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GOVERNOR

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION



MELANIE LOYZIM
COMMISSIONER

January 28, 2022

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: FERC No. 7189 – Green Lake Hydroelectric Project
Draft License Application Comments

Dear Ms. Bose:

The Maine Department of Environmental Protection (Department) received and reviewed a Draft License Application (DLA) for the Green Lake Hydroelectric Project, located on Green Lake and Reeds Brook in the towns of Ellsworth and Dedham in Hancock County, Maine.

The existing Green Lake Project consists of a dam on Green Lake, an intake structure, a penstock, a powerhouse, two generating units and their associated transmission and control facilities. The dam is a dry stone and timber structure to which sheet steel was added on the upstream face and deck to replace deteriorating hemlock planks. A concrete gate structure was added in the 1960s and a 12' by 15' intake structure was added in 1984. The dam measures 7.5 feet high and 270 feet long, with a maximum top width of 7 feet; 82 feet of the dam is a concrete gravity section with an 80-foot spillway channel having a crest elevation of 160.7 feet¹. The dam impounds Green Lake which has an area of approximate area of 2,989 acres and a maximum storage of approximately 3,000 acre-feet. Lake water levels are maintained between 157.5 feet and 160.7 feet over the course of the year and maintained between 159.7 and 160.7 feet between June 1 and Labor Day, annually. A 1,740-foot-long wood and concrete penstock delivers water to the Project powerhouse containing two turbine units (400 kW and 25 kW, respectively) with a total hydraulic capacity of 97 cfs; the total installed capacity of the facility is 425 kW. Power generated at the project is fed to Emera Maine through a 12.476 kV, 3-phase distribution line. leakage flow from the Project dam provides an instantaneous minimum flow of 1 cfs to Reeds Brook.

The Green Lake watershed has an area of 45 square miles and comprises a portion of the Union River watershed, with an area of 547 square miles. Reeds Brook flows for approximately 2000 feet from the outlet of Green Lake to Graham Lake, dropping approximately 45 feet.

The Department understands that Green Lake Water Power Company (Applicant) proposes to continue operation of the facility to generate power, to supply water for downstream power

¹ All elevations are referenced to a US Geological Survey datum.

generation², to allow water supply for the Green Lake National Fish Hatchery, and for recreational and habitat considerations in Green Lake and in Reeds Brook. Green Lake Power Company no additional environmental measures. With its comments on the Project Pre-Application Document (PAD), the Department requested and the Applicant undertook, a number of studies to assess the impact of Project operations on environmental resources and to demonstrate whether the Project meets water quality standards, including:

1. Impoundment Trophic State Study;
2. Impoundment Aquatic Habitat Study;
3. Downstream Benthic Macroinvertebrate Study;
4. Downstream Temperature and Dissolved Oxygen Study; and
5. Aquatic Habitat Cross-Section Flow Study.

The water quality studies provide data sufficient to assess attainment of Maine's water quality standards in Green Lake and in Reeds Brook. The data collected provides an understanding of the current water quality conditions, document dissolved oxygen concentrations and water temperatures upstream and downstream of the Project dam, document benthic macroinvertebrate community structure and function downstream of the Green Lake dam, and determine the effect of Project operations on the habitat for fish and other aquatic life.

Impoundment Trophic State Study

Green Lake Water Power Company completed trophic state studies in Green Lake in accordance with the Department's Sampling Protocol for Hydropower Studies (2018) and a study plan approved by the Department. Data were collected from June 17 through October 19, 2020 at two stations, representing the north and south ends of Green Lake to evaluate baseline water quality and to assess the trophic state of Green Lake. Samples were collected for phosphorus, Chlorophyll-a, color, dissolved oxygen temperature, pH, total alkalinity, iron, calcium, silica, and sulfate; Secchi disk transparency measurements were also collected. Additional late season samples were collected on August 26 and 27, 2020.

The Applicant submitted a detailed description of the sampling effort and submitted some graphs and charts representing the data. A review of the samples indicate that Green Lake stratified at both sample locations, a condition that persisted throughout the summer at sample station 1 and developed but did not persist for the entire summer at sample station 2. The waters of Green Lake fall at the mesotrophic/oligotrophic transition point (total phosphorus average of 7.1 ug/L at station 1 and 4.4 ug/L at station 2; chlorophyll-a average 2 ug/L at station 1 and station 2) and the Secchi disk transparency measurements averaged 8.68 meters at station 1 and 8.11 meters at station 2. Water quality parameters measured in Green Lake were within acceptable ambient water quality ranges for GPA water bodies in Maine. Dissolved oxygen and temperature measured in the impoundment is sufficient to support a cold water fishery.

² Electric power generation occurs both at the Green Lake facility and downstream at the Ellsworth Hydroelectric Project.

Based on the results of sampling and information contained in the Initial Study Report and in the Draft License Application, the Department concludes that Green Lake Water Power Company has provided sufficient information to demonstrate that the project impoundment meets applicable GPA water quality standards and is free of culturally induced algal blooms that impair its use or enjoyment.

Impoundment Habitat Study

An Impoundment Habitat Study was conducted by the Applicant during the 2020 summer field season in accordance with a FERC approved study plan using bathymetric data and a Raymarine Axion 9RV chartplotter/depth-sounder. Average Secchi disk transparency measured in the impoundment³ was determined to be 27.5 feet; the littoral depth, calculated as twice the Secchi disk transparency measurement, therefore, is 55 feet. Maximum drawdown of the impoundment is 3.2 feet. The Applicant calculated that the littoral zone area dewatered by the maximum drawdown is 14.4% and the volume drawdown is a maximum of 13.3%.

Based on the information provided by the Applicant, operation of the project results in maintenance of at least 75% of the littoral zone of Green Lake. The Department concludes that operation of the Project provides wetted conditions in the littoral zone sufficient to meet aquatic life and habitat standards in Green Lake.

Dissolved Oxygen and Temperature Study

The Applicant conducted a Dissolved Oxygen (DO) and Temperature Study in Reeds Brook downstream of the Project dam in accordance with the Department's Sampling Protocol for Hydropower Studies during the summer of 2020, between July and October. Data were gathered downstream of the dam but upstream of the Green Lake Fish Hatchery filter backwash discharge, in the tailrace downstream of the powerhouse, in the confluence of the tailrace and the Reeds Brook bypass reach, and in Reeds Brook bypass directly upstream of the confluence of the bypass and the tailrace. DO concentrations recorded during the study ranged from 7.59 mg/L to 9.14 mg/L and between 85.2% and 112% saturation.

Analysis of the sampling results indicates that DO concentration met applicable Class B water quality standards in Reeds Brook both downstream of the Project dam and downstream of the powerhouse tailrace. Based on the results of DO and temperature monitoring presented in the Draft License Application, the Department concludes that the Applicant has provided sufficient information to demonstrate that the Project outlet stream meets applicable Class B dissolved oxygen standard under critical water quality conditions.

Benthic Macroinvertebrate Study

Green Lake Water Power Company completed a Benthic Macroinvertebrate Study between August 27 and September 24, 2020 to demonstrate whether current in-stream flow releases affect

³ Secchi disk transparency measurements are collected as part of the Trophic State Study.

attainment of aquatic life and habitat criteria in Reeds Brook downstream of the Project dam. Data were collected in accordance with a FERC approved study plan, however, data were submitted and analyzed for only one of the three sample locations⁴. Benthic macroinvertebrate samplers were deployed for 28 days (+/- 4 days), in accordance with the Department's sampling protocol. Habitat and water quality data were collected at the time of deployment and at retrieval. Habitat parameters included substrate composition, canopy cover, land use and terrain characteristics; water quality measurements included water velocity, temperature, specific conductance, and dissolved oxygen. The DLA indicates and Department analysis using its linear discriminant model determined that results from sample location 1 in Reeds Brook downstream of the Project dam⁵ demonstrates that Class B aquatic life and habitat criteria are met in the bypass reach. The Applicant indicated that the Department had not yet processed the data from the two sample locations downstream of the Project tailrace.

Based on the information included in the DLA, the Department concludes that Class B aquatic life and habitat criteria are met in the bypass reach of Reeds Brook. Department analysis of samples collected in the Project tailrace indicate that Class B aquatic life and habitat criteria are not met, and that the structure and function of the macroinvertebrate community is influenced by the discharge from the fish hatchery outfall and from backwater effects of impounded water levels in Graham Lake. The Department finds that the condition of the macroinvertebrate community is influenced by periodic inundation of the sample location and by the fish hatchery discharge and is, therefore, not caused or contributed by the presence and operation of the Green Lake Hydroelectric Project dam.

Aquatic Habitat Cross-Section Flow Study

The Applicant conducted a Cross-Section Flow Study in December 2020 and January 2021 within the Reeds Brook bypass reach downstream of the Project dam to evaluate the sufficiency of in-stream flow releases from the Project dam. Wetted area and habitat characteristics were recorded for four different flows (2 cfs, 5.5 cfs, 11 cfs, and 22 cfs⁶) at four transects in Reeds Brook to determine the flow at which at least 75% of the bankfull area is wetted at all times. The Applicant reports that even at the lowest flow of 2 cfs at least 81.42% of the bankfull width is wetted at all times.

Review of the information provided by the Applicant in its DLA including the results of the Aquatic Habitat Cross-Section Flow Study and the Benthic Macroinvertebrate Study, the Department concludes that Project operations are not expected to negatively affect the quality of aquatic habitat downstream of the Project dam. Pending review of the remaining BMI data, the

⁴ The Study Plan called for analysis of rock bags deployed at three locations in Reeds Brook, however the Applicant submitted data from only one set of rock bags. DEP requested a study modification to analyze and submit data collected for the additional sample locations or to repeat the BMI study in 2021 however FERC determined that hatchery discharges and backwatering effects could influence the data and that the data submitted was sufficient; FERC did not recommend that Green Lake Power Company repeat the study, as requested by DEP.

⁵ Sample location 1 is downstream of the Project dam but upstream of the Fish Hatchery outfall, to ensure that the study is evaluating impacts to Reeds Brook from Project operations.

⁶ Flows were approximated from gate opening calculations.

Department tentatively concludes that Green Lake Water Power Company has provided sufficient information to demonstrate that the Project meets Class B aquatic life and habitat criteria.

Other Comments

The Draft License Application did not include final reports and did not include the data collected for all the studies conducted. The Final License Application should present all raw data, including, but not limited to, tables of dissolved oxygen data to support the charts included in the Initial Study Report.

Thank you for the opportunity to comment on the Draft License Application. Please contact me by phone at (207) 446-2642 or by email at Kathy.Howatt@maine.gov if you have questions.

Sincerely,

Kathy Davis Howatt
Hydropower Coordinator
Maine Department of Environmental Protection
Bureau of Land Resources