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April 30, 2018

Maryalice Fischer
Certification Program Director
Low Impact Hydropower Institute

Subject: Recertification Recommendation for the Gilman Hydroelectric Facility (FERC # 2392, LIHI #108)

Ms. Fischer,

This letter contains my recommendation for Recertification of the Gilman Hydroelectric Facility (the "Facility"). I complete a thorough review of the application materials and the public record for this Facility, and am recommending recertification for one new, five-year term, subject to the following conditions:

- Within three (3) months of re-certification, the Owner will submit a Sampling and Analysis Plan (SAP) to New Hampshire Department of Environmental Services (NHDES,) and provide evidence of concurrence, and provide NHDES an update of the pond level fluctuation data requested Within six (6) months of re-certification, Owner will provide evidence of compliance with the Water Quality monitoring recommendations issued by NHDES in its letter dated April 13, 2018, included as Attachment 3 of this review. This includes: (1) submission of a Sampling and Analysis Plan (SAP) to NHDES; (2) execution of the SAP plan and submission of data to NHDES; (3) an update to the pond level fluctuation data submitted to LIHI in 2012. The Owner will provide evidence of concurrence from NHDES that the Facility does not negatively impact water quality. If extensions are required to conduct the sampling, the Owner will request an extension from LIHI and provide justification for the request.
- Within three (3) months of re-certification, the Owner will submit the Drawdown Management Plan and evidence of concurrence by the US Fish and Wildlife Service (USFWS).

Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter Drown", with a stylized flourish at the end.

Peter Drown, President
Cleantech Analytics LLC

I. Background:

The 4.85 MW Gilman Hydroelectric Facility (“Facility”) is located on RM 301.5 of the Connecticut River, in the Village of Gillman, Vermont. Project works include a 29¹ foot-high, 108-foot-long concrete gravity dam, with a powerhouse on the west abutment containing one Kaplan and three Francis turbines operating in a run-of-river mode and generating approximately 25,000 MWh annually. There is no bypassed reach as the powerhouse is adjacent to the dam, and the impoundment has a surface area of approximately 130 acres. The project is located approximately 70 miles downstream of the Canaan Hydroelectric Project (FERC #7528) and 12 miles upstream of the Fifteen Mile Falls Hydroelectric Projects (FERC #2077.) The Facility was initially constructed in the early 1900s, and currently operates under the terms and conditions contained in the most recent FERC License issued in 1994 (expiring in 2024.) Ampersand Gilman Hydro LP (“Owner”) owns and operates the Facility. The Facility was originally certified as “Low Impact” on December 4, 2012, and the expiration date of the initial certification was extended to March 31, 2018. On February 15, 2018, the Owner submitted a timely application for Recertification. This application review for recertification was conducted using the new, 2nd Edition Handbook that was published in March 2016.



Figure 1 - Gilman Powerhouse

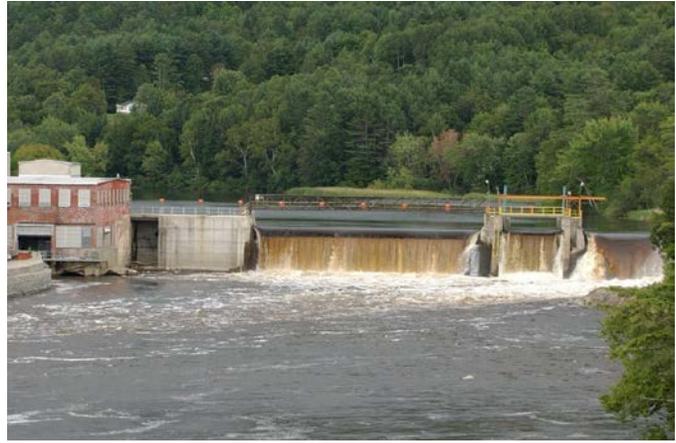


Figure 2 – Gilman Dam

II. Recertification Standards

On August 8, 2017, LIHI notified the applicant of upcoming expiration of the Low Impact Hydropower Institute certification for the Facility. The letter included an explanation of procedures to apply for an additional term of certification under the 2nd Edition LIHI Handbook, including the new two-phase process starting with a limited review of a completed LIHI application, focused on two questions:

- “(1) Has there been a material change in the operation of the certified facility since the previous certificate term began? and
- (2) Has there been a change in LIHI criteria since the certificate was issued?”

If the answer to either question is “Yes,” the Application must proceed through a second phase, which consists of a more thorough review of the application using the LIHI criteria in effect at the time of the recertification application. The letter noted that “because the new Handbook involves new criteria and a new process, the answer to question two for all projects scheduled to renew in 2017 will be an automatic ‘YES.’ Therefore, all certificates applying for renewal in 2017 will be required to proceed through both phase one and phase two of the recertification application reviews.”

The Owner submitted an initial (phase one) application for re-certification on September 21, 2017. I conducted

¹ This was incorrectly stated as 6.5 foot-high in the Application.

the phase one review and noted several issues and deficiencies to address in the subsequent Phase II application. This Report comprises the Phase II review.

III. Adequacy of the Recertification Package

The Applicant provided an updated Recertification Application on February 15, 2018, which included additional supporting information and stated there have been “no material changes in the facility design or operation since the most recent LIHI review that was conducted in May 2013.” To verify this, I have reviewed the application package, supporting comments and documentation and public records on FERC e-library posted since the original certification report (TRC Solutions, 2013). I also independently verified the submitted criteria were appropriate given the changes in the 2nd edition LIHI handbook.

The application was public noticed and received no comments.

IV. There have not been any “material changes” at the facility that would affect recertification

In accordance with the Recertification Standards, "material changes" mean non-compliance and/or new or renewed issues of concern that are relevant to LIHI's criteria. Based on my review of materials provided, review of FERC's public records, and consultation with the noted individuals, I found that there are no areas of noncompliance or new or renewed issues of concern. The previous LIHI Governing Board's vote to certify the Gilman Project was unanimous for a term of 5 years with the following specific conditions:

1. The Applicant will conduct sampling for temperature and dissolved oxygen when minimum flows are close to the 7Q10 flow and temperatures are relatively high such that it's possible that water quality standards for dissolved oxygen and temperature may not be met. By January 31 of each year, the Applicant shall notify LIHI as to whether it conducted sampling during the prior year and file documentation with LIHI that NHDES and VANR have concurred with the results of any water quality sampling conducted.

2. Upon request of USFWS, the Applicant shall assess whether the plunge pool associated with the downstream fish passage facility is significantly contributing to fish scaling, injury, or mortality and make modifications to the plunge pool, if the assessment finds that it is significantly contributing to fish scaling, injury, or mortality. By January 31 of each year, the Applicant shall notify LIHI as to whether it has received a request from USFWS to assess the effects of the plunge pool on downstream migrating Atlantic salmon smolt.

Compliance with these two conditions is described in the relevant criteria (Water Quality, Fish Passage) below.

V. LIHI certification criteria are satisfied in all zones

In my Opinion, the Applicant properly selected two zones of effect for the Facility. There is no bypassed reach because the powerhouse abuts the west abutment of the dam. The Applicant defined Zone 1 as the downstream riverine reach from the base of the dam to approximately .25 miles downstream, and Zone 2 as the impoundment from the upstream dam face to approximately 0.3 miles upstream. The upstream project boundary is significantly underestimated. The FERC Project License (and Application) state the reservoir has a Surface Area of 130 acres, which would imply the upstream reach to be approximately two miles upstream near the town of South Lunenburg. (The downstream reach is less clear, but backwater effects from the downstream Moore Reservoir can be observed within the downstream stretch, and it appears that the much-larger Moore Reservoir is the major factor influencing flows and water quality in this reach.) I conducted my review considering the entire reservoir at Gilman as the upstream zone, but did not identify any Standard Selections that were impacted by this extended zone.

A. *Ecological Flow Regimes*

The Owner selected Standard 2 for Zone 1. The Water Quality Certificate (WQC) issued by the State of Vermont (1989, amended 1994), requires the Facility to operate in a strict run-of-river mode, with a minimum flow of 210 cfs spilled at the dam from June 1 to October 15 during times where the river flows are less than 1,000 cfs². This recommendation was designed to prevent low dissolved oxygen (DO) levels in the downstream reach and minimize fluctuations to maintain fish habitat in the Connecticut River. The technical basis for this requirement is included in an Environmental Assessment developed by FERC in April 1990. On August 11, 1994, the Owner filed a Minimum Flow Release Plan and Run of River Management Plan, which defined specific procedures for monitoring, compliance and reporting on the 210 cfs requirement and run-of-river requirement. This plan was approved by FERC on August 31, 1994. The Owner is required to submit a report on Spill Management activities in a report that shows dates the crest gate was lowered to maintain the 210 cfs minimum flow and the appropriate head pond elevation. The Owner provided the most recent report from January 2018 in their Stage II Application, which was also sent to VDEC for review. This meets LIHI's Agency Recommendation requirement by including both a scientific and technical basis for the flow requirements and ongoing monitoring and reporting via the Spill Management report.

The Owner adequately demonstrated compliance with agency recommendations for flows management and monitoring, and properly selected Standard 2, Agency Recommendation for Zone 1. LIHI Handbook allows impoundment zones to automatically qualify as Standard 1, and the information submitted for Zone 1 is adequate to describe flow requirements that impact the impoundment.

B. *Water Quality*

The Owner selected Standard 2, Agency Recommendation, for both Zones. The flow requirements mentioned in Criterion A above are designed to prevent low dissolved oxygen (DO) levels at the project, so the same scientific basis and reporting requirements apply to this Criterion. This segment of the Connecticut River is water-quality limited, due to the potential of low DO levels impacting fish habitat. (Specific data on the site could not be located, as the EPA's Waterbody Assessment webpages appear to have been changed or removed recently which restricts viewing.) During the most recent LIHI Certification, the Facility was issued a condition to conduct temperature and DO sampling "when minimum flows are close to the 7Q10 flow and temperatures are relatively high such that it's possible that water quality standards for dissolved oxygen and temperature may not be met," and annually report sampling activity to LIHI, VANR and NHDES. The Owner provided sampling results for 2016, and confirmation of receipt by NHDES. LIHI records do not show any data provided prior to 2016, so it is unclear if the Owner complied with this condition during that time period³. In their review of the 2016 data, NHDES noted that continuous sampling would be required, to supplement the instantaneous measurements taken by the Owner (see Attachment 1.)

In a letter from April 13, 2018, NHDES provided a detailed request for sampling data in order to properly assess the project's impact on water quality (Attachment 3⁴). According to NHDES, the maximum age of river data that the agency can use to determine surface water quality standards is five years, and updated project-specific data is needed for this Facility in the impoundment and the downstream zone (continuous and instantaneous DO, water

² The NHDES also issued a WQC for the Facility in 1992, however the WQC issued by the VDEC is more environmentally stringent, and is used here per LIHI's requirements in the 2nd edition handbook.

³ LIHI did not have a system in place to monitor conditions issued pursuant to certifications until recently. Although this is not a justification for the Owner not submitting the data, the continuous monitoring requirements issued by NHDES are, in my opinion, more than adequate to meet the objective of the original condition from this point forward.

⁴ NHDES also included comments pertaining to fish passage and minimum flows, which I did not include as conditions because these were appropriately addressed in my report elsewhere. Furthermore, I contacted VDEC and USFWS during the review to solicit comments on fish passage and none were received.

temperature, total Phosphorus and Chlorophyll-a, and information on pond level fluctuations.) NHDES requested submission of a Sampling and Analysis Plan prior to sampling. I am recommending a LIHI condition to support this request, and passage of this Criterion is conditional upon notification from NHDES that the project has complied with the sampling and analysis plan and is not negatively impacting water quality.

C. Upstream Fish Passage

The Owner selected Standard 1, Not Applicable/De Minimis for both Zones. The facility does not pose a barrier to upstream passage, because the two dams downstream do not have upstream fish passage facilities so migrating fish do not have the opportunity to reach the Gilman dam. The Fifteen Miles Falls project (FERC #2077 and LIHI #39) is located approximately twelve miles downstream of Gilman, and features high head dams with no upstream passage. The Agencies never exercised their authority to prescribe upstream passage under Standard Article 405 of the FERC license, and I did not identify records where this topic was ever considered for this project. However, the VDEC noted on November 2017 that they plan to re-evaluate passage measures at the project during the upcoming relicensing period for this project, so the potential for future requirements exist.

The Owner adequately demonstrated compliance with Standard C1, Not Applicable for both zones. Although the potential for future requirements exist, the downstream dams will require passage before this Facility can impact the ability of migratory fish species to move upstream. Upstream passage for resident fish was never required and does not appear to be a priority at this time.

D. Downstream Fish Passage

The Owner selected Standard 1, Not Applicable/De Minimis for Zone 1 and Standard 2, Agency Recommendation for Zone 2. The single downstream reach (Zone 1) requirement consists of a plunge pool included in the functional design specifications for the passage system, and the Owner states that there has been no request for assessment of this pool (see Condition #2 of LIHI Certification.) In 2007, USFWS and VDFW requested that the applicant install downstream fish passage pursuant to their authority under Article 405, to support Atlantic Salmon restoration efforts on the Connecticut River. From 2009 – 2011, the Owner consulted with the agencies on numerous iterations of the system design, which was later completed and placed into service in August 2012. The restoration effort for Atlantic Salmon on the Connecticut has since been discontinued, due to the program's general lack of success and agency's re-focused priorities on other anadromous and catadromous species. On February 11, 2016, the Connecticut River Atlantic Salmon Commission (CRASC) submitted notification to FERC that it had suspended the effort and that downstream passage measures for adult salmon and smolts would no longer be required at projects on the Connecticut River, except at those facilities that have passed 50 or more adult salmon the prior spring. On August 24, 2017 the Owner submitted a request to FERC to suspend the requirements under Article 405, citing the letter from CRASC. The USFWS, VTDEC, and VDFW conferred on the request and concurred that the Owner could temporarily suspend downstream fish passage operations. FERC implemented this suspension via an Order issued January 10, 2018.

There are several caveats in the Agency's recommendation (and FERC's Order) which are important for LIHI certification purposes. First, the requirement does not remove or suspend Article 405, and in fact reaffirms the requirement by stating "The Commission should reserve the right to reinstate downstream passage of the Plan in the event that CRASC, the Vermont DFW, or the FWS reinitiate Atlantic salmon restoration efforts, or based on fishery management information provided by the licensee or the abovementioned entities." Second, both commenting agencies noted their decision was impacted by the imminent re-licensing proceedings to start in 2019 for the license expiration in 2024. They noted that passage will be re-considered during the proceedings in this study period. The Owner also noted that the fish passage facility would remain in use in the event another passage requirement should arise in the future. In conclusion, the Owner demonstrated compliance with the *current* Agency Recommendations for downstream fish passage, and therefore properly selected Standard D2, Agency Recommendation for Zone 2. However, the recommendation allows for future fish passage facilities,

and this appears to be under consideration by the agencies in the upcoming relicensing proceedings.

E. Watershed and Shoreline Protection

The Owner selected Standard 1, Not Applicable/De Minimis for both Zones. The north shoreline of the project is bounded by a paper mill complex and the town of Gilman, and the Owner has limited ownership and control in this area. The south shoreline consists of wooded deciduous forest, which continues above and below the project. There are no shoreline management plans issued for the Facility, and the limited project boundary (1.1 acres) does not include any other requirements that impact this Criterion (other than Standard FERC Articles for transfer of property, erosion and sediment control plans during construction, and compliance with state-issued standards such as desilting of the impoundment.) The Owner properly demonstrated that the lands surrounding the project do not have significant ecological value and no shoreline management plans are in place, and therefore demonstrated compliance with Standard 1, Not Applicable/De Minimis for both Zones.

F. Threatened and Endangered Species

The Owner properly selected Standard F4, Acceptable Mitigation for both Zones. The Dwarf Wedgemussel is found in the project vicinity and could potentially be impacted by project operations. During 2013, the Owner conducted studies and consultation with USFWS, NHFG, and VDFW to develop a plan to minimize and monitor the impacts to the Dwarf Wedgemussel during an emergency replacement of rubber flashboards, which required a drawdown of the reservoir. The Owner is currently working with USFWS to develop a formal Drawdown Management Plan to protect Dwarf Wedgemussel, and this meets the standard for Acceptable Mitigation as “any significant measures that the facility is implementing to avoid or minimize the impacts on such newly listed species.” However, to meet the second requirement there must be documentation that the measures are being implemented to the interim satisfaction of applicable resource agencies. I am recommending a condition that the Owner submit documentation of consultation and approval of the Drawdown Management Plan with the relevant agencies, when this plan is finalized and implemented, and passage of this Criterion is conditional upon approval of the Plan by the agencies listed above.

G. Cultural and Historic Resources Protection

The Owner selected Standard G1, Not Applicable/De Minimis for both Zones of Effect. Although the nearby Gilman Paper Mill was determined to be eligible for the State Register of Historic Places by the Vermont Advisory Council in 1995, the mill is not located within the project boundary, is not owned by the Owner and appears to have been re-purchased and opened by Dirigo Paper Company in 2004⁵. There are no requirements in the FERC license with respect to cultural and/or historic resources. The Owner demonstrated that there are no cultural or historic resources present on facility lands, and therefore properly applied Standard G1, Not Applicable/De Minimis for all zones.

H. Recreation

The Owner selected Standard H2, Agency Recommendation for both Zones of Effect. The primary recreational opportunities include a canoe portage and boat launch in the project area, and the Owner has constructed, upgraded and continues to maintain these facilities according to Article 406 of its License. The Owner provided photo documentation of these facilities for the 2012 certification. Ed O’Leary from the State of Vermont filed a support letter during that certification that these facilities are installed at a safe distance from the project works, and the Owner allows free public access. The Owner adequately demonstrated compliance with resource agency recommendations for recreational access and accommodation, and therefore properly selected Standard H2,

⁵ https://www.conwaydailysun.com/berlin_sun/community/gilman-vt-paper-mill-to-re-open/article_a881da45-91e9-53de-bbbd-e23b2d974923.html

Agency Recommendation for all zones.

VI. Conclusion

In my opinion, the materials provided and referenced above are sufficient to make a recertification recommendation, and no further application review is needed. In conclusion, I recommend Recertification of the Gilman Hydroelectric Facility to one new, five-year term, with the following conditions:

- Within three (3) months of re-certification, the Owner will submit a Sampling and Analysis Plan (SAP) to New Hampshire Department of Environmental Services (NHDES,) and provide evidence of concurrence, and provide NHDES an update of the pond level fluctuation data requested Within six (6) months of re-certification, Owner will provide evidence of compliance with the Water Quality monitoring recommendations issued by NHDES in its letter dated April 13, 2018, included as Attachment 3 of this review. This includes: (1) submission of a Sampling and Analysis Plan (SAP) to NHDES; (2) execution of the SAP plan and submission of data to NHDES; (3) an update to the pond level fluctuation data submitted to LIHI in 2012. For each requirement, the Owner will provide evidence of concurrence from NHDES. If extensions are required to conduct the sampling, the Owner will request an extension from LIHI and provide justification for the request.
- Within three (3) months of re-certification, the Owner will submit the Drawdown Management Plan and evidence of concurrence by the US Fish and Wildlife Service (USFWS).

Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'Peter R. Drown', with a stylized flourish at the end.

Peter R. Drown, President
Cleantech Analytics LLC

Attachment 1
Agency and Applicant Communications

Date: April 30, 2018
Contact Person: Eric Davis
Agency: Vermont Department of Environmental Conservation

5/1/2018

Gmail - Gilman Hydroelectric LIHI Review



Peter Drown <peter.drown@gmail.com>

Gilman Hydroelectric LIHI Review

Davis, Eric <Eric.Davis@vermont.gov>
To: Peter Drown
<peter.drown@cleantechanalytics.com>
Cc: "McHugh, Peter" <Peter.McHugh@vermont.gov>

Mon, Apr 30, 2018 at 8:51 AM

Good morning Peter,

I apologize for the delay in getting back to you on the LIHI application for the Gilman project. As I mentioned previously, as part of the LIHI review, the Agency wanted to provide its position on fish passage at the project. Included below please find a brief history and the Agency's current position.

Thank you,

Eric

Background

The Agency issued a water quality certification for the Gilman hydroelectric project on June 28, 1989 which was amended on February 17, 1994. Condition C of the certification required that downstream fish passage facilities be constructed and operated after being requested by the Vermont Department of Fish and Wildlife and/or U.S. Fish and Wildlife Service (Service). In 2007, the Agency and Service requested downstream fish passage facilities be constructed at the Project as part of the Connecticut River Atlantic Salmon program.

In 2012, the Connecticut River Atlantic Salmon Commission (CRASC) discontinued the cooperative restoration effort for Atlantic salmon. However, because salmon fry were still rearing in tributaries to the Connecticut River downstream passage facilities needed to be operated through spring of 2015. By letter dated February 11, 2016, CRASC notified FERC and

hydroelectric operators that downstream fish passage operations for Atlantic salmon in the Connecticut River would no longer be required. Based on this correspondence, Ampersand filed a request with FERC that article 405 (requires the Licensee to construct, operate, and maintain fishways when prescribed) of FERC license be suspended.

Comments

A goal of the Agency is to restore and protect fish passage and connectivity of riverine systems in order to connect habitats for fish to utilize during different periods of their life cycles to sustain healthy populations. This includes providing passage at instream structures that may impede or affect the movement of fish, including hydroelectric projects. However, at this time the Agency does not have the necessary information to evaluate the operations of the downstream fish passage facility in regard to the Agency's overall goal of ensuring the connectivity of river systems to sustain healthy populations.

The FERC license for the Gilman Project will be expiring in 2024, with the relicensing process will begin in 2019. The Agency intends to evaluate the need for the operation of the fish passage facility for resident species during the relicensing process.

Eric Davis, River Ecologist

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802-490-6180 / eric.davis@vermont.gov
<http://www.watershedmanagement.vt.gov/rivers>



Date: April 13, 2018
Contact Person: Ted Walsh
Agency: New Hampshire Department of Environmental Services



The State of New Hampshire
Department of Environmental Services



Robert R. Scott, Commissioner

April 13, 2018

Stella Jhang
 Ampersand Gilman Hydro LP
 717 Atlantic Avenue, Suite 1A
 Boston, MA 02111

RE: Water Quality Monitoring Recommendations for Low Impact Hydropower Institute Recertification of the Gilman Hydroelectric Project (FERC Project No. 2392), Connecticut River

Dear Stella:

The New Hampshire Department of Environmental Services (NHDES) understands that Ampersand Gilman Hydro has applied for Low Impact Hydropower Recertification from the Low Impact Hydropower Institute (LIHI) for the Gilman Hydroelectric Project (FERC No. 2392), on the Connecticut River in Dalton, NH. In order to receive LIHI recertification, you need a statement from the New Hampshire Department of Environmental Services (NHDES) stating that the upstream and downstream reaches of the Connecticut River are in compliance with New Hampshire water quality standards pursuant to the federal Clean Water Act. Table 1 provides the current assessment status of the parameters of concern included in the monitoring plan outlined in a later section of this letter.

The information provided in Table 1 is derived from NHDES's draft 2016.305(b)/303(d) report and much of the data was collected during the 2012 LIHI certification process. Table 1 provides the current assessment status of the parameters of concern included in the monitoring plan outlined in a later section of this letter.

		Quality Monitoring	Hydroelectric Project	
Table 1. Assessment Unit/Station ID	Status for Water	Parameters at Gilman	Designated Use	Current Assessment
NHMP891030201-01 33D-CNT	Gilman Hydroelectric Dam Impoundment	Dissolved Oxygen (mg/L)	Aquatic Life	Fully Supporting
		Dissolved Oxygen (% Saturation)	Aquatic Life	Fully Supporting
		Chlorophyll-a	Primary Contact Recreation	Fully Supporting
			Aquatic Life	Indeterminate ^A
		Total Phosphorus	Aquatic Life	Indeterminate ^A
NHRIV891030201-02 33-CNT	Downstream of Gilman Hydroelectric Dam	Water Temperature	Aquatic Life	No numeric criteria ^C
		Dissolved Oxygen (mg/L)	Aquatic Life	Fully Supporting
		Dissolved Oxygen (% Saturation)	Aquatic Life	Fully Supporting
		Chlorophyll-a	Primary Contact Recreation	Fully Supporting
			Aquatic Life	Indeterminate ^A
	Total Phosphorus	Aquatic Life	Indeterminate ^A	
	Water Temperature	Aquatic Life	No numeric criteria ^C	

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^A NHDES does have numeric water quality criteria for the aquatic life designated use for total phosphorus and chlorophyll-a in lakes/ponds and impoundments with characteristics similar to lakes/ponds but it can only be applied to waterbodies where the trophic class is known. For waterbodies where the trophic class is known the median total phosphorus and chlorophyll-a value is used to make the criteria comparison. The aquatic life designated use nutrient and chlorophyll-a criteria are depicted below with the median values for each parameter for the data collected at station 53D-CNT in assessment unit NHIMP801030201-01 during the summer of 2012.

	TP (ug/L)	Chl-a (ug/L)
2012 Median 53D-CNT	12	2.15
Oligotrophic	< 8	< 3.3
Mesotrophic	≤ 12	≤ 5
Eutrophic	≤ 28	≤ 11

^B NHDES does not have numeric water quality criteria for nutrients in rivers or streams. The narrative criteria states that: "Class B waters shall contain no phosphorus or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring."

^C Although there is currently no numerical water quality criteria for water temperature, NHDES is in the process of collecting biological and water temperature data that will contribute to the development of a procedure for assessing rivers and stream based on water temperature and its corresponding impact to the biological integrity of the waterbody.

In order for NHDES to determine if the Gilman Hydroelectric Project is currently causing or contributing to water quality standard violations, new monitoring data and facility information is needed. The maximum age of river data NHDES can use to determine if the river is meeting surface water quality standards is five years. This aligns with LIHI's requirement that certifications be renewed every five years.

Environmental data and project information is needed to address the following water quality concerns that are typically associated with hydropower projects:

1. Impact on ambient water quality criteria;
2. Impact of pond fluctuations on aquatic habitat;
3. Maintenance of adequate minimum flows to protect downstream aquatic life; and
4. Adequate upstream and downstream fish passage.

Specifics are provided below:

1. Water Quality

Water quality parameters most susceptible to impact from hydroelectric projects typically include dissolved oxygen, water temperature, chlorophyll-a and total phosphorus. Samples are typically collected upstream and downstream of the dam and if applicable in the bypass reach. Based on our current understanding of the project, the following is recommended.

Table 2 provides the water quality sampling locations NHDES recommends be used for recertification sampling. Recommended parameters and frequency of monitoring are provided in Table 3 below. Exact sampling locations will need to be confirmed based on field conditions, access, and secure locations for deployment of dataloggers.

Table 2. Recommended Sampling Locations for Water Quality Monitoring at the Gilman Hydroelectric Project

Assessment Unit	Location	NHDES Station ID	Latitude ^D	Longitude ^D
NHIMP801030201-01	Gilman Hydroelectric Dam Impoundment	53D-CTC	44.409718	-71.714713
NHRIV801030201-02	Downstream of Gilman Hydroelectric Dam	53-CNT	44.410964	--71.722714

^D Exact locations to be determined based on access to safe sampling locations and secure deployment of dataloggers

Table 3. Recommended Water Quality Monitoring for LIHI Recertification - Gilman Hydroelectric Project

Site ID	Location	Purpose	Parameters	Frequency
53D-CTC	Gilman Hydroelectric Dam Impoundment	Determine water quality impacts of river being impounded by the Gilman Hydroelectric Dam	Continuous dissolved oxygen (mg/L and % Saturation) and water temperature (collected with dataloggers)	At least 10 consecutive days of data collected at 15 minute increments during the following conditions: <ul style="list-style-type: none"> • Power is actively being generated • Low flow conditions ($\leq 3 \times 7Q_{10}$) • Water temperature is over 23 degrees Datalogger should be set at the bottom of the epilimnion (if stratified) or at 25% depth if not stratified.
			Instantaneous Dissolved Oxygen (mg/L and % Saturation) and Water Temperature	At least 2 vertical profiles collected at least once each week when continuous dataloggers are deployed. Profiles should be at 1 foot increments from surface to bottom
			Total Phosphorus and Chlorophyll-a	10 samples - once a week for 10 weeks (from July through September)
53-CNT	Downstream of Gilman Hydroelectric Dam	Determine water quality condition downstream of the Gilman Hydroelectric Dam	Continuous dissolved oxygen (mg/L and % Saturation) and water temperature (collected with dataloggers)	At least 10 consecutive days of data collected at 15 minute increments during the following conditions: <ul style="list-style-type: none"> • Power is actively being generated • Low flow conditions ($\leq 3 \times 7Q_{10}$) • Water temperature is over 23 degrees
			Total Phosphorus and Chlorophyll-a	10 samples - once a week for 10 weeks (from July through September)

Prior to sampling, a sampling plan should be submitted to NHDES for approval which includes sampling locations, parameters to be sampled, sample timing and frequency, sampling and laboratory analysis protocols and quality control provisions. NHDES can provide examples of sampling plans upon request.

With regards to quality assurance/quality control, the following should be included in the plan:

- During one sampling event a replicate sample should be collected for each parameter for laboratory analysis.

- Multiparameter dataloggers and handheld meters should be calibrated for dissolved oxygen before each sampling event on-site according to the manufacturer's instructions. Calibration documentation and post deployment checks should be submitted with the datalogger data.
- Field sampling quality control should consist of 1) replicate analysis, 2) maintenance records, 3) field calibration and record of calibration, and 4) record of equipment used.
- Instrument and equipment maintenance should include: 1) checking field test kits to be sure all reagents are not contaminated and are not beyond expiration dates, 2) replacing reagents in accordance with manufacturer's recommendations, 3) calibrating equipment before each sampling event, and 4) recording of maintenance and calibration activities.
- Chain of custody forms and information regarding laboratory standard methods should be submitted to NHDES with the data.

The sampling plan should specify that the continuous water quality data (i.e., dissolved oxygen and water temperature) will be collected under near critical low flow and relatively high water temperature conditions. The 7Q10 low flow is typically considered the critical low flow. However, because the 7Q10 flow occurs relatively infrequently (i.e., on average once every 10 years), NHDES typically recommends that sampling occur during slightly more frequent flows (i.e., at or below 3 x 7Q10). This usually provides an idea of near critical conditions and has a better chance of occurring in any given year. The United States Geologic Services maintains a stream gage (USGS 01131500) in Dalton, NH on the Connecticut River. Data from this gage can be used to estimate when the Connecticut River is flowing below 3 x 7Q10 low flow conditions. The 3 X 7Q10 value for USGS stream gage 01131500 is 1122 cfs. During the sampling period the Gilman Hydroelectric Dam should be operating under normal operating procedures.

All water quality and water quantity data should be submitted to NHDES electronically and in a form that can be automatically uploaded into the NHDES Environmental Monitoring Database (EMD). Information on uploading data to the EMD can be found at <http://des.nh.gov/organization/divisions/water/wmb/emd/index.htm> or by contacting Melanie Cofrin at (603) 271-1152 or Melanie.Cofrin@des.nh.gov. In addition to water quality results, data on flow through the turbines and to the bypass reach, as well as power generation during the study period should also be provided.

2. Pond Fluctuation

Pond fluctuations due to operation of hydroelectric projects can negatively impact aquatic habitat and aquatic life. To determine the impact of pond fluctuations on aquatic life, the following information was required to be submitted to NHDES during the 2012 certification process:

- a. A description and schematic of the project including the dam height, length, control structures and elevations, crest elevation, flashboard elevations, and impoundment depth, elevation, area and volume at full pool, normal and maximum drawdown elevations;
- b. Timing, frequency, duration and magnitude of drawdowns
- c. Historical water level fluctuations over the past 5 years
- d. Map of fringing wetlands preferably delineated from high-resolution aerial photography
- e. An estimate of the average and maximum percent of the littoral zone (preferably based on accurate bathymetry) that is dewatered as well as average and maximum duration of dewatering for each quarter of the calendar year

NHDES requests a statement from the applicant which identifies any changes to the information provided during the 2012 certification process for the items listed above. This includes, but is not be limited to, updated information for the period 2012 to 2017 for items b., c., and e.

3. Minimum Flows

As part of an amended 401 water quality certificate issued by the Vermont Department of Environmental Conservation (VTDEC) in 1994, Ampersand Gilman is obligated to maintain a minimum instantaneous spilled flow of 210 cfs over the face of the dam when the instantaneous inflow to the project is at or below 1000 cfs during the lower flow period of June 1 – October 15. NHDES requests information from the applicant that documents compliance with this minimum flow requirement for the period of LIHI certification. This information should include a description of how the discharge levels are measured for determining compliance with the minimum flow requirements. NHDES also requests that Ampersand Gilman Hydro provide a statement from the U.S. Fish and Wildlife Service (USFWS) and New Hampshire Fish and Game (NHFG) that the current minimum flow requirements and the monitoring of the minimum flow are adequate for the protection of aquatic life or if adjustment to the minimum flow requirements are recommended.

4. Fish Passage

In 2011 NHDES was provided with documentation that Ampersand Gilman Hydro has complied with a USFWS requirement that a downstream fish passage facility be completed. The construction and implementation of the downstream fish passage was completed in the summer of 2012. USFWS expressed interest in studying the impact of the flow in the plunge pool on out-migrating Atlantic salmon. The purpose of this study was to determine if the flows in the plunge pool are having an adverse effect on out-migrating Atlantic salmon smolts. It was agreed in 2012 that in the event that the USFWS and NHFG determine that the flows in the plunge pool are adversely impacting Atlantic salmon, the owners of the facility will would implement any other measures as requested by these agencies.

NHDES requests that Ampersand Gilman Hydro provide statements from the NHFG and the USFWS stating that they are satisfied with upstream and downstream fish passage provisions associated with the project and that the terms of LIHI certification have been met.

Copies of correspondence with NHFG and USFWS should be provided to NHDES. Contact information is provided below.

Carol Henderson
NH Fish and Game Department
11 Hazen Drive, Concord, NH 03301
603-271-3511
carol.henderson@wildlife.nh.gov

Melissa Grader
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service - New England Field Office
103 East Plumtree Road
Sunderland, MA 01375
413-548-8002 x8124
melissa_grader@fws.gov

Once all of the data has been submitted, NHDES will make a determination regarding compliance of the project with NH water quality standards.

Should you have any questions regarding these recommendations or wish to arrange a meeting, please contact me at (603) 271-2083 (ted.walsh@des.nh.gov).

Sincerely,



Ted Walsh, Surface Water Monitoring Coordinator
NHDES Watershed Management Bureau

Cc: Shannon Ames, LIHI
Maryalice Fisher, LIHI
Carol Henderson, NHFG
John Magee, NHFG
Julianne Rosset, USFWS
Melissa Grader, USFWS
Peter Drown, Cleantech Analytics

Attachment 1
Agency and Applicant Communications

Date: March 22, 2018 and March 28, 2018

Contact Person: Melissa Grader, Julianne Rosset, Ken Sprankle

Agency: U.S. Fish and Wildlife Service

I requested USFWS comments on the ongoing Drawdown Management Plan for Dwarf Wedgemussels on the Connecticut River, and received no response.