

Cascade Hydroelectric Project — LIHI Mid-Term Review

LIHI Certificate #188 | FERC No. P-2327

Androscoggin River, Berlin and Gorham, Coos County, New Hampshire

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Project Information

1. Introduction

The current LIHI Certificate for the 8.115-MW Cascade Hydroelectric Project (Cascade Project or Project), LIHI #188, FERC Project Number P-2327, was issued to Great Lakes Hydro America, LLC (GLHA or Applicant) effective March 1, 2022, and expires on February 29, 2032. The Cascade Project was first certified by LIHI in 2022. The current LIHI certificate includes Condition 1 which required the Facility Owner to provide updates to LIHI on the ongoing status of Project relicensing (satisfied in 2026) (Kleinschmidt Associates 2026).

The Cascade Project was recently relicensed by FERC on September 10, 2025, with a new 40-year license expiring August 31, 2065 (P-2327) (FERC 2025). In accordance with Section 5.3.4 of the 2nd Edition LIHI Handbook, issuance of a new license constitutes a “material change” and triggers a mid-term LIHI Certification review. A mid-term review application package was submitted to LIHI by GLHA on February 17, 2026 (Kleinschmidt Associates 2026). A new Certificate term may be granted if the Project continues to satisfy the LIHI criteria.

Note on shared context: The Cascade Project is one of six LIHI Certified® hydroelectric projects within an 11-mile reach of the Androscoggin River between Berlin and Shelburne, New Hampshire (Table 1). Two non-LIHI projects, Riverside (FERC No. P-2423) and J. Brodie Smith (FERC No. P-2287), are located between the Sawmill and Cross Power projects.

Table 1. Nearby LIHI-Certified Hydroelectric Projects in the Upper Androscoggin River between Berlin and Shelburne, New Hampshire.

Facility Name	LIHI Certification Number	FERC Project Number	Project Owner	Location (RM)
Sawmill	173	P-2422	GLHA / Brookfield	~140
Cross Power	174	P-2326	GLHA / Brookfield	~138
Cascade	188	P-2327	GLHA / Brookfield	135.6

Cascade Hydroelectric Project — LIHI Mid-Term Review

Facility Name	LIHI Certification Number	FERC Project Number	Project Owner	Location (RM)
Upper Gorham	175	P-2311	GLHA / Brookfield	~133
Gorham	153	P-2288	Patriot Hydro / LS Power	130.4
Shelburne	176	P-2300	GLHA / Brookfield	~129

Of the six certified projects in this stretch, the Cascade Project and four others (Sawmill, Cross Power, Upper Gorham, and Shelburne) are owned by GLHA, a subsidiary of Brookfield Renewable Energy Group. The Gorham Project (LIHI #153) is the only facility in this reach owned by a different operator, Central Rivers Power NH, LLC (CRP), a subsidiary of LS Power/Patriot Hydro, LLC. The Cascade Project is located downstream from the Cross Power Project (LIHI #174) and upstream from the Upper Gorham Project (LIHI #175). All six projects received new 40-year FERC licenses in 2025. The GLHA projects submitted a combined LIHI mid-term review application (Kleinschmidt Associates 2026). The Gorham Project submitted a separate LIHI mid-term review application.

The long-term, primary flow reference gage for this reach is USGS 01054000 (Androscoggin near Gorham), which has records back to the early 1900s (Table 2).

Table 2. Nearby USGS Stream Gages in the Upper Androscoggin River between Berlin and Shelburne, New Hampshire.

USGS Gage	Gage Name	Location (River Mile)	Nearest Project
01053600	Androscoggin R. at Cambridge NH	~141	Riverside (upstream) J. Brodie Smith (downstream)
01054000	Androscoggin R. near Gorham, NH	~131	Cascade (upstream) Upper Gorham (downstream)

Background information on watershed conditions, shoreline regulations, cultural resources, studies conducted for FERC relicensing on water quality, fish passage, threatened and endangered species, and recreation are inherently similar across all six projects. With this shared context, standard language will be used across each mid-term review report where applicable.

Cascade Hydroelectric Project — LIHI Mid-Term Review

2. Facilities and Operations

The Cascade Project is a 8.115-MW run-of-river hydroelectric facility located on the Androscoggin River at river mile 135.6, straddling the city of Berlin and the town of Gorham, New Hampshire (Figures 1 and 2). The Project was originally constructed and completed in 1903 and converted to hydroelectric generation by 1918. The annual average generation is 49,897 MWh.

The dam is a 583-foot-long, 53-foot-high concrete gravity structure consisting of concrete non-overflow section, a 313-foot-long ogee spillway with flashboards, and parallel concrete retaining walls. A forebay downstream of the gate structure is about 300 feet long, 240 feet wide, and 24 feet deep. The forebay wall extends about 326 feet downstream and has a maximum height of 41 feet. It includes a deep gate, sluiceway, and a concrete platform supporting an electrical tower. The powerhouse is a steel-framed brick structure, and three penstocks connect the headgates to three Francis turbines. Water passing over the spillway feeds a 400-foot-long bedrock bypass reach.

The Project operates in run-of-river mode, impounding a 28-acre reservoir with a storage volume of 200 acre-feet. The impoundment fluctuates over a six-inch range from normal pond elevation of 901.4 feet (NGVD 29). The Project provides a minimum flow of 6 cfs, or inflow whichever is less, into a 400-foot-long bedrock channel bypass reach year-round.

Under the new license, the Project continues to operate in substantially the same manner as before, with an additional notification and reporting requirement to FERC for planned and unplanned deviations (Article 402) (Table 3) (GLHA 2025).

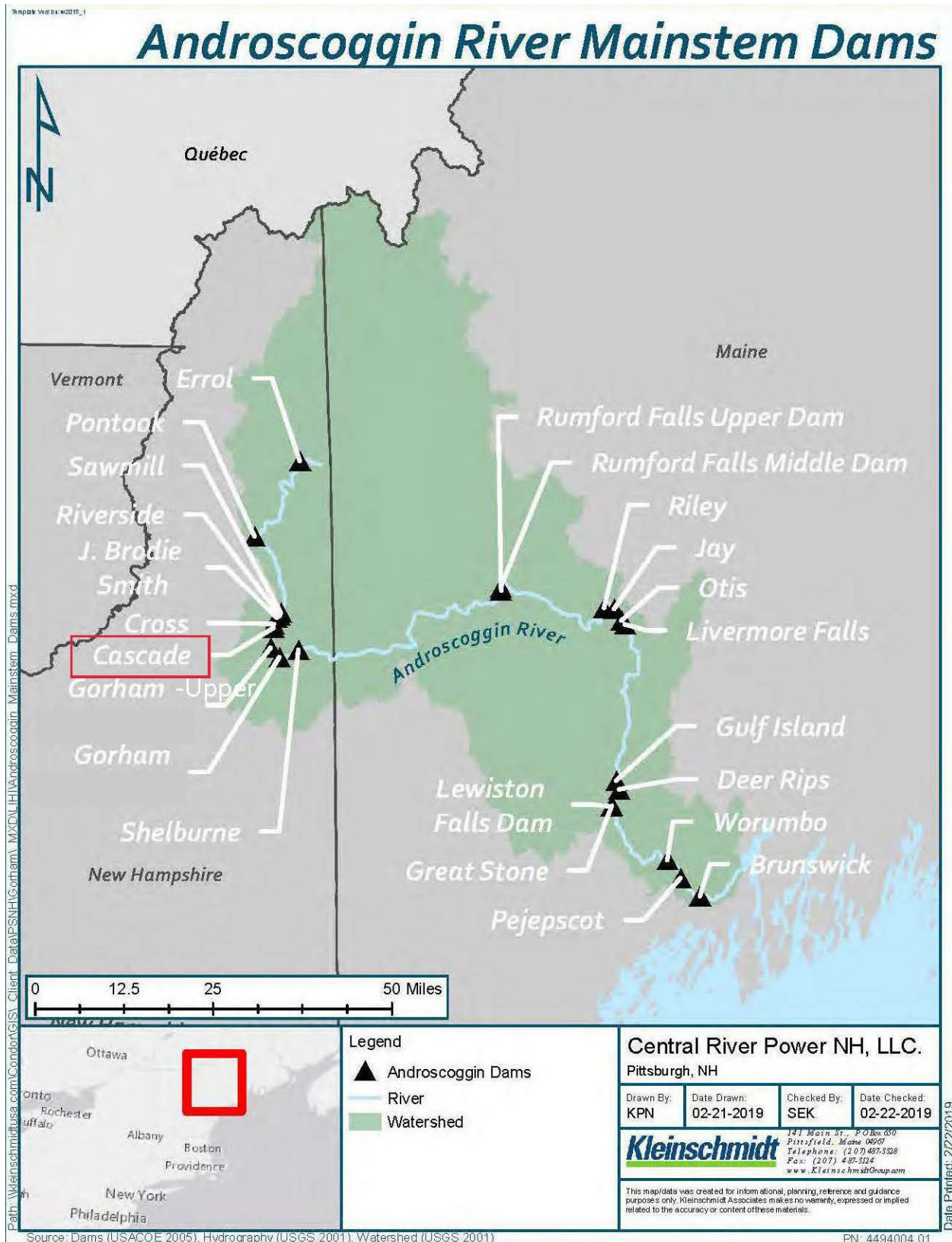


Figure 1 – Androscoggin River Watershed. Cascade denoted by a red box (edited from original).

Cascade Hydroelectric Project — LIHI Mid-Term Review



Figure 2 – Cascade Project location at River Mile 135.6 on the Androscoggin River in Berlin and Gorham, Coos County, NH.

Table 3. Articles from the 2025 Cascade Project (FERC No. 2327) license order:

Article	Title	Summary
401	Commission Approval, Reporting, and Filing of Amendments	Plans and reports required under the water quality certification must be filed with FERC for approval; amendments require FERC application.
402	Project Operation	Licensee must operate in run-of-river mode per NH DES certification condition E-7; additional notification and reporting requirements apply for operational deviations.
403	Reservation of Authority (Fishways)	FERC reserves authority to require fishways as may be prescribed by the Secretary of the Interior under FPA section 18.
404	Protection of Northern Long-Eared Bat and Tricolored Bat	No tree removal of any size on project land from April 15–October 31, except for public/project safety hazards; emergency removal requires notification to NH FGD and FWS.

Cascade Hydroelectric Project — LIHI Mid-Term Review

Article	Title	Summary
405	Programmatic Agreement and Historic Properties Management Plan	Licensee must implement the November 27, 2024 PA with the NH SHPO and file a new HPMP for FERC approval within one year of license issuance.
406	Recreation Facilities	Licensee must notify FERC if the non-project Cascade impoundment access area, which provides recreational access to the Project, ceases operation.
407	Use and Occupancy	Licensee may grant permission for minor uses and occupancies of project lands without prior FERC approval, provided they are consistent with protecting scenic, recreational, and environmental values.

3. Scope of the Mid-Term Review

This review evaluates the Cascade Project’s continued compliance with the current LIHI criteria and standards in consideration of the new FERC license, the 2024 New Hampshire Department of Environmental Services (NHDES) Water Quality Certificate (WQC), and other regulatory and operational requirements (FERC 2025, Appendix A). This review includes a comparison of the prior and new FERC licenses, the FERC Environmental Assessment, the NHDES WQC, annual LIHI compliance submittals, and the supporting studies prepared for FERC relicensing.

Public notice of the mid-term review was made on April 28, 2026, on the LIHI webpage, to LIHI email subscribers in New Hampshire and to agencies and stakeholders provided by GLHA. The 60-day public comment period closed on June 27, 2026 and no comments were received. Due to the completeness of information in the application and recent relicensing documents, the reviewer did not need to reach out to any resource agencies or interested parties.

4. Zones of Effect

In the mid-term review application, GLHA selected the exact same three Zones of Effect (ZoEs) as in their current LIHI Certificate. Zone 1 is the impoundment extending upstream from the dam approximately 0.6 miles. Zone 2 is the bypassed reach approximately 350 feet long, and Zone 3 is tailrace zone and downstream regulated reach extending approximately 2 miles to the Upper Gorham impoundment.

Cascade Hydroelectric Project — LIHI Mid-Term Review

GLHA stated that the proposed standards changed from the 2022 LIHI review, denoted by an asterisk. While the new license does not create significant changes in operations or other requirements that would substantially affect Project resources, three standards were updated as noted in the table. However, the reviewer disagrees with the selections for some criteria and changes to the selected standards are noted in **red** in Table 4 and discussed in Section 5.

Table 4. Selected LIHI Standards

Zone of Effect:		Zone 1 Impoundment	Zone 2 Bypassed Reach	Zone 3 Tailrace and downstream Regulated River Reach
River mile at upper and lower extent of Zone:		136.2 – 135.6	135.6-135.5	135.5-133.5
Criterion		Standard Selected		
A	Flow Regimes	1 , 2	2	2
B	Water Quality	3 , 2	3 , 2	3 , 2
C	Upstream Fish Passage	1	1	1
D	Downstream Fish Passage	1	1	1
E	Shorelines and Watershed	3*	3*	3*
F	Threatened and Endangered Species	2	2	2
G	Cultural and Historic Resources	2*	2*	2*
H	Recreational, Public, and Traditional Cultural Access	2*	1	1

5. Detailed Criteria Review

A. Flow Regimes

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

Assessment of Criterion: Standard A-2, Resource Agency and Tribal Government Recommendations remains appropriate for the bypass reach and tailrace zones and is the reviewer’s recommended standard for the impoundment zone as discussed below.

Cascade Hydroelectric Project — LIHI Mid-Term Review

The minimum flow regime was developed based on results of an Instream Flow Study conducted during the prior FERC licensing, a Bypass Reach Aquatic Habitat Study conducted in November 2020 and in consultation with US Geological Survey (USGS), US Fish and Wildlife Service (USFWS), the NH Fish and Game Department (NHFG) and the NHDES (FERC 1993, Kleinschmidt Associates 2026). Minimum flow requirements were determined to provide suitable protection for resident aquatic species, including trout, and their habitat. A Bypass Reach Aquatic Habitat Study conducted by GLHA observed a fully wetted river channel with diverse aquatic habitats at existing minimum flows (GLHA 2021).

Under the new license, the Project continues to operate in a run-of-river mode, maintaining the impoundment at a target elevation of 901.4 feet within a 6-inch fluctuation range and a minimum flow of 6 cfs (GLHA 2025). An Operations Compliance Monitoring Plan (OCMP) is required under Article 401 and Condition E-9 of the Water Quality Certificate (NHDES 2024, FERC 2025, Appendix A) which changes the selected standard A-1 to A-2 in the impoundment zone. The Project is now also subject to notification and reporting in the event of flow or impoundment level deviations (Condition E-8 of the WQC). GLHA is additionally required to protect aquatic resources downstream under Condition E-7 for emergency or maintenance “Impoundment Refill Procedures” to discharge 90 percent of inflow using 10% of inflow for refill (FERC 2025, Appendix A).

There were no reported flow or impoundment-level deviations identified in the FERC eLibrary. The flow regime has not changed under the new license, and the Project continues to provide a stable hydraulic environment consistent with prior operations. Therefore, the Project continues to satisfy the flow regimes criterion with the condition recommended in Section 7 to implement the OCMP.

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: Standard B-2, Resource Agency and Tribal Government Recommendations is appropriate for all zones given the recent Water Quality Certification (WQC) although Standard B-3, Site Specific Studies could also be appropriate because the Project completed a water quality study during relicensing which confirmed that it does not contribute to existing water quality impairments (GLHA 2025). The Project reach is designated Class B by NHDES and is impaired for mercury, low dissolved oxygen, and pH.

The Project continues to meet surface water quality standards consistent with the Androscoggin Rivers Class B designation and the Water Quality Certificate issued by NHDES on September 19, 2024 (NHDES 2024, FERC 2025, Appendix A). The Project does not adversely affect water quality under Condition E-1 of the WQC and the new license does not impose a different water quality regime. A 10-week water quality study conducted by GLHA between June and September of 2020, observed pH and dissolved oxygen (concentration and percent saturation) exceeded or

Cascade Hydroelectric Project — LIHI Mid-Term Review

were within the range of attainment for Class B standards during the monitoring period and pH also remained within standards at this Project (FERC 2024). Chlorophyll-a and total phosphorus values indicated overall low productivity, consistent with oligotrophic conditions, and no presence of nuisance algal blooms (FERC 2024).

The new license preserves compliance obligations addressed during relicensing under Conditions E-10 and E-11 of the WQC, which requires GLHA to provide a Water Quality Improvement Plan to NHDES within 120 days of notice if the Project is determined to be contributing to a violation. Although there remain legacy impairments in this reach of the Androscoggin River unrelated to Project operations, the Project 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.

Assessment of Criterion: Standard C-1, Not Applicable/De Minimis Effect, remains appropriate for all zones. The upper Androscoggin River is not accessible to diadromous species in the Project area due to natural and human made barriers downstream in the Maine section of the river (Wippelhauser et al. 2017, Yoder 2006). As such, there is no upstream migratory fish passage at the Project, and the new license does not impose a current operational requirement for fish passage (FERC 2025). No fish passage studies were requested or conducted during FERC relicensing, and no upstream fish passage structures are currently required per the new FERC license.

Although there are no anadromous fish present in the Project area, the new license preserves FERC's authority to require fishways that may be prescribed by the Secretary of the Interior pursuant to section 18 of the Federal Power Act through Article 403 (FERC 2025). Based on the absence of migratory fish in the reach and the lack of any passage structures required by the new license, the Project continues to satisfy the upstream fish passage criterion.

D. Downstream Fish Passage

Goal: The facility allows for the safe, timely, and effective downstream passage of migratory fish and minimizes loss of resident fish from impoundments.

Assessment of Criterion: Standard D-1, Not Applicable/De Minimis Effect, remains appropriate for all zones. There are no catadromous or other migratory fish requiring downstream passage at the Project (FERC 2025). Downstream passage for resident fish occurs through spillage, low-level gate releases, and turbine flow through the trashracks. Resident fish species include stocked trout, fallfish, smallmouth bass, white sucker, and longnose dace (FERC 2024).

During relicensing, GLHA conducted a desktop entrainment/impingement study and created estimates of turbine passage survival for juvenile and adult life stages of resident fish species

Cascade Hydroelectric Project — LIHI Mid-Term Review

using the USFWS Turbine Blade Strike Analysis model (Towler and Pica 2020). Results indicated low entrainment and impingement risk in addition to a baseline lack of quality aquatic habitat due to legacy impairments in this riverine reach and the absence of migratory fish species.

The Project's operational and structural characteristics were also determined by FERC's EA to create little downstream passage concern for the resident species present (FERC 2024). Resource agencies did not identify downstream passage measures that were required as part of the new license. Therefore, the Project continues to satisfy the downstream passage criterion.

E. Shorelines and Watershed Protection

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

Assessment of Criterion: Standard E-3, Enforceable Protection, is appropriate for all zones, updated from E-2, Resource Agency Recommendation in the prior certification. All projects on the river are subject to the New Hampshire Shoreland Water Quality Protection Act (SWQPA), which governs shoreland uses within a 250-foot buffer of the high-water mark. The SWQPA establishes minimum standards for the subdivision, use and development of shorelands adjacent to the state's public water bodies. It includes limits on impervious surfaces, a provision for waterfront and natural woodland buffers in which vegetation removal is limited, shoreland protection, and the establishment of a permit requirement for many new construction, excavation and filling activities within the Protected Shoreland.

The prior license required a Shoreline Protection Plan, for which FERC approved the Project's adoption of the New Hampshire Comprehensive Shoreland Protection Act as its Shoreline Protection Plan. That Act has since been superseded by the SWQPA. The Project lands are limited to the area occupied by Project infrastructure in the City of Berlin and there are no lands of ecological significance. The new license does not require a Project-specific shoreline management plan in lieu of the SWQPA.

Shoreline protection is maintained through compliance with the SWQPA. The Project continues to operate in a run-of-river mode that minimizes shoreline erosion and negative impacts of reservoir fluctuation. Therefore, the Project continues to satisfy the shorelines and watershed criterion.

F. Threatened and Endangered Species

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

Assessment of Criterion: Standard F-2, Finding of No Negative Effect, remains appropriate for all zones. Based on the USFWS IPaC online tool, the federally endangered northern long-eared bat, the federally threatened Canada lynx, the federally proposed endangered tricolored bat, and

Cascade Hydroelectric Project — LIHI Mid-Term Review

the federally proposed threatened monarch butterfly have the potential to occur within the Project boundary (FERC 2024). No critical habitat for either bat species, Canada lynx, or monarch butterfly is proposed or designated within the Project area. In addition, a freshwater mussel survey conducted in the summer of 2021 found no state-listed mussel species. A botanical survey conducted in September 2020 documented no federal or state threatened or endangered plant species. In an August 23, 2024 letter to FERC, the USFWS indicated that the Project would have no effect on Canada lynx and any effect on bats would be “insignificant and/or discountable”.¹

Article 404 of the new FERC license implements protection for the northern long-eared bat and tricolored bat on Project land by imposing a seasonal tree-cutting restriction from April 15 through October 31 (FERC 2024, 2025). Operation under the new license is not expected to create significant impacts. Therefore, the Project continues to satisfy the threatened and endangered species criterion.

G. Cultural and Historic Resources

Goal: The facility does not adversely impact cultural or historic resources associated with the facility’s lands and waters, including archaeological sites, historic era sites, traditional cultural landscapes, traditional cultural properties, and other tribal trust resources.

Assessment of Criterion: Standard G-2, Approved Plan, is appropriate for all zones. Standard G-1 was used in the original LIHI certification because there were no known archaeological sites or properties listed on the National Register of Historic Places (NRHP). However, because the dam and powerhouse were eligible for listing on the NRHP, the prior license required submittal of annual reports under a Programmatic Agreement with the New Hampshire State Historic Preservation Office (SHPO). Article 405 of the new license requires implementation of a new Programmatic Agreement between FERC and the SHPO. For management of cultural and historic resources, GLHA must develop a Historic Properties Management Plan (HPMP) within one year of license issuance (FERC 2025). Thus, Standard G-2, Approved Plan would have been appropriate in the original LIHI certification.

FERC designated GLHA as its non-federal representative for Section 106 consultation in 2019. As the Cascade Project's dam and powerhouse were previously determined eligible historic properties, GLHA will develop a Project-specific HPMP in consultation with the NH SHPO. No Native American lands, known as traditional cultural properties, or NRHP-eligible tribal resources are present within the Project boundary. There are no state or federal recognized tribes in New Hampshire, but three local tribes² were notified of the LIHI mid-term review application. No comments were received from any tribal interests. Therefore, the Project

¹ https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20240826-5026&optimized=false&sid=81cecaab-53b3-48d9-8053-ab3eaccbf6e0

² Abenaki Nation of New Hampshire, Koasek Abenaki Nation, and Pennacook New Hampshire Tribe

Cascade Hydroelectric Project — LIHI Mid-Term Review

continues to satisfy the cultural and historic resources with the condition recommended in Section 7 to implement the HPMP.

H. Recreational, Public, and Traditional Cultural Access

Goal: The facility accommodates recreational activities and provides recreational, public, and traditional cultural access to associated lands and waters without fee or charge.

Assessment of Criterion: Standard H-2, Resource Agency and Tribal Government Recommendations, is appropriate for the impoundment under the new license. Standard H-1, Not Applicable/De Minimis Effect, remains appropriate for the bypassed reach and tailrace/downstream reach since there is no safe access to those reaches. GLHA does not own, operate, or maintain any Project recreation facilities. However, the impoundment access area is owned and operated by the City of Berlin outside the Project boundary. This area provides scenic views, a gravel hand-carry boat access, and bank and boat fishing.

GLHA conducted recreation user intercept surveys during the 2022 recreation season. Respondents indicated good or excellent conditions and adequate facilities. Respondents recommended recreational improvements to water access but most users on the site participated in hiking and walking, followed by water activities (fishing, swimming and boating).

Article 406 requires GLHA to notify FERC if the non-Project impoundment access area ceases operations (FERC 2025). While not within the Project boundary, this site provides public access opportunities to the impoundment. Additionally, GLHA proposed to install a safety chain and/or a gate across the boating put-in at the impoundment access area with safety signage that states the site is closed when the boat barrier is not installed, and open from dawn to dusk when the boat barrier is installed. FERC did not require this installation under the license since the area is not a Project recreational facility.

The Project continues to provide free public access where it is safe to do so, and therefore continues to satisfy the recreation, public and traditional cultural access criterion with the condition recommended in Section 7 regarding proposed enhancements. Since FERC did not require installation of safety measures at the boating put-in this review finds that GLHA should still consult with the City on the need for these measures as an off-license and LIHI condition.

6. Current Certificate Conditions

The current LIHI certificate includes one condition. Condition 1 required the Facility Owner to provide updates to LIHI on the ongoing status of Project relicensing, including studies, FERC filings, resource agency consultation, recommendations, and agency comments on study results. This condition was fully satisfied with the issuance of the new FERC license in September 2025 and the submission of the mid-term review application (Kleinschmidt Associates 2026).

Cascade Hydroelectric Project — LIHI Mid-Term Review

7. Conclusion and Recommendation

This review determined that the Project continues to satisfy the LIHI criteria and that a new 10-year Certificate term can be granted. All requirements of Condition 1 of the current certification have been satisfied. The Project's new FERC license formalizes existing operational practices and establishes compliance reporting structures and monitoring requirements for continued resource protection. However, the following conditions are recommended to ensure completion of post-license requirements related to the LIHI criteria:

Condition 1: The Facility Owner shall submit the final Operational Compliance Monitoring Plan (OCMP) to LIHI once it has been approved by resource agencies and FERC. In annual compliance submittals to LIHI the Facility Owner shall submit a summary of all planned and unplanned operational deviations that occurred during the year along with evidence of resource agency consultation and comments received.

Condition 2: The Facility Owner shall submit the final Historic Properties Management Plan to LIHI once it has been approved by the SHPO and FERC. In annual compliance submittals to LIHI, the Facility Owner shall report on any consultation that occurred during the year related to ground-disturbing or other activities subject to the HPMP.

Condition 3: The Facility Owner shall consult with the City of Berlin on the proposed installation of a safety chain and/or a gate across the boating put-in at the impoundment access area with safety signage that states when the site is open and closed. If the City feels it is needed, the Facility Owner shall provide LIHI with a plan and schedule for implementation. If the City agrees that a chain/gate or signage is not needed, the Facility Owner shall provide documented evidence of that agreement.

Cascade Hydroelectric Project — LIHI Mid-Term Review

Appendix A — License Crosswalk

Resource Area	Previous License Requirement	Change from Existing License
Flow Regimes	Articles 401 and 402 included restrictions on run-of-river operations, minimum bypass flows, and an operational compliance monitoring plan.	Articles 401, 402 and WQC Conditions E-7 – E-9 require an updated operational compliance monitoring plan including deviation reporting and drawdown/refill operations.
Water Quality	Article 404 required developing a water quality monitoring plan.	Article 401 and WQC Conditions E-10 and E-11 require a water quality improvement plan and reporting, if NHDES determines that the project is contributing to non-compliance with state water quality standards.
Fish Passage	Article 403 retained FERC's Section 18 reservation of authority to prescribe fishways.	Article 403 preserves FERC's authority to require fishways.
Shorelines and Watershed Protection	No project-specific shoreline management plan required.	The new license does not require a shoreline management plan; the project is subject to restrictions under the state Shoreline Water Quality Protection Act
Threatened and Endangered Species Protection	No species-specific protection measures.	Article 404 requires avoidance of tree removal, trimming from April 15 through October 31.
Cultural and Historic Resources	Section 106 consultation conducted on a project-specific basis.	Article 405 requires implementation of the Programmatic Agreement and development of an updated historic properties management plan.
Recreation	No project recreation facilities; informal access via non-project sites.	Article 406 requires notification to FERC if the non-project Cascade impoundment access area ceases operations.

Cascade Hydroelectric Project — LIHI Mid-Term Review

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Cascade Hydroelectric Project — LIHI Mid-Term Review

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