

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

In the matter of: **Green Mountain Power Corporation**
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P.O. Box 850
South Burlington, Vermont 05402

APPLICATION FOR VERGENNES HYDROELECTRIC PROJECT

The Water Quality Division of the Vermont Department of Environmental Conservation (the Department) has reviewed a water quality certification application filed by Green Mountain Power Corporation (the applicant) for the Vergennes Hydroelectric Project. The application was originally filed in May 1997; the application was subsequently withdrawn and refiled with the Department by letter dated April 28, 1998. The application was reviewed under the Vermont Water Quality Standards adopted by the Water Resources Board on April 2, 1997, in accordance with Section 1-01(A) *Applicability*. The application includes the applicant's Federal Energy Regulatory Commission (FERC) license application, filed with FERC under a cover letter dated May 29, 1997.

The Department held a public hearing on April 7, 1999 under the rules governing certification and received testimony during the hearing and, as written filings, until April 12, 1999. Attached as Appendix A is a copy of the Department's responsiveness summary.

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

I. Background/General Setting

1. Otter Creek, Vermont's longest river, flows about one hundred miles 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, hosting seven active dams on the mainstem. Vergennes Dam is the lowest dam in the system, and the only one owned and operated by the applicant. The other dams are owned by Central Vermont Public Service Corporation (CVPS) and OMYA, Inc. The Vergennes Electric Company developed this site in 1911-12 for the Burlington Traction Company, which produced electricity to operate Burlington's trolley system. The Vergennes Electric Company was acquired by a holding company, Peoples Light and Power Corporation, in 1926, and that corporation later became Green Mountain Power Corporation.

2. Vergennes Dam is located at a large natural cascade located at River Mile 7.4, directly downstream of the Vermont Route 22A bridge. The civil works are located entirely within the City of Vergennes. The project impounds a reach of river almost nine miles in length, about three quarters of the way up to the Weybridge hydroelectric dam (River Mile 19.5; normal tailwater elevation 143.3 feet NGVD), which is operated by CVPS. All but nine feet of the total drop (about 46 feet) from the CVPS dam's tailwater to Lake Champlain is harnessed for electrical production by the Vergennes Project.
3. Of Otter Creek's 936 square mile watershed, the project utilizes runoff from an area of 866 square miles.
4. The Federal Energy Regulatory Commission licensed the project on June 29, 1979, with the term of the license running from June 1, 1949 through May 29, 1999. Federal jurisdiction over the project was determined based on the Commission having found in 1965 that the Otter Creek is a navigable waterway.

II. Project and Civil Works

5. The project has powerhouses located on both riverbanks. The main plant, Plant 9, is on the south bank. The powerhouse, built in 1911, is a two-story brick structure. Water is transported about 110 feet to the powerhouse via two 10-foot diameter concrete-encased penstocks that transition into two 9-foot diameter steel penstocks. The powerhouse contains its two original Holyoke Machine Company horizontal Francis turbines, each driving generators with a capacity of 700 kW. The net head at the powerhouse is estimated at 35 feet, reflecting a loss of about two feet from the static head. The penstock entrances are protected by a trashrack 19 feet in length, with a clear spacing between the bars of one inch.
6. Powerhouse 9B, a 1943 reinforced concrete structure, contains a single James Leffel & Company vertical Francis turbine that drives a 1,000 kW generator. From the forebay, two 7-foot steel penstocks carry water to the turbine. The penstock entrance is protected by a trashrack 16 feet in length and 14 feet high, with a clear spacing between the bars of two inches.
7. The existing dam consists of three concrete overflow sections and one concrete non-overflow section spanning the riverbanks and two midstream islands. The south island is occupied by an abandoned grist mill and a storage building. A pump house formerly used by the municipal water system is located on the smaller north island. The spillway connecting the two islands is 60 feet long, with a crest elevation of 132.78 feet NGVD. An 84-foot

section of spillway, crest elevation of 132.52 feet NGVD, connects the Plant 9B forebay with the pumphouse island. The southern spillway, 87 feet in length with a crest elevation of 132.49 feet NGVD, connects the grist mill island with the Plant 9 forebay. Flashboards 1.5 feet in height are normally maintained on the spillways to raise the full impoundment height to elevation 134.28 feet NGVD. Due to the differences in the spillway crest elevations, this results in the side spillway flashboard being set about three inches lower than the center spillway boards. The channel entrance losses for the two plants result in the local headpond elevation being lower by the three-inch difference, so the headpond is maintained at the top of the center flashboards without spillage occurring over the lower side spillway flashboards. The flashboards on the north and south spillways generally fail when overtopped by 2.0 - 2.5 feet of water.

8. The headpond is normally cycled for generation over the 1.5 foot range created by the flashboards. The bedrock formation directly upstream of the dam prevents the headpond from being drawn more than about half a foot below the concrete crest. The average elevation of the bedrock profile at the Vermont Route 22A bridge is about 130 feet NGVD (*Application for License for Major Water Power Project 5 Megawatts or Less for the Vergennes Hydroelectric Project, FERC No. 2674, May 1997, vol. 1, p. E(4)-6*). The headpond is contained within the riverbanks. When full, the headpond has a surface area of about 133 acres and provides about 200 acre-feet of useable storage.
9. The two stations are operated independently. Plant 9B is operated remotely from the applicant's Colchester dispatch center. Plant 9 is a manned station. Personnel adjust the units as necessary during the day; when they leave at the end of the day, the units are left with a fixed gate position, and the dispatch center controls the project discharge via Plant 9B.
10. The plant, with its total installed capacity of 2,400 kW, produces an average annual output of 10,288,000 kWh based on records from 1967 to 1992.

III. River Hydrology and Streamflow Regulation

11. The flow of Otter Creek is regulated by several of the hydroelectric facilities in the basin. Four hydroelectric dams are located on the river mainstem between Vergennes and Middlebury. Starting at Vergennes and going upstream, the four are Weybridge (River Mile 19.5), Huntington Falls (River Mile 21.0), Beldens (River Mile 23.0), and Middlebury Lower (River Mile 24.7). The Weybridge and Middlebury Lower projects are owned by CVPS and are currently going through federal relicensing, lagging the Vergennes Project by about one year. The Huntington Falls and Beldens facilities are owned by OMYA, Inc. and were

redeveloped under a license amendment issued in 1986 to increase the installed capacity at both facilities.

12. The Beldens and Huntington Falls plants are operated as strict run-of-the-river facilities. As such, they no longer regulate flows to preferentially generate on peak. CVPS proposes to operate the Middlebury Lower facility to a strict run-of-the-river operation under its new license. The utility, however, proposes to maintain a daily cycle operation at the Weybridge facility except during the spring period, April 15 - June 15. As proposed, the station would maintain a minimum release of 250 cfs; during generation, releases would vary from the single turbine's capacity range of 450 cfs to 1,600 cfs, plus the 125 cfs to be maintained as a bypass flow. (*Application for New License for Major Project (5 MW or Less) - Weybridge Project*, May 1994, Volume I)
13. Other dams in the basin also influence flows at Vergennes. CVPS operates seasonal storage reservoirs at Chittenden Dam and Goshen Dam, in the East Creek and Leicester River watersheds, respectively. Because these dams control only a minor portion of the watershed, the effect on flows in the lower portion of the Otter Creek basin are slight.
14. The Vergennes Project historically has operated as a daily cycle plant with a 1.5-foot operating cycle behind the flashboards. Plant 9 has a hydraulic range of about 140 cfs (single unit at minimum capacity) to 700 cfs (two units at 350 cfs maximum); Plant 9B's single unit has a range of about 200 cfs to 480 cfs. Combined total capacity is about 1,180 cfs. With impoundment cycling, the project has theoretically been able to utilize all flows in a range of 0 to 1,180 cfs. Higher flows are spilled.
15. Under the existing operating rule, one of the units in Plant 9 is used for operation when the generation flow is less than 200 cfs. From 200 cfs to 480 cfs, the Plant 9B unit is used for generation. When generation flows exceed 480 cfs, one of Plant 9 units is brought on line, and the Plant 9B unit is adjusted to match the flow. For generation flows in excess of 830 cfs, all three units are on line.
16. Since 1903, the U.S. Geological Survey has operated a surface water gaging station (No. 04282500) on Otter Creek in Middlebury. The gage records flows from 73% of the watershed above Vergennes. Based on the gage, the following flow statistics can be estimated for the Vergennes site:

| | |
|------------------|--------------|
| Mean annual flow | 1,380 cfs |
| Annual runoff | 21.64 inches |
| 10% exceeds | 3,200 cfs |
| 50% exceeds | 870 cfs |
| 90% exceeds | 360 cfs |
| 7Q10 | 216 cfs |

17. Backwater from Lake Champlain influences the lower reach of Otter Creek up to Vergennes Falls. Lake levels historically have varied over a range of elevations from about 93 feet NGVD to 101 feet NGVD. During a typical year, the lake elevation varies from its spring high of 99 feet NGVD to its fall low of 94 feet NGVD. The minimum riverbed elevation at the project tailraces is 89 feet NGVD. Water levels below the Falls are dependent on the lake level and the river flow; measurements taken by the applicant during 1996 indicate that the project tailwater elevation is ranges from about 0.5 feet to 1.5 feet higher than the lake level.

Applicant proposal for relicensing:

18. The applicant proposes to operate the Vergennes Project as a strict run-of-the-river project. Effectively, this would result in the project maintaining a stable headpond and passing the flows received from the upstream Weybridge Hydroelectric Project without reregulation. Channel storage between the two dams and the influence of the Lemon Fair River, a major intervening tributary of Otter Creek with 89 square miles of watershed area, would tend to dampen Weybridge's peaking effects.
19. The applicant would maintain spillage over the spillways to support aesthetics using the following schedule:

| | |
|--------------------|--------------------------------------|
| April 1 - Oct. 31 | 150 cfs daytime and 75 cfs nighttime |
| Nov. 1 - Dec. 15 | 100 cfs daytime and 50 cfs nighttime |
| Dec. 16 - March 31 | No special flows |

Daytime would be defined as half an hour before sunrise to half an hour after sunset.

20. The relicensing of projects upstream of Vergennes will require all stations to maintain conservation flows. Based on the gage data, extreme drought conditions are on the order of 200-250 cfs. With a project minimum turbine capacity of 140 cfs and the proposed bypass

flow schedule, the project will be able to utilize almost all flows less than its maximum capacity of 1,180 cfs.

21. The applicant proposes to automate Plant 9 so that it can be operated remotely similar to Plant 9B.

IV. Standards Designation

22. Otter Creek has been designated by the Vermont Water Resources Board as Class B waters. The Water Resources Board has also designated the entire reach from Huntington Falls Dam to Lake Champlain as warm water fish habitat.
23. Class B stream reaches are managed to achieve and maintain a high level of quality compatible with certain beneficial values and uses. Values are high quality habitat for aquatic biota, fish and wildlife and a water quality that consistently exhibits good aesthetic value; uses are public water supply with filtration and disinfection, irrigation and other agricultural uses, swimming, and recreation. (Standards, Section 3-03(A) *Class B Waters: Management Objectives*)
24. The dissolved oxygen standard for warm water fish habitat streams is 5 mg/l and 60 percent saturation at all times. Depending on ambient stream temperature conditions, the temperature standard limits increases to values between 1.0 and 5.0 deg F from background. (Standards, Section 3-01(B)(2) *Temperature*) The turbidity standard is 25 NTU. (Standards, Section 3-03(B)(1) *Turbidity*)
25. Under the general water quality criteria, all waters, except mixing zones, are managed to achieve, as in-stream conditions, aquatic habitat with “[n]o change from background 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 3-01(B)(5) *Aquatic Habitat*)
26. Standards Section 2-02(B) *Hydrology: Artificial Flow Conditions* requires that “[t]he flow of waters shall not be controlled or substantially influenced by man-made structures or devices in a manner that would result in an undue adverse effect on any existing use, beneficial value or use or result in a level of water quality that does not comply with these rules.” The project dam is a man-made structure that artificially regulates water levels and streamflows.

Present status:

27. By letter dated December 30, 1998, the Department issued, under Section 303(d) of the Federal Clean Water Act, a list of waters considered to be impaired based on water quality monitoring efforts. The so-called "Part A" list indicates that Otter Creek, for the seven mile reach below the Vergennes municipal wastewater treatment facility, has a contact recreation (eg. swimming) impairment due to pathogens that enter the river from periodic treatment lagoon overflows. The reach from the project dam to Lake Champlain is also impaired by mercury contamination, which affects fish consumption.

28. Also by letter dated December 30, 1998, the Department issued a draft four-part list, *List of Priority Surface Waters*. Part F lists those surface waters where water quality or habitat are being altered by flow regulation, obstructions, and other water level manipulations. The reach directly below Vergennes Dam, including Vergennes Falls, is listed for flow impacts on aesthetics and aquatic life support.

V. Water Chemistry

29. Pursuant to requests by the Agency and the U.S. Fish and Wildlife Service, the applicant sampled dissolved oxygen and temperature weekly through the summer of 1996 (June 25 through August 27), at and upstream of the dam. Available data from this study and an earlier 1982 study completed by the Department suggested that dissolved oxygen standards are met on the Lower Otter Creek. Unfortunately, the data had several shortcomings related to the lack of critical low-flow conditions and collection during daylight hours, when algal photosynthetic oxygen production becomes a major influence on the dissolved oxygen regime.

30. The applicant, therefore, performed additional water quality sampling of dissolved oxygen and temperature conditions at the project during the summer of 1997. This data was filed with the Department by letter dated February 2, 1998. Compared to the 1996 data set, the 1997 data was collected during flow conditions that better reflected critical water quality conditions. All samples conformed to the dissolved oxygen standards applicable to warm water fish habitat. During the lowest flows experienced during summer sampling (about 260 cfs, or 20% above the 7Q10 flow, on August 8, 1997 at 0500), the dissolved oxygen concentration directly upstream of the dam was at saturation (8.7 mg/l). On August 17 at 0515, a sample collected at the same station measured 8.0 mg/l, or 87% saturation.

VI. Aquatic Biota and Habitat

31. Class B waters are managed for high quality habitat for aquatic biota (Standards Section 3-03(A) *Class B Waters: Management Objectives*). Aquatic biota are defined in Standards Section 1-01(B) *Definitions* as “organisms that spend all or part of their life cycle in or on the water.” Included, for example, are fish, aquatic insects, amphibians, and some reptiles, such as turtles.
32. Otter Creek is managed to support both cold water and warm water fish. Fish found between Weybridge and Vergennes dams include northern pike, perch, smallmouth bass, brown trout, pan fish, and minnows. Northern pike are especially abundant. Downstream of Vergennes, the river is influenced by Lake Champlain and is managed as part of the overall Champlain ecosystem. Fish found in this reach include the state-listed endangered lake sturgeon (*Acipenser fulvescens*), landlocked Atlantic salmon, steelhead rainbow trout, walleye, pike, and bass.
33. Lake sturgeon use has been documented through sightings and records of the fish having been caught by anglers. Since sightings are generally in the spring, that has been interpreted as evidence that the fish are continuing to exhibit spawning behavior. The fish is being considered for listing as federally endangered.
34. As part of New York State and Vermont’s salmonid fishery development plan for Lake Champlain, both steelhead and salmon are stocked downstream of Vergennes Dam. A fishery for these two species exists at the base of the Falls and downstream. There may also be some level of spawning use in this reach.
35. Small spawning runs of walleye enter Otter Creek in the early spring. The most suitable spawning habitat is believed to be nearest the Falls. Post-spawn walleyes also use the lower Otter Creek for feeding, and this use provides an important fishery from mid-May through much of June.
36. An angler survey completed by the applicant indicated that anglers preferred the bass fishery, the spring walleye fishery, and the fall salmon fishery. The most common access was found to be directly below the two powerhouses, with most use occurring on the Plant 9 side of the river. Anglers showed a preference for fishing during flow releases.
37. Lower Otter Creek also contains a rich diversity of mussel species. On August 15 and 16, 1996, the applicant completed a mussel survey below the dam at the same time it

completed substrate mapping. Due primarily to the lack of unconsolidated substrates, there was an absence of live mussels in the first 200 feet below the Falls. Mussels were found to be most common in the Vergennes Falls Park area and across from the city dock. A total of 115 live specimens were found, with the dominant species of the seven being the eastern elliptio (*Elliptio complanata*). Small numbers of three rare species were found: fragile papershell (*Leptodea fragilis*), pink heelsplitter (*Potamilus alatus*), and pocketbook mussel (*Lampsilis ovata*). The Vermont Endangered Species Committee has recently recommended these species for listing as endangered. Another species found at Vergennes, the giant floater (*Pyganodon grandis*), was also found; the Committee is proposing this species for listing as threatened. A state-threatened species found in the late 1970s, black sandshell (*Ligumia recta*) was not recovered; this mussel species is now proposed for listing as endangered. Shells of fluted-shell (*Lasmigona costata*) were also found during the applicant's survey; this species is also proposed for listing as endangered.

38. Plant operations were determined to have very little effect on the distribution of mussels downstream. Mean column velocity measurements were taken at several locations where mussels were found, and the velocities were very low even with the powerhouse operating at a high discharge. The river channel directly below Vergennes Falls is about 500 feet wide and several feet deep. The large waterway area results in the current quickly dissipating below the project tailraces.

Flow needs for fish protection

39. The conversion of the project to a true run-of-the-river operation, with instantaneous inflow equaling instantaneous outflow, reduces the potential project impacts on downstream aquatic habitat. Substrate mapping information obtained by the applicant indicated that the best spawning substrate for walleye and sturgeon exists near the Plant 9 tailrace. The applicant's angler survey data and results from past electrofishing done by the Department of Fish and Wildlife suggests that fish are preferentially attracted to the Plant 9 tailrace when that station is operating. In fact, when neither plant is operating or when only Plant 9B is operating, a relatively small number of salmon are caught when electrofishing is done during the fall run.
40. Based on this information, the applicant has proposed giving Plant 9 first call status during the spring and fall fish runs. Plant 9 would be brought on line first and maintained on line at all times that the project is operating during the seasonal time periods. The time periods under this proposal are April 1 through June 15 and September 15 through November 15.

Fish passage/movement

41. Historically, migratory fish from Lake Champlain ascended many of its tributaries to access spawning waters. To meet the goals of the bistate plan for the development of the Lake's salmonid fishery (*A Strategic Plan for Development of Salmonid Fisheries in Lake Champlain*, NYS Department of Environmental Conservation, October 4, 1977), upstream and downstream passage provisions are being sought at dams on certain Lake tributaries. In Vermont, the Winooski River and the Lamoille River are included in this effort; however, this initiative has not been extended to Otter Creek as the other tributaries present a better opportunity for coldwater fish spawning.

42. Fish injury and mortality due to intake entrainment and trashrack impingement has been investigated. The entrance at Plant 9B was found to present the highest risk due to the faster approach velocity and the larger 2-inch clear spacing between the bars in the trashrack. An approach velocity of 2.6 fps was estimated at a six-inch distance from the rack. As part of the relicensing, the applicant states that consideration will be given to using racks with a one-inch clear spacing at such time as the racks need replacement (*Application for License for Major Water Power Project 5 Megawatts or Less for the Vergennes Hydroelectric Project*, FERC No. 2674, May 1997, vol. 1, p. E(3)-37).

VII. Wildlife and Wetlands

43. Extensive wetlands are associated with the reach of Otter Creek below Vergennes Falls. From the river mouth upstream five miles is a wetland complex designated as the Otter Creek Marsh Wildlife Management Area. The complex includes approximately 1,500 acres of shallow to deep marsh habitat. Dead Creek, a major tributary, enters Otter Creek from the south about half way up the five-mile section.

44. Based on the National Wetland Inventory maps, thirty Class Two wetlands comprising about 50 acres in total area border the impoundment from the City of Vergennes up to the Lemon Fair confluence. The surrounding land use in this area is predominately agricultural. Little if any forested areas remain along this reach of Otter Creek. Most of these wetlands in the impoundment area are emergent, probably dominated by cattails, rushes and sedges. Many areas along the shoreline of Otter Creek do not have a buffer except for these wetlands. The wetlands filter water from agricultural land runoff before it enters the Otter Creek and act as habitat for wildlife and fish.

45. Due to the proposal to convert the project to run-of-the-river operation, no site specific wetland assessments of the area were completed for this project. Conversion of the project to run-of-the-river will stabilize the water level during normal operations and provide an opportunity for wetlands to become more diverse.

VIII. Rare and Endangered Plants and Animals; Outstanding Natural Communities

The Vermont Endangered Species Law (10 V.S.A. ' 5401 to 5403) governs activities related to the protection of endangered and threatened species.

46. As discussed above, the reach below Vergennes Falls provides habitat for several mussel species that are proposed for state listing as endangered or threatened and for the state-endangered lake sturgeon. The relatively recent introduction of zebra mussels in Lake Champlain is a particular concern with respect to the maintenance of populations of the native mussel species.
47. The downstream wetlands contains several rare plant species. Green dragon (*Arisaema dracontium*), last found in the Otter Creek Marsh in 1993, is listed as threatened.

IX. Shoreline Erosion

48. Shoreline reconnaissance for bank erosion problems was completed in September 1996. Under full reservoir conditions, the impoundment depth varies from about 6 to 8 feet upstream of the Vermont Route 22A bridge to less than 3 feet at the upstream project limits, about 8.8 miles from the dam.
49. Cultivated farmland borders the mid and upper sections of the impoundment.
50. The river courses through soils that are classified as Vergennes series in the U.S. Department of Agriculture Soil Survey system. These soils are moderately well drained clays with low permeability and moderate to high erosion potential.
51. During the reconnaissance work, observations were made with the impoundment level set at the spillway crest. Erosion problems were predominantly found in the mid-to-upper portions of the impoundment. Shoreline erosion in the 1.5-foot operating zone was found to consist primarily of minor laminations within the clayey soils of the riverbank and ice scour that has exposed tree root systems. The investigators concluded that these conditions are typical for streams of this type and unrelated to the impoundment cycling. The most significant erosion stemmed from agricultural use, including cattle paths, cropland management, and lack of vegetative buffers, and from the normal meander progression associated with alluvial streams.

X. Recreational Use

52. The reach of Otter Creek below Vergennes Falls is heavily used for recreation. The City of Vergennes maintains Vergennes Falls Park, which is located on the south bank a short distance below Plant 9. The 6.5-acre park provides a boat ramp, a picnic area, walking paths, and shoreline fishing. On the opposite side of the river, the municipality manages MacDonough Park, which includes a boat docking facility. The facility serves boat traffic to and from Lake Champlain. On the north bank upstream of Vermont Route 22A, the applicant furnishes carry-on boat access and parking at Settlers Park. The applicant also provides directional signage for portaging the dam.
53. The project area contains many historic and archeological resources related to Vergennes' rich history from the War of 1812 through the Industrial Age. The pumphouse on Pumhouse Island dates from 1874 and still houses the waterworks' original Flanders pump; restoration of the pumphouse is underway with assistance from the applicant. Norton Grist Mill (1877), with its former stable, is located on the other island; the mill is owned by the applicant, and repair and stabilization of the mill is included as part of the relicensing proposal.
54. The applicant proposes to complete several recreational improvements as part of the relicensing. Bank fishing access will be improved downstream of Plant 9 with the construction of a fishing platform that will meet Americans with Disabilities Act guidelines. This area will be linked with Vergennes Falls Park through construction of a shoreline path. The Settlers Park boat launch will be made more functional. Additional directional and interpretative signs will be installed; the interpretative signs will include information on the history of the Falls and its development.
55. The district fisheries biologist from the Department of Fish and Wildlife raised a concern that over time the parking on the south side of the river may become inadequate to serve the increasing number of anglers during the walleye run in the spring. The applicant agreed to continue to monitor use as part of the FERC Form 80 process.

XI. Aesthetics

56. Vergennes Falls is segmented by the two islands into three cascades. These cascades are highly visible from several downstream vantage points, including Vergennes Falls Park and MacDonough Park. Measured against natural conditions, past operation, especially with Plant

9B's construction in 1943, has resulted in a substantial loss of spillage over the Falls. With its total hydraulic capacity of 1,180 cfs, the project is able to utilize all of the river flow about two thirds of the time during an average year. During the summer recreational period, June - August, the project is able to prevent spillage over 80% of the time.

57. A special aesthetics flow study, including videotaping, was completed on October 14, 1996 to determine an appropriate level of spillage to restore the aesthetics value of the Falls. A study team comprised of the Vergennes city manager, personnel from the Department, Green Mountain Power Corporation, and the utility's consultant, Gomez and Sullivan Engineers. From four downstream locations, the team completed a qualitative evaluation of a range of special flow releases over the three spillway sections, which were rated individually and collectively at each flow. Observations were made looking at successively lower flows. For each target flow, the true flow rate varied somewhat over the observation period. Also, the end of the observations, it became apparent that the center spillway, although shorter, was discharging more water. The localized drawdown at the entrance channels for the two plants was responsible for reducing the spillage depths over those two spillways relative to the center spillway. The observation flows are shown in the following table.

Table 1. Flows (cfs) observed during aesthetics flow study and consensus ratings.

| Target Flow | Actual Range Total Flow | Plant 9 Spillway (l = 87 feet) | Center Spillway (l = 60 feet) | Plant 9B Spillway (l = 84 feet) |
|-------------|-------------------------|--------------------------------|-------------------------------|---------------------------------|
| 300 | 271-327 | 78-104 G G+ N G | 117-129 G G+ G G | 70-94 G+ G+ G G- |
| 200 | 262-274 | 72-97 G G+ N G+ | 117-123 G G+ G G | 70-75 G+ G+ G+ G- |
| 150 | 192-223 | 50-67 G G+ N G+ | 93-103 G+ G+ G G- | 49-54 G+ G+ G G- |
| 100 | 146-167 | 31-40 G G N G | 78-88 G G G G- | 35-39 G G G- G- |
| 50 | 100-113 | 19-23 F G- N F+ | 63-68 G- G- G F+ | 17-22 G- G- F- F+ |

Ratings are from four vantage points: in order, Vergennes Falls Park, McDonough Park, below Plant 9B, and below Plant 9. Ratings are Poor, Fair, Good, Excellent, and Not Visible. Where there was a split rating, the higher one is used (e.g. G- to G is called G).

58. Aesthetic value was rated from poor to excellent, and judgements were made as to whether the change in value between flows was significantly worse, worse, the same, better, or significantly better. All team members agreed that a substantial reduction in aesthetic values occurred when flows dropped from the target flows of 100 cfs to 50 cfs. The team judged the aesthetic value as having diminished slightly when flows were reduced from the target of 150 cfs to 100 cfs. Department staff on the team were of the opinion that aesthetics was enhanced when target flows increased above 150 cfs, but only slightly. As indicated in Finding 19 above, the primary aesthetics flow proposed by the applicant is 150 cfs. This flow would be provided during the daylight hours from April through October.
59. As part of relicensing, the applicant will be improving the appearance of the Norton Grist Mill. Work will include installing period-appropriate window sash in the building where windows have been removed and replaced with plywood. The historic building is a prominent structure in the Vergennes Falls setting.

XIII. State Comprehensive River Plans

The Agency, pursuant to 10 V.S.A. Chapter 49, is mandated to create plans and policies under which Vermont's water resources are managed and uses of these resources are defined. The Agency must, under Chapter 49 and general principles of administrative law, act consistently with these plans and policies, whenever possible.

Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities
(May 1988)

60. The Department publication *Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities* is a state comprehensive river plan. The hydropower study, which was initiated in 1982, indicated that hydroelectric development has a tremendous impact on Vermont streams. Artificial regulation of natural stream flows and the lack of adequate minimum flows at the sites were found to have reduced to a large extent the success of the state's initiatives to restore the beneficial values and uses for which the affected waters are managed.
61. With respect to the Vergennes Hydroelectric Project, the plan recommended that additional studies be completed with respect to five topics: dissolved oxygen, potential for dewatering of downstream habitat during low lake levels, extent and cause of impoundment siltation, status of recreational development, and need for spillage for aesthetics. All of these topics were considered in relicensing studies at the Department's request.

62. The *1993 Vermont Recreation Plan* (Department of Forests, Parks and Recreation), through extensive public involvement, identified water resources and access as top priority issues. The planning process disclosed that recreational use of surface waters is increasing, resulting in greater concern about water quality, public access to Vermont's waters, and shoreland development.

63. The Water Resources and Access Policy is:

It is the policy of the State of Vermont to protect the quality of the rivers, streams, lakes, and ponds with scenic, recreational, cultural and natural values and to increase efforts and programs that strive to balance competing uses. It is also the policy of the State of Vermont to provide improved public access through the acquisition and development of sites that meet the needs for a variety of water-based recreational opportunities.

64. Enhancement of access and improved flow management would be compatible with this policy and balance the competing uses of recreation and hydropower. Failure to provide access would exacerbate a critical state recreational problem.

65. Another priority issue identified in the Recreation Plan is the loss or mismanagement of scenic resources. The plan notes "[t]he protection of the scenic and visual resources in Vermont is paramount if Vermont is to maintain its renowned charm and character."

66. The Scenic Resources Protection and Enhancement Policy is:

It is the policy of the State of Vermont to initiate and support programs that identify, enhance, plan for, and protect the scenic character and rural traditions of Vermont.

XIV. Analysis

Water Chemistry

67. There are no identified problems with respect to dissolved oxygen concentrations. Some slight enhancement may occur, however, due to the applicant's proposal to provide a continuous spillage during the summer and fall. Spillage over the cascade causes turbulent entrainment of oxygen in the water.

Flow Needs in Stream Reaches for Habitat Protection

68. Conversion of the project to run-of-the-river will provide for the protection of downstream habitat. First call operation of Plant 9 in the spring and fall, as proposed, will attract fish to the Plant 9 tailrace and potentially provide enhanced spawning opportunities for walleye and sturgeon. Water levels in the wetlands complex at the Otter Creek Marsh Wildlife Management Area are probably not influenced by project operations; however, conversion to run-of-the-river will assure that no conflicts will occur.
69. Bypass flows will provide localized habitat improvement where highly oxygenated water will exist prior to mixing with the water in the downstream channel. The entrained bubbles in that zone will provide cover for fish.
70. Flashboards are removed in anticipation of high flows. During the refill of the impoundment following flashboard reinstallation, true run-of-the-river operation is not feasible as water will be going into storage. Given that, this certification is being conditioned to allow up to 10% of project inflow to be placed in storage.

Impoundment Habitat

71. No wetlands habitats associated with the impoundment were identified. Impoundment aquatic habitat, including the wetland habitats, will be protected by the cessation of impoundment cycling. Occasional loss of the flashboards will result in the impoundment dropping 1.5 feet, but this relatively small drop in water surface is not expected to result in significant habitat damage.

Screening

72. The 2-inch bar spacing on the Plant 9B trashrack may promote fish entrainment. By condition of this certification, the applicant shall be required to consult the Department of Fish and Wildlife at the time the trashrack for either plant is scheduled for replacement, and to obtain Department approval for the design.

Recreation and Aesthetics

73. Vermont Water Quality Standards require the protection of existing water uses, including the use of water for recreation. Standards also requires the management of the waters of the State to improve and protect water quality in such a manner that the beneficial uses and

values associated with a water's classification are attained. (Standards Section 1-03 *Anti-degradation Policy*)

74. Beneficial values and uses of Class B waters include water that exhibits good aesthetic value and swimming and recreation. (Standards Section 3-03(A) *Class B Waters: Management Objectives*) Standards Section 2-02(B) *Hydrology: Artificial Flow Conditions* prohibits regulation of river flows in a manner that would result in an undue adverse effect on any existing use, beneficial value or use.
75. Conversion of the project to run-of-the-river operation and preferential operation of Plant 9 will enhance angling opportunities below the project.
76. The applicant will be preparing a final recreation plan for the project. By condition of this certification, the applicant shall be required to obtain Department approval of the plan, including related erosion control provisions. The applicant's proposal, with continued access to the river, will provide support for the designated use of recreation.
77. The applicant does not propose any additional parking facilities at this time; however, the adequacy of parking will be monitored as part of the FERC Form 80 process. This is a special concern during the spring walleye fishery.
78. The consensus of the aesthetics study team was that increasing flows above the target flow of 150 cfs did not substantially improve the aesthetics of the Falls. The management objective for Class B waters is to attain good aesthetic value. At the target flow of 100 cfs (actual flow of 146-167 cfs), the three cascades were consensus rated as good; under that condition, the center cascade carried almost twice as much flow as the other two cascades due to the channel entrance head loss discussed in findings 7 and 57. According to the consensus ratings, the center cascade requires disproportionately higher flows to maintain its aesthetic value. A flow distribution similar to that provided during the target flow of 100 cfs will achieve good aesthetic value: 35 cfs for the Plant 9 and Plant 9B cascades and 80 cfs for the center cascade. This certification is being conditioned consistent with the bypass flow schedule proposed by the applicant, but with the additional constraint that the 150 cfs flow be distributed over the three spillways as 35 cfs/80 cfs/35 cfs. The lower nighttime and late fall/winter flows are acceptable as proposed. The nighttime flow of 75 cfs will maintain the aesthetic integrity of the Falls and provide viewing opportunities under the reduced nighttime visibility, as well as provide white noise that masks the noise from traffic on Vermont Route 22A. Special winter flows for aesthetics are unnecessary as the dominant visible feature during the winter is the ice formation on the falls.

Erosion

79. Erosion, if severe, can impair recreational use and cause turbidity and the discharge of suspended solids, potentially violating the standards for those parameters (Turbidity: Standards Section 3-03(B)(1); Total Suspended Solids: Standards Section 3-01(B)(7)). The applicant identified significant erosion areas along the impoundment; however, the problems appeared to be unrelated to daily cycling of the impoundment for enhanced power production.

Debris

80. The applicant does not provide 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 the state solid waste laws and Standards, Section 3-01(B)(7) *Settleable solids, floating solids, oil, grease, scum, or total suspended solids*. A plan is being required as a condition of this certification.

General Conclusions

81. The project, if operated consistent with the conditions of this certification, will support the designated uses for Class B waters (Standards Section 3-03(A) *Class B Waters: Management Objectives*); will not have a significant impact on aquatic biota, fish or wildlife such that the existing populations would have their viability impaired (Standards Section 1-03(B)(2)(a) *Anti-degradation Policy: Protection of Existing Uses*); and will not significantly degrade the use of the water body for recreation, fishing, water supply or commercial purposes (Standards Section 1-03(B)(2)(a) *Anti-degradation Policy: Protection of Existing Uses*).
82. As required under Standards Section 2-02 *Hydrology*, the applicant's artificial regulation of flows, if consistent with the conditions of this certification, will not result in an undue adverse effect on any existing or designated use, including high quality habitat for aquatic biota, fish and wildlife. In making this determination, the Water Quality Policy (10 V.S.A. ' 1250) has been considered, including the need to allow beneficial and environmentally sound development.

83. All of the restrictions and conditions set forth herein, in conjunction with the applicant's proposal, are necessary to ensure compliance with all applicable provisions of the Vermont Water Quality Standards and other appropriate requirements of state law.

ACTION OF THE DEPARTMENT

Based on its review of the applicant's proposal and the above findings, the Department concludes that there is reasonable assurance that operation and maintenance of the Vergennes 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, P.L. 92-500, as amended, and other appropriate requirements of state law:

A. The applicant shall operate and maintain this project consistent with the findings and conditions of this certification, where those findings and conditions relate to protection of water quality and support of designated and existing uses under Vermont Water Quality Standards and other appropriate requirements of state law.

B. **Flow Management.** Except as allowed in Condition C below, the facility shall be operated in a true run-of-the-river mode where instantaneous flows below the project shall equal instantaneous inflow to the impoundment at all times. When the facility is not operating, all flows shall be spilled at the dam. Minimum bypass flows shall be provided in accordance with the following schedule:

April 1 - Oct. 31 150 cfs daytime and 75 cfs nighttime

Nov. 1 - Dec. 15 100 cfs daytime and 50 cfs nighttime

Dec. 16 - March 31 No special flows

The 150 cfs daytime flow shall be apportioned between the spillways with 80 cfs at the center spillway and 35 cfs at each of the two flanking spillways. The 100 cfs daytime flow shall be apportioned similarly. Daytime is one half hour before sunrise through one hour after sunset.

C. **Flow Management during Flashboard Replacement.** To the extent necessary to facilitate flashboard replacement, bypass flows may be suspended. During refill of the impoundment, up to 10% of instantaneous project inflow may be placed in storage.

D. **Plan for Method to Maintain Bypass Flows and Run-of-the-River Operating Conditions.** The applicant shall develop a plan, including descriptions, hydraulic design

calculations, an implementation schedule, and design drawings for the measures to be used to release the bypass flows set forth in Condition B and to maintain a stable headpond with true run-of-the-river operating conditions. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the applicant shall submit the plan to the Department for approval of the changes. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.

- E. **Monitoring Plan for Impoundment and Flow Management.** The applicant shall develop a plan for continuous monitoring of flow releases at the project (below individual spillways and as discharged from each of the two powerhouses), impoundment levels, and estimated inflows. The applicant shall maintain continuous records of flows and impoundment levels and provide such records on a regular basis as per specifications of the Department. The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the applicant shall submit the plan to the Department for approval of the changes. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.
- F. **Prevention of Fish Entrainment at Intakes.** Prior to any future replacement of the Plant 9 or Plant 9B trashracks, the applicant shall consult with the Department of Fish and Wildlife with respect to appropriate bar clear spacing and file the trashrack design information with the Department of Environmental Conservation for approval prior to commencement of work.
- G. **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 two years of the issuance of the license.
- H. **Debris Disposal Plan.** 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. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the applicant shall submit the plan to the Department for approval of the changes. The plan shall then be

filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.

- I. **Maintenance and Repair Work.** Any proposals for project maintenance or repair work, including desilting, drawdowns below the spillway crest to facilitate repair/maintenance work, and tailrace dredging, shall be filed with the Department for prior review and approval, if said work may adversely affect water quality or cause less-than-full support of designated and existing uses of State waters.
- J. **Public Access.** The applicant shall allow public access to the 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. In cases where an immediate threat to public safety exists, access may be restricted without prior approval; 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.
- K. **Recreational Facilities.** Recreational facilities shall be constructed and maintained consistent with a recreation plan approved by the Department. The plan shall be filed with the Department within 60 days of license issuance and shall include an implementation schedule. The applicant is advised to consult with the Department and the City of Vergennes in the development of plans. Where appropriate, the recreation plans shall include details on erosion control. Modifications to the recreation plan shall also be subject to Department approval over the term of the license.
- L. **Erosion Control.** Upon a written request by the Department, the applicant shall design and implement erosion control measures as necessary to address erosion occurring as a result of use of the project lands for recreation. Any work that exceeds minor maintenance shall be subject to prior approval by the Department and FERC.
- M. **Compliance Inspection by Department.** The applicant shall allow the Department to inspect the project area at any time to monitor compliance with certification conditions.
- N. **Posting of Certification.** A copy of this certification shall be prominently posted within the project powerhouse.

- O. **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.
- P. **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 Vermont Water Quality Standards.
- Q. **Continuing Jurisdiction.** The Department reserves the right to add and alter the terms and conditions of this certification, when authorized by law and as appropriate to carry out its responsibilities during the life of the project with respect to water quality.

_____/s/_____
Wallace McLean
Director, Division of Water Quality
for Canute Dalmasse
Commissioner
Department of Environmental Conservation

Dated at Waterbury, Vermont
this 15th day of April, 1999.

Attachments: Appendix A. Responsiveness Summary

cc: Distribution List

APPENDIX A

PUBLIC RESPONSIVENESS SUMMARY