

REVIEW OF APPLICATION FOR RECERTIFICATION BY THE LOW IMPACT HYDROPOWER INSTITUTE OF THE UNION GAS PROJECT

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July 13, 2021

I. INTRODUCTION

This report summarizes the review findings of the application submitted by Messalonskee Stream Hydro, LLC¹ (Applicant or licensee) to the Low Impact Hydropower Institute (LIHI) for recertification of the Union Gas Hydroelectric Project FERC (P-2556). The Project, LIHI #58 is a 1.5-MW facility that operates in a modified run-of-river mode and is located on Messalonskee Stream approximately 1 mile upstream of the confluence with the Kennebec River in Waterville, Maine. On April 29, 2021 LIHI received a complete application package for recertification of the Project. This current review was conducted using the new 2nd Edition LIHI Certification Handbook.

II. RECERTIFICATION PROCESS AND MATERIAL CHANGE REVIEW

Under the current LIHI Handbook (Revision 2.04: April 1, 2020), recertification reviews are a two-phase process starting with a limited review of a completed LIHI application, focused on three questions:

- (1) Is there any missing information from the application?
- (2) Has there been a material change in the operation of the certified facility since the previous certificate term?
- (3) Has there been a change in LIHI criteria since the Certificate was issued?

In accordance with the Recertification Standards, all Projects currently applying for renewal must go through a full review unless their most recent certification was completed using the 2016 version of the Handbook. While there were no material changes at the Project, the LIHI Handbook was materially changed, thus, this Stage II report was required for the Project.

A review of the initial application, dated February 2021, resulted in a Stage I Report dated March 26, 2021 that indicated additional data was needed, which was sent as a supplement to the application on June 11, 2021.

This Stage II assessment included review of the application package, public records in FERC's eLibrary since the last LIHI certification in 2015, and annual compliance statements received by

¹ A subsidiary of Essex Hydro Associates, LLC

LIHI during the past term of Certification.

III. PROJECT'S GEOGRAPHIC LOCATION

The Project is located at river mile 1.0 on Messalonskee Stream in Kennebec County, Maine (Figure 1). The Union Gas Project is one of three hydroelectric projects, along with the upstream Rice Rips and Oakland hydroelectric projects, on the lower Messalonskee Stream that were collectively licensed by FERC on July 28, 1999 as the Messalonskee Project. The 1999 FERC license also includes Messalonskee Lake (a.k.a. Snow Pond) and dam that does not have generating equipment, but releases flows for generation purposes at the downstream projects. Immediately upstream of the Union Gas Project is the Automatic Project (LIHI #72) that was issued a separate license by FERC concurrently with the Messalonskee Project, on July 28, 1999 (Figure 2).

IV. PROJECT AND IMMEDIATE SITE CHARACTERISTICS

Construction of the Union Gas Project was completed in the early 20th century by the Union Gas & Electric Company and the Project was operated as an unlicensed facility from that time until February 24, 1969, when FERC issued it a 30-year license. Project works consist of a 343-foot-long dam with 1.5-foot-high flashboards; a powerhouse containing one 1.5-MW vertical Francis turbine and generator; and a 1.5-mile-long impoundment with a gross storage capacity of 600 acre-feet. An upstream eel ramp was constructed along the left descending side of the dam in 2012 (see Figures 3 - 6). The original dam failed in 2001 and was rebuilt in 2007.



Figure 1 – Union Gas Project Location



Figure 2 –Messalonskee Stream Projects



Figure 3 – Union Gas Project area



Figure 4 –Project facilities, tailrace, and bypassed reach



Figure 5 – Downstream reach with upstream eel ramp on the left



Figure 6 –Upstream eel ramp

V. ZONES OF EFFECT AND STANDARDS SELECTED

Three Zones of Effect (ZOE) were designated by the Applicant and were determined to be appropriate. Zone 1 includes the Union Gas impoundment; Zone 2 includes the bypassed reach from the dam to the Project tailrace; and Zone 3 includes the tailrace and downstream reach. Table 1 shows the Standards selected for each criterion for the three ZOE. Where applicable, reviewer recommendations for alternate standards are show in **red**.

Table 1. Standards Matrix for the Union Gas Project.

Zone:		1: Impoundment Reach	2: Bypass Reach	3. Downstream Reach
River Mile Extent:		RM 1.5 – 1.0	RM 1.0 – 0.9	RM 0.9 – 0.32
Criterion		Standard Selected		
<i>A</i>	<i>Ecological Flows</i>	1	2	2
<i>B</i>	<i>Water Quality</i>	2	2	2
<i>C</i>	<i>Upstream Fish Passage</i>	2, 1	2	2
<i>D</i>	<i>Downstream Fish Passage</i>	2, 4 , PLUS	2, 4 , PLUS	2, 1 , PLUS
<i>E</i>	<i>Shoreline and Watershed Protection</i>	1	1	1
<i>F</i>	<i>Threatened and Endangered Species</i>	2	2	2
<i>G</i>	<i>Cultural and Historic Resources</i>	1	1	1
<i>H</i>	<i>Recreational Resources</i>	2	2	2

VI. REGULATORY AND COMPLIANCE STATUS

The Project was issued a license order from the Federal Energy Regulatory Commission (FERC) in 1999. The Maine Department of Environmental Protection (Maine DEP) issued a Water Quality Certificate (WQC) for the operation of the Project on August 28, 1995. The FERC license initially required a minimum flow of 100 cubic feet per second from the Project. However, following a request for rehearing submitted by the licensee arguing that the Maine DEP required minimum flow of 15 cfs was adequate to protect aquatic resources, FERC modified the license in October 2000 to require a minimum flow of 15 cfs. FERC also issued an order on November 14, 2017 amending the previously approved Recreation Plan to require the construction of the fishing platform at Messalonskee Lake dam.

The current LIHI certification was issued effective May 9, 2015 expiring on May 9, 2020. It was subsequently extended three times, most recently to July 31, 2021. The certification includes the following condition:

- Condition 1. On the Owner's Annual Compliance Statements, the Owner will update LIHI on the status of downstream eel passage at the site. The Owner will notify LIHI within 45 days of when DMR determines there is a sufficient number of eel to present in the river to conduct the studies needed to determine the best location to install downstream passage. A summary of those study results, along with a DMR approved plan and schedule for downstream eel passage installation, shall be included in that year's Annual Compliance Statement.

A review of annual compliance statements indicate that the Applicant has submitted required documentation under Condition 1. To date, no studies have been required.

VII. PUBLIC COMMENT RECEIVED OR SOLICITED BY LIHI

The application was posted for public comment on May 3, 2021 and the notice was forwarded to agencies and stakeholders listed in the application. The deadline for submission of comments was July 2, 2021. No formal comments were submitted. Based on the completeness of the application and documents available on the FERC elibrary, I did not need to contact resource agencies.

VIII. DETAILED CRITERIA REVIEW

A. ECOLOGICAL FLOW REGIMES

Goal: The flow regimes in riverine reaches that are affected by the facility support habitat and other conditions suitable for healthy fish and wildlife resources.

Assessment of Criterion Passage: The Applicant correctly selected Standard A-1, Not Applicable/De Minimis Effect for the impoundment zone and A-2, Agency Recommendation for the Bypass and Downstream Zones.

The Project operates in a modified run-of-river mode with outflow equaling inflow when inflow into Messalonskee Lake upstream is greater than 570 cubic feet per second (cfs). When inflow is less than 570 cfs the Project is cycled. The project has limited storage. The authorized minimum and maximum impoundment water surface elevations are 67.8 feet (ft) and 69.1 ft, thereby allowing for a useable storage range of 1.3 ft.

A minimum bypass flow of 15 cfs is released downstream of the dam into the bypass reach at all times. This minimum flow is required pursuant to the 1995 WQC Condition 1 and subsequently incorporated into the FERC License by an October 2000 order on rehearing (affirmed in an April 2001 order on rehearing).² The minimum flow was based on a hydrologic analysis of the Messalonskee Stream drainage and on a bypass reach instream flow study submitted to Maine DEP as part of the WQC application. Maine DEP concluded in its WQC that the flow level along with restricted impoundment fluctuations and down-ramping sequence were adequate to protect fish and aquatic habitat and meet Class C dissolved oxygen standards.

² https://elibrary.ferc.gov/eLibrary/docinfo?document_id=2095775

License article 403 and WQC Condition 4 require that when closing wicket gates at the powerhouse, closures from 70 percent open to 40 percent open shall occur over a fixed 30-minute period, resulting in a gradual reduction of 1 percent gate closing per minute. No restrictions are required when the wicket gates are closing from 100 percent to 70 percent or closing from 40 percent open to fully closed. These ramping restrictions offer fish some protection from being stranded during Project shutdowns. As discussed in more detail in section D below, planned shutdowns occur from September 1 through October 20 from 6pm to 2am to promote downstream eel passage.

Additionally, license article 404 required a streamflow and water level monitoring plan that was developed in consultation with resource agencies and submitted in November 2001 and subsequently approved by FERC.

Based on my review of the application, supporting documentation, and publicly available information, the Project is operated in a manner such that it does not adversely affect fish and wildlife resources under its limited flow regime. As such, the Project continues to satisfy the Ecological Flow Regimes criterion.

B. WATER QUALITY

Goal: Water Quality is protected in waterbodies directly affected by the facility, including downstream reaches, bypassed reaches, and impoundments above dams and diversions.

Assessment of Criterion Passage: The Applicant appropriately selected Standard B-2, Agency Recommendation for all Zones.

The entire Messalonskee Stream is listed as a Category 2: Rivers and Streams Attaining Some Designated Uses and Insufficient Information for Other Uses in Maine DEP’s 2016 Integrated Water Quality Monitoring and Assessment Report.³ The WQC notes that waters from the outlet of Messalonskee Lake to its confluence with the Kennebec River are designated Class C by Maine DEP. Class C waters are of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; 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.

In support of its WQC application, the Applicant conducted a study entitled “Hydrologic Analysis of the Messalonskee Stream Drainage.” The purpose of this study was to provide an understanding of the watershed and examine the availability of water in Messalonskee Stream. The water quality in Messalonskee Stream was characterized as poor, since the levels of

³ https://www.maine.gov/dep/water/monitoring/305b/2016/28-Feb-2018_2016-ME-IntegratedREPORT.pdf

dissolved oxygen (DO) observed had in many instances violated state water quality standards. The cause of this impairment was determined to be phosphorus loading from the Union Gas wastewater treatment facility, existing dams and hydroelectric facilities, and algal blooms.

As noted previously in Criterion A – Ecological Flow Regimes, a minimum bypass flow of 15 cfs is released downstream of the dam into the bypass reach at all times. This minimum flow is also released at each of the upstream dams between the Project and Messalonskee Lake. Maine DEP commented in the WQC that “there is a reasonable assurance that Class C dissolved oxygen standards in Messalonskee Stream will be met if the applicant passes a minimum flow of 15 cfs through all project developments, including the Union Gas bypass, provided the applicant monitor water quality in Messalonskee Stream.”

WQC Condition 3 and Article 407 of the Project’s FERC license required a water quality monitoring plan that included monitoring, for a 5-year period, of DO, water temperature, and chlorophyll-a concentrations in Union Gas dam at the intake, and downstream from Union Gas dam. FERC approved the plan on March 30, 2001. The collected data sufficiently demonstrated that water quality standards for dissolved oxygen are met throughout the Project reach.

The limited (1.3 ft) allowable impoundment fluctuation, run-of-river operation, and minimum flow requirement minimize Project impacts on water quality. A review of the FERC eLibrary and the Applicant’s annual compliance letters to LIHI, indicated that no issues related to water quality have occurred at the Project during the previous LIHI certification period.

Based on my review of the application, supporting documentation, and publicly available information, the Project does not appear to impact water quality in the river and therefore continues to satisfy the Water Quality criterion.

C. UPSTREAM FISH PASSAGE

Goal: The facility allows for the safe, timely, and effective upstream passage of migratory fish. This criterion is intended to ensure that migratory species can successfully complete their life cycles and maintain healthy populations in areas affected by the facility.

Assessment of Criterion Passage: The Applicant selected Standard C-2, Agency Recommendation for all zones. However, for reasons discussed below, this review finds that Standard C-1, Not Applicable/De Minimis Effect is more appropriate for the Impoundment zone.

The Project waters support a mix of coldwater and warmwater fish species. The application states that there is no available evidence to support the historical presence of anadromous fish

species in Messalonskee Stream.⁴ The only migratory species is the catadromous American eel. Resident species include: silvery minnow, fallfish, golden shiner, white sucker, rainbow smelt, brown bullhead, northern pike, chain pickerel, threespine stickleback, largemouth bass, smallmouth bass, pumpkinseed sunfish, white perch, and yellow perch. Maine Department of Inland Fisheries and Wildlife (Maine DIFW) annually stocks brown and brook trout and splake (lake trout and brook trout hybrid).

There are no barriers to upstream fish passage in the impoundment zone. As such, this review finds that Standard C-1, Not Applicable/De Minimis Effect is appropriate for this zone of effect.

Article 406 of the FERC license includes reservation of authority to prescribe upstream and downstream fishways. To date, that authority has not been exercised.

During the initial 2010 LIHI certification review process, Maine Department of Marine Resources (Maine DMR) commended that it was concerned with the lack of upstream and downstream eel passage at the Union Gas, Rice Rips, and Oakland Projects. In response, the Applicant worked with Maine DMR and FWS and completed the installation of an upstream eel ramp in 2012. This ramp, and ramps at Rice Rips and Oakland were subsequently approved by Maine DMR. The eel ramp has been operating since May 25, 2012. In 2012, eels migrated upstream via the ramp from May 25 to August 31 with the biggest volume of eels passing from June 15 to July 18. The application did not include more recent passage counts than the 2012 data and so a request was made to the Applicant to provide any additional passage count data. In response, the Applicant stated that after Maine DNR's acceptance of the upstream eel passage, the agency has not required any data collection or auditing of the efficiency of the ramp since the original efficiency testing in 2015 that showed 92-99 percent passage efficiency. The Applicant also noted that the ramp is inspected at the start of every season and repairs are made as necessary.

Based on my review of the application, supporting documentation, and publicly available information, the Project continues to satisfy the Upstream Fish Passage criterion.

D. DOWNSTREAM FISH PASSAGE AND PROTECTION

Goal: The facility allows for the safe, timely, and effective downstream passage of migratory fish. For riverine (resident) fish, the facility minimizes loss of fish from reservoirs and upstream river reaches affected by Facility operations. Migratory species are able to successfully complete their life cycles and maintain healthy populations in the areas affected by the Facility.

⁴ The 1995 WQC suggested that American shad “can be expected to utilize some of the habitat” in the tailwater between the Project and its confluence with the Kennebec River. Shad had been stocked by Maine DMR in the Kennebec River but was discontinued in 2008/2009
http://www.asmfc.org/files/Shad%20SFMPs/ME_AmShadSFMP_2020.pdf

Assessment of Criterion Passage: The Applicant selected Standard D-2, Agency Recommendation for all zones. However, for reasons discussed below, this review finds that Standard D-4, Acceptable Mitigation is more appropriate for the Impoundment and Bypass Reach Zones, and Standard D-1, Not Applicable/De Minimis Effect is more appropriate for the Downstream Reach Zone because once in this zone there are no Project-related barriers to hinder downstream movement.

As noted previously in Criterion C - Upstream Fish Passage, the only migratory species that uses the Project area is the catadromous American eel. The Union Gas Dam acts as a barrier to fish in the impoundment zone that attempt to move downstream. However, the 15-cfs minimum bypass flow facilitates downstream movement past the Project. Article 406 of the FERC license includes reservation of authority to prescribe upstream and downstream fishways. To date, that authority has not been exercised.

From 2012 through 2019, eels were trapped at the Messalonskee Lake Dam and trucked down past all four Messalonskee Stream Projects to the Union Gas tailrace. At the time, resource agencies agreed to this mitigation approach in lieu of providing downstream passage at each Project. However, this practice had limited success (often one or no eels per year, and never more than four) and following consultation with Maine DMR, the Applicant voluntarily agreed that the Union Gas Project, along with the Automatic, Rice Rips, and Oakland Projects, would instead, annually shut down between 6pm and 2am from September 1 through October 30.

In preparation of the new passage practice, the following actions were taken in 2020: 1) a steel access platform was bolted onto the top of the spillway at the Project for the staff to check the eel trap; 2) a 1" coated screen was installed along the total length of the flashboards reaching 1 ft above the boards to prevent eel passage; 3) an eel trap (22" x 22" x 22") holding pen with screen mesh and ½" screen was reinforced with 1" coated screen and secured behind the flashboards with a 6" pipe through the flashboard into the headpond; 4) a cod finger cone was used in the transition from the 6" pipe into the trap holding pen; and 5) an eel release chute was constructed on the downstream side of the dam, using 6" PVC pipe. This new practice resulted in 11 eels being trapped, measured, and released downstream of the Project.

The Applicant provided supplemental information to LIHI on June 11, 2021 that included Maine DMR's approval of the 2020 downstream passage results and support for additional Project nightly shutdowns in 2021 in order to continue evaluation of whether this method can be used for permanent downstream passage.

The Union Gas powerhouse includes one vertical Francis turbine rated at 1.5 MW and a minimum and maximum hydraulic capacity of 324 cfs and 660 cfs, respectively. The intake

trashrack has 3-inch clear spacing between the bars. Fish survival estimates compiled by the Electric Power Research Institute show that immediate and 48-hour turbine survival estimates at sites with similar turbine characteristics as the Union Gas Project range from 87 percent to 94 percent for immediate survival and 76 percent to 81 percent for 48-hour survival. In its supplemental information, the Applicant states that no request to mitigate any entrainment has been made.

The Applicant also selected **Standard D-Plus** for all Zones, although it only applies to the Impoundment and Bypass Reach Zones. As noted above, the Applicant now voluntarily provides nighttime shutdowns at all four projects on Messalonskee Stream for eel downstream passage. This action also constitutes a basin-wide redevelopment strategy both within Messalonskee Stream and within the larger Kennebec River watershed where restoration of the diadromous fishery began with the removal of Edwards Dam at the head-of-tide in 1999 and allowed fish access to about 17 miles of river to Waterville, upstream of the Messalonskee Stream confluence. The Maine DMR issued the Kennebec River Management Plan Diadromous Resources Amendment⁵ in 2020, which updated a prior 1993 plan. The amendment includes American eel for the first time, with a stated goal “to provide safe, timely, and effective upstream and downstream passage for American eel throughout its historically accessible habitat.”

Based on my review of the application, supporting documentation, and publicly available information, the Project continues to satisfy the Downstream Fish Passage and Protection criterion and also satisfies the PLUS Standard.

E. SHORELINE AND WATERSHED PROTECTION

Goal: The Facility has demonstrated that enough action has been taken to protect, mitigate and enhance the condition of soils, vegetation and ecosystem functions on shoreline and watershed lands associated with the facility.

Assessment of Criterion Passage: The Applicant initially selected Standard E-2, Agency Recommendation for all Zones, but in its supplemental information indicated that it agreed with the Stage 1 review of the initial application that recommended Standard E-1, Not Applicable/De Minimis Effect is more appropriate for all Zones.

The FERC Project boundary covers approximately 19 acres of which one acre is fee owned and the rest consists of flowage rights. The watershed area formed by the Union Gas dam impoundment extends approximately 1.5 miles upstream to the Automatic dam. The Union Gas Project has a gross reservoir volume of 600 acre-feet. The 200-foot boundary zone extending around the impoundment is highly developed, bordered by a steep gradient, and is comprised of

⁵ https://www.maine.gov/dmr/laws-regulations/documents/Final%20Amendment_12_22.pdf

land occupied by commercial buildings and residential homes. The flows below the Project have minimal effect on shoreline erosion due to the predominantly granite and gravel substrates in the tailrace area. There are no lands of ecological significance.

The Project is not required to have, nor does it have a shoreline management or similar plan. The run-of-river operations and limited allowable (1.3 ft) impoundment fluctuations minimize the potential for the Project to negatively affect the shoreline.

A review of the FERC eLibrary indicated that no issues related to shoreline and watershed protection have occurred during the FERC licensing period.

Based on my review of the application, supporting documentation, and publicly available information, the Project's operations sufficiently protect shoreline and watershed lands. Therefore, the Project continues to satisfy the Shoreline and Watershed Protection criterion.

F. THREATENED AND ENDANGERED SPECIES PROTECTION

Goal: The facility does not negatively impact federal or state listed species.

Assessment of Criterion Passage: The Applicant appropriately selected Standard F-2, Finding of No Negative Effect, for all Zones.

A FWS IPaC report generated by the Applicant, included the federally-endangered Atlantic salmon and the federally-threatened Northern long-eared bat. No critical habitat is present for either species in the Project area. The Applicant reached out to Maine DIFW regarding state-listed species and was informed that the black tern is the only state-listed species associated with the Project. They nest in the freshwater emergent marsh associated with Messalonskee Lake but not near Union Gas.

The FWS consistency letter included in the application states that Union Gas Project operations are not likely to result in unauthorized take of Northern long-eared bat. Additionally, during the previous recertification, FWS informed the Applicant that passage of salmon and sturgeon in the Kennebec River into the Messalonskee watershed is not desirable and the Union Gas Project does not affect these species. With the exception of the annual nighttime shutdowns for downstream eel passage discussed above, Project operations have not changed since the previous recertification.

A review of the Project's record on the FERC eLibrary indicated that no issues related to threatened and endangered species have occurred.

Based on my review of the application, supporting documentation, and publicly available

information, the Project continues to satisfy the Threatened and Endangered Species criterion.

G. CULTURAL AND HISTORIC RESOURCE PROTECTION

Goal: The facility does not unnecessarily impact cultural or historic resources that are associated with the Facility's lands and waters, including resources important to local indigenous populations, such as Native Americans.

Assessment of Criterion Passage: The Applicant initially selected Standard G-2, Approved Plan, for all Zones, but in its supplemental information indicated that it agreed with the Stage 1 review of the initial application that recommended Standard G-1, Not Applicable/De Minimis Effect is more appropriate for all Zones.

In its supplemental information sent to LIHI on June 11, 2021, the Applicant states that no cultural or historic resources exist at the Project. The Applicant does perform cultural resource monitoring as required by license article 414 and the Cultural Resources Monitoring Plan which only requires monitoring at sites around Messalonskee Lake and is not applicable to the Union Gas Project. A review of the National Register of Historic Places database found seven registered sites within the city of Waterville, but none are inside the Project boundary.

Based on a review of the application, supporting documentation, and publicly available information, the Project continues to satisfy the Cultural and Historic Resource Protection criterion.

H. RECREATIONAL RESOURCES

Goal: The facility accommodates recreation activities on lands and waters controlled by the facility and provides recreational access to its associated lands and waters without fee or charge.

Assessment of Criterion Passage: The Applicant appropriately selected Standard H-2, Agency Recommendations for all zones.

No fee is charged for public access to recreational facilities at the Project. License Article 411 and 412 required a plan to develop and monitor recreation sites at the Project. Recreation sites to be included at the Project included a platform for tailrace fishing, a parking facility near the powerhouse, and an access trail connecting the parking area to the fishing platform. Additionally, there is informal access on the east side of the river and a boat ramp on the river just upstream of the Route 137 bridge that is jointly maintained by the Applicant and the City of Waterville (Figure 7).

The Recreation Plan proposed to postpone constructing the required accessible fishing area site

until such a fishery resource developed and demand for the facility existed. Article 412 requires recreational monitoring every 6 years, to reevaluate over time the need to develop the required accessible fishing area. In its review of the 2016 recreation monitoring report, FERC determined that the need for an accessible fishing area at the Project had not been conclusively analyzed and that the Applicant should consult with resource agencies regarding the need. During consultation, Maine DIFW advised that angling access was not needed at the Project and suggested an alternative location at the fish screen near the Messalonskee Lake dam outlet. The Applicant filed an amendment with FERC that was subsequently approved on November 14, 2017 for construction of the fishing platform at Messalonskee Lake dam.

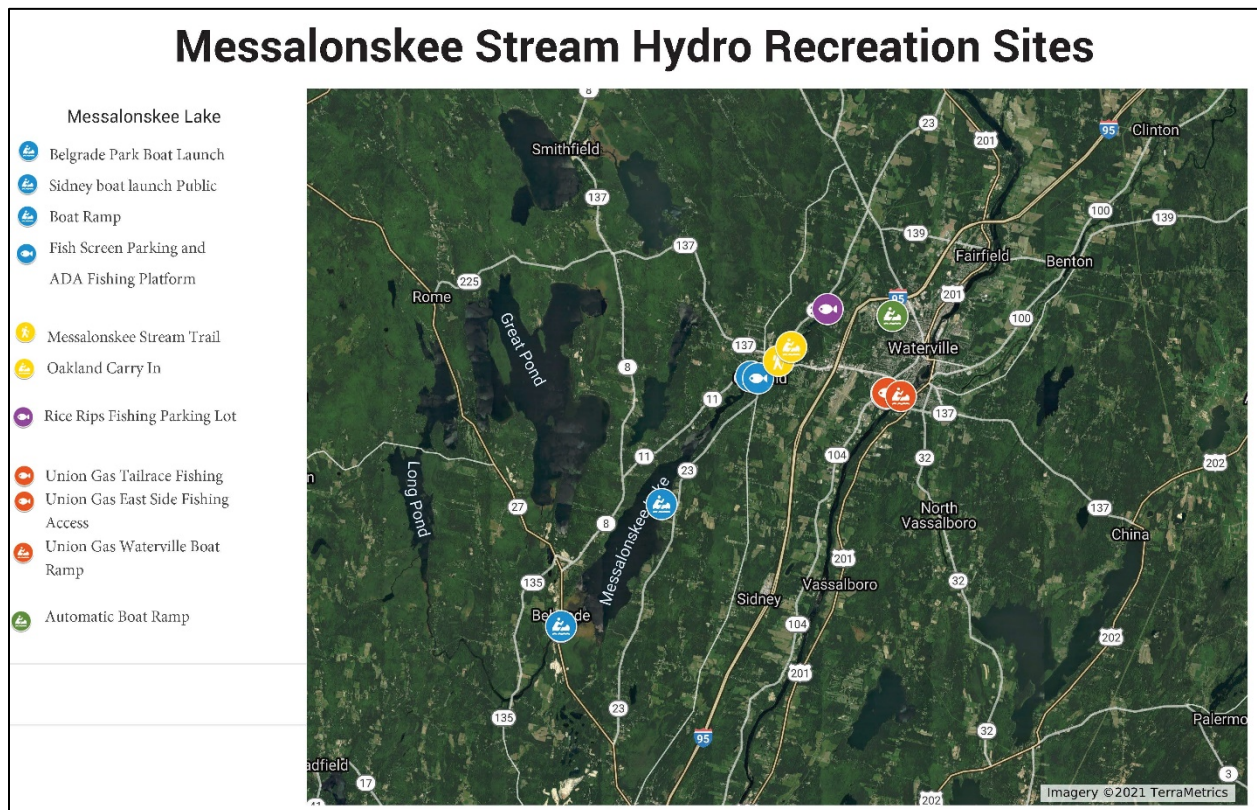


Figure 7 – Recreational resources

A review of the FERC eLibrary indicated that no issues related to recreation have occurred during the FERC licensing period.

Based on my review of the application, supporting documentation, and publicly available information, the Project continues to satisfy the Recreational Resources criterion.

IX. GENERAL CONCLUSIONS AND REVIEWER RECOMMENDATION

Based on my review, I believe that the Project continues to meet the requirements of Low Impact

Certification and recommend it be recertified for an eight-year period including a three-year extension for satisfying the PLUS Standard for downstream passage. Given the history of compliance with the existing certification Condition 1, and the implementation of project shutdowns to facilitate downstream eel passage, that condition is no longer warranted.