Draft Water Quality Certification
(33 U.S.C. §1341)

In the matter of: North Hartland, LLC
c/o Essex Hydro Associates, LLC
55 Union Street, 4th Floor
Boston, Massachusetts 02108

APPLICATION FOR NORTH HARTLAND HYDROELECTRIC PROJECT

Section 401 of the federal Clean Water Act requires that any applicant for a federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates that any such discharge will comply with other substantive provisions of the Clean Water Act. 33 U.S.C. § 1341(a)(1). The certifying state may set forth any effluent limitations and other limitations, and monitoring requirements necessary to assure that any applicant for a federal license will comply with the Clean Water Act and with any other appropriate requirement of state law. 33 U.S.C. § 1341(d). The Secretary of the Agency of Natural Resources has delegated the authority to make certification determinations to the Department of Environmental Conservation.

The Vermont Department of Environmental Conservation (the Department) has reviewed a water quality certification application dated October 23, 2020, and filed by North Hartland, LLC (the Applicant or NHL) for the North Hartland Hydroelectric Project (the Project). The supporting documentation for the application includes the Applicant's Federal Energy Regulatory Commission (FERC) license application (FERC Project No. 2816) filed with FERC under a cover letter dated November 26, 2019, and other supporting documents filed by the Applicant in support of the application. The record for this decision includes the May 29, 2020, response to a FERC Additional Information Request (AIR) and many other documents related to the project and its relicensing filed through October 1, 2021. Collectively, these materials are referred to as the "application."

The current application is subject to review under the Vermont Water Quality Standards promulgated by the Agency of Natural Resources and effective beginning January 15, 2017 (Standards). (Standards, § 29A1-01(a) Applicability).

The Department will hold a public hearing on September 29, 2021, at the Department's office located at the National Life Campus in Montpelier, Vermont to receive oral comments on this draft certification. The Department will also accept written comments through 4:30 p.m. on October 1, 2021.

The Department, based on the application and record before it, makes the following findings and conclusions:

I. Applicable Statutes and Regulations

A. Applicable provisions of the Vermont Water Quality Standards

1. The 2017 Vermont Water Quality Standards (Standards) were adopted by the Secretary of the Agency of Natural Resources pursuant to 10 V.S.A., Chapter 47, Water Pollution Control. Section 1252 of this chapter provides for the classification of designated uses as either Class A(1), A(2), B(1) or B(2) and authorizes the adoption of standards of water quality to achieve the purpose of classification.

2. All waters of the State shall be managed to support their designated and existing uses. (Standards, § 29A-104(b)).

3. The designated uses are: aquatic biota and wildlife that may utilize or are present in the waters; aquatic habitat to support aquatic biota, wildlife, or plant life; the use of waters for swimming and other primary contact recreation; the use of waters for boating and related recreational uses; the use of waters for fishing and related recreational uses; the use of waters for the enjoyment of aesthetic conditions; the use of the water for a public water source; and the use of water for irrigation of crops and other agricultural uses. (Standards, § 29A-104(d)).

4. The proposed activity affects waters classified as Class B(2) for all uses. These waters are the North Hartland Reservoir and the Ottauquechee River.

5. The management objectives for waters classified as Class B(2) for aquatic biota and wildlife are "to achieve and maintain good biological integrity". (Standards, § 29A-306(a)(3)(A)). The associated biological criteria with this use classification are "change from the natural condition for aquatic macroinvertebrate and fish assemblages not exceeding moderate changes in the relative proportions of taxonomic, functional, tolerant, and intolerant aquatic organisms." (Standards, § 29A-306(a)(3)(B)). The associated nutrient criteria with this use classification are: (1) total phosphorous concentrations not exceeding 12 µg/L in small, high-gradient rivers and streams; (2) total phosphorous concentrations not exceeding 15 µg/L in medium, high-gradient rivers and streams; and (3) total phosphorous concentrations not exceeding 27 µg/L in warmwater, medium gradient rivers and streams. A pH limit of 8.5 standard units is applicable to each size class. (Standards, § 29A-306(a)(3)(C)).

6. The management objectives for waters classified as Class B(2) for aquatic habitat are "to achieve and maintain high quality aquatic habitat. The physical habitat structure, stream processes, and flow characteristics of rivers and streams and physical character and water level of lakes and ponds necessary to fully support all life-cycle functions of aquatic biota and wildlife, including overwintering and reproductive requirements, are maintained and protected." (Standards, § 29A-306(b)(3)(A)). The associated criteria with this use classification for rivers and streams are "changes to flow characteristics, physical habitat structure, and stream processes limited to moderate differences from the natural condition and consistent with the full support of high quality aquatic habitat." (Standards, § 29A-306(b)(3)(B)(i)). The associated criteria with this use classification for lakes, ponds, and reservoirs are "changes in aquatic habitat limited to moderate differences from the natural condition and consistent with high quality aquatic

habitat. When such habitat changes are a result of water level fluctuation, compliance may be determined on the basis of aquatic habitat studies". (Standards, § 29A-306(b)(B)(3)(ii)). Additionally, "waters shall comply with the Hydrology Criteria in § 29A-304" of the Standards. (Standards, § 29A-306(b)(3)(B)(iii)).

7. The management objectives for waters classified as Class B(2) for aesthetics are "to achieve and maintain good aesthetic quality." (Standards, § 29A-306(c)(3)(A)). The associated criteria for this use classification in rivers and streams are "water character, flows, water level, bed, and channel characteristics, and flowing and falling waters of good aesthetic value." (Standards, § 29A-306(c)(3)(B)(i)). The associated nutrient criteria for this use classification in lakes, ponds, and reservoirs are total phosphorous concentrations not exceeding 18 µg/L, Secchi disk depths not less than 2.6 meters, Chlorophyll-a concentrations not exceeding 7 µg/L, and pH not exceeding 8.5 standard units. (Standards, § 29A-306(c)(3)(B)(ii)).

8. The management objectives for waters classified as Class B(2) for boating and related recreational uses are "to achieve and maintain a level of water quality compatible with good quality boating." (Standards, § 29A-306(d)(3)(A)). The associated criteria with this use classification are "waters shall comply with the Hydrology Criteria in § 29A-304 of these rules." (Standards, § 29A-306(d)(3)(B)).

9. The management objectives for waters classified as Class B(2) for fishing and related recreational uses are "to achieve and maintain a level of water quality compatible with good quality fishing." (Standards, § 29A-306(e)(3)(A)). The associated criteria with this use classification are "measures of wild salmonid densities, biomass, and age composition indicative of good population levels." (Standards, § 29A-306(e)(3)(B)(i). An Additional criterion is compliance with the temperature criteria in § 29A-302(B) of the Standards. (Standards, § 29A-306(e)(3)(B)(ii)).

10. The management objectives for waters classified as Class B(2) for swimming and related recreational uses are "to achieve and maintain a level of water quality compatible with good quality swimming and other primary contact recreation with very little risk of illness or injury from conditions that are a result of human activities." (Standards, § 29A-306(f)(3)(A)). The associated criteria with this use classification are *Escherichia coli* levels not exceeding "a geometric mean of 126 organisms/100ml obtained over a representative period of 60 days, and no more than 10% of samples above 235 organisms/100ml. In waters receiving combined sewer overflows, the representative period shall be 30 days." (Standards, § 29A-306(f)(3)(B)).

11. The management objectives for waters classified as Class B(2) for public water source use are "to achieve and maintain a level of quality that is suitable for use as a public water source with filtration and disinfection or other required treatment. (Standards, § 29A-306(g)(2)(A)). The associated criterion with this use classification is compliance "with the *Escherichia coli* criteria in subsection (f)(2)(B)" of the Standards. (Standards, § 29A-306(g)(2)(B)).

12. The management objectives or waters classified as Class B(2) for irrigation of crops and other agricultural uses are "to achieve and maintain a level of quality that is

suitable, without treatment, for irrigation of crops used for human consumption without cooking and suitable for other agricultural uses. (Standards, § 29A-306(h)).

13. The Anti-Degradation Policy in the Standards requires that "all waters shall be managed in accordance with [Standards] to protect, maintain, and improve water quality." (Standards, § 29A-105).

14. The general temperature standard for waters is "change or rate of change in temperature, either upward or downward, shall be controlled to ensure full support of aquatic biota, wildlife, and aquatic habitat uses." (Standards, § 29A-302(1)(A)).

15. Additional temperature criteria are applicable to waters based on fish habitat designation, use classification, and type of body of water. The waters affected by the Project are designated as cold water fish habitat and warm water fish habitat. (Standards, § 29A-308). The impounded waters above the North Hartland Dam are designated as cold water fish habitat, while the riverine waters below the North Hartland Dam are designated as warm water fish habitat. (Standards, § A-01(9)(H)).

16. North Hartland Reservoir is designated as cold water fish habitat and classified as Class B(2) for the fishing use where the total increase from ambient temperature due to all discharges and activities shall not exceed 1.0° F. (Standards, § 29A-302(1)(B)(iii)).

17. The Ottauquechee River is a riverine water designated as warm water fish habitat where the total increase from the ambient temperature due to all discharges and activities shall not exceed the following temperature criteria: (1) For waters with an ambient temperature above 66 degrees Fahrenheit (F), the total temperature change shall not exceed 1 degree F; (2) For waters with an ambient temperature between 63 degrees F and 66 degrees F, the total temperature change shall not exceed 2 degrees F; (3) For waters with an ambient temperature between 59 degrees F and 62 degrees F, the total temperature change shall not exceed 3 degrees F; (4) For waters with an ambient temperature between 55 degrees F and 58 degrees F, the total temperature change shall not exceed 4 degrees F; and (5) For waters with an ambient temperature below 55 degrees F, the total temperature change shall not exceed 5 degrees F.

18. In waters designated as cold water fish habitat, the dissolved oxygen (D.O.) standard is not less than 7mg/L and 75 percent saturation at all times, nor less than 95 percent saturation during late egg maturation and larval development of salmonids in areas that the Secretary determines are salmonid spawning or nursery areas important to the establishment or maintenance of the fishery resource. In all other waters designated as a cold water fish habitat, the standard is not less than 6 mg/L and 70 percent saturation. (Standards, § 29A-302(5)(A)).

19. In waters designated as warm water fish habitat, the D.O. standard is not less than 5 mg/l and 60% saturation at all times.

20. The Hydrology Policy in the Standards requires "the proper management of water resources now and for the future requires careful consideration of the interruption of the natural flow regime and the fluctuation of water levels resulting from the

construction of new, and the operation of existing, dams, diversions, and other control structures." (Standards, § 29A-103(f)(1)).

21. To effectively implement the hydrology policy, hydrology criteria shall be achieved and maintained, where applicable (Standards, § 29A-304(a)). The hydrology criteria include high flow regime criteria, streamflow protection criteria, and water level fluctuation criteria that differ by use classification.

22. The water level fluctuation criteria for lakes, ponds, reservoirs, riverine impoundments, and any other waters classified as B(2) for aquatic habitat or boating establish that "waters may exhibit artificial variations in water level when subject to water level management, but only to the extent that such variations ensure full support of uses." (Standards, § 29A-304(d)(2)).

23. The high flow regime criteria for waters classified as Class B(2) for aquatic habitat or boating require "no change from the natural flow regime that would result in runoff causing an increase in the frequency, magnitude, or duration of peak flows adversely affecting channel integrity or prevent the full support of uses." (Standards, § 29A-304(e)(2)).

24. The streamflow protection criteria for waters classified as Class B(2) for aquatic habitat or boating require that "any change from the natural flow regime shall provide for maintenance of flow characteristics that ensure the full support of uses and comply with the applicable water quality criteria." Further, the Standards establish "the preferred method for ensuring compliance with this subsection is a site-flow study. In the absence of a site-specific study, the Secretary may establish hydrologic standards and impose additional hydrologic constraints, consistent with any applicable Agency of Natural Resources rule or procedure, to ensure compliance with the requirements of this subsection." (Standards, § 29A-304(b)(3)).

II. Factual Findings

A. General Setting and Background

25. The mainstem of the Ottauquechee River is roughly 38 miles long and drains approximately 223 square miles. The main stem drops 1,485 feet in elevation over its course, originating on the eastern slopes of the Green Mountains in the Town of Killington and terminating at its confluence with the Connecticut River in the Town of Hartland.

26. The Ottauquechee River has eroded through a mantle of predominantly glacial material and some underlying bedrock. The river valley is generally characterized by glacial deposits, terrace remnants, rock outcrops and incised gorges.

27. A large portion (approximately 80 percent) of the Ottauquechee River Valley is forested. Unfavorable depths to bedrock, steep slopes, and excessive stoniness on portions of the basin limit land uses.

28. A 40-year federal license was issued to the Vermont Electric Cooperative in 1981 to develop a hydroelectric facility at the dam. In 1983, the license was transferred to the Vermont Electric Generation and Transmission Cooperative, Inc., which

completed construction of the facility in 1986 and operated it until 1996 when it filed for bankruptcy. Subsequently, ownership passed to the current licensee, which restarted operation of the station in November 2005.

29. The original license for the Project was issued on November 24, 1981, and amended on July 28, 2003, May 15, 2007, and October 8, 2009, expires on November 30, 2021. The water quality certification associated with the original license application was issued on March 18, 1981, which was amended on July 20th, 2009.

B. Project and Civil Works

30. The North Hartland Hydroelectric Project (the Project) is owned and operated by North Hartland, LLC and located on the Ottauquechee River at the base of the United States Army Corps of Engineers (USACE) flood control dam in Hartland, Vermont. The dam is approximately 1.5 miles above the confluence of the Ottauquechee River with the Connecticut River.

31. The flood control dam is a rolled earth and rockfill dam with a 24-foot top width at an elevation of 572 feet msl. The foundation of the dam is at an elevation of approximately 390 feet msl at the centerline of the dam.

32. The Project makes use of the existing dam outlet and flow control gates as an intake to the 12-foot in diameter steel penstock. Trash racks are installed upstream of the three control gates to prevent passage of large fish and debris. Water level monitoring sensors are installed at the penstock intake that input to the turbine control system.

33. The 12-foot diameter penstock bifurcates into an approximately 470-foot penstock that delivers water to the powerhouse and a penstock that delivers water to the control gate. The latter includes two additional taps that deliver water to the bypass flow system in the powerhouse, as well as a 30-inch penstock that delivers water to the bypass flow turbine.

34. The control gate is a vertical lift fixed wheel gate housed in a metal clad building. The gate is enclosed in a concrete base structure. The hoist for the gate is located above the concrete base supported by a steel frame. The control gate discharges into a 60 feet long concrete-lined channel east of the powerhouse, which then discharges to the Ottauquechee River.

35. The powerhouse is a reinforced concrete structure that measures 59 feet by 40 feet. It houses a vertical 4 MW turbine generator unit with a minimum and maximum hydraulic capacity of 120 and 810 cfs.

36. The minimum flow turbine is installed on a reinforced concrete platform erected outside of the eastern wall of the powerhouse and enclosed in a concrete and vinyl clad building. The bypass flow turbine is a fixed geometry turbine with a maximum hydraulic capacity of 30 cfs.

37. A maintenance and service area is located on the north side of the powerhouse. Access to the powerhouse is provided by a road that connects the powerhouse area to Vermont Route 5.

38. The tailrace channel is approximately 400 feet long and its width varies from about 50 feet at the powerhouse end to about 150 feet at the confluence of the outlet channel and the Ottauquechee River. The minimum flow turbine also discharges to the tailrace channel.

39. The Project interconnects to an existing three-phase distribution system via a 0.9-mile transmission line. A switchyard measuring approximately 40 feet by 50 feet is located on the north side of the penstock bifurcation adjacent to the powerhouse. A 12.5 kV transmission line runs approximately 600 feet underground in an easterly direction to a riser that connects to a 4,000 foot above ground transmission line, which continues in a northeasterly direction to interconnect at Pole 115 with GMP Distribution system via the Clay Hill Road Line 66 Transmission Project (FERC No. P-12766).

C. Hydrology and Flow Regulation

40. The flow of the Ottauquechee is unregulated above the USGS gage (01150900) in West Bridgewater.

41. Downstream of the USGS gage in West Bridgewater, flow altering activities on the Ottauquechee River include water withdrawals at Killington Mountain Resort, sewage treatment plants in Woodstock, Taftsville, Quechee, and South Woodstock, dams associated with the Taftsville, Quechee Mills, and Dewey Mills hydroelectric projects, as well as the North Hartland dam, which involves both USACE flood control operations and operations of the Project.

42. The Ottauquechee River is impounded by the North Hartland Dam, which creates the 215-acre North Hartland Reservoir. In 1970, the maximum depth was documented as 35 feet with an average depth of 12 feet. However, surveys in 1998 and 2016 documented a maximum depth of only 16 feet.

43. Both operations of the hydroelectric project and flood control activities at the USACE dam fluctuate the water levels of North Hartland Reservoir.

44. The Project regulates flow in the mainstem of the Ottauquechee River below the North Hartland Dam. There is a second USGS gage on the Ottauquechee River below the project (01151500). Hydrologic statistics for the affected reach were determined from USGS gage 01151500 from the years 1985-2019 to characterize existing conditions. For comparison, hydrologic statistics for the affected reach were also determined from the pre-dam record (1930-1957) and extended via linear regression to the 1985-2019 time period to approximate unaltered conditions over the same time period. These statistics are enumerated in Table 1.

Table 1. Hydrologic statistics for the reaches of the Ottauquechee River affected by the North Hartland Hydroelectric Project

Condition	Drainage Area (Sq. miles)	Annual Runoff (inches)	10% Exceedance Flow (cfs)	50% Exceedance Flow (cfs)	90% Exceedance Flow (cfs)	7Q10 (cfs)
Existing	220	27.9	1020	268	64.6	21.4
Unaltered	220	n/a	1004	282	83	28

D. Current and Proposed Operations

45. The North Hartland Project is licensed as a peaking facility. The Project is required to release a minimum flow of 23 cfs during the summer months and 40 cfs during winter months. Currently, there is no restriction on maximum generation flows.

46. In order to peak, the Project can fluctuate the reservoir in a 3-foot band during the winter (between 428 MSL and 425 MSL) and a 1.5-foot band in the summer (426.5 and 425 MSL).

47. Water level management is subject to a memorandum of agreement (MOA) between the Applicant and the USACE. When utilizing storage for peaking operations in the summer, the reservoir level must be returned to 425.5 MSL the following day by 10 AM.

48. Since the fourth quarter of 2012, the Project has operated in a modified run of river mode in order to qualify for Connecticut Class 1 renewable energy certificates. Generally under this regime, the reservoir is held at a set point within the operating band and outflows are equal to inflows; however, the project's infrastructure is only able to match inflow down to 120 cfs. Below this level, a limited number of discrete flows can be released (e.g., 23, 25, 40, and 60 cfs). Currently when inflow is below 120 cfs, water is typically impounded until there is sufficient water to flow through the turbines and maintain the reservoir level within the bands of the MOA.

49. The Applicant proposed the following minimum and maximum generation flows for the Project: 60/700 cfs from October through March; 160/835 cfs in April; 160/550 cfs in May; 140/450 cfs in June; and 60/300 cfs from July through September. After subsequent discussions, the Applicant agreed to accept an alternate flow regime for the Project: run-of-river from April 1 through September 30 and 225/400 cfs from October 1 through March 31.

50. The Applicant has not proposed any changes to the current water level management regime.

51. The Applicant has proposed additional mitigation measures. To address passage for American eel, the Applicant proposed to consult with the Agency of Natural Resources to implement an eel trapping program within one year of Bellows Falls (FERC No. 1855) installing upstream eel passage and review the results to

determine if permanent upstream eel passage should be installed at the project.[1] To address dissolved oxygen concentrations, the Applicant also proposed to develop a plan to mitigate the low dissolved oxygen concentrations in the project tailrace and work with the Department to implement a solution.

E. Current Status

52. The Department issued a six-part list, List of Priority Surface Waters, in 2020. Part F identifies waters altered by flow regulation where non-support of aquatic habitat and/or other designated uses has highlighted these waters for management action to address impacts associated with hydrologic alteration.

53. North Hartland Reservoir and the Ottauquechee River below the dam are listed as Priority Surface Waters on Part F. North Hartland Reservoir is listed due to annual water level fluctuations that alter aquatic habitat. The 0.9-mile reach of the Ottauquechee River below North Hartland Dam is listed due to flow regulation, partly attributed to operations of the Project.

54. The Agency's publication *Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities* is a state comprehensive plan.[2] The plan indicated that hydroelectric development has a significant impact on Vermont streams. Artificial regulation of natural stream flows and the lack of adequate minimum flow at sites were found to have reduced to a large extent the success of the state's initiatives to restore the beneficial values and uses for which the affected waters are managed under the federal Clean Water Act and Vermont law.

55. The *Statewide Management Plan for Smallmouth and Largemouth Bass* is a state comprehensive plan that identifies water level manipulation as a threat to bass and recommends that the state require permit conditions that maintain a stable pool to protect bass reproduction and aquatic habitat.[3] Additionally, a statewide survey of almost 10,000 Vermont anglers conducted in 2020, identified smallmouth and largemouth bass to be two of the top three species preferred by open water fishing anglers indicating a social desire to focus on the conservation and management of these species.

56. Vermont's *Wildlife Action Plan* lists the American eel in the Connecticut River drainage basin as a species of greatest conservation need and a medium priority.[4] Dams are identified as a threat to the species as they fragment habitat and impede access to valuable rearing habitats. A high priority strategy for eels is to restore fish passage at dams to allow upstream migrants access to rearing habitats and ensure safe, timely and effective downstream passage of silver eels. The plan

[1] Part F., Surface Waters Altered by Flow Regulation, https://dec.vermont.gov/sites/dec/files/documents/mp_PriorityWatersList_PartF_2020.pdf.
[2] DesMueles and Parks. 1988. Hydropower in Vermont. An assessment of Environmental Problems and Opportunities. Vermont Department of Environmental Conservation. Montpelier, Vermont.
[3] Vermont Fish & Wildlife Department. 2017. Statewide Management Plan for Largemouth and Smallmouth Bass. Vermont Fish & Wildlife Department. Montpelier, VT.
[4] Vermont Fish & Wildlife Department. 2015. Vermont Wildlife Action Plan 2015. Vermont Fish & Wildlife Department. Montpelier, VT.

recommends the requirement of eelways where warranted for peak passage performance.

F. Water Chemistry

57. The Project has a deep-water intake that has the potential to draw oxygen depleted water from the hypolimnion during periods of reservoir stratification.

58. The Vermont Fish and Wildlife Department (VFWD) conducted temperature monitoring in the Ottauquechee River below the project in 2005 and 2016 between the months of June and October. Additionally, VFWD deployed temperature loggers in North Hartland Reservoir in 2016, and measured temperature and dissolved oxygen (DO) along depth profiles at eight locations in July 2016.

59. The Applicant monitored dissolved oxygen and temperature in the Ottauquechee River immediately above the reservoir, within the reservoir, near the intake and immediately downstream of the tailrace in 2018. The monitoring in 2018 included depth profiles on June 8, June 22, July 5, and July 22, 2018. The Applicant conducted additional monitoring at the intake and tailrace sites in 2019.

North Hartland Reservoir

60. The continuous water temperature monitoring performed by VFWD within the reservoir in 2016 confirmed observations of limited diurnal cooling. The largest daily temperature difference within North Hartland Reservoir was 5.5°F vs. 12.8° F at the upstream site, showing even less pronounced cooling than when compared to temperatures just downstream of the reservoir.

61. The dissolved oxygen and temperature profiles collected on July 6, 2016, showed no water column stratification (no distinguishable thermocline) and low dissolved oxygen concentrations in bottom waters.

62. The Applicant's temperature and dissolved oxygen temperature profiles were similar to the results described above. There was not a distinct thermocline, but dissolved oxygen concentrations were low at depth. The lowest levels were observed on July 5, 2018, where the percent saturation of dissolved oxygen at depth was 31.2 percent at station 2 and 27.2 percent at station 3.

63. Over the course of the Applicant's monitoring in 2019, water temperature ranged from a low of 67 °F to a high of 85 °F at the intake and averaged 76.1 °F.

64. At the intake, dissolved oxygen was generally highest when the facility was generating at a flow of greater than 200 cfs, though there were periods when the DO criteria were not attained. DO in the intake area was recorded to be less than 3 mg/L on multiple occasions when the release was approximately the minimum flow (23 cfs).

Ottauquechee River

65. VTDFW's temperature monitoring (Table 2) showed that maximum daily water temperature moderated below North Hartland Dam, particularly in July and August, when temperature peaks changed more rapidly upstream as compared to the reservoir due to the mixing and large volume of water stored. Conversely, minimum daily water temperatures below North Hartland dam were consistently higher than upstream temperatures due to the limited diurnal cooling again due to the volume of water stored in the reservoir. As a result of these moderated temperatures, the average daily difference in maximum and minimum temperatures were considerably more narrow below the dam than at an upstream site.

Table 2. Temperature in the Ottauquechee River from the monitoring conducted by the Vermont Fish and Wildlife Department

Temperature Metric	Upstream Site		Below North Hartland Dam	
	2005	2016	2005	2016
Average Daily Maximum	74.6 °F	n/a*	73.4 °F	n/a*
Average Daily Minimum	65.3 °F	67.0 °F	71.0 °F	71.5 °F
Average Daily Difference	9.3 °F	7.8 °F	2.4 °F	2.5 °F

* In 2016, the temperature logger below North Hartland Dam was dewatered from July 7th and 27th, so this period could not be included in these analyses.

66. This loss of daily cooling potential can have significant consequences for cold water species which can only survive relatively short periods of high temperature. Minimum temperatures reached or exceeded 70 °F for much of the period from late June through mid-September below the North Hartland Dam.

67. Over the course of the Applicant's monitoring in 2019, temperature ranged from a low of 67 °F to a high of 85 °F in the intake and from a low of 67 °F to a high of 82 °F in the tailrace. The average water temperature was 76.1 °F in the intake and 75.5 °F in the tailrace.

68. Dissolved oxygen concentration in the tailrace varied from a minimum of 0.15 mg/L to a maximum of 8.73 mg/L, with an average of 4.77 mg/L. DO saturation varied from a minimum of 2 percent to a maximum of 105 percent, with an average of 58 percent at tailrace logger 1.

69. Dissolved oxygen in the tailrace was generally highest when the facility was generating at a flow of greater than 200 cfs though there were instances of the discharge falling below the dissolved oxygen criteria for Warm Water Fish Habitat under these conditions. DO concentration and percent saturation in the tailrace were consistently below the VWQS DO criteria when the project was releasing the minimum flow of approximately 23 cfs. DO concentration and percent saturation in the tailrace were also consistently below the VWQS DO criteria when the project was releasing a higher flow of approximately 60 cfs to the tailrace.

G. Aquatic Biota

70. "Aquatic biota" means all organisms that, as part of their natural life cycle, live in or on waters. (Standards, § 29A-102(5)). For example, fish, aquatic insects, amphibians, and some reptiles, such as turtles.

North Hartland Reservoir

71. Fisheries sampling within the reservoir has occurred periodically since 1970. Fish species observed within the reservoir are identified in Table 3.

Table 3. Fish species regularly observed within the North Hartland Reservoir

Common Name	***Scientific name***
Largemouth Bass	*Micropterus salmoides*
Northern Pike	*Esox lucius*
Fallfish	*Semotilus corporalis*
Common Rudd	*Scardinius erythrophthalmus*
Golden Shiner	*Notemigonus crysoleucas*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*
White Sucker	*Catostomus commersoni*
Brown Bullhead	*Ameiurus nebulosus*
Bluegill	*Lepomis macrochirus*
Pumpkinseed	*Lepomis gibbosus*
Yellow Perch	*Perca flavescens*
Rock Bass	*Ambloplites rupestris*
Bluntnose Minnow	*Pimephales notatus*
Rainbow trout (stocked)	*Oncorhynchus mykiss*

72. Historic observations stated that "the fishery in North Harland Reservoir is in very poor condition. Suckers, bullhead, and shiners made up 91% of the sample by number and 95% by weight". Brown trout and rainbow trout have been stocked periodically since the 1950s to provide angling opportunity. Following poor angler returns and a conclusion that "the reservoir does not meet the standards for salmonid management" the stocking of brown trout discontinued in 1969.[5] Wild (naturally reproducing) salmonids have not been observed in the reservoir since the 1980s.

73. Largemouth bass, tiger muskellunge, and walleye were stocked to improve the quality of the warm water fishery, although only largemouth bass were found within the reservoir following stocking. Of the 1,313 fish collected between 1976 and 1981, only 11 largemouth bass were captured despite stocking almost 35,000 prior to 1981. Water level fluctuations were cited as the primary physical factor affecting habitat although turbidity, bottom substrate and limited aquatic vegetation were also cited as likely contributors to poor largemouth bass productivity.[6]

[5] Claussen, J.H. 1971. North Hartland Reservoir. Vermont Fish and Wildlife Department. Federal Aid in Fish Restoration, F-12-R-4. Montpelier, Vermont.
[6] Claussen, J.H. 1984. North Hartland Lake Fish Management Plan. Vermont Fish and Wildlife Department. Montpelier, Vermont.

74. Fisheries sampling after 1987 continued to show poor largemouth bass production. During three electrofishing surveys (1990, 2005, and 2012) totaling 6.4 hours of sampling, only 33 largemouth bass were captured of which only 12 were more than 10 inches in length and two exceeded 15 inches. When compared to largemouth bass catch rates in other Vermont waters, North Hartland Reservoir ranks as one of the least productive statewide, ranking 65 of 66 in average catch per hour of quality bass (>12").[7]

75. Northern pike were first observed in the reservoir in 2012, but due to a lack of aquatic vegetation along with frequent water level fluctuations it is unlikely this fishery will provide quality angling opportunity. During an electrofishing survey in 2017, no Northern Pike were found.

Ottauquechee River

76. The Ottauquechee River below the North Hartland Dam was sampled using electrofishing gear along shallow and edge habitat in 1999 and 2016. The fish species observed are identified in Table 4.

Table 4. Fish species documented in the Ottauquechee River downstream of the Project

Common Name	***Scientific name***
Largemouth Bass	*Micropterus salmoides*
Smallmouth Bass	*Micropterus dolomieu*
Lake Chub	*Couesius plumbeus*
Tessellated Darter	*Etheostoma olmstedi*
Bluntnose Minnow	*Pimephales notatus*
Golden Shiner	*Notemigonus crysoleucas*
Common Shiner	*Luxilus cornutus*
White Sucker	*Catostomus commersoni*
Yellow Perch	*Perca flavescens*
Bluegill	*Lepomis macrochirus*
Pumpkinseed	*Lepomis gibbosus*
Longnose Dace	*Rhinichthys cataractae*
Rock Bass	*Ambloplites rupestris*

77. The Ottauquechee drainage is also within the native range of the American eel, a species of greatest conservation need in Vermont.

78. American eels were common in Vermont historically, but since colonial settlement of the state eels have been negatively affected by artificial barriers to their migrations (dams) and habitat loss and alteration.[8]

[7] Vermont Fish & Wildlife Department. 2017. Statewide Management Plan for Largemouth and Smallmouth Bass. Vermont Fish & Wildlife Department. Montpelier, VT.
[8] Vermont Fish & Wildlife Department. 2015. Vermont Wildlife Action Plan 2015. Vermont Fish & Wildlife Department. Montpelier, VT.

Protection Measures for Aquatic Biota

79. Properly sized and positioned intake screening is necessary to minimize impingement[9] and entrainment[10]. Operation of the hydroelectric project without adequate exclusionary screening may subject fish to impingement on the racks or entrainment through the turbine, which conflicts with the management objectives for aquatic biota.

80. The US Fish and Wildlife Service typically requires full depth, angled trashracks with 1-inch spacing and an approach velocity of two feet per second or less to minimize impingement and entrainment.

81. Trash racks with 2-inch clear bar spacing are installed upstream of the control gates at the intake to prevent passage of large fish and debris.

82. In order to assess the impingement and entrainment risk associated with the current trash rack configuration, the Applicant conducted a fish impingement and entrainment study.[11] The study identified species of interest in consultation with Vermont FWD, described the physical characteristics of the project, and the traits of the target species to estimate entrainment and impingement rates, as well as turbine and project survival.

83. The study reported that Golden shiner was the only target species that does not reach a size that would result in physical exclusion. Based on swim speeds and approach velocity, impingement at the intake is not expected for any of the species that may reach a size at which they would be excluded by the trash rack bar spacing. Entrainment of fish less than 200 mm in length was highest for yellow perch and lowest for rainbow trout. For fish 200-400 mm in length, entrainment estimates were relatively low. Annual entrainment for all species combined was estimated to be 48,818 for fish with lengths less than 200 mm and 1,088 for 200-400 mm fish. Entrainment risk was concluded to be low to medium for seven of the nine species evaluated, however white sucker and yellow perch were classified as having a high potential risk for entrainment. Turbine survival ranged from 0-91% through the main unit, with smaller fish having the higher estimated survival. Turbine survival for fish 40 mm in length was estimated to be 16% if passed through the minimum flow unit, while all fish greater than 60 mm would not be expected to survive if entrained through this turbine. The annual total survival for all species and size groups combined was estimated to be 73% for fish passing downstream through the project. Annual entrainment mortality was estimated to be 7,767 for fish less than 200 mm in length and 145 for 200-400 mm fish.

[9] Impingement refers to when a fish is held in contact with the intake screen by the flow of water and is unable to free itself.
[10] Entrainment refers to when a fish and other aquatic organisms is drawn into a water intake and travels through the turbine.
[11] Alden Research Laboratory. 2018. Fish Impingement and Entrainment Study for the North Hartland Hydroelectric Project (FERC No. P-2816).

H. Aquatic Habitat

84. "Aquatic habitat" means the physical, chemical, and biological components of the water environment. (Standards § 29A-102(6)). For example, aquatic plants, woody debris, and an adequate flow or water level fluctuation regime.

Hydrologic Conditions to Support Aquatic Habitat

Water Level Fluctuation in North Hartland Reservoir

85. As described in Findings 46 and 50, the applicant proposes to continue to fluctuate the water level of North Hartland Reservoir as currently licensed and outlined in the existing MOA with the USACE. The current fluctuation regime involves holding the water level near a set point or Normal Operating Level (NOL), at 425.5 msl and storing water above that point to use for generation, with the upper elevation varying by season. The water level can be raised to 426.5 msl in the summer and 428 msl in the winter for short periods of time (less than a day) before being returned to the set point by 10 AM each day. Subsequent to the Application, the Applicant stated an interest in choosing a new NOL under the new license term.

86. The near shore area of lentic systems act as a "breadbasket" because of their high productivity and physical complexity. The penetration of sunlight into the shallow waters can produce abundant plant growth. These plants provide food for other aquatic life, serve as spawning substrate for fish and provide cover for juvenile fish, forage fish and predator fish. Aquatic invertebrate production is also greatest in this area.

87. Unnatural water level fluctuations can adversely affect fish populations by limiting available habitat, affecting water quality, and impacting trophic interactions. Some fish species become increasingly vulnerable to predation as available refuge may become limited and shallow spawning species risk stranding eggs and young fish as waters recede.[12] Rising waters can also inundate nests by increasing water depth leaving eggs and young susceptible to predation and sedimentation.[13]

Winter

88. In general, winter is a stressful time for aquatic biota, where low temperatures and freezing conditions exert additional physiological stress on organisms. Additionally, for aquatic species that rely on the near shore area for overwintering, such as aquatic plants, invertebrates, and herptiles, water level drawdown can dewater this habitat, exposing organisms to desiccation, which may negatively affect the survival of aquatic biota and impact the ability of this habitat to support overwintering. As a result, the overall productivity of the reservoir may be negatively affected.

[12] Ploskey, G. R. 1986. Effects of Water-Level Changes on Reservoir Ecosystems, with Implications for Fisheries Management. Reservoir Fisheries Management: National Symposium on Managing Reservoir Fishery Resources 86-97. Bethesda, Maryland.
[13] Miranda, L.E and Bettoli, P.W. "Large Reservoirs." Inland Fisheries Management in North America Third Edition. Hubert W.A and Quist M.C. Bethesda Maryland: American Fisheries Society, 2010.

Spring and Summer

89. Water level fluctuation can adversely affect the reproduction of spring spawning species. The spawning of largemouth bass and other centrarchid species occurs from late May to early June. Nests are usually constructed in water at depths of 2 to 5 feet on gravel or broken rock and often near boulders, logs, or other cover.[14] Males guard their offspring from the egg stage until the young fry are ready to disperse, a period of a month or more. Among common hazards to eggs and fry are temperature fluctuations, floods, and receding water levels.[15]

90. Optimal spawning conditions are considered to be a relatively stable water level during spawning and for 45 days thereafter.[16] Reservoir water level fluctuations during the period from spawning through the early-fry stage can interfere with nest site selection and spawning; dewater nests, resulting in egg desiccation; cause the guardian male to abandon the nest or fry, resulting in high predation on the offspring. Since fry prefer shallow water associated with shoreline or marginal areas, they are especially vulnerable to stranding.

Streamflow Protection in the Ottauquechee River

91. Changes in flow releases from peaking hydropower projects are known to cause adverse effects on aquatic habitat.[17, 18, 19] Hydroelectric peaking operations have the potential to impact to aquatic habitat at both low and high flow events. Low flow events limit habitat by reducing stream depth (dewatering habitat and stranding organisms) and water velocity. High flow events mainly limit habitat by increasing velocities beyond the suitability of organisms.[20] These dynamics force mobile organisms to relocate since the locations of suitable habitat change, which exposes them to predation, results in energy needed for survival and growth being expended, and may also cause other behavioral effects. Immobile species and life stages are affected to a greater extent since they cannot relocate or move to suitable habitat if it shifts in location between the base and generation flows.

92. The Applicant conducted a hydraulic habitat study utilizing physical habitat simulation modelling (PHABSIM) to characterize the relationship between streamflow and aquatic habitat.

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[14] Edwards, EA., G. Gebhart, and O.E. Maughan. 1983. Habitat suitability information: smallmouth bass. USDI, FWS. FWS/ OBS-82/10.36. 47 pp.
[15] Coble, D. W. 1975. Smallmouth bass. Pages 21-33 in R.H. Stroud and H. Clepper, editors. Black bass management. National Symposium on the Biology and Management of the Centrarchid Basses, Tulsa, Oklahoma.
[16] Edwards et al., Op. cit.
[17] Cushman, R.M. 1985. Review of ecological effects of rapidly varying flows downstream from hydroelectric facilities. North American Journal of Fisheries Management 5: 330–339.
[18] Blinn, W., J.P. Shannon, L.E. Stevens, and J.P. Carder. 1995. Consequences of fluctuating discharge for lotic communities. Journal of the North American Benthological Society 14: 233–248.
[19] Freeman, M.C, Z.H. Bowen, K.D. Bovee, and E.R. Irwin. 2001. Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes. Ecological Applications 11: 179–190.
[20] [27]Thuemler, T.F., G.E. Whelan and J.D. Fossum. 1991. Assessment of the effects on aquatic habitat from a hydroelectric peaking project using the Instream Flow Incremental Methodology. Instream Flow Chronicle VIII(1):1-3.

93. The hydraulic habitat study focused on two transects in the lower study reach between the White Current Dam (FERC No. 2787) and the mouth of the Ottauquechee River and four transects in the upper study reach between the Route 5 Bridge and the North Hartland tailrace. Four to five calibration flows were measured on the Ottauquechee River during summer 2018 that span a range from low summer flows to project generating flows.

94. Target species included fallfish, white sucker, tessellated darter, smallmouth bass, and sea lamprey (spawning life stage, only in the lower section), as well as co-occurring mussels and benthic macroinvertebrates.

95. The hydraulic habitat study showed that available habitat (in terms of area weighted suitability, AWS) varied with flow. For many species and life stages considered, maximum steady state AWS occurred at flows between 240 and 450 cfs. Maximum available habitat occurred at flows below 100 cfs for several fry life stages (fallfish, smallmouth bass, and white sucker). Maximum AWS occurred at 140 cfs for smallmouth bass spawning.

96. As both the life stages present and the proposed minimum/generation flow pairs vary by season, dual and two-flow analyses were performed seasonally. Dual flow analysis was used for immobile species and represents the area of suitable habitat that overlaps at a base/peak pair. Two-flow analysis was used for mobile species and represents the minimum habitat available at the base/peak pair. The results of this analysis for the Applicant's proposed flow regime and an alternate flow regime are discussed in the subsequent findings.[21]

Winter (October – March)

97. During the winter period from October to March, species and life stages present included fallfish juveniles and adults, white sucker juveniles and adults, smallmouth bass juveniles and adults, tessellated darter adults, macroinvertebrate nymphs, and co-occurring mussels. The Applicant's proposed 60 cfs minimum flow and 700 cfs generation flow would result in suitable habitat for several species and life stages, including white sucker juveniles and adults, macroinvertebrate nymphs, and smallmouth bass adults, to be reduced by more than 50% from maximum AWS. The amount of suitable habitat for other species and life stages, including fallfish juveniles and adults, smallmouth bass juveniles, tessellated darter adults, and co-occurring mussels, would be reduced by 20 and 50% from maximum AWS.

98. Given that the amount of suitable habitat for all species and life stages considered during this time period would be reduced by more than 20% from the flow maximizing AWS, dual flow and two-flow tables were generated to analyze alternative minimum and generating flow pairs.

99. A minimum flow of 225 cfs and a generation flow of 400 cfs would increase the percent of habitat available for all species and life stages considered compared to

[21] Memorandum from Hannah Harris, Vermont Fish and Wildlife Department to Jeff Crocker (VT DEC), Bret Ladago (VT FWD), Betsy Simard (VT DEC), Eric Davis (VT DEC), and Margaret Murphy (VT FWD), Review of instream habitat under North Hartland's operating proposal, May 11, 2020.

the Applicant's initial proposal. Table 5 compares habitat availability between the Applicant's proposal and this combination. The suitable habitat available for fallfish juveniles and adults, smallmouth bass juveniles and adults, tessellated darter adults, and co-occurring mussels would maintain 80% of maximum AWS. White sucker juveniles and adults and macroinvertebrate nymphs would maintain between 50 and 80% of the maximum AWS.

Table 5. AWS for proposed flow regime (60/700 cfs) vs. alternative flow regime (225/400 cfs)

Species & life stage	AWS for proposed flow regime (60/700 cfs)	Percent loss from baseflow for proposed flow regime	AWS for alternative flow regime (225/400 cfs)	Percent loss from baseflow for alternative flow regime
Fallfish juvenile	221	16	320	6
Fallfish adult	131	3	181	6
White sucker juv. & adult	70	50	92	34
Smallmouth bass juvenile	64	25	98	4
Smallmouth bass adult	31	48	58	9
Tessellated darter adult	126	15	191	17
Co-occurring mussels	173	23	240	6
Macroinvertebrate nymphs	35	38	132	23

April

100. In addition to the year-round species considered in the October- March analysis, white sucker spawning was also considered in April. Under the Applicant's proposed 160/835 cfs flow regime, the amount of suitable habitat provided for white sucker spawning would be less than 30% of the maximum AWS.

May

101. In addition to the presence of year-round species and life stages, several species spawn in May including fallfish, white sucker, smallmouth bass, and sea lamprey. Under the Applicant's proposed 160/550 cfs flow regime, the amount of suitable spawning habitat that would be available for fallfish, white sucker, and smallmouth bass would be less than 50% of maximum AWS. The amount of suitable habitat available for sea lamprey spawning would be between 60 and 80% of maximum AWS.

June

102. During June, spawning activity continues for fallfish, white sucker, smallmouth bass, and sea lamprey. Fry stages are present for fallfish and white sucker. Under the Applicant's proposed 140/450 cfs flow regime, the amount of suitable habitat available for fallfish spawning and fry, white sucker spawning and fry, and smallmouth bass spawning would be reduced by more than 50% compared to

maximum AWS. For sea lamprey spawning, the amount of suitable habitat available would be 60-80% of maximum AWS.

Summer (July – September)

103. By July, spawning has ended for all species except sea lamprey. Fry, however, are present for fallfish, white sucker, and smallmouth bass. Under the Applicant's proposed 60/300 cfs flow regime, available habitat for fry of these species would be reduced by more than 50% from maximum AWS.

Stream Processes and Physical Structure

104. Stream processes are defined as the hydrologic, bed-load sediment, and large woody debris regimes of a particular stream reach and is a term used to describe stream channel hydraulics, or the erosion, deposition, sorting, and distribution of instream materials by the power of flowing water. Stream processes work toward an equilibrium condition, are governed by flow characteristics, stream morphology, channel roughness, and floodplain connectivity and, in part, determine physical habitat structure and aquatic habitat quality (Standards § 29A-102 (43)).

105. Physical habitat structure is defined as the diverse combination and complexity of instream forms created within substrate and woody debris on and within the bed and banks of the channel by stream processes and flow characteristics. Physical habitat structure, in part, determines aquatic habitat quality at the stream reach and stream network scales by providing for all life cycle functions, which include the full set of forms necessary for the provision of and access to cover, overwintering, and temperature refuge and the substrates necessary for feeding and reproduction of aquatic biota and wildlife (Standards, § 29A-102 (34)).

106. Repetitive water level fluctuation and flow alteration caused by hydroelectric peaking operations are known to be a major contributor to shoreline erosion.[22]

107. In order to assess the effect of project operations on stream processes and physical habitat structure, the Applicant conducted an erosion assessment focused on the shoreline and riverbank areas potentially influenced by the Project.[23] The shoreline of North Hartland Reservoir was assessed as 88.2 % stable, with 11.8 % having experienced erosion in the past, although most of these areas were generally well-vegetated at the time of the assessment. Within the Upper Ottauquechee River, approximately 15 percent of the shoreline was found to be affected by some degree of erosion including a portion located near the tailrace that may be associated with discharges from the Project and flood-control operations. Within the Lower Ottauquechee River, approximately 52% of the shoreline in this reach was characterized as eroding.

[22] Lawson, D.E., 1985, Erosion of northern reservoir shores: An analysis and application of pertinent literature: US Army Corps of Engineers Cold Regions Research and Engineering Laboratory Monograph 85-1, 198 p.
[23] VHB. 2019. North Hartland Hydroelectric Project (FERC No. 2816) Study Report: Relicensing Study 3.4 Erosion Assessment.

Passage Measures for Migratory Species to Complete Life-cycle

108. American eel is a catadromous species and is reported to only spawn in the Sargasso Sea of the Atlantic Ocean. Larvae are carried by ocean currents to coastal areas where they transform into glass eels, then elvers and begin a long upstream migration to inland waters where they can live more than 20 years (as immature yellow eels) before returning to the sea to spawn (as silver eels).

109. The Project does not currently have passage measures in place for American eel to access the inland waters above the project that are within their historical range.

110. The Applicant has proposed that within one year of the Bellows Falls Hydroelectric Project (FERC No. 1855) installing upstream eel passage, North Hartland will implement an eel trapping program. Before beginning the program, North Hartland will develop the plan with the Vermont Agency of Natural Resources (VANR) and the US Fish and Wildlife Service (USFW). The results of the trapping program will be reviewed with VANR, USFW, and US Army Corps of Engineers. The results will be used as the basis for determining if permanent upstream eel passage should be installed at the project.

I. Wildlife

111. The shoreline areas of reservoirs are, in general, important overwintering habitat for reptiles and amphibians. In addition, beaver and muskrats are known to use shoreline areas as refuge.

J. Rare, Threatened and Endangered Species

112. The Project is within the range of the dwarf wedgemussel (*Alasmidonta heterodon*) which is state and federally listed as endangered.

113. The Project is within the range of the Northern long-eared bat (*Myotis septenrionalis*) which is state listed as endangered and federally listed as threatened.

114. The Applicant has proposed avoiding tree removal activities associated with the operation or maintenance of the Project between April 1 and October 31 to protect the Northern long-eared bat.

115. Based on consultation with Vermont Fish and Wildlife's Natural Heritage Program, it was determined that a number of a Rare, Threatened, or Endangered (RTE) species may occur in the project area and may be affected by the Project.

116. The Applicant conducted a survey for RTE plants during two separate seasonal timeframes.[24] Two species of rare plants were identified within the survey area; a previously documented occurrence of snowy aster (*Oligoneuron album*) on rock outcrops along and within the Ottauquechee River, as well as undocumented

[24] VHB. 2019. North Hartland Hydroelectric Project (FERC No. 2816) Study Report: Relicensing Study 3.8 Rare, Threatened, and Endangered Plant and Natural Community Inventory.

occurrences of plains frostweed (*Helianthemum bicknellii*) in two locations, one somewhat proximal to the reservoir and the other within the corridor of a buried electric transmission line and an access road.

117. Continued operation of the Project would not impact the population of plains frostweed proximal to the reservoir, nor the snowy aster downstream of the Project.

118. Continued operation of the Project may not impact the population of plains frostweed within the corridor of a buried electric transmission line and access road if certain avoidance and mitigation measures are employed within the terrestrial portion of the Project boundary. Specifically, seasonal vehicle access and soil disturbance should be avoided in the location of and proximity to this population of plains frostweed.

K. Wetlands

119. The Vermont Water Quality Standards require the Secretary of the Agency of Natural Resources to identify and protect existing uses of state waters, which include those of surficial wetlands. The Standards prohibit activities that degrade the existing uses of wetlands. These uses can include aquatic habitat, fish and wildlife habitat, fishing, swimming, recreation, water quality maintenance and others.

120. Wetlands and their contiguous areas that appear on the Vermont Significant Wetland Inventory maps have been designated Class One or Two wetlands, unless determined otherwise by the Secretary pursuant to Section 4 of the Vermont Wetlands Rules. Any activity in a Class Two wetland or associated 50-foot buffer zone, other than allowed uses specified in Section 6 of the Vermont Wetland Rules, requires a permit authorizing such an activity from the Agency of Natural Resources (10 V.S.A. § 913). The Agency may only grant such a permit if the applicant demonstrates that the proposed activity will not have undue adverse impacts on protected wetland functions. In making this determination, the conditional use shall be assessed on the basis of both its direct and immediate effects as well as on the basis of any cumulative or on-going effects on the significant wetland. Section 5 of the Vermont Wetland Rules lists the criteria for determination of the significance of wetland functions and values. Applicants are required to apply the criteria under pre- and post-project conditions to determine if a significant impact is to be expected.

121. Two freshwater wetlands, a Palustrine Emergent wetland and a Palustrine Scrub-Shrub wetland, are mapped by the VSWI within the southern portion of the Project Boundary along the Project's overhead transmission line corridor.

L. Recreation

122. The land surrounding the Reservoir is entirely under the jurisdiction of the United States Department of Defense and consists of 1,711 acres of recreation use areas including mixed forests, wetlands, open fields, the George Perkins Marsh Conservation Area and the Quechee State Park.

123. Formal recreational facilities both at the dam and around North Hartland Reservoir are maintained and operated by the USACE and provide the opportunity to swim, boat, and fish, as well as to picnic, hike, walk, and participate in ranger-conducted programs.

M. Aesthetics

124. The discharge from the project directly impacts the aesthetics of the reach downstream, in particular, its character, flow, water level, as well as its bed and channel.

125. The Applicant conducted an aesthetic flow study to assess a range of flows in the Ottauquechee River. The flows assessed were 23, 40, 60 and 120 cfs. The study consisted of 4 participants who scored the flow, either poor, fair, good, or excellent, and how it compared to the previous flow, either significantly worse, worse, same, better or significantly better.

126. Based on an average of the scores of the participants, a flow of 23 cfs was rated as poor, 40 cfs was rated as fair, 60 cfs was rated as good to excellent, and 120 cfs was rated as excellent.

III. Analysis and Determination

127. A state's 401 certification shall assure "that a discharge from a Federally licensed or permitted activity will comply with water quality requirements." 40 C.F.R. § 121.3. Accordingly, the Department may set forth limitations and other requirements necessary for it to find that there is reasonable assurance that the discharge will not violate the Vermont Water Quality Standards.

128. Both North Hartland Reservoir and the Ottauquechee River immediately below the North Hartland Dam to its confluence with the Connecticut River are listed as priority waters on Vermont's List of Priority Surface Waters outside the Scope of the Clean Water Act Section 303(d) Part F because they do not support all designated uses. Of particular concern is non-support of aquatic habitat, due to the current flow and water-level management practices. A goal of the Standards and the Clean Water Act is to restore the biological integrity of waters such that aquatic biota and wildlife are sustained by high quality habitat.

129. Continued operation of the Project may lead to violations of water quality standards. The particular aspects of operation that have the potential to cause violations of water quality standards are analyzed below to determine the limitations and requirements necessary to find that there is reasonable assurance that the proposed activity will not violate the Vermont Water Quality Standards.

130. In addition to the specific items pertaining to the Application on review, if an activity was not presented in the Application and not consistent with the findings of this Certification, the Department reserves the right to review said activity to assure it will not cause a violation of Vermont Water Quality Standards (e.g., change in operation, maintenance drawdown, construction activity, etc.). In addition to specific operational conditions, other provisions like inspections and a

posting of this certification will also be necessary to assure the activity does not violate Vermont Water Quality Standards.

A. Water chemistry

131. The monitoring conducted by the Applicant showed dissolved oxygen levels drop below the levels required by the VWQS (Findings 68 and 69).

132. In order to meet dissolved oxygen criteria for Class B(2) warmwater fish habitat (5 mg/L and 60 percent saturation at all times) in the Ottauquechee River, the Applicant proposes to develop a proposal to mitigate the low dissolved oxygen concentration in the project tailrace in consultation with the Agency.

133. In order to provide assurance that continued operation of the project will attain the dissolved oxygen criteria, per Condition E, this certification will adopt the Applicant's proposal and require the development of a dissolved oxygen compliance and monitoring plan.

B. Aquatic Biota

134. North Hartland Reservoir supports a warm water fishery. Warm water fisheries contain fish populations able to tolerate water temperatures above 80°F for long periods of time. The Agency's goals include minimizing potential negative effects on fish and other aquatic life.

Protection Measures for Aquatic Biota

135. Based on the results of the fish impingement and entrainment study, the existing trashrack configuration does not appear to create excessive impingement and entrainment risk. Therefore, additional exclusionary measures are not required at this time. However, to assure the exclusionary devices at the project remain consistent with fisheries management objectives, by Condition G of this certification, the Applicant is required to consult with the Vermont Fish and Wildlife Department prior to the next replacement of the trash rack.

C. Aquatic Habitat

Hydrologic Conditions Necessary to Support Aquatic Habitat

Water Level Fluctuation in North Hartland Reservoir

136. Waters may exhibit artificial water level to the extent uses are supported. For aquatic habitat, this means the fluctuation regime ensures that the physical character and water levels fully support all life-cycle functions of aquatic biota and wildlife, including overwintering and reproductive requirements. Further any changes must be limited to moderate and be consistent with the previously stated objectives.

137. The current fluctuation regime involves holding the water at a set level, the NOL, at elevation 425.5 feet msl, and utilizing storage above that level for generation,

varying by season. The water level can be raised to 426.5 feet msl in the summer for short periods of time (less than a day) before being returned to the set point by 10 AM each day. In the winter, the water level can be raised to 428 feet msl.

138. To analyze whether the Applicant's proposal meets these criteria, two concerns must be assessed: whether the drawdown in the winter months will protect the overwintering of aquatic biota and whether the water level fluctuation will support spawning success in the spring and early summer months.

Winter

139. Due to the Applicant's proposal to utilize storage above the NOL, the fluctuation regime will not dewater aquatic habitat and impact the overwintering of aquatic plants, invertebrates, and herptiles in the same way that water level drawdown, which exposes organisms to dewatering and desiccation would. A regime similar to the current regime, where water levels could rise from the NOL up to elevation 428 feet msl for short periods of time is not expected to interfere with the life-cycle functions of aquatic biota. The Applicant may choose a new NOL for the new license term. Per Condition D, the Applicant shall develop a Flow and Water Level Management and Monitoring Plan that explains how the Project will be operated to comply with this certification, which shall specify the NOL and how operations will be monitored to assure the Project does not violate Vermont Water Quality Standards.

Spring and Summer

140. The poor reproduction of bass in North Hartland Reservoir (Finding 74) underlines the importance of considering the timing and magnitude of water level fluctuations on the life-cycle needs of bass, bluegill and other spring spawning species.

141. Findings 89 and 90 describe how a water level management regime that minimizes unnatural fluctuations from late May through July supports spawning and incubation, as well as the sensitive fry life stages of largemouth bass and other spring spawning species. The Applicant's proposal to continue to fluctuate the water levels during the spring and summer months is inconsistent with promoting successful spawning and rearing conditions in North Hartland Reservoir. More stable water levels during May and June will help protect spawning, incubation, and fry of bass and other spring spawning species.

142. This certification is being conditioned to include a water level fluctuation regime that protects the life cycle functions of aquatic biota and provides high quality aquatic habitat by minimizing unnatural water level fluctuations during the spring and summer periods. Specifically, Condition C requires that during this sensitive time period, the reservoir elevation shall be maintained at the NOL, except for periods when inflow is not within the range of project infrastructure.

Streamflow Protection in the Ottauquechee River

143. In the findings below, the Applicant's proposed flow regime is analyzed by season to determine if it would fully support the aquatic habitat criteria

Winter (October – March)

144. The Applicant's originally proposed 60 cfs minimum flow and 700 cfs generation flow would result in suitable habitat for several species and life stages, including white sucker adults and juveniles, macroinvertebrate nymphs, and smallmouth bass adults, being reduced by more than 50% from maximum AWS. Such a flow regime is inconsistent with high quality aquatic habitat.

145. A minimum flow of 225 cfs and a generation flow of 400 cfs would result in a flow regime that would maintain 80% of maximum AWS for most species (fallfish juveniles and adults, smallmouth bass juveniles and adults, tessellated darter adults, and co-occurring mussels), while maintaining between 50 and 80% of maximum AWS for white sucker juveniles and adults and macroinvertebrate nymphs. Considering the seasonal hydrology of the site and the dual flow context of the analysis, this flow regime is expected to provide high quality aquatic habitat during this time period.

146. This certification is being conditioned to provide a flow regime that fully supports high quality aquatic habitat during the winter period. Per Condition B of this certification, the Project shall maintain a 225 cfs minimum flow or inflow if less and not exceed a 400 cfs generation flow or inflow if greater from October through March.

April

147. In April, a flow regime that fully supports aquatic habitat must also support white sucker spawning.

148. Under the Applicant's original proposal, the amount of suitable habitat provided for white suckers would be less than 30% of the maximum AWS. This proposal would not support spawning and reproduction. Subsequent analysis did not identify a peaking regime that would fully support these critical life-cycle functions.

149. This certification is being conditioned to provide a flow regime that fully supports these life-cycle functions and maintains high quality aquatic habitat in April. To protect white sucker reproduction and provide high quality aquatic habitat for other species, per Condition B of this certification, run-of-river operations shall be implemented in April.

May

150. In May, a flow regime that fully supports aquatic habitat must also consider the spawning of fallfish, white sucker, smallmouth bass, and sea lamprey.

151. Under the Applicant's original proposal, the amount of suitable spawning habitat that would be available for fallfish, white sucker, and smallmouth bass would be less than 50% of maximum AWS, while spawning for sea lamprey would be between 60-80% of maximum AWS. This proposal would not support spawning and reproduction. Subsequent analysis did not identify a peaking regime that would fully support these critical life-cycle functions.

152. This certification is being conditioned to provide a flow regime that supports these life-cycle functions and maintains high quality aquatic habitat in May. To protect fallfish, white sucker, smallmouth bass, and sea lamprey spawning and provide high quality aquatic habitat for other species, per Condition B of this certification, run-of-river operations shall be implemented in May.

June

153. In June, a flow regime that fully supports aquatic habitat must also consider the spawning of fallfish, white sucker, smallmouth bass, and sea lamprey, as well as the sensitive fry life stages of fallfish and white suckers.

154. Under the Applicant's original proposal, the amount of suitable habitat available for fallfish spawning and fry, white sucker spawning and fry, and smallmouth bass spawning would be reduced by more than 50% compared to maximum AWS while spawning for sea lamprey would be between 60-80% of maximum AWS. This proposal would not support spawning and reproduction. Subsequent analysis did not identify a peaking regime that would fully support these critical life-cycle functions.

155. This certification is being conditioned to provide a flow regime that supports these life-cycle functions, protects sensitive life stages, and maintains high quality aquatic habitat in June. To protect fallfish, white sucker, smallmouth bass, and sea lamprey spawning, fallfish and white sucker fry, and provide high quality aquatic habitat for other species, per Condition B of this certification, run-of-river operations shall be implemented in June.

Summer (July – September)

156. In the later portion of the summer from July through September, a flow regime that fully supports aquatic habitat must not only consider the adult and juvenile life stages of resident species, but also sea lamprey spawning (until July 15) and the sensitive fry life stage of fallfish, white suckers, and smallmouth bass.

157. Under the Applicant's original proposal, available habitat for fry of these species would be reduced by more than 50% from maximum AWS. This proposal would not support these sensitive life stages. Subsequent analysis did not identify a peaking regime that would fully support the species of fry present during this time.

158. This certification is being conditioned to provide a flow regime that fully supports reproduction through the protection of sensitive life stages and maintains high quality aquatic habitat during the summer period. To protect sea lamprey spawning, fallfish, white sucker and smallmouth bass fry, and provide high quality aquatic habitat for other resident species, per Condition B of this certification, run-of-river operations shall be implemented from July through September.

Stream Processes and Physical Habitat Structure

159. Based on the results of the erosion assessment, there did not appear to be excessive erosion in the areas where the Project has the most direct effect. For example, the shoreline of North Hartland Reservoir and the upper Ottauquechee River was predominately stable. There was significant erosion in the Lower Ottauquechee River segment, however this reach is also heavily influenced by the mainstem of the Connecticut River.

160. Both the flow and water level regimes needed to support the hydrology criteria and provide high quality aquatic habitat will reduce hydrologic alteration which is expected to further alleviate any project related effects related to erosion.

Passage Measures to Protect the Life-cycle Functions of Migratory Species

161. American eel require passage above the North Hartland Dam to access inland lakes within their historical range to complete their lifecycle.

162. The Applicant proposes to provide upstream eel passage at the Project at a specific point in the future once certain conditions are met (Finding 110). Passage measures for American eel are necessary to support the life cycle functions of this migratory species. To support the life-cycle functions of American eel, this certification adopts the Applicant's proposal to provide passage per Condition F.

D. Wildlife

163. While winter drawdowns can impact the overwintering of amphibians, reptiles, and furbearers, the regime proposed by the Applicant for the winter period, which relies on raising the water level on a short-term basis is not anticipated to result in increased impacts to wildlife that inhabit the reservoir and shoreline areas.

E. Rare, Threatened, and Endangered Species

164. The United States Fish and Wildlife Service (USFWS) analyzed the Applicant's proposal and determined that there would be no effect to the federally and state endangered dwarf wedgemussel (*Alasmidonta heterodon*). The Agency concurs with this determination.

165. In order to protect the Northern long-eared bat (*Myotis septenrionalis*), the Applicant has proposed avoiding tree removal activities associated with operation or maintenance of the Project between April 1 and October 31. The USFWS determined that the Applicant's proposal was in compliance with the Northern long-eared bat rule and that the time of year restriction for tree removal was a worthy conservation measure. The Agency has determined that the time of year restriction is necessary to protect this state endangered species. This certification is conditioned to avoid impacts to state endangered species. Per Condition H, the Applicant shall develop a plan for project maintenance that avoids tree removal activities between April 1 and October 31.

166. The Agency has determined that the Applicant's proposal would not affect snowy

aster (*Oligoneuron album*) or the population of plains frostweed (*Helianthemum bicknellii*) proximal to the reservoir. However, the project may affect the population of plains frostweed that is within the corridor of a buried electric transmission line and an access road. In order to not impact to this population of rare species, avoidance and mitigation measures must be employed, including avoiding seasonal vehicular access and soil disturbance in the location of and proximity to this population of plains frostweed. This certification is conditioned to avoid impacts to this rare species. Per Condition H, the Applicant shall develop a plan for project maintenance that describes the avoidance measures that will be employed to avoid impacting plains frostweed within the corridor of the buried electric transmission line and access road.

F. Wetlands

167. The presence of two VSWI mapped freshwater wetlands along the Project's overhead transmission line corridor does raise the possibility that maintenance activities could impact these wetlands. However, the routine repair and maintenance of utility poles, lines and corridors in a manner which minimizes adverse impacts and is accordance with Best Management Practices developed by the Secretary is allowed use under the Vermont Wetland Rules (Vt. Code R. 12 030 026; Section 6). This certification is conditioned to comply with the Vermont Wetland Rules. Per Condition H, the Applicant shall develop a plan for project maintenance that includes employing the Best Management Practices developed by the Secretary when conducting repair and maintenance of utility poles and lines within the vicinity of the mapped significant wetlands.

G. Recreation

168. Adequate public access to the project affected waters for recreation use is provided by the existing USACE facilities, which are permanent in nature and actively maintained.

169. The quality of the waters to support each recreation use, boating, fishing and swimming, is expected to improve with the flow and water level regimes conditioned by this certification to attain the hydrology criteria and support aquatic habitat. Therefore, this certification as conditioned will achieve and maintain a level of water quality compatible with good quality boating, fishing, and swimming.

H. Aesthetics

170. The results of the aesthetics assessment demonstrated that a flow of 60 cfs provided good aesthetic value and full support of the aesthetics designated use. The flow regime needed to support aquatic habitat requires that a flow of at least 60 cfs be provided in each season when available from inflow. Therefore, this certification as conditioned will achieve and maintain good aesthetic quality.

I. Anti-Degradation

171. Pursuant to the Anti-Degradation Policy set forth in the Standards (§ 29A-105) and

the Agency's 2010 Interim Anti-Degradation Implementation Procedure (Procedure), the Secretary must determine whether a proposed discharge or activities are consistent with the Policy by applying the Procedure during the review of applications for any permit for a new discharge if during the application review process compliance with the Standards is evaluated pursuant to applicable state or federal law. (Procedure, Section III(A)). This includes water quality certifications required by Section 401 of the federal Clean Water Act for a federal license or permit for flow modifying activities. (Procedure, Section III(B)(3)).

172. In making a determination that proposed activities are consistent with the Anti-Degradation Policy and Implementation Procedure, the Secretary is required to use all credible and relevant information and the best professional judgement of Agency staff. (Procedure, Section III(D)). Section VIII of the Procedure governs the Agency's review of Section 401 applications for flow modifying activities. (Procedure, Section VIII(A)(1)). The Secretary may have to review a single waterbody under multiple tiers of review depending on whether a waterbody is impaired or high quality for certain parameters.

173. Tier 3 review is required if the project will discharge to an Outstanding Resource Water. (Procedure, Section VIII(D)). This project does not affect any Outstanding Resource Waters and therefore does not trigger a Tier 3 review under Section VIII of the Procedure.

174. This project affects waters classified as B(2) for all designated uses and associated criteria. The Procedure assumes these waters to be high quality for certain parameters, which triggers a Tier 2 review under Section VIII of the Procedure. (Procedure, Section VIII(E)(1)(c)). Under Tier 2, the Secretary must determine whether the proposed discharge will result in a limited reduction in water quality of a high quality water by utilizing all credible and relevant information and the best professional judgment of Agency staff. (Procedure, Section VIII(E)(2)(b)).

175. When conducting a Tier 2 review, the Secretary may consider, when appropriate, one or more of the following factors when determining if a proposed new discharge will result in a reduction in water quality: (i) the predicted change, if any, in ambient water quality criteria at the appropriate critical conditions; (ii) whether there is a change in total pollutant loadings; (iii) whether there is a reduction in available assimilative capacity; (iv) the nature, persistence and potential effects of the pollutant; (v) the ratio of stream flow to discharge flow (dilution ratio); (vi) the duration of discharge; (vii) whether there are impacts to aquatic biota or habitat that are capable of being detected in the applicable receiving water; (viii) the existing physical, chemical and biological data for the receiving water; (ix) degree of hydrologic or sediment regime modifications; and (x) any other flow modifications. (Procedure, Section VIII(E)(2)(d)).

176. The Secretary considered the foregoing factors pertinent to a Tier 2 review of the project to determine if the project will result in a reduction of water quality at each of the waters affected by the project. The principal impacts of the project at North Hartland Reservoir and the Ottauquechee River and is the flow and water level management associated with project operations and their resulting effects on aquatic habitat and water chemistry. The changes in operation of the North Hartland Hydroelectric Project will not result in a discharge of additional pollutants or reduce

other ambient water quality criteria. As a result, factors (i), (ii), (iii), (iv), (v), and (vi) are not at issue. The existing flow and water level management regime have not supported aquatic habitat and have resulted in impacts. However, Conditions B and C prescribe flow and water level management regimes that vary by season to support the differing needs of species and life stages, including the protection of life-cycle functions, while reducing the degree of hydrologic alteration. Additionally, Condition E requires a plan to be developed to assure compliance with the dissolved oxygen criteria.

177. This certification does not authorize any activities that would result in a reduction of water quality for any parameters that may be exceeding water quality standards.

178. For those parameters for which project affected waters do not exceed water quality standards, the Secretary must conduct a Tier 1 review. (Procedure, Section VIII(F)).

179. Under Tier 1 review, the Secretary may identify existing uses and determine the maintenance necessary to protect these uses. (Procedure, Section VIII(F)). In determining the existing uses to be protected and maintained, the Secretary must consider the following factors: (a) aquatic biota and wildlife that utilize or are present in the waters; (b) habitat that supports existing aquatic biota, wildlife, or plant life; (c) the use of the waters for recreation and fishing; (d) the use of the water for water supply, or commercial activity that depends directly on the preservation of an existing high level of water quality; and (e) evidence of the uses' ecological significance in the functioning of the ecosystem or evidence of the uses' rarity. (Procedure, Section VIII(F)(2)).

180. The Secretary considered the foregoing factors pertinent to a Tier 1 review of the Project and, based on information supplied by the Applicant and Agency staff field investigations, identified the following existing uses at the Ottauquechee River: aquatic biota and wildlife; aquatic habitat; aesthetics; and recreation.

181. While a minimum flow in the Ottauquechee River below the Project is required, it does not have a basis in habitat and is low by current standards. No restrictions on maximum generation flows are in place. The dissolved oxygen criteria are not consistently attained. These conditions do not protect and maintain the existing uses in the Ottauquechee River below the Project. This certification prescribes a flow and water level regime based on the varying habitat needs of aquatic biota by season that includes run-of-river operations during certain times of year to protect life-cycle functions and sensitive life stages of aquatic biota, as well as a minimum and maximum flow during other times of year to provide high quality aquatic habitat for resident species. Additionally, a plan for attaining and monitoring compliance with the dissolved oxygen criteria is required. This certification will result in improvements to water quality and will protect and maintain conditions that support existing uses.

182. The Secretary considered the foregoing factors pertinent to a Tier 1 review of the Project and, based on information supplied by the Applicant and Agency staff field investigations, identified the following existing uses North Hartland Reservoir: aquatic biota and wildlife; aquatic habitat; aesthetics; and recreation.

183. The currently permitted water level management regime in North Hartland Reservoir allows fluctuations in water levels of up to 3 feet during the winter period and 1.5 feet during the rest of the year. Currently, aquatic biota and wildlife and aquatic habitat are impacted by the water level fluctuation regime, in particular the reproduction of spring spawning species. This certification prescribes a water level management regime that reduces unnatural water level fluctuations during the spawning period. This certification will result in improvements to water quality and will protect and maintain conditions that support existing uses.

184. The Secretary finds that development and operation of the project as conditioned by this certification will comply with the Vermont Water Quality Standards and other applicable rules. Accordingly, the Secretary finds that the project, as conditioned, meets the requirements of the Policy and Procedure relating to the protection, maintenance, and improvement of water quality.

IV. Decision and Certification

The Department has examined the project application and other pertinent information deemed relevant by the Department in order to issue a decision on this certification application pursuant to the Department's responsibilities under Section 401 of the federal Clean Water Act. After examination of these materials, the Department certifies that there is reasonable assurance that operation of Project, when done in accordance with the following conditions will not violate water quality standards; will not have a significant impact on use of the affected waters by aquatic biota, fish or wildlife, including their growth, reproduction, and habitat; will not impair the viability of the existing populations; will not result in a significant degradation of any use of the waters for recreation, fishing, water supply or commercial enterprises that depend directly on the existing level of water quality; and will be in compliance with sections 301, 302, 303, 306, and 307 of the Federal Clean Water Act, 33 U.S.C. §1341, and other appropriate requirements of state law:

A. **Compliance with Conditions.** The applicant shall operate and maintain this project consistent with the findings and conditions of this certification. The Applicant shall not make any change to the project or its operation that would have a significant or material effect on the findings, conclusions or conditions of this Certification without approval of the Department.

See Findings 127 and 130 for a statement of necessity. 33 U.S.C. § 1341, 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-101.

B. **Flow Management.** When the Project is under the control of the Applicant, downstream flows shall be managed in accordance with the following seasonal schedule. Flows shall be released on a continuous basis and not interrupted. The minimum flow values listed below are or instantaneous inflow, if less, unless otherwise noted. The maximum flow values listed below are or instantaneous inflow, if greater, unless otherwise noted.

Time Period	Operating Mode	Minimum Flow	Maximum Flow
April 1 – September 30	Run-of-River*	N/A	N/A
October 1 – March 31	Peaking	225	400

See Findings 144 through 158 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-304 & § 29A-306(b).

C. **Water Level Management.** While operating in run -of-river mode, the normal operating level (NOL) shall be elevation 425 feet, elevation 426.5 feet, or an elevation in between, as selected by the Applicant. The Applicant shall indicate the selected NOL in the flow management plan. When the Project is in control of the applicant, water levels shall be managed consistent with the following seasonal operational constraints. When operating in run-of-river mode, the reservoir elevation shall be maintained at the NOL, except for necessary deviations due to the limitations of the infrastructure to match inflow. During these time periods when deviations are unavoidable, water levels should be managed according to the following prioritization by month. During the months of May to June, if inflow cannot be matched, stable or rising water levels shall be prioritized. During the months of July through September, matching outflow closest to inflow shall be

prioritized. When peaking is permitted from October through March, the reservoir shall be maintained in a range from the run-of-river NOL at the lower bound to no more than 2.5 feet above the NOL at the upper bound, unless the upper bound is exceeded due to high inflow.

See Findings 140 through 142 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-304 & § 29A-306(b).

D. **Flow and Water Level Management and Monitoring Plan.** Within 180 days of the effective date of this Certification, the Applicant shall develop and file with the Department a water level and flow management and monitoring plan detailing how the project will be operated to achieve compliance with the operational mode and conservation flows prescribed in Conditions B and C. The plan shall include a detailed description of how impoundment levels, downstream flows, and consistent bypass flows will be maintained.

The Applicant shall provide the Department with a copy of the turbine rating curve, accurately depicting the flow/production relationship. Additionally, the plan shall include information on methods for continuous monitoring of flow, water levels, and generation associated with project operation. The plan shall include procedures for reporting deviations from prescribed operating conditions to the Department. Reports shall be made within 15 days after a deviation explaining the cause, severity and duration of the deviation, observed or reported adverse environmental impacts from the incident, pertinent data, and measures to be taken to avoid recurrences. The Applicant shall maintain records and provide such records upon request by the Department.

The plan shall be subject to Department review and approval. The Department reserves the right of review and approval of any material changes made to the plan.

See Finding 139 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-304 & § 29A-306(b).

E. Dissolved Oxygen. The licensee shall develop, within 180 days of the effective date of the FERC license, a plan for measures necessary to meet dissolved oxygen standards in the Project tailrace. The plan shall include a monitoring component to assess the effectiveness of the measures taken and an implementation schedule. The plan and schedule shall be subject to approval by the Agency prior to implementation. If violations of dissolved oxygen standards persist, the applicant shall revise the plan to include additional measures to meet dissolved oxygen standards. Any revised plan shall be subject to approval by the Agency prior to implementation.

See Findings 131 through 133 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-302(5).

F. **Fish Passage.** Within one year of eel passage having been installed and commissioned at the Bellows Falls hydroelectric project on the mainstem of the Connecticut River, the Applicant shall initiate an eel trapping program. Before beginning the program, North Hartland will develop the plan with the Vermont Agency of Natural Resources (VANR) and the US Fish and Wildlife Service (USFW). The results of the trapping program will be reviewed with VANR, USFW, and US Army Corps of Engineers. The results will be used as the basis for determining if permanent upstream eel passage should be installed at the project.

See Findings 161 and 162 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-306(b).

G. **Trashracks.** Prior to the next replacement of the trashracks at the Project, the Applicant shall consult with the Department of Fish and Wildlife with respect to the trashrack design and placement, to determine the appropriate bar clearance spacing and location. The Applicant shall file the trashrack design information with the Department of Environmental Conservation for approval prior to replacement.

See Finding 135 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-306(a).

H. **Maintenance Plan.** The Applicant shall develop a maintenance plan within 180 days of the effective date of the FERC license. The plan shall identify how the project infrastructure and the transmission line will be maintained in a manner that will avoid impacts to rare, threatened, and endangered species, specifically the state endangered Northern long-eared bat and state threatened plains frostweed.

See Findings 165 and 166 for a statement of necessity. 10 V.S.A. § 5403.

I. **Debris Disposal.** Debris associated with project operation shall be disposed of in accordance with state laws and regulations.

See Findings 2 and 127 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-303(1).

J. **Maintenance and Repair Work.** Any proposals for project maintenance or repair work, including a drawdown outside the normal operating level to facilitate repair or maintenance work, shall be filed with the Department for prior review and approval, if said work may have an adverse effect on water quality.

See Findings 2 , 127, and 130 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-101(a).

K. **Compliance Inspection by Department.** The Applicant shall allow the Department to inspect the hydroelectric project at any time.

See Findings 2, 127, and 130 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-104(a).

L. Posting of Certification. A copy of this certification shall be prominently posted within the project powerhouse.

See Findings 2, 127, and 130 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-104(a).

M. Modification of License. The Department may request, at any time, that FERC reopen the license to consider modifications to the license as necessary to assure compliance with Vermont Water Quality Standards.

See Findings 2, 127, and 130 for a statement of necessity. 10 V.S.A. § 1258 & Vt. Code R. 12 030 026 § 29A-104(a).

Effective Date and Expiration of Certification

This certification shall become effective on the date of issuance, and the condition of any certification shall become conditions of the federal permit (33 U.S.C. § 1341(d)). If the federal authority denies a permit, the certification becomes null and void. Otherwise, the certification runs for the terms of the federal license or permit.

Enforcement

Upon receipt of information that water quality standards are being violated as a consequence of the project's construction or operation or that one or more certification conditions has not been complied with, the Secretary, after consultation with the applicant and notification of the appropriate federal permitting agency, may, after notice and opportunity for a public hearing, modify the Certification and provide a copy of such modification to the applicant and the federal permitting agency.

Certification conditions are subject to enforcement mechanisms available to the federal agency issuing the license and to the state of Vermont. Other mechanisms under Vermont state law may also be used to correct or prevent adverse water quality impacts from construction or operation of activities for which certification has been issued.

Appeals

Pursuant to 10 V.S.A. Chapter 220, any appeal of this decision must be filed with the clerk of the Environmental Division of the Superior Court within 30 days of the date of the decision. The Notice of Appeal must specify the parties taking the appeal and the statutory provision under which each party claims party status; must designate the act or decision appealed from; must name the Environmental Division; and must be signed by the appellant or their attorney. In addition, the appeal must give the address or location and description of the property, project, or facility with which the appeal is concerned and the name of the applicant or any permit involved in the appeal. The appellant must also serve a copy of the Notice of Appeal in accordance with Rule 5(b)(4)(B) of the Vermont Rules for Environmental Court Proceedings. For further information, see the Vermont Rules for Environmental Court Proceedings, available online at www.vermontjudiciary.org. The address for the Environmental Division is 32 Cherry Street, 2nd Floor, Suite 303; Burlington, VT 05401 (Tel. 802.951.1740).

Dated at Montpelier, Vermont this 14th day of October, 2021

Peter Walke, Commissioner
Department of Environmental Conservation

By 
Digitally signed by Peter LaFlamme
DN: cn=Peter LaFlamme, o=VTDEC, ou=Watershed Management Division, email=pete.laflamme@vermont.gov, c=US
Date: 2021.10.14 14:39:36 -04'00'

Peter LaFlamme, Director
Watershed Management Division
Department of Environmental Conservation