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

In the matter of: Blue Heron Hydro LLC
133 Bartlett Road
Plainfield, VT 05667

APPLICATION FOR BALL MOUNTAIN DAM HYDROELECTRIC PROJECT

The Vermont Department of Environmental Conservation (Department) has reviewed a water quality certification application dated July 10, 2009 and filed by Blue Heron Hydro LLC (Applicant) for the Ball Mountain Dam Hydroelectric Project. The application was determined to be technically complete with the filing of a downstream fish passage facility design on April 12, 2010. Supporting documentation for the application includes the Applicant's Federal Energy Regulatory Commission (FERC) Notice of Intent and Pre-Application Document (NOI/PAD) filed with FERC on July 10, 2009, an updated NOI/PAD dated November 24, 2009 and other filings made by or on behalf of the Applicant through May 5, 2010.

In accordance with 10 V.S.A. § 1004, the current application is subject to review under the Vermont Water Quality Standards adopted by the Water Resources Panel that became effective on January 1, 2008 (Standards, Section 1-01. Applicability and Definitions).

The Department held a public hearing on June 22, 2010 under the rules governing certification and received testimony during the hearing and, as written filings, through June 25, 2010.

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

Findings

Background and General Setting

1. The Ball Mountain Dam Hydroelectric Project is in the town of Jamaica, Vermont at the existing U.S. Army Corps of Engineers (Corps) Ball Mountain Dam. The dam is at river mile 29.7.
2. The dam's primary purpose is flood control in the Connecticut River Valley, but it is also managed for recreational purposes. It is part of a system of sixteen Corps flood control dams in the Connecticut River Basin.
3. The West River drainage basin covers 423 square miles of southeastern Vermont. It flows generally south and southeast from its headwaters in Mt. Holly through Weston, Londonderry, Jamaica, Townshend, Newfane, Dummerston and Brattleboro, where it joins the Connecticut River. The mainstem is 46 miles long. The principal tributaries are the Winhall River, Ball Mountain Brook, Wardsboro Brook and Rock River.
4. The watershed area at Ball Mountain Dam is 172 square miles.

Project and Civil Works

5. Ball Mountain Dam was completed by the Corps in 1961. It is a rock and earthfill structure approximately 915 feet long with a maximum height of 246.5 feet (1,052.0 feet NGVD). The emergency spillway is a concrete ogee weir, 235 feet long with a crest elevation of 1,017.0 feet NGVD. A concrete tower housing the gates and machinery for the outlet works is located upstream of the dam. Outflow is controlled by three 5-foot 8-inch by 10-foot hydraulic slide gates, the inverts of which are at stage 0 feet or 805.5 feet NGVD. The gate tunnels converge into a circular concrete outlet conduit. The conduit is 13.5 feet in diameter and 864 feet long with a hydraulic capacity of 5,000 cfs.

6. The center gate can be operated automatically by a programmable logic controller that uses inputs from a headpond level sensor and sensors that monitor the settings of the two side gates.

7. The reservoir extends west and then north along the West River upstream toward South Londonderry. At full capacity the reservoir extends upstream approximately six miles. Total reservoir capacity is 52,450 acre-feet with a surface area of 810 acres. Reservoir capacity has been reduced by accumulation of approximately 230,000 cubic yards of sediment.

8. The Corps has identified significant foundation seepage problems at Ball Mountain Dam and has taken steps to reduce the risk. Those measures include special operational restrictions that will allow for a lower reservoir elevation to be maintained during flood control operations.

9. There are no hydroelectric facilities presently at the dam. The Applicant proposes to install turbine-generator arrays on the upstream side of the two outside gates. The arrays will consist of axial flow turbines arranged in a matrix arranged two wide by three high, for a total of twelve turbines in the two arrays.

10. The arrays will be lowered into bulkhead slots in the outlet works using a crane to be installed at the top of the gate tower. The arrays will be raised for cleaning, maintenance and when additional discharge capacity is required for flood control operations.

11. The turbine-generators will be Obermeyer axial flow units with a design hydraulic capacity of 33-38 cfs at a 35-foot reservoir stage, depending on their location in the array. Combined total capacity of the arrays will be 425 cfs at a 35-foot stage.

12. The turbines have fixed guide vanes and runner blades. The hydraulic capacity of the units will vary with head. For the units in the bottom tier of the array, the hydraulic capacity is 31 cfs at stage 25 feet; 38 cfs at stage 35 feet; and 53 cfs at stage 65 feet. The units can be spun “no-load” at approximately 40 percent of their rated hydraulic capacity.

13. Each turbine will be attached to a submersible generator with a rated electrical capacity of 183 kW. Total generation capacity for the project will be 2.2 MW.

14. Trashracks with vertical bars and 1.5-inch clear spacing will be installed to minimize the entrainment of fish through the turbines. During the fish passage season of April 1 to June 15, these racks will be replaced by racks with 1.0-inch clear spacing.

15. Downstream fish passage will be provided by 2-foot deep by 3-foot wide surface skimmers located above each turbine array. Each skimmer will connect to a 10-inch diameter bypass

pipe that will discharge into the chamber behind the turbine draft tubes. The skimmers will be located at the water surface when the reservoir is at the 35-foot stage.

16. In addition to the turbine arrays, fish passage facility and crane atop the tower, the project will require installation of a working platform on the tower and control equipment, a transformer and switch gear adjacent to the access bridge. Approximately 6000 feet of distribution line and utility poles will be installed along the dam access road.

17. The project boundary will incorporate the intake tower and bridge and a corridor along the access road for the powerline.

River Hydrology and Streamflow Regulation

18. Since Ball Mountain Dam was constructed in 1961, Corps' operational protocols have varied. Beginning in the 1990s, the Corps implemented conservation flow requirements and ramping rates. In 2005, the Corps adopted the following guidance for project operation.

<table>
<tr><td rowspan="2"></td><td rowspan="2">Maximum Outflow (cfs)</td><td colspan="3">Minimum Outflow and Aquatic Base Flow (ABF)</td><td colspan="2">Maximum change in Outflow (cfs/hr)</td></tr>
<tr><td>Oct – Mar
ABF = 170 cfs</td><td>Apr – May
ABF = 690 cfs</td><td>Jun – Sep
ABF = 90cfs</td><td>Increase</td><td>Decrease</td></tr>
<tr><td>Flood Control</td><td>5,000</td><td colspan="2">170 cfs</td><td>90 cfs</td><td>1,000 cfs/hr to 4,000 cfs/hr then 500 cfs/hr</td><td>1,600 cfs/hr</td></tr>
<tr><td>Normal Operation</td><td>NA</td><td rowspan="3">170 cfs or inflow whichever is less</td><td rowspan="3">690 cfs or inflow whichever is less</td><td rowspan="3">90 cfs or inflow whichever is less</td><td colspan="2">Incremental gate changes as needed to closely mimic run-of-river conditions</td></tr>
<tr><td>Maintenance</td><td>NA</td><td colspan="2" rowspan="2">170 cfs/hr above 690 cfs and 90 cfs/hr below 690 cfs</td></tr>
<tr><td>Whitewater</td><td>1,500</td></tr>
</table>

In addition to the above provisions, the guidance specifies that a flow of 690 cfs will be maintained during the overnight hours between a 2-day whitewater event.

19. Initially, the project was operated with a dry-bed during the summer and a 25-foot winter pool to prevent the gates from freezing. Beginning in 1966, a pool of varying depth has been maintained year-round. Currently, during normal (i.e., non-flood control) operations, the reservoir is operated at three different elevations throughout the year, as detailed in the following table:

Period	Stage (ft)	Storage Volume (ac-ft)	Upstream Reservoir Length (mi)
mid-June – September	65	2,000	1.72
October – mid-April	35	270	1.02
mid-April – mid-June	25	240	0.43

20. Regulation of Ball Mountain Reservoir is coordinated with operation of Townshend Dam which is approximately nine miles downstream.

21. Precise control of reservoir elevation and outflow is complicated by the size of the gates. Relatively small adjustments in the gate openings result in relatively large changes in outflow.

22. Since October 1946, the U.S. Geological Survey has operated a surface water gaging station (No. 01155500) on the West River in Jamaica. The gage is 2.8 miles downstream of Ball

Mountain Dam. The drainage area measured at the gage is 179 square miles. The dam has regulated gaged flows since 1961. The following hydrologic statistics for the project site are based on gage data for water years 1947-1989 and 1996-2008:

Mean annual flow	370 cfs
Annual runoff	29.2 inches
10 percent exceeds	939 cfs
50 percent exceeds	163 cfs
90 percent exceeds	32 cfs
7Q10	6.6 cfs (period of record through 2004)

Applicant Proposal for Licensing

23. Responsibility for operation of the project will be divided between the Applicant and the Corps. The exact nature of that relationship will be defined by a Memorandum of Agreement that will be developed after the project receives a FERC license. The agreement will define how the Applicant will install, operate and manage the hydroelectric facility.

24. During those periods when the Applicant is responsible for outflow regulation, the project will be operated in run-of-river mode.[1]

25. The Applicant has defined the proposed development as a "following project," i.e., the reservoir levels and downstream flows currently maintained by the Corps will be continued.

26. The Applicant proposes to maintain run-of-river conditions with fixed-discharge units by operating multiple units under both load and no-load conditions and adjusting the center gate.

27. The Applicant has indicated its intention to operate the reservoir at a permanent stage of 65 feet, subject to review and approval by the Corps.

Standards Designation

28. The Vermont Water Quality Standards (Standards) are promulgated by the Vermont Water Resources Panel pursuant to 10 V.S.A., Chapter 47, Water Pollution Control. 10 V.S.A. § 1252 provides for the classification of State waters as either Class A or Class B and authorizes the Panel to adopt standards of water quality to achieve the purpose of classification.

29. The West River has been designated by the Vermont Water Resources Panel as Class B waters.

30. The Anti-Degradation Policy in the Standards requires that "[a]ll waters shall be managed in accordance with [Standards] to protect, maintain, and improve water quality." (Standards, Section 1-03A)

31. Class B waters are managed to achieve and maintain a high level of quality that supports the following designated uses: aquatic biota, wildlife and aquatic habitat; aesthetics; public water

[1] 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 a project shutdown or reservoir refill. Under those circumstances, a change in storage contents is necessary, and outflow is reduced below inflow for a period.

supply; irrigation of crops and other agricultural uses; swimming and other primary contact recreation; boating, fishing and other recreational uses. (Standards, Section 3-04A)

32. The waters of the West River are designated coldwater fish habitat for the protection and management of fisheries. (Standards, Section 3-05)

33. In Class B waters, the dissolved oxygen (D.O.) 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 a coldwater fish habitat, the standard is not less than 6 mg/L and 70 percent saturation. (Standards, Section 3-04B.2)

34. The temperature standard for coldwater fish habitat limits increases to 1.0° F from ambient conditions. (Standards, Section 3-01B.1b)

35. The turbidity standard is 10 NTU as an annual average under dry weather base-flow conditions for coldwater fish habitat. (Standards, Section 3-04B.1a)

36. 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." (Standards, Section 3-04B.4)

37. The Hydrology Policy in the Standards requires that "[t]he 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 1-02E.1)

38. The Hydrology criteria require that, for Class B waters that have not been classified as WMT 1, streamflows be protected in such a manner that the change from the natural flow regime "provide for maintenance of flow characteristics that ensure the full support of uses and comply with the applicable water quality criteria." There is a preference for study-based, site-specific streamflow protection standards; however, use of general hydrologic standards is also accepted. (Standards, Section 3-01C)

39. In 10 V.S.A. §1250, the Vermont Legislature enumerated the State water quality policy. The State's policy is to upgrade the quality of its waters and reduce existing risks to water quality over the long term and to protect and enhance the quality, character and usefulness of its surface waters. Further, it is the State's policy to allow beneficial and environmentally sound development.

40. On September 24, 2008, the USEPA approved a list, prepared by the Department under Section 303(d) of the Federal Clean Water Act, indicating waters considered to be impaired based on water quality monitoring efforts. The West River between Ball Mountain Dam and Townshend Dam is listed as impaired for sediment and temperature. From Ball Mountain

Dam to the head of Townshend Reservoir, the temperature impairment is caused by the release at Ball Mountain. The remainder is caused by the presences of Townshend Reservoir.

41. The sediment impairment listing is based on sediment releases at Ball Mountain Dam that occurred in 1993 and 1995 when the Corps was implementing gate automation. Equipment failure allowed the pool to drop below the 25-foot stage, mobilizing sediment and discharging it downstream. Equipment and management improvements make another occurrence unlikely, so the Department will consider removing the sediment impairment during the next update of the 303(d) list.

42. The Department issued a six-part list, *List of Priority Surface Waters Outside the Scope of the Clean Water Act Section 303(d)* in 2008. Part F lists those surface waters where water quality or habitat is being altered by flow regulation. Ball Mountain Reservoir is listed due to water level fluctuations. The West River from Ball Mountain Dam to the Townshend Reservoir is listed due to artificial flow regulation at Ball Mountain.

Water Chemistry

43. The West River has been classified as Class B waters by the Vermont Water Resources Panel. Class B waters are of a quality which consistently exhibits good aesthetic value and provide high quality habitat for aquatic biota, fish and wildlife. Uses are public water supply with filtration and disinfection; irrigation and other agricultural uses; swimming; recreation and hydropower. The West River downstream of Ball Mountain Dam meets Class B standards as determined by the Vermont Agency of Natural Resources.

44. There are no permitted direct discharges upstream of Ball Mountain Dam. The water quality is high and meets Vermont Water Quality Standards for Class B waters. Ball Mountain Reservoir is borderline oligotrophic-mesotrophic.

45. Reservoir profile data collected by the Natural Resources Consulting Services between June 14 and September 21 of 1985 show that the reservoir exhibits weak to moderate thermally induced density stratification patterns that form, break up, and reform during the summer.

46. The 65-foot pool has the effect of both increasing and moderating water temperatures. The overall average temperature increases between inflow and discharge stations in August and September are about 0.5 to 2 degrees F. The daily minimum temperature was increased by 5 to 5.7 degrees and the daily maximum was decreased by 3.7 to 5.5 degrees.

47. Data collected at Ball Mountain Reservoir show D.O. levels that meet or exceed Vermont standards at all stations except for some low D.O. levels at the bottom of the reservoir during peak stratification years.

48. The Department of Environmental Conservation, in issuing a certification to the Towns of Londonderry, Dummerston, Newfane, Wardsboro, and Windham to develop hydropower at Ball Mountain Dam (FERC Project No. 8433), reviewed available water quality data collected by the Corps within the reservoir and at river stations located 2.0 and 2.5 miles downstream. Although that data did not disclose strong thermal stratification, extreme oxygen depletion was evident during summer low flow.

49. It is probable that significant re-aeration occurs immediately downstream of the gates. At low flows gate openings may be as small as a few inches. The velocity of the discharge jet

beneath the gates may be in excess of 40 feet per second. The hydraulic jump which forms in the conduit downstream of the gates is an effective reaeration mechanism. Additional re-aeration can occur in the free surface flow in the conduit between the gates and the outlet at the downstream toe of the dam. Some reaeration occurs at the small cascade at the conduit outlet.

50. The amount of D.O. concentration improvement provided by the three physical mechanisms (hydraulic jump, free surface flow, and cascade flow) of the outlet system is unknown. The Applicant's proposal would remove the hydraulic jump mechanism, but the free surface reaeration and cascade reaeration would continue to occur.

Aquatic Biota and Habitat

Atlantic Salmon

51. The West River watershed is annually stocked with Atlantic salmon fry as part of the cooperative effort to restore salmon to the Connecticut River basin. This effort is overseen by the Connecticut River Atlantic Salmon Commission.

52. Experimental salmon fry stocking started in 1981. Large scale stocking started in 1987 and expanded to the current area in 1993. Suitable habitat is stocked throughout the basin, including tributaries and the West River mainstem from its headwaters downriver to the upper end of Townshend Reservoir. The West River below Townshend Reservoir is not stocked due to high water temperatures.

53. Habitat surveys have been conducted by the Vermont Department of Fish and Wildlife and the USDA Forest Service. Based on these surveys, 82 percent of the salmon habitat in the basin is above Townshend Dam and 49 percent is above Ball Mountain Dam.

54. In recent years, the number of fry stocked annually has varied from about 600,000 to 1.1 million.

55. Salmon in the West River watershed typically live in fresh water for two years before migrating to the ocean as smolts.

56. The Vermont Department of Fish and Wildlife and the USDA Forest Service annually electrofish index sites throughout the watershed to monitor survival and growth of stocked salmon and other fish populations. Survival and growth of stocked salmon fry is generally good to excellent. The West River is the largest producer of smolts in the Connecticut River watershed.

57. One exception to the general pattern of good survival of stocked salmon fry in the West River occurs at an index site below Ball Mountain Dam. There, survival of stocked fry during their first summer is poor despite good physical habitat. The fry are very small and not very mobile, and the high mortality may be attributable to stranding or scouring caused by artificial flow fluctuations below the dam. Yearling salmon parr, which are much larger and more mobile, move into this reach from habitat upstream of the dam and are present at normal densities.

58. The period of operation for downstream fish passage facilities specified by the Connecticut River Atlantic Salmon Commission in the Connecticut River watershed is April 1 – June 15 and September 15 – November 15. In years when adult salmon are above a facility,

downstream passage also needs to be provided for kelts from October 15 to December 31. These operational periods are subject to revision based on new information about fish movement.

59. Passage for smolts migrating downstream through Ball Mountain Dam has been provided by lowering the pool to 25 feet during the spring outmigration season. Smolts are surface oriented, but will follow the current and sound to the outlet at this depth.

60. The U.S. Fish and Wildlife Service conducted radio tracking studies in 1990 and 1991 which indicated effective smolt passage with minimal delay at Ball Mountain. The studies were not designed to evaluate mortality. Some tags became stationary below Ball Mountain Dam, but that could be the result of loss of external tags during passage rather than mortality.

61. The proposed turbines are expected to cause extremely high mortality on any fish that pass through them.

62. About 10 percent of the adult Atlantic salmon to reach the Holyoke Dam (the first mainstem dam to be encountered by returning fish) are radio-tagged and released. Ninety percent of the salmon at Holyoke are held for hatchery broodstock. Prior to 1998, released adult salmon were not radio-tagged.

63. The Corps constructed a trap and truck facility at Townshend Dam in 1993 for upstream passage of adult Atlantic salmon. To date, trapped adults have been released just above Townshend Reservoir. When run sizes increase, adult salmon will be released above Ball Mountain as well.

64. There have been numerous operational problems with the salmon trap and several modifications have been made to improve it. The U.S. Fish and Wildlife Service and Vermont Department of Fish and Wildlife believe additional improvements to attraction flow are needed, but the last four salmon to reach the trap since the last modifications have been successfully trapped and released upriver (two in 2007 and two in 2009).

65. Since 1998, 20 radio-tagged adult salmon have reached the salmon trap, but only five have actually been trapped and released upstream due to problems with the trapping facility. Three salmon were trapped and released upstream at Townshend from 1993-1997.

66. The Vermont Department of Fish and Wildlife conducts monitoring of radio-tagged salmon on a limited basis. Radio-tagged salmon have been documented spawning in 1998 and 2009. The 2009 spawning was in the North Branch of Ball Mountain Brook, a tributary above Townshend Dam.

67. Male salmon mature as parr in freshwater and are abundant throughout the West River watershed. Most adult returns are females, and any female salmon that has reached the upper West River watershed has likely spawned.

Resident and Other Diadromous Species

68. Ball Mountain Reservoir is poor fish habitat because it is an onstream impoundment that is used for flood control. Water level fluctuations for flood control and operations are dramatic and limit development of riparian and aquatic vegetation.

69. Habitat in the reach below Ball Mountain Dam is impacted by flow regulation at the dam and in the past by sediment releases.

70. Habitat limitations notwithstanding, the West River below Ball Mountain Dam supports a variety of other species including blacknose dace, longnose dace, slimy sculpin, white sucker, fallfish, and occasional brook trout. Wild brown trout are also present in this reach, but have been rare since the sediment releases in the 1990s. Rainbow trout are stocked for fishing in this reach. American eel were historically present.

Wildlife and Wetlands

71. The Vermont Significant Wetlands Inventory shows no protected wetlands associated with Ball Mountain Reservoir.

72. Based on mapping performed by the Corps in 1996, approximately 128 acres of the Ball Mountain project area are wetland. Most of the wetland is open water (Ball Mountain Reservoir) or riverine.

73. Mudflats upstream of the Ball Mountain dam provide habitat for a variety of migrating shorebirds after the reservoir is drawn down in late September.

Rare and Endangered Species and Outstanding Natural Resources

74. Two state-threatened freshwater mussels are known to occur in the West River in the vicinity of Ball Mountain Dam and elsewhere. The brook floater (*Alasmidonta varicosa*) is found from the reach below the dam downstream to the Connecticut River. Recent studies indicate that it has undergone a serious population decline in the West River over the last two decades. The Eastern pearlshell (*Margaritifera margaritifera*) is found from above Ball Mountain Reservoir to below Townshend Dam. This is a coldwater species that occupies waters with salmonids and does not tolerate silt or turbid water.

75. The cobblestone tiger beetle (*Cicindela marginipennis*), a state-threatened species, occurs along the banks of the West River in Brattleboro, where it occupies cobble shores and islands near the water line. It is unlikely to be found farther upriver toward Ball Mountain Dam.

76. The Vermont Non-Game and Natural Heritage Program lists the following rare vascular plant species as occurring along the West River:

Tubercled orchid	*Platanthera flava*	State Threatened and Rare (S2)
Riverweed	*Podostemum certophyllum*	Very Rare (S1)
Smith's bulrush	*Schoenoplectus smithii*	Very Rare (S1)
Tapering rush	*Juncus acuminatus*	Very Rare (S1)
Hairy wild rye	*Elymus villosus*	Very Rare (S1)
Dwarf bilberry	*Vaccinium caespitosum*	Rare (S2)
Sand cherry	*Prunus pumila var. depressa*	Rare (S2)
Whorled milkwort	*Polygala verticillata*	Rare (S2)
Vasey's pondweed	*Potamogeton vaseyi*	Rare (S2)
Canada burnet	*Sanguisorba canadnese*	Uncommon to Rare (S2/S3)
Grass rush	*Juncus marginatus*	Uncommon (S3)
Nuttal waterweed	*Elodea nuttallii*	Uncommon (S3)
Shining Ladies Tresses	*Spiranthes lucida*	Uncommon (S3)
Mountain laurel	*Kalmia latifolia*	Uncommon (S3)
Field Milkwort	*Polygla sanguinea*	Uncommon (S3)

Erosion

77. Fluctuation of the reservoir both during flood control and normal operations has prevented vegetation from becoming established along the reservoir shoreline. When the reservoir is maintained at stages below 65 feet, unvegetated areas are exposed and subject to erosion. However, specific problem areas have not been identified.

78. Development of the project will require construction of approximately 6,000 feet of powerline along the access road to the dam. No other earth disturbing activities are anticipated.

Recreation

79. The dam access road provides access to the dam and reservoir for outdoor recreation activities.

80. The Corps operates the Winhall Brook Camping Area upriver from the dam, which provides seasonal camping opportunities.

81. The Vermont Agency of Natural Resources operates the seasonal Jamaica State Park, located along the river approximately 2.5 miles downstream from the dam.

82. Whitewater boating is a popular pursuit from Ball Mountain Dam to a takeout at the highway crossing about 1.8 miles below Jamaica State Park. When sufficient water is available, the Corps conducts two special releases for whitewater boating in April and September. Opportunistic releases occur when the Corps is lowering the reservoir pool following flood control operations.

83. The West River Trail, a former railroad right-of-way, provides walking and biking opportunities between the state park past the dam to the vicinity of South Londonderry.

Aesthetics

84. When the reservoir is lower than its 65-foot summer stage, the unvegetated shoreline is exposed.

85. When the dam is operated in accordance with Corps outflow guidance, conservation flows are maintained below the dam to support aesthetics.

Comprehensive Plans

86. 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.

Vermont Agency of Natural Resources Basin 11 Management Plan – West River, Williams River, Saxtons River (June 2008)

87. The Agency of Natural Resources, with extensive public involvement, completed a comprehensive river plan for the basin that includes the West River in 2008. The plan, entitled *Vermont Agency of Natural Resources Basin 11 Management Plan – West River, Williams River, Saxtons River* recommends several actions to address water quality issues associated with Ball Mountain Dam, including: determining the impacts of the dam and its operation on aquatic biota and physical habitat upstream and downstream; replacing the

outlet gates to enable run-of-river flows; monitoring compliance with the coordination plan in place with the Vermont Agency of Natural Resources and U.S. Fish and Wildlife Service; providing public outreach and river stewardship education pertaining to the adverse impacts of rapid releases from flood control dams on stream habitat, biota and water quality; and coordinating the efforts of federal, state, and local agencies to address fish passage issues and natural flow regimes at dams on the West River.

88. The plan notes that the West River and its major tributaries have been designated as a "special focus area – high priority" by the U.S. Fish and Wildlife Service because of the watershed's rare species, potential for Atlantic salmon restoration, and contiguous habitat type. These features have also prompted The Nature Conservancy of Vermont to consider the West River watershed as one of its highest priority areas for protection. These organizations have identified specific threats to the water quality and aquatic habitat of the West River to include sedimentation and thermal modification resulting from riparian vegetation removal, erosion, flow alteration from flood control dams and acidic conditions.

89. The plan notes that "[d]am operations in the West River are still a major concern and Basin 11 planners will work with all parties involved to create a reasonable and feasible scope of activities to help facilitate a solution to this larger issue."

Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River (July 1998)

90. The Connecticut River Atlantic Salmon Commission adopted a revised *Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River* in 1998. The plan summarizes strategies to further the mission of the Connecticut River Atlantic Salmon Restoration Program "to protect, conserve, restore and enhance the Atlantic salmon population in the Connecticut River basin for public benefit, including recreational fishing."

91. Goal 2 in the plan states:

> Enhance and maintain the quantity, quality and accessibility of salmon habitat necessary to support re-established spawning populations.

92. Goal 2 encompasses three objectives:

> Objective 2.A. Protect, maintain and restore existing Atlantic salmon habitat in all 38 selected tributaries.
>
> Objective 2.B. Provide adult Atlantic salmon access to selected upstream spawning habitat in the Connecticut River and 13 identified tributaries.
>
> Objective 2.C. Minimize passage obstructions, migratory delays and mortality of Atlantic salmon smolts and kelts downstream of areas stocked with fry, parr, smolts or adults.

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

93. 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.

1993 Vermont Recreation Plan

94. 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, loss of public access to Vermont's waters, and shoreland development.

95. The plan's 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.

96. 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."

97. The Scenic Resources Protection and Enhancement Policy in the Recreation Plan 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.

Analysis

Project and Civil Works

98. Final design and operation of the hydroelectric project will be subject to a Memorandum of Agreement between the Corps and the Applicant. The effect that agreement will have on the project as certified is unknown. By condition of this Certification, the Department will reserve the right to amend or revoke this Certification if the Memorandum of Agreement is not sufficient to ensure the Applicant's compliance with this Certification.

Water Chemistry

99. Available data indicate that thermal stratification of the reservoir and low D.O. concentrations at depth can occur. The degree to which installation and operation of the turbines would alter reaeration is unknown. Consequently, it will be necessary to conduct a study to determine whether the proposed project will degrade downstream D.O. concentrations once it is operational. By condition of this Certification, the Applicant will be required to complete such a study and, depending on the results, implement any necessary mitigation measures.

100. Temperature data show that the reservoir increases downstream water temperature and moderates diurnal temperature fluctuations. The reach of the West River below the dam is listed as impaired for temperature. It will be necessary to document that operation of the project will not exacerbate this impairment. By condition of this Certification, the Applicant will be required to complete a temperature study and determine the project's impact on downstream water temperatures and propose mitigation if necessary.

Flow and Water Level Management

101. For the purposes of this Certification, it is assumed that the Applicant will be responsible for all operations, including whitewater boating releases, with the exception of special maintenance operations and flood control. The division of responsibilities for project operation between the Applicant and the Corps will be determined by a Memorandum of Agreement; negotiations on that agreement have yet to begin.

102. The Applicant has submitted information stating that the hydroelectric project "will maintain the same reservoir levels and downstream flows as presently provided by the Corps." (letter from Lori Barg to Brian T. Fitzgerald, April 9, 2010) Other submittals, including the fish passage design, also indicate that seasonal reservoir stages will be maintained in the future. Nonetheless, the Applicant also indicates an intention to stabilize the reservoir at the 65-foot stage year-round, provided that the Corps approves the change. A permanent pool at 65 feet or any other elevation would constitute a significant operational change from that described in the current certification application. This change would have a material effect on water quality, so an amended water quality certification would be required prior to implementing the change.

103. Ball Mountain Reservoir and the West River below Ball Mountain Dam are currently listed by the Department as priority waters due to water level and flow fluctuations, respectively, that are caused by dam operation. Consequently, the current operation does not conform with Standards.

104. Operation of the project will continue current Corps water level management protocols, so conditions in the reservoir will not be altered.

105. Downstream releases of impounded sediment can be avoided by maintaining the reservoir stage at the 25-foot level or higher.

106. Run-of-river operation will be necessary to provide aquatic habitat protection below the project.

107. Run-of-river operation will address any issues related to aesthetics for the downstream reach.

108. Run-of-river operation will address some of the impacts of flow regulation that have resulted in the West River below Ball Mountain Dam being included in Part F of the *List of Priority Surface Waters Outside the Scope of the Clean Water Act Section 303(d)* (2008). The impacts of flow regulation during Corps flood control operations will continue.

109. Continued operation of the project for flood control will perpetuate the conditions leading to the reservoir's inclusion on the Part F list. A major operational change, such as dry-bed operation or a year-round stable pool, would partially address the impacts of the flood control

operation on the reservoir, but impacts would continue as long as the flood control reservoir exists.

110. By conditions of this Certification, the Applicant shall be required to maintain run-of-river operation and a pool stage of at least 25 feet when the project is under the Applicant's control. Further, the applicant shall be required to develop a flow and water level management plan that details the equipment and operating protocols that will be used to meet these requirements.

Aquatic Biota and Habitat

111. Aquatic habitat conditions in the reservoir will not change as a result of project operation.

112. Cooling at night is very important to fish during periods of high water temperatures. Water temperatures are increased in the reservoir and diurnal temperature fluctuations are reduced.

113. The current operation allows outmigrating salmon to move downstream unimpeded.

114. The Connecticut River Atlantic Salmon Commission has specified periods for operation of downstream fish passage facilities to be April 1 – June 15 and September 15 – November 15. In years when downstream passage for kelts is needed, the fall period is extended to December 31. By condition of this Certification, the downstream fish passage facility will be required to operate during these periods, subject to modification based on new information about the behavior of migratory salmonids.

115. Extremely high mortality is expected for any fish that are entrained by the turbines. Downstream fish passage facilities will be needed to convey fish safely and effectively downstream. The Applicant has submitted a downstream fish passage design, but changes and additional details are needed. The Applicant will be required to complete the design, subject to Department approval, and install the facility prior to project operation.

116. The effectiveness of the proposed fish passage facility design is unknown. By condition of this Certification, the Applicant will be required to conduct a post-operation effectiveness study and make operational or structural changes as necessary if passage is not adequate.

Debris Disposal

117. 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)(7). Debris may also impair aesthetics. A debris disposal plan shall be required as a condition of this Certification.

Comprehensive Plans

118. The project, if designed and operated in accordance with the conditions of this Certification, will be consistent with the comprehensive plans cited above.

119. True run-of-river operation will help to restore and support designated uses of the affected waters.

Anti-Degradation

120. As part of the issuance of this certification, the Agency must apply the anti-degradation provisions of Section 1-03 of the Standards.

121. Existing water quality impairments for temperature and sediment are associated with Ball Mountain Dam. These impairments affect the reach of the West River between Ball Mountain Dam and Townshend Dam.

122. The sediment impairment resulted from two sediment releases that occurred in the 1990s when the pool level was allowed to drop below 25 feet. Changes in Corps operating practices and equipment have prevented their recurrence. The Applicant will be required to maintain a pool stage of at least 25 feet whenever the project is under the Applicant's control. Systems necessary to meet this requirement will be described in the flow and water level management plan, which will also be required.

123. The temperature impairment is a consequence of the presence of the reservoir. Major changes in the way the Corps operates the reservoir, which are beyond the scope of this certification, would be needed to eliminate the temperature impacts. Nonetheless, the Applicant has an obligation to demonstrate that the hydroelectric facility does not exacerbate the impairment. This will be accomplished through a post-license temperature study required by this certification and possible changes in project design or operation if an impact is demonstrated.

124. There is some possibility that the installation and operation of the hydroelectric facility could degrade downstream D.O., which is not currently a problem.

125. The Applicant will be required to complete a study to determine if downstream D.O. is being degraded due to project operation. If that is the case, the Applicant will be required to propose and implement mitigative measures to eliminate any degradation. Failure to remediate any degradation due to D.O. may result in a reopening of this certification.

126. The project is designed so that there is no penstock or tailrace, and therefore, no bypass reach receiving a reduced portion of the river's total flow.

127. Water quality alterations related to flow and water level regulation currently exist due to operation of Ball Mountain Dam. The alterations affect the reach from the dam downriver to the Townshend Dam (flow fluctuations) and the Ball Mountain Dam impoundment (water level regulation).

128. The flow regulation alteration results from Corps operation of the dam. The hydroelectric facility will be required by condition to operate in a strict run-of-river mode, which will result in flow management improvements outside of Corps flood control operations.

129. The reservoir water level alteration will continue as a result of Corps operating procedures for flood control and other purposes, but will not be exacerbated by hydroelectric operations.

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 Ball Mountain Dam 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.** The project shall be operated in a true run-of-river mode except during scheduled whitewater boating releases, when the Corps has taken control of the project for flood control or special maintenance operations, or when the Applicant is conducting special maintenance operations approved in advance by the Department. When the Applicant is conducting scheduled whitewater boating releases or special maintenance operations, the conservation flow and ramping requirements described in Finding 18 shall be met at all times. Under no circumstances shall the applicant allow the reservoir stage to drop below 25 feet when the project is under the Applicant's control. True run-of-river operation means no utilization of reservoir storage and that outflow from the facility is equal to inflow to the reservoir on an instantaneous basis, as further described in Footnote 1, page 4.

C. **Flow Management During Reservoir Refill.** During refilling of the project reservoir following a drawdown, 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 and Water Level Management Plan.** The Applicant shall develop and file with the Department a flow and water level management plan detailing how the project will be operated to achieve compliance with the flow and water level management limitations described above. The plan shall include details of the systems that will be used to maintain a pool stage of at least 25 feet, including a backup system that will function in the event of primary system failure. The plan shall be subject to Department review and approval. Project operation shall not commence prior to approval of the plan by the Department. The Department reserves the right of review and approval of any material changes made to the plan.

E. **Monitoring Plan for Reservoir and Flow Management.** The Applicant shall develop a plan for continuous monitoring and reporting of flow releases at the project, reservoir levels and inflows. The plan shall include procedures for reporting deviations from prescribed

operating conditions to the Department, explaining the reasons for those deviations and indicating measures to be taken to avoid recurrences. The Applicant shall maintain continuous records of flows and reservoir levels and provide such upon request by the Department. The plan shall include a provision for the inclusion of contemporaneous records from the U.S. Geological Survey gage (West River at Jamaica, Vermont, Gage No. 01155500). The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service. The plan shall be subject to Department review and approval. Project operation shall not commence prior to approval of the plan by the Department. The Department reserves the right to review and approve or deny any material changes made to the plan.

F. **Memorandum of Agreement.** The Applicant shall ensure that its Memorandum of Agreement with the Corps relating to responsibilities for project operation is consistent with the findings and conditions of this Certification. The Applicant shall provide a copy of the final Memorandum of Agreement to the Department upon its signature. The Department reserves the right to amend or revoke this Certification if the Memorandum of Agreement is not sufficient to ensure the Applicant's compliance with this Certification.

G. **Dissolved Oxygen.** The Applicant shall conduct a study to sample D.O. below the dam and determine if project operation is degrading downstream D.O. concentrations. The study plan shall be developed in consultation with the Department and shall be subject to Department review and approval. Project operation shall not commence prior to approval of the plan by the Department. If the study documents that D.O concentrations are being degraded, the Applicant shall propose, subject to Department review and approval, changes in project design or operation to mitigate the impact. The Applicant shall implement any project design and operation changes approved by the Department within the timeframes specified by the Department. Failure to implement any required changes may result in a reopening of this Certification.

H. **Water Temperature.** The Applicant shall conduct a study to determine the impact of project operation on downstream water temperature. The study plan shall be developed in consultation with the Department and shall be subject to Department review and approval. Project operation shall not commence prior to approval of the plan by the Department. If the study documents downstream temperature impacts, the Applicant shall propose, subject to Department review and approval, changes in project design or operation to mitigate the impacts.

I. **Downstream Fish Passage.** Prior to initial project operation, the Applicant shall install a downstream fish passage facility to convey fish safely and effectively to the river immediately below the dam. A downstream fish passage plan shall be developed in consultation with the Department, the Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service and shall be submitted to the Department at least 180 days prior to the commencement of construction. The plan shall be subject to Department review and approval prior to construction. The plan shall include:

1) Design and construction plans and specifications;
2) Plans for operation and maintenance;
3) Provisions to minimize entrainment of fish into the generating units;

4) Provisions to minimize impingement of fish on devices or structures used to prevent entrainment; and

5) Provisions to convey fish safely and effectively downstream of the facility.

Downstream passage shall be provided 24 hours per day, April 1 – June 15 and September 15 – November 15. In years when adult salmon are above the project, the fall passage period shall be extended through December 31. The downstream passage facility shall be functional at all reservoir operating levels. The passage period shall be subject to adjustment based on knowledge gained about migration periods for migratory salmonids.

J. **Downstream Fish Passage Effectiveness Study.** Prior to initial project operation, the Applicant shall develop a plan to study the effectiveness of the downstream fish passage facility. The study plan shall include a schedule; shall be developed in consultation with the Department of Fish and Wildlife and the U.S. Fish and Wildlife Service; and shall be subject to Department approval prior to implementation. Based on the outcome of the study, the Department may require that the facilities required under Condition I be modified or replaced in order to assure safe passage. The Applicant shall implement any project design and operational changes approved by the Department within the timeframes specified by the Department.

K. **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 for review at least 60 days prior to commencement of project operation. 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.

L. **Maintenance and Repair Work.** Any proposals for project maintenance or repair 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.

M. **Commencement of Operation.** The Applicant shall notify the Department within two weeks of project completion and commencement of operation.

N. **Record Drawings.** The Applicant shall provide the Department with a set of as-built plans for the record within one year of the completion of construction.

O. **Compliance Inspection by Department.** Subject to limitations imposed by the Corps, the Applicant shall allow the Department to inspect the project area at any time to monitor compliance with Certification conditions.

P. **Posting of Certification.** A copy of this Certification shall be prominently posted within the gate control structure.

Q. **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.

R. **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.

S. **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.

Dated at Waterbury, Vermont this
14th day of July, 2010

Justin G. Johnson, Commissioner
Department of Environmental Conservation

By _____
Peter LaFlamme, Director
Water Quality Division