACF	Maine Department of Agriculture, Conservation, and Forestry
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries & Wildlife
MDMR	Maine Department of Marine Resources
MHPC	Maine Historic Preservation Commission
MNAP	Maine Natural Areas Program
MOT	Maine Office of Tourism
MSCORP	Maine State Comprehensive Outdoor Recreation Plan
MW	megawatt
MWh	megawatt-hour (equals one thousand kilowatt-hours)
NEPA	National Environmental Policy Act
NGO	Non-governmental organization
NMFS	National Marine Fisheries Services, same as NOAA Fisheries
NOAA Fisheries	NOAA National Oceanic and Atmospheric Administration Marine Fisheries Service, same as NMFS
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NOI	Notice of Intent
Normal Operating Capacity	The maximum MW output of a generator or group of generators under normal maximum head and flow conditions
NWI	National Wetlands Inventory
NWS	National Weather Service, part of NOAA
PAD	Pre-Application Document
Penstock	An inclined pressurized pipe through which water flows from a forebay or tunnel to the powerhouse turbine
PDF	Portable Document Format
PM&E	Protection, Mitigation and Enhancement Measures
Project	FERC Project No. 7189, Green Lake Project
Project Area	The area within the FERC Project Boundary

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Project Boundary	The boundary line defined in the Project license issued by FERC that surrounds those areas needed for operation of the Project. In the case of the Green Lake Hydroelectric Project, the project boundary encompasses the impoundment up to 6.1 miles upstream. The project boundary includes the bypass reach and encloses the dam, and the powerhouse.
Project Impoundment	The water body whose surface elevation is controlled by the project dam, Green Lake.
Project Vicinity	The general geographic area in which the Project is located; for this PAD, Ellsworth, Maine
Relicensing	The process of acquiring a new FERC license for an existing hydroelectric Project upon expiration of the existing FERC license
Relicensing Participants	Individuals and entities that are actively participating in a proceeding
Resource Affected Area	The geographic area in which a specific resource is potentially affected by the Project
RM	River mile
SD	Scoping Document
Service List	A list maintained by FERC of parties who have formally intervened in a proceeding. In relicensing, there is no Service List until the license application is filed and accepted by FERC. Once FERC establishes a Service List, any documents filed with FERC must also be sent to the Service List
SHPO	State Historic Preservation Officer
STID	Supporting Technical Information Documents
Tailrace	Channel through which water is discharged from the powerhouse turbines
T&E Species	Threatened and endangered species, which for purposes of this PAD is defined to include (1) all botanical species listed as threatened or endangered identified as occurring within the project boundary or immediate vicinity by the MNAP; (2) all wildlife species listed as threatened or endangered identified as occurring within Hancock County by the MDIFW; (3) all federal wildlife species listed as threatened or endangered for Hancock County identified by the USFWS and NMFS and (4) species identified during other surveys or through consultation with the resource agencies. Special status species includes the federally protected bald eagle (<i>Haliaeetus leucocephalus</i>) and Osprey (<i>Pandion haliaetus</i>).
THPO	Tribal Historic Preservation Officer
TLP	Traditional Licensing Process
TU	Trout Unlimited
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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Watershed	The land area that drains through the outlet of Green Lake
WQC	Water Quality Certificate

**GREEN LAKE HYDROELECTRIC PROJECT
FERC PROJECT NO. 7189**

**GREEN LAKE WATER POWER COMPANY
ELLSWORTH, MAINE**

PRE-APPLICATION DOCUMENT

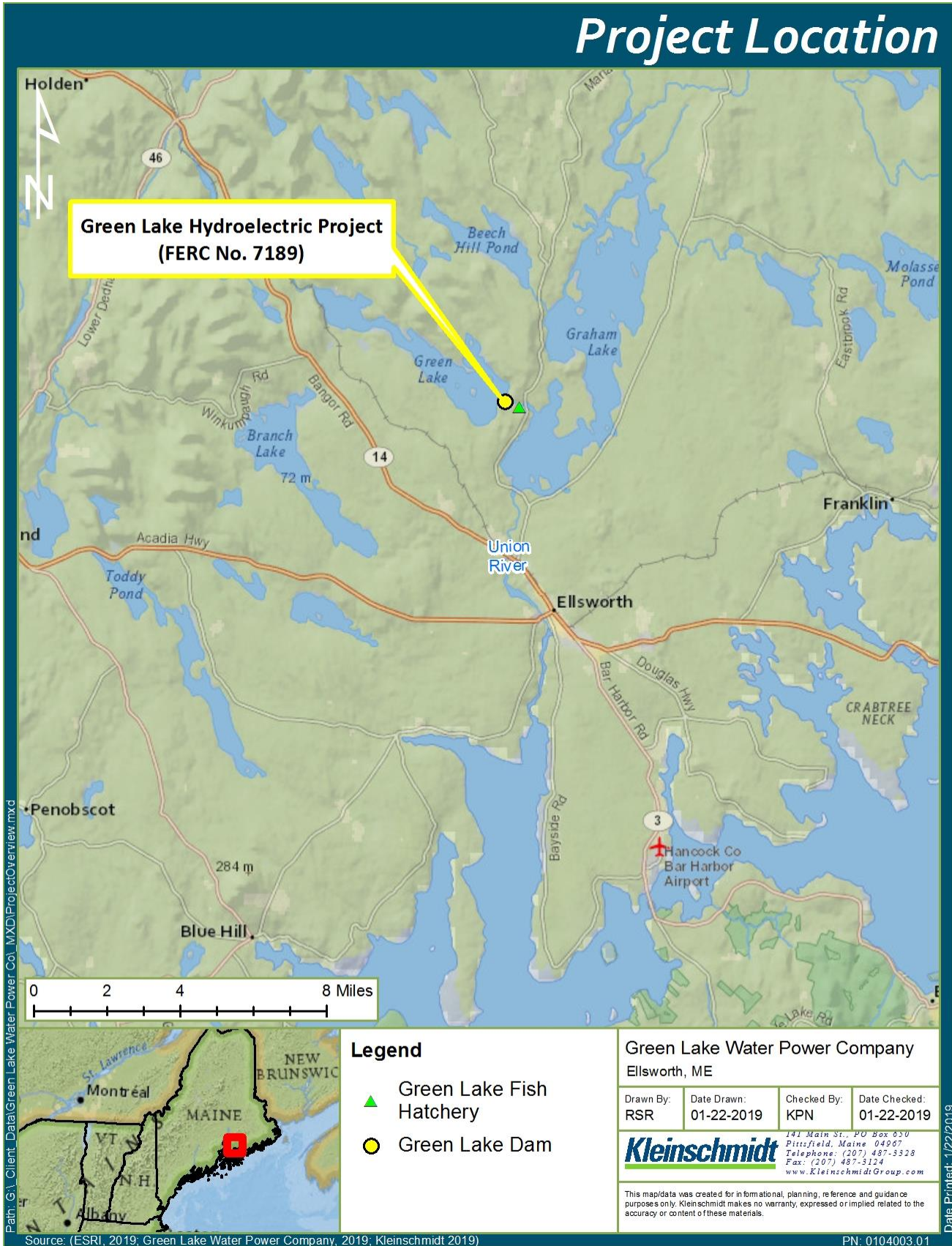
1.0 INTRODUCTION

Green Lake Water Power Company (GLWP) is filing with the Federal Energy Regulatory Commission (FERC or Commission) its Notification of Intent (NOI) to relicense and the required Pre-Application Document (PAD) for the 500 kW Green Lake Dam Hydroelectric Project (FERC No. 7189) (Project). The Project is located on Green Lake and Reeds Brook near the City of Ellsworth, Hancock County, Maine.

GLWP provides this PAD as required by Title 18 § 5.6 and §16.8 of the U.S. Code of Federal Regulations (CFR). This PAD accompanies GLWP's NOI to seek a new license for the Project. GLWP distributed this PAD and NOI simultaneously to federal and state resource agencies, local governments, Native American tribes, members of the public, and others interested in the relicensing proceeding. Appendix A provides the distribution list for the NOI and PAD. As specified in 18 CFR § 5.6 (c) and (d) the PAD provides FERC and the entities listed above with summaries of existing, relevant, and reasonably available information related to the Project that is in the Licensee's possession or was obtained through due diligence.

The information presented in this PAD provides participants in this relicensing the information necessary to identify issues and related information needs; to develop study requests and study plans; and to prepare documents analyzing GLWP's Application for Subsequent License (License Application) that will be filed with FERC on or before March 31, 2022. The PAD is also a precursor to the environmental analysis section of the License Application and to FERC's Scoping Documents and Environmental Impact Statement (EIS) or Environmental Assessment (EA) under the National Environmental Policy Act (NEPA). Filing the PAD concurrently with the NOI enables those who plan to participate in the relicensing to familiarize themselves with the Project at the start of the proceeding. This familiarity will lead to enhanced success of FERC's scoping process.

FIGURE 1-1 GREEN LAKE PROJECT LOCATION MAP



1.1 AGENTS FOR GREEN LAKE WATER POWER COMPANY

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

Caroline Kleinschmidt
Green Lake Water Power Company
120 Hatchery Way
Ellsworth, ME 04605
Phone: (425) 553-6718
Email: : caroline@greenlakewaterpower.com

1.2 PAD CONTENT

This PAD follows the content and form requirements of 18 CFR § 5.6 (c) and (d), with minor changes in form for enhanced readability. The PAD contains all of the information required by 18 CFR § 5.6 (c) and (d) for distribution to Federal and state resource agencies, local governments, Native American tribes, members of the public, and others likely to be interested in the relicensing proceeding. Appendix B contains drawings of Project works that meet the definition of Critical Energy Infrastructure Information (CEII) pursuant to FERC’s June 23, 2003 Order No. 630-A. Consistent with that order, GLWP is distributing Appendix B only to FERC.

The PAD is organized as follows:

- Table of Contents; List of Tables; List of Figures; List of Appendices; List of Photographs; and Definitions of Terms, Acronyms, and Abbreviations.
- Section 1.0 – Introduction and Background Information.
- Section 2.0 – Process Plan and Schedule, Communications Protocol, and TLP Flow Chart, per 18 CFR § 5.6(d)(1).
- Section 3.0 – General Description of the Green Lake basin, per 18 CFR § 5.6(d)(3)(xiii).
- Section 4.0 – Description of Project Location, Facilities, and Operation, per 18 CFR § 5.6(d)(2).
- Section 5.0 – Description of the Existing Environment by Resource Area, per 18 CFR § 5.6(d)(3)(ii)-(xii).
- Section 6.0 – Description of Impacts, Issues, Study and Information Needs, Resource Measures, and Existing Plans, per 18 CFR § 5.6(d)(3) and (4).
- Appendices:
 - Appendix A – Distribution List
 - Appendix B – Design Drawings (CEII)
 - Appendix C – Process Plan and Schedule, per 18 CFR § 5.6(d)(1)
 - Appendix D – Current License Requirements
 - Appendix E – Flow Duration Curves
 - Appendix F – Stakeholder Responses

1.3 REFERENCES

Federal Energy Regulatory Commission (FERC). 1984 Order Issuing License (Minor) for Green Lake Hydroelectric Project (FERC No. 7189). 27 FERC ¶62,023. Issued April 5, 1984.

2.0 PLANS, SCHEDULE, AND PROTOCOLS

18 CFR 5.6(d)(1) requires "The pre-application document must include a plan and schedule for all pre-application activity that incorporates the time frames for pre-filing consultation, information gathering, and studies set forth in this part. The plan and schedule must include a proposed location and date for the scoping meeting and site visit required by §5.8(b)(3)(viii)."

In its NOI, GLWP requests FERC's approval to use the Traditional Licensing Process (TLP) for the Project. The TLP has three stages (18 CFR 4.38). The first stage involves coordination between the Applicant, resource agencies, affected Indian tribes, and the public and includes the sharing of project information, notification of interested parties, and study planning and implementation using the PAD. The second stage involves study implementation and additional data gathering as well as development of a Draft License Application (DLA) and review of the Draft License Application by resource agencies and optionally, FERC. The third stage commences with the filing of the Final License Application (FLA), whereby FERC initiates its own review and public comment process, ultimately issuing a license for the Project. Figure 2-1 depicts the regulatory milestones of the TLP.

2.1 PROCESS PLAN AND SCHEDULE THROUGH FILING OF LICENSE APPLICATION

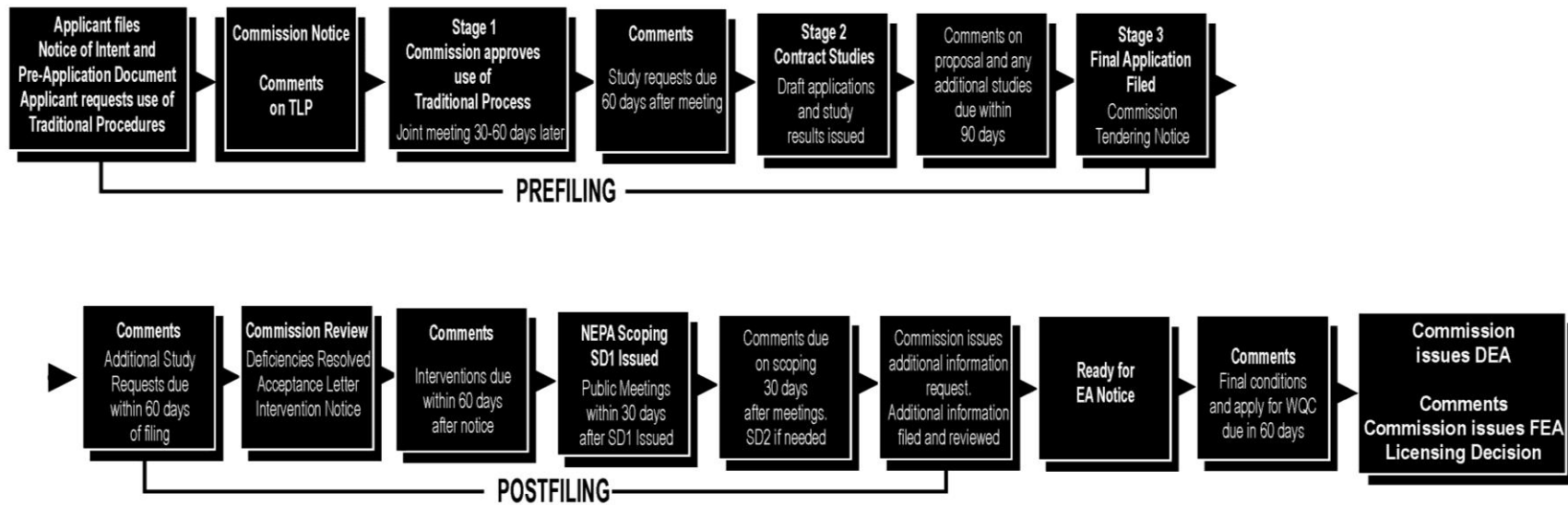
The Process Plan and Schedule outlines actions by FERC, GLWP, and other participants in the relicensing process through filing of the FLA. Appendix C provides a Process Plan and Schedule for the TLP and is based upon the License Application filing deadline of March 31, 2022 for the Green Lake Hydroelectric Project and all subsequent dates given derive from this date. The Final License Application must be filed no later than two years before license expiration, but could be filed earlier. The following diagram prepared by FERC and provided as Figure 2-1 illustrates the TLP pursuant to 18 CFR 4.38.

The Process Plan and Schedule includes an anticipated Joint Agency Meeting and site visit in the June/July 2019 timeframe, to be held at a location determined to be mutually convenient for the stakeholders. GLWP will issue a public notice prior to the meeting.

FIGURE 2-1 TLP PROCESS FLOW CHART

TRADITIONAL LICENSING PROCESS

Figure 2. Traditional Licensing Process



Source: FERC, 2004

2.2 PROPOSED COMMUNICATIONS PROTOCOLS

Effective communication is essential for a timely, cost-effective relicensing. GLWP anticipates that the primary means of communication will be electronically, via telephone, or in meetings.

2.2.1 PARTIES TO THE RELICENSING

Under FERC proceedings, participating individuals typically are identified as one of two groups: a) Interested Parties, which is the broad group of individuals and entities that may have an interest in a proceeding, including Native American tribes, agencies, groups and individuals that may wish to participate in the licensing process and are sometimes referred to as "stakeholders" and b) Relicensing Participants, which is a subset of Interested Parties and consists of individuals and entities that are actively participating in a proceeding, such as by participating on committees. Relicensing Participants may receive additional communications relative to the specific activity or function. Any Interested Party may elect to be a Relicensing Participant by request to GLWP.

FERC also maintains a mailing list of Interested Parties, on which the applicant's mailing list is typically based. FERC generally integrates the licensee's Interested Parties mailing list with their own once the relicensing process has started. Once the FLA is filed with the FERC, FERC will establish an official Service List for parties who formally intervene in the proceeding. Typically, this is comprised of the Relicensing Participants who have been recognized by FERC as official parties.

2.2.2 GENERAL COMMUNICATIONS

Communications include written correspondence, emails, and notes from individual and conference telephone calls. GLWP's goal is to keep the lines of communication open during the relicensing process and make it easy for Interested Parties, Relicensing Participants and the public to get information related to the relicensing and the interests of other stakeholders.

2.2.2.1 TELEPHONE

GLWP anticipates that telephone calls among Interested Parties and Licensing Participants will be treated informally, with no specific documentation unless specifically agreed upon in the discussion or as part of formal agency consultation proceedings.

GLWP anticipates that FERC will distribute to the FERC Project No. 7189 Mailing List summaries of any informal decisional telephone calls in which it participates prior to acceptance of the FLA.

2.2.2.2 ELECTRONIC COMMUNICATIONS

GLWP anticipates distribution of relevant documents and submittal of comments, correspondence, and study requests from agencies will be conducted primarily electronically (either by electronic filing of documents with the FERC and/or via email distribution). In addition, some formal agency consultation proceedings and correspondence may, as a matter of convenience and expediency, occur electronically or via email. GLWP will maintain documentation of all correspondence as part of formal agency consultation proceedings.

The Commission makes information available to the public via the Internet through eLibrary, a records information system that contains documents submitted to and issued by the FERC. Documents filed with the FERC as part of the Project's licensing process are available for viewing and printing via eLibrary, accessed through the Commission's homepage or directly at <http://www.ferc.gov/docsfilings/elibrary.asp> (Docket P-7189). Interested Parties and Relicensing Participants can also subscribe to the docket for the Project under eSubscription and be sent notices of issuances and filings by email. Instructions for subscribing to the electronic FERC docket for the Green Lake Dam Project are provided on FERC's website at <http://www.ferc.gov/docs-filing/esubscription.asp>.

2.2.2.3 MEETINGS

GLWP will work with all Interested Parties to develop meeting schedules that include practical locations and times to accommodate the majority of participants. In general, GLWP will schedule meetings between the hours of 9:00 a.m. and 4:00 p.m. GLWP will make every effort to begin and end meetings on time.

GLWP will notify all Interested Parties at least two weeks in advance of the next planned public meeting.

2.2.3 DOCUMENTS

GLWP will maintain copies of all mailing lists, announcements, notices, communications, and other documents related to the relicensing of the Project at the GLWP office in Ellsworth, Maine. GLWP will regularly update the public files to ensure the public has the latest information related to the relicensing process available to them and that all public documents are available. Anyone may obtain documents by contacting:

Caroline Kleinschmidt
Green Lake Water Power Company
120 Hatchery Way
Ellsworth, ME 04605

Phone: (425) 553-6718
Email: caroline@greenlakewaterpower.com

As discussed above, documents submitted to and issued by the FERC for the Project are available through eLibrary under Docket P-7189 (<http://www.ferc.gov/docsfilings/elibrary.asp>). In addition, all materials filed with or issued by the FERC will be available for review and copying at the FERC offices in Washington, DC:

Federal Energy Regulatory Commission
Public Reference Room, Room 2-A
Attn: Secretary
888 First Street, N.E.
Washington, D.C. 20426

2.2.3.1 PUBLIC REFERENCE FILE

The public reference file is a listing of important materials pertaining to the relicensing. This includes background reference material as well as the consultation record, all relevant studies and data collected during the development of the PAD, meeting summaries, notices, reports as well as Project documents such as the current FERC license.

GLWP will maintain public reference files on the Green Lake Hydroelectric Project. These will be available for download at <https://greenlakewaterpower.com>

For a nominal copying fee, hard copies of all documents are available upon request.

All communications added to the public reference file will be available to the public consistent with the public records procedures set forth in the Freedom of Information Act (FOIA).

2.2.3.2 RESTRICTED DOCUMENTS

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

Information related to protecting sensitive archaeological or other culturally important information is also restricted under Section 106 of the National Historic Preservation Act (NHPA)¹ as amended and its implementing regulations (36 CFR 800). In addition, information related to threatened and endangered species are protected under Section 7 of the Endangered Species Act (ESA). Anyone seeking this information from FERC must file a FOIA request. Instructions for FOIA are available on FERC's website at www.ferc.gov/legal/ceii-foia/foia.asp.

2.2.3.3 MAILING LISTS

GLWP will maintain a Relicensing Mailing List of all Interested Parties including Relicensing Participants (Appendix A). The list will include both standard U.S. Post Office addresses and available email addresses for distributing notices and documents for public review (Table 2-1).

FERC also maintains a mailing list of Interested Parties for the Project (Appendix A). GLWP anticipates that once the relicensing proceeding begins, GLWP's Relicensing Mailing List and FERC's Mailing List will be consolidated into one common list. After GLWP files the FLA, FERC will establish an official Service List (Table 2-1) for parties who formally intervene in the proceeding. Once FERC establishes a Service List, any written documents filed with FERC must also be sent to the Service List. A Certificate of Service must be included with the document filed with FERC.

¹ Section 106 of the NHPA of 1966, as amended, 54 U.S.C. § 306108, Pub. L. No. 113-287, 128 Stat. 3188 (2014). The NHPA was recodified in Title 54 in December 2014.

**TABLE 2-1 MAILING LISTS FOR THE GREEN LAKE HYDROELECTRIC PROJECT
RELICENSING FERC PROJECT NO. 7189**

ENTITY	TYPE	DESCRIPTION
GLWP	Project No.7189 Interested Parties Relicensing Mailing List	A list of Interested Parties prepared by Licensee in anticipation of the Project relicensing proceeding.
FERC	Project No. 7189 Mailing List	A mailing list of Interested Parties prepared and maintained by FERC throughout the Project relicensing proceeding.
FERC	Project No. 7189 Service List	A mailing list of parties that have formally intervened in the relicensing proceeding, prepared and maintained by FERC after it accepts the License Application.

2.2.3.4 DOCUMENT DISTRIBUTION

GLWP will distribute, whenever possible, all documents electronically in standard MS Word format or PDF, either via email or on CD. GLWP may distribute hard copies of some documents for convenience or by request. Distribution of information will follow the guidelines presented below (Table 2-2).

TABLE 2-2 DOCUMENT DISTRIBUTION FOR THE GREEN LAKE RELICENSING FERC PROJECT NO. 7189

DOCUMENT	METHOD	DISTRIBUTION
Public Meeting Notices	Email or U.S. Mail* and Newspaper	Public and all Potential Interested Parties
Meeting Agendas	Email or US Mail*	Interested Parties
Meeting Summaries	Email or US Mail*	On Request
Process Plan & Schedule	Email or US Mail*	On Request
Major Documents: Proposed Study Plans, Study Reports, Draft License Application, Final License Application, etc.	Email or US Mail*	Notice of availability by US Mail or Email to Interested Parties and/or Major documents on CD to Relicensing Participants
PAD support documents	GLWP office	On Request
Written Communications	Email or US Mail*	On Request

*US Mail service by special request.

2.2.4 STUDY REQUESTS

In the development of the PAD, GLWP has used information gathered in consultation with agencies on the Draft Biological Assessment and Species Protection Plan to identify areas where there is little or no information relevant to issues of potential concern for Project effects to the human and natural environments. However, stakeholders may identify and request additional studies for consideration. As specified by CFR 18, § 5.9(b), any study request must:

- Describe the goals and objectives of each study proposal and the information to be obtained.
- If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.
- If the requestor is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.
- Describe existing information concerning the subject of the study proposal, and the need for additional information.
- Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.
- Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.
- Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The requestor should also describe any available cost-share funds or in-kind services that the sponsor of the request may contribute towards the study effort.

Email or mail completed study requests in MS Word or PDF format to:

Caroline Kleinschmidt
Green Lake Water Power Company
120 Hatchery Way
Ellsworth, ME 04605

Phone: (425) 553-6718
Email: caroline@greenlakewaterpower.com

2.3 REFERENCES

Federal Energy Regulatory Commission (FERC). 2004. Handbook for Hydroelectric Project Licensing and 5 MW Exemptions from Licensing. [Online] URL: http://www.ferc.gov/industries/hydropower/gen-info/handbooks/licensing_handbook.pdf. Accessed January 22, 2018.

3.0 GENERAL DESCRIPTION OF RIVER BASIN

18 CFR 5.6(d)(3)(xiii) requires "A general description of the river basin or sub-basin, as appropriate, in which the proposed project is located, including information on: (A) the area of the river basin or sub-basin and length of stream reaches therein; (B) Major land and water uses in the project area; (C) all dams and diversion structures in the basin or sub-basin, regardless of function; and (D) Tributary rivers and streams, the resources of which are or may be affected by project operations."

3.1 OVERVIEW

The Green Lake Dam Hydroelectric Project (FERC No. 7189) is located on Green Lake and Reeds Brook near the City of Ellsworth, Hancock County, Maine. The Project intake is at the Green Lake dam and the tailrace discharges into Reeds Brook near Graham Lake. The Green Lake drainage area is part of the Union River watershed.

The Union River watershed has an area of 547 square miles. Within that area, the Green Lake watershed has an area of 45 square miles. Green Lake stretches 6.1 miles from the dam to the northwest end of the lake.

Reeds Brook flows 1497 feet from Green Lake to Graham Lake, dropping 55.8 feet in the process, with both Green Lake and Graham Lake at normal high water.

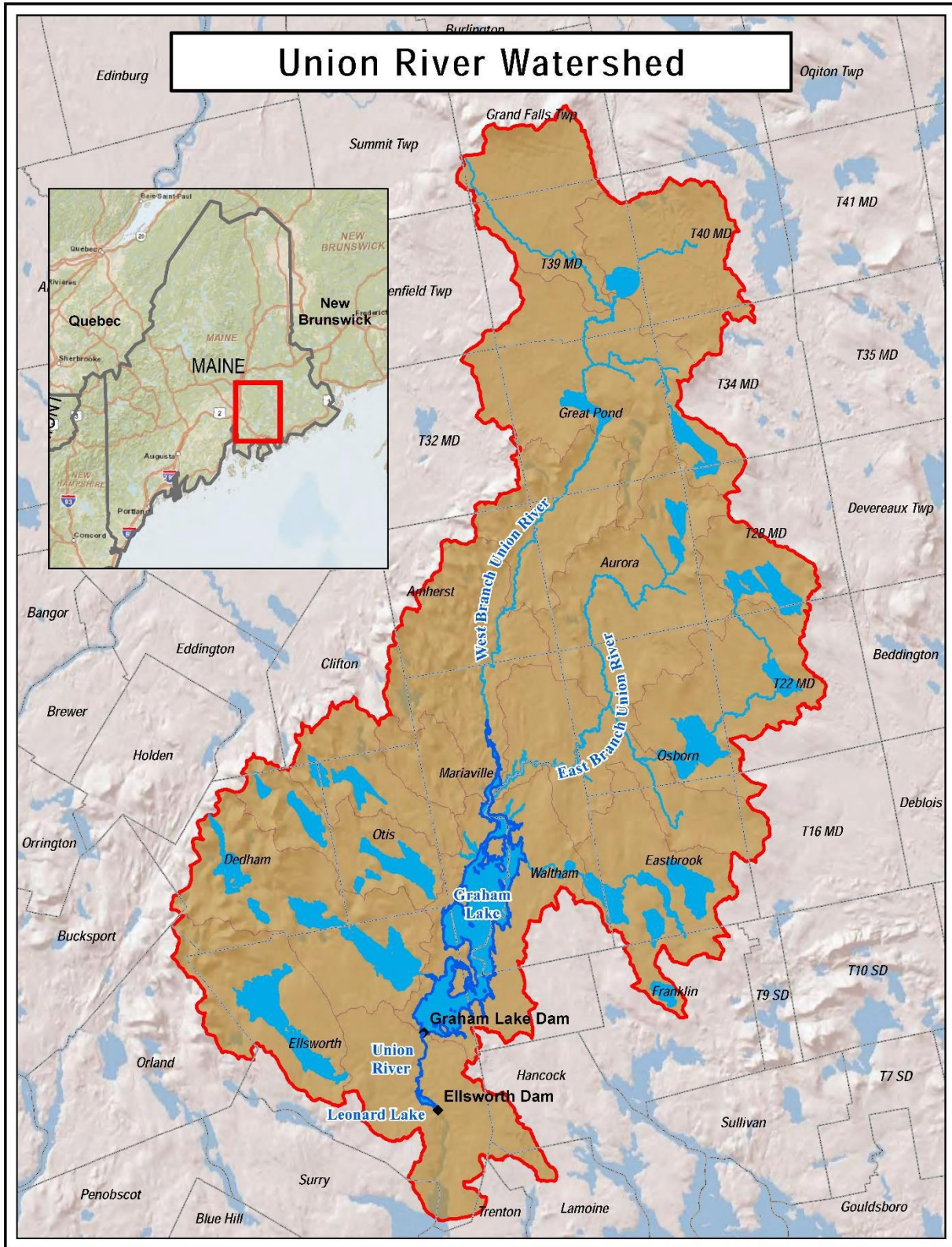
The following ponds and associated wetlands drain into Green Lake via streams:

- Hatcase Pond
- Mountainy Pond
- Little Burnt Pond
- Rocky Pond
- Wormwood Pond
- Little Duck Pond
- Little Rocky Pond
- Goose Pond

These ponds and wetlands absorb precipitation and have a large effect on the quantity and timing of rain runoff into Green Lake. Small amounts of precipitation result in little new water in Green Lake beyond that which falls directly on the lake. Larger amounts of precipitation cause disproportionately larger amounts of runoff—the actual amount depending on season, weather, and prior precipitation.

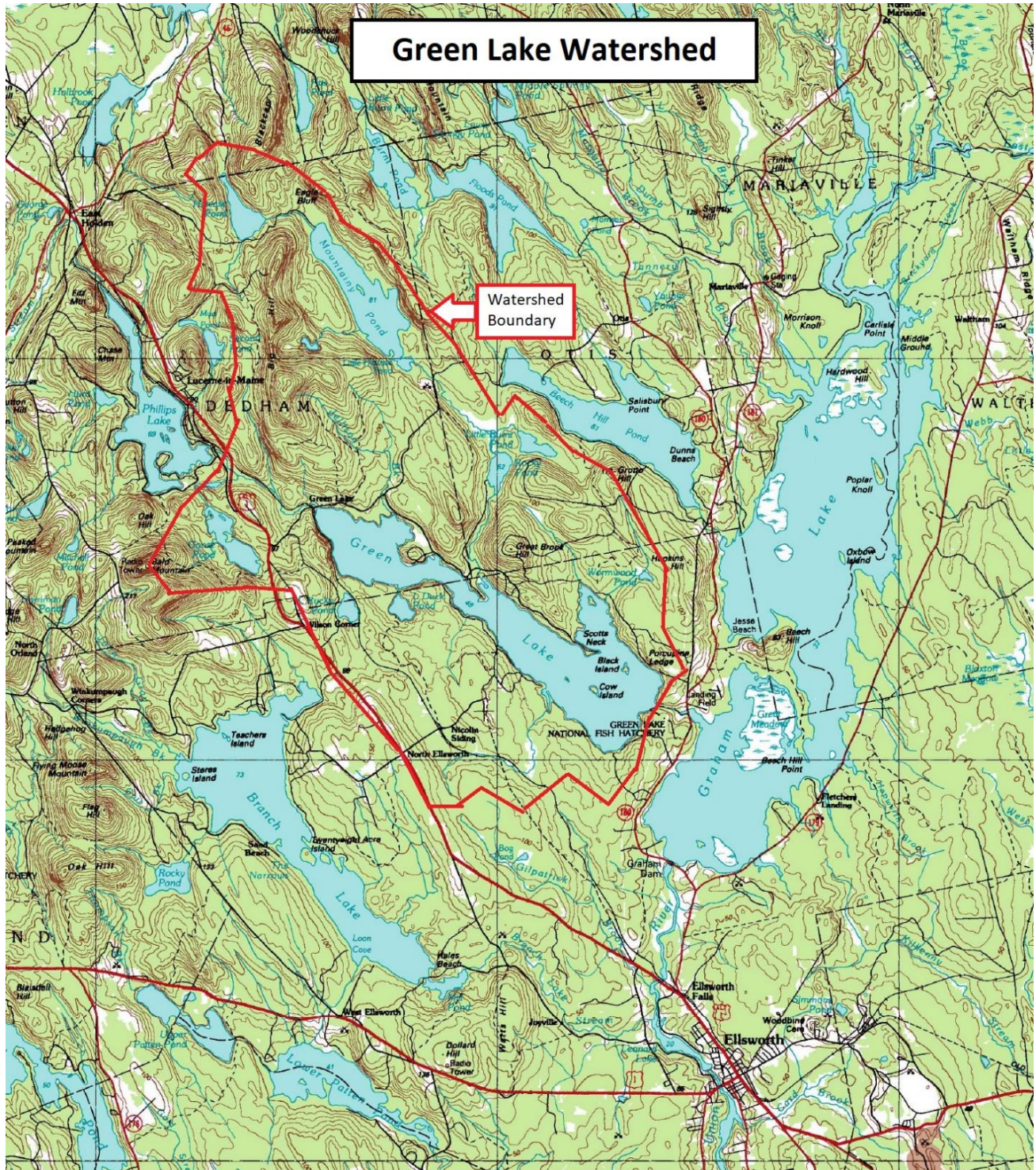
Ellsworth Hydroelectric's Union River Watershed map includes Phillips Lake. USGS maps show both Mann Brook and Mill Stream as possible outlets for Phillips Lake. GLWP conducted a field survey and determined that there was a large flow of water north from Phillips Lake into Mill Stream and, on the ground, Mann Brook does not appear to connect in any meaningful way with Phillips Lake. Because of this GLWP concluded Phillips lake drains to the north, away from the Union river, and is not part of the Green Lake Watershed.

FIGURE 3-1 UNION RIVER BASIN



Source: Ellsworth Hydroelectric Project (FERC No. 2727) License application, Dec-2015

FIGURE 3-2 PROJECT DRAINAGE AREA



Source: GLWP and USGS Map 44068-E1-TM-100, "Bangor, Maine", 1994 Revision

3.2 MAJOR LAND USES

Most of the land in the Green Lake watershed is used for tree growth. Some rural residential, seasonal recreational and commercial uses are also found within the drainage area.

3.3 MAJOR WATER USES

Significant water in the Green Lake watershed is used naturally for tree growth. Some is also used by seasonal lake residents as the source of water in seasonal camps. The largest users of water from Green Lake are the Green Lake Water Power Project (about 90 cfs when running) and the Green Lake National Fish Hatchery (up to 30 cfs).

TABLE 3-1 HYDRO PROJECTS UPSTREAM AND DOWNSTREAM FROM THE PROJECT

PROJECT	OWNER	WATERBODY
Ellsworth (FERC No. 2727)	Brookfield	Union River

Source: FERC Website, <https://www.ferc.gov/industries/hydropower/gen-info/licensing/active-licenses.xls?csrt=16048373010205709392>

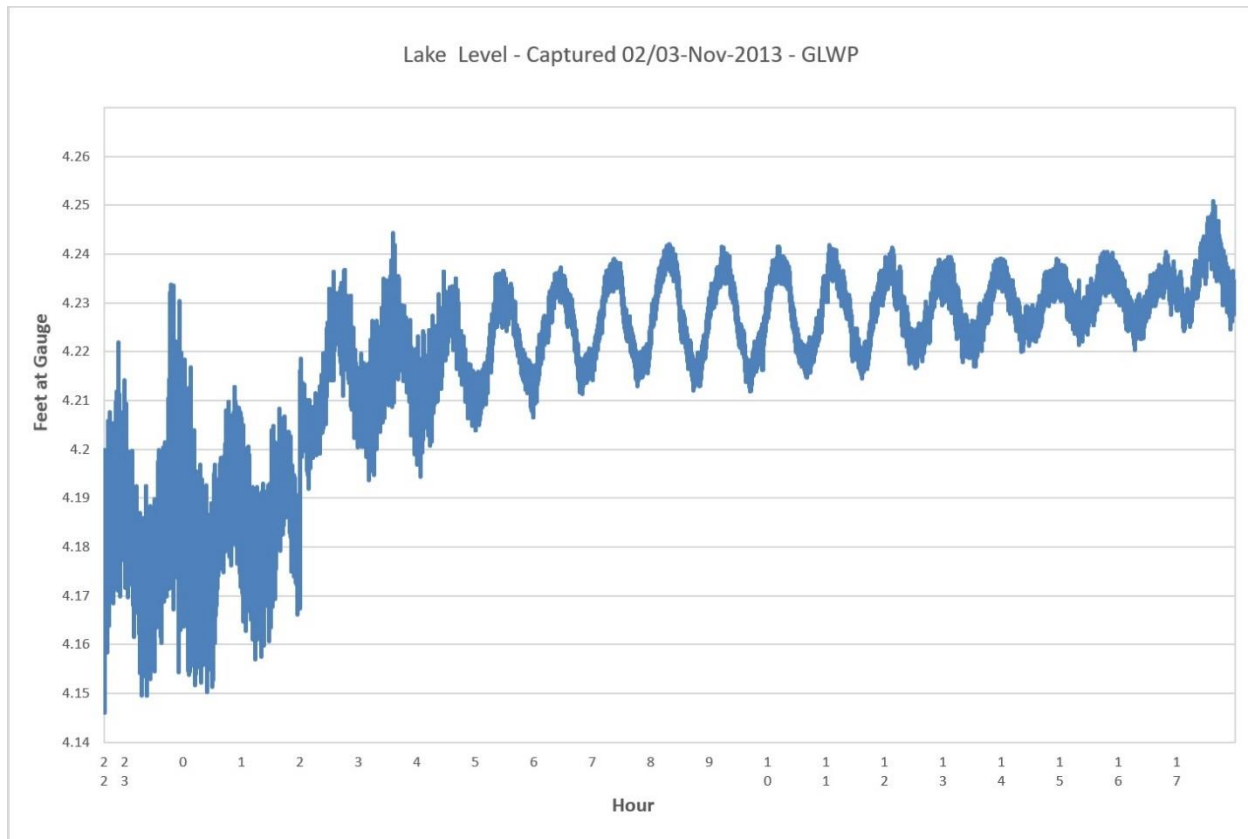
3.4 PROJECT RESERVOIR AND STORAGE

The Green Lake Water Power Project dam is located at the outlet of Green Lake and head of Reeds Brook. Depending on season, the Project uses up to 3.2 feet of drawdown on Green Lake, amounting to approximately 10,000 acre-feet of water. This corresponds to drawing the lake down from a full level of 160.7 USGS to a minimum level of 157.5 feet.

During the summer season, from 01-June to Labor Day weekend, recreational uses of the lake are given priority. During this season the maximum level of 160.7 remains the same, but the minimum level is increased to 159.7. This one foot of water gives a potential storage of up to approximately 3085 acre-feet during the summer. In practice, with only a foot of allowed range on the lake, some of this storage cannot be used effectively. During a typical summer, the GLWP must stop generating with the lake at a level near the middle of the one-foot range. This reduces the risk Green Lake will drop below the summer minimum level by Labor Day weekend from a lack of rain.

Accurately measuring the level of Green Lake has proven to be challenging. Lake level readings showed changes from day to day that were inconsistent with inflow and outflow conditions. GLWP undertook a study to determine why. One theory for unexpected lake level changes was that storm surge had an appreciable effect on lake level readings. Another was that there were long period standing waves in the lake from shallow water waves flowing up and back in the lake, reflecting off each end of the lake. To get an order of magnitude of what to look for, GLWP calculated the approximate period of such a wave, using an average depth of 44 feet for Green Lake and a length of 6.1 miles, as 30 minutes. Using a temporary pressure transducer and logging hardware produced the following graph:

FIGURE 3-3 STORM SURGE AND STANDING WAVES IN GREEN LAKE



Source: GLWP, 2013

During the period of this graph no appreciable precipitation was recorded, the turbine did not operate, and the gates at the dam were closed, but the GLNFH was drawing water from Green Lake. An inch of precipitation was received the day before, but the previous appreciable precipitation was about 40 days earlier. The lake level was expected to be basically stable.

Several things can be seen on the graph. A change in overall lake level can be seen between 2:00 and 3:00 am, this corresponds to a shift in the wind direction and/or strength. The width of the “line” reflects the magnitude of the wind waves on the lake. The waves had diminished considerably by 5am, and then started to increase again about 11:00am. Periodic changes in lake level are evident throughout the graph, with a period of slightly less than one hour. The magnitude of the surge effect is about 0.04 feet, and of the oscillations about 0.03 feet. The difference between the lowest and highest level readings on the graph was about 0.10 feet.

From this study, GLWP concluded that both storm surge and standing waves affect the short term water level readings at the dam. Depending on timing, the study concluded that lake level readings on two days could be 0.1 feet or more different, despite the fact that the actual lake level had not changed.

3.5 PROJECT DRAINAGE BASIN TRIBUTARY STREAMS

Most of the streams in the Project drainage basin are quite small, traveling one or two miles before entering the lake. The larger streams are the following:

- Great Brook, which drains Rocky Pond and Little Burnt Pond directly, and Mountainy Pond and Hatcase Pond via Mountainy Pond Brook. With all major forks included, this system of ponds and brooks runs about 11 miles before entering Green Lake.

PHOTO 3-1 GREAT BROOK AT SCOTT'S NECK ROAD



Source of all photos: GLWP 2019 or as marked

PHOTO 3-2 MOUNTAINY POND BROOK AT BEECH HILL POND ROAD



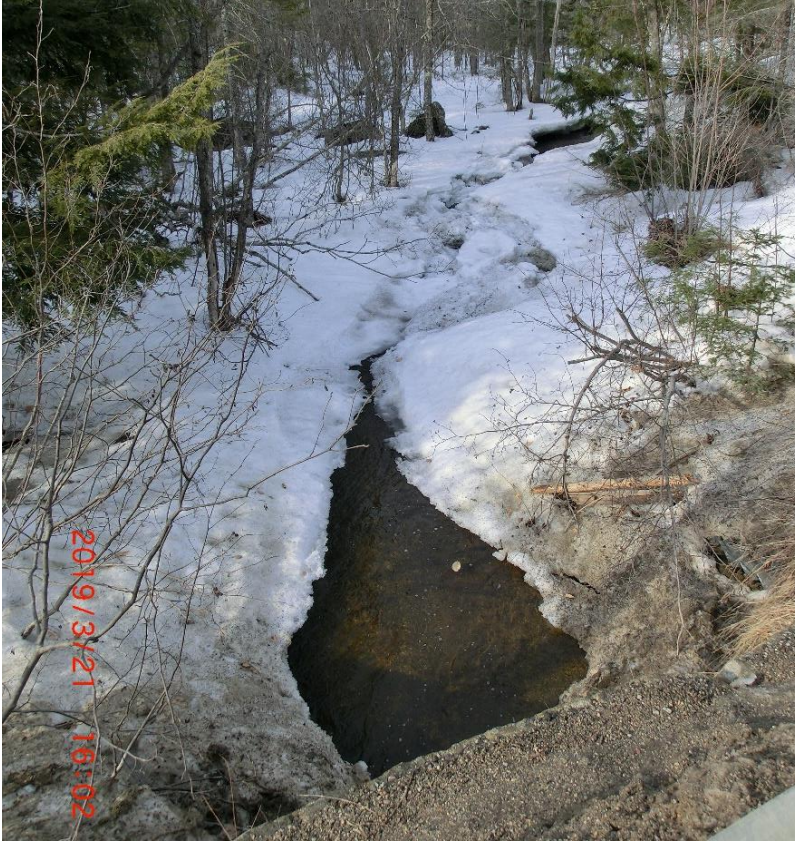
- Mann Brook drains Goose Pond, Mann Bog, Coon Bog. It runs about 6.5 miles including all of its branches.

PHOTO 3-3 MANN BROOK AT GREEN LAKE ROAD



- Jellison Brook runs about 4 miles to Green Lake. It does not drain any ponds.

PHOTO 3-4 JELLISON BROOK AT GREEN LAKE ROAD



- Boggy Brook runs about 3 miles to Green Lake. It does not drain any ponds.

PHOTO 3-5 BOGGY BROOK AT UPPER BOGGY BROOK ROAD



Reeds Brook is the only stream whose water source is affected by Project operation. Reeds Brook starts at the Green Lake Dam and flows about 2000 feet to discharge into Graham Lake. Project operation maintains a flow of greater than one cfs in Reeds Brook just below the Green Lake Dam. Flow in most of Reeds Brook is considerably higher than this because of drainage from the land area between Green and Graham Lakes, and because of water that is discharged continuously as part of the normal operation of the GLNFH filter house.

PHOTO 3-6 GLNFH FILTER OVERFLOW DISCHARGE INTO REEDS BROOK



PHOTO 3-7 REEDS BROOK JUST BELOW GREEN LAKE DAM
Orange hats (non-project) included for scale: hat width 9 inches



PHOTO 3-8 REEDS BROOK BELOW GLNFH FILTER OVERFLOW DISCHARGE



PHOTO 3-9 REEDS BROOK NEAR PROJECT POWER HOUSE AND GRAHAM LAKE



3.6 CLIMATE

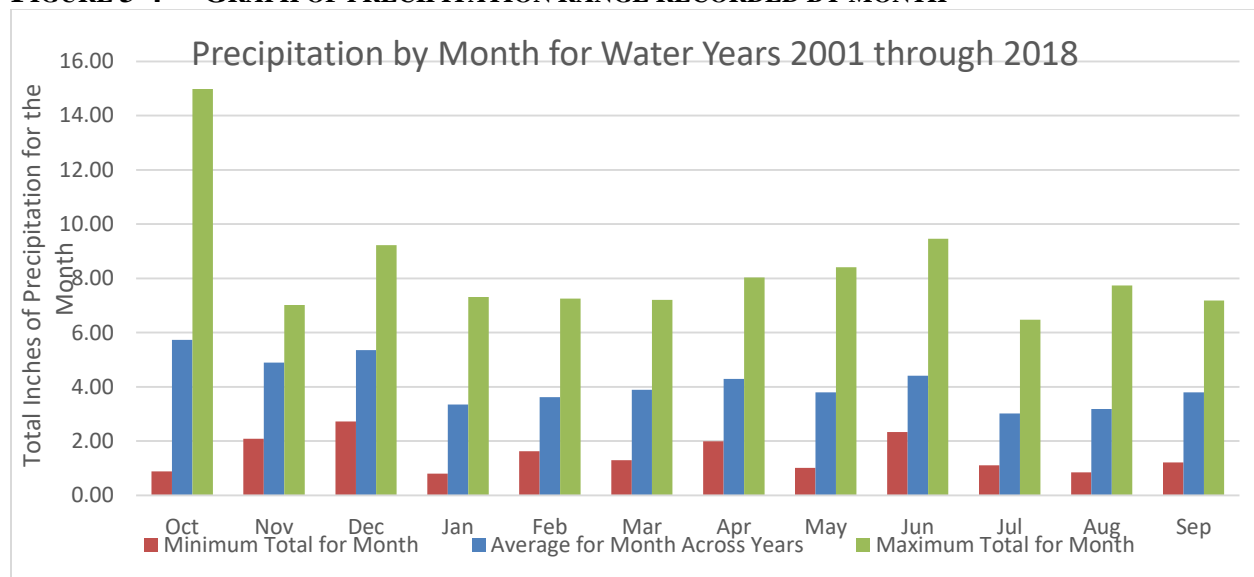
The climate of the Green Lake area is quite varied. Summer and fall can be anything from a severe, extended dry period to a period of frequent, heavy rain. Hurricanes and tropical depressions traveling northeast near the coast can spiral large amounts of moisture inland from the Gulf Stream. With Green Lake located about 30 miles from the ocean, winters are a battle between cold air masses traveling westward from the middle of the country and moist, warm onshore flows from storms. Resulting winter weather can bring snow which accumulates until spring; or snow followed by rain which results in a shallow, dense snow pack; or mostly rain, which results in negligible snow pack, but icy conditions between storms.

A “typical” water year would be damp in the late fall with rain and some snow. Snow starts accumulating from late December. Snow and frost melt and run off into Green Lake around mid-April. Spring rain is intermixed with sunny periods into June, which kicks the trees on the land surrounding Green Lake into full growth. From July through September precipitation is reduced from spring levels--trees are absorbing much of the precipitation that falls on the land surrounding Green Lake. Individual years can vary greatly from this typical scenario.

The hills to the northwest of Green Lake affect the climate of the Green Lake Watershed. Low pressure areas that track northeast near Maine cause a moist airflow from the southeast which condenses and forms rain/snow as it cools from being forced to rise over the hills. The Green Lake Watershed often receives more precipitation from large storms than surrounding areas and than the NWS predicts. Even though the Green Lake Watershed is located between two NWS monitoring and recording stations (the Bar Harbor and Bangor Airports), forecasts and records for these locations are not necessarily a good prediction of Green Lake Watershed precipitation. During the summer, Project experience has been that actual precipitation amounts are often quite a bit less than amounts called for by NWS forecasts 2 to 3 days before the rain.

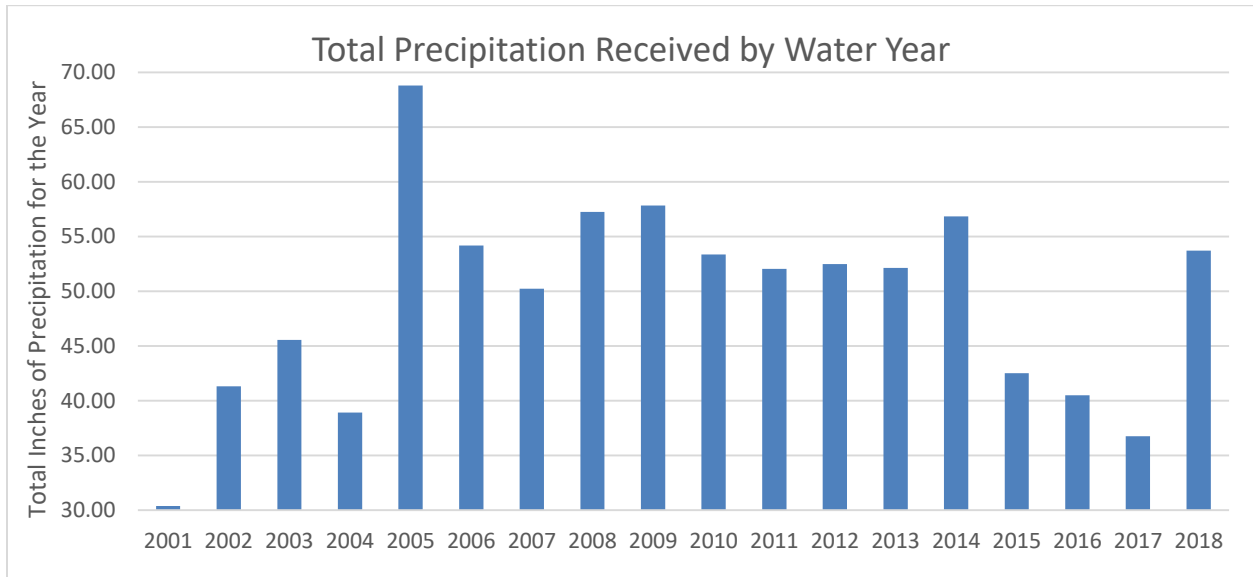
GLWP recorded the following precipitation amounts by month and year over the last eighteen years: (Sources: GLWP Daily Hydrological Logs, 2000 to 2018)

FIGURE 3-4 GRAPH OF PRECIPITATION RANGE RECORDED BY MONTH



Source: GLWP Daily Hydrological Logs, 2000 to 2018

FIGURE 3-5 GRAPH OF TOTAL PRECIPITATION RECORDED BY YEAR



Source: GLWP Daily Hydrological Logs, 2000 to 2018

3.7 REFERENCES

U.S. Geological Survey (USGS) maps, <https://store.usgs.gov/maps>

Bangor, Maine, 1:100k, 1994

Bar Harbor, 1:100k, 1991

Beech Hill Pond, 1:24k, 1981

Branch Lake, 1:24k, 1981

Brewer Lake, 1:24k, 1982

Chemo Pond, 1:24k, 1988

Ellsworth, 1:24k, 1981

Green Lake, 1:24k, 1982

Hopkins Pond, 1:24k, 1988

Veazie, 1:24k, 1988

Ellsworth Hydroelectric Project (FERC No. 2727) License application, Dec-2015,

<https://www.ferc.gov/docs-filing/elibrary.asp>

Lakes of Maine, <https://www.lakesofmaine.org/lake-overview.html?m=4294>

4.0 PROJECT LOCATION, FACILITIES, AND OPERATIONS

4.1 EXISTING PROJECT FACILITIES

18 CFR §5.6(d)(2) requires "detailed description of all existing and proposed project facilities and components; Physical composition, dimensions, general configuration of any dams, spillways, penstocks, canals, powerhouses, tailraces and other structures proposed to be included as part of the project or connected directly to it; normal maximum water surface area and normal maximum water surface elevation (msl), gross storage capacity of any impoundments."

EXISTING FACILITIES

The Green Lake Water Power Project is located on Green Lake and Reeds Brook, six miles north of the City of Ellsworth in Hancock County, Maine. The project includes the dam on Green Lake, an intake structure, a penstock, a powerhouse, two generating units and appurtenant transmission and control facilities.

RESERVOIR

The Green Lake Water Power Company owns the Green Lake Dam as part of the Project. The Project manages the lake level on Green Lake to maintain recreation values, allow a dependable water supply for the Green Lake National Fish Hatchery (GLNFH), and to protect lake trout spawning habitat. The Green Lake dam gates are manually operated. Water is drawn from Green Lake by GLNFH by means of two submerged pipes (non-project) to supply the Hatchery. Up to 30 cfs may be used on a priority basis by the Hatchery.

Green Lake has an area of approximately 2,989 acres. During much of the year, the Project can maintain the water level within a range of 157.9 to 160.7 feet USGS, yielding a maximum usable storage of about 10,000 acre-feet. Net volume from gate sill elevation to full pond (154.0 to 160.7 feet USGS) is approximately 16,000 acre feet.

During the summer, recreational uses of the lake are given priority. The project is allowed to maintain the lake level from 159.7 to 160.7 USGS from 01-June through Labor Day weekend, yielding a maximum storage of about 3,000 acre-feet. In practice, to allow for anticipated dry weather during the late summer, along with the possibility of occasional heavy rain, less than half of this storage amount can be used for turbine operation.

PHOTO 4-1 GREEN LAKE FROM THE DAM



PROJECT STRUCTURES

DAM

The Green Lake dam was built in the early 1900's by the Bangor Hydro-Electric Company for water storage purposes. It was originally a dry stone and timber structure. In the 1960's a concrete gate structure was added, and sheet steel was added to the upstream face of the dam and on the deck to replace deteriorating hemlock planks.

The Green Lake Hydroelectric Project acquired the dam in 1984. As part of the initial Project license a 12' by 15' intake structure was added to the dam, on the southwest side of the dam, adjacent to the concrete gate structure. The intake is protected by 8' wide by 12' trashracks, which have one-inch clear spacing to prevent large debris from passing into the penstock. The structure contains a 5' x 5' headgate and manually operated gate lift.

In the late 1980's the section of the dam between the intake structure and the southwest shore was improved to include a concrete spillway and a flume to safely channel the spillway flow into Reeds Brook. The GLNFH valve house is located approximately 50 feet downstream of the dam on the southwest side of Reeds Brook. The new spillway and flume protect the GLNFH valve house and road from the possibility of inundation by high spillway flow during extreme weather events. The GLNFH draws water from the lake via two concrete lined ductile iron pipes (non-project) beneath the southwest section of the dam.

The dam, as of 2019, is a dry rock, concrete, timber, and sheet steel dam that is a maximum of 7.5 feet high, has a maximum top width of 7 feet, and is approximately 270 feet long. The dam is oriented in the northeast-southwest direction. A concrete gravity dam section 82 feet long makes up the southeast end of the dam. Within this section is an 80 foot spillway channel with a crest elevation of 160.7 feet USGS datum, with fish screens which extend two feet above the crest.

Adjacent to the spillway is the intake structure, described above. Moving northeast along the dam, adjacent to the intake structure is the concrete gate structure. The gate structure is 22.2 feet in length and contains two manually operated gates which measure approximately 6' x 7' each. The gate sill elevation is 154.0 feet USGS datum, which corresponds to the 0.5 foot mark on the staff gauge located next to the gate structure. A concrete walkway and a 14' x 10' steel frame with a 6-ton (or similar) chain hoist for the gates and a 2-ton (or similar) chain hoist for the fish screens are located over the gate section. The deck is at an elevation of 162.5 feet and has a handrail on the downstream side (away from the gates).

The northeast end of the dam is a dry stone, timber, sheet steel, and concrete structure, totaling about 157 feet in length. This section of the dam contains two auxiliary spillways: a 35-foot section adjacent to the gate structure built to elevation 162 feet USGS datum, and a 120-foot section which slopes from elevation 163 feet to 164 feet. The shorter, 35-foot section of auxiliary spillway has a concrete walkway with guardrail.

From Route 180, a one-half mile long road maintained by the GLNFH provides access to the Hatchery facilities, Hatchery water treatment building, pipeline valve pit, and the dam. The Hatchery water pipelines are underground and generally follow the centerline of the road.

PHOTO 4-2 GREEN LAKE DAM FROM THE NORTHWEST



PHOTO 4-3 GREEN LAKE DAM FROM THE SOUTHEAST



PHOTO 4-4 SPILLWAY AND FLUME



PHOTO 4-5 GREEN LAKE DAM GATES



PENSTOCK

The 1,740-foot long penstock is located along the shoulder of the hatchery road. Immediately below the intake structure, approximately 70 feet of 54-inch square (inside dimension) concrete penstock is located partially or completely beneath grade. The next section of penstock is 54-inch diameter reinforced concrete pipe that is 410 feet long. Included is an 8-ft long by 21-ft wide transition block and valve pit which create a transition to a 48-inch diameter round reinforced concrete penstock. The transition block also contains a 24-inch penstock tap and valves to supply water to the Hatchery. The 48" round concrete penstock section is approximately 260 feet long. A minimum of one foot of fill has been placed over this portion of penstock. An 8-foot square concrete transition block is at the end of the 48-inch concrete penstock. From the transition block, 1000 feet of 48-inch diameter wood stave penstock connect to the powerhouse. The wood stave penstock is supported approximately 10 inches above grade by timber cradles at 8-foot intervals. Penstock capacity at the powerhouse is approximately 115 cfs.

PHOTO 4-6 UNDERGROUND PENSTOCK



PHOTO 4-7 WOOD STAVE PENSTOCK



POWERHOUSE

The powerhouse is a reinforced concrete substructure, 27' by 35' in plan, and houses the turbine, generators, switchgear equipment, operator's quarters, and garage. The operator's quarters and garage are housed in a wood frame structure that rests on the concrete ceiling slab of the generator room. The concrete slab contains hatches that allow the turbines and generators to be lifted into the garage. The ceiling area of the garage contains a monorail with a 6-ton capacity chain hoist for lifting the units. This hoist is capable of lifting the heaviest individual component of the main turbine unit.

The powerhouse is located approximately 1,740 feet downstream of the dam, on the south side of Reeds Brook, adjacent to the GLNFH. The powerhouse is a three-story structure built into the existing slope. The site is graded so that only the operator's quarters (upper story) are visible from the south (Hatchery) side. A concrete pad outside the powerhouse supports the transformer.

Two five-foot diameter concrete pipes, extending approximately 50 feet from the powerhouse to Reeds Brook serve as the discharge pipes. The pipes are located below grade, and riprap has been placed around the mouth of the pipes to stabilize the stream bed and bank. An area extending a maximum of approximately 70 feet by 55 feet from the mouth of the discharge pipes has been dredged to improve hydraulic flow. Tailwater elevation varies between El. 98' and El. 104', depending on the level of Graham Lake.

A paved drive, 10 feet wide and approximately 75 feet long, provides access to the powerhouse. This access road connects with the existing Hatchery road at the east end of the Hatchery parking lot.

PHOTO 4-8 POWERHOUSE FROM DRIVE



PHOTO 4-9 POWERHOUSE NORTH SIDE



PHOTO 4-10 MAIN GENERATOR AND TURBINE



PHOTO 4-11 CONTROL PANEL AND SECOND UNIT



PROJECT FISH PASSAGE CONTROL FACILITIES

Fish passage in the upstream direction is not recommended for the Project because of the possibility of alewife being introduced into Green Lake and contaminating water withdrawn for the Green Lake National Fish Hatchery (GLNFH) with alewife-borne diseases. To prevent fish from migrating upstream over the dam into Green Lake, the Project proposed, with concurrence from Interior and MDEP, to maintain the pre-existing fish screens at the crest of the project dam. The Project also proposed, at the request of Interior and MDEP, to install screens at the project intake with a maximum mesh size of 2 inches to prevent adult salmonids from moving out of Green Lake.

Article 28 of the existing license requires Licensee to install screens at the project intake to minimize mortality due to entrainment and to prevent out-migration of adult salmonids from Green Lake. (FERC, 1984)

PROJECT TRANSMISSION FACILITIES

Power generated by the Project is fed into the Emera Maine Company's existing 12.476 kV, 3-phase distribution line, located on the west side of Route 180 near the entrance to the Fish Hatchery. The Project includes a 500 KVA transformer and a 12.47 KV underground cable approximately 650 feet long to interconnect with the Emera facilities.

Because the Project generators are induction units, and because both turbines are non-governable, the Project is unable to generate electricity without being connected to a live transmission line.

PHOTO 4-12 TRANSFORMER



TAILWATER

Two five-foot diameter concrete pipes, extending approximately 50 feet from the powerhouse to Reeds Brook serve as the discharge pipes. The pipes are located below grade, and riprap has been placed around the mouth of the pipes to stabilize the stream bed and bank. An area extending a maximum of approximately 70 feet by 55 feet from the mouth of the discharge pipes has been dredged to improve hydraulic flow. Tailwater elevation varies between El. 98' and El. 104', depending on the level of Graham Lake.

PHOTO 4-13 TAILWATER CONCRETE PIPES



PHOTO 4-14 REEDS BROOK BELOW POWERHOUSE, TAILWATER ON LEFT



TABLE 4-1 GREEN LAKE HYDROELECTRIC PROJECT SUMMARY TABLE

GREEN LAKE HYDROELECTRIC PROJECT – FERC No. 7189	
Description	Number or Fact
GENERAL INFORMATION	
FERC Number	P-7189
License Issued	April 5, 1984
License Expiration Date	March 31, 2024
Licensed Capacity	500 kW
Project Location	On Green Lake and Reeds Brook in the City of Ellsworth, Hancock County, Maine.
RESERVOIR AND DAM	
Surface Area of Reservoir	2,989 acres
Normal Pond Elevation	160.7 feet USGS datum
Usable Storage of Reservoir	10,000 acre feet
Drainage Area	45 square miles
Dam Construction Date	Early 1900's
Elevation Top of Dam	164 feet USGS datum
Height	7.5 feet
Length of Dam	270 feet
Lift Gates	2, 6.3 feet wide by 7.2 feet high
Log Sluice	None
Spillway	1) 80' long at 160.7 feet USGS 2) 35' long at 162.0 feet USGS 3) 120' long at 163.0 to 164.0 feet USGS
Flashboards	None
Trashracks	8' wide x 12' high, 1" clear spacing
Top of Trashrack elevation	162.5 feet USGS
POWERHOUSE	
Length (Superstructure)	35 feet
Width (Superstructure)	27 feet

TURBINES/GENERATORS

Number of units	2, 400 KW and 25 KW nameplate capacities
Rated Net Head	50 feet
Hydraulic Capacity	96 cfs
Average Annual Generation	1,656.8 MWh

FISHWAY PASSAGE

Upstream Passage	None
Downstream Passage	None

TRANSMISSION LINES AND TRANSFORMER

Transmission Line Type	Underground 12.47 kV
Transmission Line Length	650 ft
Transformer	500 kVA, Primary 12.47 kV, Secondary 480 V, 3 phase

At the time of writing this Pre-Application Document, the new second unit (roughly 25-KW capacity) is not yet online. It is expected to be ready to be used during dry conditions during the summer of 2019.

4.2 PROPOSED PROJECT FACILITIES

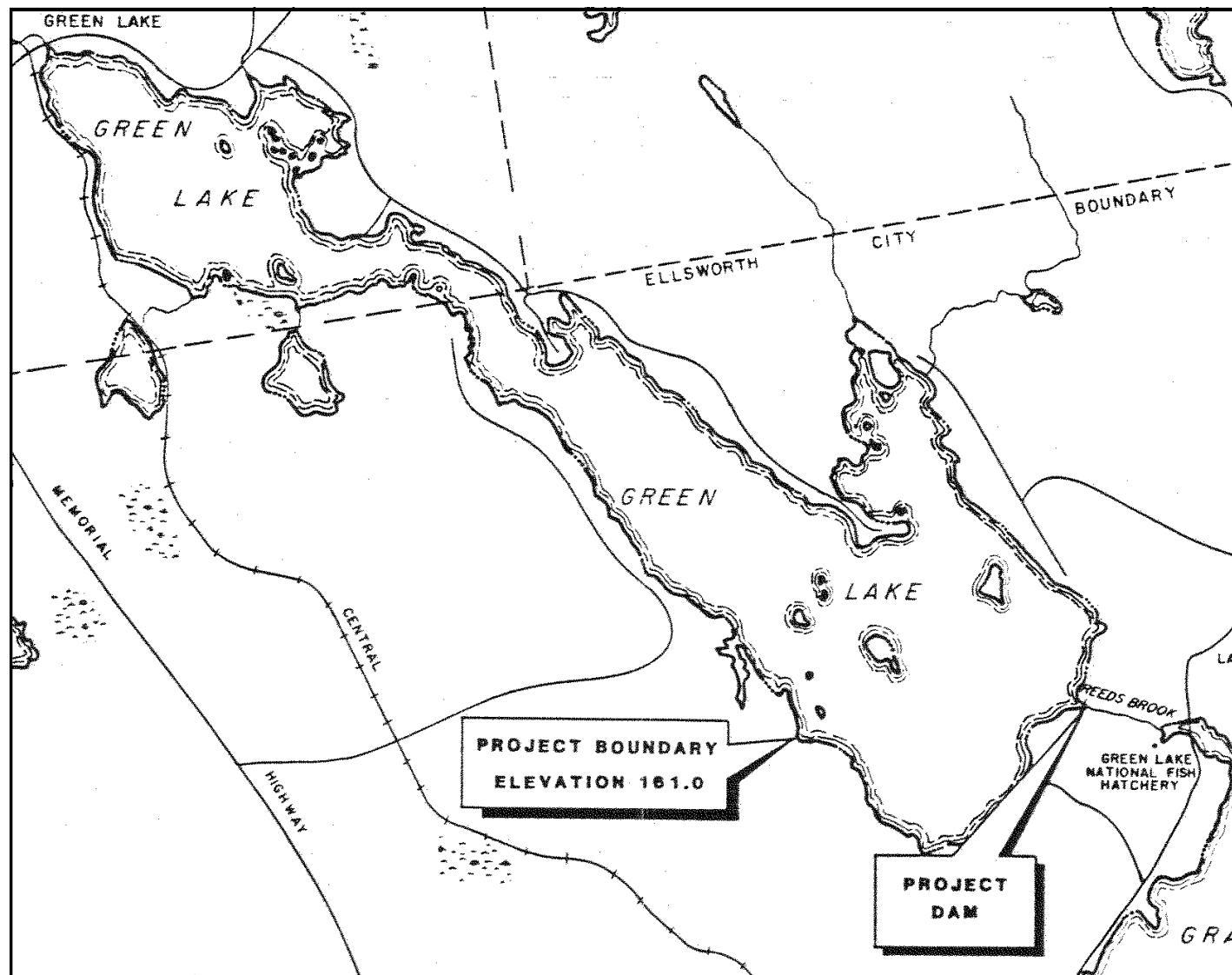
As existing with the following changes:

- 1) Replace 1000' above ground wood stave penstock, which is near the end of its useable life, with one made of a suitable material
- 2) Replace septic leaching field for operator quarters and powerstation
- 3) Disassemble and repair/renew main turbine, generator, and transformer

4.3 PROJECT BOUNDARY

The Project boundary includes Green Lake, a very thin strip of land around the lake to elevation 161.0' USGS, 0.43 acres of land containing the dam, and two acres of GLNFH land containing the other Project facilities described above.

FIGURE 4-1 PROJECT BOUNDARY MAP



4.4 EXISTING PROJECT OPERATIONS

The project is managed in part as a component of a water storage system for downstream power generation. Brookfield Renewable Energy Group owns and operates a water control dam at the outlet of Graham Lake, downstream of Green Lake, and a hydroelectric generating facility (FERC No. 2727) approximately four miles downstream of Graham Lake in the City of Ellsworth. In addition, water management of Green Lake is designed to maintain recreation values, allow water supply for the Green Lake National Fish Hatchery (GLNFH), protect lake trout spawning habitat, and maintain sufficient flow in Reeds Brook. The Green Lake dam gates are manually operated. Water is drawn from Green Lake by the GLNFH by means of two submerged pipes (non-project) to supply the Hatchery. Up to 30 cfs may be used on a priority basis by the Hatchery.

The Licensee adheres to an operating schedule which ensures maintenance of recreational values, allows water supply for the hatchery, and protects lake trout spawning habitat. The lake is drawn down during the fall and winter from the spillway elevation of 160.7 ft USGS to a minimum of 157.5 ft (7.2 to 4.0 feet on the staff gauge). The fall drawdown begins after Labor Day weekend and is completed by October 15 of each year. This completion date generally corresponds to the time of lake trout spawning. The lake is then allowed to partially refill during the fall and early winter.

Depending on the extent that the pond is refilled, the pond is drawn down prior to spring runoff to protect against flooding. Spring drawdown varies annually, but whenever possible does not go below the level accomplished on October 15 of the previous year. This prevents dewatering of lake trout eggs which may have been deposited the previous October.

The lake is restored to between elevations 159.7 ft and 160.7 ft (6.2' and 7.2' on the staff gauge) by June 1. The lake is maintained between elevation 159.7 ft and 160.7 ft for the period of June 1 through Labor Day of each year. This provides for the recreational use of the lake and shorefront areas.

Turbine operation is controlled manually. Because of the fixed operating point of the larger turbine, it is either operated at full discharge capacity of 90 cfs or is off. The smaller turbine with a fixed, but much smaller flow (estimated at 7 cfs), can operate continuously as inflow allows. The Licensee maintains an instantaneous minimum flow of 1 cfs, as per historic dam leakage, in Reeds Brook. (FERC, 1984)

4.5 PROPOSED PROJECT OPERATIONS

No changes are currently proposed for Project operations.

4.6 OTHER PROJECT INFORMATION

4.6.1 CURRENT LICENSE REQUIREMENTS

The main operational requirements for the Project are the following:

Article 27. Licensee shall release from the Green Lake project, a continuous minimum flow of 1 .0 cubic foot per second, as measured immediately downstream from the project dam, or the inflow to the

reservoir, whichever is less, for the protection and enhancement of fish and wildlife resources in Reeds Brook This flow may be temporarily modified if required by operating emergencies beyond the control of the Licensee, for inspections and maintenance and for short periods upon mutual agreement between the Licensee and the Maine Department of Environmental Protection.

Article 29: The licensee shall make adequate provision for a penstock tap in order to provide up to 30 cfs from the Green Lake to the Green Lake National Fish Hatchery.

Article 30. The Licensee shall, to protect salmonid redds, complete the fall reservoir drawdown no later than October 15 of each year, and shall reduce the reservoir water level during the spring drawdown to no lower than the reservoir water level attained on the previous October 15. Further, the Licensee shall operate the project in such a manner that the water level in Green Lake is maintained between elevations 159.7 feet (U.S.G.S. datum) and 160.7 feet during the period from June 1 through Labor Day weekend to protect recreational values of Green Lake, and between elevations 157.5 and 160.7 feet during the remainder of the year. These elevations may be temporarily modified if required by conditions beyond the control of the Licensee, for inspections and maintenance and for short periods upon mutual agreement between the Licensee, the U.S. Fish and Wildlife Service, and the Maine Department of Environmental Protection.

For a complete list of license requirements, see Appendix D.

(FERC, 1984)

4.6.2 COMPLIANCE HISTORY OF THE PROJECT

The Project has filed reports regarding water levels for each water year and any instances of the reservoir level being above or below the required range. Also, the Project received communication from FERC in 2010 that they had received a complaint about recent Green Lake water levels and they requested information to determine the cause. The FERC determined that the water levels during the period of concern had been caused by unusually high precipitation and not project operation (FERC P-7189 Issuance 20110706-0020). The FERC also noted that throughout the history of the project there were periods when the lake exceeded the allowed maximum of 160.7 feet USGS, and asked for the Project to develop and submit a plan for how the lake was going to be managed to handle this. The requested plan was submitted to the FERC (P-7189 Submittal 20110812-0005).

No further action has been requested by FERC.

4.6.3 SAFETY PROCEDURES

The Project has a Dam Safety Surveillance and Monitoring Plan (DSSMP) in place and uses it as part of its regular inspection and monitoring program. It is P-7189 Submittal 20181228-5342 on the FERC website.

The Project is exempt from the requirement to submit an EAP – Per correspondence from Director Andon J. Sidoti on June 22, 1998, marked 9807070252-3, Green Lake Water Power Company Project P-7189-ME – NATDAM # - ME00266 – “We have determined that the information previously provided, namely the dam break studies and your letter of August 21, 1985, is sufficient to justify an exemption from Part 12, Subpart C (EAP) of the Commissions Regulations. Therefore, you no longer need to submit an EAP.”

4.6.4 AVERAGE ANNUAL ENERGY AND DEPENDABLE CAPACITY

The Project generated an average annual energy output of 1,656.8 MWh between 2014 and 2018 (Table 4-2) at a plant factor of 44.5 percent, calculated as follows: $(1,656,805.33 \text{ KWh/year}) / (425\text{KW} \times 8760 \text{ hours/year}) = 44.5\%$

TABLE 4-2 HISTORICAL MONTHLY GENERATION TOTALS AT THE GREEN LAKE HYDROELECTRIC PROJECT 2014-2018 (MWh)

Year / Month	January	February	March	April	May	June	July	August	September	October	November	December	Total
2014	228.36	231.31	252.87	230.34	228.11	181.88	205.61	67.13	213.76	13.17	146.55	240.00	2239.08
2015	254.51	228.99	242.19	191.55	141.47	57.59	0.00	0.00	131.46	111.26	142.74	231.12	1732.88
2016	234.14	229.54	237.94	209.79	138.51	0.00	0.00	0.00	100.89	0.00	0.87	100.31	1252.00
2017	242.14	225.47	245.25	235.39	234.54	121.22	0.00	0.00	93.16	0.00	0.00	70.89	1468.08
2018	162.34	223.48	251.78	233.44	86.78	10.18	63.87	0.03	117.39	61.43	131.15	250.13	1591.99
5 yr Average	224.30	227.76	246.01	220.10	165.88	74.18	53.90	13.43	131.33	37.17	84.26	178.49	1656.81

Source: GLWP logs

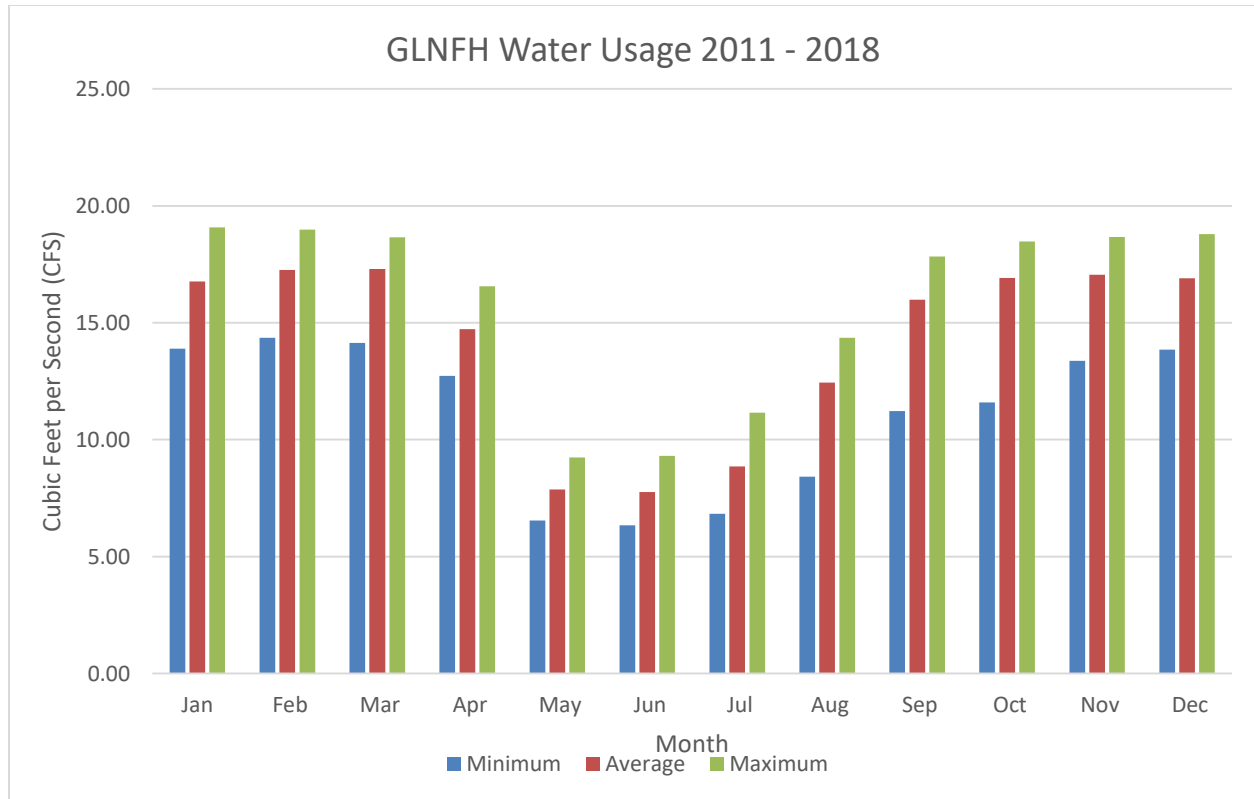
4.6.5 DELIVERY OF WATER FOR NON-POWER USES

The Green Lake National Fish Hatchery (GLNFH) uses up to 30 cfs of water from Green Lake on a priority basis. A penstock tap has been installed by the Project to provide a source of surface water to the GLNFH. From some time in May through September, the GLNFH gets most of its water from the Project penstock tap. This surface water is better oxygenated and warmer than the water supplied by the Hatchery’s Green Lake water intakes.

The Project operates in a way that facilitate the use of water by the GLNFH. Starting the main generation unit affects the pressure of the water supplied to the Hatchery through the penstock tap, and therefore requires Hatchery personnel adjust the flow into their water treatment facility. This aspect of Project operation is carefully coordinated and managed. It has not proven to be a problem.

The following graph shows the water usage by the Green Lake National Fish Hatchery for the years 2011 through 2018. This is the amount of water actually run through the fish pools, treated and discharged back into Reeds Brook below the Project tailrace. Process water that is returned to Reeds Brook from the filter house about 480 feet downstream from the dam is not included in these numbers. All numbers reflect the average cfs during a specific month. Minimum and Maximum values refer to the lowest and highest average cfs for that month across the 8 years.

TABLE 4-3 WATER USAGE OF GLNFH BY MONTH



Source: GLNFH, 2019.

When the lake level threatens to exceed the allowed maximum of 160.7 feet USGS, gates at the dam are opened. The water that flows through the gates travels down Reeds Brook into Graham Lake.

4.6.6 CURRENT NET INVESTMENT

As of December 31, 2018:

Buildings and other depreciable assets	\$1,366,507
Accumulated depreciation	\$899,097
Net investment	\$467,410

4.7 REFERENCES

Federal Energy Regulatory Commission (FERC), 1984, Order Issuing License (Minor) for Green Lake Hydroelectric Project (FERC No. 7189). 27 FERC ¶62,023. Issued April 5, 1984.

GLWP, 2018, DSSMP P-7189 Submittal 20181228-5342

<https://www.ferc.gov/docs-filing/elibrary.asp>

FERC, 2011, Response to Project response to lake level query

FERC P-7189 Issuance 20110706-0020

<https://www.ferc.gov/docs-filing/elibrary.asp>

GLWP, 2011, Project Green Lake Management Plan

P-7189 Submittal 20110812-0005

<https://www.ferc.gov/docs-filing/elibrary.asp>

5.0 DESCRIPTION OF EXISTING ENVIRONMENT

5.1 GEOLOGY AND SOILS

18 CFR §5.6(d)(3)(ii) requires "Descriptions and maps showing the existing geology, topography, and soils of the proposed project and surrounding area. Components of the description must include: (A) A description of geological features, including bedrock lithology, stratigraphy, structural features, glacial features, unconsolidated deposits, and mineral resources at the project site; (B) A description of the soils, including the types, occurrence, physical and chemical characteristics, erodability and potential for mass soil movement; (C) A description of reservoir shorelines and streambanks, including: (1) Steepness, composition (bedrock and unconsolidated deposits), and vegetative cover; and (2) Existing erosion, mass soil movement, slumping, or other forms of instability, including identification of project facilities or operations that are known to or may cause these conditions."

5.1.1 EXISTING GEOLOGICAL FEATURES

The project is approximately six miles north of the City of Ellsworth in Hancock County, Maine. The project involves Green Lake and its outlet, Reeds Brook, which flows into Graham Lake. Both lakes are located within the Union River drainage basin, which drains a large percentage of Hancock County. The main stem of the Union River forms at the upper end of Graham Lake where the east and west branches of the Union River merge. From the outlet of Graham Lake (Graham Dam) the Union River flows south approximately four miles to a hydroelectric facility in the City of Ellsworth, and then to Blue Hill Bay on the Atlantic Ocean.

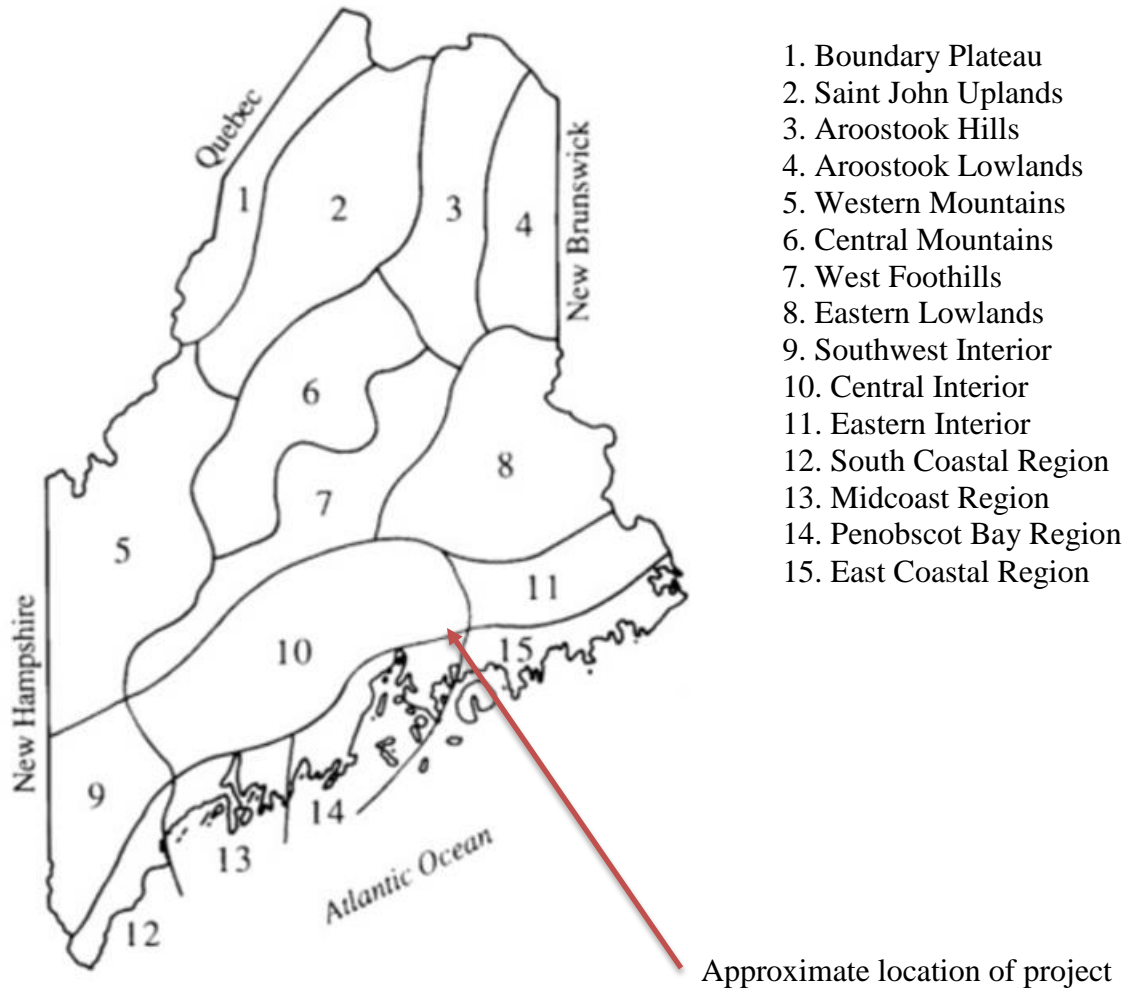
The watershed of Green Lake includes lands in the City of Ellsworth, and the towns of Otis and Dedham.

Hancock County encompasses 1,093,000 acres, of which 64,000 are fresh water lakes. The topography of the county is characterized by rolling hills, low ridges, coastal mountains, rugged coastline, forests, and numerous lakes, streams and brooks. Several areas have slopes exceeding 25 percent; however, the majority of the land has slopes ranging from 0 to 15 percent.

The geology of the region consists of gneiss, schist, and metamorphic slate, with numerous weathered rock and ledge outcroppings. The bedrock throughout most of the Hancock County is hard, impermeable, and near the surface, and is usually covered by surficial deposits of glacial origin. Surficial deposits include till, glacial meltwater deposits, marine sediments, alluvium, and organic swamp deposits. Green Lake is a glacially formed lake with the deepest portion being below mean sea level.

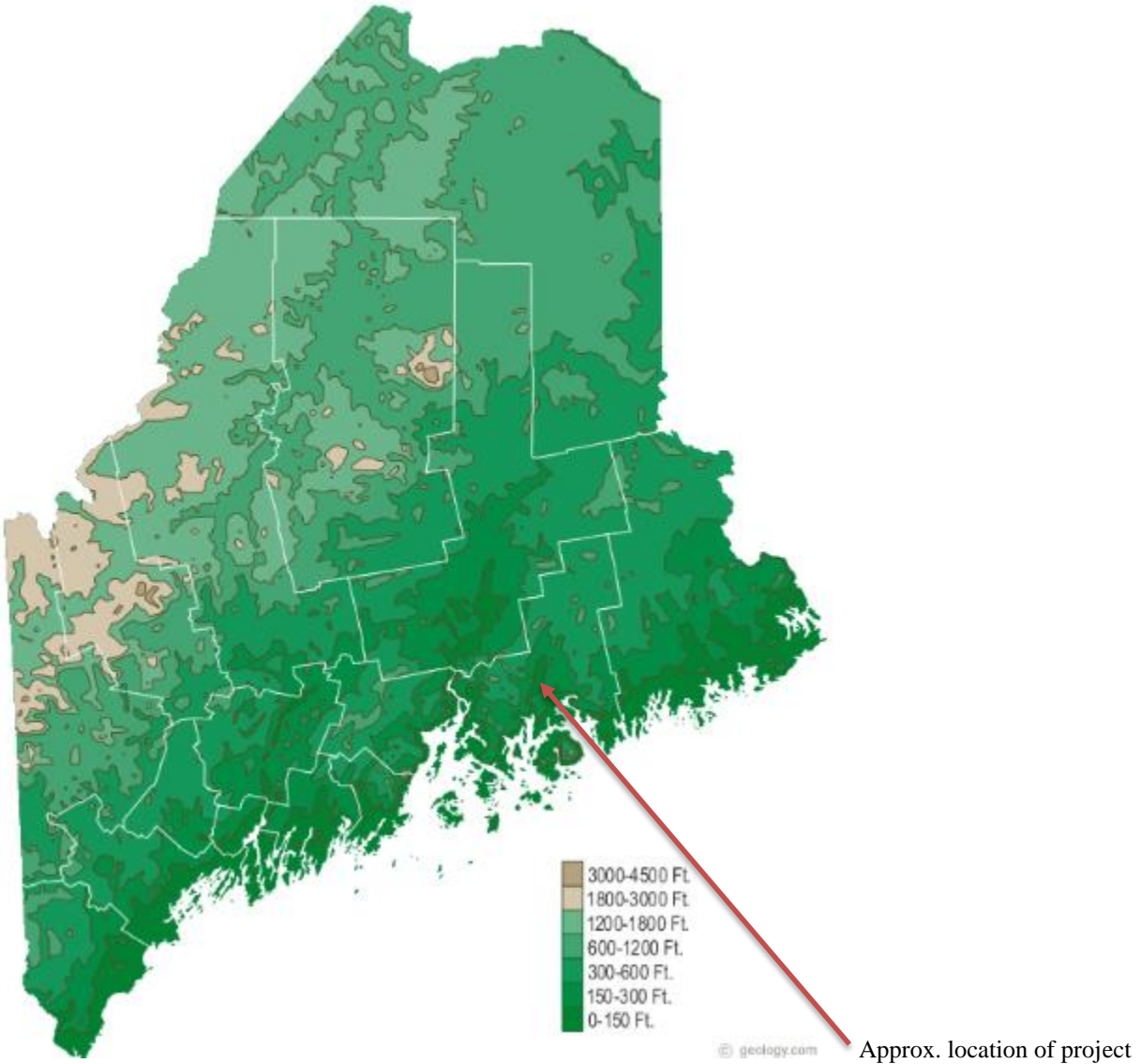
The climate in Hancock County is characterized by rapid changes and well defined seasonal variations in temperature and precipitation. Coastal storms which affect the area often generate strong winds with accompanying heavy rain and snow (GLWP, 1983). The average annual precipitation is approximately 47 inches and is fairly evenly distributed throughout the year (3-4 inches per month). The mean minimum temperature in January is about 11°F, and the mean maximum temperature in July is about 78°F (USCD, 2019).

FIGURE 5-1 GEOGRAPHICAL PROVINCES OF MAINE



Source: Wilson, 2017, modified

FIGURE 5-2 GENERAL TOPOGRAPHY OF MAINE



Source: GNI, 2018

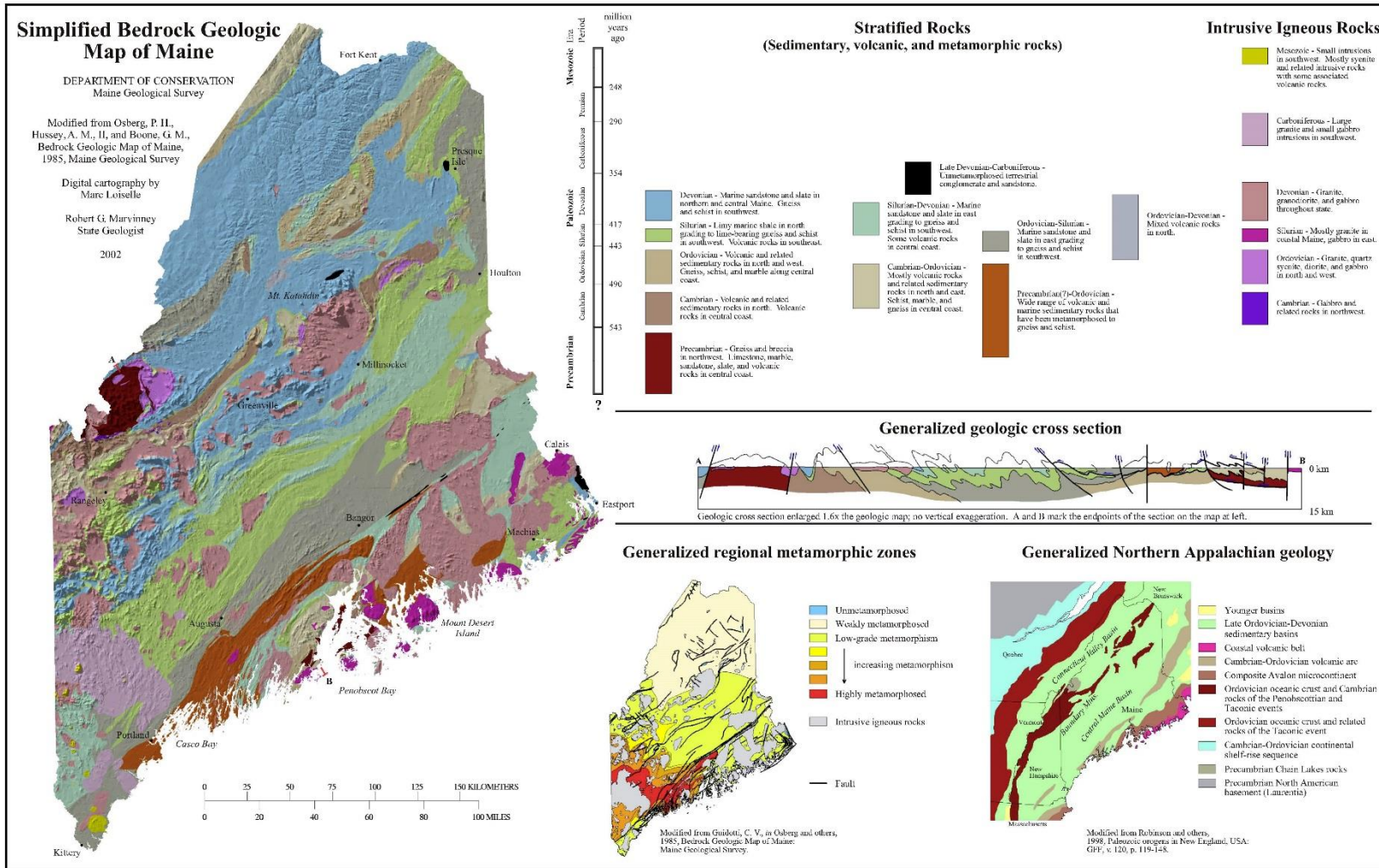
5.1.2 BEDROCK GEOLOGY

Bedrock near the Project is composed of two stratified rock formations, Silurian and Ordovician-Silurian (MDACF, 2018).

STRATIFIED ROCKS	DEFINITION
Silurian	Limy marine shale in north grading to lime-bearing gneiss and schist in southwest, volcanic rocks in southeast.
Ordovician-Silurian	Marine sandstone and slate in east grading to gneiss and schist in southwest.

Source: MDACF, 2018

FIGURE 5-3 BEDROCK GEOLOGY OF MAINE



Source: MDACF, 2018

5.1.3 SOILS

Maine soils were formed when the last glacier in Maine melted approximately 12,500 years ago and moved across the state in a northwest to southeasterly direction. Rock fragments and soil material were deposited as till, or as water-sorted sediments in streams, rivers, lake and the ocean. Land, depressed by the glacier, rebounded slowly, creating a complex pattern of soils derived from till, sediments, sands, and gravel (Ferwerda et. al, 1997).

Hancock County is composed of soils shown in Table 5-1.

TABLE 5-1 SOILS TYPES IN HANCOCK COUNTY, MAINE

SOIL TYPE	COMPOSITION	PERCENTAGE IN MAINE
Dixfield-Colonel-Lyman-Brayton	Loamy soils formed in till derived mainly from schist, granite, phyllite and gneiss	23%
Lyman-Tunbridge-Dixfield	Loamy soils formed in till derived mostly from granite, gneiss, schist, and phyllite	4%
Hermon-Brayton-Dixfield	Sandy and loamy soils formed in till derived mainly from granite, gneiss, schist, and phyllite	4%
Scantic-Lamoine-Buxton-Lyman	Clayey and loamy soils formed in clayey glaciomarine or glaciolacustrine sediments and loamy till.	7%

Source: Ferwerda et. al, 1997

FIGURE 5-4 SOILS WITHIN AN APPROXIMATE 1-MILE RADIUS OF THE PROJECT

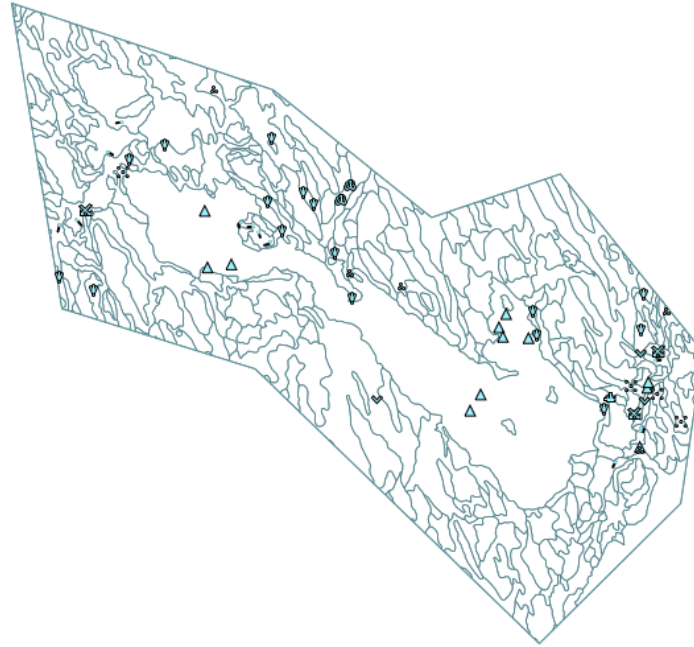


TABLE 5-2 LIST OF SOILS BY TYPE, SIZE (ACRES), AND PERCENT WITHIN AN APPROXIMATE 1-MILE RADIUS OF THE PROJECT

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	K-Factor, Whole Soil
BSB	Brayton-Colonel association, 0 to 8 percent slopes, very stony	1,448.9	8.7%	n/a
BTB	Brayton-Colonel association, gently sloping, rubbly	440.2	2.6%	n/a
BwC	Buxton silt loam, 8 to 15 percent slopes	75.7	0.5%	0.37
CSC	Colton-Adams-Sheepscot association, 0 to 15 percent slopes	124.6	0.7%	n/a
DtB	Peru-Colonel complex, 3 to 8 percent slopes, very stony	291.1	1.8%	n/a
HtC	Hermon and Monadnock soils, 8 to 15 percent slopes, very stony	85.0	0.5%	n/a
HVC	Hermon-Monadnock-Peru complex, 8 to 15 percent slopes, very stony	410.2	2.5%	n/a
HVE	Hermon-Monadnock-Peru complex, 15 to 45 percent slopes, very stony	94.7	0.6%	n/a

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	K-Factor, Whole Soil
LaB	Lamoine silt loam, 3 to 8 percent slopes	333.9	2.0%	0.37
LCB	Lamoine-Scantic-Buxton complex, 0 to 15 percent slopes	101.0	0.6%	n/a
LsE	Lyman-Schoodic complex, 15 to 35 percent slopes, rocky	110.6	0.7%	n/a
LTE	Lyman-Schoodic-Rock outcrop complex, 15 to 35 percent slopes, very stony	230.3	1.4%	n/a
LuC	Lyman-Tunbridge complex, 0 to 15 percent slopes, very stony	379.3	2.3%	n/a
LWC	Lyman-Tunbridge-Schoodic complex, 8 to 15 percent slopes, very stony	496.9	3.0%	n/a
MbC	Marlow fine sandy loam, 8 to 15 percent slopes, very stony	290.9	1.8%	n/a
McC	Marlow fine sandy loam, 3 to 15 percent slopes, extremely bouldery	111.7	0.7%	n/a
MDC	Marlow-Peru association, 3 to 15 percent slopes, very stony	2,283.1	13.7%	n/a
MDE	Marlow-Peru association, 15 to 45 percent slopes, very stony	615.2	3.7%	n/a
MGC	Marlow-Peru association, 3 to 15 percent slopes, extremely bouldery	565.6	3.4%	n/a
MGE	Marlow-Peru association, 15 to 60 percent slopes, extremely bouldery	260.0	1.6%	n/a
MhC	Monadnock-Hermon complex, 3 to 15 percent slopes, extremely bouldery	369.9	2.2%	n/a
MhE	Monadnock-Hermon complex, 15 to 45 percent slopes, extremely bouldery	96.8	0.6%	n/a
MXC	Monadnock-Hermon-Peru complex, 0 to 15 percent slopes, extremely bouldery	1,274.1	7.7%	n/a
MXE	Monadnock-Hermon-Peru complex, 8 to 45 percent slopes, extremely bouldery	582.5	3.5%	n/a
Sa	Scantic silt loam, 0 to 3 percent slopes	174.2	1.0%	0.28
SdB	Scantic-Lamoine complex, 0 to 8 percent slopes, very stony	92.3	0.6%	0.28
SEB	Scantic-Lamoine-Peru complex, 0 to 8 percent slopes, very stony	539.5	3.2%	n/a
SGE	Schoodic-Rock outcrop-Lyman complex, 15 to 60 percent slopes	84.2	0.5%	n/a

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	K-Factor, Whole Soil
W	Water bodies	3,578.7	21.5%	n/a
WT	Wonsqueak, Bucksport, and Sebago soils	188.4	1.1%	n/a
	Other soils ^a	893.4	5.4%	n/a
Totals for Area of Interest		16,622.9	100.0%	

^aOther soils (of less than 0.5% individually) include Adams loamy sand, Brayton fine sandy loam, other Colton gravelly sandy loams and Colton-Adams complex, Peru fine sandy loams and Peru-Colonel complex, Monadnock and Hermon soils, Kinsman loamy sand and Kinsman-Wonsqueak association, other Marlow fine sandy loams, Naskeag-Schoodic-Lyman complex, Nicholville very fine sandy loams, gravel and sand pits, other Scantic complexes, other Schoodic-Rock outcrop complexes, Sheepscot sandy loam soils, Tunbridge-Lyman complex soils, other Wonsqueak and Wonsqueak/Bucksport soils.

Source: USDA NRCS, 2018

TABLE 5-3 LIST OF SOILS BY TYPE, SIZE (ACRES), AND PERCENT WITHIN HANCOCK COUNTY, MAINE

Map Unit Symbol	Map Unit Name	Acres in AOI	% of AOI
BgB	Brayton fine sandy loam, 0 to 8 percent slopes, very stony	12,933.1	1.2%
BSB	Brayton-Colonel association, 0 to 8 percent slopes, very stony	34,950.7	3.2%
BTB	Brayton-Colonel association, gently sloping, rubbly	5,955.7	0.5%
BwC	Buxton silt loam, 8 to 15 percent slopes	5,842.3	0.5%
BwD	Buxton silt loam, 15 to 25 percent slopes	843.5	0.1%
Ch	Charles silt loam, 0 to 2 percent slopes, occasionally flooded	1,153.2	0.1%
CoB	Colton gravelly sandy loam, 0 to 8 percent slopes	5,304.7	0.5%
CoC	Colton gravelly sandy loam, 8 to 15 percent slopes	3,043.6	0.3%
CoE	Colton gravelly sandy loam, 15 to 45 percent slopes	1,648.6	0.1%
CRE	Colton-Adams complex, 15 to 45 percent slopes	642.8	0.1%
CSC	Colton-Adams-Sheepscot association, 0 to 15 percent slopes	7,631.2	0.7%
DbC	Peru fine sandy loam, 8 to 15 percent slopes, very stony	6,828.3	0.6%
DsB	Peru-Colonel complex, 3 to 8 percent slopes	8,503.0	0.8%
DtB	Peru-Colonel complex, 3 to 8 percent slopes, very stony	22,742.4	2.1%
DWB	Peru-Colonel-Tunbridge complex, 3 to 8 percent slopes, very stony	9,147.6	0.8%
HcC	Hermon-Colton-Rock outcrop complex, 3 to 15 percent slopes, very stony	5,251.1	0.5%

Map Unit Symbol	Map Unit Name	Acres in AOI	% of AOI
HtC	Hermon and Monadnock soils, 8 to 15 percent slopes, very stony	7,861.3	0.7%
HVC	Hermon-Monadnock-Peru complex, 8 to 15 percent slopes, very stony	27,698.0	2.5%
LaB	Lamoine silt loam, 3 to 8 percent slopes	24,811.9	2.3%
LbB	Lamoine-Scantic complex, 0 to 8 percent slopes	5,379.4	0.5%
LCB	Lamoine-Scantic-Buxton complex, 0 to 15 percent slopes	24,853.9	2.3%
LsE	Lyman-Schoodic complex, 15 to 35 percent slopes, rocky	8,313.3	0.8%
LTE	Lyman-Schoodic-Rock outcrop complex, 15 to 35 percent slopes, very stony	12,320.6	1.1%
LuC	Lyman-Tunbridge complex, 0 to 15 percent slopes, very stony	32,886.0	3.0%
LWC	Lyman-Tunbridge-Schoodic complex, 8 to 15 percent slopes, very stony	28,943.1	2.6%
MbC	Marlow fine sandy loam, 8 to 15 percent slopes, very stony	7,205.2	0.7%
MDC	Marlow-Peru association, 3 to 15 percent slopes, very stony	46,251.1	4.2%
MDE	Marlow-Peru association, 15 to 45 percent slopes, very stony	8,913.9	0.8%
MhC	Monadnock-Hermon complex, 3 to 15 percent slopes, extremely boulder	5,140.2	0.5%
MXC	Monadnock-Hermon-Peru complex, 0 to 15 percent slopes, extremely boulder	19,300.7	1.8%
MXE	Monadnock-Hermon-Peru complex, 8 to 45 percent slopes, extremely boulder	5,590.9	0.5%
NaB	Naskeag-Schoodic complex, 0 to 8 percent slopes, very stony	14,686.0	1.3%
NBB	Naskeag-Schoodic-Lyman complex, 0 to 8 percent slopes, rocky	10,791.4	1.0%
Sa	Scantic silt loam, 0 to 3 percent slopes	19,717.4	1.8%
SB	Scantic-Biddeford complex, 0 to 3 percent slopes	14,194.9	1.3%
SdB	Scantic-Lamoine complex, 0 to 8 percent slopes, very stony	9,483.8	0.9%
SEB	Scantic-Lamoine-Peru complex, 0 to 8 percent slopes, very stony	21,147.4	1.9%
SfC	Schoodic-Rock outcrop complex, 0 to 15 percent slopes	18,585.2	1.7%
SfE	Schoodic-Rock outcrop complex, 15 to 65 percent slopes	8,969.8	0.8%
SGE	Schoodic-Rock outcrop-Lyman complex, 15 to 60 percent slopes	13,417.3	1.2%
SKC	Schoodic-Rock outcrop-Naskeag complex, rolling	11,222.7	1.0%
TuB	Tunbridge-Lyman complex, 3 to 8 percent slopes, rocky	7,753.2	0.7%
W	Water bodies	443,321.9	40.2%

Map Unit Symbol	Map Unit Name	Acres in AOI	% of AOI
Ws	Wonsqueak and Bucksport mucks, 0 to 2 percent slopes	11,775.6	1.1%
WT	Wonsqueak, Bucksport, and Sebago soils	18,123.6	1.6%
	Other soils ^b	88,796.2	8.1%
Totals for Area of Interest		1,102,545.2	100.0

^bOther soils (of less than 0.5% individually) include Adams loamy sand, Biddeford muck peat, beaches, Brayton fine sandy loam, other Buxton silt loam, other Colton gravelly sandy loams and Colton-Adams complex, other Peru fine sandy loams and Peru-Colonel complex, Fort Knox and related soils, other Monadnock and Hermon soils, Kinsman loamy sand and Kinsman-Wonsqueak association, Lyman-Brayton complex soils, Marlow-Peru soils and other Marlow fine sandy loam, other Monadnock-Hermon complex, Nicholville very fine sandy loams, gravel and sand pits, Sheepscot sandy loam soils, Thorndike-Winnecook complex, other Tunbridge-Lyman complex soils, Udorthents-Urban land complex, Waskish and Sebago soils. Winnecook-Thorndike complex, other Wonsqueak soils.

Source: USDA NRCS, 2018

The dominant soil types within a 1-mile radius of the Green Lake Hydroelectric Project are (11) Hermon-Brayton-Dixfield and (5) Dixfield-Colonel-Lyman-Brayton.

5.1.4 EROSION

According to the 2013 State Hazard Mitigation Plan, all areas in Maine are susceptible to erosion, due to farming and crop cultivation throughout the state. The area around the project does not have appreciable farming and crop cultivation. Erosion can also occur in the area because of hurricanes, flooding, and wildfires, among other reasons (MDDVEM, 2013).

The Natural Resources Conservation Service has assessed the susceptibility of the soils surrounding the Project to erosion (i.e., the K Factor) caused by water including rainfall and stormwater run-off. K Factor estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity with values ranging from 0.02 to 0.69; larger values indicate greater susceptibility to sheet and rill erosion by water (USDA NRCS, 2018). The K Factor values for the soils surrounding the Green Lake Project range from 0.02 to 0.37, indicating a moderate susceptibility to erosion from water. However, soils with any K-factor rating are each 2% or less of the soils within 1 mile of Green Lake, and together represent less than 5% of these soils. (USDA NRCS, 2018).

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5.2 WATER RESOURCES

18 CFR §5.6(d)(3)(iii) requires "A description of the water resources of the proposed project and surrounding area. This must address the quantity and quality (chemical/physical parameters) of all waters affected by the project, including but not limited to the project reservoir(s) and tributaries thereto, bypassed reach, and tailrace. Components of the description must include:(A) Drainage area; (B) The monthly minimum, mean, and maximum recorded flows in cubic feet per second of the stream or other body of water at the powerplant intake or point of diversion, specifying any adjustments made for evaporation, leakage, minimum flow releases, or other reductions in available flow; (C) A monthly flow duration curve indicating the period of record and the location of gauging station(s), including identification number(s), used in deriving the curve; and a specification of the critical streamflow used to determine the project's dependable capacity;(D) Existing and proposed uses of project waters for irrigation, domestic water supply, industrial and other purposes, including any upstream or downstream requirements or constraints to accommodate those purposes; (E) Existing instream flow uses of streams in the project area that would be affected by project construction and operation; information on existing water rights and water rights applications potentially affecting or affected by the project; (F) Any federally-approved water quality standards applicable to project waters; (G) Seasonal variation of existing water quality data for any stream, lake, or reservoir that would be affected by the proposed project, including information on: (1) Water temperature and dissolved oxygen, including seasonal vertical profiles in the reservoir; (2) Other physical and chemical parameters to include, as appropriate for the project; total dissolved gas, pH, total hardness, specific conductance, chlorophyll a, suspended sediment concentrations, total nitrogen (mg/L as N), total phosphorus (mg/L as P), and fecal coliform (E. Coli) concentrations; (H) The following data with respect to any existing or proposed lake or reservoir associated with the proposed project; surface area, volume, maximum depth, mean depth, flushing rate, shoreline length, substrate composition; and (I) Gradient for downstream reaches directly affected by the proposed project."

5.2.1 DRAINAGE AREA

The drainage area of Green Lake is 46 square miles. (USGS, 2018b).

5.2.2 STREAMFLOW, GAGE DATA, AND FLOW STATISTICS

There is no active USGS gage associated with the Green Lake project area, so a comparative analysis was completed to estimate the flow into Green Lake. The USGS Gage No. 01021480 Old Stream near Wesley, Maine was used as a surrogate gage. A comparison of the two watersheds was completed to confirm that the Old Stream gage was appropriate. The Old Stream gage has a smaller watershed and slightly less open water, however the characteristics of the watershed are very similar. The table below summarizes the characteristics of each watershed. (Background: Dudley, R. W. 2004).

TABLE 5-4 WATERSHED CHARACTERISTICS

METRIC	OLD STREAM WATERSHED	GREEN LAKE WATERSHED
Drainage Area (sq. miles)	29.1	47
Mean Annual Temperature (F)	41.8	44.3
Mean Annual Precipitation (in.)	46.25	43.7
% Open Water	3.17%	15.28%
% Low Intensity Residential	0.97%	1.74%
% Commercial	0.20%	0.32%
% Deciduous Forest	10.66%	36.26%
% Evergreen Forest	26.58%	13.49%
% Mixed Forest	32.46%	17.55%
% Other	25.97%	15.36%

Based on our analysis of the two watersheds, we feel that prorating the Old Stream gage using the drainage area ratio method is appropriate to estimate the inflow and flow duration curves for the Green Lake Dam. A proration factor of 1.615 was applied to the Old Stream gage flow data to create annual and monthly flow duration curves (see Appendix E) based on a period of record from August 1998 through December 2018.

TABLE 5-5 MEAN, MEDIAN, MINIMUM, AND MAXIMUM RIVER FLOWS BY MONTH FOR THE GREEN LAKE PROJECT (AUGUST 1, 1998 TO DECEMBER 31, 2018).*

MONTH	MEAN/AVERAGE flow (cfs)	MEDIAN FLOW (cfs)	MINIMUM flow (cfs)	MAXIMUM flow (cfs)
January	104	77	9	892
February	84	55	13	862
March	154	110	18	1003
April	252	204	44	1471
May	126	97	15	883
June	74	43	13	704
July	36	19	4	730
August	27	13	3	467
September	27	11	3	809
October	70	30	3	1357
November	125	96	7	1153
December	154	107	9	2358
Annual	102	61	3	2358

*River flow data was prorated from USGS Gage # 01021480 based on comparable watershed characteristics.

5.2.3 EXISTING AND PROPOSED USES OF WATER

GLWP currently uses water from Green Lake and discharges it directly into Reeds Brook. Some seasonal residential use occurs from Green Lake waters; in addition, water from the lake is used by the U. S. Fish & Wildlife Service's Green Lake National Fish Hatchery. Hatchery effluent discharges into Reeds Brook. No changes are proposed or likely.

5.2.4 EXISTING INSTREAM FLOW USES

Inflows are used primarily for water storage, hydroelectric generation and by the fish hatchery. There is also some recreational use and domestic water use at seasonal residences.

5.2.5 EXISTING WATER RIGHTS

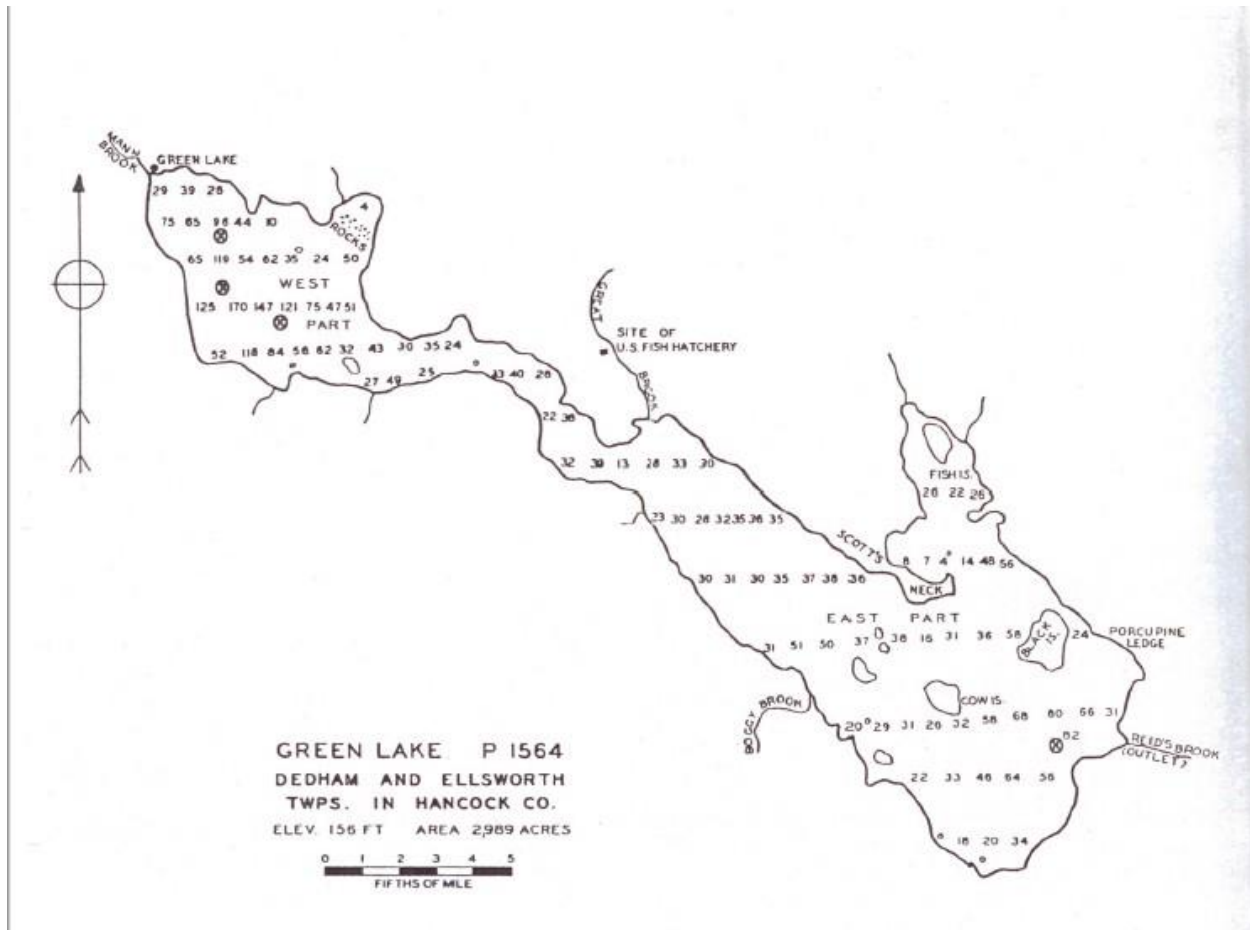
A water right may be defined as: "the right of a user to use water from a water source. This right includes the right to use water from any water source like a river, stream, pond and source of groundwater. Rights to water are established by actual use of the water, and maintained by continued use and need" (USLegal, 2016).

Under the terms of the current FERC license, GLWP is required to provide GLNFH with up to 30 CFS from Green Lake via a penstock tap (Article 29). (FERC, 1984).

5.2.6 AVAILABLE RESERVOIR INFORMATION

The reservoir is Green Lake, which is wholly within Hancock county, Maine. This lake has a surface area of 2,989 acres and a gross volume of 107,000 acre-feet. The drainage area is 47 square miles. Green Lake is a glacially formed lake with the deepest portion being below mean sea level. The earliest form of the current dam was a dry stone and timber structure built in the early 1900's for water storage. In the 1960's Bangor Hydroelectric Company added sheet steel to the dam and built a new concrete gate structure. GLWP replaced the main spillway portion of the dam with a concrete structure in the late 1980's. The main spillway has a crest elevation of 160.7 feet USGS datum, and the sill elevation of the gates is 154.0 feet (GLWP, 1983). Neither the spillway nor gate sill elevation has been changed since at least the 1960's. It is believed that the current spillway elevation is the same as when the dam was originally built in the early 1900's.

FIGURE 5-5 BATHYMETRY OF GREEN LAKE



Source: MDIFW, rev. 1995

5.2.7 GRADIENT OF DOWNSTREAM REACHES

The outlet from the Green Lake dam is Reeds Brook, which runs into Graham Lake. This brook has a natural elevation of 150± (USGS datum) feet at the dam, falling over a distance of 1500± feet to an elevation of 104± feet at the tailrace of the powerhouse, and flowing downstream to Graham Lake (USGS, 2018).

5.2.8 FEDERALLY-APPROVED WATER QUALITY STANDARDS

Maine statute 38 MRSA §464-470 establishes the state of Maine’s classification system for surface waters. Reeds Brook from the Green Lake dam to Graham Lake is Class B; Green Lake is Class A (MRS, 1989a).

Class A waters are the second highest classification and must be of such quality to support the designated uses of drinking water after disinfection; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and habitat for fish and other aquatic life (MRS, 1989b).

Class B waters must be of such quality that they are suitable for the designated use of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life (MRS, 1989b).

The state of Maine has established Class A and Class B water quality standards for DO, iron, chloride, and aluminum, and has developed draft nutrient criteria for total phosphorus, chlorophyll-a, pH, and water transparency (i.e., Secchi disk depth)

TABLE 5-6 ESTABLISHED AND PROPOSED MAINE WATER QUALITY STANDARDS FOR SELECT PARAMETERS^A

PARAMETER	CRITERIA	WATER CLASSIFICATION
Dissolved Oxygen ^a	The greater of: ≥ 7 ppm or 75% of saturation ^d	Class A
	The greater of: ≥ 7 ppm or 75% of saturation ^d	Class B
Iron ^b	1000 μL (ppb)	Freshwater
Chloride ^b	230,000 μL (ppb)	Freshwater
Aluminum ^b	87 μL (ppb) at pH 6.5-9.0	Freshwater
Total Phosphorus ^c	≤ 18.0 μL (ppb)	Class A
	≤ 30.0 μL (ppb)	Class B
Water Column Chlorophyll-a ^c	≤ 3.5 μL (ppb)	Class A
	≤ 8.0 μL (ppb)	Class B
Secchi Disk Depth ^c	≥ 2.0 m	All
pH ^c	6.0-8.5	All

^aMRS, 1989b

^bMDEP, 2012a values refer to the criterion continuous concentration (CCC) which is an estimate of the highest concentration of the substance in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

^cMDEP, 2012b

^dExcept that for the period from October 1st to May 14th, in order to ensure spawning and egg incubation of indigenous fish species, the 7-day mean dissolved oxygen concentration may not be less than 9.5 parts per million and the one-day minimum dissolved oxygen concentration may not be less than 8.0 parts per million in identified fish spawning areas (MRS, 1989b).

5.2.9 WATER QUALITY MONITORING

The Green Lake Association (GLA), the association of property owners surrounding Green Lake, does some water quality monitoring (See 6.2.2.). GLA notified GLWP the data are available. GLWP will obtain the data and assess its applicability to the project.

The GLA is also cooperating with a study being done by a student on the effects of runoff on conditions in Green Lake. GLWP will also request and evaluate this data.

5.2.10 BENTHIC MACROINVERTEBRATES

Benthic macroinvertebrates include aquatic insects (e.g., mayflies, stoneflies), annelids (e.g., worms), arthropods (e.g., crayfish), and mollusks (e.g., freshwater mussels, snails). The abundance of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT) is a useful indicator of water quality because these species have a low tolerance to pollution; EPT richness values greater than 10 are indicative of excellent water quality. Furthermore, EPT are high-quality forage for freshwater fish species, including trout and salmon. The Hilsenhoff Biotic Index (HBI) is another indicator of the level of pollution-sensitive macroinvertebrates in a surface water body; the HBI ranges from 0 to 10 with lower values indicating a higher abundance of pollution sensitive macroinvertebrates (Hilsenhoff, 1987).

For Class A waters, the aquatic life and bacteria content must be as naturally occurs (MRS, 1989b). For Class B waters, MRS 1989b merely states discharges to these waters may not cause adverse impact to aquatic life in that the receiving waters must be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.

MDEP has a Biological Monitoring Program that includes macroinvertebrate sampling in rivers and streams. Statistical models are used to determine if water bodies are attaining biological goals as described by water classifications, such as Class A, Class B, Class C.

Indicator species for Class A:

- *Brachycentrus* (Trichoptera: Brachycentridae)
- *Serratella* (Ephemeroptera: Ephemerellidae)
- *Leucrocuta* (Ephemeroptera: Heptageniidae)
- *Glossosoma* (Trichoptera: Glossosomatidae)
- *Paragnetina* (Plecoptera: Perlidae)
- *Eurylophella* (Ephemeroptera: Ephemerellidae)
- *Psilotreta* (Trichoptera: Odontoceridae)

There appear to be no specific standards for Class B waters concerning benthic macroinvertebrates.

(MDEP, 2018)

5.2.11 REFERENCES

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5.3 FISH AND AQUATIC RESOURCES

18 CFR §5.6(d)(3)(iv) requires "A description of the fish and other aquatic resources, including invasive species, in the project vicinity. This section must discuss the existing fish and macroinvertebrate communities, including the presence or absence of anadromous, catadromous, or migratory fish, and any known or potential upstream or downstream impacts of the project on the aquatic community. Components of the description must include: (A) Identification of existing fish and aquatic communities; (B) Identification of any essential fish habitat as defined under the Magnuson- Stevens Fishery Conservation and Management Act and established by the National Marine Fisheries Service; and (C) Temporal and spatial distribution of fish and aquatic communities and any associated trends with respect to: (1) Species and life stage composition; (2) Standing crop; (3) Age and growth data; (4) Spawning run timing; and (5) The extent and location of spawning, rearing, feeding, and wintering habitat."

5.3.1 EXISTING FISH AND AQUATIC COMMUNITIES

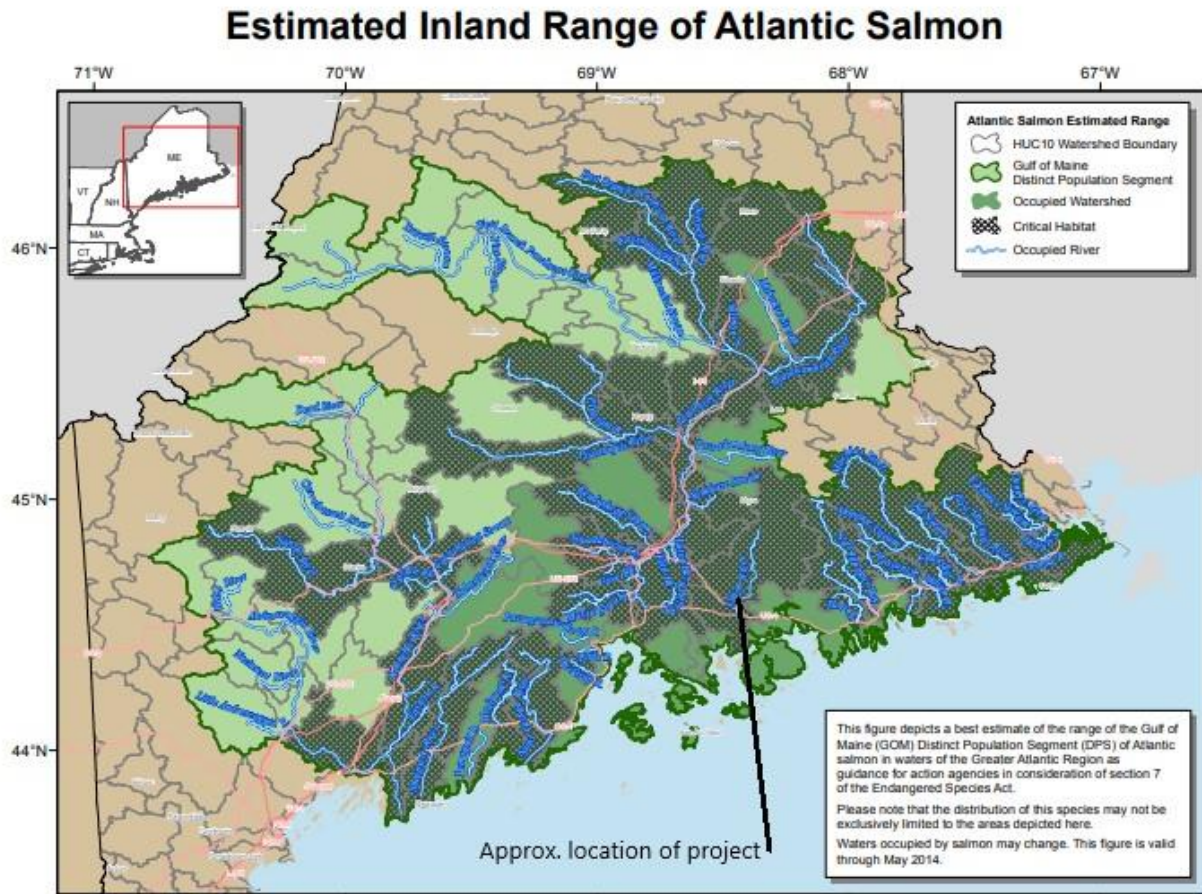
TABLE 5-7 FISH SPECIES IN GREEN LAKE

COMMON NAME	SCIENTIFIC NAME
Landlocked salmon	<i>Salmo salar</i>
Lake trout (togue)	<i>Salvelinus namaycush</i>
Brook trout	<i>Salvelinus fontinalis</i>
Sunapee charr	<i>Salvelinus alpinus</i>
Rainbow smelt	<i>Osmerus mordax</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
White perch	<i>Roccus americanus</i>
Yellow perch	<i>Perca flavescens</i>
Chain pickerel	<i>Esox niger</i>
Common shiner	<i>Notropis cornutus</i>
Creek chub	<i>Semotilus atromaculatus</i>
Fallfish (chub)	<i>Semotilus corporalis</i>
White sucker	<i>Catostomus commersoni</i>
Hornpout (bullhead)	<i>Ictalurus nebulosus</i>
Banded killifish	<i>Fundulus diaphanus</i>
Threespine stickleback	<i>Gasterosteus aculeatus</i>
Pumpkinseed sunfish	<i>Lepomis gibbosus</i>
American eel	<i>Anguilla rostrata</i>

Source: MDIFW, rev. 1995

5.3.1.1 DIADROMOUS FISH SPECIES

FIGURE 5-6 ESTIMATED INLAND RANGE OF ATLANTIC SALMON



Source: NMFS, 2014

The Maine Department of Inland Fisheries and Wildlife (MDIFW) in its stakeholder response noted: “[a]rctic char occur in the lake. In addition, our Agency stocks both landlocked salmon and lake trout. Lake trout do not spawn in the lake, but there is a large contribution of wild landlocked salmon from the tributaries. There is also a smallmouth bass fishery” (Appendix F.3).

In its stakeholder response, the National Marine Fisheries Service (NMFS) noted that “Green Lake is located within the GOM [Gulf of Maine] DPS [distinct population segment] for federally endangered Atlantic salmon, and occurs within the designated critical habitat for that species. Other diadromous fish species (including alewives, blueback herring, American shad, sea lamprey, and American eels) also use the habitat within the Union River watershed for a portion of their life cycles” (Appendix F.1).

The U. S. Fish and Wildlife Service (USFWS) operates the Green Lake National Fish Hatchery. In their stakeholder response, it was noted that one of the 14 U.S. populations of arctic char occur in Green Lake (Appendix F.2).

NMFS further noted “[t]he Green Lake Project does not currently have safe, timely, and effective passage for diadromous fish, including federally listed Atlantic salmon.” However, MDIFW in its stakeholder response stated: “Currently there is no fishway at the dam. If a fishway is constructed, our Agency would have concerns for possible impacts to the existing fisheries resulting from the upstream passage of certain species, such as largemouth bass, that could access the lake from Graham Lake downstream.”

GLWP’s current license contains discussion and requirements related to *preventing* fish passage. Discussion in the license document has the following:

Fish Passage Barriers

Fish passage is not recommended by Interior because of the possibility of alewife being introduced into Green Lake and contaminating water withdrawn for the Green Lake National Fish Hatchery (GLNFH) with alewife-borne diseases. To prevent fish from migrating upstream over the dam into Green Lake, GLWP proposed, with concurrence from Interior and MDEP, to maintain the existing fish screens at the crest of the project dam. GLWP also proposed, at the request of Interior and MDEP, to install screens at the project intake with a maximum mesh size of 2 inches to prevent adult salmonids from moving out of Green Lake.

Article 28 requires the Licensee to install screens at the project intake to minimize mortality due to entrainment and to prevent out-migration of adult salmonids from Green lake. (FERC, 1984)

GLWP’s current license contains the following requirement *specifically limiting* fish passage in both directions:

Article 28. The Licensee shall continue to consult with the U.S. Fish and Wildlife Service and the Maine Department of Environmental Protection, and within 6 months from the date of issuance of this license, file, for Commission approval, functional design drawings and a schedule for construction of an intake screen that would minimize fish mortality due to entrainment, and prevent downstream movement of adult salmonids from Green Lake. Comments on the drawings from the consulted agencies shall be included in the filing. Further, within 90 days after completion of project construction, Licensee shall file as-built drawings with the Commission. (FERC, 1984)

5.3.1.2 AMPHIBIAN AND AQUATIC REPTILE SPECIES

Maine is home to at least 39 species and subspecies of reptiles and amphibians (MDIFW 2018). Sixteen common amphibian species and six common aquatic reptiles are known to occur in the region and have life history requirements that could result in their use of the riverine or lacustrine habitat found within the Green Lake Project area. Seven species of salamander (blue-spotted salamander, spotted salamander, eastern newt, northern dusky salamander, northern redback, four-toed salamander, and northern two-lined salamander) inhabit both aquatic and terrestrial habitat. Nine species of frogs and toads may occur and require use of aquatic habitat. The primarily aquatic or semi-aquatic reptilian species include the snapping turtle, painted turtle, and the wood turtle. Four species of snake (northern redbelly, common garter, and northern ringneck

snake) may make limited use of riparian areas for shelter and feeding (DeGraaf and Yamasaki 2001, Hunter et al., 1999).

TABLE 5-8 AMPHIBIAN AND AQUATIC REPTILE SPECIES WITH THE POTENTIAL TO OCCUR IN VICINITY OF THE GREEN LAKE HYDROELECTRIC PROJECT

COMMON NAME	SCIENTIFIC NAME
Amphibians	
Blue-spotted salamander	<i>Ambystoma laterale</i>
Spotted salamander	<i>Ambystoma maculatum</i>
Eastern newt	<i>Notophthalmus v. viridescens</i>
Northern dusky salamander	<i>Desmognathus fuscus</i>
Northern redback salamander	<i>Plethodon cinereus</i>
Four-toed salamander	<i>Hemidactylium scutatum</i>
Northern two-lined salamander	<i>Eurycea bislineata</i>
Eastern American toad	<i>Bufo americanus</i>
Eastern Spring peeper	<i>Pseudacris crucifer</i>
Gray treefrog	<i>Hyla versicolor</i>
Bullfrog	<i>Rana catesbeiana</i>
Green frog	<i>Rana clamitans</i>
Mink frog	<i>Rana septentrionalis</i>
Pickerel frog	<i>Rana palustris</i>
Wood frog	<i>Rana sylvatica</i>
Northern leopard frog	<i>Rana pipiens</i>
Reptiles	
Painted turtle	<i>Chrysemys picta</i>
Snapping turtle	<i>Chelydra serpentine</i>
Wood turtle	<i>Clemmys insculpta</i>
Northern ringneck snake	<i>Diadophis punctatus</i>
Northern redbelly snake	<i>Storeria occipitomaculatum</i>
Common garter snake	<i>Thamnophis sirtalis</i>

Source: Degraaf and Yamasaki 2001, Hunter et al., 1999

5.3.2 AQUATIC HABITAT

The Maine Department of Inland Fisheries and Wildlife Green Lake (MDIFW) manages Green Lake for cold-water fish. MDIFW stocks both landlocked salmon and lake trout in Green Lake, and notes that arctic char, smallmouth bass are present and wild landlocked salmon are in the lake (Appendix F.3). Currently, the USFWS’s GLNFH raises Atlantic salmon for restocking several river systems in New England (USFWS, 2018). NMFS in its stakeholder response noted “Green Lake is located within the GOM DPS for federally endangered Atlantic salmon, and occurs within the designated critical habitat for that species...” (Appendix F.1).

5.3.3 ESSENTIAL FISH HABITAT

The Union River watershed is within the Gulf of Maine (GOM) distinct population segment (DPS) for Atlantic salmon.

There is fish passage through the Union River various structures and methods to Graham Lake, into which Reeds Brook flows. Fish using these structures include Atlantic salmon and river herring. Graham Lake is fairly shallow, with a mean depth of 17 feet and a maximum depth of 47 feet, and supports warmwater species such as smallmouth and largemouth bass, chain pickerel, and white perch (Brookfield application). (In contrast, Green Lake has a maximum depth of 170 feet (MDIFW, rev. 1995)

The Union River Stakeholders Group (including USFWS and Maine Department of Marine Resources) formed to address fisheries management in the Union River drainage, including the provision of fish passage at the Ellsworth Hydroelectric Project.

5.3.4 REFERENCES

- Degraaf, R. M. and M. Yamasaki. 2001. *New England Wildlife: Habitat, Natural History, and Distribution*. University Press of New England, Hanover. Multiple pages.
- Green Lake Water Power Project (GLWP). 1983. Application for a License for a Minor Water Power Project – FERC No. 4894.
- Federal Energy Regulatory Commission (FERC). 1984 Order Issuing License (Minor) for Green Lake Hydroelectric Project (FERC No. 7189). 27 FERC ¶62,023. Issued April 5, 1984.
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- Hunter, Malcom L., Aram J. K. Calhoun, and Mark McCollough. 1999. *Maine Amphibians and Reptiles*.
- Maine Department of Inland Fisheries and Wildlife (MDIFW). 1942, rev. 1995. Lake Survey. Surveyed August, 1942; revised 1953, 1975, 1995. [Online] URL: https://www.maine.gov/ifw/docs/lake-survey-maps/hancock/green_lake.pdf. Accessed March 22, 2019.
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- National Marine Fisheries Service. 2014. Atlantic Salmon Gulf of Maine DPS Boundaries. [Online] URL: <https://www.fisheries.noaa.gov/resource/map/atlantic-salmon-gulf-maine-dps-boundaries>
- U.S. Fish and Wildlife Service. 2018. Green Lake National Fish Hatchery. [Online] URL: <https://www.fws.gov/northeast/greenlake/>

5.4 UPLAND WILDLIFE AND BOTANICAL RESOURCES

18 CFR §5.6(d)(3)(v) requires "A description of the wildlife and botanical resources, including invasive species, in the project vicinity. Components of this description must include: (A) Upland habitat(s) in the project vicinity, including the project's transmission line corridor or right-of-way and a listing of plant and animal species that use the habitat(s); and (B) Temporal or spatial distribution of species considered important because of their commercial, recreational, or cultural value."

5.4.1 WILDLIFE HABITATS IN THE PROJECT AREA AND VICINITY

LAND COVER

From the original request for a license (GLWP, 1983):

The project area is located in the hemlock-white pine-northern hardwoods region of the eastern deciduous forest. Most of the land surrounding the project is forested; both hardwood and spruce-fir forest species are present. Dominant overstory species noted at the project site include red oak, maple, beech, white and yellow birch, hemlock, white pine, spruce, and cedar. The understory consists of saplings of the overstory species along with striped maple, mountain maple, yew, red spruce, hemlock, and hobblebush. Ground layer vegetation is sparse.

.... Mowed lawns and a variety of ornamental shrubs are located around the [GLNFH and the GLWP powerhouse]. Plant species common to disturbed areas are found along the existing gravel road between the hatchery [, powerhouse,] and the Green Lake Dam. The area at the mouth of Reeds Brook contains lowland shrubs and herbaceous plants characteristic of riverine or streamside communities.

URBAN/SUBURBAN

The City of Ellsworth is located approximately 6 miles below the project site; no land in the immediate vicinity of the project boundary is considered Urban/Suburban.

5.4.2 WILDLIFE RESOURCES IN THE PROJECT AREA AND VICINITY

From the original request for license (GLWP, 1983):

The project area supports a variety of wildlife species typical of eastern Maine. Species presumed to exist in the region include deer, fox, mink, otter, skunk, raccoon, muskrat, porcupine, woodchuck, varying hare, grouse, woodcock, and a variety of songbirds, hawks, and owls.

....

Two pairs of nesting bald eagles have been recorded along the shore of Graham Lake. The nest sites are located approximately 2 miles and 4-3/4 miles, respectively, to the northeast of the project site. Both nests have been occupied or active within the past three years (Todd, C., 1983). Eagles have been observed feeding on white suckers at the mouth of Reeds Brook during the spring (Dennison, B.A., 1983).

There are several deer wintering areas in the vicinity of Green Lake (MDIFW, 2003). Deer have been observed in the project area during the winter of 2018-2019. It is not anticipated that deer habitat will be affected by project operations.

There are several areas of state-classified inland wading bird and waterfowl habitat in the vicinity of Green Lake (MDIFW, 2003). The MDIFW stakeholder response also discussed these (see Appendix F.3). These areas occur specifically at the north end of Green Lake and are likely sensitive to water quality and lake levels. GLWP will evaluate these habitats and their wildlife as part of the relicensing process.

5.4.3 INVASIVE WILDLIFE SPECIES

None are known within the project area.

5.4.4 INVASIVE PLANTS AND WEEDS

The Maine Department of Agriculture, Conservation and Forestry considers these species to be currently considered invasive in Maine:

TABLE 5-9 INVASIVE PLANTS POTENTIALLY OCCURRING WITHIN THE PROJECT

SCIENTIFIC NAME	COMMON NAME
<i>Alliaria petiolata</i>	Garlic Mustard
<i>Berberis thunbergii</i>	Japanese Barberry
<i>Celastrus orbiculata</i>	Asiatic Bittersweet
<i>Cynanchum louiseae</i>	Black Swallowwort
<i>Elaeagnus umbellata</i>	Autumn Olive
<i>Fallopia japonica</i>	Japanese knotweed
<i>Frangula alnus</i>	Glossy buckthorn
<i>Impatiens glandulifera</i>	Ornamental Jewelweed
<i>Lepidium latifolium</i>	Perennial Pepperwort
<i>Lonicera morrowii</i>	Morrow Honeysuckle
<i>Lonicera tartarica</i>	Tartarian Honeysuckle
<i>Lythrum salicaria</i>	Purple loosestrife
<i>Phragmites australis</i>	Common reed
<i>Rosa multiflora</i>	Multiflora or Rambler rose
Aquatic Species	
<i>Cabomba caroliniana</i>	Fanwort
<i>Egeria densa</i>	Brazilian Elodea
<i>Hydrilla verticillata</i>	Hydrilla
<i>Hydrocharis morsus-ranae</i>	European Frog-bit
<i>Myriophyllum aquaticum</i>	Parrot Feather
<i>Myriophyllum heterophyllum</i>	Variable-leaf milfoil
<i>Myriophyllum spicatum</i> L.	Eurasian Milfoil
<i>Najas minor</i>	European Naiad
<i>Nymphoides peltate</i>	Yellow Floating Heart
<i>Poa nemoralis</i>	Wood Blue Grass
<i>Potamogeton crispus</i>	Curly-leaf Pondweed

Rhamnus cathartica

Common Buckthorn

Trapa natans L.

Water Chestnut

Source: MDACF, 2013; MDEP, 2018

5.4.5 REFERENCES

Maine Department of Agriculture, Conservation and Forestry (MDACF). 2013. Maine Invasive Plant Fact Sheets. 2013. [Online] https://www.maine.gov/dacf/mnap/features/invasive_plants/invsheets.htm. Accessed March 22, 2019.

Maine Department of Environmental Protection (MDEP). 2018. Invasive Aquatic Species Program. [Online] <http://www.maine.gov/dep/water/invasives/>. Accessed May 21, 2018.

Maine Department of Inland Fisheries and Wildlife (MDIFW). 2003. Map 2 – Plant and Animal Habitats: Deer Wintering Areas, Inland Wading Bird and Waterfowl Habitat layers. [Online] URL: <https://webapps2.cgis-solutions.com/beginningwithhabitat/map2/>

Green Lake Water Power Project (GLWP). 1983. Application for a License for a Minor Water Power Project – FERC No. 4894.

5.5 SHORELINE WILDLIFE AND BOTANICAL RESOURCES

18 CFR §5.6(d)(3)(vi) requires "Description of floodplains, wetlands, riparian, and littoral habitat (1) List of plant and animal species using the habitat (2) Map of wetlands, riparian and littoral habitat (3) Acreage estimate for each type of land including variability connected to project operations."

5.5.1 FLOODPLAIN AND WETLAND SPECIES AND HABITATS OF THE PROJECT AREA AND VICINITY

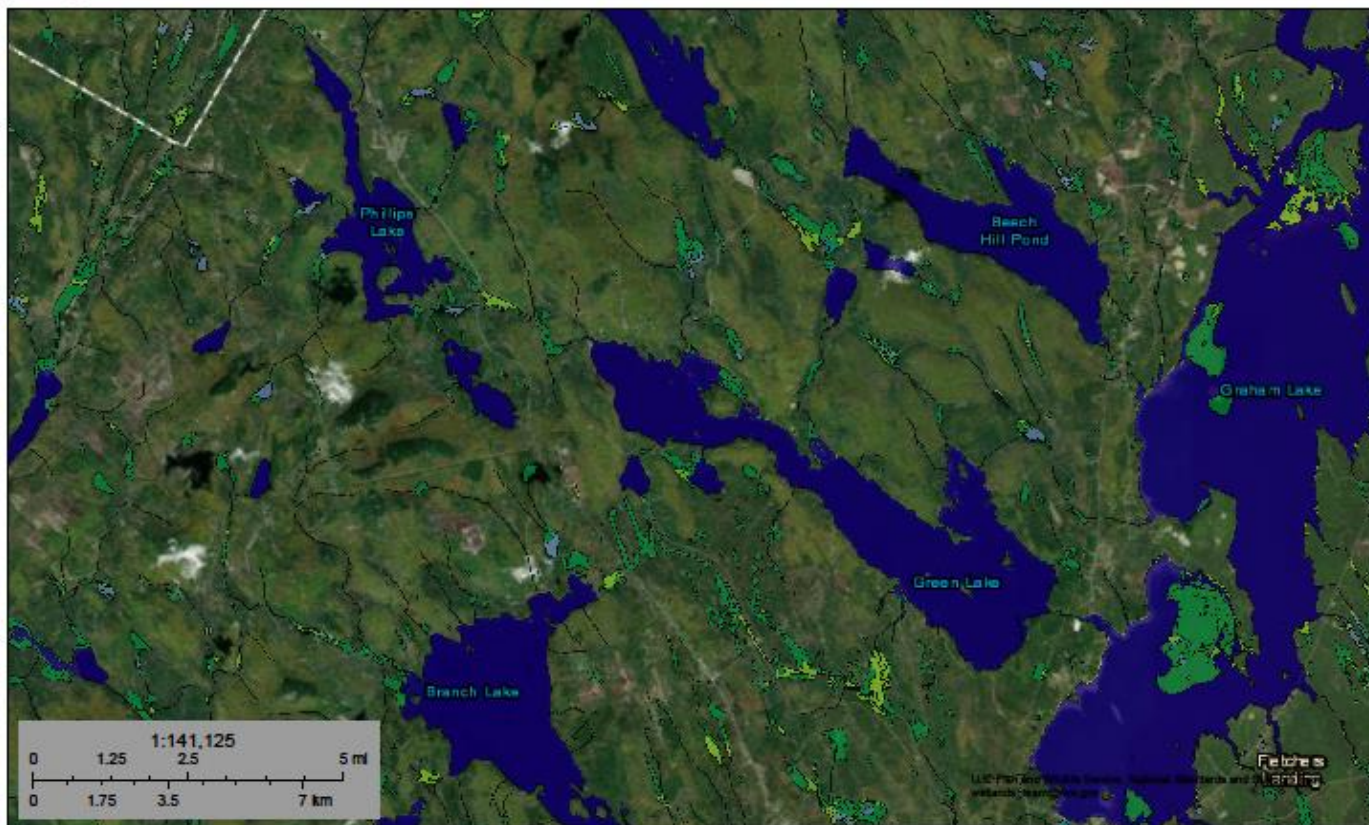
The majority of the wetlands in the project area are classified by the National Wetlands Inventory (NWI) as Freshwater Forested/Shrub Wetland.

Wetlands, both freshwater emergent wetland (FEW) and freshwater forested/shrub wetland (FFSW), occur within a mile of Green Lake and Reeds Brook, primarily to the southwest of the lower part of Green Lake. Areas of FFSW occur at or near the shoreline of the lake, mostly at the upper end; the nearest FEW area is approximately 1,500 feet from the lake, in the area between Green and Phillips lakes (USFWS, 2018a).

FIGURE 5-7 WETLANDS IN THE VICINITY OF THE PROJECT



Wetlands, vicinity of Green Lake



March 17, 2019

Wetlands

- | | | |
|--------------------------------|-----------------------------------|----------|
| Estuarine and Marine Deepwater | Freshwater Emergent Wetland | Lake |
| Estuarine and Marine Wetland | Freshwater Forested/Shrub Wetland | Other |
| | Freshwater Pond | Riverine |

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

5.5.2 RIPARIAN AND LITTORAL SPECIES AND HABITATS OF THE PROJECT AREA AND VICINITY

The Green Lake Hydroelectric Project includes Green Lake and Reeds Brook. Green Lake's shoreline is mostly forested, with some open areas including residential and recreation land uses, wetlands, and islands. The area immediately adjacent to Reeds Brook is mostly forested.

From the original license application (GLWP, 1983), in the discussion about a botanical assessment conducted for the application, these forested areas include:

Some species common in the spruce-fir forests are mixed in with the northern hardwood species in the study area...

White pine, hemlock, beech, balsam fir, and paper birch are common overstory species... Red spruce, hemlock, and hobblebush were the dominant species in the shrub layer. The ground layer [includes] wild sarsaparilla and starflower ... with rock polypody covering several rocks near the forest edge by the dam. Mosses were quite common.

....

Reeds Brook flows ... in a narrow ravine from Green Lake to Graham Lake.... The forest ... was characteristic of a northern hardwoods forest... including beech, red oak, white ash, white spruce, birches, and hemlock...lower layers [also included] striped maple, mountain maple, and yew ... [and] a few herbaceous species ... in the rather sparse ground layer.

At the mouth of Reeds Brook the stream channel broadens. A riverine or streamside community was present along the channel and on slightly elevated areas within the channel ...with characteristic lowland shrubs and herbaceous plants. The stream empties into an inlet of Graham Lake. Since the lake has a fluctuating pool elevation (which is at a low level in September), plants have invaded onto exposed gravel bars and mudflats that are probably inundated with water earlier in the year. A sedge, spearwort, and arrowhead were the dominant species on the gravel bars and mudflats in this area. Along the edges of the stream, alder, sweet gale, and inkberry were rather abundant.

The penstock runs alongside Reeds Brook and between it and the gravel road that runs from the hatchery and powerhouse area. Plant species characteristic of disturbed or waste areas are common along the road and between the road and the penstock, such as goldenrods, asters, hop clover, rabbitfoot clover, red and white clovers, and grasses, plus shrubs and tree seedlings from the nearby forested land. (GLWP, 1983)

Two species of birds are mentioned in stakeholder responses: loons (GLA, Appendix F.5) and bald eagles – directly addressed in the original license (FERC, 1984). The concern with eagles is on preserving nesting sites and habitats for prey/feed species. The current license requires maintaining a 1-cfs flow in Reeds Brook in part because it is where eagles feed, planning and executing construction of the powerhouse and transmission line to minimize disturbance to eagles, and designing and building the powerhouse to allow continued access to Reeds Brook by bald eagles.

The concern with loons is the flooding of nest sites if lake levels rise.

Common Loons are a classic bird of the North Woods lakes. They are excellent indicators of water quality as they require crystal-clear lakes (which makes it easier for

them to see prey underwater) with abundant populations of small fish. Lakes with coves and islands are preferred as they provide cover from predators while resting and nesting. ... Loons nest in quiet, protected, hidden spots of lakeshore, typically in the lee of islands or in a sheltered back bay. Loons can't walk well on land, so nests are built close to a bank, often with a steep dropoff that allows the bird to approach the nest from underwater. (Cornell, 2017)

No changes to either the shoreland around Green Lake or the edges of Reeds Brook are anticipated as a result of continued project operation.

5.5.3 REFERENCES

Cornell University. 2017. All About Birds: Common Loon: Life History [Online] URL: https://www.allaboutbirds.org/guide/Common_Loon/lifehistory

Green Lake Water Power Project (GLWP). 1983. Application for a License for a Minor Water Power Project – FERC No. 4894.

Federal Energy Regulatory Commission (FERC). 1984 Order Issuing License (Minor) for Green Lake Hydroelectric Project (FERC No. 7189). 27 FERC ¶62,023. Issued April 5, 1984.

U.S. Fish and Wildlife Service. 2018a. National Wetlands Inventory. Wetland Mapper. [Online] <https://www.fws.gov/wetlands/data/Mapper.html>. Accessed May 21, 2018.

5.6 THREATENED AND ENDANGERED SPECIES

18 CFR §5.6(d)(3)(vii) requires "A description of any listed rare, threatened and endangered, candidate, or special status species that may be present in the project vicinity. Components of this description must include: (A) A list of Federal- and state-listed, or proposed to be listed, threatened and endangered species known to be present in the project vicinity; (B) Identification of habitat requirements; (C) References to any known biological opinion, status reports, or recovery plan pertaining to a listed species; (D) Extent and location of any federally- designated critical habitat, or other habitat for listed species in the project area; and (E) Temporal and spatial distribution of the listed species within the project vicinity."

5.6.1 THREATENED AND ENDANGERED WILDLIFE RESOURCES AND HABITATS

The Endangered Species Act (ESA) was passed in 1973 to protect those animals and plants and associated habitats that are in danger of becoming extinct. The USFWS classifies animals and plants into two categories: "endangered species" are in danger of extinction throughout the area in which they are usually found and "threatened species" are those that could become endangered in the near future. The bald eagle was removed from the ESA list on June 28, 2007. However, bald eagles remain federally protected under the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act.

Wildlife species in Maine may also be protected under the Maine Endangered Species Act (MESA) like the ESA. Depending on their level of vulnerability to extinction, species may be listed as Endangered or Threatened. Under MESA, a species may also be identified as Special Concern if it does not meet the criteria of endangered or threatened but is particularly vulnerable

and could easily become threatened, or is suspected to be endangered or threatened but for which insufficient data exists (MDIFW, 2009).

MESA includes the designation and protection of Essential Habitats, which are defined as “areas currently or historically providing physical or biological features essential to the conservation of endangered or threatened species in Maine and which may require species management considerations” (MDIFW, 2009). The Natural Resources Protection Act (NRPA) provides protection to certain natural resources including Significant Wildlife Habitats and is administered by the MDEP.

The USFWS has identified one fish and one bat as listed on the federal endangered species list (USDOJ, 2018) within the Project Area: Atlantic salmon and northern long eared bat (Table 5-10).

TABLE 5-10 FEDERALLY LISTED ENDANGERED OR THREATENED WILDLIFE SPECIES DOCUMENTED AS OCCURRING IN THE PROJECT AREA

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS
Atlantic salmon	<i>Salmo salar</i>	Endangered
Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened
Rusty patched bumble bee	<i>Bombus affinis</i>	Endangered

Source: USDOJ, 2018

A review of the Maine list of threatened and endangered species was completed. Based on the available habitat and ranges of the species listed, there are five Maine state listed species identified as potentially occurring within the Project. In addition, there are eighteen species listed as Species of Special Concern that may occur in the Project (Table 5-11) (MDIFW, 2019).

TABLE 5-11 ENDANGERED, THREATENED, AND SPECIES OF SPECIAL CONCERN THAT MAY OCCUR IN THE PROJECT OR IN THE PROJECT VICINITY

SPECIES COMMON NAME	ENDANGERED	THREATENED	SPECIAL CONCERN
AMPHIBIAN			
Blue-spotted salamander			X
Northern leopard frog			X
BIRD			
Great blue heron			X
Bald eagle			X
Northern Harrier			X
Barn owl			X
Whip-poor-will			X
Barn swallow			X
Northern rough-winged swallow			X
Veery			X

SPECIES COMMON NAME	ENDANGERED	THREATENED	SPECIAL CONCERN
Rusty blackbird			X
FISH			
American eel			X
MAMMAL			
Little brown bat	X		
Northern long-eared bat	X		X
Red bat			X
Hoary bat			X
Silver-haired bat			X
Eastern pipistrelle			X
REPTILE			
Northern ribbon snake			X
MUSSEL			
Brook floater		X	
Tidewater mucket		X	
Yellow lampmussel		X	
Source: MDIFW, 2019			

5.6.2 THREATENED AND ENDANGERED WILDLIFE SPECIES DISTRIBUTION AND LIFE HISTORY INFORMATION

ATLANTIC SALMON

SPECIES DESCRIPTION AND LISTING

Atlantic salmon are an anadromous fish species with a complex life history. Individuals spend most of their adult life in marine environments but return to freshwater rivers and streams to spawn (Fay et al., 2006). Atlantic salmon are native to the North Atlantic Ocean and have been found worldwide as far south as Portugal in the eastern Atlantic and the Connecticut and Housatonic Rivers in the western Atlantic, and north to Ungava Bay in Quebec as well as the Nastapoka River in Hudson Bay (Morin, 1991). Atlantic salmon were initially listed as endangered on November 17, 2000, on eight coastal Maine watersheds by the NMFS and the USFWS (65 FR 69459). NMFS and the USFWS expanded the listing to include Atlantic salmon that inhabit large Maine rivers (Androscoggin, Kennebec, and Penobscot) that were partially or wholly excluded in the initial listing (74 FR 29344; June 19, 2009). NMFS determined that Atlantic salmon that inhabit the Gulf of Maine watersheds from the Androscoggin River eastward to the Dennys River are a distinct population segment (i.e., GOM DPS) and thus should be listed as a “species.”

Currently, the GOM DPS includes Atlantic salmon that occupy freshwater from the Androscoggin River to the Dennys River, as well as anywhere Atlantic salmon occur in the

estuarine and marine environments. The historical upstream limits of the species' freshwater range are primarily determined by impassable falls in the Penobscot River watershed, including Big Niagara Falls on Nesowadnehunk Stream in Township 3 Range 10 (91.2 miles north of the project), Grand Pitch Falls on Webster Brook in Trout Brook Township (100 miles northwest of the project), and Grand Falls on the Passadumkeag River (38 miles north of the project) (74 FR 29344; June 19, 2009). Additionally, conservation hatchery populations maintained by Green Lake National Fish Hatchery and Craig Brook National Fish Hatchery are included in the GOM DPS. Landlocked and commercially raised salmon are excluded from the listing (74 FR 29344; June 19, 2009).

LIFE HISTORY OF THE ATLANTIC SALMON

Anadromous Atlantic salmon go through several distinct phases which are accompanied by changes in behavior, physiology, morphology, and habitat requirements. While spawning by adult Atlantic salmon does not occur until fall, upstream migration begins in the spring. In Maine, most Atlantic salmon begin to ascend rivers from May to mid-July, but migration may continue until the fall (Meister, 1958). As soon as fish enter freshwater, they stop feeding and darken in coloration. Salmon that return in the early spring may spend up to 5 months in the river before spawning. These fish spend the summer months in cool water refuges such as deep pools, springs, and mouths of cold-water tributaries (Fay et al. 2006). In either the fall or the following spring, post-spawned adults (i.e., "kelts") migrate downstream after spawning and resume feeding once reaching the marine environment. A small percentage may return to spawn 1 to 2 years later.

Spawning typically takes place from late October through November when water temperatures are around 7°C to 10°C (45°F to 50°F). Preferred spawning sites consist of gravel substrate within flowing water (Peterson, 1978), with water depth ranging from 30 to 61 centimeters (11.8 to 24 inches) and water velocities averaging 60 centimeters a second (2.0 feet a second) (Beland, 1984). Eggs are deposited in a series of nests (i.e., redds) scoured from the gravel by the female. As they are deposited in the redd, one or more males will fertilize the eggs. A returning female can produce approximately 7,500 eggs (Fay et al., 2006).

In late March or April, salmon eggs hatch as alevin (or sac fry). Alevin remain in the redd for approximately 6 weeks nourished by their yolk sac. In mid-May, alevins emerge from the gravel and begin to actively feed, at which point they are called fry. Salmon fry enter the parr stage within days of emerging. This stage is indicated by vertical bars (i.e., "parr marks") which appear on their sides. Sites preferred by parr include areas with sufficient cover, water depths from roughly 10 to 60 centimeters (4.0 to 23.6 inches), water velocities between 30 and 92 centimeters a second (0.9 to 3.0 feet a second), and water temperatures around 16°C (60.8°F) (Fay et al. 2006). The diet of juvenile salmon includes aquatic invertebrates such as the larvae of mayflies, stoneflies, chironomids, caddisflies, aquatic annelids, and mollusks, as well as a variety of terrestrial invertebrates that fall into the river (Fay et al. 2006). In the fall, parr will seek shelter in the substrate as water flows increase and temperature and day length decrease (Fay et al., 2006).

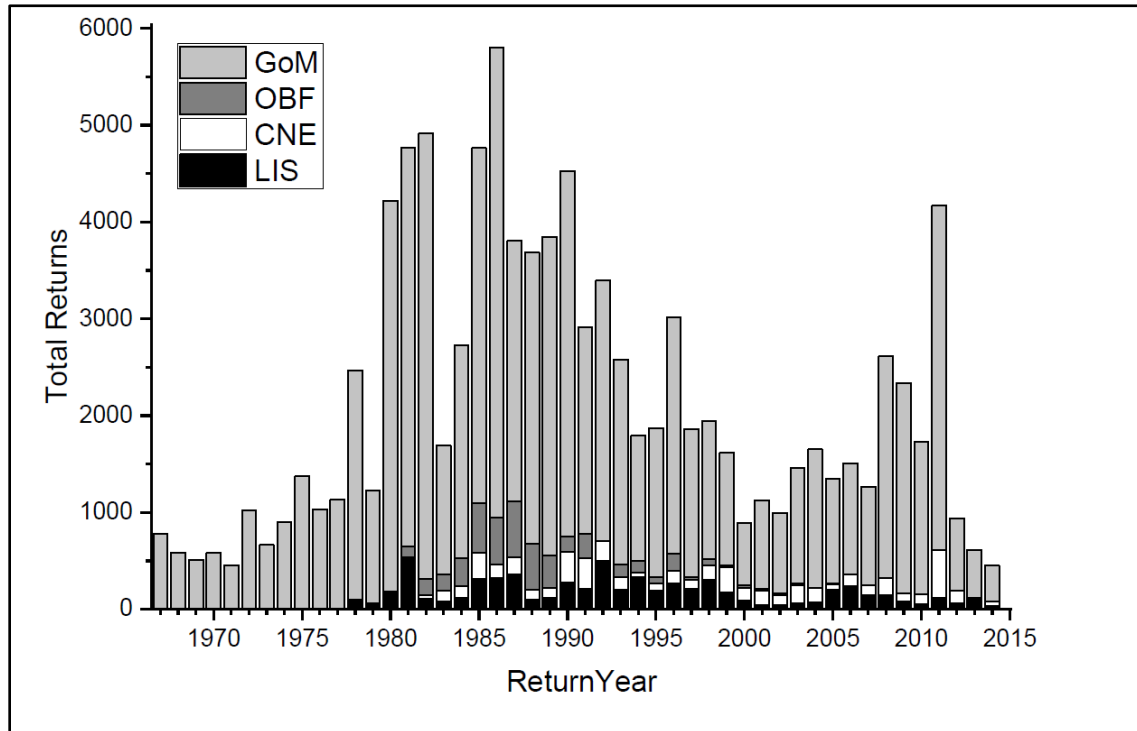
Parr will remain in freshwater for 1 to 3 years before undergoing smoltification, which is a series of physiological, morphological, and behavioral changes that prepare the salmon to move from freshwater to marine environments. In the Penobscot River watershed, smolts migrate back to the

marine environment between late April and early June with a peak movement in early May (Fay et al., 2006). After returning to sea, Atlantic salmon commence long migrations from their natal rivers. During this time, Atlantic salmon experience a period of rapid growth. Once they reach maturity, they return to their natal river (Fay et al., 2006). Atlantic salmon may spend up to 3 years in the marine environment before returning to their natal freshwater streams to spawn (Fay et al., 2006).

STATUS AND TRENDS OF ATLANTIC SALMON IN THE GULF OF MAINE DISTINCT POPULATION SEGMENT

The overall abundance of Atlantic salmon has been declining since the 1800s (Fay et al., 2006). Although comprehensive data on adult abundance are not available until after 1967, current abundance levels of Atlantic salmon are significantly lower than historical estimates. Whereas Foster and Adkins (1869) estimated that approximately 100,000 adult Atlantic salmon returned to the Penobscot Rivers historically, since 1967 it has been uncommon for adult returns for the entire Gulf of Maine DPS to exceed 5,000 individuals (Fay et al., 2006, USASAC, 2014). Adult returns have remained low since 2011; only 376 individuals returned to the Gulf of Maine area in 2014, a 24 percent decrease from 2013 (USASAC, 2014). In 2016, 626 adult salmon returned to USA rivers; of these, 616 returned to the Gulf of Maine (USASAC, 2017).

FIGURE 5-8 ESTIMATED TOTAL RETURNS TO NEW ENGLAND FOR OUTER BAY OF FUNDY (OBF), GOM DPS, CENTRAL NEW ENGLAND COMPLEX (CNE), AND LONG ISLAND SOUND (LIS) COMPLEX FROM 1967 TO 2014



CRITICAL HABITAT FOR ATLANTIC SALMON IN THE GULF OF MAINE DISTINCT POPULATION SEGMENT

Section (5)(A) of the Endangered Species Act defines “critical habitat” for a threatened or endangered species as:

(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Coincident with the June 19, 2009, Atlantic salmon listing, NMFS designated critical (74 FR 29300; June 19, 2009). The final rule was revised on August 10, 2009, (74 FR 39003; August 10, 2009) in which designated critical habitat for the Atlantic salmon was revised to exclude trust and fee holdings of the Penobscot Indian Nation. Reeds Brook is not classified as critical habitat for species recovery (74 FR 29300; June 19, 2009).

In its stakeholder response, the National marine Fisheries Service said “Green Lake ... occurs within the designated *critical* habitat for [Atlantic salmon].” (emphasis added) (Appendix F.1)

In its application for relicensing the Ellsworth Project, Black Bear discusses the Gulf of Maine Distinct Population Segment of Atlantic salmon, and notes the area included for all naturally reproducing Atlantic salmon populations includes the Union River, of which Graham Lake is a part. (Green Lake and Reeds Brook are upstream of Graham Lake.) That document notes: “[t]he Ellsworth Project falls within the designated *critical* habitat of the Downeast Coastal Salmon Habitat Recovery Unit for Atlantic salmon (NMFS 2009; Sean McDermott, NMFS, personal communication July 2, 2014).” (emphasis added) (Black Bear, 2015).

Based on these two documents, GLWP believes Green Lake is classified as *critical* habitat rather than *essential* habitat for Atlantic salmon.

NORTHERN LONG-EARED BAT

The northern long-eared bat (NLEB) is listed as a federally threatened species and is listed as Endangered at the state level. The NLEB was listed as threatened on April 2, 2015, with a final rule published in the Federal Register on January 14, 2016. On April 27, 2016, the USFWS determined that the designation of critical habitat for the species was not prudent; therefore, no critical habitat is established for the NLEB (USFWS, 2018).

The northern long-eared bat feeds on invertebrates and is known to glean prey from vegetation and water surfaces. The NLEB winters in underground caves and cave like structures, but summers singly or in small colonies in cavities, under bark, or in hollows of live and dead trees typically, greater than 3 in. in diameter. Suitable roosting trees also include exfoliating bark, cavities, or cracks (USFWS, 2018).

Since the discovery of White-nose Syndrome (WNS) in 2006 in northeastern United States NLEB populations have experienced die-offs of greater than 90 percent. Specific population

decline information for NLEB in Maine is lacking, however, WNS is present in neighboring states. It is predicted that WNS could extirpate cave and mine hibernating bats from the northeastern United States.

While the Project falls within the range of the NLEB it is unlikely that the overwintering or summer roosting occurs with the Project, although feeding may occur over the impoundment.

STATE SPECIES

LITTLE BROWN BAT

The little brown bat (LBB) is listed as state endangered. The LBB was state listed in 2015 based on their decline in Maine and throughout their range in the United States. The LBB is part of Maine's Wildlife Action Plan, which looks at many rare or poorly known species and charts a path for their conservation.

The LBB feeds on invertebrates such as flying insects, especially mosquitoes, midges, caddisflies, and smaller beetles. This species a member of the cave bats and hibernates (winters) in underground caves or cave like structures, which include tunnels, abandoned mines, and buildings with a steady temperature of about 2-12 C. Maternity colonies commonly are in warm sites in buildings (e.g., attics) and other structures; also, infrequently in hollow trees (NatureServe, 2017a).

Since the discovery of White-nose Syndrome (WNS) in 2006 in northeastern United States LBB populations have experienced die-offs of greater than 90 percent. Specific population decline information for LBB in Maine is lacking, however, WNS is present in neighboring states. It is predicted that WNS could extirpate cave and mine hibernating bats from the northeastern United States.

While the Project falls within the range of the LBB it is unlikely that the overwintering occurs within the Project, although feeding may occur over the impoundment.

BROOK FLOATER

The Brook Floater is listed as threatened under Maine's Endangered Species Act. The brook floater is found in creeks and small rivers where it is found among rocks in gravel substrates and in sandy shoals, the brook floater inhabits flowing-water habitats only. It occurs in running water and although typically found in riffles and moderate rapids with sandy shoals or riffles with gravel bottoms, it can also be found in a range of flow conditions (NatureServe, 2017b).

Although little is known about the feeding habitats of the species, stomach content analysis indicates freshwater mussels generally feed on mud, desmids, diatoms, rotifers, flagellates, and other unicellular organisms (NatureServe, 2017b).

Glochidia (larval form) of freshwater mussels are typically parasitic on fish. Historically in Maine, the species may have used the Atlantic salmon as a host species to transport larva. The brook floater is a long-term brooder. Like most species of freshwater mussels, the brook floater is long-lived and can live between 30 to 70 years (NatureServe, 2017b).

TIDEWATER MUCKET

The tidewater mucket (TWM) is listed as threatened under Maine's Endangered Species Act. The TWM inhabits ponds, canals, and slow-moving sections of rivers; including artificial

impoundments, using substrates such as silt, sand, gravel, cobble, and occasionally clay (NatureServe, 2017c).

This species is a long-term brooder as eggs are fertilized in late summer and glochidia are released the following spring. The only confirmed fish host for this species is white perch (NatureServe, 2017c).

YELLOW LAMPMUSSEL

The yellow lampmussel (YLM) is listed as threatened under Maine's Endangered Species Act. The YLM occurs in larger streams and rivers, typically found in sand and gravel where good current exists, but has also been seen to inhabit ponds in northern portions of range, but generally prefers flowing water (NatureServe, 2017d).

Dispersal of the species occurs with the glochidia attaching its self to the host fish. Adult mussels may have passive movement downstream (NatureServe, 2017d). Glochidia of the YLM are parasitic on fish while the adult mussels are filter filters.

This species is a long-term brooder where eggs are fertilized in late summer and glochidia are released the following spring (Nedeau et al., 2000).

5.6.3 THREATENED AND ENDANGERED BOTANICAL RESOURCES AND HABITATS

On the USFWS list of threatened, endangered, candidate and proposed species in Maine, no plant species are documented as occurring within Hancock County. (USFWS, 2017)

We believe there are no known state-listed plant species within the Project Boundary. (MDIFW, 2003)

5.6.4 THREATENED AND ENDANGERED BOTANICAL SPECIES DISTRIBUTION AND LIFE HISTORY INFORMATION

There are no federally or state listed threatened or endangered botanical species anticipated to occur in proximity of the Project.

5.6.5 REFERENCES

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5.7 RECREATION AND LAND USE

18 CFR §5.6(d)(3)(viii) requires "A description of the existing recreational and land uses and opportunities within the project boundary. The components of this description include: (A) Text description illustrated by maps of existing recreational facilities, type of activity supported, location, capacity, ownership and management; (B) Current recreational use of project lands and waters compared to facility or resource capacity; (C) Existing shoreline buffer zones within the project boundary; (D) Current and future recreation needs identified in current State Comprehensive Outdoor Recreation Plans, other applicable plans on file with the Commission, or other relevant local, state, or regional conservation and recreation plans; (E) If the potential applicant is an existing licensee, its current shoreline management plan or policy, if any, with regard to permitting development of piers, boat docks and landings, bulkheads, and other shoreline facilities on project lands and waters; (F) A discussion of whether the project is located within or adjacent to a: (1) River segment that is designated as part of, or under study for inclusion in, the National Wild and Scenic River System; or (2) State-protected river segment; (G) Whether any project lands are under study for inclusion in the National Trails System or designated as, or under study for inclusion as, a Wilderness Area. (H) Any regionally or nationally important recreation areas in the project vicinity; (I) Non-recreational land use and management within the project boundary; and (J) Recreational and non recreational land use and management adjacent to the project boundary."

5.7.1 EXISTING PROJECT RECREATION OPPORTUNITIES AND USE

From the original license submission (GLWP, 1983):

Green Lake provides a variety of recreational opportunities which include fishing, swimming, and boating during the warmer seasons and ice fishing in the winter. The lake's high quality water and proximity to the cities of Bangor and Ellsworth make it an attractive area for summer use. Approximately 35% of the shoreline is developed with private camps and recreational facilities which include a beach and boat launch site maintained by the City of Ellsworth, two private beaches at the north end of the lake, and a tenting area on the east side. A variety of secondary roads provide access to most of the lake shore.

There are no project-specific recreational facilities within or adjacent to the Project Boundary. Approximately 50% of the shoreline of Green Lake is estimated to be developed as of 2019. The City of Ellsworth still maintains the beach and boat launch site.

5.7.2 REGIONAL RECREATION OPPORTUNITIES

Other recreation opportunities in the area include coastal sites, Mount Desert Island including Acadia National Park and Bar Harbor, numerous lakes, streams, and ponds, and so forth.

5.7.2.1 STATE RECREATION AREAS

There are no known state recreation areas in the project vicinity.

5.7.2.2 COUNTY/MUNICIPAL RECREATION AREAS

The City of Ellsworth maintains a beach and boat launch site. As of 2019, the boat launch site is being improved and extended to provide improved access to the lake by boaters during periods of low water.

5.7.3 RECREATION NEEDS IDENTIFIED IN MANAGEMENT PLANS

2014-2019 Maine State Comprehensive Outdoor Recreation Plan

The Maine State Comprehensive Outdoor Recreation Plan (MSCORP) provides information on the supply and demand for outdoor recreation opportunities in Maine, assesses recreation issues, provides an implementation plan, as well as serves to qualify Maine for funding from the federal Land and Water Conservation Fund (LWCF) to acquire or develop lands for public outdoor recreation. There are no recommendations specific to the Green Lake Project. Recreation priorities outlined in the MSCORP that may bear relevance to the Project are (MDACF, 2015):

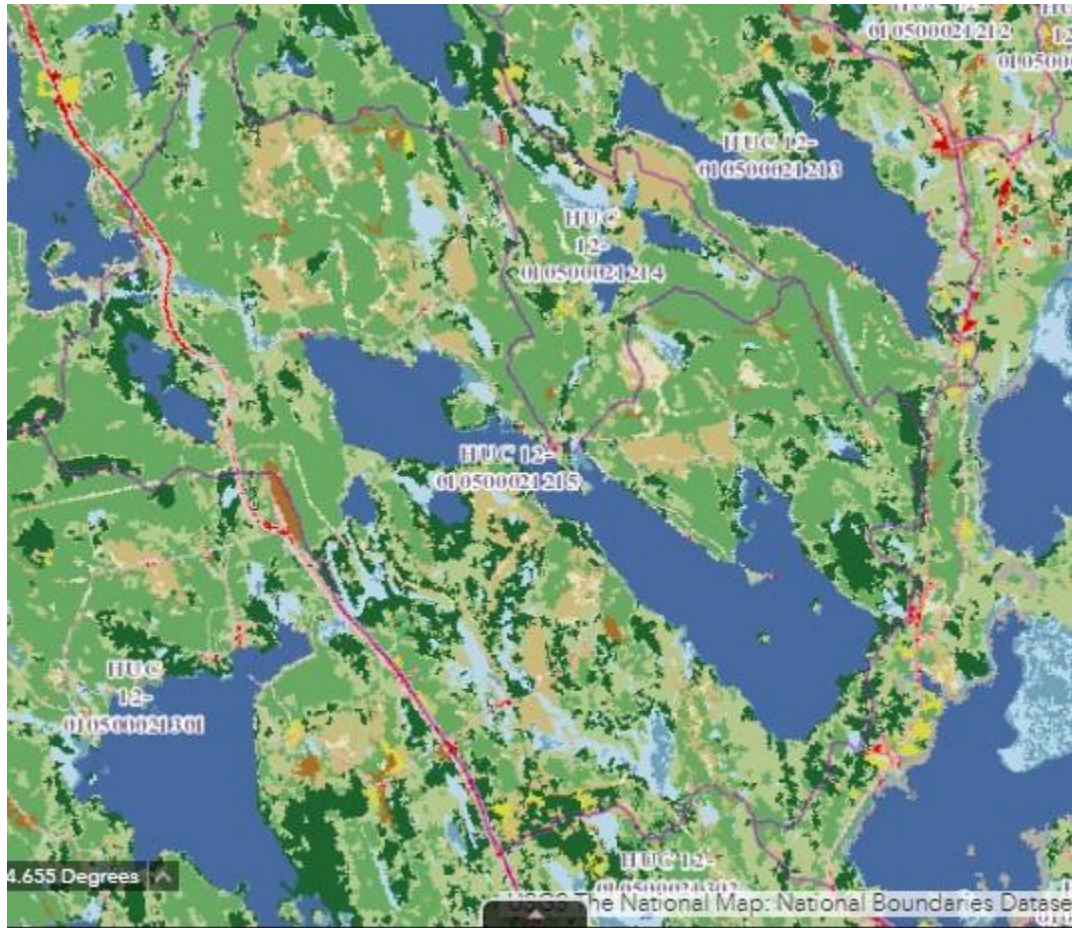
- To connect Mainers with the health and wellness benefits of outdoor recreation;
- To support regionally connected trail systems in less developed regions to increase access and enhance economic development;
- To connect to future tourism markets through recreation interests; and
- To increase access to and awareness of local and regional recreation opportunities through effective communication and collaboration between the public, municipal, and private landowners.

Green Lake and Reeds Brook do not appear to be part of any State Management Plan for public reserved land.

5.7.4 LAND USES AND MANAGEMENT WITHIN THE PROJECT VICINITY

See Table 5-12 in Section 5.10.1 below for land cover and land use data for the Maine Coastal Watershed, Hancock County, and the state. Based on that table, the watershed land cover is primarily forested (approximately 70%), woody wetland (approximately 12%), and scrub/shrub (approximately 7-8%).

FIGURE 5-9 GREEN LAKE AREA LAND COVER -- MAP



Source: USGS, 2018

FIGURE 5-10 GREEN LAKE AREA LAND COVER – IMAGE



Source: Google Maps, 2018

5.7.5 LAND USE AND MANAGEMENT OF PROJECT LANDS

Project operations and maintenance are the primary activities that occur on project lands. There are no formal public recreation facilities at the Project and access to the dam is closed to unauthorized vehicles. There is a foot path that goes near the southwest end of the dam that is maintained by the GLNFH.

5.7.6 REFERENCES

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5.8 AESTHETIC RESOURCES

18 CFR §5.6(d)(3)(ix) requires " A description of the visual characteristics of the lands and waters affected by the project. Components of this description include a description of the dam, natural water features, and other scenic attractions of the project and surrounding vicinity. Potential applicants are encouraged to supplement the text description with visual aids."

5.8.1 VISUAL CHARACTER OF THE PROJECT VICINITY

The Green Lake Project is on Green Lake in Hancock County, Maine. Green Lake is located in a rural region which provides a variety of scenic and aesthetic resources. The lake's scenic shoreline, high quality water, and recreational opportunities attract both season and year-round residents (GLWP, 1983)

PHOTO 5-1 GREEN LAKE



5.8.2 VISUAL CHARACTER OF PROJECT LANDS AND WATERS

Project facilities include a 3-story powerhouse, of which only one story is visible from the access road. Green Lake is a glacially-formed lake lined with forest, woody wetland, and scrub/shrub areas. Much of the shoreline has private year-round and seasonal residences and camps.

PHOTO 5-2 GREEN LAKE



5.8.3 NEARBY SCENIC ATTRACTIONS

See Sections 5.7.2 and 5.7.3 above for a description of recreational opportunities in the general area of the project.

5.8.4 REFERENCE

Green Lake Water Power Project (GLWP). 1983. Application for a License for a Minor Water Power Project – FERC No. 4894.

5.9 CULTURAL RESOURCES

18 CFR §5.6(d)(3)(x) requires "A description of the known cultural or historical resources of the proposed project and surrounding area. Components of this description include: (A) Identification of any historic or archaeological site in the proposed project vicinity, with particular emphasis on sites or properties either listed in, or recommended by the State Historic Preservation Officer or Tribal Historic Preservation Officer for inclusion in, the National Register of Historic Places; (B) Existing discovery measures, such as surveys, inventories, and limited subsurface testing work, for the purpose of locating, identifying, and assessing the significance of historic and archaeological resources that have been undertaken within or adjacent to the project boundary; and (C) Identification of Indian tribes that may attach religious and cultural significance to historic properties within the project boundary or in the project vicinity; as well as available information on Indian traditional cultural and religious properties, whether on or off of any federally-recognized Indian reservation (A potential applicant must delete from any information made available under this section specific site or property locations, the disclosure of which would create a risk of harm, theft, or destruction of archaeological or Native American cultural resources or to the site at which the resources are located, or would violate any Federal law, including the Archaeological Resources Protection Act of 1979, 16 U.S.C. 470w-3, and the National Historic Preservation Act of 1966, 16 U.S.C. 470hh)."

5.9.1 HISTORY OF THE PROJECT VICINITY

The State of Maine's cultural history began during the Paleo-Indian Period around 11,500 years before present. Before contact, about 20,000 Indians lived in Maine. As the "People of the Dawn," they shared language, culture, and ancestry with the larger Wabanaki confederation across New England and eastern Canada. The Ellsworth area was originally inhabited by members of the Passamaquoddy and Penobscot tribes. (MHO 2010a, Wikipedia 2019).

The first documented European visitor to Maine was Florentine seafarer Giovanni da Verrazano (~1485-1528), who came from France in search of gold. In the 1600's Pierre Du Gua, Sieur de Monts, and French Royal Geographer Samuel de Champlain established a colony on a small island at the mouth of a river they named St. Croix, at Passamaquoddy Bay (MHO 2010a).

The Penobscot River was used to explore the Maine lands during which time the explorers created a friendship with the Abenaki sagamore Bessabez (or Bashaba). (MHO 2010a).

In the 1700s inland towns became anchored to water sources. As millwrights gained economic footing, water power sites, attracted general stores, public houses, warehouses, distilleries, foundries, blacksmith shops, carding and fulling mills, spinning factories, or gristmills, and substantial towns formed. Around 1763 a party of English settled in the Union River area. They intended to build dams and sawmills to exploit the area's timber and water power. In the latter part of the 1700's ship building became a significant industry on the Union River. (MHO 2010b, Wikipedia 2019).

In the second half of the 1800s the lumber, leather, granite, ice, slate, fish, and lime industries still supported more than 40 percent of Maine's working population at the end of the century (MHO 2010c).

Between 1880 and 1900 some 40 mills were built in Maine to take advantage of the water resource, sustaining one of the most active periods of industrial expansion in Maine's history. This growth of mills moved the industries to the water, building new industrial centers in small towns and wilderness regions in the upper Androscoggin, Kennebec, and Penobscot River Basins (MHO 2010c).

Without access to cheap coal for steam power, hydroelectric power transmission promised to overcome these barriers. The hundreds of waterpower sites in upland Maine effectively placed a ceiling on development in the late 1800s monopolizing the energy by the rivers (MHO 2010c).

Before World War II, Maine hosted some 37 pulp and paper mills, 80 textile mills, and 11 large tanneries. The resulting pollution and related impacts to public health triggered the motion of river authorities, boards and other pollution control networks, and eventually contributed toward development of the federal Water Quality Act of 1965 (MHO 2010d).

The effort to restore migratory fish received a boost in 1997 when the Edwards Dam in Augusta became the first in history to have its license renewal refused by the Federal Energy Regulatory Commission, because its environmental costs outweighed its economic benefits. After the dam was removed, subsequent years saw dramatic increases in sea-run and resident fish and in osprey, bald eagles, heron, cormorants, and kingfishers (MHO 2010e).

A similar restoration project on the Penobscot River was undertaken with the Penobscot Indian Nation, American Rivers, Maine Audubon, Natural Resources Council of Maine, and Trout Unlimited to form the Penobscot River Restoration Trust in 2005. The migratory fish restoration project, like other aspects of Maine's environmental movement, reflected a strong commitment to forging ahead economically while preserving the best of Maine's past (MHO 2010e).

Hydropower continues to play an important role in electricity generation in the state. Maine produces more hydropower per capita than any other state east of the Mississippi (U.S. Energy Information Administration, 2013). Based on data derived from the U.S. Energy Information Administration, Form EIA-923, "Power Plant Operations Report" in 2012 hydroelectric generation was estimated at approximately 3,732 GWh, or 26% of the total energy generated in Maine. (Kleinschmidt, 2015)

5.9.2 IDENTIFICATION OF HISTORIC AND ARCHAEOLOGICAL SITE IN THE PROJECT VICINITY

No sites listed on the National Register of Historic Places are located within the Project boundary or within 2.5 miles of the project boundary (NPS, 2014).

5.9.3 PRIOR CULTURAL RESOURCE INVESTIGATIONS

GLWP is not aware of prior cultural resources investigation in the project boundary.

In its application for the original license, GLWP noted: "The Maine Historic Preservation Commission has identified several prehistoric Indian archaeological sites along the western shore of Graham Lake near Reeds Brook. The sites contain scattered prehistoric stone tools deposited in mud beneath the water surface" (GLWP, 1983). It should be noted these areas are outside the project boundary.

Continued project operation will have little or no change to the condition of these sites.

5.9.4 TRIBAL RESOURCES

Discussion on Tribal resources can be found in detail in Section 5.11

5.9.5 REFERENCES

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5.10 SOCIOECONOMIC RESOURCES

18 CFR §5.6(d)(3)(xi) requires "A general description of socio-economic conditions in the vicinity of the project. Components of this description include general land use patterns (e.g., urban, agricultural, forested), population patterns, and sources of employment in the project vicinity."

The following section provides a summary of selected socioeconomic variables for the project vicinity, Hancock County, as well as the City of Ellsworth and the state of Maine.

5.10.1 GENERAL LAND USE PATTERNS

TABLE 5-12 LAND USE PATTERNS FOR THE MAINE COASTAL WATERSHED, HANCOCK COUNTY AND MAINE -- 2010

	MAINE COASTAL WATERSHED		HANCOCK COUNTY		MAINE	
	(SQ. MI.)	(% NON-WATER AREA)	(SQ. MI.)	(% NON-WATER AREA)	(SQ. MI.)	(% NON-WATER AREA)
Land Cover by Type						
Developed, High Intensity	19.17	0.65%	10.55	0.66 %	157.25	0.51 %
Developed, Low Intensity	47.60	1.62 %	26.30	1.65 %	364.11	1.18 %
Developed, Open Space	12.86	0.44 %	5.59	0.35 %	135.46	0.44 %
Grassland	77.57	2.65 %	37.21	2.33 %	439.23	1.42 %
Agriculture	94.95	3.24 %	28.95	1.81 %	1,345.91	4.35 %
Forested	1,915.74	65.36 %	1,137.90	71.29 %	21,729.09	70.16 %
Scrub/Shrub	240.15	8.19 %	111.12	6.96 %	2,543.41	8.21 %
Woody Wetland	393.56	13.43 %	185.38	11.61 %	3,536.11	11.42 %
Emergent Wetland	80.15	2.73 %	35.74	2.24 %	458.13	1.48 %
Barren Land	49.24	1.68 %	17.32	1.09 %	261.45	0.84 %
Open Water	1,853.32	----	754.95	----	4,346.80	----

Source: NOAA, 2010

5.10.2 POPULATION PATTERNS

TABLE 5-13 POPULATION STATISTICS FOR ELLSWORTH, HANCOCK COUNTY AND MAINE

	CITY OF ELLSWORTH	HANCOCK COUNTY	MAINE
Population			
Population (2017 estimate)	7,973	54,497	1,335,907
Population (2010)	7,741	54,420	1,328,363
Population Growth (2010 to 2017)	3.0%	0.14%	0.6%
Geography (2010)			
Land area in square miles	79.28	1,586.89	30,842.92

	CITY OF ELLSWORTH	HANCOCK COUNTY	MAINE
Population Density	97.6/sq. mi.	34.3/sq.mi.	43.1
Gender (2016)			
Male			49.0%
Female	53.9%	51.5%	51.0%
Age (2010)			
Persons under 5 years old	5.6%	4.4%	4.8%
Persons under 18 years old	19.9%	17.3%	18.9%
Persons 18 to 64 years old	54.4%	54.5%	56.4%
Persons 65 years old and over	20.1%	23.8%	19.9%
Race (2010)			
Caucasian	97.0%	96.0%	94.7%
Black	0.4%	1.0%	1.6%
American Indian and Alaska Native	0.4%	0.5%	0.7%
Asian	0.9%	1.2%	1.2%
Native Hawaiian and Other Pacific Islander	0.0%	Z	Z
Hispanic or Latino	1.5%	1.5%	1.6%
Two or more races	1.4%	1.4%	1.8%

Source: U.S. Census, 2016a, 2016b; Wikipedia, 2019a, 2019b

5.10.3 HOUSEHOLDS/FAMILY DISTRIBUTION AND INCOME

TABLE 5-14 HOUSEHOLDS/FAMILY DISTRIBUTION AND INCOME FOR ELLSWORTH, HANCOCK COUNTY, AND MAINE

	CITY OF ELLSWORTH	HANCOCK COUNTY	MAINE
Households (2017)	3,350	23,674	554,061
Persons per household	2.28	2.23	2.34
Median household income	\$49,737	\$51,438	\$53,024
Per capita income in past 12 month	\$27,966	\$31,178	\$29,886
Persons in poverty	11.7%	11.0%	11.1%

Source: U.S. Census, 2016aa

5.10.4 PROJECT VICINITY EMPLOYMENT SOURCES

TABLE 5-15 EMPLOYMENT STATISTICS FOR ELLSWORTH, HANCOCK COUNTY, AND MAINE, 2017

	CITY OF ELLSWORTH	HANCOCK COUNTY	MAINE
Civilian Labor Force Employment Status (16 or Older)			

	CITY OF ELLSWORTH	HANCOCK COUNTY	MAINE
Percentage Employed	63.6%	60.9%	63.1%
Non-Farm Employment by Industry			
Natural Resources, construction, and maintenance	391	4,070	70,206
Production, transportation, and material moving	344	2,419	73,757
Sales and office	828	5,500	152,919
Service	831	5,517	120,502
Healthcare	395	1,720	43,576
Education, legal, community service, arts, and media	393	2,707	78,745
Computer, engineering, and science	180	962	28,335
Management, business, and financial	587	9,021	241,309

Source: MCWRI, 2018; U.S. Census, 2016e, 2016f, 2016g

5.10.5 REFERENCES

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- United States Census. 2016e. American FactFinder – Occupation by Sex for the Civilian Employed Population 16 years and over 2012-2016: American Community Survey 5-year Estimates: Ellsworth, Maine. [Online]

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5.11 TRIBAL RESOURCES

18 CFR §5.6(d)(3)(xii) requires "A description of Indian tribes, tribal lands, and interests that may be affected by the project. Components of this description include: (A) Identification of information on resources specified in paragraphs (d)(2)(ii)–(xi) of this section to the extent that existing project construction and operation affecting those resources may impact tribal cultural or economic interests, e.g., impacts of project-induced soil erosion on tribal cultural sites; and (B) Identification of impacts on Indian tribes of existing project construction and operation that may affect tribal interests not necessarily associated with resources specified in paragraphs (d)(3)(ii)–(xi) of this Section, e.g., tribal fishing practices or agreements between the Indian tribe and other entities other than the potential applicant that have a connection to project construction and operation."

5.11.1 TRIBAL LANDS AND INTERESTS

GLWP is not aware that the Project affects any Native American tribe. There are no Native American lands, known Native American traditional cultural properties or religious properties, or National Register-eligible or -listed sites associated with Native American Nations within the Project boundary to GLWP's knowledge. The following is a listing of Native American tribes that may have some level of interest in the area surrounding the Project and will be contacted by Licensee in distribution of the PAD.

Only one tribe contacted GLWP via the Stakeholder Questionnaire and that tribe did not plan to participate in the relicensing process. See Appendix F.7 for that stakeholder response.

TABLE 5-16 NATIVE AMERICAN TRIBES OF MAINE

TRIBES OF MAINE	ADDRESS
Aroostook Band of Micmacs	7 Northern Road Presque Isle, ME 04769
Houlton Band of Maliseet Indians	88 Bell Road #1 Littleton, ME 04730
Passamaquoddy Tribe – Indian Township	PO Box 301 Princeton, ME 04668
Passamaquoddy Tribe – Pleasant Point	PO Box 343 Perry, ME 04667
Penobscot Nation	12 Wabanaki Way Indian Island, ME 04468

Source: USDOJ (no date)

There are three National Association of Tribal Historical Preservation Officers for the state of Maine. The three tribes that are represented are Aroostook Band of Micmacs, Passamaquoddy Tribe, and the Penobscot Nation (NATHPO, 2017).

TABLE 5-17 TRIBAL HISTORICAL PRESERVATION OFFICERS FOR THE STATE OF MAINE

Jennifer Pictou, THPO	Aroostook Band of Micmacs 7 Northern Road Presque Isle, ME 04769 Tel: 207.764.1972, 207.764.7667 Email: jpictou@micmac-nsn.gov Website: www.micmac-nsn.gov
Donald Soctomah, THPO	Passamaquoddy Tribe PO Box 159 Princeton, ME 04668 Tel: 207.796.5533 Cell: 207.214.4051 Email: Soctomah@gmail.com Website: www.wabanaki.com
Christopher Sockalexis, THPO	Penobscot Nation Cultural & Historic Preservation Department 12 Wabanaki Way Indian Island, ME 04468 Tel: 207.817.7471 Fax: 207.817.7450 Email: chris.sockalexis@penobscotnation.org Website: www.penobscotculture.com

Source: NATHPO, 2017

5.11.2 REFERENCES

National Association of Tribal Historical Preservation Officers (NATHPO). 2017. Find a THPO. [Online] <http://nathpo.org/wp/thpos/find-a-thpo/#me>. Accessed March 22, 2018.

United States Department of Interior Indian Affairs (USDO I). No date. Eastern Region. [Online] <https://www.bia.gov/regional-offices/eastern>. Accessed March 22, 2018.

6.0 PRELIMINARY LISTING OF POTENTIAL ISSUES, INFORMATIONAL NEEDS, AND MITIGATION BY RESOURCE

18 CFR §5.6(d)(4) requires "Based on the resource description and impacts discussion required by paragraph (d)(3) of this section; the pre-application document must include with respect to each resource area identified above, a list of: (i) Issues pertaining to the identified resources; (ii) Potential studies or information gathering requirements associated with the identified issues; (iii) Relevant qualifying Federal and state or tribal comprehensive waterway plans; and (iv) Relevant resource management plans."

This section of the PAD also discusses relevant qualifying Federal and state or tribal comprehensive waterway plans.

6.1 PRELIMINARY ISSUES BY RESOURCE

This section identifies any known or potential effects of project operations. This includes potential effects from continuing operations and those that may result from cumulative effects, on the resources specified in Section 5.0, including those identified through consultation with agencies and stakeholders.

On January 22, 2019, a questionnaire was sent to 21 individuals at 12 organizations, state and federal agencies, and tribes. GLWP received 7 responses to the stakeholder questionnaire (including one not on the original distribution list), from the following organizations and individuals:

TABLE 6-1 STAKEHOLDER ORGANIZATIONS RESPONDING TO QUESTIONNAIRE

ORGANIZATION	PERSON	RESOURCE AREA(S)
NOAA, National Marine Fisheries Service, Protected Resources Division	Dan Tierney	<ul style="list-style-type: none"> • Fish and aquatic resources • Rare, threatened, and endangered species
U.S. Fish and Wildlife Service	Steven Shepard	<ul style="list-style-type: none"> • Water resources • Fish and aquatic resources • Rare, threatened, and endangered species • Other resource information

ORGANIZATION	PERSON	RESOURCE AREA(S)
Maine Department of Inland Fisheries and Wildlife	John Perry, Environmental Review Coordinator	<ul style="list-style-type: none"> • Fish and aquatic resources • Wildlife and botanical resources • Rare, threatened, and endangered species • Recreation and land use
Maine Historic Preservation Commission	Kirk F. Mohny, State Historic Preservation Officer	<ul style="list-style-type: none"> • Geology and soils (erosion) • Cultural resources
Green Lake Association	Audrey F. Tunney, President	<ul style="list-style-type: none"> • Water resources • Recreation and land use • Wetlands, riparian, and littoral habitat • Socioeconomic resources
Jenkins' Beach	Raymond L. Jenkins, Jr., Owner	<ul style="list-style-type: none"> • Recreation and land use • Socioeconomic resources
Houlton Band of Maliseet Indians	Susan Young, Natural Resources Director and Acting Tribal Historic Preservation Officer	Organization does not plan to participate in GLWP relicensing

The responses from the organizations in the above table are appended in Appendix F below.

6.1.1 GEOLOGY AND SOILS

The Project is operated in an impoundment mode and will continue to be operated as such under the new license. Erosion can occur within the project area around Green Lake and along Reeds Brook. The Green Lake level is managed by the Project with a smaller, lower range of allowed lake levels than was the case before GLWP purchased the dam. This reduces the potential for waves causing erosion high on the shore. The intent is to continue the use of the current levels. High flow periods in Reeds Brook are reduced and smoothed out by Project operation. This lessens the chance of erosion along Reeds Brook. (GLWP 1983, FERC 1984)

In order to provide consultation regarding archaeological studies, the Maine Historic Preservation Commission expressed the need for a defined area of potential effect (APE), defined for hydro-power impoundments as "...all land around the margin of the impoundment that may be affected by erosion during the term of the future license" (see Appendix F.4).

Mr. Jenkins expressed concern about shoreland and personal property damage from ice during a period of high water in February 2017 and offered to provide photographs (see Appendix F.6). The formation of ice is outside the control of the Project. Although the Project seeks to maintain fairly low lake levels during the winter (while conforming to the requirements of its license) in order to capture and use spring runoff flows, freezing conditions at the dam may mean it is not possible to bring the level of the lake down during periods of high lake levels.

GLA in its response also mentioned ice damage during winter high-water periods, causing uprooting trees and damage to rock walls that are meant to reduce storm water runoff. Also described were how development has changed around the lake, especially with the building of year-round homes and the modification of seasonal homes to allow use later in the year (see Appendix F.5). However, this increased development may not mean the shoreline is more susceptible to erosion.

6.1.2 WATER RESOURCES

Reeds Brook from the Green Lake dam to Graham Lake is Class B; Green Lake is Class A. The existing conditions of the Project have not affected the overall classification of Reeds Brook. The Project is and will continue to be operated as it has in the past. The project operations are not expected to affect either the Green Lake or the Reeds Brook classification.

USFWS response mentioned the Project penstock that supplies water to the federal fish hatchery and a second intake that extends into the lake for hatchery water supply, water-based recreation, and properties located around Green Lake (see Appendix F.2).

While the Houlton Band of Maliseet Indians does not intend to participate in the relicensing proceeding, these comments were provided: “We ... hope that you take into consideration ... water quality and its impacts on other aquatic organisms” (see Appendix F.7).

The Green Lake Association response described issues with Green Lake water levels; because they affect recreational use and socioeconomic resources, these issues are discussed in those sections below.

6.1.3 FISH AND AQUATIC RESOURCES (INCLUDING T&E SPECIES)

Project operation will continue as it has in the past, thereby limiting additional effects to aquatic habitat in the impoundment and bypass reach.

The Maine Department of Inland Fisheries and Wildlife provided these preliminary comments:

Arctic char occur in the lake. In addition, our Agency stocks both landlocked salmon and lake trout. Lake trout do not spawn in the lake, but there is a large contribution of wild landlocked salmon from the tributaries. There is also a smallmouth bass fishery in the lake which necessitates stable water levels during the smallmouth bass spawning window of June 5 through July 5. Currently there is no fishway at the dam. If a fishway is constructed, our Agency would have concerns for possible impacts to the existing fisheries resulting from the upstream passage of certain species, such as largemouth bass, that could access the lake from Graham Lake downstream (see Appendix F.3).

The U.S. Fish and Wildlife Service (USFWS) response mentioned that one of only 14 U.S. populations of arctic charr occurs in Green Lake, and the federal fish hatchery located at the outlet of Green lake is rearing ESA-listed Atlantic salmon (Shepard 2019). Mr. Shepard included in this response a white paper titled “Arctic Char of the Northeastern United States” (Shepard, 2018). (see Appendix F.2).

The Maine Field Station of NOAA’s National Marine Fisheries Service (NMFS) provided these preliminary comments:

The Green Lake Project does not currently have safe, timely, and effective passage for diadromous fish, including federally listed Atlantic salmon.

Green Lake is located within the GOM [Gulf of Maine] DPS [distinct population segment] for federally endangered Atlantic salmon, and occurs within the designated critical habitat [but not “essential” per NMFS, 2011] for that species. Other diadromous fish species (including alewives, blueback herring, American shad, sea lamprey, and American eels) also use the habitat within the Union River watershed for a portion of their life cycles (see Appendix F.1).

While the Houlton Band of Maliseet Indians does not intend to participate in the relicensing proceeding, these comments were provided:

We ... hope that you take into consideration fish passage when making decisions with regard to the dam’s infrastructure (see Appendix F.7).

However, as discussed in Section 5.3.1.1 above, MDIFW in its stakeholder response stated: “Currently there is no fishway at the dam. If a fishway is constructed, our Agency would have concerns for possible impacts to the existing fisheries resulting from the upstream passage of certain species, such as largemouth bass, that could access the lake from Graham Lake downstream.” (See Appendix F.3)

GLWP’s current license contains discussion and requirements related to *preventing* fish passage. Discussion in the license document has the following:

Fish Passage Barriers

Fish passage is not recommended by Interior because of the possibility of alewife being introduced into Green Lake and contaminating water withdrawn for the Green Lake National Fish Hatchery (GLNFH) with alewife-borne diseases. To prevent fish from migrating upstream over the dam into Green Lake, GLWP proposed, with concurrence from Interior and MDEP, to maintain the existing fish screens at the crest of the project dam. GLWP also proposed, at the request of Interior and MDEP, to install screens at the project intake with a maximum mesh size of 2 inches to prevent adult salmonids from moving out of Green Lake.

Article 28 requires the Licensee to install screens at the project intake to minimize mortality due to entrainment and to prevent out-migration of adult salmonids from Green lake. (FERC, 1984)

GLWP's current license contains the following requirement *specifically limiting* fish passage in both directions:

Article 28. The Licensee shall continue to consult with the U.S. Fish and Wildlife Service and the Maine Department of Environmental Protection, and within 6 months from the date of issuance of this license, file, for Commission approval, functional design drawings and a schedule for construction of an intake screen that would minimize fish mortality due to entrainment, and prevent downstream movement of adult salmonids from Green Lake. Comments on the drawings from the consulted agencies shall be included in the filing. Further, within 90 days after completion of project construction, Licensee shall file as-built drawings with the Commission. (FERC, 1984)

All areas within the Project boundary and watershed are within the Downeast Coastal Salmon Habitat Recovery Unit (HRU) drainage area, according to NOAA's National Marine Fisheries Service (NMFS). NMFS has a draft General Conservation Plan for this HRU dated October 3, 2011. "This General Conservation Plan (GCP) is a resource that private dam owners can use to facilitate dam removal or install fish passage to benefit endangered Atlantic salmon. The conservation strategies identified in this GCP describe how dam owners can avoid, minimize, and mitigate impacts to Atlantic salmon; thus, helping in the recovery of GOM DPS of Atlantic salmon and complying with ESA laws" (NMFS, 2011).

However, eligibility criteria for participation in the GCP include that: "[t]he dam structure cannot be licensed by the FERC to operate as a hydroelectric facility or otherwise generate electricity" (NMFS, 2011). Based on this criterion, the Project is not eligible to participate in this plan. There is, however, much useful information in the document.

6.1.4 WILDLIFE RESOURCES (INCLUDING T&E SPECIES)

Lands immediately adjacent to the project impoundment and bypass reach are largely forested and lightly developed. The Project is and will continue to be operated in an impoundment mode and effects to terrestrial wildlife are expected to be minimal. Any aquatic mammals, amphibians, and aquatic and semi-aquatic reptiles that may inhabit the project area are utilizing a river system that has been impounded for decades and have adapted to existing conditions. The extent of T&E species in the project area and surrounding lands is not well documented but is not expected to be significant given the limited available habitat.

The Maine Department of Inland Fisheries and Wildlife provided these preliminary comments:

There is one mapped Inland Waterfowl and Wading Bird Habitat, a Significant Wildlife Habitat under Maine's Natural Resources Protection Act, that is mapped along the lake. It is not sure at this time what impacts, if any, Project operations have on this resource. Regarding Endangered, Threatened, and Special Concern Species that may be present in the Project area, of the eight species of bats that occur in Maine, the three *Myotis* species are protected under Maine's Endangered Species Act. The three *Myotis* species include

little brown bat (State Endangered), northern longeared bat (State Endangered), and eastern small-footed bat (State Threatened). The five remaining bat species are listed as Special Concern: big brown bat, red bat, hoary bat, silver-haired bat, and tri-colored bat. While a comprehensive statewide inventory for bats has not been completed, based on historical evidence it is likely that several of these species occur within the project area during migration and/or the breeding season. *Our Agency does not anticipate significant impacts to any of the bat species as a result of this project* (emphasis added).

In addition to bats, it is possible that other several [sic] rare species may be resident or transient within the Project area based on location, habitats present, and life history requirements including one or more species of birds, including great blue heron (Special Concern) (see 6.2.10.3).

GLA in its response mentioned the danger to loon nesting areas presented by high water levels in the spring (see 6.2.10.5). In their Fall, 2018 newsletter, GLA reported the highest count of loons since 1983: 45 adults and 1 chick counted during a ½-hour period on July 21, 2018, as part of a state-wide effort by the Maine Audubon Society (MAS). GLA notes this is an unofficial total, to be possibly corrected by MAS (GLA, 2018).

6.1.5 BOTANICAL RESOURCES (INCLUDING T&E SPECIES AND RIPARIAN, WETLAND AND LITTORAL HABITAT RESOURCES)

It is not expected that continued project operations will result in adverse effects on wetland and botanical resources based on the continued impoundment mode operation.

6.1.6 RECREATION AND LAND USE

The ability of GLWP to enhance recreation at the Project is hindered by the lack of space and available land. Nevertheless, GLWP understands recreational access is an important issue to stakeholders and will work with them to address concerns through the relicensing process.

The Green Lake Association response described issues with Green Lake water levels, specifically low water levels in September (unclear if just last year, or every year) which reduce the usability of docks and boats and affect properties that draw lake water for their domestic use. Also affected are the availability of rental cottages and the ability to rent boats for recreational use in September due to low water levels. (see Appendix F.5)

Mr. Jenkins is the owner of a business at the upper end of Green Lake; the business has a freshwater swimming beach, cottage rentals, boat rentals, food service, and fishing. Mr. Jenkins expressed concern about shoreland and personal property damage from ice during a period of high water in February 2017 and offered to provide photographs.

Mr. Jenkins also expressed concern regarding the economic damage to his business (Jenkins' Beach, at the upper end of Green Lake) as a result of low water levels in September and offered to provide photographs. (see Appendix F.6)

GLWP recognizes the outstanding recreational opportunities Green Lake provides; it has in the past managed lake levels to prioritize recreational activities, including delays in the start of the fall drawdown to maintain lake levels for dock and boat use. However, it must be noted the fall

drawdown period is important to the project for two reasons: First for the economic viability of the project, and second for the management of lake levels. Both the fall and spring drawdowns are used to generate electricity. To protect salmonid redds from dewatering in the spring, the spring drawdown level can be no lower than the fall drawdown level. If average precipitation has occurred during the late summer and early fall, the complete fall drawdown period may be required to achieve the desired level of 157.5 USGS by 15-Oct. The fall drawdown, since it sets the minimum spring drawdown level, also determines how much capacity can be available in Green Lake for heavy spring runoff. Some spring thaws produce a rate of runoff into Green Lake greater than can be handled by the gates with the fish screens in place. During these springs, if the lake could not be drawn down near 157.5 the Project would have a choice of having the lake level exceed the allowed maximum of 160.7 or raising the fish screens.

During at least one summer, GLWP was faced with an unusually large amount of summer precipitation. In response to a request from a business owner on Green Lake, the gates at the dam were used to lower the water level (despite the fact that the lake level was already below the summer maximum) so the business' beach was usable by guests. GLWP risked losing generation income from this. It was decided that this action was appropriate because recreational uses of the lake are generally the priority during the summer. The Project expects to continue to operate in this spirit in the future.

6.1.7 AESTHETIC RESOURCES

No effects to aesthetic resources are expected from continued project operations.

6.1.8 CULTURAL AND TRIBAL RESOURCES

The Project itself, was constructed in the 1980's and is unlikely to have historic significance. The shoreline of the Project may contain some archaeological resources, but the impoundment has been in existence for about 100 years and project operations are not expected to affect cultural resources.

In order to provide consultation regarding archaeological studies, the Maine Historic Preservation Commission expressed the need for a defined area of potential effect (APE), defined for hydro-power impoundments as "all land around the margin of the impoundment that may be affected by erosion during the term of the future license." Regarding above-ground resources, the APE is defined as "lands ... where project construction and operation or project-related recreational development or other enhancements may cause changes in the character or use of historic properties, if any historic properties exist" (see Appendix F.1).

GLWP is currently compiling project boundary information and land around the impoundment margin to be able to propose an APE to MHCP during the study planning phase of the project.

The USFWS response mentioned the existence of a 19th-century federal fish hatchery located on or near Green Lake (see Appendix F.2).

While the Houlton Band of Maliseet Indians does not intend to participate in the relicensing proceeding, these comments were provided:

We do not have an immediate concern with your project or project site and we do not currently have the resources to fully investigate same. Should any human remains, archaeological properties or other items of historical importance be unearthed while working on the project, we recommend you stop your project and report your findings to the appropriate authorities including the Houlton Band of Maliseet Indians (see Appendix F.7).

6.1.9 SOCIOECONOMIC RESOURCES

The Project has limited socioeconomic influence over the immediate area, the City of Ellsworth. The plant is remotely monitored some of the time, and is small in nature. As a business, many of GLWP's operational supplies are purchased locally.

The Green Lake Association response described issues with Green Lake water levels, specifically low water levels in September (during the fall drawdown). This means renting a cottage or boat for recreational use is less desirable during in September, reducing income to rental property owners and businesses (see Appendix F.5).

Mr. Jenkins expressed concern regarding the economic damage to his business (Jenkin's Beach, at the upper end of Green Lake) as a result of low water levels in September and offered to provide photographs (see Appendix F.6).

6.2 LICENSEE PROPOSED STUDIES AND INFORMATION GATHERING NEEDS BY RESOURCE

The following sections identify initial information gathering and studies for each resource based upon the issues identified in Section 6.1.

6.2.1 GEOLOGY AND SOILS

GLWP believes adequate information exists to assess the effects of proposed project operations on erosion. No studies are proposed at this time.

GLWP intends to continue project operations and management of levels in Green Lake as it has in the past. Therefore, it is anticipated there will be no adverse effect pertaining to erosion.

6.2.2 WATER RESOURCES

Should MDEP require water quality studies as part of relicensing, GLWP will coordinate with MDEP on the specific metrics, methods, timing and duration of any requested water quality monitoring at the Project.

The Green Lake Association (GLA) has notified GLWP data have been collected on water quality covering several years and has offered to supply these data to GLWP.

6.2.3 FISH AND AQUATIC RESOURCES (INCLUDING RTE SPECIES)

While GLWP is not currently identifying fish passage related studies, fish passage issues will be discussed with the fisheries agencies to identify what future steps may be evaluated during the relicensing process.

In its stakeholder questionnaire response, NMFS provided the following:

Information pertaining to the fisheries in the Union River watershed can be obtained through the FERC e-library (<https://elibrary.ferc.gov/IDMWS/search/fercgensearch.asp>) under the docket (P-2727) for the Ellsworth Hydroelectric Project, which is currently going through relicensing. Specifically, Black Bear Hydro's Final License Application (filed December 31, 2015; accession #: 20151230-5275), as well as the NMFS and USFWS preliminary prescriptions filed in April 2018 (accession numbers 20180411-0016 and 20180410-5059, respectively) may be helpful. These filings reference many articles and documents containing fisheries information that could be relevant to the Green Lake Project.

Information on listed Atlantic salmon can be found on the Atlantic salmon recovery website (<http://atlanticsalmonrestoration.org>). Documents and reports (including the 2019 Final Recovery Plan) can be found under the Resources tab. (Tierney 2019)

However, as discussed in Section 5.3.1.1 above, MDIFW in its stakeholder response stated: "Currently there is no fishway at the dam. If a fishway is constructed, our Agency would have concerns for possible impacts to the existing fisheries resulting from the upstream passage of certain species, such as largemouth bass, that could access the lake from Graham Lake downstream." (See Appendix F.3)

GLWP's current license contains discussion and requirements related to *preventing* fish passage. Discussion in the license document has the following:

Fish Passage Barriers

Fish passage is not recommended by Interior because of the possibility of alewife being introduced into Green Lake and contaminating water withdrawn for the Green Lake National Fish Hatchery (GLNFH) with alewife-borne diseases. To prevent fish from migrating upstream over the dam into Green Lake, GLWP proposed, with concurrence from Interior and MDEP, to maintain the existing fish screens at the crest of the project dam. GLWP also proposed, at the request of Interior and MDEP, to install screens at the project intake with a maximum mesh size of 2 inches to prevent adult salmonids from moving out of Green Lake.

Article 28 requires the Licensee to install screens at the project intake to minimize mortality due to entrainment and to prevent out-migration of adult salmonids from Green lake. (FERC, 1984)

GLWP's current license contains the following requirement *specifically limiting* fish passage in both directions:

Article 28. The Licensee shall continue to consult with the U.S. Fish and Wildlife Service and the Maine Department of Environmental Protection, and within 6 months from the date of issuance of this license, file, for Commission approval, functional design drawings and a schedule for construction of an intake screen that would minimize fish mortality due to entrainment, and prevent downstream movement of adult salmonids from Green Lake. Comments on the drawings from the consulted agencies shall be included in the filing. Further, within 90 days after completion of project construction, Licensee shall file as-built drawings with the Commission. (FERC, 1984)

6.2.4 WILDLIFE RESOURCES (INCLUDING T&E SPECIES)

GLWP believes adequate information exists to assess the effects of proposed project operations on wildlife resources and will continue to coordinate with the USFWS, NMFS, and MDIFW on any potential threatened or endangered species, given the limited availability of habitat. No studies are proposed at this time.

6.2.5 BOTANICAL RESOURCES (INCLUDING T&E SPECIES AND RIPARIAN, WETLAND AND LITTORAL HABITAT RESOURCES)

GLWP believes adequate information exists to assess proposed project operation effects to botanical resources. No studies are proposed at this time.

6.2.6 RECREATION AND LAND USE

GLWP believes that adequate information exists to assess the effects of the Project on land use. No studies of recreation use are proposed for the relicensing effort at this time.

6.2.7 AESTHETIC RESOURCES

GLWP believes adequate information exists to assess the aesthetic effects of project operations. No studies of aesthetic resources at the Project are proposed at this time.

6.2.8 CULTURAL AND TRIBAL RESOURCES

In response to the Stakeholder questionnaire, MHPC states that the APE must be defined in order to continue consultation (see Appendix F.4). GLWP is currently compiling project boundary information and land around the impoundment margin to be able to propose an APE to MHPC during the study planning phase of the project.

There are no existing Indian reservations within proximity of the Project and tribes with a history of regional occupation are not anticipated to be affected by project operations. However, GLWP understands that through consultation with tribe(s) there may be some concern with significant cultural, historical, or archaeological sites or structures that may be affected within the APE, and will consult with the Nation(s) to address these concerns during the relicensing process.

6.2.9 SOCIOECONOMIC RESOURCES

GLWP believes that adequate information exists to assess the socioeconomic effects of the Project and project operations. No studies relevant to socioeconomics are proposed for the relicensing effort at this time.

6.2.10 RESPONSES TO STAKEHOLDER QUESTIONNAIRE

On January 28, 2019, a questionnaire was sent to 21 individuals representing 12 tribes, associations, and federal and state government agencies.

The distribution list consisted of the following people:

- Indian Tribe Chiefs
 - Penobscot Nation
 - Passamaquoddy
 - Maliseets
 - Micmac
- Green Lake Association
 - Audrey Tunney
- Green Lake National Fish Hatchery
 - Oliver Cox
- Maine Dept of Environmental Protection
 - Kathy Howatt
- Maine Dept of Inland Fisheries & Wildlife
 - Colin Shanklin
 - Gregory Burr
 - Henry Jones
 - Jacob Scoville
 - John Perry
 - Susan Bard
 - Joshua Matijas
- Maine Dept of Marine Resources
 - Casey Clark
 - Randy Spencer
- National Marine Fisheries Service
 - Jeff Murphy
 - Sean McDermott
- State Historic Preservation Office (also sending hard copy)
 - Megan Rideout
- U.S. Fish & Wildlife Service
 - Bryan Sojkowski, P.E.
 - Steve Shepard

The responses received by GLWP are in Appendix F.

6.3 RELEVANT QUALIFYING FEDERAL AND STATE OR COMPREHENSIVE WATERWAY PLANS

Section 10(a) of the Federal Power Act (FPA), 16 U.S.C. § 803(a)(2)(A), requires FERC to consider the extent to which a Project is consistent with Federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the Project. On April 27, 1988, FERC issued Order No. 481-A revising Order No. 481, issued October 26, 1987, establishing that FERC will accord FPA Section 10(a)(2)(A) comprehensive plan status to any Federal or state plan that:

- Is a comprehensive study of one or more of the beneficial uses of a waterway or waterways.
- Specifies the standards, the data, and the methodology used.
- Is filed with the Secretary of the Commission.

FERC currently lists 31 comprehensive plans for the State of Maine. The plans potentially relevant to the Project are listed below in Table 6-2. These plans may be useful in the relicensing proceeding for characterizing desired conditions.

TABLE 6-2 LIST OF QUALIFYING FEDERAL AND STATE COMPREHENSIVE WATERWAY PLANS POTENTIALLY RELEVANT TO THE GREEN LAKE PROJECT

RESOURCE	COMPREHENSIVE PLAN
Fisheries	Atlantic States Marine Fisheries Commission. 1995. Interstate fishery management plan for Atlantic striped bass. (Report No. 24). March 1995.
Fisheries	Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January 1998.
Fisheries	Atlantic States Marine Fisheries Commission. 1999. Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.
Fisheries	Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.
Fisheries	Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000.
Fisheries	Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (<i>Anguilla rostrata</i>). (Report No. 36). April 2000.
Fisheries	Atlantic States Marine Fisheries Commission. 2009. Amendment 2 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. May 2009.
Fisheries	Atlantic States Marine Fisheries Commission. 2010. Amendment 3 to the Interstate Fishery Management Plan for shad and river herring, Arlington,

RESOURCE	COMPREHENSIVE PLAN
	Virginia. February 2010.
Fisheries	Maine Atlantic Sea-Run Salmon Commission. 1984. Strategic plan for management of Atlantic salmon in the State of Maine. Augusta, Maine. July 1984.
Recreation and Land Use	Maine Department of Agriculture and Forestry. Maine State Comprehensive Outdoor Recreation Plan (SCORP): 2014-2019. Augusta, Maine.
Geology and Soils, Water Resources, Fisheries, Recreation	Maine Department of Conservation. 1982. Maine rivers study-final report. Augusta, Maine. May 1982. 181pp.
Water Resources, Fisheries, Recreation	Maine State Planning Office. 1987. Maine Comprehensive Rivers Management Plan. Vols 1-3. Augusta, Maine. May 1987.
Water Resources, Fisheries, Recreation	Maine State Planning Office. 1992. Maine Comprehensive Rivers Management Plan. Volume 4. Augusta, Maine. December 1992.
Fisheries	National Marine Fisheries Service. 1998. Final Amendment #11 to the Northeast Multi-species Fishery Management Plan; Amendment #9 to the Atlantic sea scallop Fishery Management Plan; Amendment #1 to the Atlantic salmon Fishery Management Plan; and Components of the proposed Atlantic herring Fishery Management Plan for Essential Fish Habitat. Volume 1. October 7, 1998.
Water Resources, Recreation, and Aesthetics	Nation Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, DC. 1993.
Wildlife	U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American Waterfowl Management Plan. Department of the Interior. Environment Canada. May 1986
Fisheries	U.S. Fish and Wildlife Service. Maine Department of Inland Fisheries and Wildlife. Maine Atlantic Sea Run Salmon Commission. Maine Department of Marine Resources. 1987.
Fisheries	U.S. Fish and Wildlife Service. 1989. Atlantic salmon restoration in New England; Final environmental impact statement 1989-2021. Department of the Interior, Newton Corner, Massachusetts. May 1989.
Fisheries, Recreation	U.S. Fish and Wildlife Service n.d. Fisheries USA: The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service. Washington D.C.

Source: FERC, 2018

6.4 RELEVANT RESOURCE MANAGEMENT PLANS

In addition to the qualifying Federal, state, and Tribal comprehensive waterway plans listed in Section 6.3, some resource agencies have developed resource management plans to help guide their actions regarding specific resources of jurisdiction. The resource management plans listed in Table 6-3 may be relevant to the Project and may be useful in the relicensing proceedings for characterizing desired conditions.

TABLE 6-3 LIST OF RESOURCE MANAGEMENT PLANS POTENTIALLY RELEVANT TO THE GREEN LAKE PROJECT

RESOURCE	MANAGEMENT PLANS
Fisheries	Comprehensive Fishery Management Plan for the Union River Drainage 2011-2014. Union River Fisheries Coordinating Committee. February 2010.
Fisheries	Maine Department of Inland Fisheries and Wildlife. Landlocked Salmon Management Plan. Revised January 2012.
Water Quality, Land Use	Hancock County Emergency Management Agency. Hancock County Hazard Mitigation Plan. 2018 Update.
Cultural Resources	Maine Department of Agriculture and Forestry. Downeast Management Plan. 2007.

6.5 REFERENCES

Green Lake Water Power Project (GLWP). 1983. Application for a License for a Minor Water Power Project – FERC No. 4894.

Federal Energy Regulatory Commission (FERC). 1984 Order Issuing License (Minor) for Green Lake Hydroelectric Project (FERC No. 7189). 27 FERC ¶62,023. Issued April 5, 1984.

Federal Energy Regulatory Commission (FERC). 2018. List of Comprehensive Plans. January, 2018. [Online] URL: <https://www.ferc.gov/industries/hydropower/gen-info/licensing/complan.pdf>. Accessed March 26, 2019.

Green Lake Association (GLA). Fall 2018. Newsletter. GLA, PO Box 80, Holden, ME 04429.

Shepard, Steven. October, 2018. Arctic Char of the Northeastern United States: A White Paper. U.S. Fish and Wildlife Service. October 2018.

NMFS. October 3, 2011. Downeast Coastal Salmon Habitat Recovery Unit: General Conservation Plan. [Online] https://www.greateratlantic.fisheries.noaa.gov/prot_res/altsalmon/conservationplan/general/Downeast%20Coastal%20SHRU%20GCP%20-%20Oct%202011-1.pdf. Accessed March 27, 2019.

7.0 APPENDICES

APPENDIX A DISTRIBUTION LIST

The Distribution List is in an attached file:

Green Lake Project 7189 NOI PAD Distribution List.docx

APPENDIX B DESIGN DRAWING (CEII)

The design drawings are in Volume II of the PAD

APPENDIX C PROCESS PLAN AND SCHEDULE

TLP Schedule	Start	Finish
File NOI/PAD and Request TLP	3/29/19	3/29/2019
FERC Issues Notice NOI and Comments on TLP		5/28/2019
STAGE 1		
TLP Approved	5/28/19	6/27/2019
Joint Agency Meeting (JAM)	6/27/19	7/27/2019
Comments on PAD/Study Request	7/27/19	9/25/2019
Issue Draft Study Plan	7/27/19	9/25/2019
Comments on Draft Study Plan	9/25/19	10/25/2019
Finalize Study Plan	9/25/19	10/25/2019
STAGE 2		
Conduct Studies	10/25/19	11/28/2020
Issue Draft Study Report	11/28/20	12/28/2020
2nd Year Studies	6/26/21	9/9/2021
Develop Draft Application	6/26/21	10/24/2021
Issue Draft Application, Study Results and Proposal	10/24/21	10/29/2021
Comments on Draft Application	10/29/21	1/27/2022
STAGE 3		
Final Application Due	3/31/22	3/31/22
License Expiration	3/31/24	3/31/24

Note: Dates are generally estimates and some may shift as the relicensing process progresses.

APPENDIX D CURRENT LICENSE REQUIREMENTS

From original license of 05-Apr-1984

It is ordered that:

(A) This license is issued to Green Lake Water Power Company (Licensee) under Part I of the Federal Power Act (Act), for a period of 40 years, effective the first day of the month in which this order is issued, for the construction, operation and maintenance of the Green Lake Project No. 7189 located on Green Lake and Reeds Brook, near the City of Ellsworth, Hancock County, Maine and affecting lands of the United States administered by the U.S. Department of the Interior, Green Lake National Fish Hatchery. This license is subject to the terms and conditions of the Act, which are incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the Act.

(B) The Green Lake Project No. 7189 consists of:

(1) all lands, to the extent of the Licensee's interest in those lands, constituting the project area.

The project area is shown and described by a certain exhibit that forms part of the application for license and that is designated and described as:

Exhibit	FERC No. 7189	Showing
G Sheet 1	6	General Location Map
G sheet 2	7	Project Plan and Profile

(2) Project works consisting of:

(1) a 7.5-foot-high, 270-foot-long dry stone and timber dam with an integral 15-footlong gate section containing two lift gates;

(2) fish screening devices;

(3) a 2,989-acre reservoir with a usable storage capacity of approximately 10,000 acre-feet at elevation 160.7 feet U.S.G. datum;

(4) a 1,700-foot-long, 4-foot-diameter concrete and wood stave penstock;

(5) a powerhouse containing two turbine-generators with a total rated capacity of 375 kW;

(6) the 4.16-kV generator leads, the 500-kVA 4.16/12.47-kv transformer, and the 1,000-foot-long, 12.47-kV underground transmission line; and

(7) appurtenant facilities.

The location nature, and character of these project works are generally shown and described by the exhibit cited above and more specifically shown and described by certain other exhibits and reports that also form part of the application for license and that are designated and described as:

Exhibit	FERC Mo. 7189	Showing
F Sheet 1	1	Powerhouse Floor Plans
F Sheet 2	2	Powerhouse Elevations
F Sheet 3	3	Powerhouse Sections
F Sheet 4	4	Powerhouse Site Plan
F Sheet 5	5	Dam and Intake Plans, Sections and Elevations

(3) Exhibit A —Entitled "project Description" pages A-1 to A-7 incorporating the mechanical, electrical and transmission equipment.

- (4) All structures, fixtures, equipment, or facilities used or useful in 'the operation or maintenance of the project and located within the project boundary, all portable property that may be employed in connection with the project, located within or outside the project boundary, as approved by the Commission, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.
- (C) Pursuant to Section 10(i) of the Act, it is in the public interest to waive the following Sections of part I of the Act, and they are excluded from the license: Section 4(b), except the second sentence; 4(e), insofar as it relates to approval of plans by the Chief of Engineers and the Secretary of the Army; 6, insofar as it relates to public notice and to the acceptance and expression in the license of terms and conditions of the Act that are waived here; 10(c), insofar as it relates to depreciation reserves; 10(d); 10(f), 14, except insofar as the power of condemnation is reserved; 15; 16; 194 20; and 22.
- (D) Exhibits A, F, and G designated in Ordering Paragraph (B) above, are approved and made a part of the license.
- (E) The license is also subject to the terms and conditions set forth in Form L-17 (revised October, 1975), designated Articles 1 through 14 and 16 through 26 and entitled Terms and Conditions of License for Unconstructed Minor project Affecting Lands of the United States, attached to and made a part of this license. The license is also subject to the following additional articles.

Article 27. Licensee shall release from the Green Lake project, a continuous minimum flow of 1 .0 cubic foot per second, as measured immediately downstream from the project dam, or the inflow to the reservoir, whichever is less, for the protection and enhancement of fish and wildlife resources in Reeds Brook This flow may be temporarily modified if required by operating emergencies beyond the control of the Licensee, for inspections and maintenance and for short periods upon mutual agreement between the Licensee and the Maine Department of Environmental Protection.

Article 28. The Licensee shall continue to consult with the U.S. Fish and Wildlife Service and the Maine Department of Environmental Protection, and within 6 months from the date of issuance of this license, file, for Commission approval, functional design drawings and a schedule for construction of an intake screen that would minimize fish mortality due to entrainment, and prevent downstream movement of adult salmonids from Green Lake. Comments on the drawings from the consulted agencies shall be included in the filing. Further, within 90 days after completion of project construction, Licensee shall file as-built drawings with the Commission.

Article 29: The licensee shall make adequate provision for a penstock tap in order to provide up to 30 cfs from the Green Lake to the Green Lake National Fish Hatchery.

Article 30. The Licensee shall, to protect salmonid redds, complete the fall reservoir drawdown no later than October 15 of each year, and shall reduce the reservoir water level during the spring drawdown to no lower than the reservoir water level attained on the previous October 15. Further, the Licensee shall operate the project in such a manner that the water level in Green Lake is maintained between elevations 159.7 feet (U.S.G.S. datum) and 160.7 feet during the period from June 1 through Labor Day weekend to protect recreational values of Green Lake, and between elevations 157.5 and 160.7 feet during the remainder of the year. These elevations may be temporarily modified if required by

conditions beyond the control of the Licensee, for inspections and maintenance and for short periods upon mutual agreement between the Licensee, the U.S. Fish and Wildlife Service, and the Maine Department of Environmental Protection. Until the proposed penstock tap to provide up to 30 cfs from Green Lake to the hatchery becomes operational, the minimum reservoir water level shall be no lower than elevation 158.0.

Article 31. The Licensee shall: {1} refrain from major construction activity, particularly blasting, that may disturb the feeding activities of the bald eagle in the vicinity of the project from April 15 to May 15 of each year; and (2) bury the project transmission line to avoid adverse impacts on bald eagles in the project area.

Article 32. The Licensee shall enter into an agreement with the U.S. Department of the Interior (Interior) to coordinate Licensee's plans for access to and construction-related activities on Federal lands administered by the U.S. Fish and Wildlife Service, and for establishment of construction and operational procedures to ensure the protection of the Green lake National Fish Hatchery (GLNFH) . This agreement shall include, but not be limited to, these provisions: (1) for coordination of the final design of the penstock tap to the GLNFH for supplying up to 30 cubic feet per second of water from Green Lake at any time this flow is required for hatchery operations; and (2) for coordination of the final design of the emergency power supply interconnection. Further, Licensee shall file with the Commission, for its approval, a copy of the agreement within 3 months from the date of issuance of this license. Should the Licensee and Interior fail to reach an agreement, the Licensee shall refer the matter to the Commission for resolution prior to project construction.

Article 33. The Licensee shall file with the Commission's Regional Engineer and the Director, Office of Electric Power Regulation and the Regional Director, U.S. Fish and Wildlife Service one copy each of the final contract drawings and specifications for pertinent features of the project, such as water retention structures, powerhouse, and water conveyance structures, at least 60 days prior to start of construction. The Director, Office of Electric power Regulation, may require changes in the plans and specifications to assure a safe and adequate project.

Article 34. The Licensee shall within 90 days of completion of construction file for approval of the Director, Office of Electric power Regulation revised Exhibits A, F, and G to describe and show the project as-built.

Article 35. The Licensee shall commence construction of the project within 2 years from the effective date of the license and shall thereafter in good faith and with due diligence prosecute such construction and shall complete construction of such project works within 4 years from the effective date of the license.

Article 36. The Licensee shall review and approve the design of contractor-designed cofferdams and deep excavations prior to the start of construction and shall ensure that construction of cofferdams and deep excavations are consistent with the approved design. At least 30 days prior to start of construction of the cofferdam the Licensee shall file with the Commission's Regional Engineer and Director, Office of Electric power Regulation and the Regional Director, U.S. Fish and Wildlife Service one copy of the approved cofferdam construction drawings and specifications and a copy of the letter(s) of approval.

Article 37. (a) In accordance with the provisions of this article, the Licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain other types of use and occupancy, without prior Commission approval. The Licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the Licensee shall also have continuing responsibility to supervise and control the uses and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the Licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the Licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, cancelling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The types of use and occupancy of project lands and waters for which the Licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time where said facility is intended to serve single-family type dwellings and (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the Licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The Licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the uses and occupancies for which it grants permission are maintained in good repair and comply with applicable State and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the Licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the reservoir shoreline. To implement this paragraph (b), the Licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the Licensee's costs of administering the permit program. The Commission reserves the right to require the Licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The Licensee may convey easements or rights-of-way across, or leases of, project lands for: (1) replacement, expansion, realignment, or maintenance of bridges and roads for which all necessary state and Federal approvals have been obtained; (2) storm rains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project reservoir. No later than January 31 of each year, the Licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed,

the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The Licensee may convey fee titles to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary State and Federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary Federal and state water quality certificates or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary Federal and State approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile from any other private or public marina; (6) recreational development consistent with an approved Exhibit R or approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from the edge of the project reservoir at normal maximum surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d) (7) in any calendar year. At least 45 days before conveying any interest in project lands under this paragraph (d), the Licensee must file a letter to the Director, Office of Electric Power Regulation, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G or K map may be used), the nature of the proposed use, the identity of any Federal or State agency official consulted, and any Federal or State approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the Licensee to file an application for prior approval, the Licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraphs (c) or (d) of this article:

- (1) Before conveying the interest, the Licensee shall consult with Federal and State fish and wildlife or recreation agencies, as appropriate, and the State Historic preservation Officer.
- (2) Before conveying the interest, the Licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved Exhibit R or approved report on recreational resources of an Exhibit E; or, if the project does not have an approved Exhibit R or approved report on recreational resources, that the lands to be conveyed do not have recreational value.
- (3) The instrument of conveyance must include covenants running with the land adequate to ensure that: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; and (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project.
- (4) The Commission reserves the right to require the Licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values. (f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G or K drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only

upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G or K drawings would be filed for approval for other purposes.

Article 38. 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 amount as determined in accordance with the provisions of the Commission's regulations in effect from time to time. The authorized installed capacity for that purpose is 500 horsepower.
- (b) For the purpose of recompensing the United States for use, occupancy, and enjoyment of 2 acres of its lands, a reasonable amount as determined in accordance with the provisions of the Commission's regulations in effect from time to time.

Article 39. The Licensee shall, prior to the commencement of any future construction at the project, consult with the Maine State Historic preservation Officer (SHPO) about the need for any cultural resource survey and salvage work. The Licensee shall make available funds in a reasonable amount for any such work as required. If any previously unrecorded archeological or historical sites are discovered during the course of 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 SMPO to develop a mitigation plan for the protection of significant archeological or historic resources. If the Licensee and the SHPO cannot agree on the amount of money to be expended on archeological or historic work related to the project, the Commission reserves the right to require the Licensee to conduct, at its own expense, any such work found necessary.

- (F) The Licensee's failure to file a petition appealing this order to the Commission shall constitute acceptance of this license. In acknowledgment of acceptance of this order and its terms and conditions, it shall be signed by the Licensee and returned to the Commission within 60 days from the date this order is issued.

Lawrence R. Anderson
Director, Office of Electric
Power Regulation

**From ORDER APPROVING “AS-BUILT” EXHIBITS AND AMMENDING LICENSE
(Issued July 7, 1986)**

The Director orders:

The license for Project No. 7189 is amended, effective the first day of the month in which this order is issued, as follows:

- (A) The exhibit A filed on May 6, 1986, is approved and made a part of the license.
- (B) The following revised Exhibits F and G drawings are approved and made a part of the license for Project No. 7189 superseding the Exhibits F and G drawings as noted.

<u>EXHIBIT</u>	<u>FERC No.</u>	<u>SHOWING</u>	<u>SUPERSEDING</u>
F Sheet 1	7189-8	Powerhouse Floor Plans	7189-1
F Sheet 2	7189-9	Powerhouse Elevations	7189-2
F Sheet 3	7189-10	Powerhouse Sections	7189-3
F Sheet 4	7189-11	Dam & Intake	7189-5
G Sheet 1	7189-12	General Location Map	7189-6
G Sheet 2	7189-13	Project Plan & Profile	7189-7
G Sheet 3	7189-14	Powerhouse Site Plan	7189-4

- (C) The superseded Exhibits F and G drawings are deleted from the license.
- (D) The project description in ordering paragraph (B) of the Order Issuing License, issued on April 5, 1984, for Project No. 7189 is revised to read:

(2) Project works consisting of: (1) a 7.5-foot-high, 270-foot-long dry stone and timber dam with an integral 22-foot-long gate section containing two lift gates; (2) fish screening devices; (3) a 2,989-acre reservoir with a usable storage capacity of approximately 10,000 acre-feet at elevation 160.7 feet U.S.G.S. datum; (4) a 1,740-foot-long concrete and wood stave penstock; (5) a powerhouse containing two turbine-generators with a total rated capacity of 500 kW; (6) the 4.16-kV generator leads, the 500-kVA 4.16/12.47-kV transformer, and the 1,000-foot-long, 12.47kV underground transmission line; and (7) appurtenant facilities.

- (E) Article 38 of the Order Issuing License, issued on April 5, 1984, for Project No. 7189 is revised as follows:

Article 38. The licensee shall pay the United States the following annual charges, effective July 1, 1986:

- (a) For the purpose of reimbursing the United States for the cost of administration of Part I of the Act, a reasonable amount as determined in accordance with the provisions of the Commission’s regulations in effect from time to time. The authorized installed capacity for that purpose is 670 horsepower.
- (b) For the purpose of recompensing the United States for the use, occupancy, and enjoyment of 2 acres of its lands, a reasonable amount as determined in accordance with the provisions of the Commission’s regulations in effect from time to time.

- (F) Within 90 days of the date of issuance of this order, the licensee shall file an original of the approved Exhibits F and G drawings reproduced on silver or gelatin 35 mm microfilm mounted on type D (3-1/4" x 7-3/8") aperture cards for each drawing. In addition, the licensee shall file two Diazo-type duplicate aperture cards of each drawing. The original set and one duplicate set of aperture cards should be filed with the Secretary of the Commission. The remaining duplicate set of aperture cards should be filed with the Commission's New York Regional Office. The FERC drawing number shall be shown in the margin below the title block of the microfilmed drawings, and also in the upper right corner of each aperture card.
- (G) This order is issued under authority delegated to the Director and is final unless appealed to the Commission under Rule 1902 within 30 days from the date of this order.

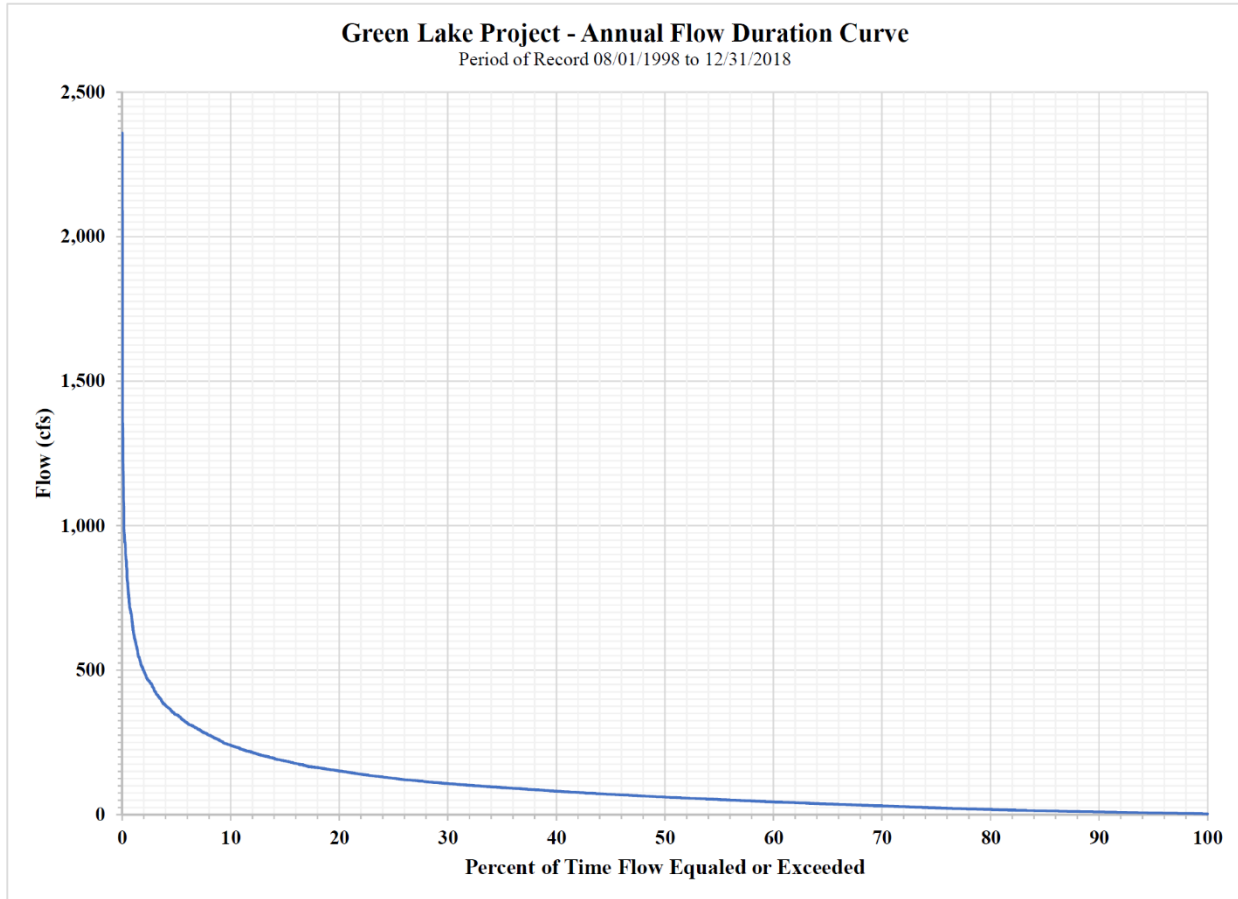
Fred E. Springer
Director, Division of Project Management

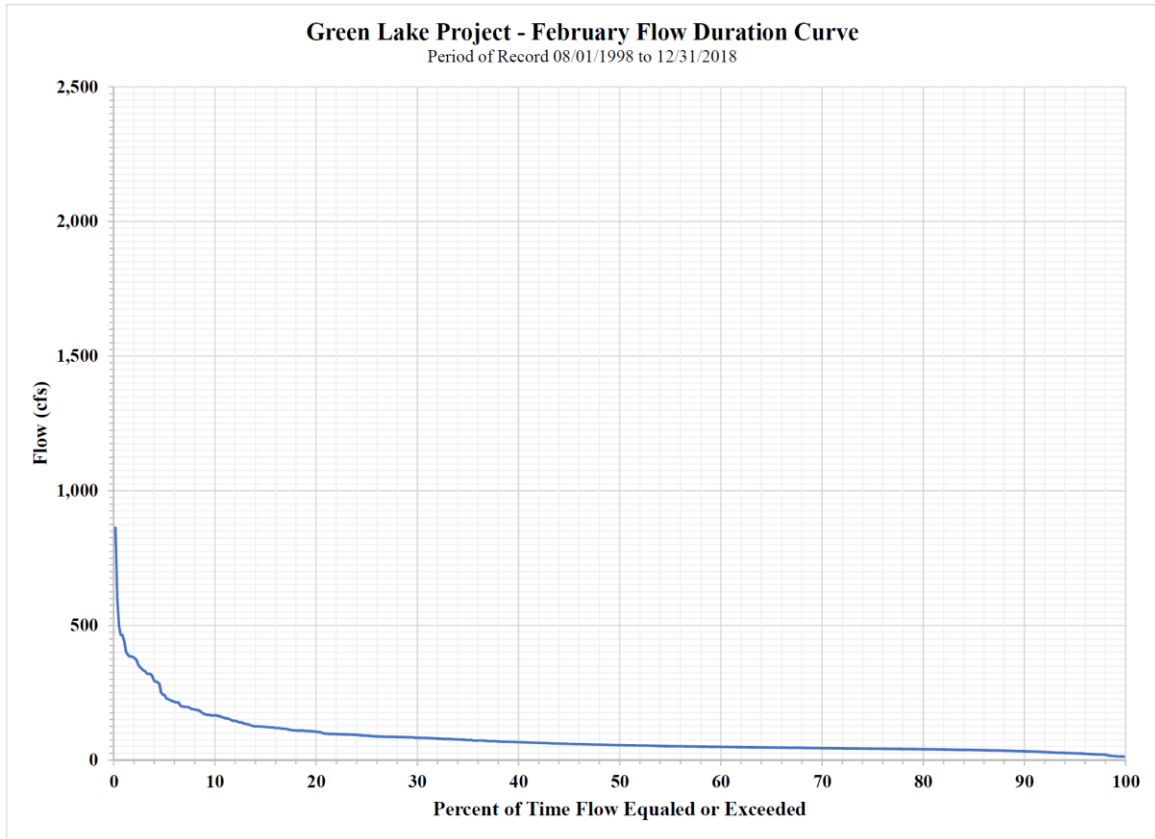
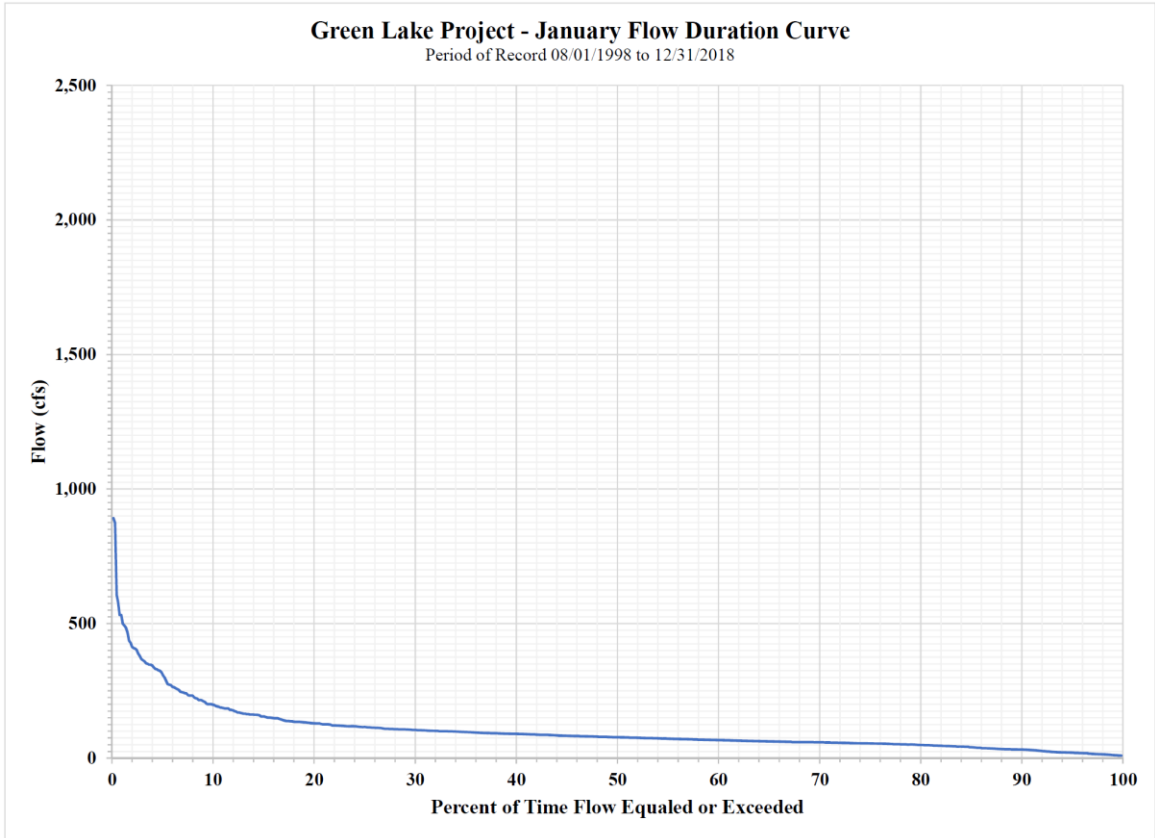
ORDER APPROVING REVISED EXHIBIT F DRAWINGS AND AMENDING LICENSE (08-FEB-1989)

This order approves changes to the dam and spillway and includes a revised Paragraph (B)(2) which may correct a discrepancy in the actual as-built project. GLWP does not have the full text of this order available as of authoring this Pre-Application Document (PAD), but it will be located or requested from FERC microfilm archives after submittal of this PAD.

GLWP notes that the actual as-built project uses 480V generator leads, a 500kVA 480V/12.47kV transformer, and a 12.47kV underground transmission line that is approximately 650 feet in length. If these discrepancies are not corrected in Paragraph (B)(2) of the amended license of 08-Feb-1989, they will be noted and changed in an addendum to this PAD or in the Final License Application.

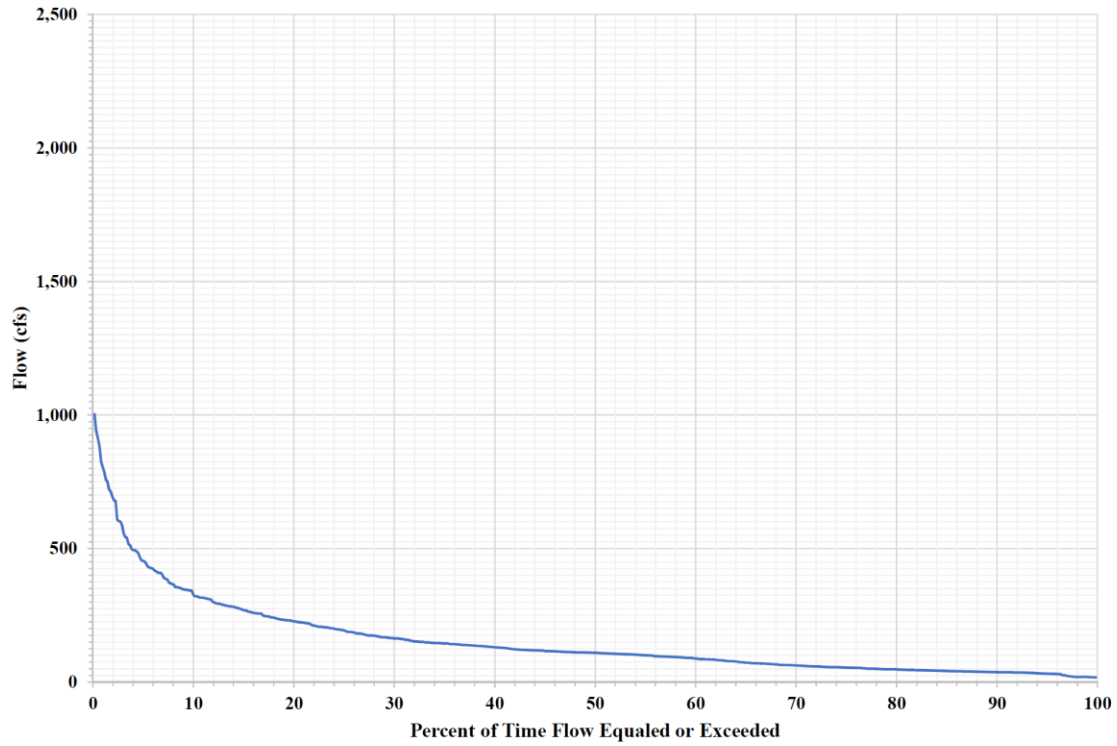
APPENDIX E FLOW DURATION CURVES





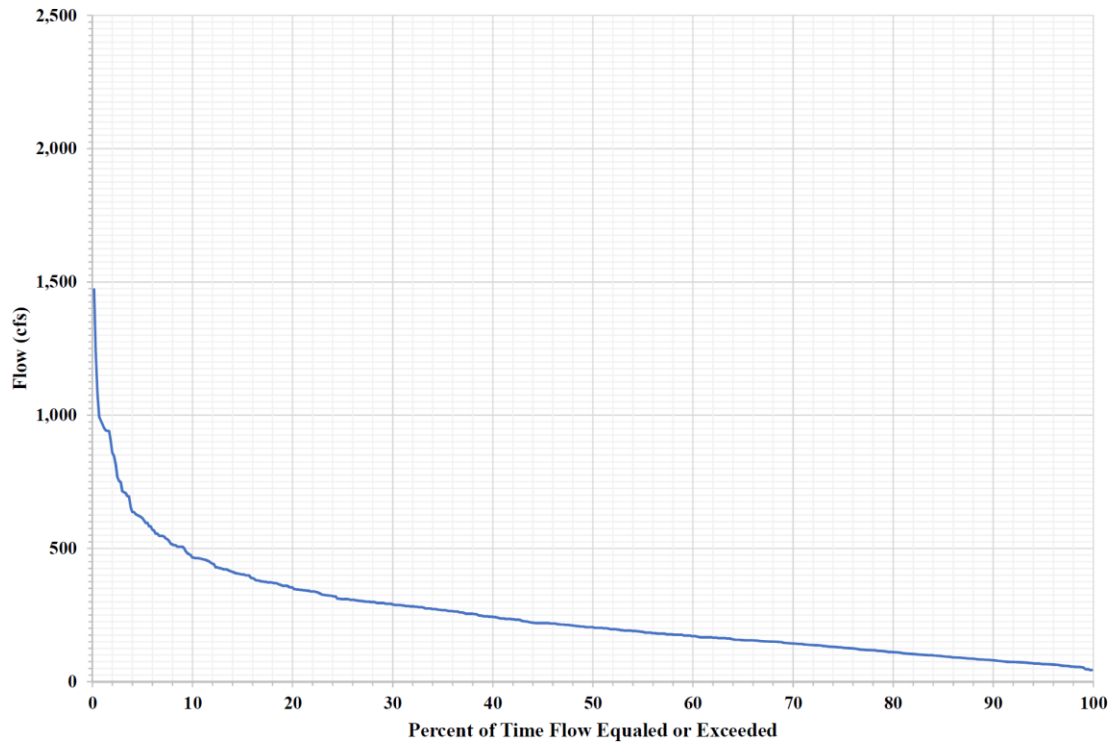
Green Lake Project - March Flow Duration Curve

Period of Record 08/01/1998 to 12/31/2018

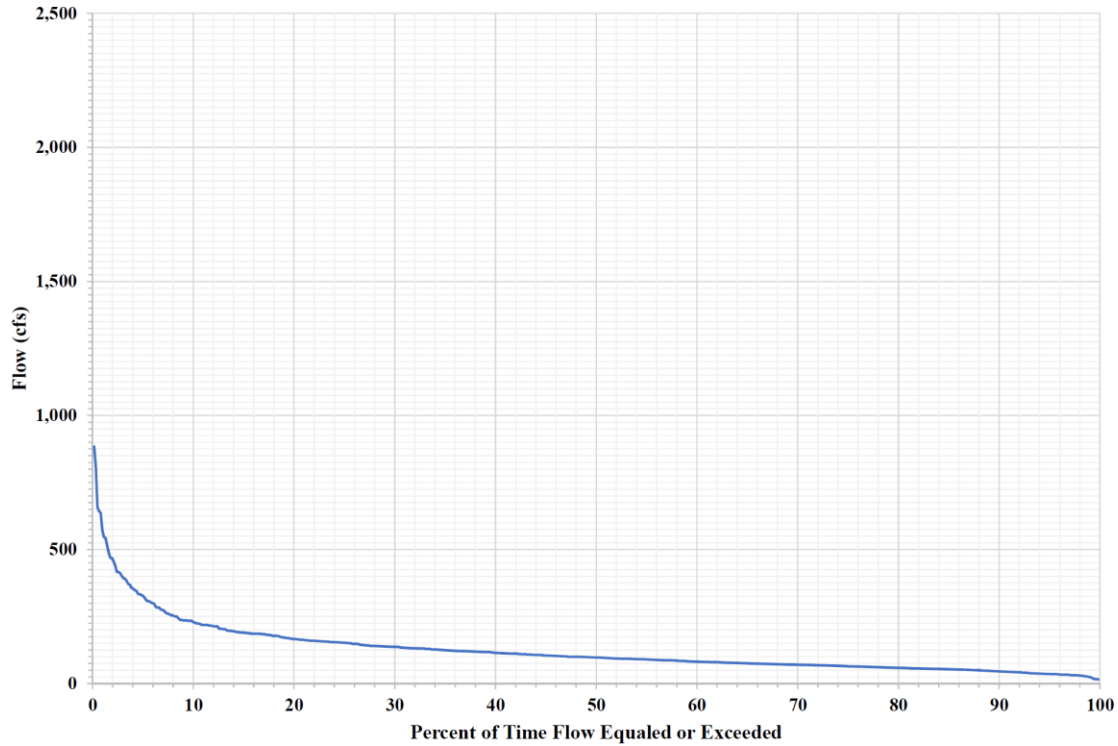


Green Lake Project - April Flow Duration Curve

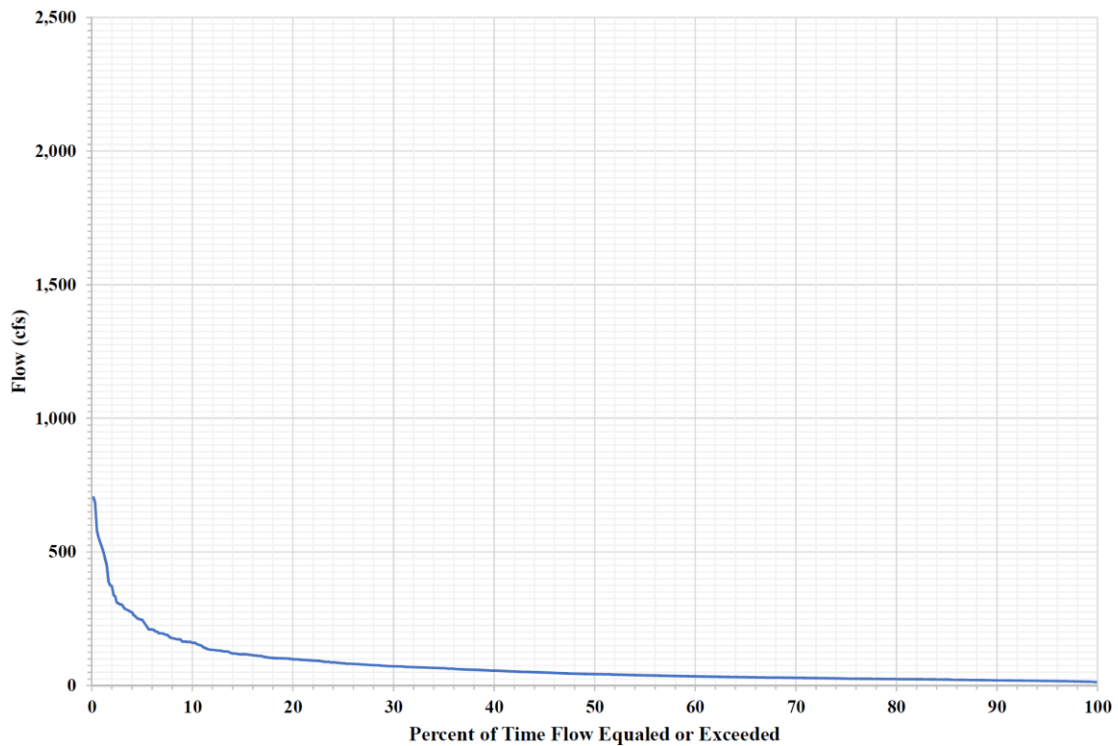
Period of Record 08/01/1998 to 12/31/2018



Green Lake Project - May Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018

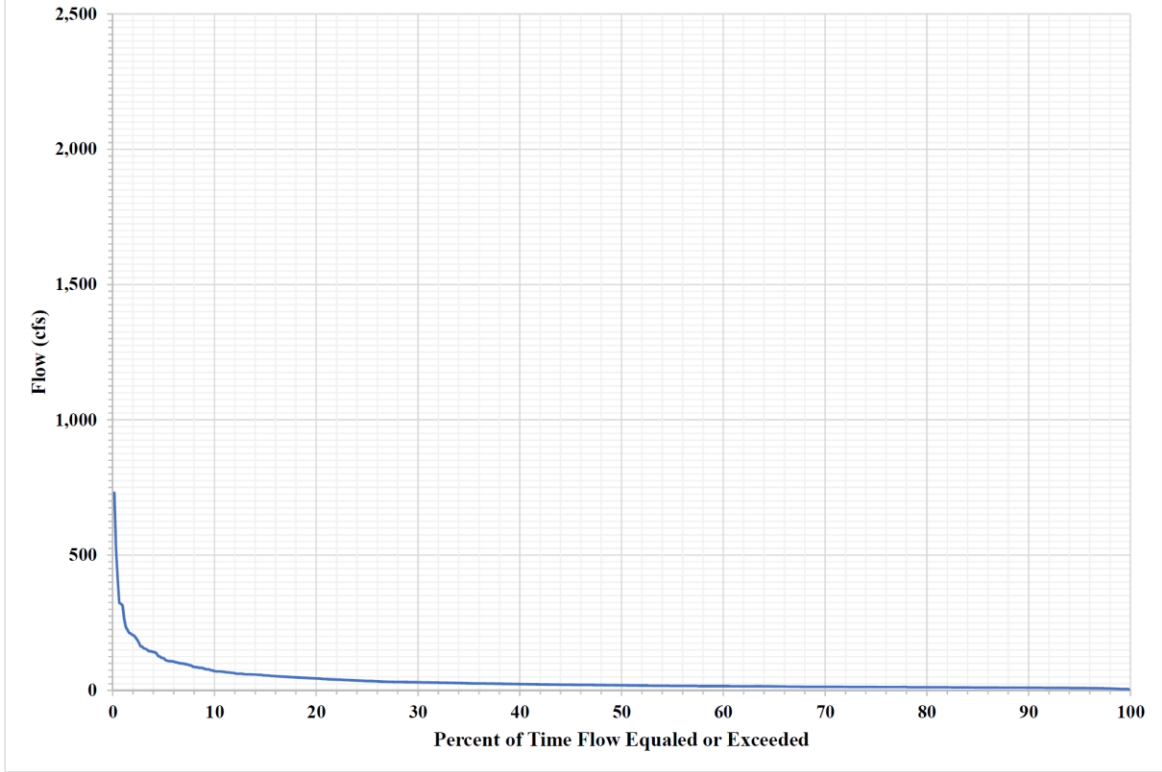


Green Lake Project - June Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018



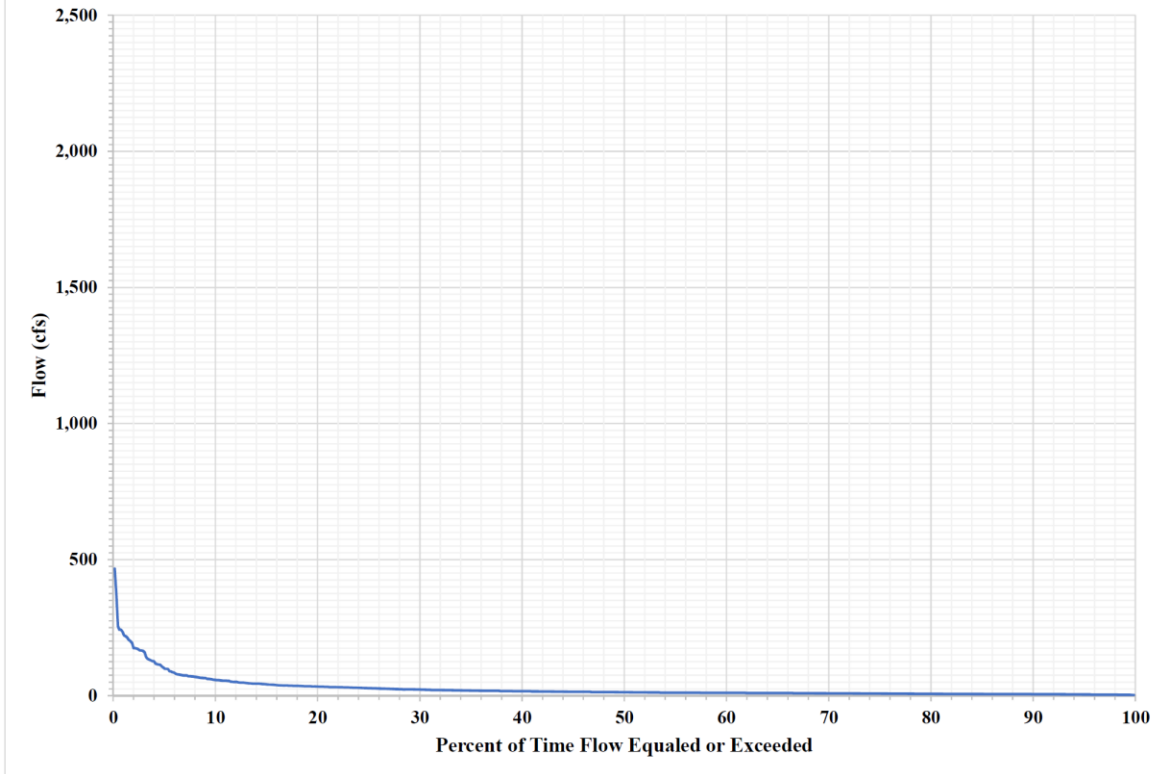
Green Lake Project - July Flow Duration Curve

Period of Record 08/01/1998 to 12/31/2018



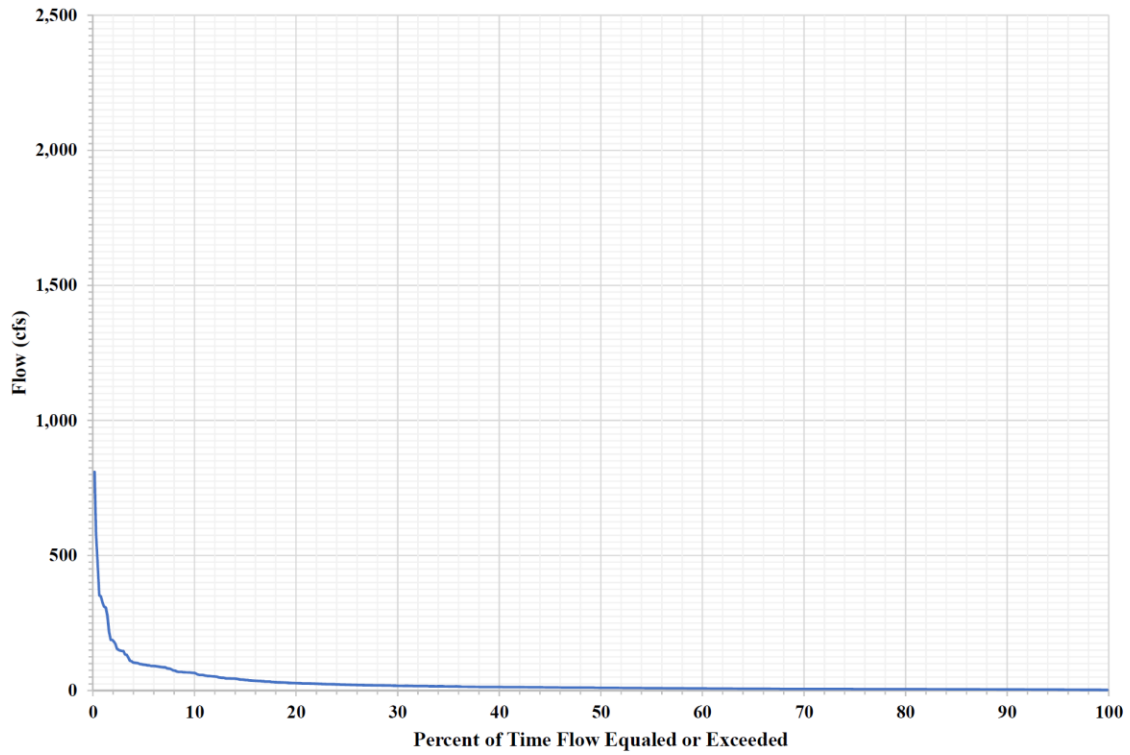
Green Lake Project - August Flow Duration Curve

Period of Record 08/01/1998 to 12/31/2018



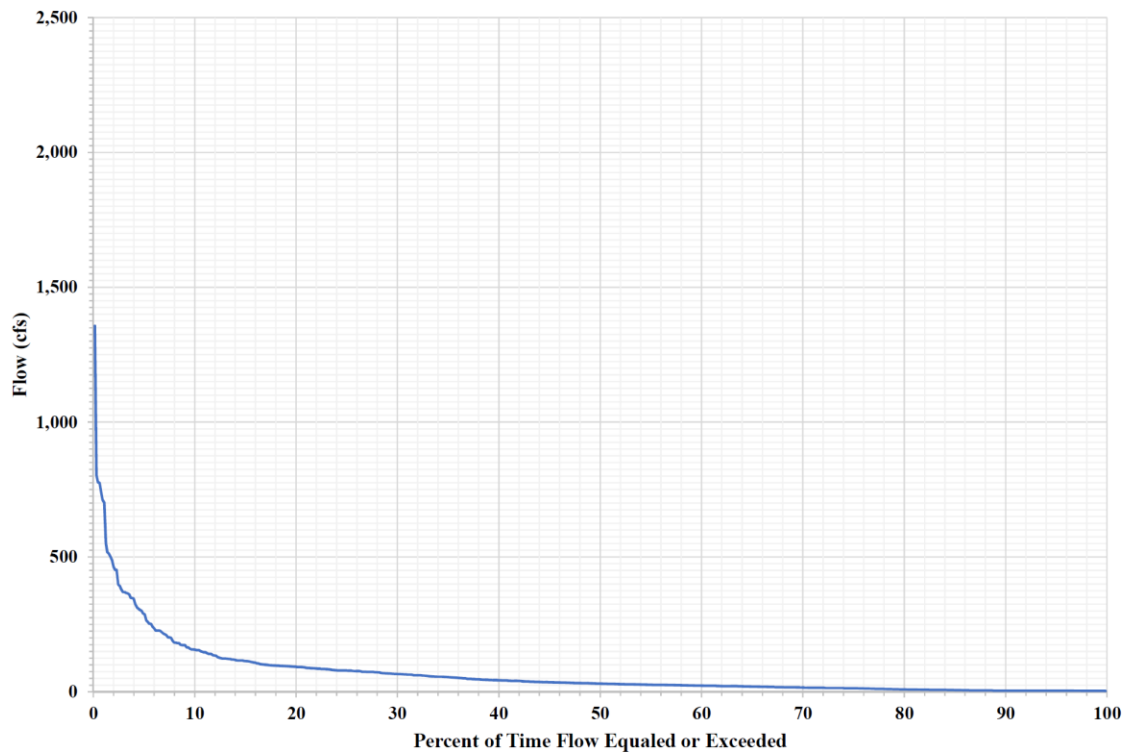
Green Lake Project - September Flow Duration Curve

Period of Record 08/01/1998 to 12/31/2018

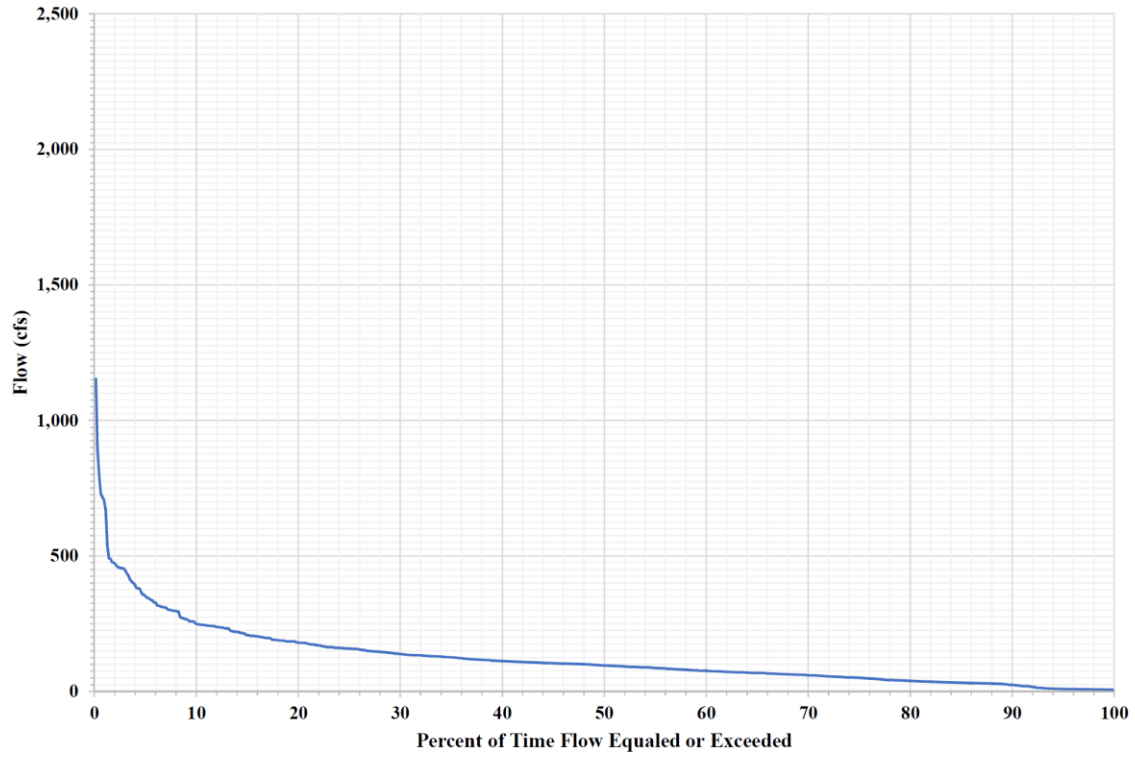


Green Lake Project - October Flow Duration Curve

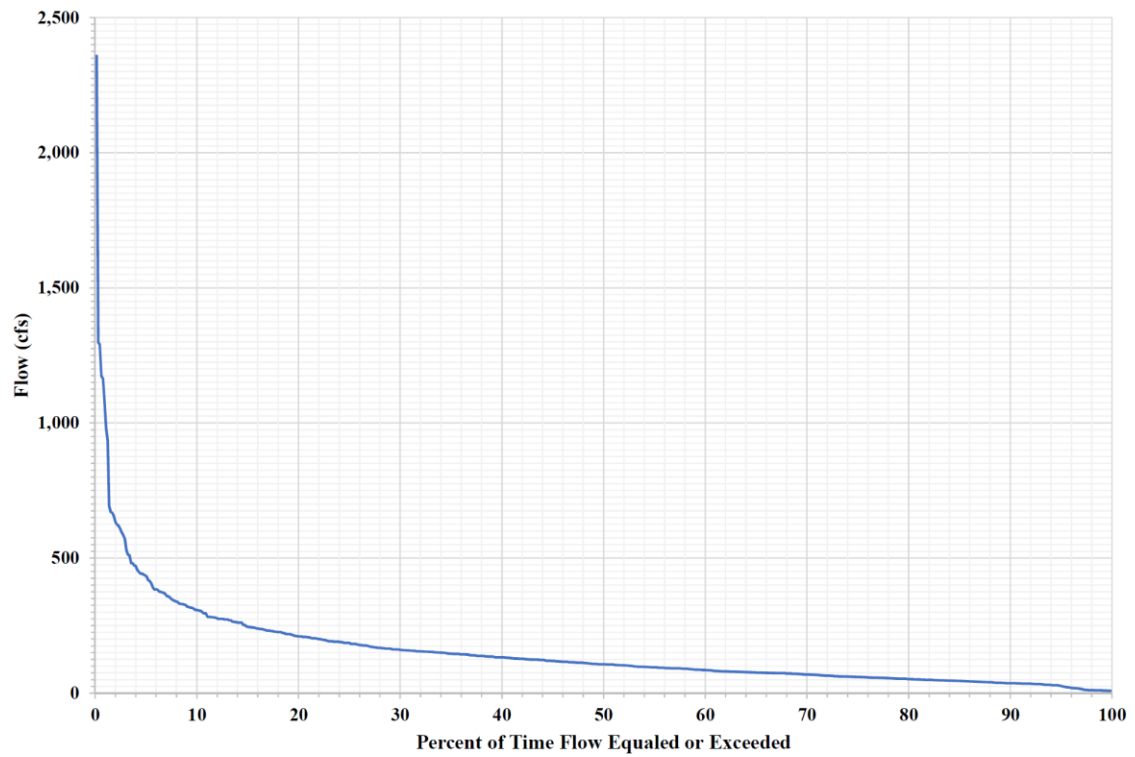
Period of Record 08/01/1998 to 12/31/2018



Green Lake Project - November Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018



Green Lake Project - December Flow Duration Curve
Period of Record 08/01/1998 to 12/31/2018



APPENDIX F STAKEHOLDER RESPONSES

F.1 NATIONAL MARINE FISHERIES SERVICE (NMFS) STAKEHOLDER RESPONSE

1. Please provide the following information about the person completing this questionnaire.

Name & Title	Dan Tierney
Organization	NOAA's National Marine Fisheries Service Protected Resources Division
Address	Maine Field Station 17 Godfrey Drive – Suite 1 Orono, Maine 04473
Phone	(207) 866-3755
Email Address	Dan.tierney@noaa.gov

2. Do you or your organization plan to participate in the Green Lake Project's relicensing proceeding?

Yes (if yes, please complete information below) No (if no, please go to No. 3)

Please provide the contact information for the representative(s) of your organization that will be participating in the relicensing process for this Project. (*Additional contacts may be provided on a separate page.*)

Name & Title	Same as above.
Organization	
Address	
Phone	
Email Address	

3. If you and the entity you represent do not want to receive any further correspondence associated with this proceeding, please indicate so here:

Please remove me and the entity I represent from the mailing list.

4. Do you or your organization know of any existing, relevant, and reasonably available information that describes the Green Lake Project's existing or historical environment (i.e., Project area, adjacent Project vicinity, or areas upstream or downstream of the Project)?

Yes (if yes, please complete Nos. 4a through 4d) No (if no, please go to No. 5)

- a. If yes, please circle the specific resource area(s) that the information relates to:
- Geology and soils
 - Water resources
 - **Fish and aquatic resources**
 - Wildlife and botanical resources
 - Wetlands, riparian, and littoral habitat
 - **Rare, threatened, and endangered species**
 - Recreation and land use
 - Aesthetic resources
 - Cultural resources
 - Socioeconomic resources
 - Tribal resources
 - Other resource information
- b. Please briefly describe the information referenced above and/or list available documents (*additional information may be provided on page 6 of this questionnaire*).

Green Lake is located within the GOM DPS for federally endangered Atlantic salmon, and occurs within the designated critical habitat for that species. Other diadromous fish species (including alewives, blueback herring, American shad, sea lamprey, and American eels) also use the habitat within the Union River watershed for a portion of their life cycles.

- c. Please provide referenced document, source website link, or description of where GLWC can obtain this information, if available.

Information pertaining to the fisheries in the Union River watershed can be obtained through the FERC e-library (<https://elibrary.ferc.gov/IDMWS/search/fercgensearch.asp>) under the docket (P-2727) for the Ellsworth Hydroelectric Project, which is currently going through relicensing. Specifically, Black Bear Hydro's Final License Application (filed December 31, 2015; accession #: 20151230-5275), as well as the NMFS and USFWS preliminary prescriptions filed in April 2018 (accession numbers 20180411-0016 and 20180410-5059, respectively) may be helpful. These filings reference many articles and documents containing fisheries information that could be relevant to the Green Lake Project.

Information on listed Atlantic salmon can be found on the Atlantic salmon recovery website (<http://atlanticsalmonrestoration.org>). Documents and reports (including the 2019 Final Recovery Plan) can be found under the Resources tab.

- d. Based on the specific resource areas listed in 4a, are you aware of any specific issues related to the identified resource area(s)?

Yes (*please list specific issues below*) No (*if no, please go to No. 5*)

Resource Area	Description of Issue
Fisheries/Threatened and endangered species	The Green Lake Project does not currently have safe, timely, and effective passage for diadromous fish, including federally listed Atlantic salmon.

5. If you have additional comments and/or questions regarding the Green Lake Project, or the relicensing process, please provide them below.

Additional Information: [blank]

F.2 U.S. FISH AND WILDLIFE SERVICE (USFWS) STAKEHOLDER RESPONSE

1. Please provide the following information about the person completing this questionnaire.

Name & Title	Steven Shepard
Organization	FWS
Address	I think I'm in your DB
Phone	
Email Address	

2. Do you or your organization plan to participate in the Green Lake Project's relicensing proceeding?

Yes (if yes, please complete information below) No (if no, please go to No. 3)

Please provide the contact information for the representative(s) of your organization that will be participating in the relicensing process for this Project. (**Additional contacts may be provided on a separate page.**)

Name & Title	See above
Organization	
Address	
Phone	
Email Address	

3. If you and the entity you represent do not want to receive any further correspondence associated with this proceeding, please indicate so here:

Please remove me and the entity I represent from the mailing list.

4. Do you or your organization know of any existing, relevant, and reasonably available information that describes the Green Lake Project's existing or historical environment (i.e., Project area, adjacent Project vicinity, or areas upstream or downstream of the Project)?

Yes (if yes, please complete Nos. 4a through 4d) No (if no, please go to No. 5)

a. If yes, please circle the specific resource area(s) that the information relates to:

- Geology and soils
- Water resources
- Fish and aquatic resources
- Wildlife and botanical resources
- Wetlands, riparian, and littoral habitat
- Rare, threatened, and endangered species
- Recreation and land use
- Aesthetic resources
- Cultural resources
- Socioeconomic resources
- Tribal resources
- Other resource information

c. Please briefly describe the information referenced above and/or list available documents (additional information may be provided on page 6 of this questionnaire).

I only have time for a quick response off the top of my head

Fish/Aquatics and RTE..

arctic charr (one of 14 US pop's is in Green Lake),
a federal hatchery rearing ESA listed Atlantic salmon is located at the outlet,

Water resources...

the Project penstock supplies water to the federal hatchery
a second penstock extends into the lake for hatchery water supply
water-based recreation
camps, camps, and (wealthy) camps

Other (historic/cultural)...

A 19th century federal fish hatchery was located (on the shores?) of Green Lake

e. Please provide referenced document, source website link, or description of where GLWC can obtain this information, if available.

An arctic charr reference is enclosed

f. Based on the specific resource areas listed in 4a, are you aware of any specific issues related to the identified resource area(s)?

Yes (please list specific issues below) No (if no, please go to No. 5)

Resource Area	Description of Issue
[blank]	

5. If you have additional comments and/or questions regarding the Green Lake Project, or the relicensing process, please provide them below.

Additional Information: [blank]

F.3 MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE (MDIFW) STAKEHOLDER RESPONSE

From: Perry, John <John.Perry@maine.gov>
Sent: Friday, February 15, 2019 9:00 AM
To: Caroline Kleinschmidt
Subject: RE: Green Lake Waterpower Relicensing Questionnaire

Good morning Caroline,

I apologize for the delayed response. The following Maine Department of Inland Fisheries and Wildlife staff will be involved with the relicensing of the Green Lake Hydroelectric Project:

John Perry, Environmental Review Coordinator (primary point of contact--please include me in all communications)

Maine Department of Inland Fisheries and Wildlife
284 State Street, 41 SHS, Augusta, ME 04333-0041
207-287-5254
John.perry@maine.gov

Greg Burr, Regional Fisheries Biologist
Maine Department of Inland Fisheries and Wildlife
317 Whitneyville Road, Jonesboro, ME 04648
207-434-5925
Gregory.Burr@maine.gov

Susan Bard, Regional Wildlife Biologist
Maine Department of Inland Fisheries and Wildlife
317 Whitneyville Road, Jonesboro, ME 04648
207-434-5927
Susan.M.Bard@maine.gov

Other staff may be brought in as needed, but these three will be the primary reviewers.

Our Agency will be primarily commenting on fisheries and wildlife, including associated habitats, as well as recreational and public access issues.

Fisheries: Arctic char occur in the lake. In addition, our Agency stocks both landlocked salmon and lake trout. Lake trout do not spawn in the lake, but there is a large contribution of wild landlocked salmon from the tributaries. There is also a smallmouth bass fishery in the lake which necessitates stable water levels during the smallmouth bass spawning window of June 5 through July 5. Currently there is no fishway at the dam. If a fishway is constructed, our Agency would have concerns for possible impacts to the existing fisheries resulting from the upstream passage of certain species, such as largemouth bass, that could access the lake from Graham Lake downstream.

Wildlife: There is one mapped Inland Waterfowl and Wading Bird Habitat, a Significant Wildlife Habitat under Maine's Natural Resources Protection Act, that is mapped along the lake. It is not sure at this time what impacts, if any, Project operations have on this resource. Regarding Endangered, Threatened, and Special Concern Species that may be present in the Project area, of the eight species of bats that occur in Maine, the three Myotis species are protected under Maine's Endangered Species Act. The three Myotis species include little brown bat (State Endangered), northern long-eared bat (State Endangered), and eastern small-footed bat (State Threatened). The five remaining bat species are listed as Special Concern: big brown bat, red bat, hoary bat, silver-haired bat, and tri-colored bat. While a comprehensive statewide inventory for bats has not been completed, based on historical evidence it is likely that several of these species occur within the project area during migration and/or the breeding season. Our Agency does not anticipate significant impacts to any of the bat species as a result of this project.

In addition to bats, it is possible that other several rare species may be resident or transient within the Project area based on location, habitats present, and life history requirements including one or more species of birds, including great blue heron (Special Concern).

Finally, our preference for receiving materials, reports, etc., is via email.

Thank you, and please let me know if you have any questions or need additional information.

John

John Perry
Environmental Review Coordinator
Maine Department of Inland Fisheries and Wildlife
284 State Street, 41 SHS
Augusta, Maine 04333-0041
Tel (207) 287-5254; Cell (207) 446-5145
Fax (207) 287-6395
www.mefishwildlife.com



Correspondence to and from this office is considered a public record and may be subject to a request under the Maine Freedom of Access Act. Information that you wish to keep confidential should not be included in email correspondence.

F.5 GREEN LAKE ASSOCIATION (GLA) STAKEHOLDER RESPONSE

1. Please provide the following information about the person completing this questionnaire.

Name & Title	Audrey F. Tunney, President
Organization	Green Lake Association
Address	35 Grant Street Ellsworth, ME 04605
Phone	207-667-0291
Email Address	aftunney@gmail.com

2. Do you or your organization plan to participate in the Green Lake Project’s relicensing proceeding?

Yes (if yes, please complete information below) No (if no, please go to No. 3)

Please provide the contact information for the representative(s) of your organization that will be participating in the relicensing process for this Project. (*Additional contacts may be provided on a separate page.*)

Name & Title	Audrey F. Tunney
Organization	Green Lake Association
Address	35 Grant Street, Ellsworth, ME 04605
Phone	207-667-0291
Email Address	aftunney@gmail.com

3. If you and the entity you represent do not want to receive any further correspondence associated with this proceeding, please indicate so here:

Please remove me and the entity I represent from the mailing list.

4. Do you or your organization know of any existing, relevant, and reasonably available information that describes the Green Lake Project's existing or historical environment (i.e., Project area, adjacent Project vicinity, or areas upstream or downstream of the Project)?

Yes (if yes, please complete Nos. 4a through 4d) No (if no, please go to No. 5)

- a. If yes, please circle the specific resource area(s) that the information relates to:

- | | |
|---|---|
| <input type="radio"/> Geology and soils | <input type="radio"/> Recreation and land use |
| <input type="radio"/> Water resources | <input type="checkbox"/> Aesthetic resources |
| <input type="checkbox"/> Fish and aquatic resources | <input type="checkbox"/> Cultural resources |
| <input type="checkbox"/> Wildlife and botanical resources | <input type="radio"/> Socioeconomic resources |
| <input type="radio"/> Wetlands, riparian, and littoral habitat | <input type="checkbox"/> Tribal resources |
| <input type="checkbox"/> Rare, threatened, and endangered species | <input type="checkbox"/> Other resource information |

- b. Please briefly describe the information referenced above and/or list available documents (*additional information may be provided on page 6 of this questionnaire*).

Water Resources: The Green Lake Precipitation report has several years of data showing the monthly precipitation amounts and water levels.

Recreation and land use: Photographs and anecdotal accounts provided by property owners around the lake.

Socioeconomic resources: Anecdotal accounts of loss of rental opportunity due to the low water levels in September.

Wetlands, riparian and littoral habitat: Photographs

- c. Please provide referenced document, source website link, or description of where GLWC can obtain this information, if available.

Precipitation Reports: Harry Moore, thumb drive available.

Photographs and anecdotal information will be available on a thumb drive provided by Audrey Tunney.

Socioeconomic impacts to be identified at a later date.

ADDITIONAL CONTACTS:

Harry Moore 54 Harmony Way, Ellsworth, Me 04605
Tel: 207-667-0503 Cell#: 207-479-4363
hmoorebec@gmail.com

David Megquier 603 Nicolin Rd., Ellsworth, Me 04605
 Tel: 207-949-4116
 megquier@maine.edu

d. Based on the specific resource areas listed in 4a, are you aware of any specific issues related to the identified resource area(s)?

Yes (please list specific issues below)

No (if no, please go to No. 5)

Resource Area	Description of Issue
Recreation Water resources	Low water levels in September make use of boats and docks difficult if not impossible. Some camp owners lose access to water for their household if they draw from the lake.
Wetlands, Riparian, and littoral habitat	High water levels in the winter cause damage to the riparian habitat causing ice floes that uproot trees and damage rock walls that are meant to reduce storm water runoff. High water levels in the spring can destroy the nesting areas for loons.
Socioeconomic resources	The low water levels in September reduce the opportunity to rent cottages for that month. Boats at the local beach cannot be rented.

5. If you have additional comments and/or questions regarding the Green Lake Project, or the relicensing process, please provide them below.

The demographics of the lake have changed significantly over the last 35-40 years. There has been significant development around the lake, much of which includes year round homes and camps that have been modified to allow for 3 season occupancy. It is no longer the rule that you close up camp on Labor Day weekend for many property owners.

Additional Information: [blank]

F.6 JENKINS' BEACH STAKEHOLDER RESPONSE

1. Please provide the following information about the person completing this questionnaire.

Name & Title RAYMOND L. JENKINS, JR. – OWNER
Organization JENKINS' BEACH
Address PO BOX 155
ELLSWORTH, ME 04605
Phone 207-266-1381
Email Address JOBEACH1@YAHOO.COM

2. Do you or your organization plan to participate in the Green Lake Project's relicensing proceeding?

Yes (if yes, please complete information below) No (if no, please go to No. 3)

Please provide the contact information for the representative(s) of your organization that will be participating in the relicensing process for this Project. (*Additional contacts may be provided on a separate page.*)

Name & Title RAYMOND L. JENKINS, JR. – OWNER
Organization JENKINS' BEACH
Address PO BOX 155
ELLSWORTH, ME 04605
Phone 207-266-1381
Email Address JOBEACH1@YAHOO.COM

3. If you and the entity you represent do not want to receive any further correspondence associated with this proceeding, please indicate so here:

Please remove me and the entity I represent from the mailing list.

4. Do you or your organization know of any existing, relevant, and reasonably available information that describes the Green Lake Project's existing or historical environment (i.e., Project area, adjacent Project vicinity, or areas upstream or downstream of the Project)?

Yes (if yes, please complete Nos. 4a through 4d) No (if no, please go to No. 5)

a. If yes, please circle the specific resource area(s) that the information relates to:

-
- Geology and soils
- Water resources
- Fish and aquatic resources
- Wildlife and botanical resources
- Wetlands, riparian, and littoral habitat
- Rare, threatened, and endangered species
- Recreation and land use
- Aesthetic resources
- Cultural resources
- Socioeconomic resources
- Tribal resources
- Other resource information

b. Please briefly describe the information referenced above and/or list available documents (*additional information may be provided on page 6 of this questionnaire*).

Pictures of damages to shoreland and to personal property cause by ice during the period of high water in February 2017. Photos of economic damage done to my business because of low water in September.

c. Please provide referenced document, source website link, or description of where GLWC can obtain this information, if available.

This information may be obtained from me at Jenkins' Beach.

d. Based on the specific resource areas listed in 4a, are you aware of any specific issues related to the identified resource area(s)?

Yes (*please list specific issues below*) No (*if no, please go to No. 5*)

Resource Area	Description of Issue
JENKINS' BEACH	SHORELAND DAMAGE
	PERSONAL PROPERTY DAMAGE
	LOSS OF INCOME

5. If you have additional comments and/or questions regarding the Green Lake Project, or the relicensing process, please provide them below.

Although I am not listed as a stakeholder in this project, I believe I should be as the nature of my business is directly affected by almost every move/decision made by GLWC.

~ Raymond L. Jenkins, Jr.

Additional Information: [blank]

F.7 HOULTON BAND OF MALISEET INDIANS (HBMI) STAKEHOLDER RESPONSE

1. Please provide the following information about the person completing this questionnaire.

Name & Title	Susan Young Natural Resources Director Acting Tribal Historic Preservation Officer
Organization	Houlton Band of Maliseet Indians
Address	88 Bell Road Littleton, ME 04730
Phone	207-532-4273 ext. 202
Email Address	Ogs1@maliseets.com

2. Do you or your organization plan to participate in the Green Lake Project’s relicensing proceeding?

Yes (if yes, please complete information below) No (if no, please go to No. 3)

Please provide the contact information for the representative(s) of your organization that will be participating in the relicensing process for this Project. (*Additional contacts may be provided on a separate page.*)

Name & Title	[blank]
Organization	
Address	
Phone	
Email Address	

3. If you and the entity you represent do not want to receive any further correspondence associated with this proceeding, please indicate so here:

Please remove me and the entity I represent from the mailing list.

4. Do you or your organization know of any existing, relevant, and reasonably available information that describes the Green Lake Project’s existing or historical environment (i.e., Project area, adjacent Project vicinity, or areas upstream or downstream of the Project)?

Yes (if yes, please complete Nos. 4a through 4d) No (if no, please go to No. 5)

a. If yes, please circle the specific resource area(s) that the information relates to:

- Geology and soils
- Water resources
- Fish and aquatic resources
- Wildlife and botanical resources
- Wetlands, riparian, and littoral habitat
- Rare, threatened, and endangered species
- Recreation and land use
- Aesthetic resources
- Cultural resources
- Socioeconomic resources
- Tribal resources
- Other resource information

b. Please briefly describe the information referenced above and/or list available documents (*additional information may be provided on page 6 of this questionnaire*).

[blank]

c. Please provide referenced document, source website link, or description of where GLWC can obtain this information, if available.

[blank]

d. Based on the specific resource areas listed in 4a, are you aware of any specific issues related to the identified resource area(s)?

Yes (*please list specific issues below*) No (*if no, please go to No. 5*)

Resource Area	Description of Issue
[blank]	

5. If you have additional comments and/or questions regarding the Green Lake Project, or the relicensing process, please provide them below.

We do not have an immediate concern with your project or project site and we do not currently have the resources to fully investigate same. Should any human remains, archaeological properties or other items of historical importance be unearthed while working on this project, we recommend that you stop your project and report your findings to the appropriate authorities including the Houlton Band of Maliseet Indians.

We also hope, that you take into consideration fish passage when making decisions with regard to the dam's infrastructure, water quality and it's impacts on other aquatic organisms.

Additional Information:

[blank]

8.0 END OF PRE-APPLICATION DOCUMENT
