

**Appendix B-1**

Letter from New Hampshire DES Re: Water Quality Monitoring  
Dtd August 12, 2013



The State of New Hampshire  
**DEPARTMENT OF ENVIRONMENTAL SERVICES**



**Thomas S. Burack, Commissioner**

August 12, 2013

Stephen Hickey  
 Essex Hydro Associates, LLC  
 55 Union Street, 4th Floor  
 Boston, MA 02108

RE: Water Quality Monitoring Recommendations for Low Impact Hydropower Institute Certification of the Clement Dam Hydroelectric Project (FERC No. P-1966), Winnepesaukee River

Dear Steve:

We understand that Essex Hydro Associates is applying on behalf of Eagle Creek Renewables L.L.C. for Low Impact Hydropower Certification from the Low Impact Hydropower Institute (LIHI) for the Clement Dam Hydroelectric Project (FERC No. P-1966), on the Winnepesaukee River in Tilton, NH. We further understand that to receive LIHI certification, you need a statement from the New Hampshire Department of Environmental Services (DES) stating that the project is not causing or contributing to violations of state water quality standards. 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 DES's draft 2012 305(b)/303(d) report.

Table 1. 2012 Water Quality Assessment Status for the Winnepesaukee River at the Clement Dam Hydroelectric Project

Assessment Unit	Location	Parameter	2012 305(b)/303(d) Assessment Status		
NHIMP700020203-05	Clement Dam Hydroelectric Project Impoundment	Dissolved Oxygen (mg/L)	No Data		
		Dissolved Oxygen (% Saturation)	No Data		
		Chlorophyll-a	Primary Contact Recreation	No Data	Aquatic Life Use No Data
			No Data		
		Total Phosphorus	No Data		
Water Temperature	No Data <sup>A</sup>				
NHRIV700020203-13	Downstream of Clement Dam Hydroelectric Project	Dissolved Oxygen (mg/L)	No Data		
		Dissolved Oxygen (% Saturation)	No Data		
		Chlorophyll-a	Primary Contact Recreation	No Data	Primary Contact Recreation No Data
			No Data		
		Total Phosphorus	No Data		
Water Temperature	No Data <sup>A</sup>				

<sup>A</sup> Although there is currently no numerical water quality criteria for water temperature, DES 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 DES to determine if the subject hydroelectric project is causing or contributing to water quality standard violations, additional monitoring and information is needed. In general, data / 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 vulnerable to hydroelectric projects typically include dissolved oxygen (DO), temperature, chlorophyll-a and total phosphorus. Samples are typically taken upstream and downstream of the dam. Based on our current understanding of the project, the following is recommended.

Table 2 provides proposed water quality sampling locations for the river segments of concern. Recommended parameters and frequency of monitoring are provided in Table 3 below. Figure 1, which is included at the end of this letter, depicts the project area and proposed monitoring locations.

**Table 2. Recommended Sampling Locations for Water Quality Monitoring – Clement Dam Hydroelectric Project**

Assessment Unit	Location	NHDES Station ID	Assessment Unit Size/Acreage
NHIMP700020203-05	Clement Dam Hydroelectric Project Impoundment	05T-WIN <sup>c</sup>	3 acres
NHRIV700020203-13	Clement Dam Bypass Reach	05K-WIN <sup>c</sup>	~ 700 feet
	Downstream of Clement Dam Hydroelectric Project Bypass Reach - Downstream of Tailrace	05-WIN <sup>c</sup>	0.6 miles

<sup>c</sup> The exact locations of the water quality monitoring stations should be determined after a field visit is conducted. In all cases sampling locations should be identified that will allow the sample to be collected from the thalweg of the river (central/deepest portion of the channel).

**Table 3. Recommended Water Quality Monitoring Plan for the Clement Dam Hydroelectric Project**

Site ID	Location	Purpose	Parameters	Frequency
05T-WIN	~200 feet upstream of Clement Hydroelectric Dam	Determine water quality impacts of river being impounded by the Clement Hydroelectric Dam	Continuous Dissolved Oxygen (mg/L and % Saturation) and Continuous Water Temperature (collected with Dataloggers)	At least 10 days of data collected at 15 minute increments during period of low flow ( $\leq 3 \times 7Q_{10}$ ) and high temperatures (preferably over 23 degrees C). Dataloggers should be set at the bottom of the epilimnion (if stratified) or at 25% depth if not stratified. (from June 1 – September 30)
			Instantaneous Dissolved Oxygen (mg/L and % Saturation) and Water Temperature	2 vertical profiles collected on 2 days 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 May 24 - September 15)
05K-WIN	Clement Hydroelectric Dam Bypass Reach	Determine water quality and quantity impacts in bypass reach	Continuous Dissolved Oxygen (mg/L and % Saturation) and Continuous Water Temperature (collected with Dataloggers)	At least 10 days of data collected at 15 minute increments during period of low flow ( $\leq 3 \times 7Q_{10}$ ) and high temperatures (preferably over 23 degrees C). (from June 1 – September 30)
			Discharge	3 measurements taken during period of low flow ( $\leq 3 \times 7Q_{10}$ ) during normal operation of the project. <sup>A</sup>
05-WIN	~500 feet downstream of the end of the bypass reach and the tailrace	Determine water quality condition downstream of the Clement Hydroelectric Dam and associated bypass reach	Instantaneous Dissolved Oxygen (mg/L and % Saturation) and Continuous Water Temperature	At least 10 days of data collected at 15 minute increments during period of low flow ( $\leq 3 \times 7Q_{10}$ ) and high temperatures (preferably over 23 degrees C). Dataloggers should be set at the bottom of the epilimnion (if stratified) or at 25% depth if not stratified. (from June 1 – September 30)
			Total Phosphorus and Chlorophyll-a	10 samples - once a week for 10 weeks (from May 24 - September 15)
			Discharge	3 measurements taken during period of low flow ( $\leq 3 \times 7Q_{10}$ ) during normal operation of the project. <sup>A</sup>

<sup>A</sup> Discharge measurements for stations 05K-WIN and 05-WIN should be taken within one hour of each other. NHDES discharge standard operating procedure should be utilized.

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

For each sampling station and event the following should be provided:

- Site map with longitudinal and latitudinal coordinates

- Site description including weather, vegetation, flow conditions, and any other site conditions that would potentially impact water quality
- Photographs of each monitoring location.

With regards to quality assurance/quality control, the following is recommended:

- During two sampling events replicate samples should be collected for laboratory analysis.
- A suite of field blanks should be collected for laboratory analysis during one sampling event.
- Multiparameter dataloggers and handheld meters should be calibrated for dissolved oxygen before each sampling event on-site according to the manufacturer's instructions.
- 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 in good working order 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 DES with the data.

The sampling plan should also specify that water quality data will be collected under critical low flow/high water temperature conditions. The United States Geologic Services maintains a stream gage (USGS 01081000) in Tilton, NH on the Winnepesaukee River approximately a half mile upstream of the Clement Dam Hydroelectric Project. Discharge data from this gage can be used to determine when the Winnepesaukee River at the Clement Dam Hydroelectric Project is flowing below 3 x 7Q10 low flow conditions. The 3 X 7Q10 value for USGS stream gage 1081000 is 528 cfs. During the sampling period the Clement Dam Hydroelectric Project should be operating under normal operating procedures.

Finally, the plan should specify that all data should be submitted to DES electronically and in a form that can be automatically uploaded into the DES 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 Titus at (603) 271-1152 or [Melanie.Titus@des.nh.gov](mailto:Melanie.Titus@des.nh.gov).

## 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 is typically needed:

- 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

### 3. Minimum Flows

To determine if adequate flow to support aquatic life is provided downstream of the facility, the following is typically needed:

- a. Minimum flow requirements through the penstock and bypass reach;
- b. Length of bypass reach (include pictures);
- c. Information on how the minimum flows were determined;
- d. Information on how compliance with minimum flow requirements is determined; and
- e. Documentation proving compliance with minimum flow requirements for the past five years.

Based on the data received, additional analyses may be required.

### 4. Fish Passage

To address fish passage concerns, DES will need notification from the New Hampshire Fish and Game Department (NHFG) and the U.S. Fish and Wildlife Service (USFWS) stating that they are satisfied with upstream and downstream fish passage provisions associated with the subject project. Copies of correspondence with NHFG and USFWS should be provided to DES. Contact information is provided below.

Carol Henderson and John Magee  
NH Fish and Game Department  
11 Hazen Drive, Concord, NH 03301  
603-271-3511  
[carol.henderson@wildlife.nh.gov](mailto:carol.henderson@wildlife.nh.gov)

John P. Warner, Energy/Hydropower Coordinator  
New England Field Office, U.S. Fish and Wildlife Service  
70 Commercial Street, Suite 300  
Concord, NH 03301  
(603) 223-2541 - ext.15  
[John\\_Warner@fws.gov](mailto:John_Warner@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](mailto:ted.walsh@des.nh.gov)).

Sincerely,



Ted Walsh, Surface Water Monitoring Coordinator  
NH DES Watershed Management Bureau

cc: Melanie Titus, NHDES  
Dr. Michael J. Sale, Executive Direction, Low Impact Hydropower Institute  
Carol Henderson, New Hampshire Fish and Game  
John Magee, New Hampshire Fish and Game  
John Warner, USFWS

Figure 1. Project Area and Proposed Monitoring Locations – Clement Hydroelectric Dam, Winnepesaukee River – Tilton, NH

