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

In the matter of: Green Mountain Power Corporation
77 Grove Street
Rutland, VT 05701

APPLICATION FOR OTTER CREEK HYDROELECTRIC PROJECT

The Vermont Department of Environmental Conservation (Department) has reviewed a water quality certification application dated January 23, 2014 and filed by the Green Mountain Power Corporation (GMP or the Applicant) for the Otter Creek Hydroelectric Project (the project). The supporting documentation for the application includes the Applicant's Federal Energy Regulatory Commission (FERC) application (FERC No. 2558) dated August 1, 2011and other supporting documents filed by the Applicant in support of the application. The record for this decision includes the April 11, 2012 and May 11, 2012 FERC Additional Information Request (AIR) responses; the FERC Environmental Assessment (EA) dated July 26, 2013; and many other documents related to the project and its relicensing filed through October 24, 2013.

The current application is subject to review under the Vermont Water Quality Standards adopted by the Natural Resources Board and effective beginning December 30, 2011 (Standards). (Standards, Section 1-01(A) Applicability).

The Department held a public hearing on May 7, 2014 under the rules governing certification and received testimony during the hearing and, as written filings, through May 14, 2014.

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

Findings

Background and General Setting

1. The Otter Creek Hydroelectric Project is an existing, licensed hydroelectric project located on Otter Creek, in west-central Vermont. Otter Creek is Vermont's longest river, flowing approximately one hundred miles, draining a significant portion of Addison and Rutland counties, and a smaller portion of Bennington County from its source at Emerald Lake in Dorset to its mouth at Lake Champlain in Ferrisburgh. The river has been heavily developed for hydroelectric power generation, with seven active dams on the mainstem.
2. The project consists of three developments located on Otter Creek, the Proctor, Beldens, and Huntington Falls developments. The Proctor development is located in the town of Proctor at river mile 64.2. The Beldens development at river mile 23.0 is in the town of New Haven, just north of Middlebury. Huntington Falls is the most downstream development, located at river mile 21.0 in the town of Weybridge.
3. The Otter Creek basin drains 936 square miles. The Proctor, Beldens, and Huntington Falls developments utilize runoff from an area of 362, 635, and 755 square miles, respectively.

4. The hydroelectric facilities of the Otter Creek Project were developed in the early twentieth century in order to provide power to the marble mills in Proctor, Beldens, and Huntington Falls. The Proctor development was constructed in 1905 and a new generator installed in 1926. The Beldens development was constructed in 1913 and the Huntington Falls development in 1910. The three developments remained unchanged until the 1980s, when a powerhouse, new generator, and penstock were installed at Proctor and new powerhouses were constructed at Beldens and Huntington Falls. The original powerhouses remain at all three facilities.

5. The project was first granted a federal license on February 23, 1976 as Project No. 2885, with the term of the license running from April 1, 1962 through December 31, 1993. FERC amended the license on October 15, 1981, extending the license term by 18 years, whereby the license expiration was designated as March 31, 2012. The license was further amended on May 12, 2012 to allow for construction of an access road and bridge, and on June 20, 2013 for headworks modifications, both at the Proctor Development.

6. The Otter Creek Project was formerly owned by the Vermont Marble Power Division of OMYA, Inc. FERC issued an order approving transfer of the project's license from OMYA to Central Vermont Public Service Corporation (CVPS) on November 23, 2010. In 2011, CVPS merged with Green Mountain Power Corporation. On September 13, 2012, FERC issued an order transferring the license to GMP, the current licensee.

Project and Civil Works

Existing Developments

Proctor

7. The dam at the Proctor development was built atop a natural cascade, known as Sutherland Falls. The dam is a masonry, concrete-capped structure 13 feet high and 128 feet long with a crest elevation of 466.5 feet msl. A 3-foot high inflatable flashboard system increases the crest elevation to 469.5 feet msl.

8. The Proctor intake and forebay were extensively modified in 2013 to improve the hydraulic efficiency of the project. The new intake structure has a maximum width of 30 feet, is 150 feet long from intake entrance to the headgates, and has a maximum depth of 14 feet at normal pond. A headgate structure with three steel gate panels is located at the entrance to the intake, downstream of the bypass flow gate. The trashrack structure is 17 feet high by 45 feet wide and is situated at an approximately 40 degree angle to river flow. The trashrack bars have 1-inch clear spacing. A minimum flow structure with a slide gate is located adjacent to the existing spillway abutment. A dual leaf sluice gate, 6 feet wide by 17 feet tall, is located just upstream of the right end of the trashrack structure. Downstream fish passage, if needed in the future, would be provided by an opening, 6 feet wide by 17 feet high, located upstream of the dual leaf sluice gate. This opening has a steel stoplog gate currently installed.

9. The powerhouse was constructed in 1905 and expanded in 1984. The original powerhouse is a concrete and stone masonry structure measuring 100 feet by 33 feet. The 1984 addition is a concrete and metal structure approximately 28 feet by 48 feet that is attached to the east (river) side of the original building.

10. Two penstocks lead from the headworks to the powerhouse. The first is a 9-foot diameter, 460-foot long riveted steel structure that decreases to 8 feet in diameter between a surge tank and the original powerhouse. The second penstock is 7 feet in diameter and constructed of spiral welded steel. It extends 500 feet to the 1984 powerhouse. An independently controlled headgate is located at the entrance of each penstock.

11. The original powerhouse houses one 1,680 kW unit with a maximum hydraulic capacity of 205 cfs (Unit 1) and three 750 kW turbines with a maximum capacity of 120 cfs each (Units 2-4). The 1984 addition houses Unit 5, a 2,960 kW machine with a maximum hydraulic capacity of 325 cfs. All five units are vertical Francis turbines. The development has a combined operational hydraulic capacity of 40-890 cfs and an installed capacity of 6.89 MW. Currently, Units 1-4 cannot be operated due to various mechanical and electrical problems.

12. The development also includes generator leads, two banks of 0.48/4.16 kV single-phase transformers and a 0.48/43.8 kV three-winding transformer, and appurtenant facilities.

13. The development is immediately adjacent to extensive non-project industrial buildings that were once part of the Vermont Marble Company marble works. One building, within the project boundary but not serving a project-related purpose, was removed in 2012. There is also a rail lift used to move equipment between the powerhouse and one of the mill buildings at the top of the fill slope. In 2012, the rail lift was rendered obsolete by construction of an access road and bridge immediately downstream of the powerhouse.

14. The bypass reach[1] of river extends approximately 680 feet and drops approximately 100 feet in elevation from the dam to the tailrace. At a normal headpond elevation of 469.5 feet msl, the impoundment extends 6 miles upstream and has a surface area of 92 acres. The usable storage capacity of the impoundment is 275.48 acre-feet. The normal tailwater elevation is 355 feet msl.

Beldens

15. The Beldens development consists of two concrete gravity dams on either side of a ledge/bedrock island. The east dam is 24 feet high and 57 feet long and discharges to the east channel. The west dam is approximately 15 feet high and 56 feet long and discharges to the west channel. Additionally, there is a crossover channel between two islands that conveys flow from the east to west channel downstream of the dams. The elevation of the concrete crest of both dams is 280.5 feet msl. Both are equipped with 2.5-foot high wooden flashboards, raising the crest elevation to 283.0 feet msl.

16. There are two powerhouses. The original powerhouse is a 40-foot by 44-foot concrete and stone masonry structure. A second powerhouse, a 40-foot by 75-foot concrete building, was built in 1988.

17. Two intake structures are located on the east (right) end of the east dam. The intake immediately adjacent to the dam provides water to the 1988 powerhouse. The intake is 20 feet wide and is fitted with 23-foot high trashracks that have 3 inch clear spacing. Upstream

[1] The bypass or bypass reach is that section of the river between the headworks (dam) and tailrace where a portion of the river flow is diverted through the penstock.

of the trashracks, there is a slide gate that discharges into the bypass below the east dam. Behind the trashracks, there is a headgate at the opening of a 12-foot diameter, 45-foot long concrete penstock connecting to the powerhouse. The second intake is against the riverbank on river-right. It is 26 feet wide and is fitted with 13-foot high trashracks spaced 1.125 inches on-center. A slide gate upstream of the trashracks discharges into a sluice that discharges into the tailrace of the original powerhouse. A headgate is located at the opening of a single 12-foot diameter steel penstock that bifurcates into two 10-foot-diameter sections, each 30 feet in length, connected to the original powerhouse.

18. The original powerhouse houses two horizontal Francis turbines, rated at 800 kW (Unit 1) and 949 kW (Unit 2). Unit 1 has a minimum hydraulic capacity of 100 cfs and maximum of 330 cfs. Unit 2 has a minimum capacity of 80 cfs and maximum of 320 cfs, for a combined maximum capacity of 650 cfs. These units discharge into a 120-foot long excavated tailrace. Unit 3 is in the 1988 powerhouse. It is a 4,100 kW horizontal Kaplan turbine with a minimum hydraulic capacity of 215 cfs and a maximum of 1,350 cfs. The unit discharges directly into the bypass. The development has a total hydraulic capacity of 2,000 cfs. The development also consists of generator leads, a 2.4/46 kV step-up transformer bank, and appurtenant facilities.

19. The Beldens impoundment is approximately 1.7 miles long, with a surface area of 22 acres at a normal headpond elevation of 283.0 feet msl. The impoundment provides 252.52 acre-feet of usable storage. The normal tailwater elevation is 241 feet msl.

Huntington Falls

20. The Huntington Falls development consists of a concrete gravity dam that is 31feet high and 187 feet long with a crest elevation of 215.3 feet msl. The dam is topped with a 2.5-foot-high inflatable flashboard system raising the elevation of 217.8 feet msl. Bypass flows are released through a gate adjacent to the right abutment.

21. There are two powerhouses at the development. The original powerhouse is brick masonry, measuring 42 feet by 60 feet. A second powerhouse was built in 1989. It is a concrete structure measuring 40 feet by 75 feet.

22. There is a forebay with two intakes at the west (left) end of the dam. One intake supplies water to the two units in the original powerhouse. It is equipped with approximately 26-foot wide by 13-foot high trash racks with bars spaced 1.125 inches on center. Two 10-foot diameter steel penstocks, each approximately 30 feet long, lead to the original powerhouse. The other intake provides water to the third unit in the 1989 powerhouse. The trashracks are approximately 30 feet wide and 16 feet high with bars having 2 inches of clear spacing and angled 45 degrees to the river flow. A 12-foot diameter concrete penstock, 75 feet long, connected to the 1989 powerhouse.

23. The original powerhouse houses two horizontal Francis turbines rated 600 kW (Unit 1) and 800 kW (Unit 2). Each unit has a minimum hydraulic capacity of 100 cfs and maximum hydraulic capacity of 330 cfs, but neither can be operated because of mechanical and electrical problems. The 1989 powerhouse encloses Unit 3, a 4,100 kW horizontal Kaplan turbine with a minimum hydraulic capacity of 215 cfs and a maximum of 1,350 cfs. The development has a total hydraulic capacity of 2,010 cfs. The development also includes generator leads, a 2.4/46 kV step-up transformer bank and appurtenant facilities.

24. When the turbine and powerhouse were added at Huntington Falls in 1989, installation of downstream fish passage was required to accommodate out-migrating juvenile salmonids as well as resident fish. These passage facilities were constructed. However, sometime later, the Vermont Department of Fish and Wildlife dropped Otter Creek from the Lake Champlain coldwater fishery development program.

25. The Huntington Falls impoundment is approximately 1.3 miles long, covering about 23 acres at a normal headpond elevation of 217.8 feet msl. The impoundment provides 234.16 acre-feet of usable storage. The normal tailwater elevation is 175 feet msl.

Proposed Developments

Proctor

26. The Applicant proposes to replace the Unit 1 runner with a new machine with an operating range of 66-274 cfs, driving a 2,350 kw generator. Units 2-4 will be completely replaced with identical machines that will operate between 47 and 198 cfs, driving 1,717 kW generators. Unit 5 will not be modified or replaced, but will run within a 130-325 cfs operating range. The combined turbine discharge of the five units will range from 47 to 1,188 cfs. Total station capacity will increase to 9.76 MW.

27. In addition to the unit replacements and upgrades, modifications to the station include removal of the surge tank, new water conduits in the powerhouse to improve hydraulic efficiency and new electrical switchgear, breakers, controls, and relays.

28. Planned recreation improvements include interpretive signage and a viewpoint of the falls on the site of the mill building removed in 2012. There will also be improved tailwater access to the east bank of Otter Creek from the new access road.

Beldens

29. No changes are proposed at the Beldens Development.

Huntington Falls

30. GMP is proposing to replace/upgrade Units 1 and 2 and the associated electrical equipment (switchgear, breakers, controls, and relays) in 2015 and 2016. This work will result in an increase in the project hydraulic capacity from 2,010 cfs to 2,250 cfs and an increase in project nameplate capacity from 5,500 kW to 6,725 kW.

31. A new gate will be constructed at the dam that will be used to provide conservation flows to the bypass reach.

32. The trashracks for Unit 3 will be replaced with trashracks that have 2-inch clear bar spacing. The trashracks will be oriented parallel to the river flow.

River Hydrology and Streamflow Regulation

33. Since 1928, the U.S. Geological Survey (USGS) has operated a surface water gaging station (No. 04282000) on Otter Creek at Center Rutland. The gage is 7.5 miles upstream of the Proctor Dam. The drainage area measured at the gage is 307 square miles. Over the period of record, natural river flows have been regulated by the operations of the Chittenden Reservoir

to augment flows at several unlicensed hydroelectric facilities located on East Creek. In addition, before 1991 operations from the Center Rutland Hydroelectric Project (FERC No. 2445) resulted in regulated downstream flows.

34. There is a second USGS gaging station on Otter Creek at Middlebury (No. 04282500). The gage has been operated since 1903, and has a 628 square mile drainage area. The gage is 4.2 miles upstream of the Beldens development and 6.2 miles upstream of the Huntington Falls development.

35. Hydrologic information is tabulated below for the three developments of the Otter Creek Project. The statistics are derived from data collected at the USGS gaging stations, adjusted for drainage areas. Statistics for the Proctor development are based on data from the Center Rutland gage for water years 1928-2012. The Beldens and Huntington Falls statistics are based on the Middlebury gage data for water years 1903-2012.

	Facility		
Hydrologic Statistic	**Proctor**	**Beldens**	**Huntington Falls**
Drainage Area (sq. miles)	362	635	755
Mean annual flow (cfs)	670	1049	1247
Annual runoff (inches)	25.2	22.5	22.5
10 percent exceeds (cfs)	1462	2396	2849
50 percent exceeds (cfs)	420	673	801
90 percent exceeds (cfs)	159	263	313
7Q10 (cfs)	82	150	178

Current License Conditions

Proctor

36. Inflows to the Proctor impoundment are regulated by water level management activities at Chittenden Reservoir. The Applicant releases water from the reservoir for hydropower production at three unlicensed hydroelectric developments on East Creek: East Pittsford, Glen, and Patch Pond. In addition, a run-of-river[2] hydroelectric project at Center Rutland (FERC No. 2445) is operated by the Applicant approximately 6.8 miles upstream.

37. Under the existing license, the Proctor facility is operated in a modified run-of-river operation, which allows impoundment drawdowns of 4 feet for hydroelectric production. Historically, impoundment fluctuations of this magnitude have occurred infrequently with the exception of Independent System Operator-New England (ISO-NE) power emergency

[2] A true run-of-river project is one which does not operate out of storage and, therefore, does not artificially regulate streamflows below the project's tailrace. Outflow from the project is equal to inflow to the project's impoundment on an instantaneous basis. The flow regime below the project is essentially the river's natural regime, except in special circumstances, such as following the reinstallation of flashboards and project shutdowns. Under those circumstances, a change in storage contents is necessary, and outflow is reduced below inflow for a period.

conditions, to meet local energy demands, maintenance or repairs, or to create reservoir storage in anticipation of high inflows.

38. During April, May, and the first two weeks of June, at least 50 percent of the inflow into the Proctor impoundment must be released downstream of the powerhouse. A conservation flow of 100 cfs, or inflow, is required downstream at all other times. There is no conservation flow required in the bypass reach.

39. The Applicant maintains a headpond transducer at the Proctor development to monitor the elevation of the reservoir. The reservoir levels at the development are manually controlled by operations staff.

Beldens

40. The Beldens development is operated in run-of-river mode. Under the existing license, a conservation flow of 5 cfs is released in the bypass through an opening in the flashboards of the west dam, and only leakage is released at the east dam.

41. The Applicant maintains a headpond transducer at the project. Units 1 and 2 at Beldens have pond control functionality installed, but is not currently utilized. Unit 3 can be operated in pond level control, but the project is typically operated manually due to the limited control once in this mode. During automated operations the headpond is maintained to plus or minus 1 to 1.5 inches under normal conditions. During high flow periods the Applicant operates the facility in manual mode, maintaining the headpond elevation within plus or minus 3 inches.

Huntington Falls

42. The Huntington Falls development currently is licensed to operate in run-of-river mode. A conservation flow of 15 cfs is released in the bypass reach via a gate on the north (right) end of the dam.

43. A headpond transducer is maintained at the project. The development has a pond control functionality installed on Units 1 and 2, but are not currently utilized. Unit 3 can be operated in pond level control, but pond levels are typically maintained manually by operations staff. Similar to Beldens, the headpond elevation is maintained at plus or minus 1 to 1.5 inches under normal conditions during automated operations, and within plus or minus 3 inches during high flow periods when the development is operated manually.

Applicant Proposal for Licensing

Proctor

44. GMP proposes to eliminate the four foot drawdown of the Proctor impoundment allowed under the current FERC license, with the exception of infrequent emergency operations and maintenance.

45. The Applicant proposes to maintain a continuous conservation flow of 60 cfs in the bypass reach.

46. GMP proposes to operate the development in either an instantaneous run-of-river mode or peaking mode depending on inflows and time of year. During peaking operations, GMP will operate the impoundment within a 1.5-foot range, or no lower than 468.0 msl. GMP proposes

peaking limits based on the ratio of minimum and maximum powerhouse discharge over a 24-hour period. The ratios vary with inflow and time of year, as described in the tables below. Dates are inclusive.

May 1 through June 30	
River Inflow (cfs)	**Description of Operations**
< 400	Operate in true run-of-river mode with outflows equaling inflows on an instantaneous basis.
≥ 400	Operate in peaking mode with total turbine discharge no more than 1.5 times inflow over 24 hours.

July 1 through July 15	
River Inflow (cfs)	**Description of Operations**
< 200	Operate in true run-of-river mode with outflows equaling inflows on an instantaneous basis.
200-399	Operate in peaking mode with total turbine discharge no more than 1.5 times inflow over 24 hours.
≥ 400	Operate in peaking mode with total turbine discharge no more than 2.0 times inflow over 24 hours.

July 16 through April 30	
River Inflow (cfs)	**Description of Operations**

< 200	Operate in true run-of-river mode with outflows equaling inflows on an instantaneous basis.
200-399	Operate in peaking mode with total turbine discharge no more than 2.5 times inflow over 24 hours.
≥ 400	Operate in peaking mode with total turbine discharge no more than 3.0 times inflow over 24 hours.

47. During high flows, the flashboards may be deflated to reduce potential flooding of the intakes and powerhouses.

Beldens

48. The Beldens development will operate in true run-of-river mode. The Applicant proposes to provide a continuous bypass conservation flow of 35 cfs with 10 cfs being spilled over the east dam and 25 cfs over the west dam.

Huntington Falls

49. The Huntington Falls development will operate in true run-of-river mode. The Applicant has proposed to release a continuous conservation flow of 66 cfs into the bypass reach through a newly constructed gate at the dam.

50. During high flows, the flashboards may be deflated to reduce potential flooding of the intakes and powerhouses.

Standards Designation

51. The applicable 2011 Vermont Water Quality Standards (Standards) were adopted by the Vermont Water Resources Panel pursuant to 10 V.S.A. chapter 47, Water Pollution Control. Section 1252 of the chapter provides for the classification of state waters as either Class A or Class B and authorizes the adoption of standards of water quality to achieve the purpose of classification.

52. Otter Creek is designated as Class B waters (Standards, Section 4-03). Class B waters are managed to achieve and maintain a high level of quality that fully supports designated uses, including aquatic biota, wildlife, and aquatic habitat, good aesthetic value, public water supply with filtration and disinfection, irrigation and other agricultural uses, swimming, boating, and recreation. (Standards, Section 3-04(A)).

53. Otter Creek, from the Proctor wastewater treatment facility, which is immediately downstream of the Proctor bypass reach, to Beldens Dam is classified as warm water fish habitat, as is the reach of Otter Creek downstream of Huntington Falls Dam. All other waters

of the project area, which includes the Proctor impoundment and bypass reach, the Beldens bypass reach and tailrace, and Huntington Falls impoundment are classified as coldwater fish habitat. (Standards, Section 3-05).

54. In Class B waters, the dissolved oxygen standard for coldwater fish habitat streams 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. At all times in all other waters designated as coldwater fish habitat, the standard is not less than 6 mg/L and 70 percent saturation. In warm water fish habitat streams, dissolved oxygen standard is not less than 5 mg/L and 60 percent saturation at all times. (Standards, Section 3-04(B)(2)).

55. The temperature standard for coldwater fish habitat limits increases to 1.0°F from ambient conditions. The temperature standard for warm water fish habitat limits the total increase from the ambient temperature due to all discharges and activities to the values below. (Standards, Section 3-01(B)(1)).

Ambient temperature	**Total allowable increase above ambient temperature**
Above 66°F	1°F
63° to 66°F	2°F
59° to 62°F	3°F
55° to 58°F	4°F
Below 55°F	5°F

56. The turbidity standard for coldwater fish habitat is either 10 NTU as an annual average under dry weather base-flow conditions or none in amounts or concentrations that prevent full support of uses. The turbidity standard for warmwater fish habitat is either 25 NTU as an annual average under dry weather base-flow conditions or none in amounts or concentrations that prevent full support of uses. (Standards, Section 3-04(B)(1)).

57. Settleable solids and total suspended solids cannot be present in such concentrations that full support of uses is prevented. (Standards, Section 3-01(B)(5)).

58. Under the Class B criterion for aquatic biota, wildlife and aquatic habitat, the Standards require "[n]o change from the reference condition that would prevent the full support of aquatic biota, wildlife, or aquatic habitat uses. Biological integrity is maintained and all expected functional groups are present in a high quality habitat. All life-cycle functions, including overwintering and reproductive requirements are maintained and protected." As Otter Creek has not been assigned a water management type, the criterion is "no change from reference conditions that would have an undue adverse effect on the composition of the aquatic biota, the physical or chemical nature of the substrate or the species composition or propagation of fishes." (Standards, Section 3-04(B)(4)).

59. Class B waters are managed to achieve and maintain a level of quality that fully supports boating, fishing, and other recreational uses at a high level. (Standards, Sections 3-04(A)(6) and (B)(6)).

60. Class B waters are managed to maintain water of a quality that consistently exhibits good aesthetic value. (Standards, Section 3-04(A)(2) and (B)(5)).

61. The Hydrology Policy states, "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, Section 1-02(E)(1)). For Class B waters, "[a]ny 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." (Standards, Section 3-01(C)(1)).

62. The Anti-Degradation Policy provides for protection of existing uses and high quality waters. (Standards, Section 1-03).

Present Status

63. On June 13, 2012, the U.S. Environmental Protection Agency approved a list of waters considered to be impaired based on water quality monitoring efforts and in need of total maximum daily load (TMDL) development to address the pollution. The Department submitted the list under Section 303(d) of the federal Clean Water Act. Two reaches of Otter Creek are listed as impaired for contact recreation (i.e., swimming) due to high levels of Escherichia coli (*E. coli*) in the vicinity of the Rutland wastewater treatment facility and for approximately seven miles below the Vergennes wastewater treatment facility. In both instances, the *E. coli* source is sewage overflows from the treatment facilities. (State of Vermont 2012 303(d) List of Waters, Part A – Impaired Surface Waters in Need of TMDL, June 2012).

64. The Department concurrently issued a six-part list, List of Priority Surface Waters Outside the Scope of the Clean Water Act Section 303(d) in 2012. Part C lists those surface waters where further assessment is needed. Otter Creek between the confluence with Furnace Brook upstream to the Mill River, which includes the river reach where the Proctor development is located, is listed due to the possible impairment aesthetics, aquatic life support, contact recreation and drinking water supply due to sediment, organic enrichment, toxics and metals. Part F lists those surface waters where flow alteration is altering water quality or habitat. The Proctor bypass reach is listed for aesthetics due to flow regulation in the Proctor bypass reach.

Water Chemistry

65. The water quality for the Otter Creek watershed generally meets or exceeds state standards for Class B waters. The primary water quality issue for Otter Creek is elevated concentrations of *E. coli* likely caused by agricultural runoff and effluent from wastewater treatment facilities in the watershed as determined by the Vermont Agency of Natural Resources. The affected reaches of the Otter Creek are not within project waters although several additional reaches are in need of further assessment, including a reach near the Proctor development.

66. There are eight wastewater treatment facilities that discharge to waters of the Otter Creek watershed, five of these directly to the mainstem. These include the Proctor wastewater treatment plant at river mile 63.8, just below the Proctor development bypass reach, and the Middlebury wastewater treatment plant discharges at river mile 25.2, just upstream from the Beldens development. In addition, there are 112 industrial, commercial, and stormwater discharge permits in the basin (ACRWC,[3] 2009), which may contribute to elevated bacterial counts.

Proctor

67. Dissolved oxygen monitoring conducted in 1988 for a new license at the Center Rutland Project (FERC No. 2445), approximately 6.8 miles upstream of the Proctor development, reported dissolved oxygen concentrations well above the state standard for waters classified as cold water fish habitat (FERC, 1993) with dissolved oxygen levels increasing an average of 1.2 mg/L downstream.

68. Water quality monitoring data collected by the Department of Environmental Conservation between 1985 and 2004 at three stations upstream of the Proctor development show that the sites generally met state standards on all sample days. Average water temperature was 58°F and pH was 7.97, on average, with a range of 7.74 to 8.74. The reading of 8.74, which occurred on October 31, 2001 was the only value that exceeded the state water quality standard of a maximum pH of 8.5. Only one reading for dissolved oxygen was taken, on October 6, 2004, with a level of 10.57 mg/L and a saturation of 99 percent.

69. Water quality monitoring conducted by the Department in 2006 indicated that 13.4 miles of the upper mainstem of Otter Creek, including the Proctor reach, were not meeting applicable water quality standards due to siltation and turbidity. This reach was identified as partially supporting aquatic biota habitat, aesthetics, and contact recreation. The primary cause of this impairment was streambank erosion (VTDEC, 2006).

70. Vermont Marble Power Division conducted water quality sampling for dissolved oxygen and temperature at four locations within the Proctor development: impoundment, bypass reach below dam, bypass below Sutherland Falls, and tailrace. Sampling occurred during a period of low-flow and high air temperature from August 3 – August 5, 2010. During the AM and PM sampling, the air temperature ranged from 21.7°C (71.1°F) to 25.0°C (77°F). The average daily river flow for the period as recorded at USGS gage at Center Rutland (Site No. 04282000) ranged from 212 to 297 cfs. The dissolved oxygen values ranged from a minimum of 7.2 mg/L (82.7 percent saturation) to maximum of 8.9 mg/L (103.2 percent saturation). The average water temperature was 22.3°C (72.1°F).

Beldens and Huntington Falls

71. In 1982, the Department conducted water quality monitoring at the Middlebury Lower Project, approximately 1 mile upstream of Beldens Dam, and at the Weybridge Project (FERC No. 2731), approximately 1.5 miles downstream of the Huntington Falls development. No water quality issues were identified. In addition, water quality monitoring

[3] Addison County River Watch Collaborative.

conducted at the Middlebury Lower and Weybridge Projects in 1997 by CVPS as part of the FERC relicensing process indicated no violations of water quality standards.

72. A water quality and aquatic habitat assessment conducted by the Department of Environmental Conservation in 1998 found that upstream of the Beldens development, the Otter Creek supported contact recreation only partially, due to pathogens from agricultural runoff and potential septic waste; within the vicinity of the Beldens development, water quality monitoring showed only partial support of aquatic biota/habitat and non-contact recreation due to flow alteration from the Middlebury Lower and Beldens dams, nutrient and organic enrichment from runoff and sediment, and turbidity caused by streambank erosion.

73. The Addison County River Water Collaborative (ACRWC) has been coordinating voluntary monitoring efforts on Otter Creek since 1992. The most recent water quality monitoring efforts occurred in 2005 at monitoring sites upstream of the Beldens dam (at the head of the impoundment), upstream of the Huntington Falls Dam, and downstream of Huntington Falls in the vicinity of the Weybridge Dam. *E. coli* levels in project waters were high but generally corresponded with storm events, high run-off, and flows (ACRWC, 2009). Generally, levels tend to hover just below the state standard, as evidenced by water quality monitoring conducted by ACRWC during the period 1995 – 2005.

74. Phosphorous levels were also monitored by the ACRWC during the same time and were generally reported to be lower than 0.05 mg/L, the level at which water quality impacts are possible.[4] The exception were levels reported at just above 0.05 mg/L on June 23, 2005, associated with high flows, indicating a weather event with high storm water runoff (ACRWC, 2009).

75. Vermont Marble Power Division conducted water quality sampling for dissolved oxygen and temperature data was conducted at five locations at the Beldens development which included the impoundment, three sites within the two bypass reach channels, and the tailrace. Three locations at Huntington Falls development were sampled, including the impoundment, bypass reach, and tailrace. Sampling occurred during a period of low-flow and high air temperature on August 4, 2010 at both developments. Air temperature during the AM and PM samples ranged from a minimum of 21.3°C (70.3°F) and 28.4°C (83.1°F). The average daily river flow for the period as recorded at USGS gage in Middlebury (Site No. 04282500) ranged from 360 to 370 cfs. The dissolved oxygen values observed at the Beldens development during the monitoring period ranged from 8.3 mg/L (95.2 percent saturation) to 8.9 mg/L (102.8 percent saturation). The maximum recorded water temperature was 22.8°C (73.1°F) with an average of 22.2°C (71.9°F). At the Huntington Falls development, dissolved oxygen values ranged from 8.5 mg/L (95.5 percent saturation) to 10.1 mg/L (117.6 percent saturation). The water temperature ranged from 21.2°C (70.2°F) to 23.1°C (73.6°F).

Aquatic Biota and Habitat

76. Class B waters are managed to provide high quality habitat for aquatic biota (Standards, Section 3-04(A)(1)). Aquatic biota are defined as "organisms that spend all or part of their

[4] U.S. EPA. 2000b. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. U.S. Environmental Protection Agency, Washington, D.C., EPA-822-B00-002.

life cycle in or on the water" (Standards, Section 1-01(B)(5)) including, for example, fish, aquatic insects, amphibians, and some reptiles, such as turtles.

77. Due to its geology, Otter Creek is a highly productive water course. Otter Creek is managed to support both cold water and warm water fish. Approximately 25 native and non-native fish species are known to occur in the Otter Creek watershed. Species found upstream and downstream of the projects include brown trout, rainbow trout, smallmouth bass, northern pike and yellow perch, white sucker, pumpkinseed, bluegill, bullhead and various minnow species. While trout do occur in Otter Creek, they tend to concentrate immediately below the dams or near the mouths of the cold water tributaries. Trout fisheries exist downstream of each of the developments and at the confluences of coldwater tributaries which include Furnace Brook, Neshobe River, and New Haven River.

Proctor

78. The Proctor impoundment consists of various types of shallow and deeper-water habitat. The impoundment is approximately 90 to 150 feet in width and is generally shallow, with maximum depths of approximately 10 feet. Substrate in the impoundment is generally sand, silts, and gravel with the majority of the aquatic plants found in water less than four feet deep.

79. The upper section of the Proctor bypass directly below the dam includes a set of falls that empties into a large pool which transitions into a section of pocket water before dropping sharply over Sutherland Falls. At the base of the Sutherland Falls, there is large plunge pool which mixes with flows discharged from the powerhouse.

80. From the Proctor tailrace downstream to Middlebury, a distance of approximately 30 miles, Otter Creek is characterized by steep banks and a flat sandy bottom. The creek has only a slight grade and is characterized by low stream velocities and high water depth in the segment.

81. The Proctor impoundment and bypass reach are managed as a cold water fishery. The Vermont Department of Environmental Conservation conducted a backpack electrofishing survey of Otter Creek approximately 13 miles upstream of the Proctor Development. The results indicated that the fish community upstream of and likely inclusive of the Proctor development includes brook trout, rainbow trout, yellow perch, fallfish, white sucker, longnose dace, and other minnow species.

82. Downstream of the Proctor Development's tailrace, Otter Creek in managed as a warm water fishery. The fish species found in this section of Otter Creek are northern pike, smallmouth bass, brown trout, fallfish, white suckers, yellow perch, brown bullhead, and minnow species.

Beldens

83. The Beldens impoundment is generally narrow and largely is contained within the historic river channel. The shoreline of the impoundment tends to consist of steep sections of bedrock which provide limited shoreline habitat for aquatic species. Substrate is generally silt with no vegetation. The development is to be operated in run-of-river mode with no fluctuations of the water level in the impoundment.

84. The two bypass reaches at the development are high gradient and dominated by bedrock. The bypass reach below the west dam includes a small gorge and two large step-pools. The two

channels are linked by a third crossover channel that originates in the eastern bypass reach and flows into the lowest pool of the western bypass.

85. The tailrace and downstream of the development consist of a riffle and run habitat. The substrate consists of cobble, gravel, and small boulders. The upper portion of the reach contains small plunge pools and deeper areas that were likely excavated during project construction.

86. Otter Creek downstream of the Beldens development is managed as a coolwater and warm water fishery with a special management interest in smallmouth bass and northern pike.

Huntington Falls

87. The Huntington Falls impoundment is approximately 200 feet wide. The upper end of the impoundment is shallow and transitions into a low-gradient riverine reach. The New Haven River enters Otter Creek in the impoundment, providing sediment for the formation of gravel bars.

88. The bypass reach consists of a short set of falls, steep-sided bedrock, and a boulder-dominated plunge pool and a lower pool. During all flow conditions the bypass reach pool at the base of the falls is entirely backwatered by the tailwater.

89. The tailrace creates a small section of riffle/run habitat immediately downstream of the powerhouse. The substrate in the tailrace area primarily consists of cobbles, gravel, and sand. Approximately 200 feet downstream of the powerhouse is the impoundment from the Weybridge Hydroelectric Project (FERC No. 2731).

Fish Passage and Movement

90. Fish species requiring extensive migratory corridors currently are not present in Otter Creek. Historically, the Vermont Fish and Wildlife Department stocked steelhead (*Oncorhynchus mykiss*) and Atlantic Salmon (*Salmo salar*) in the middle reaches of Otter Creek near the Huntington Falls and Beldens developments. However, stocking efforts have been discontinued and management for adfluvial fish is not expected to continue in the immediate future in Otter Creek.[5]

91. Upstream fish migration in the vicinity of the project is limited due to the dams and the natural stream morphology at each of the developments. A natural set of falls below Huntington Falls at Vergennes prevents upstream fish migration from Lake Champlain, thus adfluvial fish are not likely a historic component of the freshwater fish assemblage in the project area. In addition, Sutherland Falls, at the Proctor bypass reach, also prevents upstream fish migration.

92. While downstream fish passage facilities at the projects would benefit a limited number of resident fish species, these facilities are not deemed necessary at present. Since the Lake Champlain migratory salmonid program has been discontinued in Otter Creek, passage is no longer needed for adfluvial salmonids. Since trout are not abundant in Otter Creek, it is unlikely that significant numbers will seek to move past the dam. Warmwater fish species are

[5] Adfluvial species live in lakes and migrate into rivers or streams to spawn.

more prevalent and in general, move within river systems to a lesser extent than trout. By Condition E of this Certification, the Department is reserving the ability to require development of passage in the future if the status of fish populations or fishery management objectives change.

93. The reconstructed intake at Proctor includes a provision for downstream passage should it be deemed necessary in the future. The civil works at Beldens and does not include specific provisions for downstream fish passage. Downstream fish passage facilities were constructed in 1989 at the Huntington Falls.

94. The three project developments are equipped with trashracks designed to limit fish impingement[6] and entrainment.[7] The intake at Proctor development has a trashrack with 1-inch clear bar spacing that is situated at a 40 degree angle to river flow. The Beldens development has two sets of trashracks each serving a separate intake. The trashrack for the intake serving Units 1 and 2 has 1.125-inch clear bar spacing, while the trashrack for Unit 3 intake has 3-inch clear bar spacing and is situated at a 90 degree angle to river flow. Similarly, the Huntington Falls development has two sets of trashracks. The trashrack serving Units 1 and 2 is 1.125-inches clear spacing. GMP has proposed replacing the existing Unit 3 trashracks. The new racks will have 2-inch clear spacing and be oriented parallel to river flow.

Flow Needs for Protection of Aquatic Habitat

Proctor

95. Flow releases from the Proctor hydroelectric development will affect aquatic habitat by regulating the volume and timing of flows downstream of the project, in the bypass reach, in the reach of river downstream of the powerhouses, and in the impoundment. The degree of such effects depends to a large extent on the timing, magnitude, and frequency of the fluctuations.

Impoundment

96. The Applicant conducted a study on the effects of proposed project operations and impoundment drawdown on aquatic habitat. The gradient of Otter Creek upstream of the dam is characterized by slight slope, therefore the effects of an impoundment drawdown on the aquatic habitat depends largely upon the quantity of inflow into the impoundment.

97. The study assessed the effects of a drawdown on aquatic habitat at inflows of 87 and 326 cfs. The study identified six different habitats types within the impoundment at an elevation of 469.7 feet msl as described in the table below.[8] The results indicated that the two most

[6] 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.
[7] Entrainment refers to when a fish and other aquatic organisms is drawn into a water intake and travels through the turbine.
[8] The normal full pond elevation in the Proctor impoundment is 469.5 feet msl; however, to create base mapping for dropdowns evaluations, aerial photography was digitized, which resulted in an elevation of 469.7

abundant types of aquatic habitat present in the impoundment were habitat types 5 and 6 which represented approximately 30 and 50 percent, respectively. Habitat types 1 through 4 each contributed less than 10 percent of the total available habitat.

Habitat Type	**Description**
Habitat 1	Littoral, lentic, predominantly sand/gravel substrate, no vegetation[9,10]
Habitat 2	Littoral, lentic, predominantly silt substrate, submerged and emergent vegetation
Habitat 3	Littoral, lentic, predominantly silt substrate, no vegetation
Habitat 4	Littoral, lotic, predominantly sand/gravel substrate, no vegetation[11]
Habitat 5	Littoral, lotic, predominantly silt substrate, no vegetation
Habitat 6	Deep, lentic or lotic, silt or sand/gravel substrate

98. The study results indicate that at an inflow of 87 cfs into the impoundment, a 1-foot drawdown would result in the loss of approximately 7 acres of wetted habitat, with each additional foot of drawdown resulting in a loss of 14, 22, and 26 acres of aquatic habitat, respectively. With a full 4-foot drawdown of the reservoir, the total available aquatic habitat is reduced by 30 percent, with the greatest loss of habitat occurring within habitat type 6. Results also indicate that during the impoundment drawdown, habitat types 2 and 5 are reduced, while habitat types 3 and 4 increase, and habitat type 1 remains relatively unaffected.

99. Results at inflows of 326 cfs into the reservoir, a 1-foot drawdown results in the loss of approximately 6 acres of aquatic habitat, with each additional foot of drawdown resulting in the loss of 12, 18, and 23 acres of aquatic habitat, respectively. Under these inflow conditions the full 4-foot drawdown of the impoundment resulted in approximately 24 percent of the aquatic habitat. Similar to conditions assessed at 87 cfs, drawdown of the impoundment with an inflow of 326 cfs resulted in an increase of littoral habitat while the amount of deep water habitat decreased. Specifically, habitat types 2, 5, and 6 were reduced, habitat types 3 and 4 increased, and habitat type 1 remained relatively unaffected.

100. The Proctor impoundment contains several fish species, including smallmouth bass, yellow perch, and bluegill, that are known to spawn in near-shore littoral areas during spring and early summer months. In addition, several other fish species, such as longnose dace and northern pike occur in the impoundment and are known to utilize littoral habitat for cover and foraging. Under existing conditions with the 4-foot drawdown, any of these fish species

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feet msl. For consistency purposes, this elevation was used in GMP's subsequent calculations of drawdown/refill times.

[9] The littoral zone refers to aquatic habitat near the shoreline.

[10] Lentic systems are characterized by still waters, such as reservoirs.

[11] Lotic systems are characterized by flowing water such as rivers and streams.

utilizing the drawdown zone for spawning, cover, or foraging habitat are likely disturbed and forced to move from nests or preferred habitats.

101. The Applicant's proposal to operate the development in an instantaneous run-of-river mode from May 1 through June 30 when inflows are less than 400 cfs will protect aquatic habitat and spawning during these months within the littoral areas of the impoundment. Additionally, brown trout and rainbow trout occur in the impoundment. Of these two species, rainbow trout are spring-spawners. Generally, adult trout prefer habitat type 4 and spawning trout prefer habitat type 1. Within the impoundment there is approximately 8.4 acres of habitat type 1 when the impoundment is full. Although there is limited trout spawning habitat in the impoundment, the proposed run-of-river operations during low flow conditions from May 1 to June 30 would maintain this habitat. In addition, habitat 4 would be maximized for adult trout with a full pond level during low flow conditions.

102. Additionally, the Applicant has proposed to implement a peaking mode of operation at the development when inflows are greater than 200 cfs from July 1 through April 30 and when inflows are greater than 400 cfs from May 1 through June 30. The impoundment would be operated within a 1.5-foot range. The effects of the impoundment fluctuations will not have significant impacts because the drawdowns will occur outside of low flow conditions and the peak spawning times for the majority of the fish species present within the impoundment. Also the effects of the drawdown should not impact other juvenile and adult fish species that utilize the littoral areas for cover, rearing, or foraging, as they would be able to seek refuge by moving to other locations within the impoundment.

103. The proposed peaking operations together with the hydraulic gradient upstream of Proctor dam and inflows into the impoundment would influence the overall habitat characteristics and types of habitat available to fish species present in the impoundment. The results from the drawdown study indicate that habitat types 5 and 6 (see above table) with an inflow of 326 cfs into the impoundment resulted in the loss of approximately 2 and 9 acres, respectively and 5 to 6 acres at 87 cfs. Generally, the fish species and life stages that are present within the impoundment will utilize habitat type 5, including fry, adult, and spawning life stages, while habitat type 6 will provide habitat for adult fish species. Also under both flow conditions habitat types 3 and 4 (see above table) would increase by approximately 2 to 3 acres, while habitat type 2 would decrease by 1 to 2 acres. The complex relationship between the habitat type and quantity available at different impoundment elevations and inflows indicate that habitat for some species and life stages will be reduced and others types of preferred habitat for other species/life stages will increase under the proposed 1.5-foot drawdown regime.

104. The timing and magnitude of the purposed peaking operations will minimize negative effects to fish communities within the Proctor impoundment. The development will operate in run-of-river mode during low flow conditions to minimize the effects of peaking operations on aquatic resources within the impoundment.

Bypass Reach

105. The Proctor bypass reach is a steep section of the river which includes Sutherland Falls, and is primarily composed of bedrock controlled falls and alternating reaches of fast water and cascades. A large deep pool is located at the base of the falls, still within the bypass reach.

Although the falls prevents upstream fish passage, it likely serves as an important refuge area for fish that pass over the Proctor dam and hold in the pool prior to moving downstream.

106. A habitat-flow study was conducted in the bypass of the development to determine flows needed to protect aquatic habitat. Depth, velocity, and substrate measurements were collected at two transects at six study flows (10, 25, 54, 83, 149 and 218 cfs) to evaluate suitable habitat and river flows. The physical habitat data were then used in conjunction with habitat suitability criteria for the target species and life stages identified for this study which included adult brown trout, adult fallfish, and benthic macroinvertebrates.

107. Transects were assumed to represent the bypass reach and the habitat-flow needs and so were not multiplied by reach length. As such, the resulting habitat units of measurement were weighted usable width (WUW), as described in further detail in the license application. These habitat results provide the amount of habitat (measured as WUW) that is available across a range of discharges.

108. Habitat increased with flow over the entire range of study flows for adult brown trout and fallfish. A flow of 54 cfs provided 85 and 93 percent of the maximum amount of habitat occurring at 218 cfs for adult brown trout and fallfish, respectively. This is compared to 64 and 67 percent of the maximum habitat at the next highest flow of 25 cfs for brown trout and fallfish.

109. Study results found that there was no macroinvertebrate habitat present at a flow of 10 or 25 cfs. The percentage of habitat available then increased with all other study flows to the maximum available habitat at 218 cfs. A flow of 83 cfs provided 90 percent of the maximum amount of habitat, compared to 34 percent at the next highest study flow of 54 cfs.

110. In order to optimize the habitat for all target species within the study, results were combined to determine which flow would provide the best overall habitat conditions for the group of species and life stages considered. This analysis aims to maximize habitat available for the species or life stage with the lowest WUW value relative to the maximum WUW. When the habitat-flow relationships of the three target organisms were combined, habitat is optimized at the highest study flow of 218 cfs which provided 100 percent of all available habitat measured. Flows of 54 cfs and 83 cfs provided 34 percent and 90 percent, respectively, of the optimum with habitat for macroinvertebrates being the most limiting at lower flows.

111. A flow of 54 cfs provides good habitat conditions for both adult brown trout and fallfish but poor habitat conditions for macroinvertebrates. However, the amount of macroinvertebrate habitat in the bypass is limited and of lesser importance than would be the case in a typical riffle reach dominated by gravel, cobble, and boulder substrate. The Applicant has proposed to release 60 cfs into the bypass reach which will provide good habitat conditions within the pool.

Tailrace and Downstream

112. Otter Creek downstream of the development is generally a deep, low-gradient, meandering river with steep banks and a sandy bottom. As previously noted, the Applicant has proposed to implement a peaking mode of operation at the development under certain inflow conditions. Rapid changes in flow cause corresponding rapid changes in aquatic habitat conditions.

113. The Applicant conducted a habitat-flow study that involved taking water depth, velocity, and substrate measurements along two transects downstream of the powerhouse at 47 and 198 cfs and then used a hydraulic model to predict depths and velocities that would exist at other flows. These data were then used with habitat suitability criteria for adult brown trout, adult fallfish, benthic macroinvertebrates, and smallmouth bass (adult and fingerling) to evaluate the effects of five river flows on habitat. The habitat results provided the amount of habitat (measured as weighted usable width or WUW) that is available across a range of discharges. Typically adult smallmouth bass is not included in instream flow studies since it is a habitat generalist that also lives in lake environments and is not a fluvial-dependent species. However, the reach below the development is managed for smallmouth bass and providing suitable low velocity habitat during peaking operations is a concern.

114. For adult brown trout and fallfish, habitat increased with flow over the entire study flow range. A flow of 100 cfs provided 83 percent and 75 percent of the maximum amount of habitat for adult brown trout and fallfish, respectively. The maximum amount of habitat for these two species occurred at 198 cfs, the highest flow observed during the study. Since flows greater than 198 cfs were not included in the study, the information on the habitat flow relationship for these species was incomplete. Based on the shape of the habitat-flow curve, it is likely that the maximum amount of habitat occurs at a higher flow, in which case the percent values cited above are too high.

115. The results of the study showed the greatest amount of habitat for adult smallmouth bass was at 75 cfs. However, there was not a significant difference in habitat quantity between the study flows. In addition, the greatest amount of habitat for smallmouth bass fingerling was 150 cfs. Flows of 100 cfs and 198 cfs provided 92 percent and 97 percent of the maximum habitat available, respectively.

116. Habitat for macroinvertebrates increased with flow up to the maximum at the highest study flow of 198 cfs. A flow of 100 cfs and 150 cfs provided 45 percent and 78 percent, respectively, of the maximum amount of habitat.

117. The habitat-flow relationships of the above species and life stages were combined using the optimization technique, except that adult smallmouth bass were excluded. Results show that habitat was optimized at 198 cfs. Although, the results are difficult to interpret since habitat for adult brown trout, fallfish, and macroinvertebrates continues to increase at higher flows. Since the study did not assess flows greater than 198 cfs, it is difficult to put the results in perspective with conditions that occur more commonly under natural conditions. For this reason, another flow study was completed to address the concerns about the effects of hydropeaking flow regimes on the downstream aquatic habitat and organisms.

118. The Applicant conducted a follow-up study that assessed the downstream channel and habitat condition. The study characterized the aquatic habitat between the Proctor tailrace to the confluence of the Leicester River, approximately 23 miles downstream. The study surveyed 19 locations collecting data on habitat type, wetted width, dominant substrate, water depth, and stream bank height and slope. Three cross-sections at approximately 5-mile intervals were completed to define streambed geometry. The data was used in a hydraulic model to assess various operation scenarios on habitat conditions downstream.

119. The survey results classified the entire reach as a low-gradient, deep, run, or pool riverine mesohabitat type, with aquatic habitat being uniform with minor changes in channel type, bed

profile, water depth, substrate type, and bank slope. The flow during the survey ranged from 982 to 1,131 cfs (from USGS gage at Center Rutland prorated to site). The average thalweg water depth was approximately 12 feet, and ranged from 7.3 to 17.5 feet with a wetted channel width ranging from 78 to 114 feet with an average of 98 feet. Substrate consist of sand, mud, silt, and other fines sediments.

120. An additional study was conducted to assess how average channel water depth and velocity changed during proposed peaking operations at different distances downstream of the powerhouse.[12] Additionally, the study evaluated the attenuation of the flow pulse from proposed peaking operations as it travelled downstream. Data was evaluated for two river flows followed by a peaking flow as proposed. The first scenario (Scenario-1) evaluated model inflows at 200 cfs with a peak outflow of 1150 cfs for a duration of 1.5 hours. The second evaluated (Scenario-2) model inflows at 400 cfs to the project with peak outflow of 900 cfs for a duration of 2.8 hours. The results of the study were compared to the habitat suitability criteria for adult brown trout, adult fallfish, benthic, and smallmouth bass (adult and fingerling) to evaluate the effects of the proposed operations on habitat.

121. The results show that within 5 to 10 miles downstream from the Proctor dam that considerable attenuation of peak flow has occurred with a flow being within 100 cfs of the original inflow and an increase water surface elevation of 6 inches or less at 10 miles downstream. As expected the highest change in velocity above inflows was directly downstream of the Proctor station. Scenario-1 results showed the greatest difference in velocity between the steady inflow of 200 cfs and peak flow of 1150 cfs over a greater distance downstream of the Proctor development. Differences in water velocity and depth between the steady inflow of 400 cfs and peak inflow of 900 cfs for scenario-2 were considerably less.

122. Depth and velocity suitability for the fish species and life stages previously identified were compared to the results from each scenario. For brown trout the maximum velocities exceeded the optimal (< 2 ft/sec) condition in the tailrace area under scenario-1, but were suitable to protect habitat in scenario-2. Similarly, for fallfish the maximum velocity for scenario-1 exceeded velocity optimum in the tailrace area. Under scenario-2 velocity decreased a short distance downstream to velocities that protect habitat for fallfish.

123. The results for adult smallmouth bass showed that velocity remained within the optimum based on the habitat suitability criteria except for tailrace in scenario-1, but remained at optimum levels in scenario-2. Habitat and velocities remained adequate for juvenile smallmouth bass under base inflow and peak operating conditions for both scenario-1 and 2. However, the study did not determine if the Applicant proposed peaking operations up to three times the low inflow when inflows are $\geq$ 400 cfs in the winter would provide suitable amount of low velocity refuge. Smallmouth bass are relatively inactive during the winter months and further information was needed to determine whether low velocity areas were adequate to protect bass habitat.

124. The Applicant conducted an additional study to evaluate water velocities downstream of the Proctor tailrace to determine whether velocities from peaking operations would be suitable to

[12] Assessment of Downstream Channel and Habitat Conditions, Kleinschmidt, October 2011

protect smallmouth bass habitat during the early winter through early spring period (defined as December 15 – March 16 for these proceedings).[13] The study measured water column velocity, water depth, and total river discharge at 14 transects spaced at approximately 1-mile intervals to document water velocity patterns at 1,200 cfs and 1,000 cfs in Otter Creek below Proctor.

125. The results indicated that there were limited differences in water velocity at river flows of 1,000 and 1,200 cfs. Both flow regimes provided abundant areas of low velocity water throughout the study reach, principally along the stream margin (*i.e.,* stream banks and stream bed). The study indicates that suitable smallmouth bass habitat is available at both of these flow regimes downstream of Proctor Dam. Studies of juvenile and adult smallmouth bass habitat suitability criteria during the winter months found the optimal velocity ranged from 0 to 0.5 fps, usable ranged from 0 to 1.0 fps, and suitable from 0 to 1.5 fps. Velocities higher than 1.5 fps were avoided during the winter and areas with near-zero velocities were preferred.[14] The results indicated that downstream locations with velocities <1.5 fps are common. All transects and study flows had some habitat with velocities less than about 0.5 fps. Some had more than others and this seemed to be more related to variation between transects than between the study flows.

Beldens

126. Flows discharged below the development will essentially be unregulated, except during impoundment refilling following flashboard reinstallation.

127. The Beldens development bypasses about 500 feet of river, spilling over the eastern dam into the primary channel and flowing through a secondary channel downstream of the western dam. A crossover channel diverts part of the flow from the primary into the secondary channel. The channels consist of bedrock pools and chutes through a bedrock gorge. The habitat in the primary bypass channel consists mostly of a bedrock chute that enters a pool near the powerhouse and tailrace. The secondary bypass flows through a bedrock gorge into two pools near the downstream end of the bypass. The water level of the lower pool is controlled by ledge features about six feet higher than the downstream river level. Flow from the tertiary channel enters the secondary channel on the upstream end of the lower pool.

128. The Applicant conducted a study of the conservation flows needed for the bypass reach to determine a flow that would provide water movement and circulation to assure suitable conditions that would enhance the fish habitat value of the bypass reach. The study focused on the secondary bypass and evaluated habitat conditions in the pools by collecting depth, velocity, and substrate information from 12 survey points at five different study flows ranging from 10 to 65 cfs, spilled equally over both the eastern and western dams. In addition, the study determined the turnover rate of the water in the pools at the end of the secondary channel. Adult fallfish was used as a proxy species to determine suitable flow habitat conditions for other fish species utilizing the bypass.

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[13] Water velocity evaluation Otter Creek downstream of the Proctor tailrace, Kleinschmidt, July 2013

[14] Bovee, K.D., T.J. Newcomb, and T.G. Coon. 1994. Relations between habitat variability and population dynamics of bass in the Huron River, Michigan. Washington, DC: U.S. Geological Survey Biological Report 21. 63 p.

129. Results from the study found that under existing conditions of 10 cfs total spillage equally distributed across both dams, the majority of flow was being diverted from the primary channel through the tertiary channel, equating to 8 cfs entering the lower pool of the secondary bypass. Under these conditions study results indicate that pools had edge velocities that ranged from -0.10 to 0.23 feet per second (fps) with an average edge velocity of 0.09 fps and turnover rates of the lower and upper pools within the secondary bypass of 47 and 54 minutes, respectively.

130. At higher study flows of 20, 30, 45, and 65 cfs divided between the two dams, the overall average edge velocities increased to 0.13, 0.17, 0.20, and 0.27 fps, respectively. The percentage of flows meeting the velocity criterion for adult fallfish of 0.10 fps increased across all study flows. A flow of 30 cfs in the lower pool provided suitable habitat conditions at 80 percent of the points measured.

131. The Applicant's proposal to spill 10 and 25 cfs at the eastern and western dams, respectively, will result in a flow of 25 cfs in the secondary bypass upper pool and approximately 30 cfs in the lower pool. The turnover rate will also decrease from 47 to 12 minutes in the lower pool, and 54 to 10 minutes in the upper pool.

Huntington Falls

132. The tailraces discharge directly into the reach that is influenced by operations at the Weybridge Hydroelectric Project located 1.5 miles downstream. Operations at Weybridge can cause the impoundment to backwater to the base of Huntington Falls dam, affecting flows and aquatic habitat availability.[15] Flow from the bypass mixes with the tailrace discharge about 300 feet downstream of the dam. Habitat in the bypass consists of a large pool or slow run.

133. The Applicant conducted a study to assess the effects of Weybridge impoundment drawdown on aquatic biota and associated habitat within the Huntington Falls bypass reach. Changes in the water surface elevation and shoreline exposure were monitored by comparing conditions within the bypass and tailrace prior to, and after, a 2-foot drawdown at Weybridge impoundment. Results indicated that a 2-foot drawdown of the Weybridge impoundment resulted in a maximum decrease of 2 and 2.75 inches in water surface elevation within the Huntington Falls bypass and tailrace reaches, respectively. There was no observed loss of aquatic habitat as a result of the decrease in water surface elevation.

134. The Applicant conducted a modified instream flow study to assess the relationship between instream flow and habitat suitability, in particular flow quantity effect on water velocity conditions in the bypass reach. The target species for this study was adult fallfish.[16] The primary objective of this study is to maintain a flow regime that is suitable for the range of

[15] The Weybridge Hydroelectric Project is currently licensed as a peaking project utilizing a two foot drawdown of the impoundment for most of the year, except during April 1 through June 15 to protect fish spawning downstream and in the impoundment.

[16] Adult fallfish was the most applicable target fish species given the species' preferences for near shore areas, water depths greater than or equal to 3 feet and water velocities between 0.1 and 0.8 feet per second. Habitat suitability criteria indicated that substrate type is not an important factor for adult fallfish.

species that utilize this reach. The use of adult fallfish was intended to serve as a proxy for these other species.

135. Depth and velocity measurements were collected at 56 points in the bypass across eight transects at flows of 16, 66, 155, and 276 cfs, to assess changes in water depth and velocity with increased discharge. Habitat in the bypass is mostly a deep pool or slow run. Increasing flow in the bypass had little effect on water depth for the range of flows studied. Velocity measurements taken at 16 cfs had the lowest number of acceptable points, with only 2 percent meeting suitability criteria velocities for adult fallfish. The study flow of 66 cfs had the highest number of suitable points with 45 percent meeting criteria, and tended to decline slightly as flow increased. At 155 and 276 cfs, 36 and 29 percent of points measured had suitable velocities for adult fallfish, respectively. The number of points meeting velocity criteria tended to decrease as water velocity increased above the suitability threshold, or eddies and counter-currents developed as a result of increased discharge. Overall, study results indicated that increasing flows to 66 cfs in the bypass reach will increase suitable habitat for adult fallfish and other fish species that require moving water conditions.

Wildlife and Wetlands

136. Several types of wetlands exist in close proximity to the project developments based on the National Wetland Inventory (NWI) classification system. Additionally many of the wetlands are classified as Class II wetlands and are protected under the Vermont Wetland Rules. They include riverine floodplain, palustrine freshwater emergent, palustrine forested, and palustrine scrub-shrub wetlands.

137. Wetlands in the project area were surveyed by the previous licensee, Vermont Marble Power Division, in 2008. The survey found that the NWI maps for the Proctor impoundment were generally accurate, while the Huntington Falls and Beldens impoundments may have many more wetlands than indicated on NWI maps. Palustrine emergent marsh, scrub-shrub, and forested wetlands are present at all three developments. Generally, these wetlands exhibit similar characteristics at all three developments. Therefore, the functions and values of these three types of wetlands are similar at each development.

138. The majority of the wetlands found during the 2008 wetland survey are palustrine forested wetlands within the floodplain of Otter Creek. At the Proctor impoundment, a natural levee that ranges in height from 5-10 feet separated the majority of these floodplain wetlands from the impoundment at all but the highest flows (i.e., flood stage). At each impoundment, the forested wetland soils were a minimum of 5 feet above the normal impoundment elevation.

139. Hydroelectric operations can have effects on wetland and shoreline vegetation resulting from discharge flows in the tailrace and bypass reaches and water level fluctuations in the impoundments. Water level fluctuations can affect wetland structure and function and shoreline vegetation and habitats which have implications for wetland and riparian dependent wildlife (Bain and Mills, 2004). Frequent high water levels from excessive project discharges can result in stresses to wetland plant communities, which may have an effect on the quality of forage and cover for wildlife species associated with riparian and wetland habitats. Impoundment drawdowns, depending on the frequency and magnitude, can result in the desiccation of wetland plants and soils in the littoral zone and can encourage the establishment of exotic or invasive plants (Cronk and Fennessy, 2001; Bain and Mills, 2004).

Rare and Endangered Species and Outstanding Natural Resources

140. There are no records of federally threatened or endangered aquatic species within the project area. However, the U.S. Fish and Wildlife Service (USFWS) on-line species report indicates that the federally endangered Indiana bat (*Myotis sodalis*) is known to occur in Rutland and Addison counties, more specifically Weybridge, Vermont, where the Huntington Falls development is located. Indiana bats live in colonies, hibernating during the winter in caves, mines, and other hibernacula. During the non-hibernation season, Indiana bats live in roost trees that are characterized as either dead or dying trees, or live trees with loose bark, such as shagbark hickory (*Carya ovata)* or black locust (*Robinia pseudoacacia*), with a diameter of at least 8 inches. A USFWS assessment of the project's effects on the Indiana bat found that adverse effects to the federally-listed species may be avoided if construction activities are limited to the period from October 30 through April 1.[17]

141. There are four state-listed threatened or endangered mussel species known to occur in the project vicinity. The fluted shell (*Lasmigona costata*) and giant floater (*Pyganodon grandis*) are reported to occur in Otter Creek between Middlebury and Weybridge, thus they may occur at the Beldens and Huntington Falls developments. Black sandshell (*Ligumia recta*) and pink heelsplipper (*Potamilus alatus*) are present in Otter Creek in the lower watershed, but have only been reported below the first set of barrier falls at Vergennes.

142. Additionally, the creek heelsplitter (*Lasmigona compressa*), four-toed salamander (*Hemidactylium scutatum*), and mudpuppy (*Necturus maculosus*) are rare species in Vermont and are known to or could occur in the project vicinity.

143. The Vermont Non-Game and Natural Heritage Program lists five rare vascular plant species that occur in the project vicinity: water sedge (*Carex aquatilus*), loose sedge (*Carex laxiculmis*), stiff gentian (*Gentianella quinquefolia*), slender pondweed (*Potamogeton filiformis* var. *borealis*), and small dropseed (*Sporobolus neglectus*).

Shoreline Erosion

144. Erosion is not extensive within the project area. In the vicinity of the project area, Otter Creek has forested riverbanks and shorelines that are composed of bedrock. In general, the impoundments have moderately to steeply sloped banks and are forested to the river's edge. Otter Creek between the Proctor development to just upstream of the Beldens development is characterized by slow, flat water and meandering stream sections. From the Beldens development to downstream of the Huntington Falls development, Otter Creek increases in grade, with an average drop in elevation of 22 feet per mile.

145. Sections of the Proctor impoundment have steep bedrock shorelines. Downstream of the development, the river has a moderate to low gradient shoreline with cobble bars.

146. The banks of both the Huntington Falls and Beldens impoundments have many areas composed largely of bedrock substrate and vertical ledge with steeply-sloped shoreline areas composed of clay substrate.

[17] U.S. Fish and Wildlife Service letter from Thomas R. Chapman, New England Office Supervisor, Concord, NH to Kimberly D. Bose, Secretary, FERC, Washington, D.C., February 14, 2013.

Recreation

147. Otter Creek in the vicinity of the project developments is popular for several recreational uses, including fishing, canoeing, kayaking, sightseeing, and hiking. The river is enjoyed by both local residents and visitors to the area. In general, recreational facilities at the project facilities are not heavily utilized at present.

Proctor

148. At the Proctor development, there are two informal sites providing access to the impoundment and tailrace area. The impoundment can be accessed upstream of the Main Street Marble Bridge, less than a mile upstream of the dam. Access to the impoundment provides opportunities for bank fishing and a carry-in access for canoe and kayaks.

149. Access to the tailrace area for fishing, launching canoes and kayaks, and viewing Sutherland Falls is provided adjacent to the development's access road. Access to this area was improved when the access road and bridge were constructed in 2012, but the site is otherwise undeveloped. Access across the bridge is restricted for safety and security reasons, so public access is limited to the east (river-right) bank of the river.

150. Recreation at the development is primarily shoreline or land based with shorelines at the informal access areas gently sloping and not rocky enabling anglers and boaters to reach the water. A recreational assessment at the development confirmed that bank fishing was the most popular activity at the development, with nearly 72 percent of survey respondents participating in the activity.

151. The removal (in 2012) of an unused mill building on river-left between the dam and the powerhouse provides an opportunity for viewing and interpretation of the project and adjacent marble works. The Applicant proposes to provide public access to this area and install interpretive signage.

152. The Applicant is proposing enhancements at the tailwater access that include a small (2-3 vehicle) parking area and directional signage. The improved access provided by the upgraded access road and greater awareness of the recreational opportunity provided by the site may increase usage of the area.

153. Although recreational paddling opportunities on this reach of Otter Creek are supported by the informal take-out upstream of the bridge, there are no formal provisions for portaging around the development. A fairly long (approximately 0.5 mile) carry is possible using public roads and the powerhouse access road, and a put-in exists at the tailrace access area.

Beldens

154. The development offers opportunities for boating, angling, picnicking, sightseeing, hiking, and biking. Recreational amenities downstream of the dam include the canoe and kayak portage, put-in for canoes and kayaks, viewing platform, and a picnic area with grills and tables. Bank fishing occurs near the put-in and the viewing platform is also used by anglers. Facilities upstream of the dam include the canoe and kayak take-out and portage. This area is also used for bank fishing.

155. The Trail-Around Middlebury, managed by the Middlebury Area Land Trust, traverses the development and offers 18 miles of hiking and biking trails. The development is at the northern end of the trail and the development's parking lot is used by recreationists to access the trail.

156. The recreational assessment study conducted by Vermont Marble found that canoeing and kayaking was the most popular activity with 22 percent of survey respondents engaging in the activity. Other activities visitors engaged in were sightseeing, bank fishing, and hiking.

157. GMP is proposing, in consultation with the Vermont Agency of Natural Resources and the Middlebury Area Land Trust, to add signage and conduct brush clearing to clearly define the location of the existing canoe and kayak take-out and portage trail around the development.

Huntington Falls

158. The Huntington Falls development has recreational sites that provide access to the impoundment and tailrace area. The upstream site overlooks the impoundment and includes a picnic area with concrete tables and a small parking area, river access, and a canoe/kayak take out. The only downstream recreational facility is the put-in for canoes and kayaks which also provides access for bank fishing.

159. The portage trail around the development begins at the take-out at the picnic area, follows a southwesterly route to the powerhouse access road, and terminates at the put-in located approximately 400 feet downstream of the powerhouse.

160. The recreational assessment study found that bicycling, bank fishing, picnicking, and sightseeing were popular activities at the development. None of the survey respondents stated they canoed or kayaked at the Huntington Falls development. The limiting factor for boating at the time of the assessment was the location of the take-out downstream of the development's boat barrier. The barrier has since been relocated, improving access to the take-out and significantly shortening the length of the portage.

161. GMP is not proposing specific changes to the recreational facilities at Huntington Falls.

Aesthetics

Proctor

162. The Proctor development is constructed at Sutherland Falls, which drops 100 feet in elevation from the dam to the tailrace of the development. The falls are comprised of ledge and bedrock, and are one of the three largest limestone gorges in Vermont. The falls are visible from the access area near the tailrace. Minimum flows at the development are passed through the powerhouse; as a result the falls are only watered during spillage events which occur about 24 percent of the time annually.

163. An aesthetics flow study examined the visual effects flows had on the falls at leakage, 10, 25, 50, and 75 cfs. An uplifted vertical slab of bedrock in the center of the falls confines flows to the main channel on the powerhouse side of the falls, and prevents water from spreading out across the entire face of the falls. Flows at 10 cfs and 25 cfs created a veil of water and spread throughout the main channel. At 50 cfs and 75 cfs flows increased the fullness of the falls,

and at 50 cfs, the waterfall was audible at the tailrace access site. The Applicant has proposed to release 60 cfs in the bypass reach.

Beldens

164. The Belden dams are separated by a bedrock island and viewable from several locations. The east bypass is known as Belden Falls, and is approximately 150 feet in length from the dam to the tailrace. The west bypass is approximately 450 feet in length, and includes a small gorge and is primarily bedrock. The Trail Around Middlebury pedestrian bridge offers views of the west dam. The tailrace viewing platform offers views of the east dam and powerhouses. The minimum flow of 5 cfs is currently required in both bypass reaches. It is released through a flashboard notch on the west dam and is equal to leakage at the east dam.

165. An aesthetics flow study examined flows of 10, 20, 30, 45, and 65 cfs in the bypass reaches with equal amounts flowing over each dam. At a flow of 20 cfs distributed equally across both dams resulted in a thin veil of water over each, and a flow of 10 cfs or greater in the east bypass resulted in a waterfall. In addition, flow of 20 cfs or greater in the west bypass reach increased the wetted width near the pedestrian bridge. GMP is proposing to spill 25 cfs over the west dam and 10 cfs over the east dam

Huntington Falls

166. The Huntington Falls bypass reach is approximately 215 feet in length and consists of a short set of falls, steep-sided bedrock and bolder-dominated plunge pool, and a lower pool. The upper section of the bypass reach is only viewable from a portion of the canoe/kayak portage, and not visible from other established recreational sites. A flow of 15 cfs is currently released through a notch on the northern (river-right) end of the dam creating a waterfall while the dam face remains dry.

167. The Applicant has proposed to release a conservation flow of 66 cfs through a new gate to be constructed at the dam.

Analysis

Water Chemistry and Flow

168. Water quality sampling data gathered in the vicinity of and at the three developments as part of the relicensing process indicate water quality standards are being met at the project. Water quality samples collected at the three developments under existing conditions indicate that dissolved oxygen concentrations and water temperatures meet standards for Class B waters. (Standards, Sections 3-04(B)(2) and 3-01(B)(1)).

169. The Applicant is proposing to increase flow in all the bypass reaches of the project. Specifically, the proposal is to provide 60 cfs to the Proctor bypass reach,[18] increase the existing 5 cfs at the Beldens development to provide 10 and 25 cfs over the east and west

[18] Existing leakage from the Proctor dam currently provides approximately 2 to 3 cfs into the bypass reach.

dams, respectively, and increase the bypass flow at Huntington Falls from 15 to 66 cfs. In addition, the Applicant is proposing to increase the hydraulic capacity of the Proctor and Huntington Falls developments which would result in reduced spill frequencies into the respective bypass reaches. However, the proposal to increase the bypass flows at the three developments will maintain and likely improve existing water quality conditions.

Flow and Water Level Management for Each Development

Proctor

170. Water level fluctuations in the Proctor impoundment will be reduced from a maximum of 4.0 feet to 1.5 feet, although fluctuations may occur more frequently than they do presently during periods when inflow allows peaking operations. The reduction in the magnitude of fluctuations and the peaking restrictions (no peaking during periods of low inflow and seasonal, flow-based restrictions on the degree of peaking) will provide sufficient protection for aquatic biota and habitat in the impoundment. (Standards, Sections 3-04(A)(1) and (B)(4)).

171. Aquatic habitat in the Proctor bypass is limited to the pool at the base of the falls. The proposed bypass flow of 60 cfs will provide good habitat conditions within the pool. (Standards, Sections 3-04(A)(1) and (B)(4)). Sixty cfs will also support aesthetics in the bypass. (Standards, Sections 3-04(A)(2) and (B)(5)).

172. Habitat conditions in Otter Creek downstream from Proctor will not be significantly affected by peaking operations at Proctor due to the nature of the downstream habitat (discussed below) and the proposed limitations on peaking (no peaking during periods of low inflow and seasonal, flow-based restrictions on the degree of peaking). (Standards, Sections 3-04(A)(1) and (B)(4)). The limitations on peaking will avoid impacts on aesthetics. (Standards, Sections 3-04(A)(2) and (B)(5)).

173. In the study area of Otter Creek downstream from Proctor there is limited structure at depth such as boulders or logs, and thus bass will rely on the river bottom (depth) and large woody debris snags along the shoreline as refuge. Both adult and sub-adult life stages are expected to inhabit such areas during the winter months. Studies looking at smallmouth bass and flow have found that smallmouth bass utilized low velocity areas with cover in the form of log jams and undercut banks during the winter. In some rivers, bass use deep water areas during the winter and those are abundant in Otter Creek.[19]

Beldens and Huntington Falls

174. Run-of-river operation will result in impoundment water levels that are maintained within a narrow range during normal operations, supporting aquatic habitat in the impoundments. (Standards, Sections 3-04(A)(1) and (B)(4)).

[19] Bovee, K.D., T.J. Newcomb, and T.G. Coon. 1994. Relations between habitat variability and population dynamics of bass in the Huron River, Michigan. Washington, DC: U.S. Geological Survey Biological Report 21. 63 p.

175. A habitat flow study[20] in the bypass reaches at Beldens shows that continuous flows of 10 cfs over the eastern dam and 25 cfs over the western dam provides good habitat conditions. Likewise, a habitat flow study[21] at Huntington Falls shows that good habitat conditions are provided at 66 cfs. The proposed flows at the two projects support aesthetics. (Standards, Sections 3-04(A)(2) and (B)(5)).

176. Run-of-river operations will support aquatic habitat and aesthetics below the facilities' tailraces. (Standards, Sections 3-04(A)(1) and (2); 3-04(B)(4) and (5)).

All Facilities

177. By Condition B of this certification, project facilities will be required to operate in a manner consistent with Findings 44-50.

178. In order to minimize the effects on downstream flows following maintenance or emergency operations, including lowering or replacement of flashboards, Condition C of this is Certification requires that 90 percent of instantaneous inflow be released during impoundment refilling.

Fish Passage, Impingement and Entrainment

179. The Vermont Fish and Wildlife Department has determined that downstream fish passage is not warranted at project facilities at this time (See Findings 90-94). By Condition E of this Certification, the Department reserves the ability to require development of passage in the future if the status of fish populations or fishery management objectives change.

180. The existing trashracks and replacement trashracks proposed for Huntington Falls will minimize impingement and entrainment of resident fish.

Wildlife and Wetlands Habitat

181. Drawdowns of the Proctor impoundment could potentially affect adjacent wetlands and any submerged or emergent vegetation in the open water habitat, depending on the magnitude, frequency, and duration of the drawdowns. The wetlands located along the immediate shoreline, within the zone of inundation, would likely maintain saturated soil to the surface even when exposed during the drawdown as long as water levels are returned to levels that wet the soil between drawdown events. Because of the wetlands' ability to wick and hold water from the impoundment, the proposed 1.5-foot drawdown cycle, which will not occur during low flow periods, is not expected to have a significant effect on wetlands adjacent to the Proctor impoundment. (Standards, Sections 3-04(A)(1) and (B)(4)). Likewise, flow fluctuations downstream of the tailrace will not affect downstream wetlands. (Standards, Sections 3-04(A)(1) and (B)(4)).

182. Wetlands at the Huntington Falls and Beldens developments are limited due to the steep shoreline topography and natural levees. Run-of-river operations at both facilities will avoid

[20] Otter Creek Hydroelectric Project, Instream Flow Study Report, Beldens Development, submitted to FERC February 6, 2009.

[21] Otter Creek Hydroelectric Project, Instream Flow Study Report, Huntington Falls Development, submitted to FERC February 6, 2009.

impacts on any wetlands that are located by those developments. (Standards, Sections 3-04(A)(1) and (B)(4)).

Rare and Endangered Species and Outstanding Natural Resources

183. The state-listed freshwater mussel species, fluted shell (*Lasmigona costata*) (endangered) and giant floater (*Pyganodon grandis*) (threatened) may occur in the vicinity of the Beldens and Huntington Falls developments. The developments will operate in strict run-of-river mode so project operations will not alter current water quality and habitat-flow conditions. (Standards, Sections 3-04(A)(1) and (B)(4)).

184. There are no designated Outstanding Resource Waters known to occur in the vicinity of the project developments.

Debris Disposal

185. The Applicant has not provided information on the handling and disposal of trashrack debris and other project-related debris. The depositing or emission of debris and other solids to state waters violates Vermont's solid waste laws and Standards, Section 3-01(B)(5). Debris may also impair aesthetics and boating. A debris disposal plan is required by Condition I. of this Certification.

Erosion

186. Erosion at the project facilities and along the impoundments' shorelines is limited and does not appear to be exacerbated by project operations.

Recreational Use

187. The Vermont Water Quality Standards require that Class B waters be managed to achieve and maintain a high level of water quality that fully supports boating, fishing, and other recreational uses. (Standards, Sections 3-04(A)(6) and (B)(6)).

188. At Proctor, recreation improvements proposed by the Applicant include establishment of a viewing area with interpretation at the site of the former mill building, parking at the tailwater access site, and installation of directional signage. There is an informal site on the impoundment above the Marble Bridge that provides access to the river for angling and a take-out site for paddlers. The Applicant has yet to address the need to develop a formal take-out that will assure downstream paddlers can take out their boats and bypass the dam, but the Applicant is required to address this pursuant to Condition H. A portage route around the dam that follows public roads (some with sidewalks) is available.

189. The recreational sites at Beldens were rated by participants in the recreational assessment study as being in excellent condition. The Applicant will continue to operate and maintain the existing recreation facilities. Project operations are not currently affecting public access and recreational use, and GMP has not proposed any changes to project operations, hence operation will not affect recreation access and use. Recreational opportunities will be enhanced by adding signage and clearing brush to clearly define the location of the existing canoe and kayak take-out and portage around the dam.

190. The recreational facilities at the Huntington Falls development were rated by participants of the recreational assessment study as being in excellent condition. GMP is proposing to continue to operate and maintain the existing recreation facilities at the development. The location of the canoe and kayak take-out and portage will be relocated to the picnic area, which will remove the portage route from the town road and bridge, improving boater safety and enhancing recreational boating opportunities at the site.

191. The Applicant's proposal does not address sanitation at recreational facilities, but the Applicant will be required to address this under Condition H.

192. By Condition H of this certification, the Applicant is required to develop a recreation plan addressing construction, maintenance, and management of recreation facilities, including provisions for a portage at the Proctor facility and sanitation at all project facilities.

Aesthetics

193. The Applicant-proposed conservation flows at each development were evaluated by the Agency to determine if they met Standards for Class B waters for good aesthetic value. (Standards, Sections 3-04(A)(2) and (B)(5)).

194. At Proctor, the aesthetics flow study found that flows between 50 and 75 cfs increased the fullness of the falls, and at 50 cfs, the waterfall was audible at the tailrace access site. The Applicant is proposing to release 60 cfs in the bypass reach at the Proctor development, meeting Class B standards for waters to have good aesthetic value.

195. At Beldens, the aesthetics flow study found that a flow of 10 cfs over the east dam results in a waterfall which currently does not exist. In addition spilling 20 cfs or greater in the bypass reach for the west dam resulted in the reach near the pedestrian bridge being wetted, which under existing conditions is dry. The Applicant is proposing to release 10 cfs and 25 cfs over the east and west dams, respectively, which will meet the Class B standard for aesthetics.

196. The Applicant has proposed to pass a bypass flow of 66 cfs through a new gate to be constructed at the dam at Huntington Falls, replacing the existing notch on the northern end of the dam used to pass 15 cfs. Relocation of the minimum flow notch will possible eliminate a waterfall that currently exists as a result of water flowing over bedrock. This would result in only a minimal adverse effect to the aesthetics of the area because the waterfall is not visible from the established recreation sites at the development.

Anti-Degradation

197. Pursuant to the Anti-Degradation Policy set forth in Section 1-03 of the Standards 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 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 III(B)(3)).

198. In making the determination that proposed activities are consistent with the Policy, the Secretary is required to use all credible and relevant information and the best professional

judgment of Agency staff. (Procedure III(D)). Section VIII of the Procedure governs the Agency's review of Section 401 applications for flow modifying activities. (Procedure 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 different parameters.

199. Tier 3 review is required if the project will discharge to an Outstanding Resource Water. (Procedure 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.

200. This project affects Class B waters, which are high quality waters for certain parameters that trigger a Tier 2 review under Section VIII of the Procedure. (Procedure VIII(E)(1)(c)). Under Tier 2, the Secretary must determine whether the proposed discharge will result in a limited reduction in water quality in a high quality water by utilizing all credible and relevant information and the best professional judgment of Agency staff. (Procedure VIII(E)(2)(b)).

201. 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 VIII(E)(2)(d)).

202. The Secretary considered the foregoing factors during the review of the project. The principal impact of the project is its effect on water levels in the Proctor impoundment, flows in Otter Creek downstream of Proctor, and bypass flows at the three facilities. Discharge of pollutants is not an issue because the changes in project operation will not result in a discharge of additional pollutants. Other ambient water quality criteria will improve or remain unchanged. Furthermore, impacts to aquatic biota and habitat will be reduced with limitations on cycling at Proctor and increased bypass flows at all three facilities.

203. This Certification does not authorize any activities that would result in a lowering of water quality for those parameters that are exceeding water quality standards.

204. For those parameters for which Otter Creek is not exceeding water quality standards, the Secretary must conduct a Tier 1 review. (Procedure VIII(F)).

205. Under Tier 1 review, the Secretary may identify existing uses and determine the maintenance necessary to protect these uses. (Procedure 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 VIII(F)(2))

206. The Secretary considered all of the factors listed above and, based on information supplied by the Applicant and Agency staff field investigations, identified the following existing uses: aquatic biota, wildlife and aquatic habitat; aesthetics; paddling and fishing.

207. The existing dams and impoundments have changed the natural condition of the river at project facilities. Currently, aquatic biota, wildlife and aquatic habitat, aesthetics and fishing are impacted in the Proctor impoundment by water level fluctuations and in the bypasses of all three facilities by insufficient bypass flows. However, the modifications to the project conditioned under this Certification will result in improvements to water quality, which will protect and improve conditions for existing and designated uses. Those modifications include reduced water level fluctuations in the Proctor impoundment and improved bypass flows at Proctor, Beldens, and Huntington Falls.

208. The Secretary finds that development and operation of the project as conditioned by this Certification will comply with the Vermont Water Quality Standards. Accordingly, the Secretary finds that the project meets the requirements of the Policy and Procedure relating to the protection and maintenance of high quality waters.

Decision and Certification

The Department has examined the project application and bases its decision in this Certification upon an evaluation of the information contained therein that is relevant to the Department's responsibilities under Section 401 of the federal Clean Water Act and has examined other pertinent information deemed relevant by the Department, sufficient to permit the Department to certify that there is reasonable assurance that operation and maintenance of the Otter Creek Hydroelectric Project as proposed by the Applicant and in accordance with the following conditions will not cause a violation of Vermont Water Quality Standards and will be in compliance with sections 301, 302, 303, 306, and 307 of the Federal Clean Water Act, 33 U.S.C. §1251 et seq., as amended, and other appropriate requirements of state law.

A. **Compliance with Conditions.** The Applicant shall provide notice to the Department of any proposed change to the project that would have a significant or material effect on the findings, conclusions or conditions of this Certification, including any changes to operation of the project. The Applicant shall not make any such change without approval of the Department.

B. **Flow and Water Level Management.** Project facilities shall be operated in accordance with the flow and water level management prescriptions described below. Bypass conservation flows shall be released on a continuous basis and not interrupted; conservation flows are the values listed below, or instantaneous inflow, if less, unless otherwise noted. True run-of-river operations, or r-o-r, where referenced, means no utilization of impoundment storage and that outflow from the facility is equal to inflow to the impoundment on an instantaneous basis, as further described in Footnote 2, page 6. When a facility is not operating, all flows shall be spilled at the dam.

   Impoundments shall not be drawn below the fixed dam crests unless special approval is granted by the Department under Condition J. below, or for a safety-related emergency. In the latter case, the Department shall be notified within 24 hours.

Proctor: When operating in run-of-river mode, the impoundment target elevation shall be 469.5 ft. msl. During peaking operations, the impoundment shall be operated between elevations 469.5 ft. msl and 468.0 feet msl. Peaking operations shall be subject to the operational constraints described in the tables below. A bypass conservation flow of 60 cfs shall be released at the dam at all times.

May 1 through June 30[22]	
River Inflow (cfs)[23]	**Description of Operations**
< 400	Operate in true run-of-river mode with outflows equaling inflows on an instantaneous basis.
≥ 400	Operate in peaking mode with total turbine discharge no more than 1.5 times inflow over 24 hours.

July 1 through July 15	
River Inflow (cfs)	**Description of Operations**
< 200	Operate in true run-of-river mode with outflows equaling inflows on an instantaneous basis.
200-399	Operate in peaking mode with total turbine discharge no more than 1.5 times inflow over 24 hours.
≥ 400	Operate in peaking mode with total turbine discharge no more than 2.0 times inflow over 24 hours.

[22] All dates are inclusive.
[23] River inflows shall be defined by using the U.S. Geological Survey gage (Otter Creek at Center Rutland, Vermont, Gage No. 04282000) to determine the daily minimum flow for the calendar day prorated to the Proctor Station to select correct peaking mode operation.

July 16 through April 30	
River Inflow (cfs)	**Description of Operations**
< 200	Operate in true run-of-river mode with outflows equaling inflows on an instantaneous basis.
200-399	Operate in peaking mode with total turbine discharge no more than 2.5 times inflow over 24 hours.
≥ 400	Operate in peaking mode with total turbine discharge no more than 3.0 times inflow over 24 hours.

Beldens: The facility shall be operated in a true run-of-river mode where instantaneous inflows to the impoundment at all times. A bypass conservation flow of 35 cfs, with 10 cfs spilled over the east dam and 25 cfs over the west dam, shall be released at all times. The impoundment target elevation shall be 283.0 feet msl.

Huntington Falls: The facility shall be operated in a true run-of-river mode where instantaneous inflows to the impoundment at all times. A bypass conservation flow of 66 cfs shall be released at all times through a gate located at the dam. The impoundment target elevation shall be 217.8 feet msl.

C. **Flow Management During Impoundment Refill.** During refilling of a project impoundment following a drawdown associated with peaking operations at Proctor Station or for maintenance purposes, up to 10 percent of instantaneous inflow may be placed in storage in order to restore the water level without significantly reducing downstream flows.

D. **Flow Management and Monitoring Plan.** The Applicant shall develop and file with the Department a flow management and monitoring plan detailing how each development within the project will be operated to achieve compliance with the flow and water level management limitations described above. The plan shall include provisions for record keeping to demonstrate compliance. At a minimum, the records shall include hourly turbine flows, hourly impoundment elevations, hourly gate releases and gate and flashboard/inflatable dam status.

The plan shall include a detailed procedure about the operation of Proctor Station that addresses the ramping rate during peaking operations including the up ramp and down ramp. The plan shall include details on the sequence the units will be brought on/off line in order to be in compliance with agreed upon ramping rates. The plan shall include a provision for the inclusion of contemporaneous records from the U.S. Geological Survey gage (Otter Creek at Center Rutland,

Vermont, Gage No. 04282000) associated with operation of Proctor Station and for funding the State portion for operation of the gage under the Joint Funding Agreement with the USGS.

The plan shall include the design and location of the gate at the dam that will be used to release the bypass conservation flow at Huntington Falls Station.

The plan shall include procedures for reporting to the Department deviations from prescribed operating conditions. In reporting deviations, the applicant shall include an explanation of the cause; propose steps to be taken to prevent a recurrence; and revise the plan if requested to do so by the Department.

The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service, and the plan shall be submitted to the Department for review within 60 days of the issuance of a federal license. The plan shall be subject to Department approval. The Department reserves the right of review and approval of any material changes made to the plan at any time and the right to request revisions to the plan if necessary to assure compliance. Compliance records shall be kept permanently and provided to the Department on request in a format specified by the Department.

E. **Fish Passage.** In the event that the status of Otter Creek fish populations or fishery management objectives change, and upon a request of the Department of Fish and Wildlife, the Department may require the applicant to provide upstream or downstream fish passage facilities.

F. **Turbine Rating Curves.** The Applicant shall provide the Department with a copy of the turbine rating curves, accurately depicting the flow/production relationship, for the record within one year of the issuance of a federal license.

G. **Public Access.** The Applicant shall allow public access to project lands for utilization of public resources, subject to reasonable safety and liability limitations. Such access should be prominently and permanently posted so that its availability is made known to the public. Any proposed limitations of access to State waters to be imposed by the Applicant shall first be subject to written approval by the Department. Access may be restricted without prior approval when an immediate threat to public safety exists. In those cases, the Applicant shall so notify the Department and shall file a request for approval, if the restriction is to be permanent or long term, within 14 days of the restriction of access.

H. **Recreational Facilities.** Recreational facilities shall be constructed and maintained consistent with a recreation plan approved by the Department. The issues addressed in the plan shall include provision of portages and sanitation at recreation sites for the three facilities. The plan shall be filed with the Department within one year of license issuance and shall include an implementation schedule. Where appropriate, the recreation plan shall include details on erosion control. The plan shall be updated at intervals not exceeding ten years or a written statement provided that indicates the basis for there being no need to upgrade the facilities or otherwise modify the plan. Modifications to the recreation plan shall also be subject to Department approval over the term of the license. The Department approved recreation plan and all amendments thereto as approved by the Department shall be incorporated by reference as conditions of this Certification.

I. **Debris Disposal.** The Applicant shall develop a plan for proper disposal of debris associated with project operation, including trashrack debris. The plan shall be developed in consultation with the Department, and a draft shall be submitted to the Department within 90 days of license issuance. The final plan shall be subject to Department approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.

J. **Maintenance and Repair Work.** Any proposals for project maintenance or repair work, including drawdowns below the fixed dam crests to facilitate repair/maintenance work, shall be filed with the Department for prior review and approval, if said work may have a material adverse effect on water quality or cause less-than-full support of a designated use of State waters.

K. **Record Drawings.** The Applicant shall provide the Department with a digital set of as-built plans for the record within one year of the completion of construction of project modifications at Proctor and Huntington Falls.

L. **Compliance Inspection by Department.** The Applicant shall allow the Department to inspect the project area at any time to monitor compliance with Certification conditions.

M. **Posting of Certification.** A copy of this Certification shall be prominently posted within the powerhouses at the three developments.

N. **Approval of Project Changes.** Any change to the project that would have a significant or material effect on the findings, conclusions, or conditions of this Certification, including project operation, must be submitted to the Department for prior review and written approval where appropriate and authorized by law and only as related to the change proposed.

O. **Reopening 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 the Standards.

P. **Continuing Jurisdiction.** The Department reserves the right to alter or amend this Certification over the life of the project when such action is necessary to assure compliance with the Standards and to respond to any changes in classification or management objectives for the affected waters.

Q. **Reopening of Certification.** The Agency may reopen and alter or amend the conditions of this Certification over the life of the Project when such action is necessary to assure compliance with the Vermont Water Quality Standards and to respond to any changes in the classification or management objectives for the affected waters. Any amendment that results in a change of conditions for the Project shall be subject to Paragraph H (Public Notice) and Paragraph I (Public Hearing) of the Section 401 Water Quality Certification Procedure, dated April 2, 2012.

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, it 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 permittee 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 permittee and the federal permitting agency.

Certification conditions are subject to enforcement mechanisms available to the federal agency issuing the permit 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 on line at www.vermontjudiciary.org. The address for the Environmental Court is 2418 Airport Road, Suite 1, Barre, VT 05641 (Tel. 802.828.1660).

State of Vermont
Agency of Natural Resources

David K. Mears, Commissioner
Department of Environmental Conservation

BY:

Digitally signed by Peter LaFlamme
DN: cn=Peter LaFlamme, o=VTDEC,
ou=Watershed Management Division,
email=pete.laflamme@state.vt.us, c=US
Date: 2014.05.29 10:01:22 -04'00'

Peter LaFlamme, Director
Watershed Management Division

Reviewed by:

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Louis Porter, Commissioner
Vermont Department of Fish & Wildlife