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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Barton Village, Inc. Project No. 7725-005
Vermont

NOTICE OF AVAILABILITY OF ENVIRONMENTAL ASSESSMENT

(April 15, 2004)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Office of Energy Projects has reviewed the application for license for the Barton Village Hydroelectric Project and has prepared an Environmental Assessment (EA) for the project. The project is located on the Clyde River, in the Town of Charleston, within the county of Orleans, Vermont. No federal lands or facilities are occupied or used by the project.

The EA contains the staff's analysis of the potential environmental impacts of the project and concludes that licensing the project, with appropriate environmental protective measures, would not constitute a major federal action that would significantly affect the quality of the human environment.

A copy of the EA is on file with the Commission and is available for public inspection. The EA may also be viewed on the Commission's website at http://www.ferc.gov using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll-free at 866-208-3676, or for TTY, (202) 502-8659.

Any comments should be filed within 30 days from the issuance date of this notice, and should be addressed to the Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Room 1-A, Washington, D.C. 20426. Please affix "Barton Village Hydroelectric Project No. 7725" to all comments. Comments may be filed electronically via Internet in lieu of paper. The Commission strongly encourages electronic filings. See 18 CFR 385.2001(a)(1)(iii) and the instructions on the Commission's website under the "e-Filing" link. For further information, contact Timothy Looney at (202) 502-6096 or by E-mail at timothy.looney@ferc.gov.

Magalie R. Salas
Secretary

Environmental Assessment

Barton Village Hydroelectric Project
FERC Project No. 7725-005

Federal Energy Regulatory Commission
Office of Energy Projects
Washington, D.C.
April 2004

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EXECUTIVE SUMMARY

Barton Village, Inc. (Barton Village) proposes to continue to operate the existing Barton Village Hydroelectric Project (project) located on the Clyde River in the Town of Charleston, within the county of Orleans, Vermont. The project does not use or occupy any federal facilities or lands.

The existing Barton Village Hydroelectric Project consists of: (1) a 77-foot-long, 24-foot-high, masonry and concrete gravity dam; (2) 1.5-foot-high flashboards extending 57 feet across a concrete spillway; (3) a 187-acre impoundment at elevation 1,140.9 feet mean sea level (msl); (4) a 665-foot-long, 7-foot-diameter steel penstock; (5) two 105-foot-long, 5.8-foot-diameter steel penstocks; (6) a powerhouse with two units having a total installed capacity of 1.4 megawatts; (7) two tailraces; and (8) other appurtenant facilities.

In consultation with the Vermont Agency of Natural Resources (VANR), the U.S. Fish and Wildlife Service (FWS), and Vermont Division of Historic Preservation/State Historic Preservation Office (SHPO), Barton Village has proposed environmental measures for the Barton Village Hydroelectric Project (see Section III.A.3 of this EA for a complete explanation of Barton Village's proposed environmental measures). Summarized, Barton Village proposes to continue operating the project in a run-of-river mode and maintain a year-round minimum bypass flow of 45 cubic feet per second (cfs) or inflow to Pensioner Pond, whichever is less. To enhance recreational opportunities near the project, Barton Village proposes to: (1) designate two parking areas near the powerhouse for recreationalists; (2) designate and maintain a footpath to provide access to the bypassed reach; (3) designate and maintain an access path to Charleston Pond for angling and launching carry-in boats; (4) pending landowner approval, designate a canoe/kayak take-out above the dam; and (5) pending landowner approval, assist and help develop primitive campground sites near the southern shore of Charleston Pond. To protect significant cultural resources, Barton Village proposes to develop a Historic Properties Management Plan (HPMP) to protect project facilities that are considered eligible for inclusion in the National Register of Historic Places (National Register).

In this environmental assessment, we analyze the effects of continued project operation along with the measures proposed by Barton Village, VARN, FWS, and SHPO. Staff concurs with Barton Village's proposed environmental measures and recommends additional measures, consistent with the conditions in the water quality certificate. These additional measures include: (1) release at least 90 percent of instantaneous inflow below the project, when restoring the elevation of Pensioner Pond; (2) develop a flow management plan; (3) develop a plan for continuous monitoring and reporting of flow releases at the project (bypass flow release and turbine discharge), impoundment levels,

and inflows; (4) provide a turbine rating curve; (5) develop a plan for proper disposal of debris associated with project operation; and (6) design and implement an erosion control, measures when requested.

The Barton Village Hydroelectric Project as proposed by the applicant has an annual operating cost of $117,200 (28.2 mills/kWh). We estimate that the annual power benefit from the project would be about $158,400 (38.2 mills/kWh), thereby yielding an annual net benefit of $41,200 (10.0 mills/kWh).

Based on our analysis, we recommend licensing the project as proposed by Barton Village. We conclude that issuing a new license for the project, with the proposed environmental measures and conditions of the water quality certification that we recommend, would not be a major federal action significantly affecting the quality of the human environment.

Environmental Assessment

Federal Energy Regulatory Commission
Office of Energy Projects

Barton Village Hydroelectric Project
FERC Project No. 7725-005-- Vermont

I. APPLICATION

On September 27, 2002, Barton Village filed an application for a subsequent license with the Federal Energy Regulatory Commission (Commission) for the continued operation and maintenance of the existing 1.4-megawatt (MW) Barton Village Hydroelectric Project (project) that has an average annual generation of 4,897 megawatt-hours (MWh). The project is located on the Clyde River in the Town of Charleston, within the county of Orleans, Vermont. No federal lands or facilities are occupied or used by the project.

II. PURPOSE OF ACTION AND NEED FOR POWER

A. Purpose of Action

The Commission must decide: (1) whether to issue a new license to Barton Village, and, if so; (2) what, if any, conditions should be placed on that license to protect or enhance existing environmental resources and/or to mitigate for any adverse environmental impacts that would occur due to continued project operation and maintenance.

In this environmental assessment (EA), we: (1) assess the effects of operating the project as proposed by Barton Village; (2) analyze alternatives to Barton Village's proposal; and (3) recommend whether or not to issue a new license to Barton Village for the continued operation of the project. We also analyze the effects of the no-action alternative. An important issue that is addressed includes minimum flows in the bypassed reach.

B. Need for Power

Historically, the Barton Village Hydroelectric Project generates an average of 4,897 MWh annually. Barton Village uses 15 to 25 percent of the project's generation for

its electric needs. The remaining energy is sold to industrial, commercial, residential, and farm customers within the franchise area of Barton Village Electric Department.

To assess the need for power, we reviewed the power needs of the operating region in which the project is located. The Barton Village Project is located in the New England area of the Northeast Power Coordinating Council (NPCC) region of the North American Electric Reliability Council (NERC). The NERC annually forecasts electrical supply and demand in the region for ten-year periods. NERC's 2002 Reliability Assessment[1] shows that, for the New England system, the summer peak demand is projected to increase from 24,200 MW for 2002 to 27,750 MW for 2011. For NPCC to keep current with this demand, the installed generating capacity is estimated to increase from 28,000 MW for 2002 to 34,600 MW for 2011. Licensing of the Barton Village and its 1.4-MW capacity would help the NPCC continue to meet the power demands of the New England area.

We conclude that the continued operation of the Barton Village Project and the future use of power generated from the project would displace non-renewable, fossil-fueled generation and contribute to a diversified generation mix. Also, project generation would continue to help Barton Village meet its need for generation in the short and long term.

III. PROPOSED ACTION AND ALTERNATIVES

A. Barton Villages' Proposal

Barton Village proposes to continue to operate and maintain the Barton Village Hydroelectric Project to provide power to Barton Village; and to provide a number of environmental protection and enhancement measures to benefit non-power uses of the Clyde River Basin resources.

1. Project Facilities

The existing project consists of: (1) a 77-foot-long, 24-foot-high masonry and concrete gravity dam; (2) 1.5-foot-high flashboards extending 57 feet across a concrete spillway; (3) a 187-acre impoundment at elevation 1,140.9 feet mean sea level (msl); (4) a 665-foot-long, 7-foot-diameter steel penstock; (5) two 105-foot-long, 5.5 and 5.8-foot-

[1] Reliability Assessment 2002-2011, The Reliability of Bulk Electric Systems in North America, NERC, October 2002.

diameter steel penstocks; (6) a powerhouse with two units having a total installed capacity of 1.4 MW; (7) two tailraces; and (8) other appurtenant facilities. (See figure 1.)

The Barton Village Hydroelectric Project has an average annual energy production of 4,897 MWh.

2. Project Operation

A. Present Operation

The Barton Village Hydroelectric Project is operated 24 hours per day when water is available. The project operates in a run-of-river[2] mode. The project is currently operated in a manual on-site mode. In 1991, the operation of the project was automated; however, in the last several years the plant automation system has fallen into a state of disrepair. The project operator visits the site on a daily basis and makes gate settings based on available flow and load conditions.

The dam is equipped with 1.5-foot-high wooden flashboards. Seasonal loss of the flashboards is very infrequent.

The approximate minimum turbine discharge capacity is 20 cubic feet per second (cfs). However, Barton Village rarely operates the project turbines below flows of approximately 40 cfs. During these periods, the turbine wicket gates are closed and river flow is allowed to pass the dam to the project bypassed reach.

Since 1995, Barton Village has operated the project in a run-of-river mode in order to protect aquatic habitat. Currently, they are required to release a minimum flow of 21 cfs in the project bypass from June 15 to September 15, and 10 cfs at all other times in the year.

[2] Outflow from the project is equal to inflow to the project impoundment on an instantaneous basis

Figure 1
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Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov .

B. Proposed Project Operation

As part of the consultation process Barton Village reached an agreement with the Vermont Agency of Natural Resources (VANR) and U.S. Fish and Wildlife Service (FWS) on the future operation of the project. It was agreed that the project would continue to operate in a run-of-river mode. Also, Barton Village reached agreement on maintaining a year-round bypass flow of 45 cfs or inflow to Pensioner Pond, whichever is less.

Barton Village proposes to repair and upgrade the plant automation system to allow for remote operation. As part of the plant automation repairs, Barton Village proposes to install, operate, and maintain streamflow and water level equipment necessary to demonstrate run-of-river operation.

Barton Village proposes to record project operation at the following locations:

- Record hourly readings of the water level elevations at Pensioner Pond.
- Record hourly readings of the water level elevation in the project tailrace.
- Record hourly readings of project generation flows.
- Record hourly readings of flows in the bypassed reach.

Barton Village proposes an annual flashboard inspection program and to replace the flashboards every four years or sooner. The program should reduce the occurrence of temporary drawdown of Pensioner Pond due to flashboard failure.

3. Proposed Environmental Measures

A. Barton Village's Proposal

In its license application, Barton Village proposes the following environmental measures:

- Maintain a year-round minimum bypass flow of 45 cfs or inflow to Pensioner Lake, whichever is less.
- Develop a Historic Properties Management Plan.

- Designate two parking areas near the powerhouse for recreationalists.
- Maintain and provide an access foot path to the bypassed reach.
- Maintain and provide an access path to Charleston Pond for angling and launching carry-in boats.
- Allow public access to the project lands.
- Work with non-governmental organizations to develop a primitive campground near Charleston Pond and canoe/kayak take-out above the dam.
- Work with landowners to develop a canoe/kayak take-out above the dam.

B. Staff's Alternative

Staff's alternative is to license the as proposed by Barton Village with the conditions of the water quality certificate (WQC), issued by VANR (see Section IV. (B)1). The measures required by the WQC are included in Appendix A to this EA and include:

- When restoring the elevation of Pensioner Pond, release at least 90 percent of instantaneous inflow below the project. While the pond is being refilled, bypass flow requirements shall be met at all times.
- Develop a flow management plan.
- Develop a plan for continuous monitoring and reporting of flow releases at the project (bypass flow release and turbine discharge), impoundment levels, and inflows.
- Provide a turbine rating curve.
- Develop a plan for proper disposal of debris associated with project operation.
- Upon a written request by the VANR, design and implement an erosion control measures
- Develop a final historic properties management plan.

C. No-Action Alternative

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. The no-action alternative is the benchmark from which we compare the proposed action and any action alternative.

D. Alternatives Considered But Eliminated From Detailed Study

1. Federal Takeover

We don't consider federal takeover and operation of the project to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. While this fact alone does not eliminate this alternative from further analysis, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

2. Nonpower License

A nonpower license is a temporary license that the Commission would terminate whenever it would determine that another governmental agency would assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. In this case, no government agency has suggested its willingness or ability to do so. No party has sought a nonpower license, and we have no basis for concluding that the project should no longer be used to produce power. Issuing a nonpower license, therefore, is not a realistic alternative in these circumstances.

3. Denial of License and Decommissioning the Project

Project decommissioning could be accomplished with or without removing the project facilities. Either alternative would involve denial of the license application and surrender or termination of the existing license. In both cases, the energy that the project would generate would be lost, and consequently Barton Village's need for the project's power would not be satisfied. Additionally, no participant has suggested decommissioning. For these reasons, we have no basis for recommending decommissioning of the project with or without removing the project facilities.

IV. CONSULTATION AND COMPLIANCE

A. Agency Consultation

The Commission's regulations require applicants to consult with the appropriate resource agencies before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

When the Commission issues a notice that the application is ready for environmental analysis, formal comments may be submitted by concerned entities in accordance with section 4.34(b) of the Commission's regulations under the Federal Power Act (FPA). The comments provided by concerned entities are made part of the record and are considered during review of the proposed project.

1. Scoping

On January 21, 2003, we issued Scoping Document 1 (SD1) to give appropriate federal, state, and local resource agencies, Indian tribes, other nongovernmental organizations (NGO's), and individuals an opportunity to participate in the identification of issues, concerns, and opportunities associated with the relicensing process. We asked the entities to forward any information or comments they believed would assist the Commission in conducting an accurate and thorough analysis of the site-specific and cumulative effects of the proposed licensing of the project. The VANR provided comments on SD1 on February 12, 2003.

2. Interventions

In addition to filing comments, organizations and individuals may petition to intervene and become a party to the licensing proceedings. The following entities filed for intervenor status.

Intervenor	Filing Date of Motion to Intervene
Vermont Agency of Natural Resources	February 5, 2003
United States Department of the Interior	March 4, 2003

3. Comments on the Application

The Notice of Application Ready for Environmental Analysis was issued on March 20, 2003. The VANR responded by letter dated May 19, 2003, and recommends

licensing conditions. The United States Department of the Interior (DOI) responded by letter dated May 8, 2003, and also recommends licensing conditions. The conditions proposed by VANR and DOI are discussed in section V.

B. Compliance

1. Water Quality Certification

Under Section 401(a) of the Clean Water Act,[3] the Commission may not issue a license for a hydroelectric project unless the state certifying agency has either issued water quality certification for the project or has waived certification by failing to act on a request for certification within a reasonable period of time, not to exceed one year. [4] Barton Village's request for water quality certification was received by VANR on September 26, 2002.

On May 19, 2003, the VANR granted certification to Barton Village for the project. The following conditions were included in the WQC for the project:

- Operate the project in a true run-of-the-river mode. When the facility is not operating, all flows shall be spilled at the dam.

  A flow of 45 cfs, or inflow if less, shall be released into the bypass at all times.

  Pensioner Pond shall be maintained at or above elevation 1,140.94 feet mean sea level (the top of the flashboards) at all times.

- When restoring the elevation of Pensioner Pond, release at least 90 percent of instantaneous inflow below the project. While the pond is being refilled, bypass flow requirements shall be met at all times.

- Develop a flow management plan.

[3] 33 U.S.C. § 1341(a)(1).

[4] Section 401(a)(1) requires an applicant for a federal license or permit to conduct any activity that may result in any discharge into navigable waters to obtain from the state in which the discharge originates certification that any such discharge would comply with applicable water quality standards.

- Develop a plan for continuous monitoring and reporting of flow releases at the project (bypass flow release and turbine discharge), impoundment levels, and inflows.
- Provide a turbine rating curve.
- Replace flashboards at four-year intervals.
- Develop a plan for proper disposal of debris associated with project operation.
- Allow public access to the project lands.
- Recreational facilities shall be constructed and maintained consistent with a recreation plan.
- Upon a written request by the VANR, design and implement erosion control measures.

A complete outline of the WQC conditions is included in Appendix A to this EA.

2. Section 18 Fishway Prescription

Pursuant to Section 18 of the FPA, the Secretary of the Interior reserves the authority under the FPA to prescribe such fishways as may be deemed necessary during the term of any license issued for the Barton Village Hydroelectric Project.

3. Endangered Species Act

The federally listed bald eagle (threatened) is the only listed species that could be found in the project area.

As we discuss in section V.C.3, the project would have no effect on the bald eagle. Therefore, no further action under the Endangered Species Act is required.

4. Section 10(j)

Under Section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an

agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

The FWS included 10(j) recommendations in their comments dated May 8, 2003. The agency recommended measures include project operation, minimum flows, reservoir operation during refilling, monitoring plan, and installing downstream fish passage. Table 10, in Section IX, lists each of the recommendations, and whether the recommendations are recommended for adoption under the staff alternative. All recommendations are addressed in the specific resource sections of this EA.

V. ENVIRONMENTAL ANALYSIS

In this section, we discuss the effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific environmental issues.

Only the resources that would be affected, or about which comments have been made by interested parties, are included in detail in this EA and discussed in this section. Because there are no land-disturbing activities associated with the continued operation of the project we have not discussed geology and soils and terrestrial resources in detail.

A. General Description of the Project Site

The Barton Village Hydroelectric Project is located on the Clyde River in Charleston, Vermont. The project is located on river mile 11.3 of the Clyde River, between Pensioner Pond and Charleston Pond.

The Clyde River is within the St. Lawrence River watershed. The Clyde River has a drainage area of 142 square miles. At the project site, the Clyde River has a drainage area of 108 square miles. The river is characterized by a variable gradient primarily of slow meandering flow.

There is one other hydroelectric project on the Clyde River. The Clyde River Project, FERC No. 2306, consists of two developments (West Charleston and Newport 1, 2, and 3) and two nonpower impoundments (Seymour Lake and Echo Lake located on an unnamed tributary to the Clyde River). A new license for the project was issued on Novemeber 21, 2003.

B. Cumulative Effects

According to the Council on Environmental Quality's regulations for implementing NEPA (50 CFR §1508.7), an action may cause cumulative impacts on the environment if its impacts overlap in space and/or time with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

1. Geographic Scope of Analysis

As we say above, there are four other hydroelectric facilities on the Clyde River. The Clyde River Project consists of two developments (West Charleston and Newport 1, 2, and 3) and two nonpower impoundments (Seymour Lake and Echo Lake located on an unnamed tributary to the Clyde River). The Barton Village Project is located downstream of Echo Lake, and above the West Charleston Pond.

Resources that would be affected cumulatively by the Barton Village Project and the Clyde River Project include: (1) water quality and quantity, (2) fisheries, and (3) recreation. The discussions of cumulative effects are integrated into the following resource sections.

2. Temporal Scope of Analysis

The temporal scope of analysis includes a discussion of the past, present, and future actions and their effects on water, fishery, and recreational resources. For purposes of future actions, we will concentrate on impacts to aquatic resources from reasonably foreseeable actions over the next 30 to 50 years, the standard licensing term for a project such as the Barton Village Project. All actions occurring since the filing of the application up to the time of this assessment will be considered present actions. The historical discussion is limited, by necessity, to the amount of available information. We identified the present resource conditions based on the license application, agency comments, comprehensive plans, and other information.

C. Proposed Action and Action Alternatives

1. Water Resources

a. Affected Environment

Water Quantity

The Clyde River basin at the project site has a watershed area of approximately 108 square miles. The U.S. Geological Survey (USGS) operates a flow gaging station (No. 04296500) on the Clyde River near Newport, Vermont, approximately 11 miles downstream of the project. The flow gaging station has been in operation from 1909 to the present, and has drainage area of 142 square miles. To estimate streamflow at the Barton Village Hydroelectric Project, the average daily flow data were adjusted by Barton Village using a correction factor of 0.761(108 sq. mi./142 sq. mi.) to account for the smaller drainage area of the Clyde River at the project as compared to the gage location. Table 1 lists the estimated median, mean, maximum, and minimum annual and monthly flows of the Clyde River at the Barton Village Hydroelectric Project from 1909 through 2000.

Pensioner Pond (the project's reservoir) is a natural body of water whose surface elevation is maintained by a ledge hydraulic control located in the channel above the dam. As a result, the dam controls only one vertical foot of storage. Pensioner Pond has a water surface of approximately 187 acres, and is approximately 4,300 feet long and 2,200 feet wide at its widest point. It has a maximum depth of 39 feet and an average depth of 14 feet, with a gross storage capacity of 560 acre-feet and a net storage capacity of 187 acre-feet available to the project.

Currently the Barton Village Project is voluntarily operated in a run-of-river (ROR) mode. The project as licensed in 1984 is also required to release a minimum flow to the project's bypassed reach of 21 cfs from June 15 to September 15, and 10 cfs at all other times of the year.

Water Quality Standards

The Clyde River is located in the State of Vermont and classified according to the state’s water quality standards. The Vermont Water Resources Board designates a stream reach as Class A or B according to the actual or intended water uses. Table 2 describes the potential uses for Class A and Class B waters.

Table 1. Projected annual and monthly mean, median, maximum, and minimum flows (in cfs) of the Clyde River at the Barton Village Hydroelectric Project for the period of record (Water Year 1909 - 2000) (Source: Barton Village, Inc., 2002, as modified by Staff).

Period	Median Flow	Mean Flow	Max. Flow	Min. Flow
January	123	141	928	12
February	106	121	867	13
March	154	214	2746	13
April	457	527	1947	14
May	327	375	2038	16
June	162	184	1141	2
July	92	114	1156	11
August	80	98	390	6
September	79	100	1148	8
October	105	136	837	2
November	160	178	1012	17
December	149	170	1019	13
Annual	137	196	2746	2

Table 2. Vermont water quality standards (Source: Barton Village Inc., 1999, as modified by Staff).

Class A	Waters of a quality which is suitable for public water supply with disinfection when necessary. When compatible, for the enjoyment of water in its natural condition.
Class B	Waters suitable for swimming, recreation, irrigation, and other agricultural uses; good habitat for aquatic biota, fish and wildlife; good aesthetic value, acceptable for public water supply with filtration and disinfection.

In addition to having a designated class, stream reaches are categorized as either a coldwater fishery or a warmwater fishery with respect to water quality classification. Criteria for coldwater streams that must be satisfied include turbidity levels less than 10

nephelometric turbidity units and dissolved oxygen (DO) concentrations meeting or exceeding 6 mg/l and 70 percent saturation. For areas designated as salmonid spawning or nursery areas, the DO concentration must meet or exceed 7 mg/l and 75 percent saturation and not less than 95 percent saturation during late egg maturation and larval development of salmonids (Vermont Water Resources Board, 2000).

Except for Lake Derby, Toad Pond in Charleston, and Mud Pond in Morgan the Clyde River from its headwater at Island Pond to Lake Memphremagog is Class B, coldwater fishery. These above ponds are designated as Class B, warmwater fishery.

Wastewater Discharge

Specific reaches of Class B water can be designated as Waste Management Zones (WMZ). Waters designated as WMZ's have permitted discharges of treated wastes within the reach. A WMZ has been designated from the Newport wastewater treatment facility outfall to Lake Memphremagog (approximately 1 mile). The Clyde River has four discharges in its entire length. The combined maximum discharges for the four sites total 3.2 cfs, and are relatively small compared to the monthly median flows for the Clyde River at the project, which range from 79 to 457 cfs.

Water Quality

Several water quality studies have been completed for various reaches of the Clyde River. These studies have been conducted by various entities including: Vermont Department of Environmental Conservation (VDEC), Citizens Utilities (Citizens), U.S. Environmental Protection Agency (EPA), and the Barton Village.

During consultation, VANR requested that Barton Village perform a study of temperature and DO at several locations within the project waters. As a result Barton Village collected temperature and DO data from four sampling sites. Temperature was recorded using continuous, in-situ automated temperature recorders from July 27 to September 28, 2001. DO was recorded using multi-parameter water quality recorders from August 10 to September 28, 2001. The uppermost site was in the mainstem of the Clyde River approximately 1 mile upstream of the project intake and ¼ mile upstream of the inlet of Pensioner Pond (Inlet). The other sites were approximately 225 feet upstream of the project dam (Outlet), in the bypassed reach (bypass) approximately 100 feet upstream of the confluence of the west tailrace (Unit 2) and the bypassed reach, and in the east tailrace (East Tailrace) (Unit 1) approximately 30 feet downstream of the powerhouse discharge. Additionally, supplemental data were collected from the confluence of the east tailrace and the bypassed reach on August 30, 2001. As a note, the project was not operational due to low-water conditions during the monitoring period.

Barton Village's Study Results

Temperature

Temperature varied during the study period and within each day, with higher values during daylight hours. Average, minimum and maximum water temperatures for all sites are in Table 3; average, minimum and maximum temperature differences between sites are displayed in Table 4.

Table 3. Average, minimum and maximum water temperatures (EC) at four sites (Source: Barton Village Inc., 2002, as modified by Staff).

	Average	**Minimum**	**Maximum**
Pensioner Pond Inlet	19.4	13.5	27.3
Pensioner Pond Outlet	20.7	15.8	28.6
Bypassed Reach	20.9	15.9	28.1
East Tailrace*	21.1	16.2	28.6

*The project was not operating during the monitoring period

Table 4. Average, minimum and maximum temperature (EC) differences between the outlet and inlet of Pensioner Pond, the outlet of Pensioner Pond and the bypassed reach and the outlet of Pensioner Pond and the East tailrace (Source: Barton Village Inc., 2002, as modified by Staff).

	Average	**Minimum**	**Maximum**
Outlet minus Inlet	1.3	-0.6	3.3
Outlet minus Bypass	0.06	-0.7	0.8
Outlet Minus East tailrace*	-0.1	-0.8	0.6

*The project was not operating during the monitoring period

For the entire sampling period, the average water temperature at the Pensioner Pond inlet and outlet was 19.4EC and 20.7EC, respectively, or an average water temperature difference of 1.3EC. The maximum instantaneous water temperature difference was 3.3EC and occurred on September 17, 2001. The minimum instantaneous temperature difference of -0.6EC, where the inlet was warmer than the outlet, occurred on September 11, 2001. In general, the maximum difference between outlet and inlet water temperatures occurred when air temperatures varied the most over a 24-hour period.

The water temperatures of the bypass and East Tailrace were almost identical to those of Pensioner Pond Outlet site. The average temperature difference between the Outlet and bypass was 0.06EC; the average temperature difference between the Outlet and East Tailrace was -0.1EC (both within the ±0.2EC accuracy range of the Stowaway recorders used to collect the data). In general, the bypass and East Tailrace temperatures increased faster during the day than the Outlet temperatures.

Dissolved Oxygen

DO varied during the study period and within each day, with higher values during evening hours. Overall, the DO was typically lower at the Inlet than the other sites. The Inlet was generally 65 to 85% saturated and 6.6 to 8.4 mg/l, and met the State Water Quality Criteria for Class B, Coldwater fishery, 82% of the time. The Outlet always met those criteria with DO levels greater than 70% saturation and greater than 6 mg/l. Because the project was not operational due to low-water conditions, the DO data for the East Tailrace are for leakage flows through the turbine. The East Tailrace was greater than 70% saturated 96% of the time, with the exception of September 19 to 23 when it varied between 65 to 70% saturation, and was always greater than 6 mg/l. The bypass was always greater than 70% saturated and 6 mg/l. The mean, minimum, and maximum DO values are displayed in Table 5.

Table 5. Dissolved oxygen (% saturation / mg/l) in the Clyde River from August 10 to September 28, 2001. (Source: Barton Village Inc., 2002, as modified by Staff).

	Average	**Minimum**	**Maximum**
Pensioner Pond Inlet	74.8 / 7.0	61.3 / 5.2	86.9 / 8.4
Pensioner Pond Outlet	85.5 / 7.7	71.6 / 6.7	113.5 / 9.2
Bypassed Reach	88.9 / 8.1	81.4 / 6.8	96.8 / 9.3
East Tailrace*	83.1 / 7.5	65.5 / 6.3	98.3 / 8.6

*The project was not operating during the monitoring period

With respect to the State's Water Quality Criteria for Class B, Cold Water Fish Habitat Waters designated as “salmonids spawning or nursery areas important to the establishment and maintenance of the fishery resource,” the Inlet met these criteria about 50% of the time. The Outlet DO level was greater than 75% saturated and 7 mg/l, 97% of the time with one discreet drop to 71.6 to 74.8% saturation and 6.7 to 6.98 mg/l for five hours. The East Tailrace was generally greater than 75% saturated. There were three drops to less than 75% saturation in early September, but these lasted for only 2 to 11

hours each and the DO level never dropped below 70% saturation. A longer drop below 75% saturation and 7 mg/l (varied from 65.5% to 81.1% saturation and 6.3 to 7.9 mg/l) occurred between 19 and 25 September. This was during a time when the Inlet DO was on a ten-day decreasing trend, with most values of the Inlet being less than 75% saturated and less than 7 mg/l. The lower DO in the East Tailrace (compared to the Outlet) was probably due to the long residence time of water in the penstock (project was shutdown during this period), at which time the water had no contact with outside air. The bypass DO level was always greater than 75% saturated and 7 mg/l.

On August 30, the temperature and DO at the Inlet surface, 3 foot and 6 foot (bottom) depths were similar [Table E(2)-10 of the applcation]. The same was true for the Outlet surface, 2 foot and 3.5 foot (bottom) depths, although the temperature and DO were ~1.0EC and ~0.5 mg/l higher, respectively, than the Inlet. The temperature and DO at the confluence of the bypass and East Tailrace were nearly identical to that of the Outlet.

Historical Data

The VDEC performed surveys during 1956, 1968, and 1982. In general, they found that DO levels were to be above the water quality standards. However, two of the samples taken in 1956 upstream of Pensioner Pond were below 6 mg/l (values ranged between 5 and 6 mg/l) (Citizens, 1991).

Between 1968 and 1972, water samples were taken in the larger lakes and ponds throughout the Clyde River basin as part of the Lake Memphremagog Water Quality Management Plan, which was published in 1974. Except for the hypolimentic water of Salem Pond, DO levels were above the water quality standards (Citizens, 1991). In 1982, VDEC collected data showing conformance with the Vermont water quality standards throughout the basin, except for one sample from a depth of 7 feet in Charleston Pond (Lubber Lake). This sample indicated a DO level of 5.75 mg/l, while all other samples for the basin had DO levels in excess of 8.0 mg/l. The data were collected on July 27 and 28 in the Newport area, and August 6 for the West Charleston area. All riverine segments exhibited temperatures greater than 20EC (Citizens, 1991).

In addition, the EPA's STORET system documents data collection for the period 1974 to 1989. A review of this data, by Barton Village, found no violations of the DO standards in the river sections.

During July to September 1990 and June to September 1991 and as part of the relicensing process for the Clyde River Project, Citizens Utilities performed an extensive water quality survey of the Clyde River. Continuous air/water temperature recorders were

installed along the Clyde River. In addition, DO grab samples were collected at several of the water temperature sampling stations. The study reach began below the West Charleston development (Charleston Pond) and extended to Lake Memphremagog.

Results of the 1990 study indicated that water temperatures did not vary much between sampling stations. Water temperature did, however, vary over time as air temperatures increased and decreased. Average daily water temperatures gradually increased from 19 to 26EC from July 12 through July 31, varied between 19 and 26EC in the month of August, and decreased from 22 to 13EC in the month of September.

Average daily water temperatures increased to around 20EC during the last week in June 1991 and remained fairly constant (+/- 2.5EC) until the first week in September 1991 when temperatures began to decrease. The warmest period of 1991 occurred during the last week of July when average daily water temperatures typically exceeded 21EC. DO samples collected during the study were all above the Vermont water quality standards for coldwater streams (Citizens, 1991).

b. Environmental Effects

Staff's Analysis

The water quality of the Clyde River, in the vicinity of the project, appears to meet the Vermont state water quality standards for DO and temperature as designated for the Clyde River. In fact, it appears that the presence of the project may have a positive affect on DO levels as demonstrated by the improved DO levels in the Pensioner Pond outlet over those at the pond's inlet (although there may be other factors that attribute to the increase in DO, such as tributaries to Pensioner Pond). The continued operation of the Barton Village Project as proposed should not have an effect on the current water quality of the Clyde River.

Run-of-River Operations

Barton Village is proposing to operate the project as a ROR project as it is currently and voluntarily operated. FWS and VDNR recommend that the project be operated in a ROR mode and stable water levels be maintained in Pensioner Pond. Operating the project in a ROR mode would continue to provide stability to Pensioner Pond's water levels. Stable water levels in Pensioner Pond would promote good water quality and consequently healthy aquatic habitats over that of a peaking operation. This is accomplished by reducing the potential for shoreline and streambank erosion and increased turbidity in the reservoir and downstream of the project's dam.

Under Barton Village's proposal, the minimum flows in the bypassed reach would be increased to a continuous 45 cfs or inflow to Pensioner Pond, whichever is less. FWS and VANR recommend the same minimum flow release proposed by Barton Village. Because the minimum flow would be increased from the current level of 21 cfs from June 15 to September 15, and 10 cfs at all other times of the year, the water quality in the bypassed reach and downstream of the project in the Clyde River would likely be improved over those experienced under the current conditions.

Increased flows in the bypassed reach would likely improve DO levels downstream of the project as flows are spilled over the dam's crest and through increased turbulence and rapids within the bypassed reach. Additionally, the increased volume of water within the bypassed reach would likely reduce warming during the summer months by lessening the effect of solar radiation. Larger volumes of water require greater amounts of solar energy than do smaller amounts of water to accomplish the same amount of thermal warming. For these reasons, we believe that Barton Village's proposal would protect and enhance the water quality of the Clyde River downstream of the project.

Cumulative Effects

Implementation of the proposed and recommended measures would minimize any cumulative effects on water quality.

Unavoidable Adverse Impacts:

None.

2. Fishery Resources

a. Affected Environment

The Clyde River headwaters and tributary streams are typical upland step-pool waters. The fish community was originally, and in most cases still is characterized by brook trout, slimy sculpin, and blacknose dace. The Clyde River mainstem fish community is influenced by the natural lakes and ponds along its course. No state or federally listed rare, endangered, or threatened fish species are known to exist in the project area.

There are no impediments to the upstream or downstream movement of fish in the upper Clyde River. From the Spectacle Pond/Island Pond area down to the Great Falls of the Clyde there are no dams, falls, or rapids. Island Pond appears to contain most of the

species found throughout the Clyde River. The fish community in Island Pond has been documented through recent Vermont Department of Fish and Wildlife (VDFW) sampling, fishing derby reports in the early l990s, VDFW sampling and observations in the 1950s and 1960s, and anecdotal reports through the years. Island Pond contains brook trout, brown trout, lake trout, rainbow trout, smallmouth and largemouth bass, pickerel, walleye, yellow perch, bullhead, rainbow smelt, fallfish, minnows, and shiners.[5]

A number of species regularly found in Seymour Lake and Echo Lake but rare or nonexistent in Island Pond have access to the Clyde River mainstem through downstream drift. These include lake trout, landlocked Atlantic salmon, longnose suckers, and round whitefish. Although habitat preferences make many of the Island Pond, Seymour Lake, and Echo Lake species presence unlikely or rare throughout the Clyde River mainstem, the isolated occurrence of any of them is possible.

Upper reaches of the Clyde River mainstem, down to Pensioner Pond, are likely populated with brook trout, blacknose dace, slimy sculpin, white sucker, fallfish, creek chub, burbot, and tessellated darter. These species along with smallmouth bass, chain pickerel, and lake chubs were observed in recent sampling in the Brighton/East Charleston area. Brown trout were not observed, but the occurrence of stocked and wild brown trout would be expected with more extensive sampling.

Pensioner Pond is a natural pond on the mainstem of the Clyde River. No fish community information is available from sampling at Pensioner Pond. All the species listed for Island Pond, Echo Lake, Seymour Lake, the river mainstem and tributaries may occur in Pensioner Pond. The most probable persistent and year-round fish community in Pensioner Pond include white sucker, smallmouth bass, largemouth bass, rockbass, sunfish, burbot, fallfish, mimic shiners, bluntnose minnows, common shiners, creek chub, lake chub, chain pickerel, brown bullhead, yellow perch, and tessellated darter. The most common seasonal additions, coincident with cooler water temperature and higher DO levels, include brook trout, brown trout, and rainbow trout.

Approximately 800 feet of the river is bypassed by the Barton Village Hydroelectric Project's penstock. This reach is characterized by a steep gradient, and a series of bedrock cascades, rapids, and pocket water pools. The bypassed channel merges with the powerhouse tailrace at Charleston Pond (Lubber Lake). For 1.5 miles downstream of the Charleston Pond dam, the river channel is again characterized by steep

[5] This list includes species that are native to the system; species that were introduced; species that are naturally occurring; and species that are being stocked; species whose appearance is rare, not recent, and possibly transitory.

to moderate gradient.

Since 1993, the State of Vermont has been stocking landlocked Atlantic salmon fry below Charleston Pond dam as part of a salmon restoration program for Lake Memphremagog and the Clyde River. The State of Vermont has been evaluating the progress of the restoration by annual sampling at a station in the West Charleston reach. Species documented in 8 years of September sampling include white sucker, smallmouth bass, rockbass, sunfish, fallfish, blacknose dace, longnose dace, common shiner, creek chub, banded killifish, chain pickerel, yellow perch, tessellated darter, walleye, Atlantic salmon, brook trout, and brown trout.

The fish community in the Barton Village Hydroelectric Project bypassed reach likely resembles that of the West Charleston reach, except that salmon currently are absent and walleye from the Salem lakes do not have access, due to the downstream West Charleston Dam (Clyde River Project, FERC No. 2306).

The State of Vermont is considering the Barton Village project's bypassed reach for inclusion as salmon rearing habitat in the Lake Memphremagog restoration program. Charleston Pond is a man-made pond with a surface area of 40 acres and a maximum depth of about 25 feet. The composition of its fish community is likely to be similar to that of Pensioner Pond, by settlement through downstream drift.

b. Environmental Effect

Staff's Analysis

Pensioner Pond

Pensioner Pond is a natural lake within the Clyde River mainstem with an artificially elevated water level resulting from the 1.5-foot-high flashboards at the project's dam. Occasionally, the water level in Pensioner Pond has been known to drop due to flashboard failure.

A rapid decrease in the water level in Pensioner Pond as a result of a flashboard failure may result in the stranding and/or desiccation of fish, fish redds, and other aquatic organisms. Additionally, after a flashboard failure and replacement or after a scheduled and approved drawdown of the reservoir, during impoundment refilling the project can affect downstream aquatic resources if the minimum flows are not being provided to the downstream reaches. To help prevent this, Barton Village is proposing to inspect the flashboards annually after the spring freshet, and to replace the flashboards every four years in an effort to protect against flashboard failure. The VANR's water quality

certificate requires that a reservoir refilling plan be developed. The VANR required the plan provide the minimum flow requirement to the bypass reach at all times and allow Barton Village to capture 10 percent of the instantaneous inflow when refilling the reservoir after a drawdown resulting from flashboard failure or scheduled maintenance. The FWS recommended the following minimum flows during impoundment refilling:

- 54 cfs between June 1 and September 30;
- 108 cfs between October 1 and March 31; and
- 432 cfs between April 1 and May 31.

Implementing either of these flow regimes would help to protect aquatic resources downstream of the project while the impoundment is refilling. However, VANR's required release of 90 percent of inflow appears to be a more conservative approach. For most years (normal and wet years)[6] VANR's required release of 90 percent of inflow would exceed the FWS's recommended releases (except for the month of May when the FWS recommended flow of 432 cfs exceeds the mean May flow of 375 cfs). Maintaining the minimum flow and a total release of 90 percent of the instantaneous inflow would help to prevent large fluctuations in flow downstream of the project, subsequently protecting aquatic resources from stranding and desiccation. Although the FWS's recommended flows during impoundment refilling are designed to protect downstream aquatic resources, they may result in large fluctuations in flow downstream of the project at the beginning and end of each flow cycle, i.e. May 31 and June 1, September 30 and October 1, and March 31 and April 1. These fluctuations may result in the stranding and/or desiccation of fish, fish redds, and other aquatic organisms; particularly when flows are decreased from 432 cfs on May 31 to 54 cfs on June 1. Our recommendation is found in the section VII. Comprehensive Development and Recommended Alternative.

Barton Village is also proposing to operate the project in a ROR mode, as it is currently and voluntarily operated. The FWS and VANR also recommend that the project be operated in a ROR mode and that a stable pool elevation be maintained in Pensioner Pond. These agencies also recommend that a flow management and monitoring plan be developed.

Operating the project in a ROR mode would continue to provide stability to Pensioner Pond's water levels, and reduce the rate and magnitude at which the river

[6] During dry years, the FWS's recommended flows may be more conservative.

downstream of the project fluctuates. This stability provides protection against the stranding of fish and other aquatic organism and the desiccation of fish redds, both in Pensioner Pond and downstream of the project's dam, that may be experienced if the project were to operate in a peaking mode. Stable water levels in Pensioner Pond and steady flows downstream of the project's dam would also promote good water quality and consequently healthy aquatic habitats over that of a peaking operation. This is accomplished by reducing the potential for shoreline and streambank erosion resulting in increased turbidity. Additionally, the development of a flow management plan and a plan for the continuous monitoring and reporting of flow releases at the project (bypass flow release and turbine discharge), impoundment levels, and inflows would help to ensure compliance with ROR operations and the continued protection of aquatic resources within the project's reservoir, bypassed reach, and downstream.

Bypassed Reach

Barton Village proposes, with the FWS's and VANR's support, to provide a year-round minimum flow of 45 cfs to the bypassed reach, for the protection of aquatic habitats, water quality and aesthetics. To examine the instream flow needs in the project's bypassed reach, Barton Village in consultation with the VANR and the FWS, developed a study utilizing a modified Incremental Flow Methodology (IFIM) approach. This study utilized the Habitat Suitability Curves (HSC) for selected species and life stages (juvenile Atlantic salmon and adult brown trout). Five flows ranging between 35 and 55 cfs and in increments of 5 cfs, were analyzed for each species and life stage. The existing minimum flow requirement of 21 cfs between June 15 to September 15 and 10 cfs at all other times of the year was not analyzed in the study. The results of the study are summarized in Table 6.

Table 6. Percentage of maximum habitat found in all study transects combined for the selected species and life stages, at the designated test flows (Source: Barton Village Inc., 2002, as modified by Staff).

Species and Life Stage	**Percentage Maximum Habitat at:**				
	35 cfs	**40 cfs**	**45 cfs**	**50 cfs**	**55 cfs**
Juvenile landlocked Atlantic salmon	72	80	87	90	93
Adult brown trout	70	80	89	92	96

The 45-cfs minimum flow as proposed would provide 87% and 89% of the maximum habitat available to juvenile Atlantic salmon and adult brown trout, respectively. Based on our review of the Barton Village's IFIM study results, we conclude that the flows proposed for the bypassed reach would substantially increase the

amount of physical habitat available to adult brown trout and juvenile Atlantic salmon, over those experienced under the existing conditions. Average water temperatures would also likely become more favorable for these species under the proposed flow regime.

Because ROR operations and changes in minimum flow levels would affect project economics, we present our economic analysis in section VI, *Developmental Analysis* and make our final recommendation pertain to minimum flows and ROR operations in section VII, *Comprehensive Development and Recommended Alternative*.

Debris Disposal

The VANR requires that the Barton Village prepare a plan for the proper disposal of debris associated with the project's operation. Debris associated with project operations can include but is not limited to: household garbage, lumber (including flashboards), and natural woody debris. Natural woody debris is essential for healthy aquatic habitats and provides habitat and structure for fishery resources as well as a food source for macroinvertebrates.

Development of a debris removal plan would benefit the Clyde River ecosystem and downstream hydroelectric projects; however, removal of natural woody debris can inhibit stream productivity. This impact can be avoided if woody debris is returned to the river.

Cumulative Effects

Implementation of proposed and recommended measures would reduce any cumulative effects on fisheries resources.

c. Unavoidable Adverse Effects

None.

3. Threatened and Endangered Species

a. Affected Environment

No listed or proposed threatened or endangered species or designated or proposed critical habitats are known to occur in the project area, although transient species (such as bald eagles) may pass through.

b. Environmental Effects

No adverse impacts are likely to occur to transient threatened or endangered species as proposed project operations are not likely to adversely alter potential species' habitats within the project area (e.g., a perch sites or snags for bald eagles). It is likely that the run-of-river operation of the project would enhance habitats attractive to or utilized by wildlife species, including threatened or endangered species, because stable water levels would not alter the hydrologic regime. Rather, stable water levels would likely increase species and habitat diversity and would not appreciably affect endangered species and their habitats.

c. Unavoidable Adverse Effects

None.

4. Recreation Resources

a. Affected Environment

Recreational activities surrounding the project include fishing, swimming, camping, boating, hunting, picnicking, and nature watching. No formal recreation areas exist around the project, but several informal sites allow visitors to enjoy the scenic beauty of the area. Over 5 million people live within 200 miles of the project, which is located eight miles from the Canadian border. The project area receives minimum recreational usage, most likely due to its remote nature and the availability of other state and local recreation sites in the region. For the most part, recreational use is focused at the southern shoreline of Charleston Pond, near the project's tailrace no. 1. The activities that occur here are primarily bank fishing, with a carry-in boat and canoe/kayak put-in.

For angling, the Clyde River offers numerous species of warm-water and cold-water fish. The upper portion of the Clyde River, between Island Pond and Pensioner Pond, offers a stretch of flatwater approximately eight miles long that is excellent for canoeing. Downstream of the project, the 7.5-mile-long river reach between the West Charleston Pond and Clyde Pond, offers whitewater canoeing and kayaking, with several sections containing Class II and III rapids. The numerous wildlife species and the remoteness of the project area allow for a relaxing and peaceful recreational setting.

b. Environmental Analysis

The proposed recreational activities under the proposed action would formalize the recreational access to the project area and increase the usability for angling, aesthetic enjoyment, and boating. The increased aesthetic flow would also benefit the recreational

resources with improved water quality, better aquatic habitat, and more aesthetic scenery.

Barton Village, in concurrence with VANR and FWS, is proposing to: (1) designate two parking areas near the powerhouse for recreationalists to use; (2) designate and maintain a footpath to provide access to the bypassed reach; (3) designate and maintain an access path to Charleston Pond for angling and launching carry-in boats; (4) designate a canoe/kayak take-out above the dam; and (5) attempt to develop a primitive campground near the southern shore of Charleston Pond. The canoe/kayak take-out is pending landowner approval, and Barton Village, along with other non-governmental groups, is seeking landowner approval for the primitive campsite.

Barton Village's proposal includes provisions for continued public access to the project area as well as several recreational improvements. The proposal is generally consistent with the conditions set forth in VANR's Water Quality Certificate and would enhance the existing uses of fishing, canoeing, wildlife observation, and scenic appreciation. As a result of the proposed recreational enhancements associated with this alternative, the overall recreational opportunities of the project are expected to increase. However, only a minor increase in recreational use of the project lands is expected due to the presence of other state and local recreational facilities in the region. Therefore, this proposal is not expected to significantly impact recreation at Barton Village, but would positively impact the project's recreational opportunities and reduce any cumulative impacts.

c. Unavoidable Adverse Effects

None.

5. Aesthetic Resources

a. Affected Environmental

Situated on the Clyde River in a rural area of Northern Vermont, the Barton Village Hydroelectric Project offers an aesthetically pleasing setting. With rolling hills, steep-cut stream beds, natural lakes, artificial impoundments, and wooded areas interspersed with open fields, the project area offers numerous opportunities for enjoying nature. The predominant vegetative cover in the area is the spruce fir forest type but it also contains an abundance of swamp grasses, cattails, and hay. The climate in the region is cool and rainy with an average temperature of 11.1º F for January and 64.4º F for July. Average annual precipitation in the area is 40 inches, with approximately 100 inches of snowfall.

The bypassed reach contains a significant natural falls and limestone gorge known as the Great Falls of the Clyde. The project dam is located at the head of the falls and the powerhouse is located at the base. Due to the richness and diversity of the plant life in the limestone gorge, this stretch of the Clyde River was designated as notable in the 1983 inventory plan called Waterfalls, Cascades, and Gorges in Vermont. The Great Falls of the Clyde was also deemed significant and valuable because of the rarity of limestone gorges in Vermont. The project bypassed reach is remote and secluded and is not easily viewed from any nearby highways.

b. Environmental Effects

The water level in Pensioner Pond is not expected to change, since the project would continue to be operated in run-of-river mode. The 45-cfs conservation flow proposed by Barton Village, in concurrence with VANR and FWS, would increase in minimum flow in the bypassed reach, the aesthetic resources would be positively impacted because the water quality would improve, more wildlife would flourish, and the aesthetic quality and value of the bypassed reach would increase with greater amounts of flowing water, especially at the Great Falls of the Clyde.

While the addition of more formal recreational areas would most likely increase recreation at the project, the enhancements are not expected to significantly increase the recreational use. This is a result of the presence of other state and local recreation sites in the region. With the potential increase in recreational usage, there exists a possibility for increased noise and litter in the project area. However, since the recreational enhancements are not expected to greatly increase the recreational use of the project, they are not expected to significantly impact the aesthetics of the project in a negative way.

Since no major construction activities are proposed, there would not be a significant noise impact with this alternative. However, potentially, some vegetation would be lost with the designation and maintenance of the access path to Charleston Pond, the footpath to the bypassed reach, and the two parking areas near the powerhouse. Also, some short-term noise pollution might occur when the paths and the parking areas are created. However, the amount of brush cleared and noise from the creation of the proposed enhancements are expected to be minimal. Therefore, this alternative should not cause any significant negative impacts to the aesthetic resources of the project.

c. Unavoidable Adverse Effects

None.

6. Land Use Resources

a. Affected Environment

Within the project area, land uses include residential and recreational developments, timber and agricultural production, utility facilities, and open space. The entire project lies within the Town of Charleston, in Orleans County, Vermont. For the most part, land use around the project is rural with several small communities situated along the Clyde River near Pensioner Pond. Urban development increases downstream of the project toward the mouth of the Clyde River where the Town of Derby and the City of Newport are located. While approximately 74% of Orleans County is forested, most of the land in the project area is open and used for agricultural production.

Most of the land occupied by the project is private; none of the project occupies public lands. Barton Village's land ownership totals approximately 14 acres. The land boundaries begin just below the Route 105 bridge crossing, extend downstream along the Clyde River bypassed reach, and end along the east tailrace, just south of the Charleston Pond shoreline. Located within this boundary are the Pensioner Pond Dam, the Great Falls of the Clyde, and both of the project tailraces. While most of the project land is used to support power production, public access for recreational uses is unrestricted.

b. Environmental Effects

Land use would not be significantly impacted under the proposed action. With the addition of more formalized recreational sites the project lands are expected to experience an increase in recreation use, but due to numerous other recreational facilities in the project region, the use at the project is not expected to increase greatly. Also, with the introduction of more formalized recreational facilities, land use would be somewhat changed. However, since informal access for recreation was already occurring, this alternative is not expected to impact the project's land use.

c. Unavoidable Adverse Effects

None.

7. Cultural Resources

a. Affected Environment

The Barton Village Hydroelectric Project is an existing 1.4-MW run-of-river hydroelectric facility located on the Clyde River within the Town of Charleston, Vermont. The project is operated by Barton Village, Inc., a town approximately 16 miles southwest of Charleston. The project generates approximately 15 to 25 percent of Barton Village's total power consumption, that includes industrial, commercial, residential and farm use, and is administrated through the Barton Village Electric Department. The project consists of a complex of four buildings and nine structures along a 1,600-foot stretch of the Clyde River, including a small impoundment, dam, intake structures, penstocks, powerhouse, transmission lines, and other appurtenant facilities. The Barton Village hydroelectric project was originally constructed in 1895-1896, then redeveloped in 1930-1931 (Baker and Frink 2002).

Culture Historic Context [7]

Prehistoric occupations in the general area range back to the Paleoindian period (ca. 12,000 - 10,000 BP), through the Archaic (ca. 10,000 - 3000 BP), and Woodland periods (3000 BP - AD 1600). At the time of European contact in the beginning of the seventeenth century, eastern Algonquian speakers affiliated with the Western Abenaki were occupying the Clyde River Valley near the vicinity of the project area (Goddard 1978). The closest known archeological resources to the project area are located in the Town of Charleston (Baker and Frink 2002). Both sites are Contact period sites--one dating to mid-1700s, and the other to the first quarter of the 1800s--representing periodic occupations of the St. Francis tribe. Apparently, there had been a large St. Francis Indian village that now lies near the east bank of the Clyde River within East Charleston (Stone 1955), and these particular archeological Contact period sites may have some connection to it. Based on conversations with St. Francis elder tribal members at the Town of Charleston in 1824, there existed a large glacial lake on the Clyde River beginning from the present-day project area to 10 miles upriver (Hemenway 1877). Then sometime between 1763 and 1802, and perhaps related to a devastating earthquake in southern New England occurring in 1775, the Great Falls Gorge deepened and the former lake drained into the present-day ponds, then characterized by flanking bog meadows. If such a lake existed, then much of the area upriver from the Great Falls gorge would have been inundated by the lake in during much of the prehistoric past. The Indian informants also told that there were encampments on both sides of the river at the Town of Charleston, but that the bog areas associated with the former lake at that time made it difficult to cross

[7] Most of information for this section comes from the Barton Village License Application and Draft Historic Properties Management Plan (Baker and Frink 2002), in addition to the National Register of Historic Places Registration Form prepared by Henry (2001), and History of the Town of Charleston by Hamilton (1955).

the river.

The Town of Charleston (originally called Navy) was first settled by Euro-Americans after the turn of the eighteenth century (ca. 1802) and was officially named "Charleston" by the Vermont State legislature in 1825. Prior to 1800, the vicinity in and around the project area was considered a wilderness and where water ponded naturally above the Great Falls in a swampy morass which was then Pensioner (originally called Pension) Pond. However, after 1800, the Great Falls Gorge area just downstream from Pensioners Pond was increasingly being recognized as an attractive place for the development of hydro-mechanical power. In fact, the first significant development within the Town of Charleston, and near the present-day project, was a saw mill. In 1820, a son of a Revolutionary War veteran, named George Varnum, built a saw mill and placed a small log crib dam on the Clyde River between the Great Falls and Pensioner Pond. From an 1895 picture, the mill appears to be a vertical board-sided wood-frame structure with a gabled roof and stone foundation. A recorded archeological site now demarcates this particular mill site and is located within the project area. Additional small mechanical water industrial developments and farmsteads were established near the original Varnum Mill site during the mid-1800s, including another saw mill, carding mill, shoe factory, school house, and several small farmsteads, immediately northwest of the present project dam, on the east side of the Clyde River, and along the periphery of Pensioner Pond and near the intersection of Vermont Route 105 and Great Falls Road (based on H.F. Walling's 1859 Map of the Counties of Orleans, Lameille, and Essex, Vermont). By the 1880s, it was reported that one of the Clyde River saw mill (O.C. Reed's Mill) was cutting "about 500,000 feet of lumber and 1,000,000 shingles per year" (Hamilton 1955:119).

After the advent of electricity in New England in the1880s, the Great Falls Gorge was identified as a promising site for the development of hydroelectric power. In 1895, the first elements of the Barton Village Hydroelectric Project were constructed on the Clyde River at the old Varnum Mill site. At this time, Barton Village also purchased the 10 acres of land associated with the existing saw and carding mill facilities, then identified as the Plunkett or Great Falls Property. The original Varnum mill log crib dam was replaced with a larger cut granite block gravity dam, and a powerhouse, wood stave and steel penstock, intake structure, tailrace (East Tailrace), gate (West Gate) structure comprised the new 1895 Barton Village hydroelectric facility. A circa 1900 postcard shows the 1895 powerhouse as a two-story gabled roof-covered wood-frame structure with additions and an additional attic story. An earlier photograph--depicting the building of the 1895 cut-stone dam--shows the original Varnum Mill still standing in the background. However, a later 1925 15-minute USGS topographic map of the area shows that none the industrial buildings west of the Great Falls gorge were standing. All of the mid-nineteenth century residential structures along the western and northern shores of

Pensioner Pond also disappear on the 1925, and following 1953 and 1986 USGS topographic maps.

In 1925, Barton Village initiated a comprehensive improvement project for the hydroelectric facilities, which resulted in the addition of a surge tank, in addition to cement work for encasing portions of the earlier granite block structures and steel works, such as the dam, intakes, and gates. Parts of the wood stave penstock were also replaced.

In 1930, additional funding was secured by Barton Village, and the 1895 powerhouse was demolished for a new fire-proof single story brick powerhouse, along with the replacement of the existing generating units for increased power. Stone foundation walls of the 1895 powerhouse still exist at the south end of the East Tailrace. The West Tailrace was added in 1930, and the West Gate was modified, along with the replacement of additional portions of the 1895 wood stave penstock with riveted steel piping. The granite cut-stone dam and mortared granite intake structure was also encased entirely in concrete at this time.

Lesser modifications were done to the facilities in 1948, with the addition of a diesel generating building and electric substation in 1956. A workshop was added in 1960, and the dam was also resurfaced with concrete eight years later. A caretaker's cottage and footbridge was added in 1985, and modifications to the intake structure and penstock were made as recently as 1991.

Area of Potential Effects

The area of potential effects (APE) for the Barton Village Hydroelectric Project consists of the 10-acre area owned by Barton Village along the Clyde Riverbank from the south end of Charleston Pond to approximately 1,600 feet upstream to the Route 105 Bridge. This portion of the APE includes the impoundment immediately behind the project dam, in addition to the area above the riverbank around all of the project facilities which is bounded by the Great Falls Road east of the river. The APE also encompass a larger 1.7-mile-long section of the Clyde River shoreline--including all of the shoreline around Pensioner Pond--that extends on private lands through the Town of Charleston, and where Barton Village proposes to do future stream bank stabilization work as a result of erosion being caused at some areas within and near the project (Baker and Frink 2002).

Cultural Resources Investigations

As part of their requirements for a license application, Barton Village prepared a National Register of Historic Places (NRHP) registration form for the hydroelectric facility (Henry 2001), and a preliminary reconnaissance Phase 1A archeological study of

the project area encompassing the APE (Baker and Frink 2002). This work was performed in 2000 and 2001.

Cultural Resources Located within the Area of Potential Effect and Their Eligibility for Inclusion in the NRHP

Pursuant to Section 106 of the National Historic Preservation Act, the Commission is required to take into account any possible adverse effects to historic properties that might be affected by issuance of a new or subsequent license. At a minimum, the Commission must consult with State Historic Preservation Officer, and allow the Advisory Council on Historic Preservation to comment, if historic properties have been identified.

Historic properties are cultural resources 50 years or older that are considered eligible for inclusion in the National Register of Historic Places. Such cultural resources that might occur within the defined APE associated with this project might be aboriginal and historic archeological sites, along with historic standing structures. Other cultural resources, such as traditional cultural properties, could also be present, if a particular Indian tribe identifies such places.

To date, no aboriginal archeological resources have been located within the APE. However, based on the two identified aboriginal Contact period sites identified just downriver from the project in East Charleston, there is the potential that buried archeological deposits may lay within the APE, especially near northern end, close to Charleston Pond. Such aboriginal archeological sites--if discovered within the APE--would more than likely be considered eligible for inclusion in the NRHP. There is less probability of locating aboriginal prehistoric sites up-river from Charleston Pond where a former glacial lake may have existed before it was naturally drained sometime after the 1760s. At this point, no traditional cultural properties have been identified within the APE.

Based on a number of historic references and maps, along with modern-day observations of structural foundations, there is a high probability of historic-era archeological deposits existing within the APE, especially around the present-day project facilities, and along the shoreline of Clyde River south of the project and around Pensioner Pond. Most of these probable archeological deposits would be associated with the industrial mill developments and farmsteads that existed in the nineteenth century. Structural foundations and features, along with associated artifact concentrations, would be the basis for such archeological deposits. One historic archeological site, associated with the 1820 Varnum Mill, has already been identified within the APE. NRHP eligibility for the Varnum Mill site has not been determined at this point; however, this

site would be considered provisionally eligible until further archeological testing was performed on it. Other historic archeological sites associated with the nineteenth century development of the Town of Charleston--and located within the APE--would also be considered provisionally eligible. Foundations of the original 1895 powerhouse, along with associated artifacts, would be another kind of archeological site that probably exists within the APE, and this site would also be considered as provisionally eligible.

The NRHP registration form for the Barton Village Hydroelectric Project identifies 22 project components, of which 17 are considered eligible for NRHP (Baker and Frink 2002, Henry 2001). The 17 project components include: the existing powerhouse, turbines, generators, exciters, governors, crane, East Tailrace, West Tailrace, diesel generators, fuel tank, electric substation, penstock, intake structure, trashracks, dam, West Gate structure, and flashboards. Combined, all of the NRHP-eligible components constitute the historic Barton Village Hydroelectric Project that is recognized for its historical national significance as a "run-of-the-river hydroelectric generating complex developed originally during the last decade of the nineteenth century" (Henry 2001). As a whole, the project provided a reliable source of electricity in that period for both the Town of Charleston and Barton Village. The project's historic integrity essentially reflects a classic example of a 1930s-era hydroelectric development that retains much of the original vernacular industrial design from that period, along with continuing its original 1890s mission of supplying a reliable source of electricity for the Town of Charleston and Barton Village. Subsequent modifications to the facility in the 1940s through the 1960s have detracted little from the overall design and feel of the 1930s facility.

b. Environmental Effects

Barton Village's Analysis Involving a Subsequent License

In Exhibit E of the license application, Barton Village proposes to develop a historic properties management plan (HPMP) to resolve any potential effects to historic properties that could be caused by continued operation and maintenance of the project under a subsequent license. In response to an additional information request by Commission staff in December 2002, Barton Village filed a draft HPMP (Baker and Frink 2002) in January 2003.

Consultation with VTDHP/SHPO

Prior to submittal of the license application, Barton Village initiated consultation with the Vermont Department of Historic Preservation/State Historic Preservation Office (VTDHP/SHPO) which resulted in Barton Village's decision to develop a HPMP for the

subsequent license. Based on a review of the license application and draft HPMP, VTDHP/SHPO, in June 2003 recommended the following:[8]

1) A complete walkover of the project area should be conducted to satisfactorily complete the Phase 1A study that has already been initiated, including additional geomorphic research as recommended on pages 18 and 21 on the draft HPMP.

2) Depending on the results of the Phase 1A, a Phase I investigation should be completed to identify potential historic properties within the project's APE.

3) The Phase 1A study should be revised so that it meets Section 7.4 of the Vermont SHPO's Guidelines for Conducting Archeological Studies (Working Draft July 2002). Because so little is known about the pre-contact and post-contact Native American context and sensitivity of this region of Vermont, the Phase 1A background research for Native American site sensitivity should include an area larger than the Town of Charleston.

4) The Phase 1A study report should be a "stand alone" report, separated from the HPMP document.

Consultation with Indian Tribes

In March 2003, Commission staff provided a copy of the license application and HPMP to the Abenaki Self Help Organization and St. Regis Mohawk Tribes for this project, and requested that these Indian tribes provide us with any information on properties of religious or cultural significance they may know about that could be affected by the project.[9] To date, we have not received any additional information from these two groups on properties that are of religious or cultural significance.

In their June 9, 2003 letter, VTDHP/SHPO also recommended that in the process of completing the Phase 1A study, that Barton Village's archeological contractor contact Ms. Bea Nelson of the Alnobak Nebeskiak regarding any known significant Native American sites that might be in the APE. Commission staff also provided Ms. Bea Nelson a copy of a draft Programmatic Agreement (PA) and draft HPMP. We also

[8] From Emily Wadhams, SHPO, dated June 9, 2003.

[9] Letter from the Commission to April St. Francis Rushlow and Hilda Smoke, dated March 14, 2003.

provided copies of the draft PA and HPMP to representatives of the St. Regis Mohawk Tribe and Abenaki Self Help Association.[10]

Our Analysis on Issuing a Subsequent License

Development of a final HPMP would protect historic properties from potential effects caused by the continued operation and maintenance of the Barton Village Hydroelectric Project. Implementation of the recommendations made by VTDHP/SHPO would complete a Phase 1A investigation of the project meeting the requirements of Vermont SHPO's Guidelines for Conducting Archeological Studies. Taking appropriate measures in the event cultural resources are discovered during project operation and maintenance would protect historic properties located within the project's APE. We discuss these issues further in the comprehensive development section.

c. Unavoidable Adverse Effects

With the implementation of a HPMP over the term of a new license, all potential adverse effects to NRHP-eligible cultural resources should be avoided or mitigated.

D. No-action Alternative

Under the no-action alternative, the project would continue its current operation resulting in no changes to the existing environment. None of the environmental measures proposed by Barton Village and analyzed in this assessment would be implemented.

VI. DEVELOPMENTAL ANALYSIS

In this section, we estimate the effect the proposed environmental measures have on the Barton Village Project's power benefits. We do this by assessing the costs of various project mitigation and enhancement measures and the energy benefits.

Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in Mead, [11] the Commission employs an analysis that uses current

[10] Draft PA and HPMP were copied to Hilda Smoke (Chief of St. Regis Mohawk Tribe) and April St. Francis Rushlow (Abenaki Self Help Association) in Commission July 9, 2003 letter involving review and comment on draft PA and HPMP for the Barton Village Hydroelectric Project.

[11] 72 FERC ¶ 61,027 (July 13, 1995).

costs to compare the costs of the project and likely alternative power, with no forecasts concerning future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project power.

A. Power and Economic Benefits of the Project

Using the assumptions shown in table 7, we calculated the power and economic benefits of the no-action alternative and Barton Village's proposed measures.

Table 7. Assumptions used in Economic Analysis of Barton Village Project No. 7725.

Assumption	2003 Value	Source
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Energy value	38.2 mills/kWh	Barton Village
Interest rate	4.75 percent	Barton Village
Cost of money	4.75 percent	Barton Village
Net investment of the project	$1,009,200	Barton Village
Operations & maintenance (O&M)	$37,000	Barton Village
Relicensing costs	$70,000	Barton Village

Currently, the Barton Village Project has an average annual generation of 4,897 MWh. Barton Village operates the project and sells the electricity to customers within the franchise area of Barton Village Electric Department. Using Barton Village's estimated power value of 38.2 mills/kWh (Table 7), the total energy benefit would be $187,100. The total costs would be about $102,500 (20.9 mills/kWh), resulting in a net annual benefit of about $84,600 (17.3 mills/kWh).

We determined how Barton Village's proposed measures would affect its project power benefits and costs. Barton Village proposes a minimum flow of 45 cfs in the bypassed reach, which would result in a loss of 750 MWh in annual generation or a loss of $28,700 in energy benefits. The new average annual generation would be about 4,147 MWh. Table 8 shows the costs of proposed mitigation and enhancement measures. We estimate the proposed project, including the cost of relicensing, would cost about $117,200 (28.2 mills/kWh) annually. The total annual power benefits would be $158,400 (38.2 mills/kWh) and the net annual benefits would be about $41,200 (10.0 mills/kWh).

Table 8. Summary of costs of Barton Village's proposed measures for the Barton Village Hydroelectric Project. (Source: Staff, 2004.)

Project Mitigation and Enhancement Costs	Annual Cost ($2003)
Recreational Enhancements (Annual Cost)	$200
Plant Automation System Upgrade	$5,100
Historic Properties Management Plan	$5,000
Total Costs of Barton Village's Proposal	$10,300

We determined staff's proposed measures and calculated its annual costs. With staff's measures the project would have an annual generation of 4,147 GWh. Table 9 summarizes the additional measures recommended by staff. The first measure on Table 9 is required only by staff. The remaining measures are recommended by staff and required in the WQC.

We estimated the staff proposed environmental measures would cost about $2,780 (0.7 mills/kWh) annually. By adding the total annual costs of the applicant's proposal from table 2, the total annual costs of the staff's proposal would be about $119,980 (28.9 mills/kWh) and the net annual benefits would be about $38,420 (9.3 mills/kWh).

Table 9. Annual costs of proposed and recommended environmental measures for the Barton Village Project in 2003 dollars. (Source: Staff, 2004.)

Environmental Measure	Capital Cost	Annual Cost
Complete final Phase 1A archeological study	$25,000	$1,580
Develop Flow Management Plan	$ 2,500	$ 160
Plan for continuous monitoring and reporting of project flow releases (bypass flow release and turbine discharge)	$ 5,000	$ 310
Develop debris disposal plan	$ 1,500	$100
Develop turbine rating curve	$10,000	$630
Plan for restoration of water surface elevation at Pensioner Pond and release of 90% of inflow below project.	No cost	No cost
Total Costs of Environmental Measures	$44,000	$2,780

Table 10 summarizes the economic analysis for the three alternatives. The

economic analysis shows that both alternatives would be less costly to operate than alternative energy resources.

Table 10. Summary of economic analysis of alternatives. (Source: Staff, 2004.)

Alternative/ Annual Generation	Annual Cost	Annual Benefits	Net Annual Benefits
No-action alternative (4,897 MWh/year)	$102,500 (20.9 mills/kWh)	$187,100 (38.2 mills/kWh)	$84,600 (17.3 mills/kWh)
Barton Village proposal (4,147 MWh/year)	$117,200 (28.2 mills/kWh)	$158,400 (38.2 mills/kWh)	$41,200 (10.0 mills/kWh)
Staff's proposal (4,147 MWh/year)	$119,980 (28.9 mills/kWh)	$158,400 (38.2 mills/kWh)	$38,420 (9.3 mills/kWh)

VII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a proposed project, we equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Accordingly, any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

A. Preferred Alternative

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project, with measures required in the WQC, and its alternatives, we selected the proposed project with the measures required in the WQC and recommended by staff (staff alternative) as the preferred option. We recommend this option because: (1) issuance of a subsequent hydropower license by the Commission would allow Barton Village to operate the project to provide electrical energy to their customers; (2) the 1,400-kW project would eliminate the need for an equivalent amount of fossil-fuel derived energy and capacity, which helps conserve these nonrenewable resources and limits atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended mitigation and enhancement measures would protect and enhance aquatic and cultural resources; and provide improved recreation opportunities at the project.

The following summarizes the environmental enhancement measures we recommend and measures required by the WQC that would be included in any license the Commission issues for the Barton Village Hydroelectric Project:

Measures proposed by Barton Village and recommended by staff:

- Maintain a year-round minimum bypass flow of 45 cfs or inflow to Pensioner Lake, whichever is less.
- Repair and upgrade the plant automation system to allow for remote operation.
- Develop an annual flashboard inspection program and to replace the flashboards every four years or sooner.
- Develop a HPMP.
- Designate two parking areas near the powerhouse for recreationalist.
- Maintain and provide an access foot path to the bypassed reach.
- Maintain and provide an access path to Charleston Pond for angling and launching carry-in boats.
- Allow public access to project lands.
- Work with non-governmental organizations to develop a primitive campground near Charleston Pond and canoe /kayak take-out above the dam.
- Work with landowners to develop a canoe/kayak take-out above the dam.

Additional measures recommended by staff and included in the WQC:

- When restoring the elevation of Pensioner Pond, release at least 90 percent of instantaneous inflow below the project. While the pond is being refilled, bypass flow requirements shall be met at all times.
- Develop a flow management plan.

- Develop a plan for continuous monitoring and reporting of flow releases at the project (bypass flow release and turbine discharge), impoundment levels, and inflows.

- Provide a turbine rating curve.

- Develop a plan for proper disposal of debris associated with project operation.

- Upon a written request by the VANR, design and implement an erosion control measures.

In addition we recommend that the debris removal plan include provisions for returning natural woody debris to the Clyde River. We also recommend Barton Village develop a final HPMP and measures to be taken if cultural resources are discovered during continued operation and maintenance of the project during the license period.

The following is a discussion of the basis for some of the staff recommended measures.

Minimum Flow

Barton Village proposes to provide a year-round minimum flow of 45 cfs to the bypassed reach, for the protection of aquatic habitats, water quality and aesthetics. The proposed 45 cfs minimum flow would provide 87% and 89% of the maximum habitat available to juvenile Atlantic salmon and adult brown trout, respectively. Based on our review of the Barton Village's IFIM study results, we conclude that the flows proposed for the bypassed reach would substantially increase the amount of physical habitat available to adult brown trout and juvenile Atlantic salmon, over those experienced under the existing conditions. Average water temperatures would also likely become more favorable for these species under the proposed flow regime. With the proposed minimum flow of 45 cfs we estimate the resulting loss in project generation would be 750 MWh, with a corresponding value of $28,700 annually. The environmental benefits of the 45-cfs minimum flow outweigh the cost of the lost generation. Therefore, we recommend that Barton Village release the proposed flows in the project's bypassed reach.

Reservoir Refilling

After a flashboard failure and replacement or after a scheduled and approved drawdown of the reservoir, impoundment refilling the project can affect downstream aquatic resources if the minimum flows are not being provided to the downstream reaches. We looked at the effect of the VANR's reservoir refilling plan, required in the water quality certificate, and FWS's refilling plan. Implementing either of these flow

regimes would help to protect aquatic resources downstream of the project while the impoundment is refilling. However, VANR's required refilling plan appears to be a more conservative approach. The VANR's plan would help to prevent large fluctuations in flow downstream of the project, subsequently protecting aquatic resources from stranding and desiccation. The FWS's refilling plan is designed to protect downstream aquatic resources; but the plan may result in large fluctuations in flow downstream of the project. These fluctuations may result in the stranding and/or desiccation of fish, fish redds, and other aquatic organisms. Therefore, we are recommending that Barton Village refill the reservoir using VANR's refilling plan.

Cultural Resources

We agree with Barton Village's proposal to produce a HPMP for the proposed subsequent license and concur with all of the VTDHP/SHPO comments noted above in their June 9, 2003 letter. As a result, we issued a draft PA on July 9, 2003 that would direct Barton Village to produce a final Phase 1A archeological study within nine months of issuance of a new subsequent license for this project, and a final HPMP, within one year after issuance of a subsequent license. We received comments from the Advisory Council on Historic Preservation (ACHP) on July 15, 2003 stating that the ACHP need not participate in any further consultation involving cultural resources related to this process.[12] As a result, we will change the 3-party PA to a standard 2-party PA and take remove references to the ACHP from the PA. We will then resubmit the 2-party PA for review and signature with same conditions as in our July 9, 2003 draft PA, directing Barton Village to produce a final Phase 1A archeological study within nine months of issuance of a new subsequent license for this project, and a final HPMP, within one year after issuance of a new subsequent license.

Barton Village is not proposing nor are we requiring the construction of new project facilities. However, we recommend that any new license contain provisions requiring Barton Village to take appropriate measures should any cultural resources be discovered or disturbed during future operation and maintenance of the project.

Conclusion

In conclusion, from our evaluation of the environmental effects and public benefits of the project, we conclude that licensing the Barton Village Hydroelectric Project with these environmental protection measures would best adapt the project to a comprehensive plan for the Clyde River drainage basin

[12] Letter from Raymond Wallace to Magalie Salas, dated July 15, 2003.

VIII. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10 (a)(2) of the FPA[13] requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project.[14] Accordingly, federal and state agencies filed 28 comprehensive plans for the Vermont that address various resources in the state. Of these, staff identified and reviewed twelve of the plans relevant to this protect.[15] We conclude that the proposed project would not conflict with these plans.

IX. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of Section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on the recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

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[13] 16 U.S.C. § 803(a)(2)(A).

[14] Comprehensive plans for this purpose are defined at 18 C.F.R § 2.19 (2003).

[15] These plans are: (1) "North American Wildlife Management Plan," 1986, U.S. Fish and Wildlife Service; (2) "North American Waterfowl Management Plan," 1986, U.S. Fish and Wildlife Service; (3) "Final Environmental Impact Statement - Atlantic Salmon Restoration to New England Rivers," 1989, U.S. Fish and Wildlife Service; (4) "Fisheries USA: The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service," undated, U.S. Fish and Wildlife Service; (5) "The Nationwide Rivers Inventory," 1982, National Park Service; (6) "The Waterfalls, Cascades, and Gorges of Vermont," 1986, Vermont Agency of Natural Resources; (7) "Vermont State Comprehensive Outdoor Recreation Plan, 1983-1988," Vermont Agency of Environmental Conservation; (8) "Vermont Rivers Study," 1986, Vermont Agency of Environmental Conservation; (9) "Clyde River Futures Project Final Report," 1992, Vermont Department of Environmental Conservation; (10) "Hydropower in Vermont: An Assessment of Environmental Problems and Opportunities," 1988, Vermont Agency of Natural Resources; (11) "Vermont Recreation Plan," 1988, Vermont Agency of Natural Resources and; (12) "Wetlands Component of the 1988 Vermont Recreation Plan," 1988, Vermont Agency of Natural Resources.

Interior, on behalf of FWS, filed recommendations under section 10(j) of the FPA on May 8, 2003 for the Barton Village Project. On May 19, 2003, the VANR filed terms and conditions in the form of the final WQC, and are not considered 10(j) recommendations.

Table 11 lists the federal and state recommendations, and whether the recommendations are adopted under the staff alternative. We recommend adopting all the recommendations, except one.

Table 11. Analysis of fish and wildlife agency recommendations for the Barton Village Hydroelectric Project. (Source: Staff, 2004).

Recommendation	Agency	Within scope of Section 10(j)?	Staff Conclusion
1. Operate the project in a run-of-river mode	DOI	Yes	adopted
2. Maintain a stable pool in Pensioner Pond	DOI	Yes	adopted
3. Release continuous minimum flow of 45 cfs or inflow	DOI	Yes	adopted
4. Develop a monitoring plan for reservoir levels and flow releases	DOI	Yes	adopted
5. During refilling of the impoundment, operate the project such that instanteous minimum flows of 54 cfs is released June 1 through September 30, 108 cfs is released October 1 to March 31, and 432 cfs is released April 1 to May 31	DOI	Yes	not adopted

Among DOI recommendations, we recommend adopting all but one. We did not adopt DOI's measure for refilling the reservoir (Table 11, No. 5). In section V(C)2 of the EA, we analyzed DOI and VANR recommended refilling plans. While both refilling plans to some extent would help protect downstream aquatic resources, VANR's required refilling plan, as part of its WQC under section 401 of the Clean Water Act, is a more conservative approach. DOI's refilling plan may result in large fluctuations in flow downstream of the project at the beginning and end of each flow cycle, i.e. May 31 and June 1, September 30 and October 1, and March 31 and April 1. Unlike DOI's recommendation, VANR's WQC condition for maintaining a minimum flow of 90 percent of the instantaneous inflow would help to prevent large fluctuations in flow downstream of the project, subsequently protecting aquatic resources from stranding and desiccation.

Because DOI's recommended refilling plan conflicts with the WQC and may result in harm to downstream aquatic resources, our preliminary determination is that the DOI recommendation is inconsistent with section 401 of the Clean Water Act and with the comprehensive planning standard of section 10(a) of the FPA.

X. FINDING OF NO SIGNIFICANT IMPACT

We've prepared this environmental assessment for the Barton Village Hydroelectric Project pursuant to the National Environmental Policy Act of 1969. Implementing the protection measures described in this environmental assessment would ensure that the environmental effects of the project would remain insignificant. There would be no significant unavoidable adverse impacts. Continued operation of the project, with proposed and recommended measures, would reduce cumulative effects on water quality, fisheries, and recreation.

Based on this analysis, issuing a new license for the project would not be a major federal action significantly affecting the quality of the human environment. With our recommended measures, aquatic and riparian resources and any cultural resources that would be found during project operation would be protected.

XI. LITERATURE CITED

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XII. LIST OF PREPARERS

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Appendix A: Conditions of the Vermont Agency of Natural Resources Water Quality Certificate

A. **Compliance with Conditions.** 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 and Water Level Management.** Except as provided in Condition C below, the facility shall be operated in a true run-of-the-river mode. When the facility is not operating, all flows shall be spilled at the dam.

A flow of 45 cfs, or inflow if less, shall be released into the bypass at all times.

Except as provided in Condition C below, Pensioner Pond shall be maintained at or above elevation 1,140.94 feet msl (the top of the flashboards) at all times, except under circumstances when the Department has granted special approval or the flashboards have failed.

C. **Flow Management During Pensioner Pond Refill.** When restoring the elevation of Pensioner Pond after replacement of failed flashboards, or an approved drawdown related to dam maintenance or an emergency, the applicant shall release at least 90 percent of instantaneous inflow below the project. While the pond is being refilled, bypass flow requirements shall be met at all times. Normal flashboard replacement shall be done without lowering the pond level.

D. **Flow Management Plan.** The applicant shall develop a flow management plan detailing how the project will be operated to comply with the conservation flow and water level limitations described above. The plan shall include information on how the project will be managed to control lag times and avoid related non-compliance with the conservation flow requirements, how downstream fish passage will be provided, and procedures for reporting deviations from prescribed operating conditions. The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service, and a draft shall be submitted to the Department for review within 180 days of the issuance of a federal license. 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.

E. **Monitoring Plan for Impoundment and Flow Management.** The applicant shall develop a plan for continuous monitoring and reporting of flow releases at the project (bypass flow release and turbine discharge), impoundment levels, and inflows. The plan shall include procedures for reporting deviations from prescribed operating conditions. 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, and a draft shall be submitted to the Department for review within 180 days of the issuance of a federal license. 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.

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

G. **Flashboards.** The applicant shall replace flashboards at four-year intervals. In addition, the flashboards shall be inspected annually following spring runoff, and damaged boards replaced as necessary.

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, and a draft shall be submitted to the Department for review within 90 days of the issuance of a federal license. 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.

I. **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 an existing use or a beneficial value or use 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. Access may be restricted without prior approval when an immediate threat to public safety exists. In those cases, the applicant shall so notify the Department and shall file a request for approval, if

the restriction is to be permanent or long term, within 14 days of the restriction of access.

K. **Recreational Facilities.** Recreational facilities shall be constructed and maintained consistent with a recreation plan. The plan shall include an implementation schedule and, where appropriate, details on erosion control. The plan shall be developed in consultation with the Department, and a draft shall be submitted to the Department for review within one year of the issuance of a federal license. The final plan shall be subject to Department approval. The plan shall be updated at the end of each subsequent six-year period. The Department reserves the right of review and approval of any material changes made to the plan at any time.

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 with respect to water quality during the life of the project.