WATER QUALITY CERTIFICATION
(P.L. 92-500, Section 401)

In the matter of: Winooski One Partnership
26 State Street
Montpelier, VT 05602

Burlington Electric Light Department
585 Pine Street
Burlington, VT 05401

Application for Chace Mill Hydroelectric Project (Winooski One Development)

By letter dated August 12, 1985, Winooski One Partnership filed an application for a Water Quality Certification with the Water Quality Division of the Department of Water Resources and Environmental Engineering (the Department). Subsequently, a copy of the Federal Energy Regulatory Commission license application dated August 20, 1985 was furnished to the Department as supporting documentation for the certification application. An amendment to application for license dated October 13, 1986 has also been filed with the Federal Energy Regulatory Commission by Winooski One Partnership and the Burlington Electric Light Department as co-applicant. This filing and a revised Exhibit A received March 10, 1987 have been used by the Department in evaluating the project. The Department considers Winooski One Partnership and the Burlington Electric Light Department joint applicants for this certification. They are referred to as the "applicants" in this document. The Department makes the following findings:

1. The applicants propose to develop Winooski Falls on the Winooski River adjacent to the former Colchester Millyard

in the City of Winooski. Winooski Falls, downstream of the U.S. Routes 2 and 7 bridge, is the lower of two falls in the City. The upper falls, adjacent to the Chace Mill in the City of Burlington, was the subject of an earlier development proposal by the Burlington Electric Light Department.

2. The remnant 1876 timber crib dam would be left intact and a concrete dam with a 100-foot bascule-type crest gate constructed along the downstream side of the crib dam. The upper eight feet of cribbing was lost during the 1927 flood. The new dam would restore the crest elevation to 136' NGVD. The dam is presently on the National Register of Historic Places as part of the Winooski Falls Mill District.

3. Reconstruction of the dam will create an impoundment with a surface area of 5 1/2 acres and a gross storage volume of 34 acre-feet. The backwater will extend approximately 900 feet upstream, or about opposite the upper ends of the Chace and Champlain Mills. This section of the Winooski is presently riverine in character as the breached dam does not impound the river.

4. The project as proposed would have an installed capacity of 6500 kw utilizing 32 feet of gross operating head and up to 3000 cfs of river flow. The generating station would be constructed on the Winooski side of the river, adjacent to the Woolen Mill. A concrete powerhouse, 75' x 35' x 36' high, would house a single horizontal double-regulated Kaplan turbine. A second smaller bascule-type crest gate would be installed between the intake structure and the new dam.

5. The project tailrace would be excavated into the existing bedrock depression south from the proposed powerhouse location. The tailrace dimensions would be 45' to 75' wide by 125' long with a depth of excavation of 29' at the draft tube to 12' at the outlet. The tailwater elevation would vary between 101' NGVD and 104' NGVD depending on main channel conditions and the powerhouse discharge rate. The invert elevation would grade up from the draft tube at 78' NGVD to 90' NGVD at the outlet. Substantial bedrock excavation will be involved in construction of the project intake, powerhouse, fish trap, and tailrace.

6. A permanent access road is to be constructed adjacent to the river side of Woolen Mill and at about elevation 140' NGVD. The road fill would be contained behind a concrete retaining wall to minimize the river encroachment.

7. The site, ten miles upstream of Lake Champlain, has a watershed area of 1050 square miles. Fourteen hydroelectric projects presently are under commercial operation in the watershed. Directly upstream of Winooski, Green Mountain Power Corporation operates two stations - Gorge #18 and Essex #19 - as well as several other plants in the watershed. Their lower two plants have capacities of 1700 cfs and 2100 cfs, respectively.

8. The U.S. Geological Survey has operated a surface water gaging station (#04290500) on the Winooski River downstream of Essex #19 since October, 1928. The drainage area at the gage is 1044 square miles. Gaged flows are regulated.

Using a direct drainage area proration, the following hydrologic parameters have been estimated for the project:

Parameter	Value (cfs)
Mean flow	1730
95% exceedance	255
50% exceedance (median)	960
10% exceedance	4100
7Q10	168

During daily peaking operations at the Green Mountain Power facilities, flows are artificially reduced to 50-70 cfs during periods of storage replenishment.

9. The applicants propose to release 146 cfs as a minimum flow into the bypassed section when available from reservoir inflow. The 146 cfs flow is an earlier estimate of 7Q10, the low consecutive seven-day average flow with a 10% annual probability of occurrence. The Department has revised this estimate to 167 cfs at the gage based on an outlier analysis. At present, this flow is not always available because the Green Mountain Power facilities frequently operate in a peaking mode and curtail flow while storing.

10. The project would be operated strictly run-of-the-river. This means that they would not utilize pond storage and would generate with flows as they are available on an instantaneous basis. The hydraulic range of the turbine is 280 cfs to 3000 cfs.

11. The Vermont Water Resources Board has designated the Lower Winooski River as Class C. Class C waters are managed to provide habitat suitable for aquatic biota, fish, and wildlife

and to support uses including recreational boating and any recreational or other water uses in which contact with the water is minimal and ingestion not probable; irrigation of crops not used for human consumption without cooking; and compatible industrial uses. Class C waters are so designated in order to provide receiving waters for effluent from wastewater treatment facilities.

The Board has further designated the Lower Winooski (below Essex #19) as warm water fish habitat from June 1 through September 30 and cold water fish habitat the remainder of the year. This seasonal designation results in two sets of standards for the water quality parameters of dissolved oxygen, temperature, and turbidity. The most critical parameter in terms of project evaluation is summer dissolved oxygen levels. This standard is 5 mg/l or 60 percent saturation at all times (June 1 through September 30). Outside of this season, the minimum standard increases to 6 mg/l or 70 percent saturation (or 7 mg/l or 75 percent saturation in designated salmonid spawning areas).

12. The Lower Winooski below Alder Brook in Essex is a water quality limited segment as designated by the Department. Several municipal and private wastewater treatment facilities discharge to the river in this reach. To insure maintenance of Water Quality Standards, an allocation of wasteload among competing dischargers is necessary. The Department has studied the river intensively, including sampling efforts in 1977, 1978, and 1979. EPA did an earlier wasteload allocation study in 1975.

The Department published the results of its wasteload allocation study in January, 1982. Using EPA's Qual-II mathematical model and assuming background conditions of 7Q10 (earlier 142 cfs estimate at the gage), stream temperature of 80° F to 82° F, treatment levels slightly higher than secondary with phosphorus removal to 1 mg/l, and waste loading at projected design rates, the Department predicted that the river would reach a minimum dissolved oxygen (D.O.) concentration of about 5 mg/l. This would occur at the river mouth. Based on a sensitivity analysis, important variables in the model included river flow, point-source phosphorus loads, and algal photosynthesis and respiration.

The modeling assumed spillage of all flows over the Green Mountain Power facilities and did not consider a project at Chace Mill. Spillage is essential to maintaining dissolved oxygen standards. Essex #19, Gorge #18, and Winooski Falls each brought the river close to saturation D.O. concentrations. Under present-day circumstances of no provision of either spillage or minimum flows at the Green Mountain Power dams, the Winooski Falls are important sources of point reaeration. Without close-to-saturation conditions at the base of the Falls, the modeling would have disclosed substandard dissolved oxygen conditions in the lower reach of the river. Also, under modelled conditions, the river would have been substantially below standards upstream of Winooski Falls without spillage at Essex #19 and Gorge #18.

Very little comprehensive data is available for river water quality under existing regulated flow conditions and effluent loadings. A spillage at Winooski #1 in excess of 168 cfs (7Q10) may be required under certain conditions in order to assure that water quality standards will continue to be met downstream of Winooski. The Department is continuing to evaluate the assimilative capacity of the Lower Winooski. As part of this certification, the Department is requiring the applicants to undertake a two year water quality study after the start of operation. The findings of the study will be used to determine if additional measures must be taken by the applicant to maintain D.O. standards.

13. The remnant timber crib dam blocks upstream fish passage. The applicants propose to incorporate a fish trapping facility as part of the initial project construction at their expense. The trap-and-truck operation would be administered by the applicant and funded jointly by basin hydroelectric project owners. The Department of Fish and Wildlife would provide program direction in terms of ensuring that it is consistent with their department's fisheries management objectives for the basin. A flow equivalent to 3% of the generation flow has been allotted for operation of the trap from April 15 to May 15 and October 1 to November 15. A flow of 15 cfs has been set aside for downstream fish movement. These releases would be in addition to the 7Q10 minimum spillage over the dam.

14. The tailrace would discharge into the Winooski River upstream of a pool known as the "Salmon Hole". Walleye, steelhead rainbow trout, and landlocked Atlantic salmon move upstream from Lake Champlain to spawn. Walleye spawn in the Salmon Hole in the spring and provide a popular sports fishery. The plant discharge location and run-of-the-river operating mode would protect walleye spawning opportunities. Consideration is also being given to operating the trap for the purpose of transporting walleye for spawning at other locations in the basin as designated by the Department of Fish and Wildlife.

In cooperation with the New York State Department of Environmental Conservation and the U.S. Fish and Wildlife Service, the Vermont Department of Fish and Wildlife has instituted a program for the development of salmonid fisheries in Lake Champlain. The target fish species include steelhead and landlocked Atlantic salmon, both of which are now found in the Winooski River below the Lower Winooski Falls, where the log crib dam forms the first barrier to upstream fish migration. The trap-and-truck operation will enable these fish species and possibly walleye to be distributed in the upstream watershed for natural reproduction. A significant sports fishery should result.

15. Two plant species proposed for the Vermont Endangered and Threatened Species List would be directly impacted by the project. Anemone multifida, proposed for the endangered list,

grows in rock ledges on both sides of the river at the lower falls with a population of about 250 individual plants. It is rare east of Lake Superior and this is its only Vermont site. A portion of this population would be destroyed by project construction.

Carex garberi is at its southern limit of its range in Vermont and occurs at three known sites in Vermont. A small population exists in the bedrock depression where the tailrace is to be excavated. The plants would be destroyed.

The State Endangered Species Committee has recommended (letter of January 21, 1987) to the Agency of Environmental Conservation Secretary that the loss be allowed with certain conditions for mitigation. The Secretary has accepted their recommendation and the details of mitigation have been finalized. By condition of this certification, the Department will require that an approvable mitigation scheme be developed and filed with the Department, prior to the start of construction. The scheme is to include specific proposals for the protection of Anemone multifida plants located outside the construction limits, during and following construction.

16. Restoration of the dam crest will result in creation of a small impoundment which will extend to the base of the upper falls. The reduction of flows through the upstream reach of the lower falls may result in some degradation of the aesthetic values of the site. The dynamic appearance of the stream during moderate to high flows will be substantially

reduced. Spillage of 7Q10 flows over the dam will prevent the bypassed section of stream from becoming dewatered.

17. The ledge excavation and civil works construction will form an intrusion into what may be considered a focal point natural area in an urban and highly visible setting. The intensive historical use by manufacturing companies has, however, compromised the site's value as a natural area.

18. The final design details must be carefully evaluated to insure that the project scale, layout, and architectural and civil features are compatible with the site's natural attractiveness and public recreational access. The applicants have agreed to enhance public use by committing $150,000 to streamside improvements to be proposed by the City of Winooski and constructed as part of the project. The applicants also will submit the final plans for the new dam to both the City of Winooski and the Vermont Division for Historic Preservation for their review and approval. The applicants will coordinate with and seek approval by the Agency of Environmental Conservation for these improvements and architectural/landscaping design of project civil works (personal communication, Jeffrey R. Cueto, Department of Water Resources and Environmental Engineering with John L. Warshow, March 18, 1987).

Conditions

The Department certifies that the Chace Mill Hydroelectric Project (Winooski One Development) will meet Vermont Water Quality Standards. In so certifying, the Department imposes the following conditions:

A. The facility shall be operated in a strict run-of-the-river mode where instantaneous flows below the tailrace shall equal instantaneous inflow to the impoundment at all times. The impoundment may not be drawn down without prior approval by the Department. When the facility is not operating, all flows shall be spilled at the dam. This includes periods where the project inflow is less than 448 cfs (168 cfs plus the minimum turbine capacity).

B. The facility shall spill a minimum continuous flow of 168 cfs or instantaneous inflow to the project, if less, at all times over the dam crest. Before the start of construction, the applicants shall furnish a description, hydraulic design calculations, and plans for the measure to be used to pass this minimum flow.

C. The applicants shall file for review and written approval, prior to the start of construction, a comprehensive erosion control and water management plan to cover construction activities. This plan shall address the maintenance of stream flow during construction and measures taken to prevent the discharge of sediment, wet concrete, and other debris into State waters. It may be beneficial to consult with the Department during the development of this plan.

D. The applicants shall submit proposed designs to accommodate downstream fish movement to the Department of Fish and Wildlife for written approval prior to project construction. The project shall not be operated without approved measures in place.

E. Prior to the start of construction, the applicants shall enter into a written agreement with the Vermont Department of Fish and Wildlife for both the construction of a fish trap-and-truck facility and the operation of said facility. The agreement shall include a timetable for implementation. The applicants shall be responsible for proposing an operational funding plan for cost share amongst the basin hydroelectric project owners. Future operational funding administration will be the responsibility of the applicants. The applicants shall operate the trap-and-truck program as directed by the Department of Fish and Wildlife to ensure that the State fisheries management objectives are met. A copy of the signed agreement shall be filed with the Department before the start of construction.

F. The applicants shall develop and fund a two-year water quality study to take place during the first two summers of operation. Prior to the start of operation, the applicants shall file a plan of study with the Department for the Department's approval. The study shall be designed to assess the project's impact on river water quality and the sufficiency of Conditions A and B in insuring that D.O. standards are met.

G. The applicants shall provide continued public access to and use of the river resource in the project area. Restrictions to public access shall be subject to prior Departmental approval.

H. Before the site is disturbed by testing equipment, construction, or any other project-related activity, a mitigation scheme approved by the Secretary of the Agency of Environmental Conservation for the impact on Anemone multifida and Carex garberi shall be filed with the Department. This document is to include specific plans for the protection of Anemone multifida plants located outside the construction limits.

I. The applicant shall insure that every reasonable precaution is taken during construction to prevent the discharge of petro chemicals, wet concrete, and debris to State waters.

J. Debris associated with project construction and operation shall be disposed of properly.

K. Any desilting of the dam impoundment shall be done in accordance with the Agency of Environmental Conservation's Desilting Policy, a copy of which is attached. The Department shall be contacted prior to any desilting activity.

L. Any significant changes to the project must be submitted to the Department for prior review and written approval.

M. The applicant shall provide the Department with an as-built set of plans and a copy of the turbine rating curves for the record.

N. No construction may commence until after the Department issues written approval or acknowledgements under Conditions B, C, D, and E. Operation shall not commence until after the study plan required under Condition F has been approved.

The Department maintains continuing jurisdiction over the water quality aspects of this project and may at any time impose additional constraints, including changes to the operational regime, in order to protect river quality and public use.

Dated at Waterbury, Vermont this 5 day of May, 1987.

Jonathan Lash

Jonathan Lash, Commissioner
Department of Water Resources
and Environmental Engineering

JRC/eh