

**GREEN LAKE WATER POWER CO.  
REVISED STUDY PLAN  
FOR THE GREEN LAKE HYDROELECTRIC PROJECT  
(FERC NO. 7189)**



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**GREEN LAKE WATER POWER CO.**  
**GREEN LAKE HYDROELECTRIC PROJECT**  
**FERC NO. 7189**  
**REVISED STUDY PLAN**

## **1.0 INTRODUCTION**

Green Lake Water Power Co. (Licensee) is in the process of relicensing the existing 500 Kilowatt (KW) Green Lake Hydroelectric Project (Project) with the Federal Energy Regulatory Commission (FERC). The Project (FERC P-7189) is located on Green Lake and Reeds Brook in Hancock County, Maine. The Licensee is not currently proposing any changes to the Project as part of the relicensing.

The Licensee is using FERC's Integrated Licensing Process (ILP) as established in regulations issued by FERC July 23, 2003 (Final Rule, Order No. 2002) and found at Title 18 CFR, Part 5. The Licensee filed a Pre-Application Document (PAD) and Notice of Intent (NOI) to seek a new license for the Project on March 31, 2019. The PAD provides a complete description of the Project, including its structures, operations, and potentially affected resources.

The Licensee filed a Proposed Study Plan (PSP) on September 13, 2019 and held a Study Plan Meeting on October 10, 2019. Written comments on the PSP were provided by FERC, the Maine Department of Environmental Protection (MDEP), the Maine Department of Inland Fisheries and Wildlife (MDIFW), the National Marine Fisheries Service (NMFS), the Green Lake Association (GLA) and Trout Unlimited (TU). The Licensee has prepared this Revised Study Plan (RSP) per FERC's regulations at 18 CFR § 5.13. The purpose of this RSP is to provide FERC and the agencies with a plan providing descriptions of studies proposed by the Licensee to inform the relicensing process.

Section 6.0 of this RSP provides the individual studies proposed by the Licensee to gather additional information needed to analyze the potential effects of the continued operation of the Project on project-related resources. The following study plans are included in this RSP for implementation during the 2020 and 2021 field seasons, as appropriate:

**1. Study #1 – Water Quality – Encompasses Data Requested from the Maine Department of Environmental Protection (MDEP), United States National Marine Fisheries Service (US NMFS), United States Fish and Wildlife Service (US FWS) and FERC to determine current impoundment and downstream water quality.**

This study consists of the following activities (for full details, see section 6.1):

- Impoundment Trophic State Study 1-1:
  - Collect water quality data from the deepest part of the north west end and the deepest part of the south east end of Green Lake twice per month from May 2020 through September 2020.
  - Collect a more extensive set of data during a single late summer sampling event (mid to late August, as determined by weather conditions).
- Impoundment Habitat Study 1-2:
  - Determine the Secchi disk transparency from the Impoundment Trophic State data. Using two times the Secchi disk transparency depth as the bottom of the littoral zone, determine the volume and surface area dewatered by the impoundment drawdowns.
  - If more than 25% of the littoral zone is dewatered, a study of the impoundment fish and other aquatic live communities will be proposed (in consultation with MDEP) to be conducted during the summer of 2021. Existing Secchi disk transparency data and lake depth contours from Lakes of Maine suggest that considerably less than 25% of the Green Lake littoral zone is dewatered during impoundment drawdowns.
- Impoundment Temperature Study 1-3:
  - Collect continuous impoundment water temperature readings at two locations from the beginning of September until the end of November. This data is intended to inform an analysis of the effects of Project fall drawdown on arctic char.
- Downstream Benthic Macroinvertebrate (BMI) Study 1-4:
  - Select three specific sampling locations for the study and review with MDEP staff to verify the locations are acceptable (or to relocate them if necessary).
  - Perform sampling in the following three general locations:
    - Reeds Brook bypass reach
    - Powerhouse tailrace
    - Confluence of the tailrace and Reeds Brook
- Downstream Temperature and Dissolved Oxygen (DO) Study 1-5:
  - Collect water temperature and DO readings using datasondes at the following two locations:
    - In the Reeds Brook bypass reach below the dam and above the upper GLNFH discharge pipe
    - In the tailrace downstream of the powerhouse
  - The readings will be collected hourly during July and August.

2. **Study #2 – Aquatic Resources – Encompasses Data Requested from MDEP for Aquatic Habitat Cross-Section Flow and from US NMFS In-stream Flow**
  - This study will measure width and depth at various flows in Reeds Brook to determine the flow at which at least 75% of the bank full cross-sectional area of the river is continuously watered. At least three cross-sections representative of riverine habitat will be measured. This study will also assess the relationship between project discharges, minimum flows and the quantity, quality and accessibility of various habitat types for fish species.
  
3. **Study #3 – Aquatic Resources - Eel Passage Survey Requested by the United States Fish and Wildlife Service (US FWS)**
  - This study will gather data on eel abundance and behavior at the downstream face of the spillway and dam. This study will inform eel passage necessity and Facility Design and Siting decisions.
  
4. **Study #4 – Cultural Resources – Erosion Reconnaissance Survey**
  - This study will determine the Area of Potential Effect (APE) and identify architecture potentially of interest within that APE.

Section 6 of this document provides information on the goals and objectives of each study; the relationship of the study plan to the issues identified in the PAD, SD1 and scoping process; known resource management goals; methodology; and scope, schedule and budget information as per the requirements of 18 CFR § 5.11.

## 2.0 COMMENTS ON THE PROPOSED STUDY PLAN

Comments on the Licensee's PSP (including any revised information or study requests) were due December 12, 2019. As noted above, FERC, MDEP, MDIFW, NMFS, GLA and TU provided comments, which are summarized in Table 2-1.

**Table 2-1 Summary of PSP Comments**

Topic	Agency	Comments	Licensee Response
Water Quality	FERC	<p>FERC pointed out that the timing of the drawdown in the fall season, along with impoundment fluctuations that occur after October 15, have the potential to affect arctic char reproduction in Green Lake. The proposed frequency and duration of the water temperature data collection in the proposed water quality study would not be sufficient to determine how water temperatures change in the fall, including when the water temperature in Green Lake reaches 50 °F.</p> <p>FERC staff recommends modifying the proposed water quality study to include the deployment of continuous water temperature data logger(s) from the beginning of September until the end of November in the impoundment.</p>	Added to the Water Quality Study #1-3
Water Quality	MDEP	<p>The Lakes of Maine data for 2015 is deficient in sampling frequency and duration; additional sampling is required to demonstrate that the impoundment exhibits a steady or declining trophic state.</p> <p>MDEP recommends collecting water quality data from the Lake Stewards of Maine sampling Station 1 or Station 2 because these sampling locations have been determined to be sited in the deepest areas of the lake.</p> <p>MDEP notes that all appropriate studies must be conducted following the protocols in the MDEP <i>Sampling Protocol for Hydropower Studies</i> (September 2019) – Note this is an updated document.</p>	The Water Quality Study #1-1 has been updated to reflect these comments.
Water Quality	MDEP & MDIFW	<p>MDEP recommends three sampling locations for the BMI study. The first in the Reeds Brook bypass reach, the second in the powerhouse tailrace and third at the confluence of the tailrace and the Reeds Brook bypass reach. The selected locations should be approved by MDEP before the BMI study begins.</p> <p>MDIFW asked to be included in this decision.</p> <p>MDEP noted that there are several confounding factors that influence the BMI Study including; 1) two wastewater discharge points associated with the Green Lake National Fish Hatchery (GLNFH), one in the Reeds Brook bypass reach and one near the confluence</p>	The Water Quality Study #1-4 has been updated to reflect these comments.



Topic	Agency	Comments	Licensee Response
		<p>of the powerhouse tailrace and the bypass reach; and 2) the backwatering of Reeds Brook and the powerhouse tailrace during spring months when the water level of Graham Lake is highest.</p> <p>MDEP noted that the BMI study must follow MDEP's standard protocol in <i>Methods for Biological Sampling and Analysis of Maine's Rivers and Streams</i> (April 2014)</p> <p>For the DO Study MDEP states one station should be located in the Reeds Brook bypass reach between Green Lake Dam and the discharge pipe from the GLNFH and one should be located in the tailrace downstream of the Project powerhouse.</p> <p>For the Downstream Aquatic Habitat Cross-Section Flow Study MDEP requires two sampling transects, one located in the Reeds Brook bypass reach between the Green Lake Dam and the discharge pipe from the GLNFH and the other at the confluence of the Project powerhouse tailrace and the Reeds Brook bypass reach. In addition to the measurements of stream width and water depth required for this study, at each of these transects characterize the substrate of the stream, take photos to document these characteristics, and measure the slope of the stream.</p>	
Water Quality	MDEP	<p>MDEP acknowledges that the confluence of the powerhouse tailrace and the Reeds Brook bypass reach is, in some seasons, at a water elevation equal to that of Graham Lake, and that the water level of Graham Lake may dictate the timing of some studies. Therefore, the Department recommends the Applicant consult with Black Bear Hydro LLC, the owner and operator of the Ellsworth Hydroelectric Project, in order to coordinate the timing of certain studies with the drawdown of Graham Lake in order to ensure the successful collection of downstream BMI, temperature, DO and aquatic habitat data.</p>	<p>See discussion below on Graham Lake level effects.</p>
Water Quality	Trout Unlimited (at PSP meeting)	<p>On behalf of TU, Mark Whiting raised concerns that Reeds Brook is below thresholds for hard water based on his individual self survey findings of a low calcium number. Mark stated that Hancock County is the highest for acid rain and low air quality.</p>	<p>No nexus between these conditions and Project operations has been established. This information, however, could be pertinent to interpretation of Reeds Brook study results</p>
Eel Passage	MDIFW & USFWS (at PSP meeting)	<p>MDIFW and USFWS noted that the elvers start migrating in the spring so be sure to start the study early enough.</p>	<p>Noted in the Eel Passage Study #3 – changed start date to May</p>

Topic	Agency	Comments	Licensee Response
Fish Passage	NMFS & Trout Unlimited	<p>NMFS restates the need for the Fish Passage Alternatives Study.</p> <p>Trout Unlimited Maine Council and Downeast Chapter support the need for the NMFS studies.</p>	<p>Response to this is in Studies Not Adopted - Section 5</p> <p>The other two proposed studies were included in the studies proposed in the PSP and remain in this RSP.</p>
Fish Spawning & Lake Level	MDIFW & GLA	<p>The current allowable drawdown at Green Lake is up to 3.2 feet annually. Per the existing Project license, the annual impoundment drawdown must be completed by October 15 to protect arctic char spawning in the impoundment. As the timing of this annual drawdown coincides with spawning times for Arctic char in nearby Flood's Pond (between October 20 and November 7), MDIFW supports this date for a subsequent License. The majority of landlocked salmon spawning occurs upstream in the tributaries to Green Lake, and these areas are more productive than potential near-lake spawning habitat. MDIFW recommends a similar drawdown regime for the subsequent license which will continue to promote spawning by salmon in the tributaries.</p> <p>On behalf of the GLA, Dale Jellison raised concerns about the effects of the water level on the salmon during spawning season.</p>	<p>Water Quality Study #1 has been modified to gather impoundment water temperature data from September through November. The additional data from this will be used to inform decisions on the fall drawdown.</p>
	GLA	<p>On behalf of the GLA, Dale Jellison raised concerns about the effects of the water level on potential ice damage in the winter months</p>	<p>FERC has requested that we gather data on the height of docks around the lake.</p>
Loons	MDIFW	<p>MDIFW recommends, for the new License, that the Applicant incorporate more stable water levels of 0.5 vertical feet up or 1 vertical foot down during the loon nesting season of May 15 – July 31 or do a study suggested by MDIFW.</p>	<p>Licensee's current plan is to adopt the recommended water level restrictions for its license application.</p>
Cultural Resources	MHPC	<p>MHPC stands by their June 14, 2019 recommendations for architectural and archaeological surveys.</p>	<p>Response to this is in Studies Not Adopted - Section 5 as well as in Study #4 in Section 6</p>

## 2.1 Graham Lake Level Effects

Graham Lake is not necessarily predictable nor controllable within a specific limited range during the summer. With Brookfield managing the Graham Lake level within a reduced range that tends toward higher levels in the summer (for recreational uses of Graham Lake), the level of Graham Lake is very likely to affect the Project tailwater level. This is an issue that needs to be considered when decisions are made about the siting of water sampling sites near the Project powerhouse.

### 3.0 PROGRESS REPORTS, STUDY REPORTING, MEETINGS

FERC’s ILP regulations schedule the Initial Study Report for one year following FERC’s study plan determination, which is anticipated to be February 9, 2021. We will provide a progress report after 6 months, in August 2020, and then we will file the study reports in February 2021. The study reports will be filed with FERC as one package at that time and the Project distribution list will be notified. We will have the reports package available on our website as well – [www.GreenLakeWaterPower.com](http://www.GreenLakeWaterPower.com)

As needed, the Licensee will file updated study reports within the time limits provided in 18 CFR § 5.15(f). The estimated start and completion dates for studies are provided in Table 3-1:

**Table 3-1 Estimated Dates for Commencement and Completion of Field Work.**

<b>Resource</b>	<b>Study</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
<b>Water Quality</b>			
	1-1 Impoundment Trophic State		
	1-2 Impoundment Aquatic Habitat		
	1-3 Impoundment Temperature		
	1-4 Downstream Temperature and		
	1-5 Dissolved Oxygen and Benthic		
Study 1	Macroinvertebrate Survey	June-20	November-20
<b>Aquatic Resources</b>			
	Aquatic Habitat Cross-Section and In-stream		
Study 2	Flow Study	June-20	October-20
Study 3	Eel Passage Survey	May-20	October-20
<b>Cultural Resources</b>			
Study 4	Erosion Reconnaissance Survey	June-20	October-20

#### 4.0 REQUESTED STUDIES NOT ADOPTED

As required by 18 CFR § 5.11(b)(4), if the Licensee does not adopt a requested study, an explanation of why the request was not adopted, with reference to the criteria set forth in § 5.9(b) must be included in the PSP.

#### 4.1 Archaeological Surveys

The Maine Historic Preservation Commission (MHPC) has requested a Phase I Archaeological survey including subsurface testing in appropriate locations to identify all archaeological sites around the impoundment margin that might erode over the term of the license.

One of the requirements for requesting a study is that it must contain the points described in CFR Title 18: §5.9(b) – MHPC has not provided this required data in anything but a cursory, non-informative way.

One of the most notable examples of this is § 5.9(b)(3) **“Describe existing information concerning the subject of the study proposal, and the need for additional information.”** MHPC appeared to intend to address this in their study request paragraph on archeological studies:

“With regards to archaeological resources, The Green Lake impoundment margins must be subject to a Phase I archaeological survey including subsurface testing in appropriate locations to identify all archaeological sites around the impoundment margin that might erode over the term Of the license. Phase II (site assessment) field work might also be necessary depending on the results from the Phase I survey. ‘Impoundment margin’ is defined in SHPO letter dated February 8, 2019. Approximately 5% of the Green Lake impoundment margin has been subjected to professional archaeological survey. One prehistoric archaeological site is already known on the impoundment margin.”

No further information is provided. Most notably lacking is any recognition of the existence of a letter on archaeological aspects of the initial licensing process of the Project. A copy of the letter is attached below.

GLWP recognizes that the MHPC definition of significant architecture being anything over 50 year old leads to the possibility that architectural structures may be significant now that were not 40 years ago. However, we do not believe the same argument applies to archaeological sites, especially prehistoric ones, given that no changes are proposed to the maximum and minimum water levels. We have included a study to determine if there are any historic structures within the APE.



MAINE HISTORIC PRESERVATION COMMISSION  
55 Capitol Street  
Augusta, Maine 04333

Earle G. Shettleworth, Jr.  
Director

REC'D SEP 15 1981  
KLEINSCHMIDT & DUTTING

Telephone  
207-289-21

September 14, 1981

Mr. Frank H. Dunlap  
Kleinschmidt and Dutting  
75 Main Street  
P. O. Box 76  
Pittsfield, Maine 04967

re: Green Lake Hydroelectric Project, FERC #4894

Dear Mr. Dunlap:

My staff archaeologist, Dr. Arthur Spiess, has carefully field checked the project area for the proposed Green Lake Hydroelectric Project. There are archaeological sites nearby, but they are outside the project impact area.

I find that this project will have no effect upon any structure or site of historic, architectural, or archaeological significance as defined by the National Historic Preservation Act of 1966.

If I can be of further assistance concerning this matter, please do not hesitate to let me know.

Sincerely,

  
Earle G. Shettleworth, Jr.  
State Historic Preservation Officer

EGS/slm

## 4.2 Fish Passage Alternatives Study

The NMFS has requested a Fish Passage Alternatives Study. The Licensee does not see that there is a basis for investing a large amount of time and money in this study while there are clearly opposing positions between the state and federal resource agencies regarding fisheries management goals and objectives.

In comments on the PAD, MDIFW's filing of June 26, 2019 states the agency actively manages Green Lake for native and indigenous species that would be heavily at risk of exposure to invasive species that are currently unable to migrate past the project. This is counter to NMFS stated restoration objectives for Atlantic salmon and alosine species to the watershed, including providing access to Green Lake.

Furthermore, in comments filed with the study request, NMFS states: "we note that project decommissioning with dam removal is the only alternative that would completely eliminate the threat to Atlantic salmon and their critical habitat posed by the Green Lake Project." On this statement GLWP notes the following:

- 1) Removal of the dam would jeopardize the water supply to the GLNFH. During the initial Project licensing process a minimum lake level restriction of 158.0 feet USGS was imposed until the penstock tap was complete because of insufficient flow capability into the GLNFH at levels lower than that. The sill elevation of the sluice gates at the dam is 154 feet USGS, providing a very rough estimate of the water level elevation of Green Lake after dam removal. With Green Lake at a level of 154 feet, the GLNFH water supply inflow head would be four feet lower than their stated requirement.
- 2) NOAA's *Endangered and Threatened Species: Determination of Endangered Status for the Gulf of Maine Distinct Population Segment of Atlantic Salmon* (Federal Register/ Vol. 74, No. 117/Friday, June 19, 2009, page 29344) states: "We (NMFS and USFWS) collectively referred to as the Services) have determined that naturally spawned and conservation hatchery populations of anadromous Atlantic salmon (*Salmo salar*) whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, ... constitute a distinct population segment (DPS) ... the Gulf of Maine (GOM) DPS warrants listing as endangered under the Endangered Species Act (ESA)." The GLNFH contains hatchery populations of eight river specific strains of Atlantic salmon for its Atlantic salmon recovery efforts. Therefore, the GLNFH conservation populations of Atlantic salmon constitute endangered fish populations per NOAA's own regulations.
- 3) The NMFS has a stated goal of recovering a self-sustaining fish population of Atlantic salmon. They state that the removal of Green Lake Dam is the most beneficial outcome of the relicensing process towards that goal.

However, NMFS appears to be advocating an action which GLWP believe is likely to jeopardize the continued existence of any endangered species or threatened species, and thus threatens to contravene Section 7 of the Endangered Species Act.

Further, GLWP notes the following:

- 1) The Green Lake Watershed makes up approximately 8% of the overall Union River Watershed. Per the Maine Department of Marine Resources (MDMR) the total number of Atlantic Salmon that have been captured at the Ellsworth Dam on the Union River (and that would potentially be transported upstream) is 7 from 2008 through 2019. This is an average of about 0.6 fish per year.  
Assuming waterflow is proportional to drainage area, and salmon swim upstream in proportion to water flow, this would amount to a total average of less than one fish migrating up Reeds Brook in 20 years. With essentially no Atlantic Salmon present in Reeds Brook, it is questionable whether the project has or will have an effect on Atlantic Salmon.
- 2) The NMFS Fish Passage Alternatives Study request 'Existing Information' section states that "The existing blockage to upstream and downstream passage was established in the previous licensing action." This is not accurate. Fish screens are part of the current gate structure that was constructed in the 1960s. GLWP does not know whether fish screens were in use at the Green Lake Dam before the 1960s or not, but it is clear that fish passage blockage at the dam was a pre-project condition.
- 3) The estimated cost of the study is \$50,000. The study is stated to not require any fieldwork and to not produce any detailed designs. It is the opinion of GLWP that this level of expenditure is neither consistent with the size nor impact of the project (as described in item 1 above). The proposals and justification for the fish passage study by NMFS appear to be based on the assumption that if fish passage issues render the Project non-viable the dam would be removed and Atlantic salmon would receive the maximum benefit. GLWP believe this is an invalid assumption for the following reasons:
  - a. Dam removal would cause severe problems for the water supply of the GLNFH.
  - b. The dam is not on federal land, and it pre-dates the original Project licensing by more than 100 years. Restoring the project lands to their pre-project state would remove neither the dam nor the fish passage blockage.
  - c. There are other benefits to the area, its inhabitants and the GLNFH from the dam and its responsible operation.
- 4) GLWP does not believe the expense and effort of a fish passage study at the Project would lead to an effective benefit for Atlantic salmon restoration. This study is not warranted for this Project.

#### 4.2.1 References

MDMR Fish Counts – Updated November 29, 2019

<https://www.maine.gov/dmr/science-research/searun/programs/trapcounts.html>

## **5.0 ADDITIONAL INFORMATION REQUESTED**

In a letter submitted on December 5, 2019, in Schedule B, FERC requested additional information on the Project. The Licensee will coordinate with the Green Lake Association and gather the data requested. The responses to schedule B will be filed with the initial study report that is due on February 9, 2021.

### **5.1 Terrestrial Resources**

Section 5.7.1 of the PAD states that loons occur in the project area. However, the PAD does not describe the abundance, timing, activities, and general distribution of common loons within the project area. The Green Lake Association has indicated that they participate in the Maine Audubon's annual loon count on Green Lake. To assist staff with its environmental analysis of the proposed project, please provide the results from the loon counts on Green Lake. To the extent possible, the information should include annual totals of adults and chicks observed, the timing of nesting, and the locations of nests.

### **5.2 Recreation and Land Management**

2. Private landowners expressed concern during scoping about the effects of lowering the lake level after Labor Day on recreation within the project boundary. To assist staff with its environmental analysis of the effects of the annual drawdown on recreation, please file daily impoundment levels for the project from September 1 through November 31 from 2015 through 2019.

3. During the proposed study plan meeting held on October 10, 2019, the Green Lake Association stated that it would work with landowners to collect data on private docks, in order to assist with an analysis of the effects of lowering the lake level on recreation. In order to assist Commission staff in its environmental analysis, please provide the information collected by the Green Lake Association on private docks, including, to the extent available: (1) the location of the dock on the impoundment (including any georeferenced data); (2) the type of dock (i.e., permanent, floating, lift-out docks); and (2) the elevation and/or depth of the dock, taken at its end. If possible, please also document the location/type of other shoreline private usage, such as beach areas.



## 6.0 INDIVIDUAL STUDY PLAN PROPOSALS

### Background:

GLWP believes additional watershed-level context could be useful in understanding the studies appropriate to the relicensing of the Green Lake Water Power Project (the Project). For a sense of scale, a comparison of the Green Lake Project with the Ellsworth Project (FERC P-2727) is contained in the following table:

**Table 6-1 Comparison of the Green Lake Project and the Ellsworth Project**

Category	Green Lake	Ellsworth	Ratio
Nameplate Capacity	0.425 MW	8.9 MW	4.7%
Drainage Area	45 sq mi	547 sq mi	8.2%
Average Annual Generation	1,657 MWh	30,511 MWh	5.4%
Reservoirs	2,989 acres	10,090 acres	29.6%
Drawdown	3.2 ft	10.8 ft (Graham Lake)	29.6%
Storage	10,000 acre-ft	125,000 acre-ft	14.0%

The Green Lake Project is a very small hydroelectric installation—tiny by utility standards. Its licensed capacity is 500 kW, with one 400 kW fixed operating point unit and one 25 kW fixed operating point unit. With one “large” unit and one very small unit, there are essentially two flow states in the Project tailrace: 1) with the main unit on, 2) with the main unit off.

The following table summarizes the value of electricity generated by the Project. It shows the Emera Short-Term Energy-Only Avoided Costs (value per KWh) for the last 5 years and that value multiplied by average annual generation.

**Table 6-2 Green Lake Average Gross Income**

Year	Avg Rate (Cents/KWh)	Avg. Project Gross Income
2015	3.461	\$57,349
2016	3.591	\$59,503
2017	3.010	\$49,876
2018	4.222	\$69,959
2019	4.359	\$72,229
Average:	3.729	\$61,783

The income figures above are before taxes, employee payroll, insurance, equipment, supplies and maintenance and upgrade costs.

The Project does not generate significant value—though it does, with careful management, balance annual operation and maintenance costs. In addition, the Project provides other benefits that add to the social and environmental value of the Project:

- 1) It helps the Green Lake National Fish Hatchery pursue its goals of restoring Atlantic salmon.
- 2) It produces clean, renewable energy.
- 3) It maintains and operates the Green Lake Dam, summer and winter, good weather and bad.
- 4) It manages the water level in Green Lake on a daily basis for a range of recreational, environmental and other interests, despite varying weather conditions.
- 5) It maintains a minimum flow in Reeds Brook that is much less subject to impact by unusually dry periods.

We believe the benefits of the Green Lake Project can outweigh the costs and effort involved in continuing its existence. The above information is important to consider in assessing an appropriate cost and level of effort for studies as well as the nexus between the Project operations and effects on the resources to be studied. GLWP notes that the majority of study requests do not identify specific costs but rather cite the cost would be similar to other relicensings in the state/region. The Project must follow the same relicensing process as a large project, but that does not mean it *is* a large project or that the scale of studies necessary for a large project are necessary or appropriate.

GLWP looks forward to working with the resource agencies and all other interested parties to work out how information needed for the project to be relicensed can be acquired in a frugal and efficient manner, increasing the likelihood that the Project can continue to be sustainable.

**Potential GLNFH Effects on Studies:**

The Green Lake National Fish Hatchery (GLNFH) has a discharge permit for effluent into Reeds Brook/Graham Lake. The latest permit is MEPDES Permit #ME0002623, dated August 3, 2015.

In this permit the GLNFH, Special Conditions C. *AUTHORIZED DISCHARGES* states the permittee is authorized to discharge from Outfalls #001A and #002A. Per 2. *PERMIT SUMMARY, d. Wastewater Treatment*, Outfall #001A is the discharge from the wastewater settling ponds into a Section of Reeds Brook directly influenced by Graham Lake. Per 2.

*PERMIT SUMMARY, c. Source Description/Facility Operation*, Outfall #002A is filter backwash water from the GLNFH intake water treatment facility which is discharged via a 14 inch pipe directly into Reeds Brook. This discharge pipe is approximately 480 feet downstream from the Green Lake dam.

In the permit section *SPECIAL CONDITIONS, H. PESTICIDES AND OTHER COMPOUNDS*, the following compounds were identified in the permittee's application as currently being in use, and the permittee is authorized to discharge them: salt, baking soda, Lysol no-rinse sanitizer, PVP iodine. Section *G. USE OF DRUGS FOR DISEASE CONTROL* notes that formalin and Tricaine-S (Fish anesthetic) are also in use by GLNFH and authorized for discharge, in addition to other drugs, as long as the drugs and their uses are approved by the FDA. This section also specifies what conditions must be met for other drugs to be used.

GLWP is concerned that the discharge of disinfectants, drugs and other chemicals by the GLNFH could interfere with studies in Reeds Brook and conceivably the Project tailrace (such as a macroinvertebrate study). It would be unfortunate if an extremely rare or one-time discharge of a substance happened to occur upstream of a macroinvertebrate collector during a sampling period.

GLWP believes there must be coordination between the Project, the GLNFH, Maine DEP and any other involved agencies to verify that studies measure normal conditions and not unusual outside influences such as hatchery discharge of disinfectants or drugs.

**Study Requests:**

The Licensee is proposing several studies to address resources for which insufficient information was previously available for the PAD or for which specific issues have been identified through agency comments. The individual study plans detailed below are proposed for the Green Lake Project relicensing and most will commence in the summer of 2020. The Licensee proposes that most studies, unless otherwise noted in individual plans, be completed in a single field season and that a second field season for individual studies may only be required after evaluation of the Initial Study Report.

## 6.1 Water Quality – Study #1

### **Green Lake Classification:**

Green Lake is an Oligotrophic Class GPA water body. The Green Lake Project impoundment is a water storage facility in character.

Definition: 5. Great ponds. "Great ponds" means any inland bodies of water which in a natural state have a surface area in excess of 10 acres and any inland bodies of water artificially formed or increased which have a surface area in excess of 30 acres.

1. Class GPA waters. Class GPA is the sole classification both of great ponds and of natural lakes and ponds less than 10 acres in size.

A. Class GPA waters must be of such quality that they are suitable for the designated uses of drinking water after disinfection, recreation in and on the water, fishing, agriculture, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other aquatic life. The habitat must be characterized as natural. [2003, c. 227, §5 (AMD); 2003, c. 227, §9 (AFF); 2005, c. 561, §10 (AFF).]

B. Class GPA waters must be described by their trophic state based on measures of the chlorophyll "a" content, Secchi disk transparency, total phosphorus content and other appropriate criteria. Class GPA waters must have a stable or decreasing trophic state, subject only to natural fluctuations, and must be free of culturally induced algal blooms that impair their use and enjoyment. The number of *Escherichia coli* bacteria in these waters may not exceed a geometric mean of 29 CFU per 100 milliliters over a 90-day interval or 194 CFU per 100 milliliters in more than 10% of the samples in any 90-day interval. [2017, c. 319, §10 (AMD).]

### **Reeds Brook Classification:**

Reeds Brook, partially fed by bypass dam leakage flow of 1-cfs from the Project is classified as Class B water to the confluence of Graham Lake.

Class B waters must be of such quality that they are suitable for the designated uses of drinking water 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. The habitat must be characterized as unimpaired.

The dissolved oxygen content of Class B waters may not be less than 7 parts per million or 75% of saturation, whichever is higher, except 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 1-day minimum dissolved oxygen concentration may not be less than 8.0 parts per million in identified fish spawning areas.

Discharges to Class B 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.

### **6.1.1 Goals and Objectives**

The objectives of the suite of studies, including impoundment trophic state, impoundment aquatic habitat, temperature and dissolved oxygen, and benthic macroinvertebrate, are to collect contemporary water quality data in Green Lake and Reeds Brook upstream and downstream of the Green Lake dam to determine whether the Project waters meet MDEP's water quality standards and maintain the structure and function of the resident benthic macroinvertebrate community.

### **6.1.2 Known Resource Management Goals**

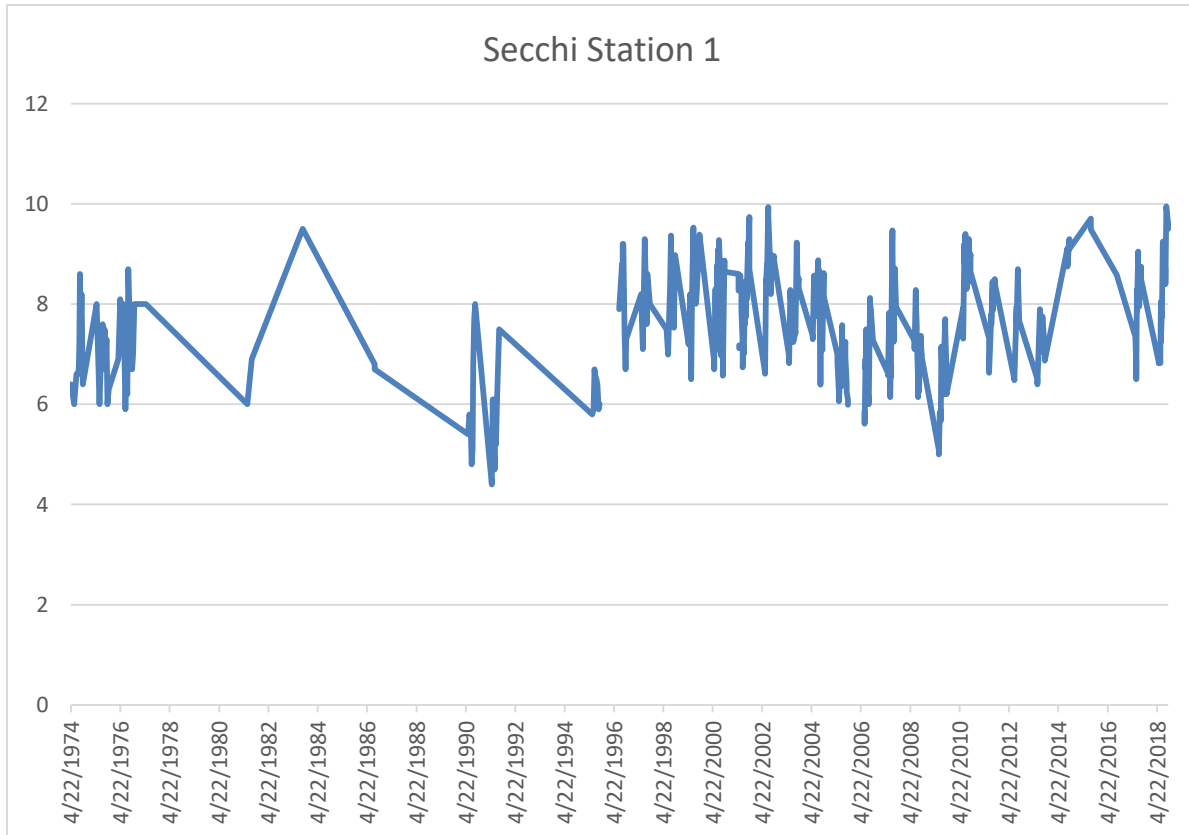
The resource management goal is to ensure attainment of Maine Water Quality Standards pursuant to the provisions of the *Water Classification Program*, 38 M.R.S. Sections 464- 468 and to certify attainment of such, with any necessary conditions, under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act).

### **6.1.3 Background and Existing Information**

Water Quality has been being monitored and recorded in Green Lake since the early 1970s (at least 1974). The Green Lake Association contributes to this. The information is available on the Lakes Of Maine web site (<https://www.lakesofmaine.org>). The downloadable Spreadsheet

describes Green Lake as having above average water quality and as Oligotrophic (as in low productivity).

Currently GLWP has data from the LakesOfMaine website that shows that the Secchi Disk Transparency has improved from an average in 1974 of 6.7 meters to an average in 2018 of 8.5 meters.



**Figure 6-1 Historic Secchi Disk Data**

Total Phosphorus on the surface in 1974 was 3.5 (g/L) and in 2012 it was 3.5 (g/L).

Average Chlorophyll-a in 1981 was 1.7 (g/L) and in 2016 it was 1.6 (g/L).

Dissolved Oxygen in September 1976 at 0 meters with a temperature of 17.8C was 9.2 ppm and at 20 meters with a temperature of 6.3 C was 9.3 ppm – in September 2018 at 0 meters with a temperature of 23.9C was 7.9 ppm and at 20 meters with a temperature of 5.8C was 10.3 ppm.

The data in the MaineLakes\_Geography\_Morphometry spreadsheet states “Also included is the Maine Department of Environmental Protection (MDEP) trophic state assessment for each surveyed lake.’ For Green Lake the data for the Water Quality Statement is “Above average”.

This data appears to show that Green Lake has a “stable or decreasing trophic state.”

MDEP has noted that the timing of the historic data collection is not sufficient to meet MDEP requirements.

#### **6.1.4 Project Nexus**

Data collected will identify trophic state and aquatic habitat of Project waters and will be used to evaluate effects on water temperature and DO concentrations in Reeds Brook downstream of the Green Lake dam and may identify stratification effects on the impounded water and habitat. Information will be used to evaluate whether the project meets Maine water quality parameters, which will inform the water quality certification process.

#### **6.1.5 Methodology**

Water quality studies will be conducted as specified in MDEP’s *Sampling Protocol for Hydropower Studies* (September 2019) and MDEP “Methods for Biological Sampling and Analysis of Maine’s Rivers and Streams” (Davies and Tsomides 2002). The studies will be conducted roughly as described below, but where there are differences, MDEP’s documents that are current and publicly available as of the date of this RSP (January 11, 2020) will prevail.

##### **6.1.5.1 Impoundment Trophic State Study – 1-1**

Sample parameters will include Secchi disk transparency, water temperature and DO profiles (1-meter intervals), and epilimnetic core samples of total phosphorus, chlorophyll-a, color, pH, and total alkalinity. GLWP will sample from the established Lakes of Maine Green Lake Station 1 and Station 2 locations. These sampling locations have been determined to be sited in the deepest areas of the northwest and southeast basins of the lake. Samples will be captured twice per month for five consecutive months (June through October 2020).

Additional lake trophic and dissolved metal analyses will be collected during one of the late summer sampling events (typically in August, but dependent on weather conditions). The late

summer sample parameters will include total phosphorus, nitrate, chlorophyll-a, color, dissolved organic carbon, pH, total alkalinity, total iron, total and dissolved aluminum, total calcium, total magnesium, total sodium, total potassium, specific conductance, chloride, and sulfate. The late season sample will be completed regardless of whether the impoundment stratifies; if the waterbody is thermally stratified (i.e., change in water temperature  $T \geq 1^{\circ}\text{C}/\text{meter}$ ), samples will be collected (1) from an epilimnetic core, (2) at the top of the hypolimnion, and (3) at one meter above the sediment. Samples will be collected with an epilimnetic core or a Van Dorn sampler, or equivalent. If the waterbody is not thermally stratified, only one sample from an integrated epilimnetic water core will be taken from the surface to two times the Secchi disk depth or within 1 meter of the bottom, whichever is less.

Water samples will be delivered on ice to the state of Maine’s Health and Environmental Testing Laboratory (HETL) in Augusta (or other qualified lab) within 24 hours of sampling. Appropriate chain-of-custody and sample labeling techniques will be followed. HETL’s laboratory detection limits differ slightly from the detection limits identified in MDEP’s sampling protocol; however, MDEP has reviewed and approved the HETL detection limits in identical water quality studies at hydropower projects in Maine. Table 6-3 provides the lab detection limits required by the MDEP and the proposed HETL detection limits.

**Table 6-3 Detection limits for impoundment trophic sampling**

<b>Parameter</b>	<b>MDEP Detection Limit</b>	<b>Proposed HETL Detection</b>
Total phosphorus	0.001 MG/L	0.002 MG/L*
Nitrate	0.01 mg/l	0.05 mg/l*
Chlorophyll a	0.001 mg/l	0.001 mg/l
Color	1.0 SPU	5.0 SPU*
DOC	0.25 mg/l	1.0 mg/l*
pH	0.1 SU	0.1 SU
Total alkalinity	1.0 mg/l	1.0 mg/l
Total iron	0.1 mg/l	0.2 mg/l*
Total dissolved aluminum	0.01 mg/l	0.2 mg/l*
Total calcium	1.0 mg/l	1.0 mg/l
Total magnesium	0.1 mg/l	1.0 mg/l*
Total sodium	0.05 mg/l	1.0 mg/l*
Total potassium	0.05 mg/l	1.0 mg/l*
Specific conductance	1 ms/cm	2 ms/cm*
Chloride	1.0 mg/l	1.0 mg/l
Sulfate	0.5 mg/l	1.0 mg/l*

\* Detection limit differs from MDEP sampling protocol.



Water temperature and DO will be measured with a handheld YSI ProSolo ODO meter (or similar). The calibration of the YSI ProSolo ODO meter will be checked in the field prior to each sampling event. According to the manufacturer's specifications, the accuracy of the YSI ProSolo ODO meter is  $\pm 0.1$  mg/L or  $\pm 1\%$  of the reading, whichever is greater, for the DO concentration range of 0-20 mg/L;  $\pm 1\%$  air saturation or  $\pm 1\%$  of the reading, whichever is greater, for DO percent saturation; and  $\pm 0.2^\circ\text{C}$  for temperature.

#### **6.1.5.2 Impoundment Aquatic Habitat Study – 1-2**

For lakes, ponds, and riverine impoundments, determination of attainment of the designated use 'habitat for fish and other aquatic life' will be determined as follows. Using a depth of twice the mean summer Secchi disk transparency, determined from the Trophic State Study or historic DEP data, as the bottom of the littoral zone, the volume and surface area dewatered by the drawdown will be calculated to determine if at least 75% of the littoral zone remains watered at all times. Alternatively, studies of fish and other aquatic life communities, including freshwater mussels, may be conducted to demonstrate that the project maintains 'structure and function of the resident biological community' even if a drawdown results in less than 75% of the littoral zone remaining watered at all times. Existing Secchi disk information (see section 7.1.3) suggests that it is unlikely that an analysis of the Impoundment Trophic State Study results will indicate less than 75% of the littoral zone remains watered at all times. The maximum drawdown of Green Lake is approximately one meter.

#### **6.1.5.3 Impoundment Temperature Study – 1-3**

Temperature loggers will be installed at two locations in the impoundment from September until the end of November. The temperature data will be logged hourly during this period. The locations and depths for the temperature loggers will be determined in consultation with Maine DIFW and Maine DEP. The data collected will be used to inform an analysis of the effects of project drawdown on arctic char.

#### **6.1.5.4 Downstream Benthic Macroinvertebrate Study – 1-4**

GLWP will employ a qualified researcher to sample the benthic macroinvertebrate community in the Reeds Brook bypass, powerhouse tailrace and the confluence of the tailrace and Reeds Brook. MDEP staff will verify that the locations are acceptable. The sampling will be conducted

in accordance with the MDEP Methods for Biological Sampling and Analysis of Maine's Rivers and Streams (Davies and Tsomides 2014). Wading and/or snorkeling will be used as needed to rapidly bioassess the habitats to find suitable sample sites (hard eroded substrates in flowing water). The researcher will install rock-filled wire baskets/mesh bags for a period of  $28 \pm$  four days during the late summer, low flow period (July 1 to September 30).

Laboratory methods will include sorting the entire sample for invertebrates and identification to genus or species as practicable. Data will be organized in order that it can be submitted to MDEP for input into the statistical model which uses linear discriminate functions to classify sampling sites according to the standards in the aquatic life use classification system. The Division of Environmental Assessment at MDEP uses a linear discriminant water quality model (LDM) and professional judgment to determine attainment of water quality class. The LDM results are percentages indicating the probability of a site attaining water quality Class A and AA (the biocriteria requirements are the same), B, or C. To attain a particular class, a site must have a 60% or greater score in the test for that class. The MDEP linear discriminant model is able to classify benthic macroinvertebrate communities to Class A aquatic life standards; a Class A determination will also indicate that Class AA standards are attained because the aquatic life criteria for both classes are the same.

#### **6.1.5.5 Downstream Temperature and Dissolved Oxygen Study – 1-5**

GLWP will monitor water temperature and DO downstream of the Project structures with submersible Onset Hobo datasonde(s) (or similar) in accordance with MDEP's *Sampling Protocol for Hydropower Studies* (September 2019). The datasonde(s) will be installed in two locations (1) in the Reeds Brook bypass reach below the dam and above the upper GLNFH discharge pipe and (2) in the tailrace downstream of the powerhouse (with MDEP review and approval). Each datasonde will be deployed from an anchored buoy and weighted cable system or attached to a vertical mounting post, will be encased in a flow-through PVC container, and will be equipped with a bio-fouling guard. The datasonde will be programmed to continuously measure water temperature and DO every hour during July and August to sample the low flow, high temperature period. The instrument will be calibrated at the beginning of the monitoring period and at periodic intervals, as needed, per the manufacturer's specifications. The equipment will be checked, and the data will be downloaded every other week.

Data will be collected in accordance with MDEP’s “Temperature and Dissolved Oxygen Study” protocol under “Rivers and Streams” in the MDEP *Sampling Protocol for Hydropower Studies* (September 2019)

All downstream study activities will be coordinated with Black Bear Hydro when practical and necessary to allow the collection of data when Graham Lake is low enough to ensure valid data can be collected. As noted in section 2, the level of Graham Lake is sometimes neither predictable nor controllable within specific ranges. The approval of sampling locations by MDEP will be taken as a certification that these locations are known to be suitable to acquire the data they need despite lake level variations that occur due to natural events.

#### **6.1.6 Consistency with Generally Accepted Scientific Practice**

This study employs generally accepted practices for evaluating water quality at hydroelectric projects. Sampling protocols are based on water quality parameter standard operating procedures (SOP’s) developed by the MDEP’s *Sampling Protocol for Hydropower Studies* (September 2019) and those detailed in the MDEP “Methods for Biological Sampling and Analysis of Maine’s Rivers and Streams” (Davies and Tsomides 2014).

#### **6.1.7 Deliverables and Schedule**

The data gathering will be conducted from June through October. A progress report will be filed in August 2020 and the data and results will be summarized in the Initial Study Report which will be filed with FERC in the Spring of 2021.

#### **6.1.8 Cost and Level of Effort**

The estimated cost to conduct this study is \$50,000.

#### **6.1.9 References**

Maine Revised Statutes. 2017. 38 MRSA §480-B. URL: [ 1987, c. 809, §2 (NEW) .]  
<http://legislature.maine.gov/statutes/38/title38sec480-B.html>

[www.LakesOfMaine.Org](http://www.LakesOfMaine.Org) spreadsheet *MaineLakes\_Geography\_Morphometry.xls*

Maine Department of Environmental Protection (MEDEP). 2011. 2010 Integrated Water Quality Monitoring and Assessment Report. DEPLW-1187.

Maine Revised Statutes. 2017. 38 MRSA §465-A. URL:  
<http://www.mainelegislature.org/legis/statutes/38/title38sec465-A.html>

Maine Revised Statutes. 2017. 38 MRSA §465. URL:  
<http://www.mainelegislature.org/legis/statutes/38/title38sec465.html>

MDEP – Methods for Biological Sampling and Analysis of Maine’s Rivers and Streams, DEP  
LW0387- B2002. [www.maine.gov/dep/water/monitoring/biomonitoring/material.html](http://www.maine.gov/dep/water/monitoring/biomonitoring/material.html)

Davies, S. P. and L. Tsomides. 2014. Methods for Biological Sampling and Analysis of Maine’s  
Rivers and Streams. Maine Department of Environmental Protection, Bureau of Land and  
Water Quality/ DEP LW0387-C2014, Revised April 2014.

## **6.2 Aquatic Habitat Cross-Section and In-stream Flow Study –Study #2**

Two versions of this study were requested by the Maine DEP (aquatic habitat cross-section) and the NMFS (in-stream flow). GLWP proposes variation of these studies consistent with those conducted at other hydropower projects in Maine to characterize habitat and flow conditions in Reeds Brook.

This study requires releasing water from Green Lake via one of the gates at the dam. Per the current Project license, GLWP is not allowed to use or release water from the dam if the lake level is at or below the minimum level for the season in question. During a very dry summer, this could preclude performing this test during late summer.

### **6.2.1 Goals and Objectives**

Assessment of aquatic habitat downstream of the Green Lake dam is required to determine whether current in-stream flow releases meet Maine habitat and aquatic life criteria. An aquatic habitat cross-section flow study measures depth, velocity, and wetted width along established transects at various discharges to determine flows where at least 75% of the stream cross-sectional area has enough water to provide sufficient habitat for fish and other aquatic organisms. Data will be evaluated to determine if the downstream waters provide sufficient quantity of water to maintain riverine aquatic habitat in the bypass and tailrace reaches.

### **6.2.2 Known Resource Management Goals**

Maine DEP requested this study. Their resource management goal is to ensure attainment of Maine Water Quality Standards pursuant to the provisions of the *Water Classification Program*, 38 M.R.S.A. Sections 464-468 and to certify attainment of such, with any necessary conditions, under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act).

NMFS also requested this study. NMFS is a federal resource agency with a mandate to protect and conserve fisheries resources and associated habitat.

### **6.2.3 Background and Existing Information**

Reeds Brook downstream of the Green Lake dam must meet Maine habitat and aquatic life criteria. Maine DEP file review indicates data is insufficient in the bypass and tailrace reaches of the Green Lake Hydroelectric Project to assess attainment of these criteria.

Insufficient data is included in the PAD to determine if the current Project license requirement of one cfs minimum flow in the bypass section of Reeds Brook is likely to jeopardize the continued existence of Atlantic salmon or result in the destruction or adverse modification of habitat of Atlantic salmon.

The tailrace of the Project is heavily influenced by the water level of Graham Lake. Since the level of Graham Lake is neither controlled nor heavily influenced by Project operation, it is an external influence in any tailwater flow studies. The Project operates only fixed operating point units, one with an approximate flow of 90 cfs and one with an estimated flow of 6 cfs.

#### **6.2.4 Project Nexus**

Data collected will be used to evaluate aquatic habitat in Reeds Brook downstream of the Green Lake dam. Information will be used to evaluate whether the project meets Maine habitat and aquatic life criteria and will inform the water quality certification process.

#### **6.2.5 Methodology Consistent with Accepted Practice**

GLWP will conduct this study as follows:

1. GLWP will consult with the Maine DEP and the NMFS to select transects in the bypass and tailrace area that are suitable for characterizing and measuring the different types and reaches of fish habitat and cross section, and to select the flow values to be used.
2. Each end of each transect will be marked by ribbons or stakes on the shore.
3. The distance along Reeds Brook that each transect represents will be measured.
4. Using the minimum flow conditions, each transect will be mapped as to bank full cross sectional area, water depth, velocity, wetted width, habitat types and length of each habitat type along the transect. Stream characteristics will be photographed and the slope of the stream measured and recorded.
5. The flow will be increased to the next flow value to be used by opening a gate at the dam.
6. For each transect, measure water depth, velocity and wetted width.
7. Repeat steps 5 and 6 for any remaining flow values.

This procedure is designed to meet the requirements of the MDEP *Sampling Protocol for Hydropower Studies* (September 2019) when combined with the Benthic Macroinvertebrate and to also collect fish habitat information requested by NMFS.

### **6.2.6 Deliverables and Schedule**

The data gathering will be conducted from June through October. A progress report will be filed in August 2020 and the data and results will be summarized in the Initial Study Report which will be filed with FERC in the Spring of 2021.

### **6.2.7 Cost and Level of Effort**

This study is estimated to cost \$15,000 to \$30,000 depending on the number of transects and flow values that are required by resource agencies.

### **6.2.8 References**

- NMFS (2016). NOAA Fisheries Habitat Enterprise Strategic Plan: 2016-2020, <https://repository.library.noaa.gov/view/noaa/14994>: 30.
- URFCC (2015). Comprehensive Fishery Management Plan for the Union River Drainage 2015 - 2017. Union River Fisheries Coordinating Committee.
- USASAC (2019). "Annual report of the U.S. Atlantic Salmon Assessment Committee. Report No. 31 - 2018 Activities. Prepared for the U.S. Section to NASCO."
- USFWS and NMFS (2019). Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon (*Salmo salar*): Final Plan for the 2009 ESA Listing, US Fish and Wildlife Service, National Marine Fisheries Service.
- USOFR (2009). 74 FR 29300. Endangered and threatened species; designation of critical habitat for Atlantic salmon (*Salmo salar*) Gulf of Maine Distinct Population Segment; Final Rule. Department of Commerce National Oceanic and Atmospheric Administration. Federal Register 74(117): 29300–29341. June 19, 2009.
- Wright, J., J. Sweka, A. Abbott and T. Trinko (2008). GIS-Based Atlantic Salmon Habitat Model. Appendix C in: NMFS (National Marine Fisheries Service). 2008. Biological valuation of Atlantic salmon habitat within the Gulf of Maine Distinct Population Segment. DRAFT. NOAA National Marine Fisheries Service, Northeast Regional Office, Gloucester, MA.
- Davies, S. P. and L. Tsomides. 2014. Methods for Biological Sampling and Analysis of Maine's Rivers and Streams. Maine Department of Environmental Protection, Bureau of Land and Water Quality/ DEP LW0387-C2014, Revised April 2014.

### **6.3 American Eel Surveys – Study #3**

The USFWS requested that Green Lake conduct an upstream American eel passage study.

The PAD references American eel in various locations and notes that American eel currently inhabit waters upstream of the Project (e.g., Table 5-7). The PAD does not specifically note that the presence of American eel in waters upstream of the Project implies that juvenile American eel are able to ascend Reed Brook and climb wetted surfaces of the dam without aid of any engineered upstream fish passage facilities. Such opportunistic upstream passage behavior is common throughout the range of American eel. The USFWS states the above in documentation of such behavior at many dams, however, this climbing behavior does not provide an efficient means of passing over a dam.

#### **6.3.1 Goals and Objectives**

The goal of this study is to assess the need and potential location(s) for a dedicated American eel upstream passage facility at the Green Lake Project. The objectives of the study are to:

- conduct systematic nighttime surveys to identify eel presence/absence, abundance, distribution, and behavior at the Green Lake Project;
- identify areas where eel congregate or attempt to ascend wetted structures; and
- identify the need for and potential locations for an upstream eel passage system.

#### **6.3.2 Known Resource Management Goals**

While there is no specific management plan for American eel in the state of Maine, all Atlantic states must, when regulating commercial and recreational fishing activity, comply with the management goals and objectives set forth by the Atlantic States Marine Fisheries Commission (ASMFC), which include:

1. Protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic States and jurisdictions and contribute to the viability of the American eel spawning population.
2. Provide for sustainable commercial, subsistence, and recreational fisheries by preventing overharvest of any eel life stage (ASMFC, 2012).



American eel were considered for listing under the Endangered Species Act (ESA) in 2007, but the USFWS determined that the listing was not warranted. The USFWS is currently completing a status review pursuant to a second listing petition submitted in 2010 by the Council for Endangered Species Act Reliability (USFWS, 2012).

### **6.3.3 Background and Existing Information**

Currently, there is not an upstream passage facility for juvenile eel at the Green Lake Project dam. Nonetheless, American eel are believed to occur in the project area because they are able to climb rough wet surfaces, such as bedrock or concrete areas with sustained leakage. There is no site specific information on eel abundance, size distribution, or behavior at the Green Lake Project.

### **6.3.4 Project Nexus**

The Green Lake Project structures are believed by agencies to block the upstream and downstream movement of American eel. Passage facilities designed for American eel may be needed to reestablish the connection between rearing and spawning habitats.

### **6.3.5 Methodology**

GLWP will conduct nighttime visual surveys to collect information about the abundance, behavior, and location of juvenile American eel at the Green Lake Project during their upstream migration. Based on experience at other hydroelectric projects in Maine, most juvenile upstream eel movement does not occur during daylight, but consistently occurs during dusk and evening hours, primarily between June 1 and August 31. GLWP will conduct observation surveys at night periodically throughout the expected primary migration season from May through July, depending on safe access (e.g., limited spill conditions), and efforts will focus on the peak migration time of June. If consistent patterns in eel behavior and migration are observed during the June 1 to June 30 monitoring effort, GLWP will consult with the agencies to determine if continuation of weekly monitoring from July 1 to August 31 is necessary. Should the agencies and GLWP agree once weekly monitoring needs to be continued but if only minor changes in eel behavior or relative abundance are noted during the July 1 – August 31 portion of the study, GLWP may elect to conduct the monitoring every other week.

Prior to the start of monitoring, GLWP will perform a site visit to identify areas along the dam and other project structures where eel may congregate or attempt to ascend the dam, and to determine if these areas are safely accessible. Nighttime eel surveys will likely take place at the downstream face of the dam and spillway, and the waste gate section, assuming access to these areas is safe and viewing conditions are satisfactory. This will be coordinated with USFWS.

Given the propensity for juvenile eel to move upstream during rain storms or under cloud cover, surveys will be timed to coincide with precipitation, if possible. Each survey will begin approximately one hour after sunset, and will last one to two hours depending on the number of eel observed. The surveys will be conducted by a two-person crew. The field crew will make visual observations using spotlights and binoculars by wading or traversing areas below the dam. If access or safety considerations are a factor, observations will be made from safely accessible sections of the dam or from other project structures. During each survey, the field crew will:

- Photograph and document each area where eel congregate and attempt to pass the Green Lake Project;
- Record the date, start time, end time, and survey conditions (i.e., weather and spill conditions);
- Approximate the number of eel per location;
- Make observations about eel behavior;
- Estimate the size range of observed eels; and
- Note the presence or absence of predators.

Based on the results of the 2020 surveys, and in consultation with the resource agencies, GLWP may elect to perform additional monitoring in 2021.

### **6.3.6 Consistency with Generally Accepted Scientific Practice**

This study employs accepted practices for evaluating upstream eel passage at hydroelectric projects.

### **6.3.7 Deliverables and Schedule**

The site visit and nighttime field surveys will be conducted between May 1 and August 31, 2020. Data analysis will begin after completion of the study. A draft report summarizing the survey data and results will be provided to the stakeholders by approximately February 1, 2021.

### **6.3.8 Cost and Level of Effort**

The level of effort for this study consists of 14 nighttime surveys, data analysis, and reporting, which is adequate to meet the goals and objectives of the study. The estimated cost to conduct the American eel upstream passage study is \$20,500.

### **6.3.9 References**

Atlantic States Marine Fisheries Commission, 2012. American Eel Stock Assessment Overview (May 2012).

Maine Department of Marine Resources (MDMR). 2002. Draft Fishery Management Plan Cobbosseecontee Stream. Prepared by Gail S. Wippelhauser. December 2002.

USFWS. 2012. U.S. Fish and Wildlife Service Endangered Species Program. The American Eel.

#### **6.4 Erosion Reconnaissance Survey – Study #4**

MHPC states “The Project Area of Potential Effects is defined as the lands enclosed by the Project’s boundary and the lands or properties outside of the Project’s boundary 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.”

The Project Boundary is defined as 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 at an elevation of 161 feet USGS. The project boundary also includes the bypass reach and encloses the dam, penstock, and the powerhouse.

The Project Impoundment is defined as the water body whose surface elevation is controlled by the project dam at Green Lake.

This survey will provide information to establish the Project APE for the Green Lake Project. Given the APE, GLWP will then utilize a MHPC approved historian to identify potentially affected structures of historical significance.

##### **6.4.1 Goals and Objectives**

The objective of this study is to conduct an erosion reconnaissance survey around Green Lake and from there to establish the APE and then to identify structures of potential architectural significance within the APE. The historic resource survey will be accomplished with a literature review and architectural resource survey.

##### **6.4.2 Known Resource Management Goals**

Per Section 106 (36 CFR 800), the Maine State Historic Preservation Officer (SHPO) represents the interests of the State of Maine and its citizens, and advises and assists FERC in determining the significance of cultural resources within the APE. The SHPO administers cultural resource management reviews under Section 106 of the National Historic Preservation Act, which involves providing technical guidance and professional advice on the potential impact of licensed projects, such as the Green Lake Project, on the state’s cultural resources.

### **6.4.3 Background and Existing Information**

There is no data to suggest that there are any structures of historical significance within the Green Lake Project Area of Potential Effect. We have no intention of making any significant changes to the management and operation of the lake or downstream flows at the Project.

### **6.4.4 Project Nexus**

MHPC have not provided any data on the nexus as no modifications to existing project facilities are proposed.

### **6.4.5 Methodology**

#### **To Define the Area of Potential Effect (APE):**

GLWP will inspect the lake edge by eye and by map contour to determine erosion potential. Locations where erosion is visible or likely will be noted on a map of the area, will be photographed and become the perimeter of the proposed Area of Potential Effect.

#### **To Identify Architecture Of Interest:**

Background research will be conducted on the history and development of the Project area and its surroundings. Published histories and previous architectural and historical studies of Hancock county will be consulted, as well as historic maps and atlases of the county. At the MHPC in Augusta, survey forms for all previously surveyed resources will be reviewed as well as cultural resource management reports for previous surveys conducted in the Project APE. This will be done to identify and record information on all historically significant resources within the Area of Potential Effect (APE) that are at least 50 years old.

### **6.4.6 Consistency with Generally Accepted Scientific Practice**

This study employs generally accepted surveying practices.

### **6.4.7 Deliverables and Schedule**

It is anticipated that the work would be completed in 2020 and the results included in the Initial Study Report (ISR).

#### **6.4.8 Cost and Level of Effort**

The estimated cost for the proposed historic architectural survey is \$10,000. The Licensee believes that the proposed level of effort is adequate to determine the Area of Potential Effect and obtain information on historic architectural resources within the Project APE.

#### **6.4.9 References**

54 U.S. Code § 306108. Effect of undertaking on historic property – this replaced Section 106 of the National Historic Preservation Act of 1966 (NHPA) in 2014

§ 800.16 Definitions.

(d) Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

(y) Undertaking means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval.