UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Littleville Power Company, Inc. Project No. 2801-027

NOTICE OF AVAILABILITY OF ENVIRONMENTAL ASSESSMENT

(March 23, 2009)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Office of Energy Projects has reviewed the application for a subsequent license for the 1.14-megawatt Glendale Hydroelectric Project, located on the Housatonic River, in the Town of Stockbridge, Berkshire County, Massachusetts, and has prepared an Environmental Assessment (EA). In the EA, Commission staff analyze the potential environmental effects of relicensing the project and conclude that issuing a subsequent license for the project, with appropriate environmental measures, would not constitute a major federal action significantly affecting 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 documents. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll-free at 1-866-208-3676, or for TTY, (202) 502-8659.

You may also register online at http://www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, contact FERC Online Support.

Comments on the EA 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 "Glendale Project No. 2801-027" 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 "eFiling" link. For further information, contact Kristen Murphy at (202) 502-6236.

Kimberly D. Bose,
Secretary.

ENVIRONMENTAL ASSESSMENT
FOR
SUBSEQUENT HYDROPOWER LICENSE

Glendale Project

FERC Project No. 2801-027

Massachusetts

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

March 2009

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On October 31, 2007, Littleville Power Company, Inc. (Littleville Power), a subsidiary of Enel North America, Inc., filed an application for a subsequent license to operate and maintain the 1.14-megawatt (MW) Glendale Hydroelectric Project, located on the Housatonic River in the Town of Stockbridge, Berkshire County, Massachusetts.

Project Description

The project consists of a 250-foot-long, 30-foot-high concrete gravity dam creating a 23-acre reservoir; a gatehouse at the northern end of the dam; a 1,500-foot-long, 40-foot-wide intake canal leading to a forebay structure (with trash racks with 1-inch clear bar spacing) that controls flow into a 250-foot-long, 12-foot-diameter steel penstock; and a powerhouse with four turbine generating units with a combined installed capacity of 1,140 kilowatts (kw). Approximately 2,500 feet of the Housatonic River is bypassed by the intake canal, penstock, powerhouse, and tailrace channel. Per the existing license, as amended on September 24, 1984, the project is required to operate in a run-of-river mode, with minimal impoundment fluctuations and a minimum flow of 10 cubic feet per second (cfs) or inflow, whichever is less, discharged from the dam into the bypassed reach. Littleville Power voluntarily operates the project such that a unit's output is reduced to its minimum hydraulic capacity before being taken off line in order to minimize downstream fluctuations. The project is described in more detail in section 2.1.1. The project does not use or occupy any federal facilities or land.

Proposed Measures

Littleville Power proposes to continue to operate in a run-of-river mode with turbine unit ramping and to increase year-round minimum flows into the bypassed reach from 10 cfs to 90 cfs or inflow, whichever is less, in order to enhance downstream water quality and aquatic habitat. Littleville Power also proposes to install a new, 165-kW turbine unit in a waste gate (which releases flows into the bypassed reach) located at the gatehouse. This unit would generate power from the proposed 90-cfs bypassed reach flow, and its intake would have trash racks with 1-inch clear spacing. To enhance public use, Littleville Power proposes to provide a canoe portage facility consisting of a new take-out located upstream of the dam on the right bank near the gatehouse; an informal portage trail that uses the existing access road and crosses the power canal at an existing bridge; and a new stairway/ramp at the bypassed reach and parking, for boaters and other recreationists, at the bypassed reach near the stairway/ramp.

Alternatives Considered

This environmental assessment (EA) analyzes the effects of continued operation and recommends conditions for a subsequent license for the project. This EA considers the following alternatives: (1) Littleville Power's proposal without a new minimum flow turbine generating unit; (2) Littleville Power's proposal with a new turbine generating unit; (3) Littleville Power's proposal including a new turbine generating unit with staff modifications (staff alternative); and (4) no action – continued operation with no changes.

Public Involvement and Areas of Concern

Before filing its license application, Littleville Power conducted a pre-filing consultation process under the traditional licensing process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission. After the application was filed, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested parties on August 22, 2008, soliciting comments, recommendations, and information on the project. On October 30, 2008, we issued a notice that the application was ready for environmental analysis and requested conditions and recommendations.

The primary issues associated with relicensing the project are aquatic habitat and recreational access.

Staff Alternative

Aquatic Resources – The staff alternative includes Littleville Power's proposals for run-of-river operation with turbine unit ramping, a bypassed reach minimum flow increase from 10 cfs to 90 cfs, and trash racks with 1-inch clear bar spacing (approach velocity of 2 feet per second or less) at the proposed minimum flow turbine generating unit. With these measures, aquatic life and habitat would continue to benefit by stable impoundment levels, habitat for a variety of species would increase in the bypassed reach and water quality would be enhanced compared to existing conditions, and fish residing in the impoundment would be protected from entrainment and turbine-induced mortality.

Staff recommend modifying Littleville Power's proposal to include providing a downstream flow of 90 percent of inflow during impoundment refilling following any maintenance and emergency drawdowns in order to protect aquatic resources below the project. Staff also recommend that Littleville Power develop and implement an operation compliance monitoring plan so all operational procedures and communication protocols are included in a single plan, and for the protection of aquatic habitat a soil erosion and

sedimentation control plan that specifies the measures that would be used to control erosion and sedimentation during the new turbine installation.

Terrestrial Resources – Under Littleville Power's proposal, shoreline habitat would continue to benefit from stable impoundment levels and run-of-river operation.

Staff recommend that Littleville Power develop and implement an invasive species control plan in order to protect native plant communities and the wildlife habitat that they provide.

Threatened and Endangered Species – No federally listed endangered or threatened species are known to exist in the project area.

Recreation – Littleville Power's proposal to provide a canoe portage around the dam, including a new take-out and put-in, would ensure that boaters are able to safely navigate around the project. Littleville Power's proposal to provide a formal parking area near the proposed put-in would benefit recreationists accessing the project's bypassed reach. Staff recommend that these recreational improvements be implemented according to a recreation plan, in consultation with the Massachusetts Division of Fisheries and Wildlife and the Housatonic Valley Association.

Cultural Resources – Under Littleville Power's proposal, continued project operation would not adversely affect cultural resources. Under the staff alternative, Littleville Power would develop and implement an historic properties management plan in order to mitigate the effects of any future modifications or activities that could potentially affect the characteristics of the Glendale Powerhouse, which is listed on the National Register of Historic Places.

Aesthetic Resources – Operating in a run-of-river mode and increasing the minimum flow from 10 to 90 cfs would enhance the visual appeal of the bypassed reach, benefiting recreationists.

Under the no-action alternative, environmental conditions would remain the same and no enhancement of environmental resources would occur.

Conclusions

Based on our analysis, we recommend licensing the project as proposed by Littleville Power including a new turbine generating unit with staff modifications, as described above under Alternatives Considered.

In section 4.2 of the EA, we estimate the annual net benefits of operating and maintaining the project under the four alternatives identified above. Our analysis shows

that the annual net benefit would be $1,640 for the proposed action without a new turbine generating unit; $-37,050 for the proposed action with a new turbine generating unit; $-40,810 for the staff alternative; and $58,380 for the no-action alternative.

On the basis of our independent analysis, we conclude that issuing a subsequent license for the project, with the environmental measures we recommend, would not be a major federal action significantly affecting the quality of the human environment.

We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (5,800 megawatt-hours (MWh), annually); (2) the project could save an equivalent amount of fossil-fueled generation and capacity, which may help conserve non-renewable energy resources and reduce atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by Littleville Power, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

GLENDALE PROJECT
FERC No. 2801-027, Massachusetts

1.0 INTRODUCTION

1.1 APPLICATION

On October 31, 2007, Littleville Power Company, Inc. (Littleville Power), a subsidiary of Enel North America, Inc., filed an application with the Federal Energy Regulatory Commission (Commission) for the continued operation of its 1.14-megawatt (MW) Glendale Hydroelectric Project located on the Housatonic River in the Town of Stockbridge, Berkshire County, Massachusetts (figures 1 and 2). The project does not occupy any federal land. Littleville Power proposes to increase capacity with the installation of a new 165-kilowatt (kw) turbine generating unit.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The Commission must decide whether to issue a subsequent license for the project and what conditions should be placed in any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation and water supply), the Commission must give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

Issuing a subsequent license for the Glendale Project would allow Littleville Power to generate electricity at the project for the term of a subsequent license, making electric power from a renewable resource available to its customers.

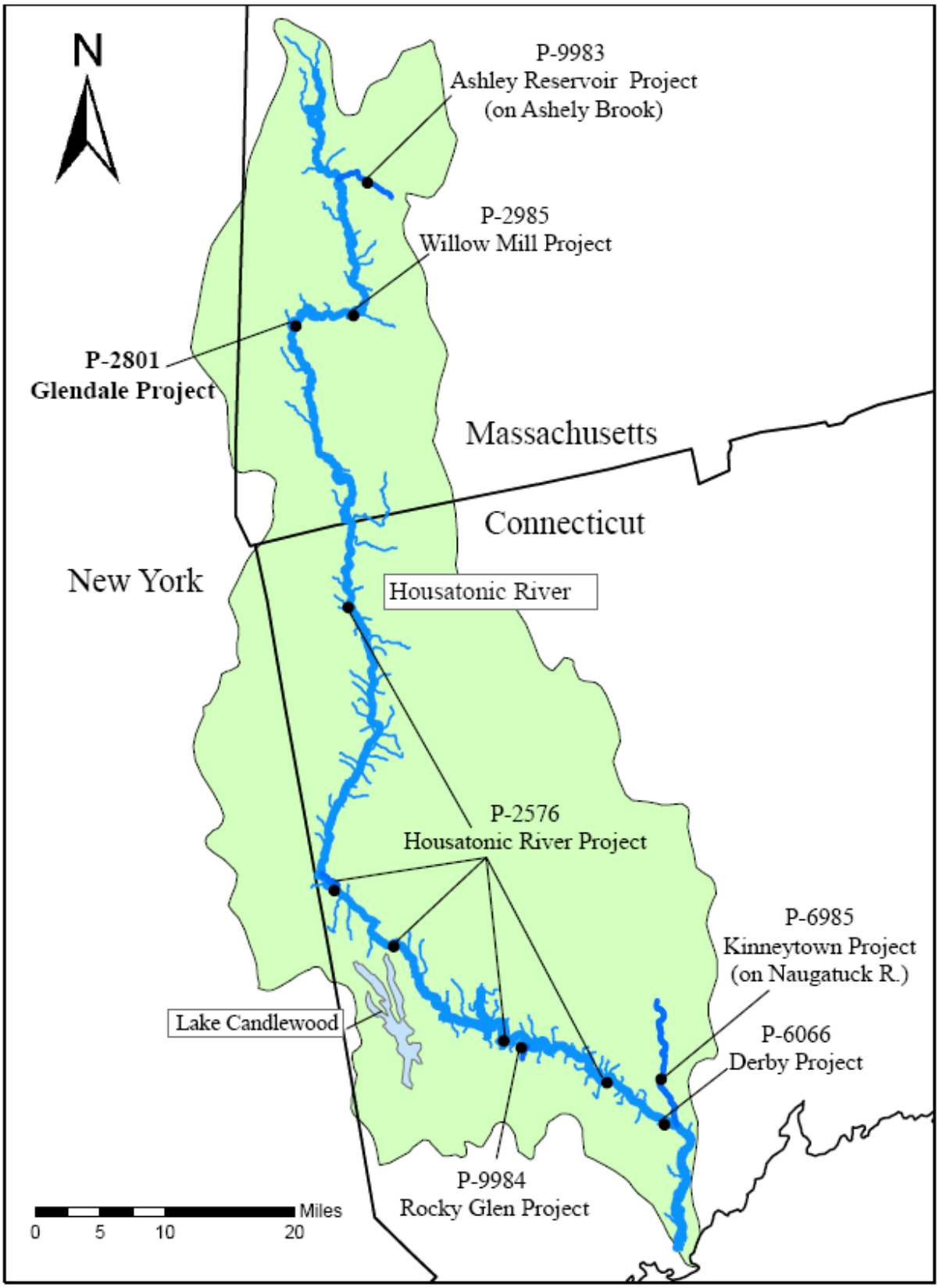

Figure 1. Housatonic River Watershed Map. Source: Staff

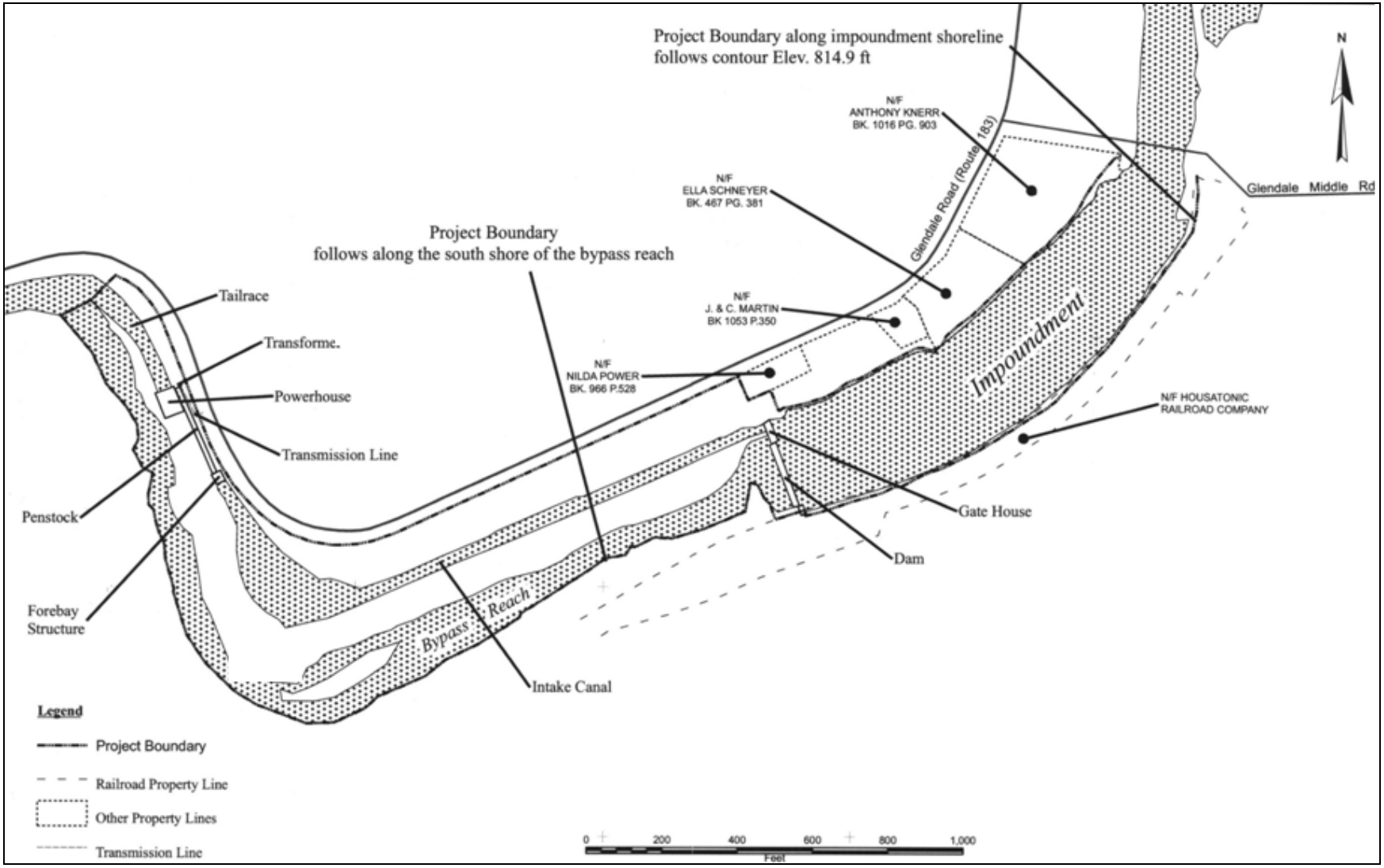

Figure 2. Glendale Project Site Plan. Source: License application, adapted by staff

In this environmental assessment (EA) staff assess the effects associated with continued operation of the project, alternatives to the proposed project, and make recommendations to the Commission on whether to issue a subsequent license, and if so, recommends terms and conditions to become a part of any license issued.

The EA includes an assessment of the environmental and economic effects of continuing to operate the project: (1) as proposed by Littleville Power but without a new minimum flow turbine generating unit; (2) as proposed by Littleville Power, including a new turbine generating unit; (3) as proposed by Littleville Power including a new turbine generating unit with staff modifications (staff alternative); and (4) no action – continued operation with no changes. Important issues that are addressed include minimum flows in the bypassed reach, impoundment refill procedures, erosion and sedimentation control, invasive species control, recreational access, and protection of cultural resources.

1.2.2 Need for Power

To assess the need for project power, we reviewed Littleville Power's present and anticipated future use of project power, together with that of the operating region in which the project is located. Historically, the Glendale Project generates an average of 5,000 megawatt hours (MWh) annually; the estimated average annual generation with the addition of a new minimum flow turbine generating unit at the dam is 5,800 MWh.

The Glendale Project is located in the Northeast Power Coordinating Council (NPCC) region of the North American Electric Reliability Council (NERC). According to NERC, the projected summer peak 10-year compound annual average growth rate is about 1.2 percent during 2008-2017 in the New England area (NERC, 2008).

Power from the Glendale Project would help meet the need for power in the NPCC region in both the short and long-term. The project provides low-cost power that displaces non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities avoids some power plant emissions, which may benefit the environment.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Glendale Project is subject to numerous requirements under the Federal Power Act and other applicable statutes. The major regulatory and statutory requirements are summarized in table 1 and described below.

Table 1. Major Statutory and Regulatory Requirements for the Glendale Project

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	Department of the Interior (Interior)	Reservation of authority to prescribe fishways filed on December 30, 2008.
Section 10(j) of the FPA	Interior and Massachusetts Division of Fisheries and Wildlife (Massachusetts DFW)	Six section 10(j) conditions filed by Interior on December 30, 2008; six section 10(j) conditions filed by Massachusetts DFW on December 22, 2008.
Section 401 of the Clean Water Act—water quality certification	Massachusetts Department of Environmental Protection (Massachusetts DEP)	Certification due by November 12, 2009.
Endangered Species Act Consultation	U.S. Fish and Wildlife Service (FWS)	Per the FWS, no listed species affected.
Coastal Zone Management Act Consistency	Connecticut Department of Environmental Protection	Per the Connecticut Department of Environmental Protection, consistency review is unnecessary.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the Federal Power Act states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the Interior. In a letter filed December 30, 2008, Interior requested that the Commission reserve its authority to require fishways that may be prescribed by Interior in the future.

1.3.1.2 Section 10(j) Recommendations

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.

On December 22 and 30, Massachusetts DFW and Interior, respectively, each filed six recommendations under section 10(j), as summarized in table 3, and discussed in section 5.4, Recommendations of Fish and Wildlife Agencies.

1.3.1.3 Section 10(a) Recommendations

Under section 10(a) of the FPA, each hydroelectric license issued by the Commission should be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce; for the improvement and utilization of waterpower development; for the adequate protection, mitigation, and enhancement of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, recreation, and other purposes.

Interior filed a recommendation pursuant to section 10(a) of the FPA, as follows: "The Licensee shall serve, prior to or at the time of filing with the Commission, all representatives of the Department on the service list, with a copy of any request the Licensee may file for amendment of license, amendment or appeal of any fish and wildlife-related license conditions or extension of time requests for project construction or implementation of license article provisions."

1.3.2 Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA), license applicants must obtain either certification that any discharge from a project would comply with applicable provisions of the CWA, or a waiver of certification by the appropriate state agency. On November 14, 2007, Littleville Power applied to the Massachusetts DEP for 401 water quality certification (WQC) for the Glendale Project. Massachusetts DEP received this request on November 20, 2007. On November 3, 2008, Littleville Power received a letter from Massachusetts DEP requesting that Littleville Power withdraw and resubmit its application in order to extend the processing deadline one additional year. By letter dated November 11, 2008, Littleville Power withdrew and resubmitted its application. Certification is due by November 12, 2009.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. FWS staff informed Littleville Power in an April 27, 2007 letter (license application, Appendix A) that there are no known federally listed endangered or threatened species or critical habitat for such species within the project area. No listed

species were identified during the 2006 Housatonic mussel survey. Because the presence of listed species has not been documented at the project, staff conclude that issuing a license would not affect federally listed threatened and endangered species. Therefore, further consultation under section 7 is not needed.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The Glendale Project is located approximately 122 miles upstream of Long Island Sound and outside of the designated boundaries of the coastal zone. By letter dated June 19, 2008 (filed July 8, 2008), the Connecticut Department of Environmental Protection confirmed that the project is located beyond the limit of tidal influence on the Housatonic River and would otherwise have no reasonably foreseeable effect on coastal resources or uses in Connecticut; thus, the project is not subject to Connecticut coastal zone program review and no consistency certification is needed for the action.

1.3.5 National Historic Preservation Act

Section 106 requires that a federal agency "take into account" how its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

The project's powerhouse is listed on the National Register of Historic Places for its engineering and industrial uses from 1900 to 1924. However, Littleville Power is not proposing any alterations to the Glendale powerhouse. By letter filed October 30, 2008, the SHPO determined that the relicensing proposal will not adversely affect the significant historic characteristics of the property. The SHPO commented that operation of the powerhouse for its historical purposes assists in maintaining the historic property.

By letter dated January 27, 2009 (filed February 12, 2009) the SHPO recommended that an historic properties management plan (HPMP) for the project be developed, using a Historical Overview Report filed January 14, 2009, and other existing materials and requiring consultation with the Commission, SHPO, and the Stockbridge Historical Commission prior to any future undertaking involving new construction, demolition, or rehabilitation.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 CFR, sections 16.8) require that applicants consult with appropriate resource agencies, tribes, and other entities 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.

1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested agencies and others on August 22, 2008. The following entities provided written comments:

Commenting Entity	Date Filed
Littleville Power	September 15, 2008
Berkshire Regional Planning Commission	September 22, 2008
Housatonic Valley Association	September 24, 2008

1.4.2 Interventions

On October 30, 2008, the Commission issued a public notice accepting Littleville Power's application to relicense the Glendale Project, soliciting motions to intervene and protests. This notice set December 30, 2008, as the deadline for filing protests and motions to intervene. No entities filed motions to intervene.

1.4.3 Comments on the License Application

On October 30, 2008, the Commission issued a public notice requesting comments, final recommendations, conditions and prescriptions with a filing deadline of December 30, 2008. The following entities commented.

Commenting Entity	Date Filed
Massachusetts DFW	December 22, 2008
Interior	December 30, 2008

Littleville Power filed reply comments on February 12, 2009.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 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. We use this alternative as the baseline environmental condition for comparison with other alternatives.

2.1.1 Existing Project Facilities

The existing Glendale Project consists of: (1) a 250-foot-long, 30-foot-high concrete gravity dam with a 182-foot-long spillway and a gatehouse containing two manually-operated 10 by 10-foot-square intake gates and two 8-by 8-foot-square waste gates; (2) a 23-acre reservoir with a normal water surface elevation of 810.9 feet National Geodetic Vertical Datum (NGVD); (3) a 1,500-foot-long, 40-foot-wide intake canal; (4) a forebay structure containing two manually-operated headgates (with trash racks with 1-inch clear bar spacing) and one hydraulically-operated canal waste gate; (5) a 250-foot-long, 12-foot-diameter steel penstock; (6) a powerhouse with four turbine generating units with a combined installed capacity of 1,140 kW; (7) a 300-foot-long tailrace channel; (8) a step-up transformer and 83-foot-long, 13.8-kilovolt transmission line; and (9) appurtenant facilities. The Housatonic River reach that is bypassed by the project (measured from the gatehouse to the tailrace channel) is about 2,500 feet long.

The project boundary encloses all the project facilities described above.

2.1.2 Project Safety

The project has been operating for over 29 years under the current license which was effective November 1, 1979. During this time, Commission staff have conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. As part of the relicensing process, Commission staff will evaluate the continued adequacy of the proposed project facilities under a subsequent license. Special articles will be included in any license issued, as appropriate. Commission staff will continue to inspect the project during the subsequent license term to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.3 Existing Project Operation

Littleville Power currently operates the project in a run-of-river mode using

automatic pond level control (PLC). The powerhouse contains four identical vertical semi-Kaplan turbine/generator units with a total maximum hydraulic capacity of approximately 400 cubic feet per second (cfs), or 100 cfs for each turbine, and a minimum hydraulic capacity of approximately 55 cfs for each turbine. Water discharged through the turbines enters the project tailrace and flows approximately 300 feet before reentering the Housatonic River. All inflow in excess of the project's generating capacity is passed over the dam.

When about 2.5 inches of spill occurs over the dam, the PLC unit is programmed to start one unit beginning at 55 percent gate and then gradually increasing to 80 percent gate. If the level of spill exceeds 2.5 inches with one unit operating, the PLC is programmed to start additional units sequentially as flows become available while maintaining the 10-cfs minimum flow.

Since 2001, in an effort to reduce river level fluctuations observed downstream of the Glendale Project at the U.S. Geological Survey (USGS) gaging station in Great Barrington, Massachusetts, Littleville Power has voluntarily ceased all generation when inflow is below 200 cfs and, when possible, has refrained from taking each turbine unit off line until after it is operating at its minimum hydraulic capacity (55 cfs). The result of this ramping mode of operation is that downstream fluctuations (caused by the time delay that occurs between the decreased flows from the powerhouse when a unit is taken off line and increased spillage at the dam) are minimized or eliminated.

Littleville Power estimates that the project's total average annual generation is 5,000 MWh.

2.1.4 Existing Environmental Measures

Under the current license, Littleville Power is required to operate the project in a run-of-river mode, and provide a continuous minimum flow of 10 cfs or inflow from the dam to protect aquatic resources in the Housatonic River (Article 25). The flow to the bypassed reach is currently passed over the length of the spillway crest, or alternatively, through a 6-foot-wide by 10-inch-deep notch in the spillway crest.

No designated recreation facilities exist at the project.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

Littleville Power proposes to install a new 165-kW minimum flow turbine generating unit, including new trash racks with 1-inch clear spacing, in one of the waste gate slots located at the gatehouse adjacent to the project dam.

2.2.3 Proposed Project Operation

Littleville Power proposes to continue run-of-river operation with minimal impoundment fluctuations and turbine unit ramping.

2.2.4 Proposed Environmental Measures

Aquatic Resources and Operations

To enhance aquatic habitat and protect fish, Littleville Power proposes to:

- continually release 90 cfs or inflow into the bypassed reach. The 90 cfs would be released through the new 165-kW minimum flow turbine generating unit at the dam into the bypassed reach
- install trash racks with 1-inch spacing at the minimum flow unit intake.

Recreation

To enhance recreation opportunities, Littleville Power proposes to:

- provide a canoe portage around the dam, including a new take-out and put-in and a portage trail using an existing access road; and
- provide formal parking, for the public at the bypassed reach, adjacent to the proposed put-in.

2.2.5 Modifications to Applicant's Proposal – Mandatory Conditions

The following mandatory conditions have been provided and are evaluated as part of the applicant's proposal.

Section 18 Prescription

Interior requests that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would include all of Littleville Power's proposed measures plus the following measures: (1) release (downstream of the project) 90 percent of inflow during impoundment refilling following any maintenance and emergency drawdowns; (2) an operation compliance monitoring plan; (3) an erosion and sedimentation control plan; (4) an invasive species control plan; (5) a recreation plan for

the proposed measures; and (6) an HPMP that addresses procedures regarding future activities at the project. Proposed and recommended measures are discussed under the appropriate resource sections and summarized in section 4 of the EA.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

2.4.1 Project Retirement

Decommissioning of the project could be accomplished with or without dam removal. Either alternative would require denying the relicense application and surrender or termination of the existing license with appropriate conditions. There could be significant costs involved with decommissioning the project and/or removing any project facilities. The project provides a viable, safe, and clean renewable source of power to the region, as well as informal recreation opportunities, such as bank fishing. With decommissioning, the project would no longer be authorized to generate power.

No party has suggested that project decommissioning would be appropriate in this case, and we have no basis for recommending it. Thus, we do not consider project decommissioning a reasonable alternative to relicensing the project with appropriate environmental enhancement measures.

3.0 ENVIRONMENTAL ANALYSIS

This section includes: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommendations are discussed in section 5.2 of the EA, Comprehensive Development and Recommended Alternative.

Unless noted otherwise, the sources of our information are the license application (Littleville Power, 2007) and additional information filed by Littleville Power (2008).

3.1 GENERAL SETTING

The Glendale Project is located at approximately river mile 122 on the mainstem Housatonic River in southwestern Massachusetts, in the Town of Stockbridge. The

Housatonic River originates about 30 miles upstream from the project, in Pittsfield, Massachusetts, at the confluence of the West and Southwest Branches. From Pittsfield, the river flows south for 149 miles between the Taconic Mountains in eastern New York and the Berkshires in western Massachusetts, emptying into Long Island Sound in southeastern Connecticut. The Housatonic River at the Glendale Project has a drainage area of 272 square miles.

The topography of the basin is greatly varied, being hilly and mountainous in the east, giving way to rolling upland toward the west, with the Massachusetts and New York border region containing a large valley running in a north-south direction. The river reach between the nearest upstream dam (Willow Mill) and the Glendale dam is predominately flat water with some areas of quick water and riffles. It meanders through areas of marble-limestone bedrock, wide floodplains, wetlands, meadows, and a golf course. The banks along the project impoundment, canal, and bypassed reach are relatively steep with a flatter area located to the west of the tailrace, which is the base of the adjacent Monument Mountain. Below the project, the river is swift with lots of quick water and several mid-sized rapids. This region experiences all four seasons, with cold winters (average temperature around 21.6 degrees Fahrenheit in January), and mild summers (typically temperature is in the mid to high 60s).

There are several dams on the mainstem of the Housatonic River used for hydropower generation (figure 1), as well as others used for flood storage or water withdrawal. The Willow Mill Project (FERC Project No. 2985), used for hydropower generation and water withdrawals for paper mill processing, is the next upstream dam located about 6 miles from the Glendale Project dam. The next downstream dam is at the Risingdale Impoundment (non-hydro), approximately 4 miles from the project dam in Great Barrington, Massachusetts.

3.2 SCOPE OF CUMULATIVE EFFECTS ANAYLSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 CFR § 1508.7 2008), an action may cause cumulative effects on the environment if its impacts overlap in time and/or space with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such 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.

Based on our review of the license application and agency and public comments, we have identified water quality as potentially being cumulatively affected by the proposed continued operation of the Glendale Project in combination with the Willow Mill Project located upstream and municipal, industrial and urban land use and other non-point sources of pollution in the Housatonic River Basin.

3.2.1 Geographic Scope

The geographic scope of the cumulative analysis defines the physical limits or boundaries of the proposed action's effect on the resources. We have identified the scope for water quality to include the Housatonic River from the Risingdale dam located about 4 miles downstream of the Glendale dam upstream to the outlet of Woods Pond, approximately 16 miles upstream from the Glendale dam. This 19.9-mile segment is classified by the Massachusetts DEP according to the Massachusetts Stream Classification Program and is considered impaired requiring a total maximum daily load for unknown toxicity, priority organics, thermal modifications, pathogens, and turbidity. We chose this geographic scope because the project in combination with other activities could affect water quality resources within this 19.9-mile reach.

3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis includes a discussion of past, present, and future actions and their effects on aquatic resources. Based on the potential subsequent license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effects on the resources from reasonably foreseeable future 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, and comprehensive plans.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

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 site-specific environmental effects and any cumulative effects.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. We present our recommendations in section 5.2, Comprehensive Development and Recommended Alternative section.

3.3.1 Aquatic Resources

Affected Environment

Hydrologic information

Monthly flow duration curves were developed for the project using USGS gage number 01197500 located about 5 miles downstream of the Glendale Project for the

period of record 1913 to 2005. The total drainage area at the gage is 282 square miles compared to a drainage area of 272 square miles at the project. Therefore, to estimate streamflow at the project, the flow data was adjusted by a factor of 0.965 to account for the smaller drainage area of the Housatonic River at the project compared to the gage location. The Risingdale dam, which has appreciable storage capacity, is located about 4 miles downstream of the Glendale dam and about 0.9 miles above the USGS gage.

The annual average flow and 10 percent and 90 percent exceedance flows are 508 cfs, 1,109 cfs, and 122 cfs, respectively. Littleville Power calculated the 7Q10[1] flow to be 66.6 cfs. Monthly median flows for the period of record at the Glendale Project are presented in table 1. Generally, flows are lowest during the summer and highest during the late winter and early spring.

Table 2. Monthly median flows in cfs for the period of record October 1, 1913, to September 30, 2005, at the Glendale Project (calculated from USGS gage no. 01197500 data and adjusted for drainage area.

Month	Median flow (cfs)
January	347
February	345
March	651
April	939
May	537
June	288
July	182
August	158
September	161
October	209
November	330
December	384

The project is operated in a run-of-river mode using automatic pond level control. The project powerhouse contains four identical semi-vertical Kaplan turbine generator units with a total installed hydraulic capacity of 400 cfs. Water exiting the turbines enters the project tailrace and then flows about 300 feet before reentering the Housatonic River. A minimum flow of 10 cfs, or inflow, whichever is less, is provided to the bypassed reach. The bypassed reach minimum flow is currently provided over the length of the spillway crest, or alternatively through a 6-foot-wide by 10-inch-deep notch in the spillway crest. There is no usable storage and all inflow in excess of the project's generating capacity is passed over the dam.

[1] The lowest streamflow for 7 consecutive days that occurs on average once every 10 years.

Historical water quality

Massachusetts DEP conducts water quality assessments for the Housatonic River by river segments based on the Massachusetts Stream Classification Program hierarchy. The 19.9-mile segment of the Housatonic River including the project site is located in segment MA21-19, which is bounded by the outlet of Woods Pond downstream to the Risingdale dam in Great Barrington, Massachusetts. Massachusetts DEP measured a number of water quality parameters at sampling locations located about 10.5 miles upstream of the project (station 19C) and 0.7 miles downstream of the project (station 19E) during May, June, July, and September during 2002. Water quality conditions at station 19C were relatively poor with low dissolved oxygen (DO) levels and extremely high total phosphorus and ammonia-nitrogen concentrations. These conditions were attributed to the proximity of the sampling location to the Lee wastewater treatment plant. Water quality conditions at station 19E generally met state standards with the exception of high phosphorus levels.

Massachusetts DEP also conducted habitat assessments and sampled benthic macroinvertebrate communities as part of the 2002 water quality assessment. Station 19E received a total habitat score of 185 out of 200 and was chosen as a reference station for the mainstem Housatonic River, as it represented the least impacted conditions.

Based on the 2002 water quality assessment, Massachusetts DEP designated the entire MA21-19 segment as impaired for the aquatic life and fish consumption designated uses, due to contamination from polychlorinated biphenyls (PCBs) from the General Electric Company (GE) superfund site in Pittsfield, Massachusetts. Total concentrations of PCBs from fish tissue collected by the U.S. Environmental Protection Agency between 1998 and 2002 in the vicinity of the project exceeded the National Academy of Sciences/National Academy of Engineering guideline for the protection of fish-eating wildlife (500 µg/kg wet weight) by between 4 and 83 times.

Segment MA21-19 contains five permitted water withdrawals: (1) Schweitzer-Mauduit International, Inc.; (2) MeadWestvaco Corporation – Specialty Paper Division; (3) Cranwell Conference Center; (4) Lane Construction Company; and (5) Lee Water Department. All of these facilities are located upstream of the project. Seven National Pollutant Discharge Elimination System (NPDES) permitted facilities discharge into segment MA21-19 and all are located upstream of the project. Municipal water use within Stockbridge has consisted of both surface water and groundwater. Water use by the town is projected to reach 0.37 million gallons per day in 2010.

Water quality standards

Segment MA21-19 of the Housatonic River, along with the entire mainstem, is

designated as a Class B surface water body and a warmwater fishery. Massachusetts state water quality standards define a warmwater fishery as "Waters in which the maximum mean monthly temperature generally exceeds 68 degrees Fahrenheit during the summer months and are not capable of sustaining a year-round population of stenothermal (i.e., capable of surviving within a narrow range of temperature) aquatic life" (2006).

Massachusetts standards in Class B waters for DO are greater than or equal to 5.0 milligrams per liter (mg/l) and greater than or equal to 60 percent saturation unless background conditions are lower; temperature is not to exceed 28.3 degrees Celsius (°C) with a temperature change in rivers of not more than 2.8°C; and the pH standard unit range is 6.5-8.3. Designated uses for Class B waters include habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Class B waters shall also have consistently good aesthetic value. The lower 10.7-mile reach of segment MA21-19, which contains the project, was listed as supporting the primary contact, secondary contact, and aesthetic designated uses.

Water quality studies

In support of its license application, Littleville Power collected water quality profile information from three locations within the project impoundment and from one location at the inflow to the project impoundment on August 30, 2006. The vertical profile data showed that the impoundment was well oxygenated throughout the water column and not thermally stratified. DO levels ranged from 7.58 to 7.72 mg/l (80.6 to 82.1 percent saturation) and water temperatures ranged from 18.3 to 18.5°C within the impoundment locations. Upstream of the impoundment, water temperature was 18.3°C and DO was 7.77 mg/l. Temperatures and DO concentrations during the August sampling event met the state standards for Class B waters with the warmwater fishery restrictions.

Fisheries

The fish community within segment MA21-19 is generally represented by warmwater species but brook trout and brown trout are stocked in several reaches. Massachusetts DFW stocks over 35,000 trout (brook, brown, and rainbow) within the basin. A total of about 2,000 brown trout is stocked within two catch and release areas along the mainstem, one of which extends downstream from the Glendale dam for approximately 1 mile. No diadromous species are known to migrate into the Massachusetts portion of the Housatonic River. Migrations of anadromous fish and American eel are blocked by several downstream dams.

The most recent fish surveys were conducted by Massachusetts DFW between 2002 and 2004 at 18 sites within segment MA21-19, including one site within the

Glendale impoundment and one 0.7 mile downstream of the project tailrace. A total of 3,623 fish representing 24 species were collected. Overall, rock bass was the most abundant species collected. At the impoundment site, 207 fish were collected with bluegill, common shiner, largemouth bass, and rock bass being the most abundant. At the tailrace site, 135 fish were collected with longnose dace, smallmouth bass, rock bass, and common carp being the most abundant. Two brown trout were also collected in the tailrace location.

The Massachusetts Natural Heritage and Endangered Species Program (Massachusetts NHESP) lists four aquatic species—longnose sucker, bridle shiner, creeper mussel, and triangle floater mussel—as species of special concern that have been observed within the project area during the last 25 years. Massachusetts NHESP maps indicate the 3-mile-long reach downstream of the Glendale dam as longnose sucker habitat; however, Massachusetts DFW did not collect any longnose sucker during its most recent fish sampling.

Littleville Power conducted a survey for freshwater mussels within the bypassed reach of the Glendale Project on October 12, 2006. Habitats within the bypassed reach were checked for mussel presence using view buckets and an Aqua-Scope II™, however, no live mussels were found. One relic shell of a creeper mussel was found during the survey.

Habitat

Aquatic habitat mapping of the bypassed reach was completed on July 12, 2006, as part of an Instream Flow Incremental Methodology Study. The bypassed reach was characterized by a relatively moderate gradient dominated by riffle and run habitat representing about 39 and 38 percent of the total habitat length, respectively. Side-channel habitat, which was mostly riffle, represented 11 percent of the total habitat, and pool habitat represented 12 percent of the total. The predominant substrate type in the bypassed reach was large and small boulder, with lesser amounts of cobble and gravel. Substrate embeddedness was low (0 to 25 percent) which means that the space between larger rocks was not filled with fine substrate. Low embeddedness is consistent with quality habitat for macroinvertebrates and fish. Overhead cover was limited (0 to 25 percent) but instream cover in the form of boulders and large woody debris was common.

Environmental Effects

Mode of operation

In its license application, Littleville Power proposes to continue operating the project in a run-of-river mode under which impoundment levels would continue to be stable and project outflows would equal project inflows and to provide a 90-cfs minimum

flow in the bypassed reach with a new turbine generator unit (discussed below). To address downstream flow fluctuations, Littleville Power states that it would continue to operate the main turbine units, when possible, such that a unit's output is reduced to its minimum hydraulic capacity before being taken offline ensuring that the magnitude of downstream fluctuations is minimized.

Interior and Massachusetts DFW recommend under section 10(j) that the project be operated in a run-of-river mode such that inflow to the project equals outflow from the project on an instantaneous basis, and fluctuations of the impoundment water level are minimized.

Staff Analysis

Fish species that inhabit and spawn in near-shore areas of project impoundments can be susceptible to stranding as well as egg desiccation from project-related fluctuating water levels.

Operating in a run-of-river mode and limiting impoundment fluctuations as proposed by Littleville Power would continue to reduce the chances of fish stranding and disruption of spawning. Maintaining relatively stable impoundment levels within the control of the Glendale Project (up to flows of about 490 cfs) would continue to benefit aquatic vegetation beds near the shoreline, as well as fish and other aquatic organisms that rely on near-shore habitat for feeding, spawning, and cover. Erosion of shoreline areas and resultant turbidity as well as sediment mobilization (including any contaminated sediments) would also continue to be minimized when the impoundment is held relatively stable. In addition, by not storing water, impoundment water would be less likely to increase in temperature or decrease in DO content.

Fluctuating water levels downstream of hydro projects can cause fish stranding, egg desiccation, and effects to invertebrate populations. We discuss below Littleville Power's proposal to provide a minimum flow to the bypassed reach to protect and enhance water quality and aquatic habitats. Downstream of the confluence of the bypassed reach and the project tailrace channel, run-of-river operation along with Littleville Power's ramping of turbine units prior to taking a unit offline would ensure that any fluctuations occurring in the Housatonic River due to project operation are kept to a minimum.

<u>Water quality effects due to operation of minimum flow turbine</u>

Littleville Power proposes to install a 165-kW turbine generator unit within an existing waste gate slot adjacent to the dam. Because the proposed unit would draw water from the deeper portions of the impoundment, water released from the unit could be low in DO and affect water quality conditions in the bypassed reach.

Interior and Massachusetts DFW state that the likelihood of DO depletion is low given the frequent amount of project spills and the proximity of the minimum flow unit's discharge location to a riffle which would facilitate reaeration.

Staff Analysis

We agree with the agencies' assessment. Water quality profile information from a single sampling day during August 2006 indicated that the impoundment was well oxygenated throughout the water column and not thermally stratified. Because this sample was taken during a typical summer month, if stratification was going to take place we would have expected it to be evident at this time. Therefore, it is likely that operation of the minimum flow unit would not result in the release of poorly oxygenated water during most years. In the event that low DO conditions do set up in deeper portions of the impoundment, spill flows and aeration due to the minimum flow release could ameliorate the low DO conditions in the bypassed reach. Spill flows would occur in the bypassed reach about 30 to 75 percent of the time on a monthly basis, and riffle habitat represents nearly 40 percent of the total habitat in the bypassed reach. Therefore, any potential for the minimum flow unit to release oxygen-depleted water from the deeper strata of the impoundment would likely be offset by increased turbulence and aeration caused by the higher minimum flows and frequent spill flows.

Flow continuation following impoundment drawdown

Hydro project impoundments may need to be drawn down periodically due to scheduled and unscheduled maintenance as well as emergencies beyond the control of the operator. The refill of an impoundment following a drawdown can disrupt flows downstream of a project and affect water quality and aquatic habitat. Littleville Power does not propose a refill protocol following impoundment drawdowns.

Interior and Massachusetts DFW recommend under section 10(j) that Littleville Power use 10 percent of the inflow to the project to refill the project impoundment after dam maintenance or emergency drawdowns and release 90 percent of inflow downstream of the project impoundment for the protection of aquatic resources.

Staff Analysis

Maintaining flow in the bypassed reach and below the project during project maintenance activities is important for the protection of aquatic biota. While most fish successfully move to deeper areas when flow decreases, many macroinvertebrates are not as mobile. Additionally, with lower flows, both fish and macroinvertebrates are more likely to be preyed on or stressed by increased water temperatures and decreased DO levels, especially in the summer. Releasing 90 percent of the project impoundment's

inflow during refill would ensure that downstream flows are kept at near natural flow levels. Releasing the majority of the project's inflow would help maintain water quality conditions by maximizing water turbulence and aeration and preventing desiccation of most aquatic habitats.

Minimum flows in the bypassed reach

Under current conditions, the project's 2,500-foot-long bypassed reach receives a minimum flow of 10 cfs, or inflow, whichever is less. The project impoundment is typically held at elevation 811.0 feet above mean sea level. At this elevation, about 1 inch of flow passes over the dam which is enough to provide the required minimum flow of 10 cfs. When about 2.5 inches of spill occurs over the dam, the pond level control (PLC) unit is programmed to start up one unit beginning at 55 percent gate and then gradually increasing the setting to 80 percent gate. If the level of spill exceeds 2.5 inches with one unit operating, the PLC is programmed to start additional units sequentially as flows become available while maintaining the 10-cfs minimum flow. When the project is not generating, as might occur during scheduled maintenance or unscheduled shutdown, or when inflows to the impoundment are less than 200 cfs, as discussed previously, all inflow to the project is spilled through the bypassed reach.

Littleville Power proposes to increase the minimum flow in the bypassed reach to 90 cfs to enhance water quality and aquatic habitat in the bypassed reach and to minimize the effects of fluctuating water levels downstream of the confluence of the bypassed reach and tailrace due to unit operation. Littleville Power intends to provide the minimum flow through a new 165-kW turbine generator unit to be installed at the project dam.

Interior and Massachusetts DFW recommend under section 10(j) that Littleville Power release a continuous minimum flow of 90 cfs, or inflow, whichever is less in the project bypassed reach for the protection of fish and aquatic habitat.

Staff Analysis

Littleville Power based its minimum flow proposal on an Instream Flow Incremental Methodology (IFIM)[2] study. Littleville Power formed a study team

[2] The IFIM is a tool developed by the U.S. Fish and Wildlife Service (FWS) to evaluate the relationship between flow and habitat. Habitat suitable for a particular species life stage is often expressed in terms of weighted usable area (WUA). WUA is the wetted area of a stream weighted by its suitability for use by aquatic organisms or recreational activity. WUA is usually expressed in units of square feet or square meters of habitat per a specified length of stream.

composed of representatives of the FWS, Massachusetts DFW, Massachusetts DEP, Massachusetts Riverways, Housatonic Valley Association, and Trout Unlimited. Habitat mapping within the 2,500-foot-long bypassed reach was used to delineate the different mesohabitat types. Six transects were established representing the different habitat types. Two transects each were placed in riffle and run habitats while one transect was established in a pool and another in side channel habitat. A list of species potentially occurring in the bypassed reach was identified and grouped into five habitat guilds based on similar habitat preferences. Four evaluation species – brown trout, fallfish, white sucker, and longnose dace – were chosen from each of the four fish guilds to represent the habitat requirements of the guild. A fifth guild represented the habitat requirements of macroinvertebrates (mayflies, stoneflies, and caddisflies). Field data were collected at four flows: 70, 92, 174, and 299 cfs—which allowed extrapolation of habitat calculations over a range of flows from 28 cfs to 748 cfs.[3] Because the hydraulic model could not be extrapolated to flows less than 28 cfs, habitat results from the flow study could not be compared to the existing 10-cfs minimum flow condition. The flow corresponding to the maximum WUA for each species life stage; the percent of maximum WUA at several selected flows; and the percent of total habitat available at the maximum WUA[4] for each species are presented in table 3.

Table 3. Flows (cfs) corresponding to the maximum WUA for each species life stage evaluated, the percent of maximum WUA at several selected flows (proposed 90-cfs flow shaded), and the percent of total habitat available at the maximum WUA.

Species/life stage	Maximum WUA flow (cfs)	Percent of maximum WUA at 60 cfs	Percent of maximum WUA at 90 cfs	Percent of maximum WUA at 200 cfs	Percent of total habitat available at the maximum WUA
Brown trout					
Juvenile	150	83	91	96	48
Adult	180	73	86	100	36
Fallfish					
Spawning/Incubation	160	53	67	96	1
Fry	90	77	100	84	5
Juvenile	160	61	67	95	15

[3] The IFG4 hydraulic model used in the analysis permits calculations of habitat conditions over a range of flows from 40 percent of the lowest calibration flow (70 cfs) to about 250 percent of the highest calibration flow (299 cfs).

[4] Percent of total habitat available at the maximum WUA is calculated by dividing the habitat area at the maximum WUA flow by the total wetted area at the maximum WUA flow multiplied by 100.

Adult	200	79	89	100	26
White sucker					
Spawning/Incubation	110	82	97	87	2
Fry	50	99	90	72	39
Juvenile/Adult	60	100	96	95	17
Longnose dace					
Spawning/Incubation	130	64	86	96	12
Fry	120	56	84	77	5
Juvenile	110	84	98	73	11
Adult	130	79	93	93	27
Macroinvertebrates					
Ephemeroptera	100	92	100	90	42
Plecoptera	160	83	91	96	18
Trichoptera	140	87	95	95	48

A flow of 90 cfs would provide more than 80 percent of the maximum WUA for all but two of the sixteen species life stages evaluated and over 90 percent of the maximum WUA for 9 of the species life stages evaluated. For fallfish spawning/incubation and fallfish juveniles, the two species life stages with less than 80 percent maximum WUA at 90 cfs, 67 percent of the maximum WUA would be provided. However, even at 160 cfs, which provides the maximum WUA for those two species life stages, only 1 percent and 15 percent of the total wetted habitat in the bypassed reach would be available for those species life stages, respectively. These results indicate that the bypassed reach has very little habitat available for those species life stages regardless of the flow. In general, the bypassed reach has limited spawning and incubation habitat for most species, which is likely due to an absence of suitable substrate.

On the other hand, at flows producing the maximum WUA for five of the species life stages evaluated—brown trout juveniles (150 cfs) and adults (180 cfs), white sucker fry (50 cfs), and two families of macroinvertebrates (100 to 140 cfs)—36 to 48 percent of the total habitat present in the bypassed reach would be available for those species life stages. Therefore, with more suitable habitat potentially available in the bypassed reach, a minimum flow would be most beneficial for those species life stages. While a flow of 90 cfs would not provide the maximum habitat for any of these species life stages, it does provide 90 percent or more of the maximum WUA for all but brown trout adults (86 percent).

In addition to the IFIM study results, we considered how frequently spill flows would occur in the bypassed reach and what benefit, if any, these flows may have on the fish and macroinvertebrate life stages evaluated in the IFIM study. Based on the annual and monthly flow duration curves, flows in the Housatonic River would exceed the project's hydraulic capacity and proposed minimum flow about 45 percent of the time on an annual basis and between 50 and 75 percent of the time during the spring spawning

months of April and May. Therefore, spill flows would provide additional habitat for those species life stages whose maximum WUA occurred at flows higher than the proposed 90-cfs release.

Operation compliance monitoring plan

Littleville Power did not propose a means of ensuring compliance with its proposed operating mode.

Interior and Massachusetts DFW recommend under section 10(j) that Littleville Power prepare a plan for monitoring run-of-river operation and flow releases from the project. Interior and Massachusetts DFW recommend that the plan include a description and design of the mechanisms and structures to be used along with any periodic maintenance and calibration that would be necessary. Both agencies request that the monitoring data be made available for inspection.

Staff Analysis

A plan to monitor run-of-river operation and minimum flow releases developed in consultation with the relevant resource agencies that describes contingencies for emergencies (such as providing downstream flows during project shutdown), scheduled maintenance drawdowns, droughts, as well as reporting criteria, would minimize misunderstandings about operational compliance and help ensure that aquatic resources at the project are protected. Such a plan could include monitoring water surface elevations in the project's impoundment and tailwater, maintaining a log of impoundment and tailwater water surface elevations and project generation data, establishing a staff gage in the bypassed reach, and a means for providing the data to the resource agencies upon request.[5]

Short-term construction effects

Littleville Power states that the turbine generator unit installation would not require a drawdown and would be accomplished by enclosing the work area within a cofferdam installed upstream of the gatehouse. As such, the work area could be completely dewatered without affecting impoundment levels. In addition, Littleville Power proposes to undertake all necessary and reasonable measures to minimize the effects of short-term construction effects including, but not limited to, erosion, siltation,

[5] Littleville Power requests that the filing deadline for any operations compliance and monitoring plan be 6 months from license issuance, as opposed to 3 months, as recommended by Interior and Massachusetts; the due date for any required plans will be discussed in the license order.

and dust control measures.

In a letter filed January 3, 2008, Massachusetts DFW states that if a drawdown of the impoundment is needed to complete the turbine installation, the lowered water levels may affect wildlife, including state-listed mussels.

Staff Analysis

The installation of the new turbine generator unit could cause some short-term effects on habitat within the impoundment and downstream in the bypassed reach resulting from erosion and sedimentation. However, because the installation activities would not require an impoundment drawdown, we would not expect much of an effect on aquatic habitats within the impoundment or downstream in the bypassed reach. Nevertheless, implementing specific measures to control erosion and sedimentation during construction activities would help ensure that aquatic habitats are protected. These measures would also protect habitat during construction of the proposed recreation facilities, discussed in section 3.3.4.

Fish entrainment and impingement

Currently, there are no upstream fish passage facilities at the project and any downstream passage occurs via spillage or turbine passage. The existing trash racks with 1-inch clear spacing and approach velocities of 2 feet per second or less provide some level of protection to fishes susceptible to entrainment and turbine-induced mortality through the project's main turbine intakes. Littleville Power proposes to use similar trashracks with 1-inch clear bar spacing to protect fishes from entrainment and turbine-induced mortality at the proposed minimum flow turbine unit. The trashracks at the minimum flow unit would also be of sufficient dimensions to ensure approach velocities of 2 feet per second or less.

Interior and Massachusetts DFW recommend under section 10(j) that full depth, 1-inch clear trash racks with velocities less than or equal to 2 feet per second be installed at the project's main and minimum flow units.

Staff Analysis

Fish that reside in the project impoundment could be susceptible to impingement on the trash rack or entrainment through the project's turbine units when the project is operating. For any fish entrained through the turbines, a certain number may be killed due to turbine-induced mortality.

The existing trash rack at the intake to the main turbine units already meets Interior's and Massachusetts DFW's recommendation for 1-inch clear bar spacing and

approach velocities of 2 feet per second or less. Littleville Power's proposal to install trash racks with similar requirements at the proposed minimum flow turbine unit intake would provide a similar level of protection.

Trash racks with 1-inch clear bar spacing would prevent all but the smaller fish from passing through the intake structures. Based on the results of studies conducted by Lawler et al. (1991), 1-inch clear spacing would generally not allow passage of smallmouth bass or brown trout greater than 9 inches in total length,[6] thus preventing most adult resident bass and stocked trout from entering the project turbines. Littleville Power presented similar results for data obtained from Smith (1985) for a variety of fish species found in the project vicinity. Littleville Power's analysis showed that for seven of the nine species analyzed (including smallmouth bass and brown trout), fish with total lengths greater than 8 inches would be excluded by the trash racks. In addition, the turbulence generated by the trash racks may create a behavioral deterrent to reduce entrainment of the smaller individuals that would otherwise be able to fit through the racks.

Littleville Power provided the results of a literature review of mortality rates for various groups of fishes obtained from studies conducted at other projects with Kaplan or propeller-type turbines.[7] While no projects were identified that had the exact turbine configuration as the Glendale Project, turbine survival at the three most similar projects was 81 percent or greater (range 81 to 98 percent) for the fish species and sizes tested and survival estimates for fish smaller than 8 inches were 86 percent or greater (range 86 to 98 percent). Kleinschmidt (2003) reported an average mortality rate of 13.7 percent based on the results of 14 turbine mortality studies conducted on Kaplan/propeller-type turbines which corroborate the results of Littleville Power's analysis.

In addition to entrainment effects, fish can become impinged on the bars of a trash rack if they are not able to overcome the approach velocity. As stated above, the average approach velocity in front of the existing project intake is 2 feet per second or less and a similar maximum approach velocity is predicted for the proposed minimum flow turbine intake. To escape the influence of a trash rack, fish are capable of swimming at a burst speed, which is defined as a short, intense swimming effort generally sustainable for about 1 second or less (Bell, 1991). Beamish (1978) reports that most fish can burst at a speed equal to about 10 times their body length in centimeters per second.

To analyze whether or not impingement of gamefish on the trash racks would

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[6] Total length is defined as the distance from the furthest forward protruding portion of a fish's head to the tip of the furthest protruding tail fin ray.

[7] Four identical vertical Kaplan turbine units are used to generate power at the Glendale Project.

occur at the project, we used the results of Beamish (1978) and coupled them with our calculation of the smallest gamefish that would be excluded by the 1-inch clear-spaced trash rack. The burst speed for a 9-inch bass or trout is about 7.5 feet per second. Therefore, a 9-inch smallmouth bass or brown trout would be expected to easily escape the 2-foot-per-second intake velocities at the project and avoid becoming impinged on the trash rack. Bell (1991) also reported sustained swimming speeds of nearly 4 feet per second for white sucker, which is another commonly occurring species in the Housatonic River and likely to occur in the impoundment. Therefore, white sucker should also be able to avoid impingement on the project trash rack.

In summary, the existing 1-inch-spaced trashracks at the project's main turbine intake would protect most of the adult gamefish residing within the impoundment from being entrained into the turbines and being subjected to potential turbine-induced mortality. Based on the swimming speeds of fishes residing in the project impoundment and the existing approach velocities in front of the intakes, most fishes would be able to avoid impingement. Installing trashracks with similar 1-inch clear spacing and approach velocities at the intakes for the proposed minimum flow turbine unit would provide an equal level of protection. Although smaller fishes would still be susceptible to entrainment and some level of turbine mortality, by acting as a behavioral barrier, the trashracks may guide many of them away from the intakes and prevent them from entering the turbine units. Last, nothing in the record for this project suggests that entrainment and turbine mortality are having an adverse effect on fish populations in the project area.

Cumulative Effects

During the scoping process, water quality was identified as a resource that may be cumulatively affected by the proposed operation of the Glendale Project in combination with the Willow Mill Hydroelectric Project located upstream and municipal, industrial and urban land use and other non-point sources of pollution in the basin.

As discussed above, run-of-river operation would minimize the effect of the project on DO concentrations and water temperatures under most conditions. Erosion of shoreline areas and resultant turbidity as well as sediment mobilization (including any contaminated sediments) would also continue to be minimized when the impoundment is held relatively stable. The use of cofferdams and implementing soil erosion control measures during the installation of the proposed minimum flow unit would minimize any effects on water quality within the impoundment and the Housatonic River downstream of the dam due to erosion and sedimentation. The potential for the minimum flow unit to release oxygen-depleted water from the deeper strata of the impoundment would be offset by increased turbulence and aeration within the bypassed reach caused by the higher minimum flows. Also, increased flow would minimize pockets of standing water and thus reduce the likelihood of any temperature increases in the bypassed reach and

downstream of the project. Therefore, any contribution to cumulative water quality effects in the Housatonic River Basin due to operation of the Glendale Project or construction activities should be minimal and short term.

Unavoidable Adverse Effects

Unavoidable adverse impacts would include some entrainment mortality that would persist with the continued operation of the Glendale Project. However, there is no indication that any losses associated with entrainment have had a significant effect on fishery resources or fish populations within the project area. Trash racks with 1.0-inch clear spacing would continue to protect fish over 8 inches from entrainment at the main turbine intakes and provide a similar level of protection at the proposed minimum flow unit's intake. The project dam would continue to be an impediment to upstream movement of resident fish unless Interior prescribes fishways at the project in the future. As a result, any mussel species residing in the Housatonic River downstream of the project would not be able to recolonize areas upstream of the project because fishes serving as hosts to early life history stages of mussels would be prevented from moving upstream.[8] Also, there may be some minor short-term erosion and sedimentation effects resulting from the installation of the minimum flow turbine unit.

3.3.2 Terrestrial Resources

Affected Environment

The project boundary encloses about 43 acres of land within the Northeastern Highlands ecoregion of the commonwealth of Massachusetts. The limestone deposits and underlying carbonate rocks create alkaline soil conditions and mineral-rich wetlands. The project area is characterized by transitional hardwood forest dominated by white pine, oak, and hemlock.

The shoreline along the Housatonic River in the project vicinity varies from low wetland areas to relatively steep and sloped banks. Below the Glendale Dam, the river is confined by the railroad and Glendale Road. Above the dam to the Glendale Middle Road Bridge (approximately 1,400 feet upstream), the eastern side of the river is bordered by railroad and the western side of the river is bound by single-family residential development. The remainder of the river within the project area is bound by herbaceous wetlands and scrub and upland forests ranging from 100 to 750 feet in width.

[8] Massachusetts DFW states that resident host fishes for early life stages of these mussels include largemouth bass, fallfish, longnose dace, blacknose dace, common shiner, golden shiner, slimy sculpin, bluegill, rock bass, white sucker, and pumpkinseed sunfish.

The riparian zone below the Glendale Dam consists of a thin strip of shrubby vegetation and mixed-forest between the waters edge and Glendale Road to the west and the railroad to the east. Similar to the riparian zone along the tail race, the impoundment between the Glendale Dam and Glendale Middle Road Bridge is also bordered by the railroad on the eastern shore with a thin section of herbaceous and shrubby vegetation and Glendale Road on the western shore with a mixed-forest section. Upstream of the Glendale Middle Road Bridge, the riparian zone consists of wetlands and forested habitat along the eastern shore and residential development and mixed-forest on the western shore.

Several species of woody and herbaceous vegetation occupy the Housatonic shoreline along the riparian zone, including: jewelweed (*Impatiens capensis*), purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), white pine (*Pinus strobus*), Canadian hemlock (*Tsuga canadensis*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), eastern hophornbeam (*Ostrya virginiana*), and black locust (*Robinia pseudoacacia*). The limited shrubby vegetation along the railroad on the eastern side of the project area is likely subject to periodic human disturbance during railroad maintenance activities. Likewise, the riparian zone bound by the residential development on the western shore is likely subject to periodic human disturbance.

Eight invasive species have been identified at the project. These are: purple loosestrife, reed canary grass, Japanese knotweed (*Polygonum cuspidatum*), an unidentified honeysuckle (*Lonicera* spp.), black locust, multiflora rose (*Rosa multiflora*), Eurasian watermilfoil, and curly leaf pondweed.

Wetlands and Aquatic Vegetation

There are two wetland areas documented in the project area upstream of the Glendale Middle Road Bridge on either side of the old bridge abutment. The wetland south of the abutment is a palustrine emergent (PEM) wetland dominated by broad leaf cattail (*Typha latifolia*). The wetland north of the abutment is composed of two wetland types, a PEM and palustrine scrub shrub (PSS) wetland. The PEM is dominated by jewelweed, purple loosestrife, reed canary grass, and broad leaf cattail. The PSS is dominated by boxelder (*Acer negundo*), honeysuckle, multiflora rose, and riverbank grape (*Vitis riparia*).

The littoral area in the impoundment is extensive, with multiple submergent aquatic vegetation (SAV) and emergent aquatic vegetation (EAV) beds present along margins of the impoundment and in the two coves of the wetlands along the eastern shore of the impoundment north and south of the old bridge abutments (figure 3). The dominant SAV species include wild celery (*Valisneria americana*), common waterweed (*Elodea canadensis*), coontail (*Ceratophyllum demersum*), and flatstem pondweed (*Potamogeton zosteriformis*). A sparse abundance of two invasive SAV species was found in the impoundment, Eurasian watermilfoil (*Myriophyllum spicatum*) and curly

leaf pondweed (*Potamogeton crispus*). The dominant EAV species are great bur reed (*Sparganium eurycarpum*), common arrowhead (*Sagittaria latifolia*), pickerelweed (*Pontederia cordata*), and purple loosestrife (*Lythrum salicaria*), an invasive species.

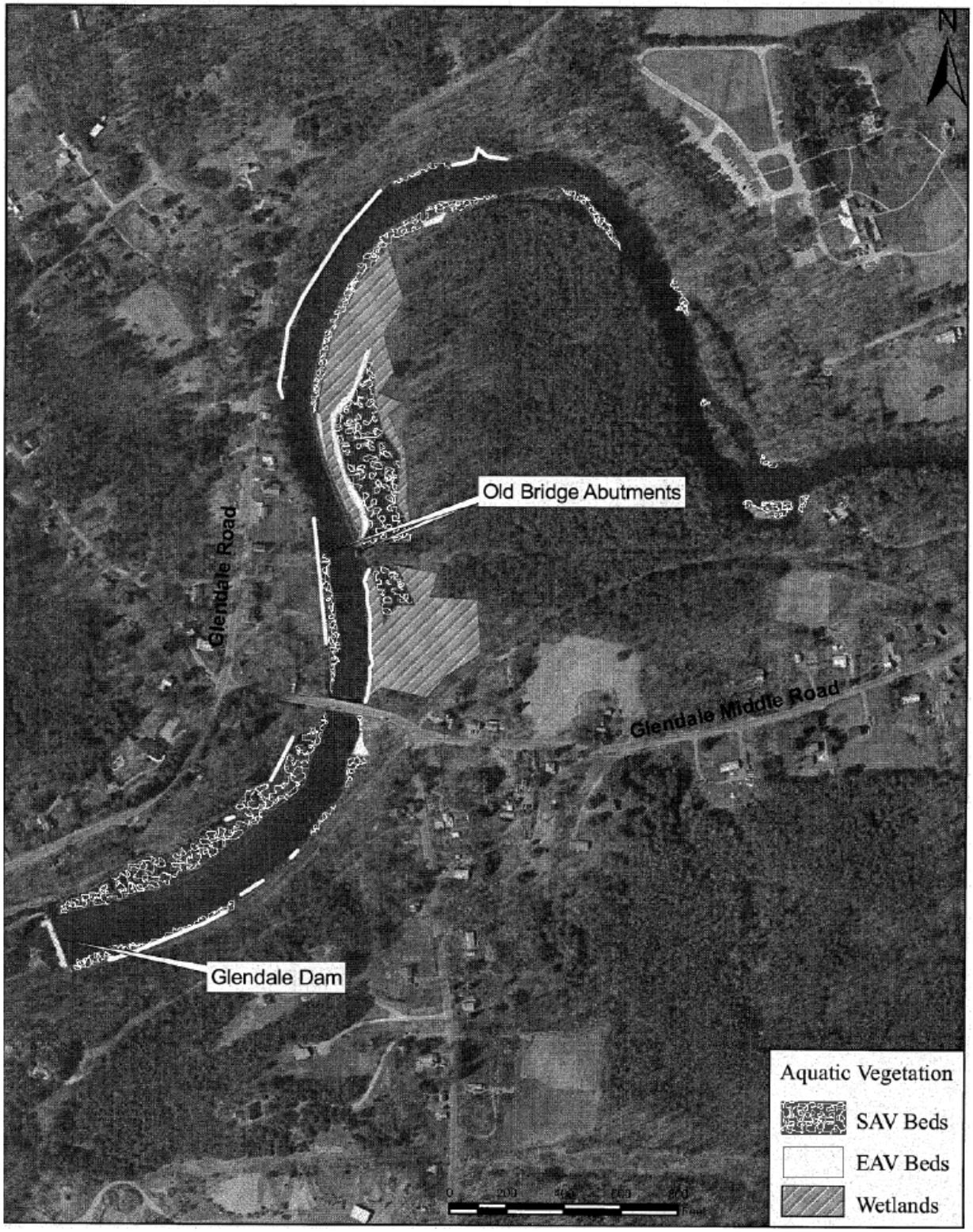

Figure 3. Aquatic vegetation in the impoundment. Source: License application

Wildlife

Wildlife habitat within the project area includes the two wetland complexes upstream of the Glendale Middle Road Bridge, and an island and tract of land below the dam contiguous to the bypass reach and intake canal. The two wetland complexes provide ample cover and food for wildlife. Wildlife species observed include the American beaver, great blue heron, belted kingfisher, American black duck, and mallard. An American beaver lodge was also observed, indicating a resident population within the project area.

The majority of the surrounding areas outside of the project boundary consist of residential development and transportation corridors. The tract of land along the eastern boundary of the two wetland complexes and the Housatonic River consists of mixed coniferous and deciduous forest that likely provides habitat for multiple mammalian and avian species.

Environmental Effects

Project Operation

Littleville Power proposes to continue operating the project in a run-of-river mode under which impoundment levels would continue to be stable and project outflows would equal project inflows and to provide a 90-cfs minimum flow in the bypassed reach with a new turbine generator unit.

Interior and Massachusetts DFW recommend under section 10(j) that the project be operated in a run-of-river mode such that inflow to the project equals outflow from the project on an instantaneous basis, and fluctuations of the impoundment water level are minimized. Both agencies also recommend a bypassed reach minimum flow of 90 cfs and that Littleville Power release 90 percent of inflow downstream during impoundment refilling for the protection of aquatic resources.

Staff Analysis

Under run-of-river operation, habitat below the project would continue to experience the same variation of flows as occurs above the project, and the recommendation for flows during impoundment refill would protect downstream reaches from major fluctuations in water level during maintenance activities. The increased higher minimum flow will increase the permanently wetted area and could potentially increase fringe wetlands along the tailrace. Maintaining the impoundment at a stable level would continue to benefit the emergent wetlands and riparian vegetation along the shoreline by decreasing incidence of dewatering and flooding.

Riparian Vegetation Management

Currently, Littleville Power does not have a vegetation management plan in place to address riparian vegetation or invasive plant species. Although Littleville Power does not own any land adjacent to the impoundment, they maintain flowage rights four feet above the normal water surface elevation.

During pre-filing consultation,[9] FWS requested that Littleville Power assess the benefits of implementing a vegetated buffer zone along the riparian zone of the impoundment and river. In response, Littleville Power indicated a 150-foot buffer from the high water mark along the shore of the Housatonic River and its permanent tributaries is already in place under the Town of Stockbridge's Lake and Pond Overlay District Zoning Bylaws. This district places restrictions on shoreline development within the 150 foot buffer zone.[10] Interior, in its response to the Ready for Environmental Analysis (REA) notice, noted that "it appears that sufficient mechanisms exist at this particular project to minimize impacts to the riparian buffer," and did not recommend further protection measures.

Staff Analysis

According to the Town of Stockbridge Zoning Bylaws, riparian areas along the Housatonic River and its permanent tributaries are protected from development and certain land use activities by a 150-foot buffer. Exempt activities that are allowed in the buffer zone include removal of dead, diseased or dying trees and vegetation and ordinary pruning or maintenance of shrubs or trees. Erosion and sediment control measures required by the Lake and Pond Overlay District zoning bylaws include maintenance of natural vegetation on at least seventy-five percent of the total lot area within the district. Further restrictions on vegetation removal state that no vegetation may be removed within thirty-five feet extending inland from any point along the high water mark and the area shall be maintained as an undisturbed natural buffer strip. In addition to the district's protection measures, almost half the project's impoundment is permanently protected by the conservation easement at Laurel Hill (Bowkers Woods), as further discussed in section 3.3.5. In summary, significant riparian buffer protections are afforded by the Lake and Pond Overlay District standards and the conservation easement.

Invasive Species Management

Interior and Massachusetts DFW recommend under section 10(j) that Littleville Power prepare, in consultation with FWS and Massachusetts DEP, an invasive species

[9] Comments on draft application, filed September 25, 2007.

[10] Section 6.5.2 of the Town of Stockbridge Zoning Bylaws.

control plan that includes a schedule for regularly monitoring invasive plants within the project area and identifies methods of controlling selected species. Littleville Power responded that they believe the invasive plant infestation is a regional issue and that project specific measures will have little or no impact on the issue as a whole.

Staff Analysis

Although invasive species infestation may be a basin problem, the existing invasive species documented in the project area can spread and outcompete native desirable species. The project impoundment includes multiple wetland areas which provide the necessary conditions for certain invasive species to thrive. The presence of purple loosestrife as a dominant species in portions of the impoundment indicates its ability to spread in the project area. The two wetland areas north of Glendale Middle Road Bridge are of particular concern because, as noted by Stockbridge Team (2002), this area would be good for breeding ducks and other water-wading birds. However, if purple loosestrife and reed canary grass are left un-managed, wildfowl could lose this area as a breeding location.

Unavoidable Adverse Effects

Wildlife at the project may experience temporarily and minor disturbance during the installation of the new turbine unit and construction of new recreational facilities.

3.3.3 Threatened and Endangered Species

According to a letter, dated April 27, 2007, from FWS no federal, no federally-listed or proposed, threatened or endangered species are known to inhabit the project area and there is no critical habitat for these species within the project area. No populations or critical habitat of threatened or endangered species were identified during the 2006 reconnaissance level survey of the project area impoundment or the 2006 Housatonic mussel survey. Therefore Littleville Power does not propose any specific environmental measures to enhance or protect RTE species.

Staff Analysis

Due to the absence of listed species and their habitat in the project vicinity, relicensing of the Glendale Project would have no effect on threatened or endangered species. Should any listed species migrate through or use the area in the future, they would likely benefit from the stability provided by run-of-river operation with limited impoundment fluctuations, minimum flows in the bypassed reach, and the continued existence of a naturally vegetated riparian zone throughout the majority of the shoreline.

3.3.4 Recreation

Affected Environment

Regional Recreation

There are over 100,000 acres of public recreation land throughout the Housatonic River Basin. With New York City nearby, ten million potential recreation users live within 50 miles of the Housatonic River Valley. Connecticut, New York, and Massachusetts combine to offer about 354 public recreation sites within a 50 miles radius of the basin (FERC, 2004).

According to year 2000 census data, the Massachusetts portion of the basin supports a population of approximately 90,210 people with 45,793 of them residing upstream of the project in the City of Pittsfield (EOEA, 2003). The many historic sites, cottages, tours, parks, and ski areas in the Upper Housatonic River Valley attract seasonal tourist year round. There are no National Natural Landmarks[11] located near the project, however, those in the Massachusetts portion of the basin include (National Park Service, 2002):

Wahconah Falls
Yorkin Ridge
Berkshire Botanical Gardens
Laurel Hill
Ice Glen
Monument Mountain
Tyringham Cobble
Bash Bish Falls
Mount Everett
Race Mountain
Sage's Ravine
Bartholomew's Cobble
Campbell Falls

The river is paralleled by the Appalachian Trail for five miles between Kent and Cornwall Bridge, Connecticut and again in Sheffield, Massachusetts for another mile (Housatonic Valley Association, 2005). There are many outfitters, schools, and clubs that use the Housatonic River for whitewater rafting. Upstream of the project the river segment from Lenox to the Lee-Stockbridge town line is a common whitewater rafting site. Bulls Bridge in Kent, Rattlesnake Rapids in Falls Village, and the West Cornwall Covered Bridge, located upstream of the project, are all popular whitewater rafting sites in Connecticut (FERC, 2004).

[11] The National Natural Landmarks Program recognizes and encourages the conservation of outstanding examples of our countries natural history by identifying and recognizing the best examples of biological and geological features in both public and private ownership. National Natural Landmarks are designated by the Secretary of the Interior, with the owner's concurrence.

There are several areas of protected and recreational open space, including Massachusetts State Parks and Forests, and Department of Fisheries, Wildlife and Environmental Law Enforcement land holdings, located within the region. At many of these areas, visitors can enjoy camping, hiking, fishing, canoeing, hunting, mountain biking, cross-country skiing, snowmobiling, horseback riding, picnicking, swimming and bird watching. The areas closets to the project include:

Chesterwood National Trust Historic Site.
Laurel Hill
Agawam Lake Wildlife Management Area.

There are several unofficial canoe access points in the area, but many are cumbersome to use or go across private property. Two access sites are proposed at the Stockbridge Town Park, several miles upstream from the project (Stockbridge Stream Team, 2002).

The Housatonic River is undergoing a process of restoration; waste water initiatives and PCB clean-up activities are underway. Recreational activities in and around continue to grow in popularity. A small river park has been built as part of the Town of Lees' recent downtown revitalization. Plans are under way to construct a downtown river walk as well. Plans are also underway in Stockbridge to construct a trail system that would link different parts of the town. The residents of Great Barrington are building the Great Barrington River Walk off the town's main Street, but is not completed (Housatonic River Restoration, Inc., undated).

Recreation at the Project

There are no designated recreation facilities at the project. Access to the Housatonic River downstream of the project is available via Route 183 and to the impoundment via an unofficial carry-in boat launch adjacent to Glendale Middle Road at Glendale Bridge, where is crosses the impoundment approximately 1,400 feet upstream from the dam. This site is located on Housatonic Railroad property. Recreation users park along Cherry Hill Road and cross over the railroad tracks to access the shoreline.

A Massachusetts Public Access Board canoe launch facility is located seven miles upstream of the project impoundment at the South Street (Route 7) Bridge crossing in Stockbridge. This facility is located adjacent to the Park Street Skateboard Park and consists of a mowed trail leading to the river and associated signage. At the trail head there is a parking area for approximately 15 vehicles. Other water-based recreation facilities include informal boat launches at Glendale Middle Road (at Cherry Street), Butler Bridge, Norman Rockwell Museum property, and the Route 183/Dugway location.

Table 4. Water-Based Recreation Facilities in the vicinity of the Glendale Project

Name	Type of facility	Approximate location to project
Mary V. Flynn Trail	hiking trail	9 miles upstream of impoundment
Stockbridge Town Park	a Massachusetts Public Access Board formal boat launch (non-motorized)	5 miles upstream of impoundment
Glendale Middle Road (at Cherry Street)	informal boat launch (non-motorized)	5 miles upstream of impoundment
Butler Bridge	informal boat launch (non-motorized)	0.5 mile upstream of impoundment
Norman Rockwell Museum	informal boat launch (non-motorized)	at impoundment
Glendale Middle Road (at Glendale Bridge)	informal boat launch (non-motorized)	at impoundment on land owned by railroad
Route 183/Dugway Road	informal boat launch (non-motorized)	1 mile downstream of dam

Currently, overall use at the project is moderate. However, restoration efforts are being funded as a result of the PCB remediation program for the Housatonic River. In particular, a basin-wide river access implementation plan is currently being developed for the Massachusetts portion of the Housatonic River. The focus of the plan is to identify and develop recreational access points at strategic locations. None of these sites are planned at the project impoundment. The plan is being funded through a Natural Resources Damages Trustees grant, which was set up through the national Super Fund program. It is a goal of these efforts to make the Housatonic River a much more visible and useable community resource in the future. Therefore, recreation use in the area is expected to increase to some degree (Dennis Regan, Housatonic Valley Association, personal communication, June 5, 2009).

Located on the upper portion of the project's impoundment is Laurel Hill (Bowkers' Woods), a large tract of conservation land that is maintained by the Laurel Hill Association (see figure 5). The river in this area provides excellent fishing as well as wetland and riparian habitat for many species of birds and other wildlife, providing opportunities for wildlife viewing.

The approximately three-mile-long reach downstream of the dam to the head of the Risingdale impoundment provides whitewater boating opportunities. There is a catch

and release fishing area extending approximately one mile downstream from the dam. Massachusetts DFW stocks this area with brown trout. The Route 183/Dugway Road site location, located about a mile downstream from the Glendale dam, is primarily used by fly fisherman.

The most popular activity near the project is fishing, particularly within the catch and release area located below the project's dam in the bypassed reach. Fishing use of the impoundment is moderate, while the project's bypassed reach receives little boating use. The informal Glendale Middle Road (at Glendale Bridge) site is used to access the impoundment for fishing and boating. Below the project whitewater boating is popular, and the impoundment receives relatively high boating use in the summer and fall compared to other areas in the project area.[12]

Environmental Effects and Recommendations

Littleville Power proposes the following enhancements to improve use of and access to project lands and waters (see figure 4):

- Construct a canoe portage around the dam consisting of: a new take-out located upstream of the dam on the right bank near the gatehouse; an informal portage trail that uses the existing access road and crosses the power canal at an existing bridge; and a new stairway/ramp at the bypassed reach. The total length of the portage would be approximately 875 feet. The access at the bypassed reach will serve as both a put-in site for canoeists and an access point for bank fishing. The final location for the proposed stairway/ramp will be determined in consultation with the stakeholders. Appropriate signage and safety fencing will be installed as part of the proposed improvements.

- Provide formal vehicular and pedestrian access to the Glendale Dam area and bypassed reach by providing a formal public parking area at the existing dam access road, adjacent to the proposed new portage trail and bypassed reach put-in.

The proposed recreation facilities would be located within the current project boundary.

[12] Comments by Glendale Project operations staff and stewards at the Housatonic Valley Association.

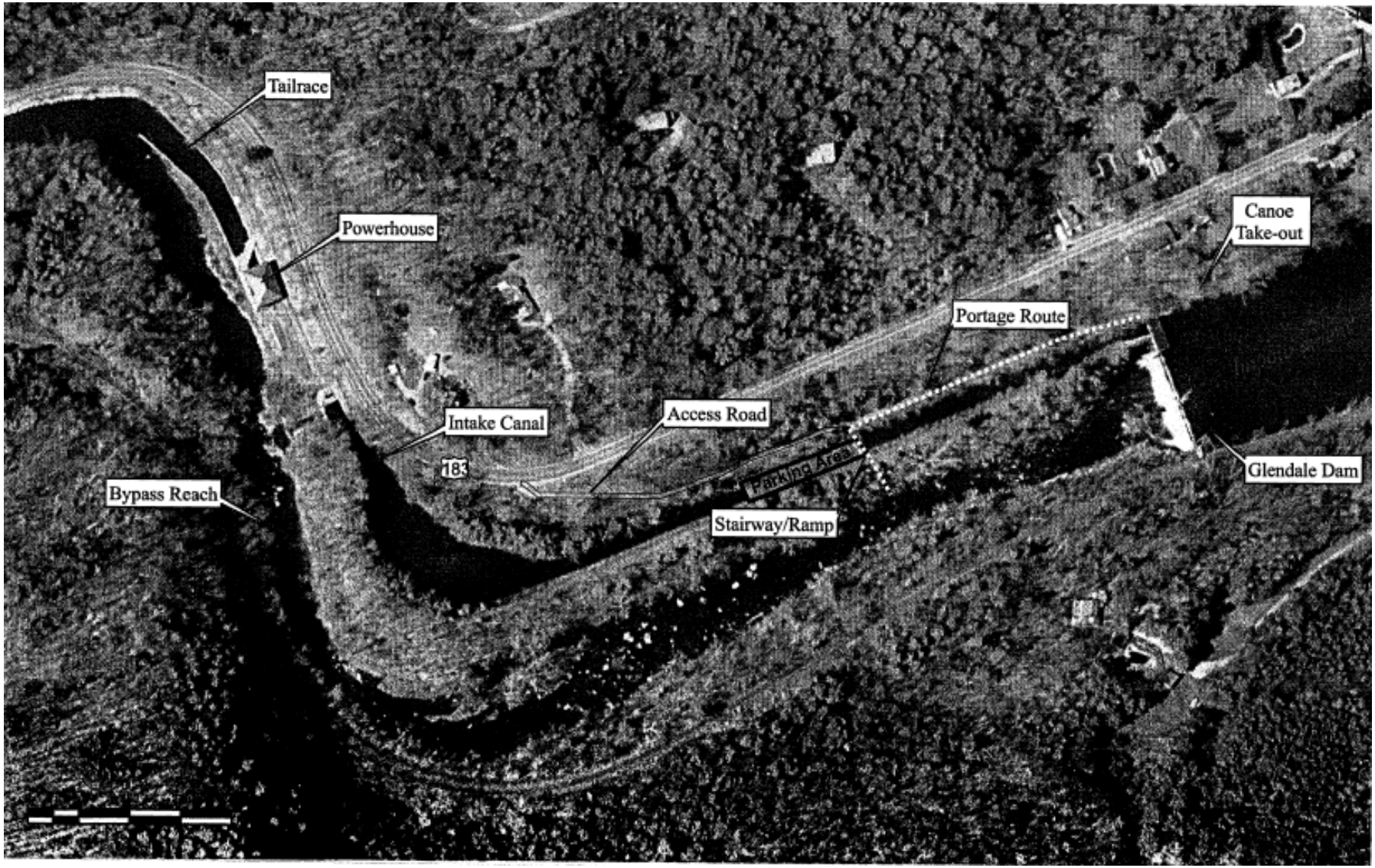

Figure 4. Proposed Recreational Facilities. Source: License application

By letter filed September 24, 2008, the Housatonic Valley Association agreed with Littleville Power's proposal to provide the canoe portage. It commented that the association received a grant from the Natural Resources Trustees, which will be used, among other things, to install five new canoe/kayak access sites in the Housatonic River watershed. Housatonic Valley Association stated that Littleville Power's proposed canoe portage will complement its efforts and will be helpful in determining where to locate its five new facilities.

The Massachusetts DFW, by letter filed September 13, 2008, commented that efforts are ongoing to restore water quality in the river and remediate the longstanding PCB contamination upstream of the project in the Pittsfield area. Massachusetts DFW commented that recreation activities in and around the Housatonic River continue to grow in popularity. For example two new catch and release fishing areas, particularly for brown trout, have been established on the Housatonic River, including the Glendale Project's bypassed reach. The Massachusetts DFW states that it intends to work with Littleville Power to finalize plans for the canoe portage.

Staff Analysis

Currently fishing use of the impoundment is moderate, while the project's bypassed reach receives little use; however, with the proposed increase in the bypassed reach minimum flow as well as the proposed recreational access improvements, boating and fishing use can be expected to increase. In addition, the newly established catch and release fishing area should generate an increase in fishing use in the bypassed reach.

Currently a canoe portage is not available and formal access to the bypassed reach is not provided. Based on current use patterns in the project area, recreation facilities appear to be adequately meeting recreation demand, with the exception being the lack of a portage and access to the bypassed reach. Providing portage, as proposed by Littleville Power, would ensure that boaters are able to safely navigate around the project. Improving access near the dam by providing the new put-in and a formal parking area at the bypassed reach would also improve recreational access at the project for both boating and fishing. Providing these measures in a recreation plan would facilitate development of the proposed facilities and ensure their continued operation. The recreation plan should include a procedure for consulting with the Massachusetts DFW and Housatonic Valley Association on the design of the recreation facilities, procedures for operating and maintaining the facilities, and appropriate signage.

3.3.5 Land Use and Aesthetic Resources

Affected Environment

Most residential and commercial and industrial land uses in the project area are concentrated along the West Branch of the Housatonic River in the City of Pittsfield and along the mainstem of the Housatonic River in the towns of Lee, Stockbridge and Great Barrington. There are some residents near the impoundment at the Glendale Bridget and along Route 183. A railroad right-of-way runs parallel to the southern bank of the impoundment and bypassed reach

The total area within the project boundary is approximately 42 acres, including the surface of the project's 23 acre impoundment. Littleville Power's owns appropriately 12 acres of land within the project boundary (including the power canal). The bypassed reach accounts for approximately 5 acres. The remaining ±2 acres within the project boundary lies within the 4 feet of elevation between the normal impoundment surface elevation and the extent of Littleville Power's flowage rights. Littleville Power does maintain flowage rights to elevation 814.9 feet, which is four feet above the spillway crest elevation.

Much of the Housatonic River basin topography is upland terrain, with low rolling hills rising above the river valley. The river is characterized by quick and swift drops in the narrow valley and a broad, flattened, slower flow as it emerges from the hills. The river corridor includes both riverine stretches and impounded and natural lakes.

A shoreline survey indicated that aesthetic resources abound upstream and downstream from the Glendale Dam. The Housatonic River upstream from the dam contains riffles which flow into the flatwater impoundment. Over this portion of the river a railroad track runs along the south shore, crossing the river approximately 1.1 miles downstream from the dam. Route 183 follows closely along the north bank. Downstream from the dam, the river drops approximately 100 feet over 2.7 miles, creating rapids and riffles which may be used for whitewater boating (Stockbridge Stream Team, 2002).

Development Control

As noted in section 3.3.2, the Glendale Project is located within land regulated by the Lake and Pond Overlay District of the Town of Stockbridge's zoning bylaws. This district includes all the shoreline and all lands within 150 feet of the high water mark of the Housatonic River and its permanent tributaries. The purpose of this ordinance is "to protect and enhance the principal lakefronts and shorelines of the Town of Stockbridge; to maintain safe and healthful conditions; to protect and control water pollution; and to preserve habitat, vegetative cover and natural beauty." The Lake and Pond Overlay

District ordinance allows the Stockbridge Planning Board control over developmental activities within the 150-foot wide district boundaries. The ordinance specifies land use and development standards, use of permeable materials for hard surfaces, setbacks from high water, maintaining natural vegetation, erosion and sediment control and stormwater management, among other things. In addition, the ordinance provides the procedures and standards used by the Stockbridge Conservation Commission to protect the wetlands, water supply and groundwater of the town.

Protected Open Space

There are three recreational and protected open space areas in proximity to the project (see figure 5).

Laurel Hill (Bowkers Woods): This 57-acre parcel was donated to the Town of Stockbridge by Richard Rogers Bowker (1848-1933) encompasses both banks of the river upstream of the project's dam. Approximately 10 acres of the Bowkers Woods parcel is within the project boundary. The Bowkers Woods parcel is maintained by the Laurel Hill Association, a local land trust which allows non-motorized public access. This parcel has excellent wetland and riparian habitat for many species of birds and other animals as well as providing opportunities for boating, fishing, and observing nature. (Stockbridge Stream Team, 2002).

Chesterwood National Trust Historic Site: The 148-acre Chesterwood parcel is situated across Glendale Road near the project's powerhouse, outside of the project's boundary. Chesterwood is a private museum and charges admission for use of the museum and grounds for passive recreation.

Unnamed Parcel (Berkshire Natural Resources Council): The 600-acre parcel is located on the southern shoreline of the river outside the project boundary. The privately owned parcel is protected from development by a conservation easement held by the Berkshire Natural Resources Council. Public use is prohibited. The parcel supports state-listed rare species.

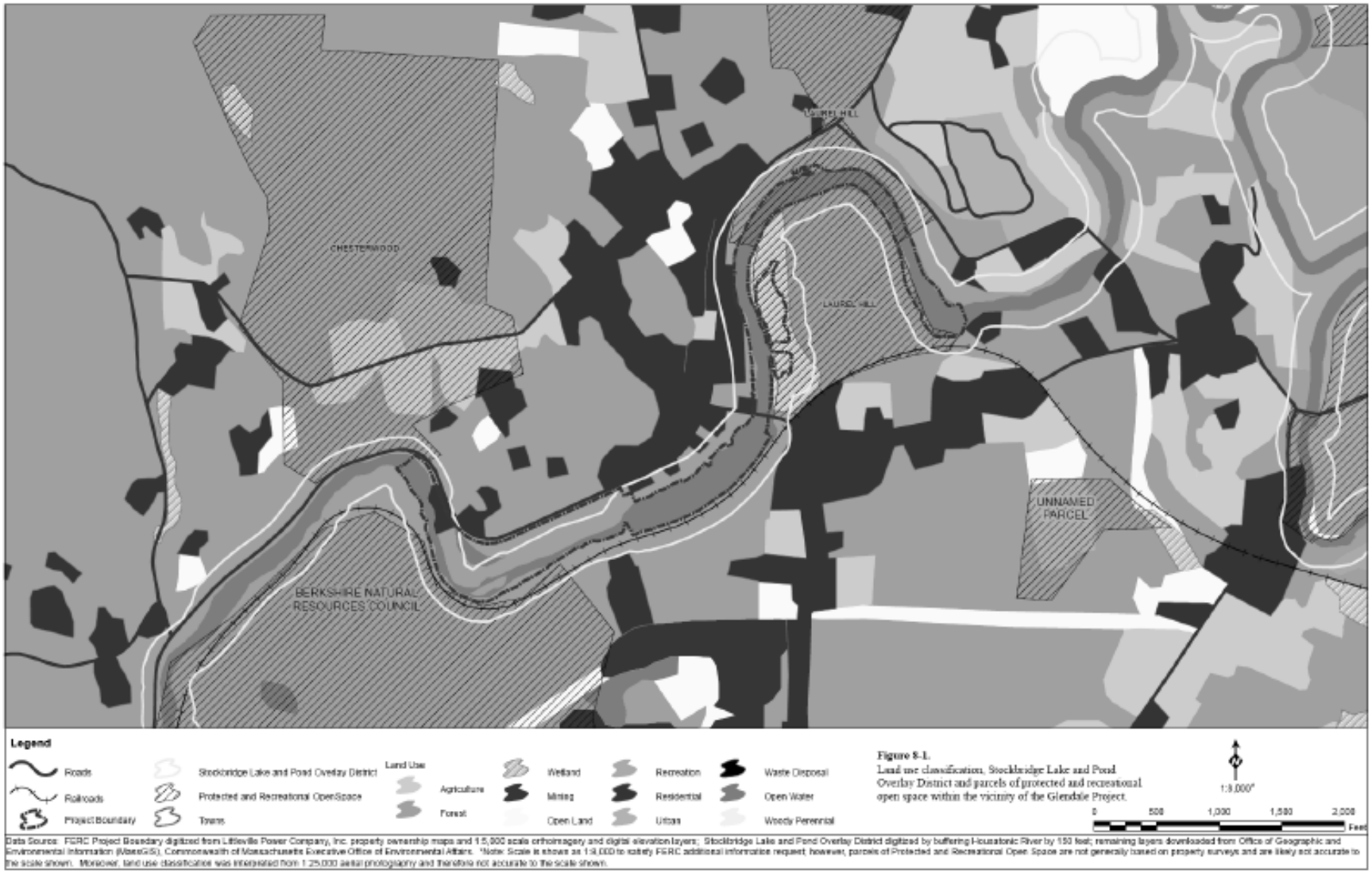

Figure 5. Land use in the vicinity of the project. Source: Additional information filed July 8, 2008, Figure 8-1, see filing on eLibrary to view in full color.

Environmental Effects and Recommendations

As previously discussed, Littleville Power proposes to increase the minimum flow in the bypassed reach from 10 cfs to 90 cfs to improve aquatic habitat, which is also recommended by Massachusetts DFW and Interior as 10(j) recommendations. Littleville Power also proposes to provide a portage consisting of a stairway/ramp at the bypassed reach and parking.

Staff Analysis

With the exception of the railroad tract on the south side of the river, Route 183 along the north side of the river and some homes located near the Glendale Bridge and along Route 183, there is not a lot of development adjacent to the project boundary. The restrictions placed on development along the Housatonic River and its permanent tributaries by the Town of Stockbridge's Lake and Pond Overlay District provide protection against uncontrolled development. The district provides standards for the management of vegetation, wetlands, and soil and sedimentation. In addition to the district's protection measures, almost half the project's impoundment is permanently protected by the conservation easement at Laurel Hill (Bowkers Woods).

Regarding the proposed minimum flow in the bypassed reach, this will increase the wetted area and amount of pools. The faster flowing water will be more turbulent creating ripples and increasing the sound of the rushing water. Thus, the proposal to increase the minimum flow to 90 cfs will enhance the aesthetic experience of the recreationist using the bypassed reach.

Unavoidable Adverse Effects

A minor, short term increase in erosion, traffic, noise, and visual disturbance could occur during the installation of the minimum flow turbine unit and during construction of the proposed recreation enhancements.

3.3.6 Cultural Resources

Affected Environment

Area of Potential Effect

The Advisory Council on Historic Preservation defines an area of potential effect (APE) as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE for the Glendale Project includes: (a) lands enclosed by the project boundary; and (b) lands or properties outside the project boundary which project operations or

project-related actions may cause changes in the character or use of historic properties, if any exist.

Historical Background

The earliest settlers, the Indians, arrived in the project area some 10,000 years ago. They settled along the river's banks, farmed the floodplains, and fished the river. The Mohicans were the local tribe when the English arrived in the 1720s and 1730s. The English made agriculture the major activity throughout the valley for the next century. During the 1700s and 1800s, waterpower played an important role in the development of industry throughout the valley. By the end of the Civil War there were at least 28 paper mills in Berkshire County alone.

Historic Properties

The upper Housatonic Valley is rich in historic resources. The area contains numerous historic sites, districts, and museums. In the town of Stockbridge, there is the Norman Rockwell Museum, the Chesterwood Estate and Museum, the Naumkeag Mission, and the Merwin House (National Park Service, 2002). A portion of the Chesterwood Estate and Museum is located near the project's impoundment. This estate was the 1920s summer home, studio, and garden of sculptor Daniel Chester French (1850-1931), sculptor of the Lincoln Memorial in Washington, DC and the Minute Man statue in Concord, Massachusetts.

In response to an additional information request, Hartgen Archaeological Associates, Inc. prepared an *Historical Overview Report for the Glendale Hydroelectric Project* for Littleville Power. The report was filed with the Commission and the Massachusetts Historical Commission (SHPO) on January 14, 2009.

The Glendale Powerhouse, also known as the Monument Mills Power Station, was added to the National Register of Historic Places (National Register) in 1982. The powerhouse is significant for its engineering and industrial uses from 1900 to 1924. The powerhouse, built in 1906, is a one story, 49-foot by 67-foot rectangular structure on a concrete foundation. It is constructed of coursed random ashlar blocks made of local Stockbridge marble, reportedly salvaged from the Glendale Woolen Mill which stood upstream (Jenkins 1981). The powerhouse has a hipped roof supported by steel trusses and covered with slate shingles. The Glendale Powerhouse is also listed in the Massachusetts State Register of Historic Properties.

Environment Impacts and Recommendations

Littleville Power is not proposing any alterations to the Glendale powerhouse. By letter filed October 30, 2008, the SHPO determined that the proposal will not adversely

affect the significant historic characteristics of the property. The SHPO commented that operation of the powerhouse for its historical purposes also assists in maintaining the historic property.

By letter dated January 27, 2009, the SHPO commented that the Historical Overview Report prepared by Hartgen Archaeological Associates, Inc. is comprehensive and recommended that a copy of the report be provided to the Stockbridge Historical Commission. The SHPO also commended that an HPMP for the project need not be complex. The HPMP could consist of: (1) the Historical Overview Report; (2) photocopies of information showing existing and proposed conditions and plans already prepared for the license application; (3) the requirement that prior to any future undertaking of new construction, demolition, or rehabilitation the plans will be submitted to the Commission, SHPO, and the Stockbridge Historical Commission for review and comment pursuant to 36 CFR Part 800 (2008); and (4) new construction or rehabilitation within the project should be completed in accordance with the Secretary of the Interior's Standards for Rehabilitation, 36 CFR Part 67(2008).

Staff Analysis

The only proposed modification to project facilities is the installation of a new minimum flow turbine at the dam, which is not listed or considered eligible for the National Register. Littleville Power is not proposing any alterations to the powerhouse. Littleville Power has consulted with the SHPO concerning the proposal.

The proposal is not likely to have an effect on the identified historic resources because the proposed project would not involve any new construction (other than the limited construction related to the proposed new recreation facilities) or modification to the existing powerhouse. Therefore, pursuant to the National Historic Preservation Act, Section 106 (16 U.S.C. § 470f (2006) and 36 CFR § 800.5(b) (2008)), we have determined that the proposed project would not have an adverse affect on the Glendale Powerhouse conditioned on developing and implementing an HPMP. An HPMP including the measures recommended by the SHPO would ensure that appropriate consultation occurs prior to any future activity that may affect the historic features of the powerhouse.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Glendale Project's use of the Housatonic River for hydropower purposes to see what effect various environmental measures would have on the project's cost and power benefits. Consistent with the Commission's approach to economic analysis, the power benefit of the project is determined by estimating the cost of obtaining the same amount of energy and capacity using the likely alternative

generating resources available in the region. In keeping with Commission policy as described in Mead, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits. [13]

Our estimate of the energy and capacity value was developed from the most reasonable alternative generation available. We base our estimate of the comparable cost of energy generation on the fixed cost of a combined-cycle combustion turbine plant fueled by natural gas in the New England region of the United States. We estimate the energy cost based on information in Energy Information Administration (EIA), Annual Energy Outlook 2008.[14] Based on EIA information, the regional energy cost is $59.13/MWh. We estimate the existing dependable capacity of the project is 0.57 MW, and assume a capacity value of $108 per kilowatt-year. Under current 2009 conditions, the total energy and capacity cost is $71.44/MWh.

For any alternative assessed, a positive net annual power benefit indicates that the project power costs less than the current cost of alternative generation resources and a negative net annual benefit indicates that project power costs more than the current cost of alternative generation resources. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 5 summarizes the assumptions and economic information we use in our analysis. We find that the values provided by Littleville Power are reasonable for the purposes of our analysis.

Table 5. Staff parameters for economic analysis of the Glendale Project. Source: Staff

Parameters	Values (2009$)	Sources
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Interest/cost of capital	8.0 percent	Staff
Escalation rate	0 percent	Staff

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

[14] See http://www.eia.doe.gov/oiaf/archive/aeo08/index.html.

Parameters	Values (2009$)	Sources
Federal and State tax rate	37 percent	Staff
Net investment [1]	$512,500	Staff
Operation and maintenance [2]	$195,500	Littleville Power
Energy and capacity value	$71.44/MWh	Staff

[1] This is the estimated book value of the project depreciated to 2009 (see page 10, license application). The cost to file for relicense was $130,000 (see page 10, license application).
[2] Includes insurance, administrative, and general costs (see page 10, license application).

4.2 COMPARISON OF ALTERNATIVES

Table 6 summarizes the annual cost, power benefits, and annual net benefits for the four alternatives considered in this EA: no-action, Littleville Power's proposal without and with the new turbine generator unit, and the staff alternative (proposed action with staff recommended measures).

Table 6. Summary of annual net benefits of the alternatives for the Glendale Project Source: Staff

Parameter	No-action alternative	Proposed action without new unit	Proposed action with new unit	Proposed action with staff recommended measures
Annual generation (MWh)	5,000	4,410	5,800	5,800
Installed capacity (MW)	1.14	1.14	1.305	1.305
Annual power value ($)	357,210	315,060	414,360	414,360
Annual cost ($)	298,830	313,420	451,410	455,170
Annual net benefit ($)	58,380	1,640	-37,050	-40,810

No-Action Alternative

Under the no-action alternative, the project would continue to operate as it does now. Based on a total installed capacity of 1.14 MW, the project generates an average of 5,000 MWh of electricity annually. The average annual power value of the project under

the no-action alternative would be about $357,210 ($71.44/MWh). The average annual cost of producing this power including depreciation, operation and maintenance costs, and taxes would be about $289,830 ($59.77/MWh). The resulting annual net benefit of the project would be about $58,380 ($11.68/MWh).

Littleville Power's Proposal without New Generating Unit

Littleville Power proposes to release a 90-cfs year-round minimum flow in the bypassed reach below the project dam through a new minimum flow turbine generating unit at the project dam. Releasing the recommended 90-cfs year-round minimum flow in the bypassed reach without the proposed new turbine generating would decrease the average annual generation of the current project from 5,000 MWh to an estimated 4,410 MWh (590 MWh lost generation). Based on the total installed capacity of 1.14 MW, an estimated average annual generation of 4,410 MWh, the Glendale Project without the new generating unit (see table 6) would have an average annual power value of $315,060 ($71.44/MWh), an average production cost (levelized over the 30-year period of our analysis) of about $313,420 ($71.07/MWh), and an annual net benefit of about $1,640 ($0.37/MWh).

Littleville Power's Proposal with New Generating Unit

Littleville Power proposes to release 90-cfs year-round minimum flow in the bypassed reach below the project dam through a new minimum flow turbine generating unit at the project dam. Littleville Power also proposes to install a trash rack as an entrainment protection measure for the new turbine generating unit. Releasing a minimum flow through the new turbine generating unit would increase the average annual generation of the current project from 5,000 MWh to an estimated 5,800 MWh, annually (800 MWh generation gain). Based on a total proposed capacity of 1.305 MW, an estimated average annual generation of 5,800 MWh, the Glendale Project as proposed by Littleville Power (see table 6) would have an average annual power value of $414,360 ($71.44/MWh), an average production cost (levelized over the 30-year period of our analysis) of about $451,410 ($77.83/MWh), and an annual net benefit of about $-37,050 ($-6.39/MWh).

Staff Alternative

As noted above, the Glendale Project would have annual net benefits without and with the new minimum flow turbine generating unit of about $1,640 and $-37,050, respectively. Littleville Power's proposal to increase generation at the project by release a year-round minimum flow in the bypassed reach through a new minimum flow turbine generating unit would reduce the estimated net annual benefit by about $38,690. As noted above, our economic analysis does not consider future escalation of fuel prices in valuing the hydropower project's power benefits. However, if the value of power

increases during the term of any issued subsequent license, the project's net annual benefit would likely increase. Because Littleville Power proposes to increase project generation by releasing a minimum flow through a new turbine generating unit with entrainment protection (trash racks), and due to the likelihood that the net annual benefit of the project may increase over time, we recommend installing and operating the new turbine generating unit with trash racks.

The staff alternative includes the measures proposed by Littleville Power, and also includes releasing 90 percent of inflow downstream during reservoir refill, and developing and implementing plans for operation compliance monitoring, erosion and sedimentation control, invasive species control, recreation, and historic properties management. Table 7 shows the staff recommended environmental measures and the estimated cost of each.

Based on the total proposed capacity of 1.305 MW, and an average annual generation of 5,800 MWh, the Glendale Project with staff recommended measures (see table 6) would have an average annual power value of $414,360 ($71.44/MWh), an annual production cost (levelized over the 30-year period of our analysis) of about $455,170 ($78.48/MWh), and an annual project benefit of about $-40,810 ($-7.04/MWh). The staff alternative would reduce the net annual benefit by about $3,760 ($0.65/MWh) compared to the project as proposed by Littleville Power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 7 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 7. Summary of annual costs (2009$) of the proposed and recommended measures for the Glendale Project. Source: Staff

Measures	Recommending entity	Capital cost	Operation and maintenance cost	Levelized annual cost
Continue run-of-river mode of operation [a]	Littleville Power, Interior, Massachusetts DFW, Staff	0	0	0
Install a new 165 kW turbine generating unit [b]	Littleville Power, Staff	1,400,000	20,000	80,840
Maintain 90-cfs minimum flow, or inflow, in the bypassed reach	Littleville Power, Interior,	0	0	42,150

Measures	Recommending entity	Capital cost	Operation and maintenance cost	Levelized annual cost
year-round [c]	Massachusetts DFW, Staff			
During reservoir refilling, release 90 percent of inflow below the project, and refill with the remaining 10 percent [d]	Interior, MA DF&W, Staff	0	0	0
Install trash racks at the intakes to the main and minimum flow units [e]	Littleville Power, Interior, Massachusetts DFW, Staff	0	0	0
Operation compliance monitoring plan	Interior, Massachusetts DFW, Staff	5,000	1,500	1,370
Erosion and sedimentation control plan [f]	Staff	5,000	0	380
Invasive species control plan	Interior, Massachusetts DFW, Staff	4,000	1,500	1,300
Develop and implement recreational improvement [g]	Littleville Power, Staff	150,000	5,000	14,590
Recreation plan	Staff	2,000	0	150
HPMP	Staff	3,000	500	560

[a] Run-of-river is the current mode of project operation, therefore no additional annual cost would be incurred.
[b] Releasing a 90-cfs minimum flow in the bypassed reach through the new minimum flow generating unit would result in an incremental annual increase in generation of 800 MWh valued at about $57,150.
[c] Releasing a 90-cfs minimum flow in the bypassed reach without the new minimum flow generating unit would result in an incremental annual decrease in generation of 590 MWh valued at about $42,150.
[d] We assume the reservoir refill downstream flow releases would be through the minimum flow generating unit or the powerhouse resulting in minimal cost.
[e] The cost of the trash racks at the minimum flow generating unit is included in the cost to install the new unit; the main generating units have existing trash racks.
[f] The operation and maintenance cost to implement the erosion control plan is included in the cost to maintain the new generating unit.
[g] Littleville Power proposes to develop a canoe portage around the project dam, and provide access to the area near the dam and the bypassed reach.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPARISON OF ALTERNATIVES

In this section, we compare the developmental and environmental effects of Littleville Power's proposal without a new minimum flow turbine generating unit, Littleville Power's proposal with a new turbine generating unit, Littleville Power's proposal including a new turbine generating unit with staff modifications (staff alternative), and a no-action alternative (continued operation with no changes).

We summarize the environmental effects of the different alternatives below.

Table 8. Comparison of alternatives for the Glendale Project. Source: FERC staff.

Resource	No-action alternative	Proposed action without new turbine unit	Proposed action including new turbine unit	Staff alternative
Annual Generation (MWh)	5,000	4,410	5,800	5,800
Aquatic Resources	Run-of river operation with minimal reservoir drawdowns and a minimum bypassed reach flow of 10 cfs	Run-of-river operation with minimal reservoir drawdowns would continue to protect downstream aquatic resources Increasing bypassed reach minimum flows to 90 cfs would benefit aquatic habitat	Run-of-river operation with minimal reservoir drawdowns would continue to protect downstream aquatic resources Increasing bypassed reach minimum flows to 90 cfs would benefit aquatic habitat Trash racks (at new turbine unit) with 1-inch clear spacing would protect fish from entrainment and turbine-induced mortality.	Operating as proposed but with the provision of 90 percent of inflow released during impoundment refilling (following maintenance drawdowns) would add aquatic biota protection below the project during drawdowns. An operations compliance monitoring plan would ensure the protection of aquatic resources
Terrestrial Resources	Run-of river operation with minimal reservoir drawdowns	Stable impoundment levels and run-of-river operation would continue to benefit shoreline	Stable impoundment levels and run-of-river operation would continue to benefit shoreline	Operating as proposed, but with the development and implementation of an invasive species control plan would

Resource	No-action alternative	Proposed action without new turbine unit	Proposed action including new turbine unit	Staff alternative
		habitat	habitat	protect native plant communities and wildlife habitat
Recreation and Land Use	No formal recreational facilities	Provision of a formal canoe portage, including a new take-out and put-in, and use of an existing access road as a portage trail, would benefit boaters using the project Provision of formal parking at the project dam and bypassed reach would improve recreational access	Provision of a formal canoe portage, including a new take-out and put-in, and use of an existing access road as a portage trail, would benefit boaters using the project Provision of formal parking at the project dam and bypassed reach would improve recreational access	Providing the proposed recreational enhancements through the development and implementation of a recreation plan would ensure appropriate consultation during planning and would ensure the facilities are maintained properly.
Cultural Resources	Existing project does not affect cultural resources	As proposed, continued project operation would not affect cultural resources.	As proposed, continued project operation would not affect cultural resources.	An HPMP, based on existing information, would ensure that procedures are in place in the event that future activities would affect cultural resources.
Aesthetic Resources	Run-of river operation with minimal reservoir drawdowns and a minimum bypassed reach	An increase in bypassed reach minimum flows would enhance the visual appeal of the river	An increase in bypassed reach minimum flows would enhance the visual appeal of the river	Operating as proposed but with the provision of 90 percent of inflow released during impoundment refilling (following maintenance drawdowns) would protect

Resource	No-action alternative	Proposed action without new turbine unit	Proposed action including new turbine unit	Staff alternative
	flow of 10 cfs			aesthetic resources

We estimate the annual net benefits of operating and maintaining the project under the four alternatives identified above. Our analysis shows that the annual net benefit would be $1,640 for the proposed action without the new minimum flow turbine unit; -$37,050 for the proposed action including the new turbine unit; -$40,810 for the staff alternative; and $58,380 for the no-action alternative.

5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) 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 hydropower project, we consider the water quality, fish and wildlife, recreation, cultural, and other non-developmental values of the involved waterway equally with its electric energy and other developmental values. In deciding whether, and under what conditions a hydropower project should be licensed, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing the waterway.

This section contains the basis for, and a summary of, our recommendations for relicensing the Glendale Project.

A. Recommended Alternative

Based on our independent review and evaluation of the environmental and economic effects of the proposed action, with and without the new minimum flow turbine unit, the proposed action with additional staff-recommended measures, and no-action, we recommend the proposed action with additional staff-recommended measures, as the preferred alternative.

We recommend this alternative because: (1) issuing a subsequent license would allow Littleville Power to continue operating the project as a beneficial and dependable source of electric energy; (2) the project, with an installed capacity of 1.14 MW, would eliminate the need for an equivalent amount of fossil-fuel-produced energy and capacity, which helps conserve these nonrenewable resources and limits atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures would protect water quality, fish and wildlife resources, and cultural resources, and would improve public recreational access.

Measures proposed by Littleville Power

Littleville Power proposes to: (1) continue to operate in a run-of-river mode and reduce a unit's output to its minimum hydraulic capacity before being taken off line; (2)

release a year-round minimum flow of 90 cfs or inflow, whichever is less, into the bypassed reach; (3) install a new, 165-kW turbine unit in the waste gate slot located at the gatehouse adjacent to the project dam, which would generate power from the proposed 90-cfs bypassed reach minimum flow, and would have trash racks with 1-inch clear spacing; and (4) provide additional recreational access through formal canoe portage facilities and parking.

Additional Staff-Recommended Measures

We recommend the measures proposed by Littleville Power with some additional staff-recommended measures including: (1) release 90 percent of inflow during impoundment refilling following any maintenance or emergency drawdowns; (2) an operation compliance monitoring plan; (3) an invasive species control plan (4) a recreation plan for implementing the proposed measures; and (5) an HPMP that addresses procedures regarding future activities at the project. We discuss the rationale for the measures we our recommending or not recommending below.

Run-of-river operation

Littleville Power proposes to operate the project in a run-of-river mode. Interior and Massachusetts DFW recommend under section 10(j) that the project be operated in a run-of-river mode such that inflow to the project equals outflow from the project on an instantaneous basis, and fluctuations of the impoundment water level are minimized. Operating in a run-of-river mode and limiting impoundment fluctuations as proposed by Littleville Power would continue to reduce the chances of fish stranding and disruption of spawning. Maintaining relatively stable impoundment levels within the control of the Glendale Project (up to flows of about 490 cfs) would continue to benefit aquatic vegetation beds near the shoreline, as well as fish and other aquatic organisms that rely on near-shore habitat for feeding, spawning, and cover. Erosion of shoreline areas and resultant turbidity as well as sediment mobilization would also continue to be minimized when the impoundment is held relatively stable. In addition, by not storing water, impoundment water would be less likely to increase in temperature or decrease in DO content. Downstream of the confluence of the bypassed reach and the project tailrace channel, run-of-river operation along with Littleville Power's ramping of turbine units prior to taking a unit offline would ensure that any fluctuations occurring in the Housatonic River due to project operation would be kept to a minimum. Therefore, we recommend that the Glendale Project be operated in a run-of-river mode as proposed by Littleville Power and recommended by Interior and Massachusetts DFW. There would be no cost associated with operating in a run-of-river mode.

Minimum flow in the bypassed reach

Under current conditions the project's 2,500-foot-long bypassed reach receives a

minimum flow of 10 cfs. Littleville Power proposes, and Interior and Massachusetts DFW recommend under section 10(j), increasing the minimum flow to 90 cfs. Based on the IFIM study results, a flow of 90 cfs would provide more than 80 percent of the maximum available habitat for all but two of the sixteen species life stages evaluated and over 90 percent of the maximum available habitat for nine of the species life stages evaluated. For brown trout adults, an important catch and release fishery resource in the area, 86 percent of the maximum available habitat would be present at a flow of 90 cfs. Although minor improvements in habitat for some species life stages would occur at slightly higher flows, fry habitat for several species would be compromised at such flows. In addition, frequent spill flows would provide additional habitat for those species life stages that could benefit from flows above 90 cfs. Therefore, we recommend that Littleville Power maintain a minimum flow in the bypassed reach of 90 cfs which would be worth the annual cost of $42,150 in lost generation. If 90 cfs is released through the proposed minimum flow turbine generating unit, Littleville Power would gain about 800 MWh of annual generation valued at about $57,150.

Flow continuation following impoundment drawdown

Interior and Massachusetts DFW recommend under section 10(j) that Littleville Power use 10 percent of the inflow to the project to refill the project impoundment after dam maintenance or emergency drawdowns and release the rest (90 percent) of inflow downstream of the project impoundment for the protection of aquatic resources. Littleville Power did not propose a refill protocol following impoundment drawdowns but states that it has no objection to these recommendations. Releasing 90 percent of the project impoundment's inflow during refill would ensure that downstream flows are kept at near natural flow levels which would help maintain water quality conditions by maximizing water turbulence and aeration and prevent most aquatic habitats from desiccation. Therefore, we recommend that Littleville Power use 10 percent of the inflow to the project to refill the project impoundment after dam maintenance or emergency drawdowns and release 90 percent of inflow downstream of the project impoundment for the protection of aquatic resources. The cost of the refill protocol would be minimal because the downstream flow releases would be through either the minimum flow generating unit or the powerhouse and only 10 percent of the inflow would be retained for refill.

Operation compliance monitoring plan

Littleville Power did not propose a means of ensuring compliance with its proposed operating mode. Interior and Massachusetts DFW recommend under section 10(j) that Littleville Power prepare a plan for monitoring run-of-river operation and flow releases from the project. Interior and Massachusetts DFW recommend that the plan include a description and design of the mechanisms and structures to be used along with any periodic maintenance and calibration that would be necessary. Both agencies request

that the monitoring data be made available for inspection. A plan to monitor run-of-river operation and minimum flow releases developed in consultation with the relevant resource agencies that describes contingencies for emergencies (such as providing downstream flows during project shutdown), turbine unit ramping procedures, scheduled maintenance drawdowns, droughts, as well as reporting criteria, would minimize misunderstandings about operational compliance and help ensure that aquatic resources at the project are protected. Such a plan could include monitoring water surface elevations in the project's impoundment and tailwater, maintaining a log of impoundment and tailwater water surface elevations and project generation data, establishing a staff gage in the bypassed reach, and a means for providing the data to the resource agencies upon request. Therefore, we recommend that a plan for monitoring run-of-river operation and minimum flows be developed in consultation with the agencies which would be worth the estimated annual cost of $1,570.

Downstream fish protection

The project's main turbine intakes are equipped with trashracks with 1-inch clear spacing and approach velocities of 2 feet per second. Littleville Power proposes to use similar trashracks with 1-inch clear bar spacing to protect fish from entrainment and turbine-induced mortality at the proposed minimum flow turbine unit. The trashracks at the minimum flow unit would also be of sufficient dimensions to ensure approach velocities of 2 feet per second or less. Interior and Massachusetts DFW recommend under section 10(j) that full depth, 1-inch clear trashracks with velocities less than or equal to 2 feet per second be installed at the project's main and minimum flow units. The existing 1-inch-spaced trashracks at the project's main turbine intake protect most of the adult gamefish (greater than 8 inches) residing within the impoundment from being entrained into the turbines and being subjected to potential turbine-induced mortality. Based on the swimming speeds of fishes residing in the project impoundment and the existing approach velocities in front of the intakes, most fish would be able to avoid impingement. Installing trashracks with similar 1-inch clear spacing and approach velocities at the intakes for the proposed minimum flow turbine unit would provide an equal level of protection. Therefore, we recommend that Littleville Power install trashracks with 1-inch clear bar spacing with approach velocities of 2 feet per second or less in front of the intake for the minimum flow turbine unit. Because the cost of the proposed trashracks are included in the cost of installing the minimum flow unit there would be no additional cost associated with this recommendation.

Erosion and Sedimentation Control Plan

Littleville Power proposes to install a new 165-kW turbine-generator unit in a waste gate slot located at the gatehouse adjacent to the project dam to pass the 90-cfs minimum flow into the bypassed reach. Littleville Power indicates that a drawdown of the impoundment would not be necessary to install the new unit and proposes to

undertake all necessary and reasonable measures to minimize the effects of short-term construction effects including, but not limited to, erosion, siltation, and dust control measures. Even though a drawdown would not be needed, the installation of the new turbine-generator unit could cause some short-term effects on habitat within the impoundment and downstream in the bypassed reach resulting from erosion and sedimentation. Construction of the proposed boating access sites (upstream and downstream from the dam) and formal parking area adjacent to the bypassed reach could also cause erosion and sedimentation. A soil erosion and sedimentation control plan that specifies the measures that would be used during the turbine unit installation and construction of recreation facilities to control erosion and sedimentation would help ensure that aquatic habitats are protected. Therefore, we recommend that Littleville Power develop and implement a soil erosion and sedimentation control plan which would be worth the estimated annual cost of $380.

Invasive Species Control Plan

Interior and Massachusetts DFW recommend under section 10(j) that Littleville Power prepare, in consultation with FWS and Massachusetts DEP, an invasive species control plan that includes a schedule for regularly monitoring invasive plants within the project area and identifies methods of controlling selected species.

Developing and implementing an invasive species control plan would benefit wildlife by establishing measures to monitor and, if necessary, control invasive plant species, preventing them from outcompeting the native plant species that are necessary for wildlife food, cover, and nesting. These benefits would be worth the estimated annual cost of $1,300.

Recreation Plan

Currently the project does not have any designated recreation facilities. Littleville Power proposes to construct a canoe portage around the dam consisting of a take-out located upstream of the dam near the gatehouse. A portage trail will be established using the existing access road, crossing the power canal at the existing bridge, and leading to a new stairway/ramp to the bypassed reach. The facility will be a put-in site for canoeists and an access point for bank fishing within the bypassed reach. The final location for the proposed stairway/ramp would be determined in consultation with the stakeholders. Appropriate signage and safety fencing would be installed as part of the proposed improvements.

Additionally, Littleville Power proposes to provide formal vehicle parking adjacent to the new stairway/ramp to the bypassed reach. Pedestrians would be able to access the Glendale Dam area and the impoundment by using the existing dam access road.

Installing the proposed recreation improvements (canoe portage and access trail to the bypassed reach and access to the dam) would enhance the recreation opportunities at the project area, and the new portage facilities would ensure that boaters are able to safely navigate around the project. Improving access near the dam would enhance boating and fishing at the project. Improving access to the bypassed reach will enhance the catch and release area provided by Massachusetts DFW. Littleville Power did not provide details for the proposed recreation facilities, such as conceptual design drawings of each facility, measures for operation and maintenance of the facilities, and hours the facilities will be available to the public. To ensure that the facilities are adequately maintained for the term of any new license, we recommend that Littleville Power develop and implement a recreation management plan that includes these measure.

Because of the addition of the proposed recreation enhancements and the expected increase in recreation use it will be important to monitor recreation use to determine if the facilities are adequate for the demand. Thus, we recommend that the recreation plan include a monitoring provision. Littleville Power estimates the annual cost of the proposed measures to be $14,590. The estimated additional annual cost of developing and implementing a plan is $150.

Historic Properties Management Plan

The project's powerhouse is listed on the National Register of Historic Places for its engineering and industrial uses from 1900 to 1924. In order to mitigate the effects of any future modifications or activities that could potentially affect the characteristics of the Glendale Powerhouse, we recommend that Littleville Power prepare an historic properties management plan (HPMP). This measure is worth the estimated annual cost of $560.

B. Measures not Recommended

Agency Notification

Interior requested, as a section 10(a) recommendation, that Littleville Power serve all representatives of Interior on the service list with a copy of any request the licensee may file for amendment of license, amendment or appeal of any fish and wildlife-related license conditions, or extension of time requests for project construction or implementation of license article provisions. The service list for this subsequent licensing proceeding would expire upon issuance of the order, and the party status of any intervenors in the proceeding would also terminate at that point. Consequently, the Commission's rule requiring service, 18 C.F.R. § 2010 (2008), does not require that former parties be served with relevant pleadings filed after a permit, license, or exemption has been issued. However, Littleville Power would be required to consult or

notify Interior, through FWS, on a number of measures, including the operations compliance monitoring plan and the invasive species control plan. Moreover, entities interested in a specific project may register for the Commission's "e-subscription" in order to be notified by e-mail about future correspondence regarding a specific docket.[15] We therefore do not recommend requiring the above notifications.

C. Conclusion

Based on our review of the agency and public comments filed on the project and our independent analysis pursuant to sections 4(e), 10(a)(1), and 10(a)(2) of the FPA, we conclude that licensing the Glendale Project, as proposed by Littleville Power with additional staff-recommended measures, would be best adapted to a plan for improving or developing the Housatonic waterway.

5.3 UNAVOIDABLE ADVERSE IMPACTS

A minor, short term increase in erosion, traffic, noise, and visual disturbance could occur during the installation of the minimum flow turbine unit and during construction of the proposed recreation enhancements. Wildlife and recreation users may experience temporary and minor disturbance during this time. Some minor fish entrainment and mortality would continue but is expected to be minor, given the health of the existing fishery in the project area. The project dam would continue to be an impediment to upstream movement of resident fish unless Interior prescribes fishways at the project in the future. As a result, any mussel species residing in the Housatonic River downstream of the project would not be able to recolonize areas upstream of the project because fishes serving as hosts to early life history stages of mussels would be prevented from moving upstream. Also, there may be some minor short-term erosion and sedimentation effects resulting from the installation of the minimum flow turbine unit.

5.4 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 recommendations provided by the federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission finds that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall

[15] *See* http://www.ferc.gov/docs-filing/esubscription.asp. E-Subscription subscribers receive docketed correspondence, issuances, and news releases electronically.

attempt to resolve such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

In response to the REA notice, Interior (letter filed December 30, 2008) and Massachusetts DFW (letter filed December 22, 2008) each recommended six fish and wildlife measures. Table 5 lists the 10(j) recommendations. As noted, staff found all recommendations to be within the scope of 10(j) and recommended their adoption.

Table 9. Analysis of fish and wildlife agency recommendations for the Glendale Project.

Recommendation	Agency	Within scope of section 10(j)?	Annual cost	Recommended adopting?
1. Operate the project in a run-of-river mode	Interior, Mass. DFW	Yes	0	Yes
2. Provide a 90-cfs minimum flow in the bypassed reach year-round	Interior, Mass. DFW	Yes	$42,150	Yes
3. During impoundment refilling, release 90 percent of inflow downstream of the project	Interior, Mass. DFW	Yes	0	Yes
4. Install trash racks with 1-inch clear spacing and approach velocities of less than or equal to 2 feet per second at the intakes to the main and minimum flow turbine units	Interior, Mass. DFW	Yes	*	Yes
5. Develop an operation compliance monitoring plan	Interior, Mass. DFW	Yes	$1,370	Yes
6. Invasive species control plan	Interior, Mass. DFW	Yes	$1,3000	Yes

* Cost included in the cost to install minimum flow turbine generator unit; the existing trash racks at the main powerhouse intake already meet said specifications.

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C § 803(a)(2)(A) (2006), requires the Commission to consider the extent to which a project is consistent with federal and state

comprehensive plans for improving, developing, or conserving waterways affected by the project. We reviewed five comprehensive plans that are applicable to the Glendale Project.[16] No inconsistencies were found.

6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Glendale Project is licensed as proposed with the additional staff-recommended measures, the project would continue to operate while providing enhancements to fish and wildlife resources, improvements to recreation facilities, and protection of cultural resources in the project area, if discovered.

Based on our independent analysis, issuance of a subsequent license for the Glendale Project, as proposed with additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

7.0 LITERATURE CITED

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