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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

International Paper Company) Project No. 2375-013, Maine
Otis Hydroelectric Company) Project No. 8277-008, Maine

NOTICE OF AVAILABILITY OF FINAL ENVIRONMENTAL ASSESSMENT

(June 23, 1998)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 F.R. 47897), the Office of Hydropower Licensing has reviewed the applications for major new licenses for the Riley-Jay-Livermore Project and Otis Hydroelectric Project located on the Androscoggin River in Franklin, Androscoggin, and Oxford Counties, near the Towns of Canton, Jay, Livermore, and Livermore Falls, Maine, and has prepared a final Environmental Assessment (EA) for re-licensing the projects. In the EA, the Commission's staff has analyzed the potential environmental impacts of the projects and has concluded that approval of the projects, with appropriate mitigative measures, would not constitute a major federal action significantly affecting the quality of the human environment.

Copies of the EA are available for review in the Public Reference Branch, Room 2-A, of the Commission's offices at 888 First Street, N.E., Washington, D.C. 20426.

For further information, please contact Monte J. TerHaar at (202) 219-2768 or Patti-Leppert Slack at (202) 219-2767.

Linwood A. Watson, Jr.
Acting Secretary

980624-0349-3

FINAL ENVIRONMENTAL ASSESSMENT FOR HYDROPOWER LICENSES

Riley-Jay-Livermore Project (FERC No. 2375)
Otis Hydroelectric Project (FERC No. 8277)

Maine

Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Licensing and Compliance
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ACRONYMS AND ABBREVIATIONS

ABF	Aquatic Base Flow
ACOE	Department of the Army, Corps of Engineers
ACHP	Advisory Council on Historic Preservation
AMC	Appalachian Mountain Club
APE	Area of Potential Effect
Applicants	International Paper Company and Otis Hydroelectric Company
AR	American Rivers
BMP	Best Management Practice
BOD	biological oxygen demand
cfs	cubic feet per second
CLF	Conservation Law Foundation
CMP	Central Maine Power Company
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zoning Management Act
DEA	draft environmental assessment
DO	dissolved oxygen
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
fps	feet per second
ft	Feet
Gerber	Robert G. Gerber, Inc.
Gwh	gigawatthours
HSI	Habitat Suitability Index
IFIM	Instream Flow Incremental Methodology
in	inches
IP	International Paper Company
ISCD	Initial Stage Consultation Document
KA	Kleinschmidt Associates
kV	kilovolt
kW	kilowatts
kWh	kilowatthours
LWA	Land and Water Associates
MASA	Maine Atlantic Salmon Authority
MDEP	Maine Department of Environmental Protection
MDHS	Maine Department of Human Services
MDIFW	Maine Dept. of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
mgd	million gallons per day
MHPC	Maine Historic Preservation Commission
MOA	Memorandum of Agreement
MSPO	Maine State Planning Office
MW	megawatt

MWH	megawatt-hours
NAI	Normandeau Associates
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NEPOOL	New England Power Pool
NHPA	National Historic Preservation Act
NGO	Non-governmental organization
NMFS	National Marine Fisheries Service
NPS	National Park Service
OHC	Otis Hydroelectric Company
PGP	Programmatic General Permit
PHABSIM	Physical Habitat Simulation
RBC	Risk based concentration
Register	National Register of Historic Places
SCORP	State Comprehensive Outdoor Recreation Plan
SDI	Scoping Document I
SHPO	State Historic Preservation Officer
sq. mi	Square Miles
TSS	Total Suspended Solids
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFDA	U.S. Food and Drug Administration
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWPC	Union Water Power Company
WA	Woodlot Alternatives
WQC	Water Quality Certificate
WUA	Weighted Useable Area
YOY	Young-of-year

FINAL ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Riley-Jay-Livermore Project (FERC No. 2375)
Otis Hydroelectric Project (FERC No. 8277)

EXECUTIVE SUMMARY

On October 25, 1997, International Paper Company (IP) and Otis Hydroelectric Company (OHC) filed with the Federal Energy Regulatory Commission (Commission) applications for new major licenses for the Riley-Jay-Livermore Project (FERC No. 2375) and Otis Hydroelectric Project (FERC No. 8277) respectively. IP proposes to increase capacity at the Riley-Jay-Livermore Project by upgrading generation facilities at the Livermore site from 7.8 megawatts (MW) to 12.26 MW. Existing generation capacity would be maintained at the Riley and Jay sites. OHC proposes to continue operating the 10.35-megawatt Otis Project with no change in generation capacity.

The Riley-Jay-Livermore Project is an existing, licensed hydroelectric facility owned and operated by IP on the Androscoggin River between river miles 65.3 and 53.25. The project is located in the western portion of central Maine in the Village of Riley and the Towns of Canton, Jay, Livermore and Livermore Falls at the junction of Franklin, Androscoggin, and Oxford Counties. The project includes three separate developments: Riley, Jay, and Livermore. Construction of the project dams, impoundments, and associated powerhouses occurred between 1881 and 1915. The total existing installed capacity of the project is 18.725 MW with an average annual generation of 62,272 megawatt hours (MWH). With the proposed redevelopment of the existing Livermore station, the Riley-Jay-Livermore Project would have an installed capacity of 23.185 MW and an average annual generation of 105,739 MWH.

The Otis Project is situated between the Jay and Livermore developments at river mile 54.0 on the Androscoggin River. The project is an existing, licensed hydroelectric facility that is owned and operated by Otis Hydroelectric Company, a partnership in which IP, through its subsidiary, is a general partner. The original dam, impoundment, powerhouse, and appurtenant facilities were constructed in 1888. A new forebay and powerhouse were constructed in 1984, across the river from the original facilities. The total installed capacity of the project is 10.35 MW with an average annual generation of about 49,556 MWH. OHC is

proposing no changes in operation or capacity additions for the Otis Project.

To improve and expedite the relicensing efforts for these projects, the Applicants formed a Collaborative Team consisting of Federal, state, and non-governmental organizations (NGOs). Since September of 1994, members of the Collaborative Team have been meeting regularly to address resource concerns, and develop an enhancement package that protects and enhances the natural and human environment. This collaborative process culminated in the preparation of an applicant prepared environmental assessment (APEA) that was filed with both applications for license. The proposed action contained in the APEA represents an agreement among Collaborative Team members on operational and environmental enhancement measures needed at the proposed projects.

On April 9, 1998, the Commission issued a Notice of Availability of Draft Environmental Assessment and Notice of Commission Staff Meeting. The Commission Staff meeting was held on May 6, 1998, in Augusta, Maine to discuss the draft EA. The staff made minor changes to the draft EA in response to issues discussed at the May 6th meeting and written comments received in response to the Commission Notice.

The Applicants propose the following: (1) continue to operate the projects in a run-of-river mode, (2) continue to release a minimum flow of 1,245 cubic feet per second (cfs) downstream of the projects during atypical periods (e.g., re-installation of the flashboards), (3) provide year-round minimum flows in the upper and lower portions of the Livermore bypassed reach (see section 3.3.2.1) to enhance aquatic habitat and provide for greater fishing opportunities; (4) provide a flow of 5 cfs below the southern section of the Jay dam during low flow high temperature periods to benefit water quality downstream of the dam; (5) coordinate with the adjacent non-project waste treatment plant to continue annual toxins monitoring in conjunction with the State's dioxin program; (6) participate with the Maine Department of Inland Fisheries and Wildlife (MDIFW) in the annual stocking of up to 250 brown trout in the Androscoggin River below Livermore; (7) develop or enhance several recreation facilities related to the projects; (8) protect cultural resources during the term of the new licenses; and (9) acquire and protect lands to provide for enhanced public access, recreation, shoreline control and/or protection of aesthetics or natural resources. With the proposed action, the Riley-Jay-Livermore Project and Otis Project would have a total annual net benefit of approximately $461,000 and approximately $193,000, respectively (see Section 6.0 of this EA for details).

On September 22, 1997, the Applicants requested 401 Water Quality Certificates (WQC) from the Maine Department of Environmental Protection (MDEP), as required by the Clean Water Act (CWA). On May 5, 1998 the MDEP issued a single WQC for both the Riley-Jay-Livermore Project and the Otis Project. As outlined in section 2.2.3.2 and section 7, we make recommendations consistent with the terms of the WQC.

The U.S. Department of the Interior (Interior), by letter dated December 17, 1997, requested reservation of authority to prescribe fishways in the future, under Section 18 of the Federal Power Act (FPA). No resource agency has recommended upstream or downstream fish passage facilities for the proposed projects at this time. Staff recommends that a license article be included that reserves Interior's authority to prescribe fishways.

Alternatives to the proposed action include: 1) No Action Alternative (Status Quo); 2) Environmental Enhancements Without Redevelopment of the Livermore Powerhouse Alternative; 3) License Denial, Decommissioning, and Dam Removal Alternative; and 4) Commission Staff's Recommended Alternative (the proposed action with additional staff-recommended enhancement measures). In addition, resources which could be affected in a cumulative manner by the proposed action and non-hydro activities were reviewed and considered in the development of the proposed alternative.

The proposed action presented in the APEA represents a consensus agreement among the members of the Collaborative Team. While the Collaborative Team initially took different positions on a number of issues, they were able to reach concensus on all the major issues. Difficult issues included the Commission's view of the "No Action" alternative and dam decommissioning in the context of relicensing, the preference for detailed descriptions of historic conditions and a cumulative effects analysis, and conducting an energy conservation audit as a standard requirement for every environmental assessment. In this case, the energy audit conducted for these projects identified significant energy savings through economically viable conservation methods. These issues and others are discussed in this EA.

Based on our independent review and evaluation of the Riley-Jay-Livermore and Otis Projects, the proposed action, other agency and public recommendations, and the no-action alternative, we recommend issuing new licenses for the Riley-Jay-Livermore Project and the Otis Project, with additional staff-recommended enhancement measures. We select this option because: (1) our

recommended measures would protect and enhance geology and soils, water quality, fishery, recreational, land use and cultural resources; and (2) the net benefit of electric energy that would be generated annually from a renewable resource would continue to reduce the use of fossil-fueled, steam-electric generating plants, conserve nonrenewable energy resources, and reduce atmospheric pollution. Under staff's recommended alternative, the Riley-Jay-Livermore Project would generate about 43,467 MWH more annually than under existing conditions. Generation at the Otis Project would be about the same.

In addition to the Collaborative Team's proposals, Commission staff is recommending the following measures: (1) a final plan and construction schedule for the installation of the generating units at the Livermore station, (2) a final stream flow gaging and flow monitoring plan, (3) a final plan for the installation of dissolved oxygen and water temperature monitors, (4) a final plan and schedule for monitoring water quality, including D.O. concentrations, water temperature, and aquatic invertebrates, (5) an annual report which evaluates D.O., water temperature, and macroinvertebrate data and the ability of the projects to meet the state water quality standards, (6) reserving the Commission's authority to require changes in project operations and/or environmental enhancements needed to maintain the state water quality standards, (7) IP should continue to work with the MDIFW and FWS to re-establish a cold water, put-grow-take, brown trout fishery downstream of the Livermore project and, after 5 years, prepare a report which assesses the success of stocking brown trout downstream of the Livermore Project, (8) reserving the Commission's authority to require fishways as prescribed by the Secretary of the Interior, and (9) implementing the provisions of a Programmatic Agreement to protect National Register-eligible archaeological sites. These measures are discussed in section 7 of this EA.

Under the provisions of Section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations of Federal and state fish and wildlife resource agencies submitted to "adequately and equitably protect, mitigate damages to, and enhance, fish and wildlife (including spawning grounds and habitat)" affected by the project. Recommended terms or conditions filed by fish and wildlife agencies in response to the Commission's public notice issued on October 14, 1997, are discussed in section 8. In this EA, we have addressed the concerns of the Federal and state fish

and wildlife agencies and made recommendations consistent with those of the agencies. Therefore, there is no inconsistency with Section 10(j) of the FPA. In addition, our recommendations are consistent with that of the Collaborative Team.

Based on our independent environmental analysis, we conclude in this EA that issuing new licenses for the Riley-Jay-Livermore Project and Otis Project would not constitute a major Federal action significantly affecting the quality of the human environment.

INTRODUCTION

The Riley-Jay-Livermore Project (FERC No. 2375) is an existing, licensed hydroelectric facility owned and operated by International Paper Company. The project is located on the Androscoggin River in the western portion of central Maine within the village of Riley and the towns of Canton, Jay, Livermore, and Livermore Falls at the junction of Franklin, Androscoggin, and Oxford Counties. The project includes three developments: Riley, Jay, and Livermore. Situated between the Jay and Livermore developments is the Otis Hydroelectric Project (FERC No. 8277), owned and operated by the Otis Hydroelectric Company (OHC).

Section 102(2) of the National Environmental Policy Act(NEPA)1/ requires that all Federal agencies give appropriate consideration to environmental resources in the decision-making process, and provide a detailed statement on any major actions significantly affecting the quality of the human environment. On April 9, 1998, the Commission issued a Notice of Availability of Draft Environmental Assessment and Notice of Commission Staff Meeting. The Commission Staff meeting was held on May 6, 1998, in Augusta, Maine to discuss the draft EA. All timely-filed comment letters were reviewed by the staff (see Appendix A for a list of comment letters and staff responses). All issues discussed at the May 6th meeting, and written comments received in response to the Commission's notice, are addressed in this Final EA.

1/ National Environmental Policy Act of 1969, as amended.

1. APPLICATION

On October 25, 1997, IP and OHC filed separate applications for new licenses for the existing Riley-Jay-Livermore and Otis Projects, respectively. As part of each of those applications, and in place of the Exhibit E required in traditional applications, IP and OHC (Applicants) jointly filed one Applicant Prepared Environmental Assessment (APEA) which addresses all environmental issues relating to the projects.

Section 2403(b) of the Energy Policy Act of 1992 allows an applicant to file an environmental assessment, pursuant to NEPA, with its application for license. Consistent with NEPA and the Energy Policy Act of 1992, and as part of the collaborative process, IP and OHC have filed an Applicant Prepared Environmental Assessment (APEA) for the Riley-Jay-Livermore and Otis Projects. A list of studies conducted in support of the APEA is contained in Appendix B of the APEA. Copies of the Applicants' APEA and associated studies are available for review in the Commission's Public Reference Room and at IP's offices in Jay, Maine.

Since September of 1994, members of a Collaborative Team, consisting of the Applicants, state and Federal resource agencies, and NGOs have met regularly to address resource concerns, assist and guide the Applicants in completing a timely relicensing process, and to develop an enhancement package that protects and improves the natural and human environment by balancing the concerns of the public, regulatory agencies, and the Applicants. The preferred alternative in the APEA represents a consensus among the Collaborative Team members on operational and environmental enhancement measures needed at the proposed projects.

2. PURPOSE AND NEED FOR ACTION

2.1 Purpose of Action

The purpose of the proposed Federal action is the timely relicensing of the Riley-Jay-Livermore and Otis Projects in order to provide a reliable source of renewable energy that will achieve the protection and enhancement of the natural and human environment by balancing the interests of the public, regulatory agencies, and the Applicants.

The Federal Energy Regulatory Commission (Commission), under the authority of the Federal Power Act (FPA), may issue licenses, with terms up to 50 years, for the construction, operation, and maintenance of non-Federal hydroelectric projects. If that the Federal government does not take over either or both of the projects pursuant to Section 14 of the FPA, the Commission can, upon expiration of the existing license, issue a new license to either or both of the existing licensees "upon such terms and conditions as may be authorized or required under the then existing laws and regulations, or to issue a new license under said terms and conditions to a new licensee." Should the Federal government not exercise any of the above actions, the Commission shall issue annual licenses to the existing licensee "until the property is taken over or a new license is issued." The Commission may also deny a license at the time of relicensing if it is determined that no license can be fashioned that will meet the statutory standards. This could result in project retirement and/or removal.

Under Section 10(a)(1) of the FPA, for any license issued, the Commission must determine that the project as licensed will be best adapted to a comprehensive plan for improving or developing the waterway. In addition to the power and developmental purposes for which licenses are issued, The Commission must also give equal consideration to the purposes of (1) energy conservation; (2) protection of, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat); (3) other beneficial public uses, including flood control, water supply, and recreation; and (4) the preservation of other aspects of environmental quality. This EA reflects the above considerations. The EA also makes recommendations to the Commission on whether to issue licenses, and if so, the terms and conditions to include in any licenses issued.

2.2 Need for Action

This section discusses the Applicants' need for hydroelectricity as well as the need to balance competing resources for the protection and improvement of the natural and human environment.

2.2.1 Applicants' Need for Hydroelectricity

The projects provide IP with a reliable and stable source of power to help meet the energy demands of the pulp and paper manufacturing processes at the Androscoggin Mill. The projects together currently provide approximately 111,828 MWH of energy (*i.e.*, 13% of the mill's energy requirements). The power generated by the projects is integrated with the energy produced at the mill (*i.e.*, steam turbines) and power purchased from Central Maine Power Company (CMP). The Riley-Jay-Livermore Project currently provides approximately 7% of the total mill energy on an average basis, while the Otis Project contributes almost 6% toward that requirement.

While the energy requirements of the mill are increasing (*e.g.*, additional energy requirements associated with improved paper quality), it is expected that the Riley-Jay-Livermore Project, once redeveloped, and the Otis Project will provide approximately 155,300 MWH of energy (*i.e.*, 11% and 5% of the energy requirements of the mill, respectively). With the redevelopment and other environmental enhancements outlined in the Proposed Alternative (see Section 3.3), the Applicants each requested a term of new licenses of 50 years.

The projects are located in the New England Power Pool (NEPOOL) subregion of the Northeast Power Coordination Council, Regional Electric Reliability Council region. NEPOOL forecasts an annual decrease in planned capacity of 0.5% during the summer months and 0.3% during the winter months for the 1995 to 2004 planning period. However, an average annual increase in peak capacity demand of 1.1% during the summer months and 1.3 during the winter months is expected to occur during this same period. These growth rate projections support the finding in Section 6.0 of a long-term need for electricity generated by the Riley-Jay-Livermore and Otis Projects.

2.2.2 Other Needs

As a result of public scoping and the collaborative process, the following additional issues related to the Androscoggin River in the vicinity of the projects have been identified and studied.

Pursuant to Section 10 of the FPA, each of these issues has been considered when balancing the Applicants' need for hydroelectric power with other competing resources. As noted in Section 2.2.3 below, there are specific legislated and regulatory requirements with which the Applicants must comply. Other needs of the public and the Applicants identified by the scoping and collaborative process will be considered equally and implemented based on relative importance and to the extent that they do not conflict with these other specific legislated and regulatory requirements, such as Section 401 of the Clean Water Act and Section 7 of the Endangered Species Act. Regulatory requirements to be met and needs of the public considered include the following:

a. Protection and enhancement of aquatic and riparian habitats.

b. Restoration of salmonid fisheries, including Atlantic salmon.

c. Protection and enhancement of existing fisheries for smallmouth bass and other non-salmonid fisheries, including American eels.

d. Within the confines of this regulatory process, reduction of toxin levels in fish that inhabit project waters.

e. Protection and enhancement of water quality.

f. Protection of significant archaeological resources to prevent any adverse effects of existing project operation and maintenance.

g. Protection and enhancement of existing scenic and aesthetic characteristics of the project area.

h. Protection and enhancement of recreation opportunities, including public access to projects lands and waters.

i. Within the confines of this regulatory process, reduction of energy demand through conservation and energy efficiency measures.

j. Continuation of safe operation of the projects, including use of flood control measures.

2.2.3 Mandatory Requirements

The following mandatory requirements, and any terms or conditions that have been issued as part of these requirements,

have been considered for any and all alternatives included as part of the relicensing of the projects (see Section 3 for a description of alternatives considered).

2.2.3.1 Federal Power Act - Section 18 Fishway Prescription

Section 18 of the FPA states that the Commission shall require such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior as appropriate. Interior has not prescribed, nor has any resource agency recommended upstream or downstream fish passage facilities for the Riley-Jay-Livermore or Otis Projects at this time. Interior, by letter dated December 17, 1997, requested reservation of authority to prescribe fishways in the future, under Section 18 of the Federal Power Act.

We recognize that future fish passage needs and management objectives cannot always be predicted at the time of license issuance. Section 18 of the FPA provides the Secretary of the Interior and Secretary of Commerce the authority to prescribe fishways. Although fishways may not be prescribed by Interior or Commerce at the time of project licensing, upon receiving a specific request from Interior or Commerce, it is appropriate for the Commission to include a license article which reserves their prescription authority when so requested.2/ Therefore, staff recommends that a license article be included which reserves Interior's and Commerce's authority to prescribe fishways.

2.2.3.2 Clean Water Act - 401 Water Quality Certification

Section 401(a)(1) of the Federal Clean Water Act (CWA) requires an applicant for a Federal license or permit for any activity that may result in a discharge into navigable waters of the U.S. to provide to the licensing or permitting agency a certification from the state in which the discharge originates that such discharge will comply with certain sections of the CWA. A state Water Quality Certification (WQC), or waiver of this certification, is a prerequisite for obtaining a license from the Commission.

By letters dated September 22, 1997, the Applicants requested Section 401 Water Quality Certificates from the MDEP. On May 5, 1998 the MDEP issued a single WQC for both the Riley-Jay-Livermore Project and the Otis Project with 19 conditions.

2/ Lynchburg Hydro Associates, 39 FERC ¶ 61,079 (1987).

These conditions address the following issues: operating the projects in a run-of-river mode, providing flow releases at the Jay and Livermore developments, monitoring dissolved oxygen and water temperature, flashboard installation, fish passage facilities, establishing a brown trout fishery, reducing effluent limits at the IP mills to reduce total suspended solids, monitoring macroinvertebrate communities, analyzing fish samples for PCB's and mercury, constructing and maintaining recreation and access facilities, controlling erosion and sedimentation during the upgrade of Livermore, avoiding contact of concrete with water, solid waste disposal, and complying with and obtaining the proper permits, as needed.

As discussed in section 2.2.3.2 and section 7, we make recommendations consistent with all the terms of the WQC.

2.2.3.3 National Historic Preservation Act (Section 106)

Section 106 of the National Historic Preservation Act requires that Federal agencies consider what effects their actions, and actions they may assist, permit, or license, may have on historic properties, and that they give the Advisory Council on Historic Preservation a "reasonable opportunity to comment" on such actions. Section 106 applies to properties that have been listed in the National Register of Historic Places (National Register), properties that have been determined to be eligible for inclusion in the Register, and properties that may be eligible but have not yet been evaluated.

By letters dated March 15, 1996 and November 13, 1996, the Maine Historic Preservation Commission (MHPC) determined that above ground properties within the boundaries of the projects are not eligible for nomination to the National Register due to the substantial loss of historic integrity of several features.

Issuing licenses for the Riley-Jay-Livermore Project and the Otis Project could adversely affect the archaeological sites eligible for listing in the National Register. Adverse effects can be taken into account by executing a Programmatic Agreement (see section 5.3.10.2).

2.2.3.4 Coastal Zone Management Act

The Maine State Planning Office (MSPO) is responsible for reviewing the projects for consistency with the state's Coastal Management Program pursuant to Section 930.54 of the Coastal Zone Management Act (CZMA) of 1972, as amended. The MSPO has not yet defined a geographic area for Federally licensed activities which

are outside of the coastal zone but could potentially affect the coastal zone. The projects are located between river mile 65.3 and 53.25 of the Androscoggin River, well upstream from the coastal area. The relicensing of the projects will not affect coastal resources subject to the requirements of the CZMA (Todd Burrowes, MSPO, Coastal management Program, phone memo dated October 4, 1996). Our assessment is that no coastal zone consistency certification is needed for this project.

2.2.3.5 Federal Clean Water Act (Section 404)

Section 404 of the Federal Clean Water Act (CWA) authorizes the U.S. Army Corps of Engineers (ACOE) to regulate the discharge of dredged or fill material into the waters (including wetlands) of the U.S. IP will file an application for a Department of the Army Permit which includes all information, including fill/impact areas, as required by the Corps. The ACOE New England Division's Maine field office reviews Maine applications. Impacts regulated under Section 404 for the projects include the proposed placement of fill below the mean high water level of a navigable water for recreation improvements (*e.g.* boat launches), installation of cofferdams and the potential disturbance of approximately 0.4 acre of shrub dominated wetlands adjacent to navigable waters for improvements to the Livermore facilities. If the proposed impact areas indicate that an Individual Permit Application is required, as outlined under the Programmatic General Permit (PGP) for the State of Maine, an application for Individual Permit will be prepared by IP and submitted directly to the ACOE for review.

3. PROPOSED ACTION AND ALTERNATIVES

3.1 Description of Existing Facilities

The projects are located between river miles 65.3 and 53.25 on the Androscoggin River in the western portion of central Maine (see Figure 1). Operation of the projects is coordinated with the extensive storage systems located in the headwaters of the Androscoggin River. Inflow to the projects is essentially equal to the regulated river flow released by the upstream storage system, generally at least 1,550 cubic feet per second (cfs), plus inflow from the drainage area (approximately 2,421 sq. mi.). Below is a description of existing facilities at each project. A more detailed description of the existing project facilities is contained in Exhibit A of the applications for new licenses. All elevations in this document are based on U.S. Geological Survey (USGS) datum unless stated otherwise.

3.1.1 Riley-Jay-Livermore Project

The Riley-Jay-Livermore Project consists of three separate developments: Riley, Jay, and Livermore (see Figure 2). The project has a total installed capacity of 18,725 kilowatts (KW) and an average annual generation of approximately 62,272 MWH. All three developments of the Riley-Jay-Livermore Project, and the Otis Project, are located in series along an approximately 12 mile-long reach of the Androscoggin River. Of the four developments, only the Livermore and Jay developments contain bypassed reaches (1,600 ft and 131 ft, respectively).

The Riley development, located furthest upstream (dam at river mile 58.0), consists of the following principal features: *(1)* a 19.2-foot-high by 757-foot-long, L-shaped dam constructed of rock-filled timber cribbing, with (a) two contiguous spillway sections totaling 649 ft in length and topped with 48-inch-high flashboards, and (b) a 108-foot-long forebay intake structure containing ten 8-foot-wide by 16-foot-high headgates; *(2)* a 7.3-mile-long impoundment with a surface area of approximately 578 acres at the normal high water elevation of 374.92 feet, and a gross storage capacity of approximately 2,000 acre-feet; *(3)* a triangular-shaped forebay which is located downstream of the forebay intake structure and adjacent to the powerhouse intake; *(4)* a powerhouse intake containing six timber gates, each 15.7-foot-wide by 16-foot-high; *(5)* a powerhouse measuring 236-foot-long by 100-foot-wide, equipped with six identical horizontal shaft generating units (turbines and generators) rated at 1.3 MW each

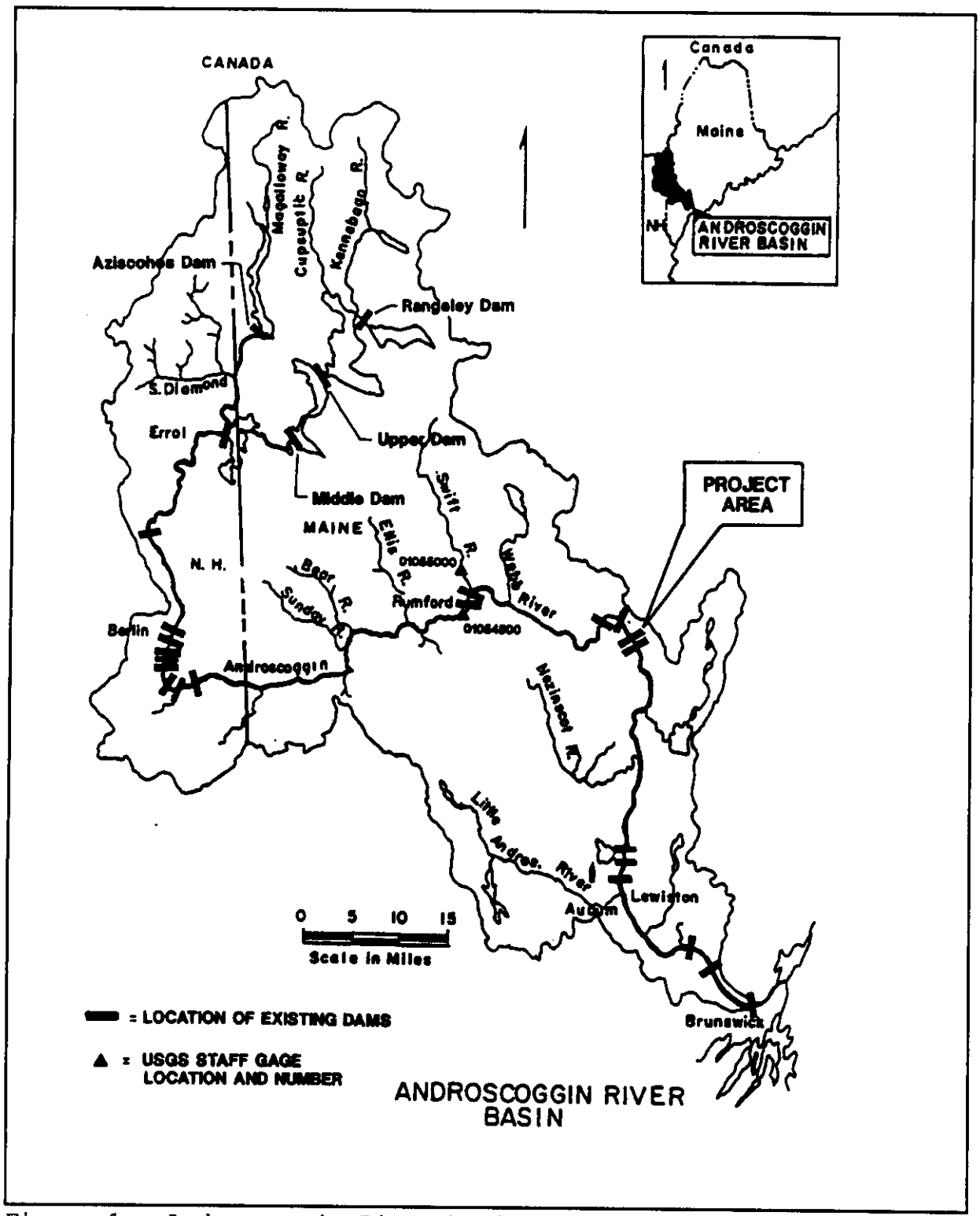

Figure 1. Androscoggin River basin and Project Area

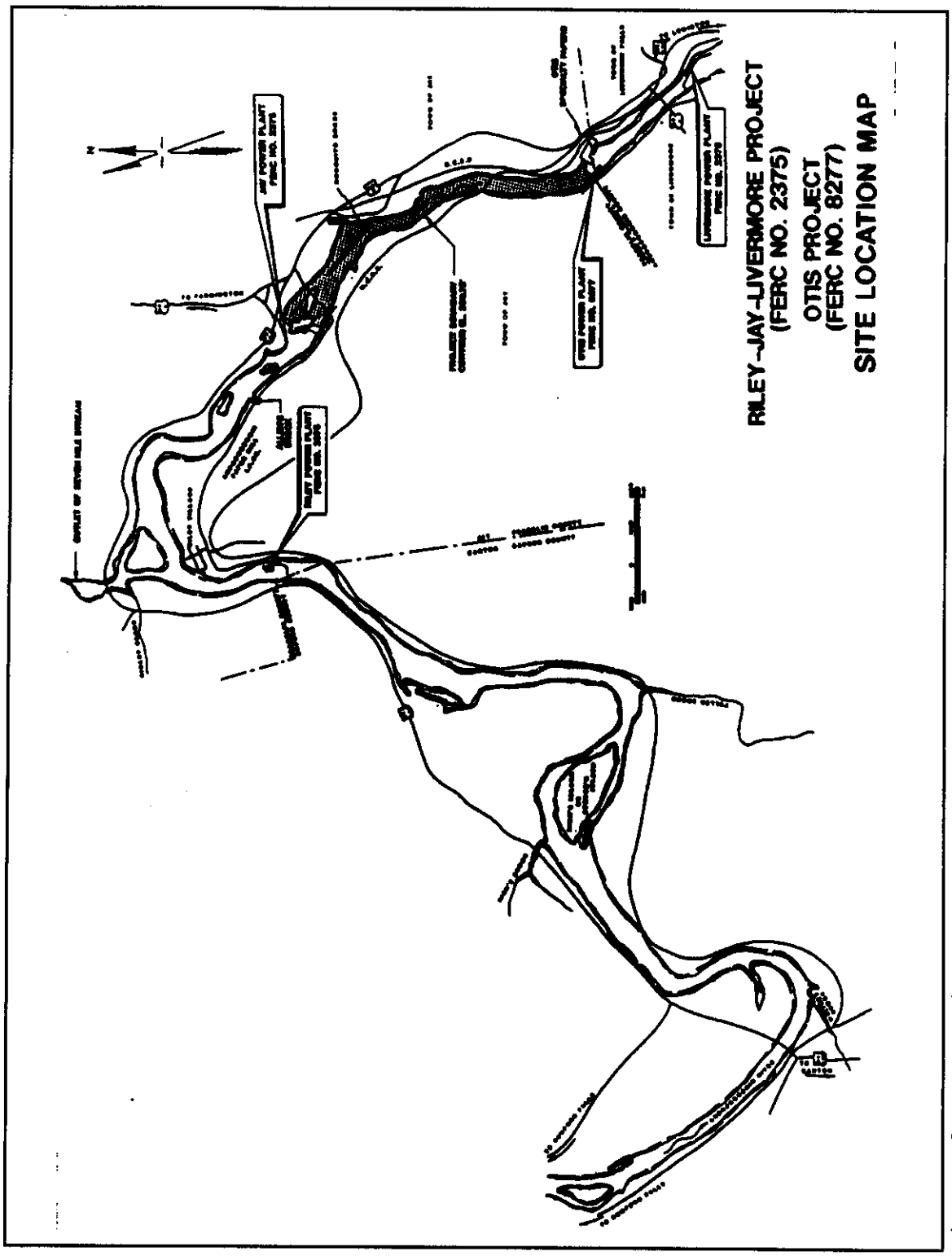

Figure 2. Location of Riley-Jay-Livermore Project and Otis Projects on the Androscoggin River.

and operate at 20 feet of head for a total rated installed capacity of 7.8 MW and hydraulic capacity of about 5,556 cfs; and *(6)* a substation containing a 2.3-13.8-kilovolt (KV) step-up transformer connected to a one mile-long 13.8-KV transmission line that supplies power to the Androscoggin Mill.

The Jay development is situated 1.5 miles downstream of the Riley development at river mile 56.5 and consists of the following principal features: *(1)* a 893-foot-long dam comprised of three non-contiguous sections separated by two island areas with (a) a 319-foot-long western spillway section constructed of concrete and topped with 32-inch-high flashboards, (b) a concrete center section approximately 150 feet in length, (c) a 277-foot-long concrete spillway section topped with 32-inch-high flashboards that abuts the powerhouse intake, and (d) a 150-foot-long by 37-foot-wide powerhouse intake containing six 21-foot-wide timber gates that control flow to six identical horizontal shaft turbines with maximum and minimum hydraulic capacities of 550 cfs and 200 cfs, respectively, for a total rated hydraulic capacity of 3,300 cfs; *(2)* a 1.5-mile-long impoundment with a surface area of approximately 206 acres at the normal high water elevation of 354.0 feet, and gross storage capacity of about 1,800 acre-ft; *(3)* a forebay that lies just upstream of the easternmost section of the dam and extends northerly about 320 feet along the east bank of the river; *(4)* a 32-foot-wide by 147-foot-long powerhouse containing six generator units with a total installed capacity of 3,125 KW and hydraulic capacity of 3,300 cfs; and *(5)* a substation containing a single phase, 4.16-13.8-KV step-up transformer connected to two 6,000-foot-long, 13.8 KV transmission lines.

The Livermore development, located downstream of the Jay and Otis developments at river mile 53.25, consists of the following principal features: *(1)* a 849-foot-long concrete gravity dam comprised of two contiguous spillway sections totaling 599 feet in length with 28-inch-high flashboards, forming an L-shaped structure that abuts the forebay intake structure, and a 250-foot-long forebay intake structure containing ten steel headgates measuring 9 feet wide by 20.7 feet high; *(2)* a 0.75-mile-long impoundment with an estimated surface area of 46 acres at the normal high water elevation of 312.6 feet and gross storage capacity of approximately 300 acre-feet; *(3)* a forebay measuring approximately 185 feet wide by 594 feet long; *(4)* a 156-foot-long powerhouse intake structure containing eight timber gates, each 13.2 feet wide by 13.0 feet high; *(5)* a 157-foot-long by 88-foot-wide powerhouse containing eight identical turbines with maximum and minimum hydraulic capacities of 432 cfs and 100 cfs,

respectively, for a total rated hydraulic capacity of 3,456 cfs and eight generators with a total installed capacity of 8.165 MW (the effective installed capacity is 7.8 MW due to limitations of the turbines); and *(6)* a substation containing a 2.3-13.8 KV step-up transformer that supplies power to the Androscoggin Mill via a 3.2-mile-long, 13.8-KV transmission line.

3.1.2 Otis Project

The Otis Project is located at river mile 54.0, approximately 2.5 miles downstream of the Jay development and 0.75 mile upstream of the Livermore development (see Figure 2). The project has a total installed capacity of 10,350 KW and an average annual generation of approximately 49,556 MWH. The Otis Project includes: *(1)* a dam comprised of two contiguous spillway sections totaling 577 feet in length (the east section being 198 feet in length and topped by 2.21-foot-high flashboards and the west section being 379 feet in length and topped by 2-foot-high flashboards) and a 189-foot-long concrete non-overflow section; *(2)* a 2.5-mile-long impoundment with an estimated surface area of 115 acres at the normal high water elevation of 339.5 feet; *(3)* a 95-foot-long forebay wall and spillway section extending at right angles from the dam to the powerhouse intake; *(4)* a 43-foot-wide by 80-foot-long powerhouse intake that contains two 20-foot-wide by 20-foot-high headgates; *(5)* a powerhouse, measuring 70 feet wide by 86.5 feet long, contains two identical 5.175-MW generating units (turbines and generators) that operate at 26 feet of head for a total hydraulic capacity of 6,000 cfs; and *(6)* a substation containing a three-phase, 4.16-13.8-KV step-up transformer connected to a three mile-long, 13.8-KV transmission line which supplies power to the Androscoggin Mill.

3.2 Existing Operation

The Androscoggin River is primarily regulated by the upstream storage system located at its headwaters. There are five storage facilities located in the upper basin area which control flows from 1,045 square miles of drainage. Four of the storage facilities are located upstream of and feed into Umbagog Lake at the Errol Project (FERC No. 3133) via the Rapid and Magalloway Rivers (see Figure 1). These include Rangeley Lake, Mooselookmeguntic Lake (Upper Dam) and the Richardson Lakes (Middle Dam) on the Rapid River and the Aziscohos Project on the Magalloway River. The Mooselookmeguntic Lake and Richardson Lakes are operated by the Union Water Power Company (UWPC). The Aziscohos Project is owned by the Androscoggin Reservoir Company and operated by UWPC. Based upon a recent Commission order (73 FERC ¶61,296), it was determined that these facilities are

operated for flood storage and to maintain relatively consistent flows in the Androscoggin River throughout the year. In the same order, The Commission determined that the Rangeley dam (*i.e.*, Rangeley Lake), which is operated by UWPC, impounds only a small amount of the water in the river system, is located furthermost upstream and therefore, does not significantly affect downstream flows and generation.

Flows from the upstream storage system are controlled to provide as uniform and reliable a flow as possible on an annual basis from the Errol Project dam (see Exhibit B of the license applications for additional discussion of the non-project storage system). Due to the large storage capacity of the non-project upstream storage system (except Rangeley), the majority of the high flows can be stored and released for relatively consistent use throughout the year. Under these operations, spring flooding is reduced in some locations and summer and winter flows are more consistent and reliable. These operations provide beneficial flows to downstream users including municipal, hydroelectric and industrial uses.

In accordance with the 1909 operating agreement and the current Androscoggin River Headwater Benefits Agreement 3/, UWPC tries to maintain a target flow in the summer months of at least 1,550 cfs at Berlin, New Hampshire. All of the twenty-one dams below the Errol Project, including the proposed projects, are operated in a run-of-river mode except for the Gulf Island dam (FERC No. 2283), located approximately 25 miles downstream of the Livermore dam, which is operated in a peaking mode.

Operation of the Riley-Jay-Livermore and Otis Projects has been in run-of-river mode, such that inflow equals outflow, except during flashboard replacement. The projects' impoundments do not contain sufficient storage capability to significantly influence river flows. Each of the four developments is required, by Article 39 of their existing Commission license, to pass a minimum instantaneous flow of 1,245 cfs or inflow minus process-co oling water withdrawn, whichever is less. This minimum flow is based on the Aquatic Base Flow (ABF, equivalent

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3/ Central Maine Power Company, 59 FERC ¶ 62,372 (1992). In a 1909 agreement between Union Water Power Company, International Paper Company, Berlin Mills Company, and the Rumford Falls Power Company, Union Water Power Company agreed to release through its dam on the Androscoggin River at Errol, New Hampshire a minimum flow of 1,550 cfs. The 1909 Agreement also established a method for calculating headwater benefits received by downstream projects. The Commission, by order dated June 30, 1992, approved the headwater benefits agreement between parties for the Androscoggin River Basin.

to 0.5 cubic ft per second per square mile of drainage area) as determined by the USFWS.

Operation of the projects during adverse, mean, and high water years does not change significantly. The regulated 7Q10 flow for both the projects is 1,730 cfs. During adverse water years, the units are operated, as they would be during a normal year, to utilize available inflow up to the hydraulic capacity of the units. During normal water years, the projects are operated to utilize available inflow while maintaining the impoundment levels at their respective normal pond elevations (Riley - 374.92 ft, Jay - 354.0 ft, Otis - 339.5 ft, Livermore - 312.6ft). Automatic pond-level sensors are installed at the Riley, Otis, and Livermore developments. Any flow received into the impoundments that is in excess of station turbine capacity is spilled at the respective dams.

Flashboards are kept on throughout the year but may fail during high flows typical of spring run-off (usually in March or April). The flashboards are designed to automatically fail when overtopped by approximately 24 inches of water, or a flow of approximately 11,900 cfs. Although flashboard failure results in a reduction of head, it provides an increase in flood water passage. Once flows subside to a level within the hydraulic capacity of the turbines (typically late-April to mid-May), the impoundments are drawn down a few inches (not more than 12 inches) below the dam crest for the replacement of flashboards. Flashboard replacement typically occurs first at the Riley dam, followed by Jay and Otis, then Livermore. Once the flashboards are reinstalled, inflow is used to refill the impoundment to its normal high water elevation, while maintaining a minimum flow of 1,245 cfs below the dam. With overtopping, failure and replacement of the flashboards, the projects impoundments have the short-term potential of undergoing 7 ft (Riley), 5.7 ft (Jay), 5.2 ft (Otis) and 5.3 ft (Livermore) of fluctuation. The impacts associated with operation of the projects on each of the environmental resources are assessed in Section 5.0 of this document.

3.3 Proposed Action

3.3.1 Proposed Modifications to Operations and Facilities

With the exceptions noted in Section 3.3.2 below, the Applicants propose that the projects continue to operate as run-of-river facilities. The Applicants conducted numerous assessments related to operational improvements (*e.g.*, inflatable flashboards) and capacity increases at the projects (Gomez and

Sullivan, 1995a; KA, 1995a). The results of these investigations are summarized in Exhibit H of the respective license applications. These studies show that the generating units at Riley, Jay, and Otis stations are in good operable condition, and no capacity additions are proposed for these stations.

In order to utilize more of the generation potential, IP proposes to redevelop the generating units and increase generation at the Livermore station. The existing 8 turbine and generator units will be replaced by 6 units, 3 new units and 3 refurbished units. The 8 existing units are horizontal Kaplans, with 7.8 MW total installed capacity, 3,456 cfs maximum hydraulic capacity, and 100 cfs minimum hydraulic capacity. The 6 proposed turbine and generator units are as follows:

Unit 1: new vertical Kaplan; 1.32 MW; 510 cfs maximum hydraulic capacity
Units 2, 3: new horizontal Kaplan; 4.12 MW; 1,800 cfs maximum hydraulic capacity
Units 6, 7, 8: refurbished Kaplans; 937 KW, 950 KW, and 1,000 KW, respectively; 432 cfs maximum hydraulic capacity.

The proposed redevelopment of the generating units would increase the Livermore station capacity from 7.8 MW to 12.26 MW, increase annual generation from 23,133 MWH to 66,600 MWH, and increase hydraulic capacity from 3,456 cfs to 5,400 cfs. Overall, this would increase capacity at the Riley-Jay-Livermore developments to 23.185 MW and its annual generation to approximately 105,739 MWH. Redevelopment would take place within the existing footprint of the existing powerhouse. Installation would begin about 1 year after issuance of a new license and require 3 more years to complete.

Installation of the new turbines would also change the way flows are distributed. One of the redeveloped turbines, a vertical Kaplan unit, would be designated a bypass unit, discharging flows into the lower portion of the bypassed reach of the river. This turbine could provide up to 510 cfs into the bypassed reach to enhance aquatic habitat.

3.3.2 Proposed Non-Power Improvement Measures

3.3.2.1 Water Quality Resources

a. Continue to operate the projects in a run-of-river mode such that inflow equals outflow and impoundment fluctuations, resulting from normal operation of the projects, is 12-inches or less.

b. During atypical periods of operation (*e.g.*, refill of impoundments following replacement of the flashboards, or other occurrences required to maintain water quality standards), provide a minimum flow of 1,245 cfs downstream, or inflow, minus process-cooling water withdrawn, whichever is less.

c. IP will install a D.O. and water temperature monitor in the Jay impoundment upstream of the Jay powerhouse intake structure to monitor water quality conditions4/. D.O. would be monitored from June 15 through September 15 each year. Should the D.O. and temperature readings approach the minimum state standards (instantaneous D.O. levels not less than 5 mg/l or 60% of saturation, which ever is higher, and monthly average D.O. levels not less than 6.5 mg/l), IP will take action to maintain the state standard for D.O. Water quality conditions will be deemed to be approaching minimum standards when the monthly average D.O. reaches 6.6 mg/l at the monitor, or the daily D.O. reaches a point 0.1 mg/l or less above the D.O. standard applicable at that river temperature.

d. With assistance of the Collaborative Team, IP will take appropriate actions to ensure that the Class C aquatic life standard of the state water quality standards are met in the projects' impoundments. IP, as part of its Town of Jay permit, is proposing to implement improvements at its wastewater treatment plant to reduce the discharge of solids, monitor the effectiveness of this measure for five years, and make further adjustments as part of an operational plan to meet the Class C standards. Macroinvertebrate studies conducted from 1995 to 1996

4/ Based upon the requirements of the existing Town of Jay Water Permit, IP (the permittee of the waste discharge facility) is also monitoring D.O. at the Town of Jay gage, located in the Jay impoundment, daily during the period of June 15 to September 15. If the Town of Jay monitor records a D.O. value of 5.2 parts per million (ppm) or less, IP institutes a manual monitoring program to verify the readings from the Town monitor. This monitoring program consists of IP personnel checking the Jay monitor data daily and measuring D.O./temperature in the vicinity of the Town's probe. If the Town's and IP's data show significant differences, IP notifies the Town code enforcement officer to initiate adjustments and recalibration of the Town monitor. However, if the readings from the Town of Jay monitor are verified or the IP monitoring data shows lower D.O., IP continues its monitoring of the Town monitor until readings of 5.1 ppm occur. If the readings reach 5.1 ppm, IP implements temporary operational adjustments from the Riley development so that D.O. levels can be improved and applicable D.O. standards maintained.

provided the data needed to address this issue5/. However, flow conditions during 1995 and 1996 were atypical. The Applicants conducted additional studies during the summer of 1997 to assess the impact of two variables on the macroinvertebrate community. IP is also conducting a separate macroinvertebrate monitoring program for its existing Town of Jay Water Permit6/.

e. Continue annual toxics monitoring (i.e., furans, and dioxin concentrations in fish) in conjunction with the State's Dioxin and Surface Water Ambient Toxics Program.

f. Within the next flashboard replacement cycle following issuance of the new license, provide a minimum flow of 5 cfs from the southern section of the Jay dam from June 15 to September 15 for the purpose of maintaining D.O. levels, in the pool downstream of the southern segment of the Jay dam, in compliance with state Class C water quality standards. Should high flows prevent the replacement of flashboards until June (see bass spawning protection below), the minimum flow would not be released until the boards are reinstalled after July 15.

g. Within the next flashboard replacement cycle following issuance of a new license for Riley-Jay-Livermore, provide a minimum flow of 100 cfs in the upstream portion of the

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5/ As detailed in Section 5.3.2.1, the results of studies conducted in 1995 concluded that the macroinvertebrate community in the Riley and upstream end of the Jay impoundments attained standards and that the downstream end of the Jay impoundment, Otis and Livermore impoundments did not attain standards. The results of the 1996 follow-up study investigated the variables of flow, depth, solids discharge and light penetration on the macroinvertebrate community. The 1996 study concluded that due to higher than normal river flows and improved solids discharges from the waste discharge plant that the aquatic community in all impoundments attained standards. In addition, in the Otis and Livermore impoundments, a comparison of results for littoral zone samples with the standard MDEP mid-channel samples revealed that while the macroinvertebrate community differed between the two sites, there were no signs of community stress. The community differences at those sites is attributable to habitat and substrate differences.

6/ As part of its Water Permit with the Town of Jay, IP (the permittee for the waste discharge plant) contracts with a consultant with expertise in macroinvertebrate assessment, to monitor the macroinvertebrate community in accordance with state guidelines (see the Water Permit for specifics). The biologist reports the results of the macroinvertebrate analysis to IP, the Town of Jay, and the MDEP. Following the five year monitoring process, IP is going to review the results of the data collected, and consult with the Town of Jay and MDEP.

Livermore bypassed reach, from July 1 through September 30 and November 1 through April 30, to maintain compliance with state Class C water quality standards. From May 1 through June 30, and October 1 through October 31, the minimum flow for this segment would be increased to 150 cfs. This seasonal flow reflects compliance with D.O., aquatic life criteria, and use (*i.e.*, brown trout fishing in May, June, and October and bass fishing during the remaining months).

3.3.2.2 Fishery Resources

a. Provide the minimum flows, as discussed in the water resources section above, in the Livermore bypassed reach to improve habitat conditions and provide greater fishing opportunity.

b. Delay, until July 15, any reinstallation of flashboards on the Jay dam which may be scheduled during the bass spawning period (June) to avoid dewatering of eggs in the short bypassed reach immediately downstream of the dam.

c. Provide upstream and downstream fish passage facilities when the need for passage at the projects is identified and fish passage facilities are required by the Commission.

d. Continue to work cooperatively with the MDIFW and the USFWS to re-establish a cold water put-grow-take fishery in the Androscoggin River downstream of the Livermore development. The target is to stock up to 250 brown trout annually, for a period of five years, downstream from Livermore. After 5 years, IP would file a report with the Commission which includes an evaluation of the success of the stocking program in establishing a coldwater fishery, and any changes, including continuing, modifying, or ceasing stocking fish, as recommended by the MDIFW and USFWS.

3.3.2.3 Recreation Resources

a. Monitor and report findings of recreational use at the projects to comply with Commission regulations, currently every six years.

b. Maintain public signage and boater safety devices in accordance with Part 8 of Commission's regulations.

c. Implement recreational improvements in the area of the projects based on consultation with local communities and the Comprehensive Recreation Plan. In developing the

Comprehensive Recreation Plan for the projects, the Collaborative Team has determined that all improvements be made to support low levels of use and be designed to maintain the natural, rustic character of the surroundings. Below is a list of improvements identified by the Collaborative Team that would provide a variety of recreational opportunities that would be consistent with the project area and would meet expected future recreational needs:

i) Acquire sufficient land and construct a car-top boat launch to provide access for small boats to the river and the Riley impoundment that will also include signage and parking for vehicles. As part of the Form 80 process (see item a. above), IP will monitor the use at this new site. If this monitoring effort demonstrates that use of the site relative to its capacity is greater than 80% during peak weekend days (*e.g.*, summer weekend days associated with holidays), IP will start the process of consulting with the MDOC, the Towns of Canton and Jay, and MDIFW to determine whether additional modifications to the site are warranted or whether improvements to another site would meet the needs of the public and balance the impact on the environmental resources.

ii) Design and construct a canoe portage/take-out on the left side of the river at the Riley dam. This facility would consist of a landing and a series of portage trail improvements extending from the water's edge on the upstream side of the Riley dam to the existing dam access road, following the access road downstream to a point where the river can be accessed. Improvements to this site would also include relocating the gate to the access road to permit parking of a few vehicles and modification of the gate to permit recreationists to pass their canoes and themselves through the gate if they want to exit the river at this location.

iii) Improve the boat/canoe launch in the Jay impoundment on the right side of the river in the vicinity of the "Snoopy Tank". The improvements would consist of signage, stabilizing the existing embankment to permit launching of small boats, creation of a small parking area suitable for three vehicles, and signage indicating that there is additional parking along either shoulder of the River Road.

iv) Based on conditions of the site, including (1) removal by the Town of Jay of its salt pile, (2) the successful acquisition by IP of the right-of-way through the island, currently owned by the Town, and (3) IP's successful acquisition, or other appropriate arrangements, for the use and maintenance of the existing bridge to the island, currently owned by the Town: provide a summer day-use facility on Pine Island in the Jay impoundment with improvements to include a boat launch suitable to permit the launching of small boats downstream into the Otis impoundment, a small parking area sufficient to permit the parking of five vehicles without boat trailers, signage, porta-potties, picnic tables, a small play area, a barrier-free fishing dock, and trails.

v) Provide a walk-in angler access trail to the upper Livermore bypass after angling flows are established in the bypassed reach. This will include the addition of gravel to the existing shoulder of the road to permit the parking of three vehicles, and improvements to the existing trail that leads to the upper segment of the bypassed reach. Depending upon discussions with the landowner, improvements may also be made to the trail leading to the lower bypassed reach for use by kayakers utilizing the lower portion of the reach during spillage flows.

vi) Provide a flow gage in the Livermore bypassed reach that is visible from the shore to permit local kayakers to be knowledgeable of spillage flows into the bypassed reach during high flow events. IP would also install signage to the local kayakers indicating the potential dangers associated with kayaking below hydro projects, including flashboard failure and resulting debris.

vii) Improve the existing trail and carry-in boat/canoe launch immediately downstream of the Livermore development tailrace. Improvements to this site would include construction of a parking area suitable for four vehicles, clearing of a path from the Town road to the river, installation of a set of timber steps to access the river and shoreline protection to allow easy foot access to the waters' edge.

viii) Maintain access to the projects' impoundments via existing trails used by the general public. These trails include: the Multi-use Trail (an old railroad

bed which extends to Farmington approximately 13.5 miles in length), located along the northern side of the Otis impoundment; the adjacent fishing access trail located in the vicinity of Mosquito Brook (approximately 1,680 ft in length); and the informal hiking and fishing trail that extends from Route 140 to the Riley impoundment (approximately 700 ft in length).

3.3.2.4 Cultural Resources7/

Protect or recover three significant archaeological sites that could be adversely affected by operation and maintenance of the projects during the term of the new licenses.

3.3.2.5 Land Use8/

The projects' boundaries would be expanded to include lands necessary for public access (see Section 3.3.2.3 above), recreation, shoreline control and the protection of natural resources (see Section 5.3.8.1 for details).

3.3.3 Proposed Actions on Energy Conservation and Toxins Monitoring

At the request of the Collaborative Team, IP studied potential energy conservation measures and potential impacts of the dams on toxins during the relicensing process. The energy review evaluated the availability of energy conservation measures at IP's Androscoggin Mill. The toxic monitoring evaluated whether the presence of the project dams have any effect on toxins. The results of those studies are presented in Sections 5.3.2 and 6.1.

3.4 Alternatives to the Proposed Action

Sections 3.4.1, 3.4.2, 3.4.3, and 3.4.4 below, describe alternatives to the proposed action that are being considered in this proceeding. Details regarding the environmental and economic impacts of these alternatives are provided later in the

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7/ Separate from these license efforts, IP has entered into an agreement with the MHPC to address potential adverse impacts to archaeological resources during high flow conditions on lands located adjacent to the APE.

8/ The Applicants will be entering into a separate agreement with NGOs and other interested parties that will address land use, public access, shoreline control and the protection of natural resource on other non-project lands (see Section 5.3.8.3 for more detail).

document under Sections 5 and 6.

3.4.1 No Action Alternative (Status Quo)9/

The No Action Alternative would be to continue operating the projects as currently operated. No new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives. This alternative could be accomplished through the issuance of annual licenses until a licensing decision is made.

3.4.2 Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

Under this alternative the Riley, Jay and Otis developments would continue to operate and the non-power improvements outlined above for the Proposed Action would be implemented. The Livermore powerhouse would continue to be operated as a run-of river facility and annual improvements would be made as long as economically feasible. Once it became uneconomical to operate the Livermore powerhouse, the generator 1 eads would be pulled and all flow enterin g the impoundment would be passed over the dam. The dam would remain in place, but the existing 28-inch-high flashboards would be removed to provide increased head to the upstream Otis Project.

If the Livermore powerhouse ceases generation and fish passage facilities were required to meet the salmon restoration objectives for the Androscoggin River, appropriate modifications

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9/ The NGOs and some of the other members of the Collaborative Team, including some Federal agencies, disagree with the Commission's interpretation of the no action alternative and believe that no action should be defined as license denial, decommissioning, and dam removal. This position is based on, among other things, interpretations of the Commission regulations (pursuant to the FPA), court decisions interpreting the FPA (which define relicensing as the issuance of a "new license"), and CEQ's published guidance, which states that one interpretation of the no action alternative is intended to represent conditons without the project (CEQ, 40 Most Asked Questions Concerning CEQ's NEPA Regulations, 46 Fed. Reg. 18026 (March 23, 1981), as amended 51 Fed. Reg. 15618 (April 25, 1986).

Determining the "correct" definition for the "no action" alternative in a relicensing proceeding is in the Commission's view a non-issue. What matters is that all reasonable alternatives are considered, not how they are labeled. See Public Service Co. of New Hampshire, 68 FERC ¶ 61,177 at p. 61,866 (1994).

would be made. Additional modifications would be made to the dam, as necessary, in order to maintain safety requirements set forth by the Commission. All of the non-operational enhancements identified above under the Proposed Action would be implemented. Once the Livermore powerhouse was decommissioned, the flow into the existing Livermore bypassed reach would be governed by total flow in the river.

3.4.3 License Denial, Decommissioning, and Dam Removal Alternative 10/

Under this alternative each of the four dams would be removed and the impoundments converted to free-flowing river reaches. Where the intent of this alternative was to remove the dams and impounded segments behind them and to minimize the amount of capital dollars required for this option, this option included disabling the generating equipment but allowing the powerhouse structures themselves to remain standing.

This alternative would have the effect of changing approximately 12 miles of impounded water to a free-flowing river. The river would include several miles of riffles and rapids and at least one waterfall (Livermore Falls). Free-flowing river segments, with a waterfall and rapids, are unusual, particularly on the Androscoggin River.

This alternative would not, however, recreate pre-dam conditions because of significant flow regulation in the river's headwaters, changes in the substrate and morphology of the riverbed due to flow regulation, point and nonpoint source pollution, and alterations caused by land use practices in the watershed that have probably increased sediment load and water temperatures in the river.

10/ No agency or interested party has recommended decommissioning or dam removal, and in such cases, the Commission staff would normally treat dam removal in this EA as an "Alternative Considered but Eliminated from Detailed Study".

However, the Collaborative Team included an extensive discussion of this alternative in their APEA because they believe that license denial, decommissioning, and dam removal (dam removal) is a valid alternative warranting detailed analysis and discussion in this EA.

Therefore, in the interest of preserving the consensus between the Collaborative team members, we have included in this EA the Collaborative Team's detailed analysis of dam removal.

3.4.4 Commission Staff's Recommended Alternative

This alternative includes the Applicants' proposal with additional Commission staff recommended measures. It is presented in detail in Section 7 of this EA, Comprehensive Development and Recommended Alternative.

3.5 Other Alternatives Considered

3.5.1 Transfer of Project or Project Facilities

In the event that the Applicants' decide to transfer any of the projects or project facilities, the Commission would be required to complete an analysis to evaluate whether to approve or disapprove the proposed transfer. If determined necessary from the analysis, the Commission could investigate the financial capabilities of the transferee to ensure that the new company is able to carry out the terms of the existing license and any potential future licensing requirements.

We do not consider this a reasonable alternative in the circumstances of this case. No party has recommended a transfer of project and the Applicants have the financial resources necessary to comply with future Commission licensing requirements.

3.5.2 Project Retirement

This alternative would involve retaining the dam and disabling or removing equipment used to generate power. The project works would remain in place and could be used for historic or other purposes. This alternative would require the Commission to identify another governmental agency willing and able to assume regulatory control and supervision of the remaining facility. No agency has stepped forward to assume such responsibility. Because the projects are in good operable condition (or will be in the case of the Livermore development) and power supplied by the projects is needed, a source of replacement power would have to be identified. Under these circumstances, license denial is not considered to be a reasonable alternative, and we have no basis for recommending it.

3.5.3 Federal Takeover and Operation of the Projects

The alternative involving a Federal government takeover has been eliminated from further investigation. No person has suggested that Federal takeover would be appropriate or reasonable, and no Federal agency has expressed an interest in

operating the projects. Federal Government takeover of the projects would require further Congressional approval. While that fact alone would not preclude further consideration of this alternative, there is no evidence indicating that a Federal takeover should be recommended to Congress.

3.5.4 Issuing a Non-power License

A non-power license is a temporary license that the Commission could issue whenever it determines that another governmental agency should assume regulatory authority and supervision over the lands and facilities covered by the non-power license. Issuing a non-power license would not provide a long-term resolution of the issues presented. During the scoping process, no participant has sought a non-power license, and there is no basis for concluding that the projects should no longer be used to produce power; therefore, a non-power license is not a realistic alternative in these circumstances.

3.5.5 Maximize Power Values

This alternative would consist of the implementation of several equipment and operational changes at the projects, which were investigated under the Phase I scope of studies (GSE, 1995a). This alternative was dropped from further consideration due to insufficient economic return for the Applicants and the conflict with various environmental enhancements either being required to satisfy regulatory requirements or being suggested by members of the Collaborative Team to meet the desires of the public.

3.5.6 Maximize Non-power Values

This alternative consists of specific constraints on operations to maximize non-power values of each project and includes the non-power enhancements identified during scoping and in various study reports. Many of the non-power (environmental) enhancements identified during scoping and the study process have already been incorporated into the proposed action. In those cases where it was not possible to maximize or optimize the resource, a balance of public and the Applicants' needs has resulted in a proposed action that significantly enhances the resource. Therefore, the alternative to maximize non-power values was dropped from further consideration.

4. CONSULTATION

4.1 Consultation

The Applicants have coordinated their relicensing efforts with Commission staff and with members of a collaborative team consisting of representatives from resource agencies, NGOs, and the public (see Section 12 for a list of Collaborative Team members). The Collaborative Team adopted a Communications Protocol which outlines procedures for documenting consultation among parties and communications with Commission staff. The APEA approach required some modifications to the traditional relicensing and consultation process. Accordingly, the Applicants filed a request for waiver of the regulations that are inconsistent or duplicative with this coordinated process (see letter dated January 19, 1995). The Commission granted this request by letter dated April 27, 1995.

4.2 Comments and Interventions

The following entities commented on the license applications and APEA pursuant to the public notice requesting final terms and conditions, recommendations and prescriptions, issued by the Commission on October 14, 1997. All comments were considered during our analysis and preparation of this EA.

Commenting agencies and other entities	Date of Letter
U.S. Department of the Interior	12/17/97
U.S. Environmental Protection Agency	12/24/97

Interventions

The following entities filed a motion to intervene, but not in opposition, to the proceeding. We address all environmental concerns raised in the interventions in appropriate sections of this EA.

The Maine State Planning Office (MSPO) intervened by letter dated October 30, 1997. The USEPA intervened by letter dated December 15, 1997. The Town of Jay intervened by letter dated December 12, 1997. These agencies identified concerns regarding the 401 WQC and the measures needed to protect water quality. The Town of Jay also identified interest in a wider range of matters including, but not limited to, land use, aesthetics, fisheries, wildlife, recreation, and energy production (see comment letter from Town of Jay, dated May 7, 1998, in Appendix A).

The Conservation Law Foundation, Appalachian Mountain Club, and American Rivers intervened by letter filed with the Commission on December 15, 1997. These groups noted support of the license applications and APEA.

On April 9, 1998, the Commission issued a Notice of Availability of Draft Environmental Assessment and Notice of Commission Staff Meeting. The Commission Staff meeting was held on May 6, 1998, in Augusta, Maine to discuss the draft EA. The Town of Jay provided written comments on the draft EA in a letter dated May 8, 1998. These comments are addressed in Appendix A of this final EA.

The staff made minor changes to the draft EA to address issues discussed at the May 6th meeting (see meeting minutes dated May 6, 1998 for a summary of issues discussed). All members of the Collaborative Team generally supported the Commission's draft EA. Some Team members did note, however, that the Commission's draft EA did not retain all the elements of the APEA filed with the Commission. For example, parts of the "Affected Environment" section were reduced in length. Also, the "Unavoidable Adverse Effects" section in each resource area no longer used both natural and existing conditions as a baseline for determining adverse effects. While the Commission's draft EA did not follow the APEA on these issues, the staff noted that an assessment of natural and predevelopment conditions was retained in section 5, "Cummulative Impacts".

5. ENVIRONMENTAL ANALYSIS

5.1 Scope of Analysis

The following sections of this EA are organized first to provide a general understanding of the dynamics which have occurred historically along the Androscoggin River and those which are currently occurring, followed by the environmental analysis of projects resources. Specifically, Section 5.2 discusses, in geographic terms, each segment of the river basin separately to provide background information on how other actions under Federal and state review authority may have affected resources contained in the area of the projects. The background discussion, provided in Section 5.2, is for the purpose of establishing the relationship between those resources that currently exist in the area of the projects, to those existing and historic actions occurring elsewhere in the basin. The detailed analysis of existing projects' resources (Section 5.3) resulting from the action defined in Section 3.0 of this document, as well as a general discussion of natural and predevelopment resources, will follow this background discussion.

5.1.1 Project Effects Analysis

The purpose of scoping was to determine the scope of issues, alternatives, cumulatively affected resources and to identify the project's Area of Potential Effect (APE) or study area. The APE utilized in Section 5.3 is based upon the study area for each resource defined during the scoping process, and relates primarily to the area directly affected by the projects (KA, 1994; KA, 1995c). While the APE was expanded for some resources, it typically is defined as the area extending from the upstream extent of the Riley impoundment to a point 300 ft downstream of the Livermore development and extending 250 ft inland from either shoreline.

Scoping Document I (SDI) was distributed on December 8, 1994, to the Collaborative Team, and other Federal, state, and local agencies, NGOs and the public, to facilitate participation in the scoping process. Public notice of the scoping meetings were carried in several local newspapers. The Applicants and the Collaborative Team conducted scoping meetings and site visits on January 10, 1995, with The Commission staff participating.

The Applicants incorporated all comments made on SDI and any comments made during the agency and public scoping meetings into SDII, which was issued on May 12, 1995.

The analysis of specific resources focuses on how the action of issuing a new license for the continued operation of the projects may affect resources located in the APE. The analysis section for each resource discusses whether the APE was expanded to address a specific resource issue. In response to comments received during the scoping process, studies were undertaken within the APE to document present resource conditions and to assess impacts resulting from continued operation of the projects. Results of these studies are discussed in Section 5.3.

5.1.2 Cumulative Effects Analysis

Cumulative effects are the impacts on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR Section 1508.7). Individually small or other seemingly minor effects of past, present, and reasonably foreseeable future actions taken by several agencies or persons, when added together in space and time, may result in combined or cumulative effects that have significant environmental consequences. The cumulative effects discussion within each resource section in Section 5.3 summarizes how the licensing action, in combination with past and reasonably foreseeable future actions in the basin, may affect resources within and outside of the APE. A more detailed discussion may be found in LWA (1996).

In addition, these projects and the associated resources may be influenced differently by various actions expected to occur in portions of the basin. The assessment of impacts resulting from these actions have already been, or will be, the subject of separate EAs/EISs. It is not the intent of this EA to duplicate or anticipate the analyses presented in previous assessments, nor to conduct additional analysis of impacts that may be created by some of these projects or actions. Instead, this EA utilizes a common process known as "tiering" in which the information derived from other EAs/EISs are incorporated by reference.

The effects of other actions occurring in the basin relative to existing project resources, can be derived from the following EAs/EISs prepared by the Commission staff:

- EA for Pontook Project (FERC 1981)
- EA for Errol Project (FERC 1983)
- EA for Riverside Project(FERC 1992)
- FEIS for Upper Androscoggin River Basin Hydroelectric Projects (FERC 1993a)
- EA for Rumford Falls Project (FERC 1993b)
- FEIS for Lower Androscoggin River Basin Hydroelectric Projects (FERC 1996)

5.1.2.1 Geographic Scope

The geographic scope of the cumulative effects analysis is defined by the physical limits or natural boundaries of the proposed action's effects on specific resources. Because the proposed action may affect some of the resources differently, the geographic scope for each of the resources may vary. For each of the resources, the geographic scope of our cumulative analysis is contained within the Androscoggin River Basin.

5.1.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on each of the resources. The scope used to define each time period included in the analysis (past, present, and future) is identified below. The historical accounting of previous actions that have occurred in the APE and the basin are provided in Section 5.3 to provide background information on how the existing resources may have developed to their present condition and also to provide a model for use in establishing enhancement efforts. Based on the anticipated term of new licenses, the temporal scope will look 30 to 50 years into the future, concentrating on the effects on each of the resources from reasonably foreseeable future actions.

The review of past actions and effects is, by necessity, limited to the amount of available information for each resource. Existing information on environmental resources in the area of the projects and interviews with knowledgeable sources were utilized to assess the relative condition of various resources occurring in the basin during the periods 1600 and 1880 (LWA, 1996). The years 1600 and 1880 were used as benchmarks to collect available information from historic documents or historical accounts that directly or indirectly relate to flows, water quality, fisheries, wildlife, riparian vegetation, and aesthetics of the Androscoggin River. The year 1600 was selected as the time frame for characterizing natural conditions in the watershed prior to European settlement, while 1880 marks the beginning of industrial development in the area, immediately precedes the establishment and rapid growth of the pulp and paper industry in the Jay-Livermore area and is the date when at least one of the projects dams was completed in more or less its present configuration.

5.2 General Description of the Androscoggin River Basin

The projects are located on a 12 mile reach of the Androscoggin River at the junction of Androscoggin, Oxford, and Franklin Counties, Maine. The Androscoggin River flows from Errol dam at the outlet of Umbagog Lake in New Hampshire in a generally southeast direction for approximately 165 miles to the head-of-tide at Merrymeeting Bay in Brunswick, Maine (see Figure 1). The entire basin for the Androscoggin River is approximately 110 miles long by 65 miles wide and encompasses a drainage area of 3,450 square miles. The projects are located in the central portion of the basin, having a drainage area of approximately 2,421 square miles.

The headwaters of the Androscoggin River consist of a network of streams and storage lakes, which flow into Umbagog Lake on the border between Maine and New Hampshire. The river originates at the discharge of Umbagog Lake near Errol, New Hampshire, and travels approximately 50 miles through New Hampshire, then returns to Maine. The remaining 115 miles of river pass through the central and southern portions of Maine to its confluence with the Kennebec River below Brunswick dam. Major tributaries of the Androscoggin include the Cupsuptic, Kennebago, Magalloway, Dead Diamond, Ellis, Swift, Webb, Dead, Nezinscott, and Little Androscoggin Rivers. The Androscoggin River watershed can be divided into three distinct zones; the area containing the storage system operated by UWPC, the upper Androscoggin River section which is mountainous and has numerous unregulated tributaries, and the coastal plain section which is more developed and relatively flat. The Lewiston-Auburn and Brunswick areas, located downstream of the projects, include the largest concentration of industrial, commercial, and residential land use in the basin.

The projects are located at the southern end of the Western Foothills Region of Maine and are influenced by actions occurring upstream. This region is transitional between the Central Interior and Western Mountainous Regions, with elevations ranging between 600 and 1000 ft. The climate is characterized by severe winters (mean minimum January temperature of 5° F) and relatively cool summers (mean maximum July temperature of 79° F). Average annual precipitation is 43 inches with 100 inches being the average annual snowfall (McMahon, 1990). During the months of March, April, and May, large volumes of melting snow and heavy rainfall combine to cause extensive runoff and possible flooding. The magnitude of these floods is dependent on several natural factors, including water content of the snow cover, the extent of frost, temperature variations, and rainfall. Heavy rainfall in November and December can also result in large volumes of runoff.

Today, an estimated 45% of the river's length, from the upstream storage system to Brunswick, is impounded. The dams along the river and mode of flow regulation have been in existence since at least 1909. There are 34 hydropower developments located along the Androscoggin River providing about 256 MW of capacity (FERC, 1996)(see Table 1).

5.2.1 Upstream Storage System

Much of the northern portion of the basin contains heavily forested, mountainous terrain that is largely undeveloped with the majority of the Towns being unorganized or unincorporated townships that have relatively few or no year-round residents. Development is generally limited to the banks of the Androscoggin River and the Rangeley Lakes Region, a major recreation area and tourist attraction. Lands in the upstream portion of the basin are utilized primarily for timber harvesting and outdoor recreation.

The upstream portion of the Androscoggin River Basin includes a series of lakes which were impounded initially for logdriving and later enlarged during the period 1878 to 1885 to create a system of storage reservoirs (UWPC, Undated). These are known as Rangeley, Mooselookmeguntic, Richardson, and Umbagog Lakes. In 1911, a fifth reservoir, Aziscohos Lake, was created on the Magalloway River, a tributary which joins the Rapid River to form the Androscoggin River at the outlet of Umbagog Lake. The Mooselookmeguntic, Richardson, Umbagog and Aziscohos reservoirs have been managed by UWPC and the Androscoggin Reservoir Company to provide for flood storage and to maintain relatively consistent flows in the Androscoggin River throughout the year. The water levels in the upstream storage system are drawn down during periods of typical low flow in order to provide a target flow in the summer months of at least 1,550 cfs at Berlin, New Hampshire. Figure 1 illustrates the location of the projects in relation to the entire river and the upstream storage system.

The original dams (circa 1836 - 1880) were constructed by lumbering interests and were used primarily for log driving. Under historical operations, the impoundments were allowed to fill in the spring and were drained in the early summer for the purposes of floating logs to downstream mills. The gates on the dams were then left open until the following spring and the lakes were allowed to resume more natural levels (UWPC, 1995). Log driving operations continued into the 1950s. The Middle dam on the Richardson Lakes and Upper dam on Mooselookmeguntic Lake were raised and the Aziscohos dam and reservoir were constructed in the late 1800s and early 1900s in order to meet increasing

Table 1. Existing hydropower projects along the Androscoggin River listed in order from downstream to upstream. (Source: FERC, 1996)

Name	Project No.	River	Capacity (MW)
Brunswick	2284	Androscoggin	19.000
Pejebscot	4784	Androscoggin	13.800
East Worumbo	None	Androscoggin	0.900
West Worumbo	3428	Androscoggin	19.100
Upper Androscoggin	11006	Lewiston Canal	0.995
Continental Mills	2302	Lewiston Canal	1.584
Bates 2	2302	Lewiston Canal	0.450
Hill Mill	2302	Lewiston Canal	2.160
Bates Weave Shed	2302	Lewiston Canal	3.900
Lewiston	None	Lewiston Canal	0.750
Lewiston Falls	2302	Androscoggin	28.440
Deer Rips	2283	Androscoggin	6.625
Androscoggin No. 3	2283	Androscoggin	3.600
Gulf Island	2283	Androscoggin	20.900
Livermore	2375	Androscoggin	8.615
Otis	8277	Androscoggin	10.350
Jay	2375	Androscoggin	3.125
Riley	2375	Androscoggin	7.800
Lower Rumford Falls	2333	Androscoggin	12.800
Upper Rumford Falls	2333	Androscoggin	26.550
Shelburne	2300	Androscoggin	3.720
Gorham	2288	Androscoggin	2.150
Gorham	2311	Androscoggin	4.800
Cascade	2327	Androscoggin	7.920
Cross	2326	Androscoggin	3.220
J. Brodie Smith	2287	Androscoggin	15.000
Riverside	2423	Androscoggin	7.400
Sawmill	2422	Androscoggin	3.174
Pontook	2861	Androscoggin	9.900
Errol*	3133	Androscoggin	2.031
Aziscohos*	4026	Magalloway	5.200
Middle Dam*	UL 94-1	Rapid	None
Upper Dam*	UL 94-1	Rapid	None
Rangeley Dam*	None	Rangeley Stream	None

* Headwater storage reservoirs for the Androscoggin River.

demands for power by industrial developments along the Androscoggin River. Today, the major considerations in the operation of the upstream storage system are to (1) establish a more uniform flow in the river; (2) use available storage for downstream industries consistent with climatic conditions; (3) create an essential water supply for public and private users along the river; and, (4) minimize impacts to recreational users and fish and wildlife in the upper basin area (UWPC, 1995).

To meet the current management goals, the gates at each of the dams are operated by UWPC to hold the lakes at or near their rated full elevations until downstream flow regulation requires water to be withdrawn from storage. The seasonal draw on the storage system typically starts in June, as soon as the natural runoff above Errol dam drops to a point less than the discharge necessary to maintain the regulated flow at Berlin (1,550 cfs). The maximum possible draw from each of the lakes that comprise the upstream storage system ranges between 4 feet at Rangeley to 45 feet at Aziscohos. When UWPC determines the amount of water to be taken from the lakes, attempts to maintain stable summer water levels are considered along with any scheduled or anticipated repair work.

From an overview perspective, the existence and operation of UWPC's upstream storage system has affected the resources of the Androscoggin River by changing hydrologic and ecological conditions in both the upstream storage lakes and the Androscoggin River itself. First, and perhaps most obviously, the upstream storage system has changed the ecosystem within the area occupied by the lakes themselves. The storage system expanded the surface area of lakes in the storage system by approximately 11,000 acres. In the process, some 37 miles of river and an unknown length of smaller streams were transformed to impounded habitat. Further, the operation of the storage system has changed the ecology of the lakes. The seasonal drawdowns used to augment low flows in the river and capture spring floods have benefited some resources and worked to the detriment of others.

To understand the actions that have occurred in the basin and how they have affected the existing resources, it is also important to note how the flows are released from the upstream storage system. The following discussion is excerpted from UWPC's publication (UWPC, undated) to provide a general understanding of how the storage system is operated to meet river flow requirements.

"factors affecting lake levels are primarily a result of the need to maintain minimum and maximum flows in the river at Berlin. . . While the minimum flow of 1,550 cfs is attainable most of the time, the flow at Berlin has been less than this at times, even if for only a few days. The maximum usable flow in the several power stations at Berlin is about 2,600 cfs. Therefore, the flow at Berlin is maintained at a level somewhere between these two limits (1,550 - 2,600 cfs), except during periods of excess run-in above Berlin, and for the few extreme dry seasons that have and will inevitably occur. . . At the completion of the spring run-off, each reservoir in the Rangeley chain is brought to within about six inches of its normal full pond elevation, provided that a sufficient volume has come into the lakes to attain these elevations. Gates are operated to hold the lakes at or near their full pond elevations until regulation and draw from storage become necessary. As soon as the natural run-off above Errol Dam drops to a point less than the discharge through Errol necessary to maintain the regulated flow at Berlin, the seasonal draw on the storage system starts. This is usually sometime during the month of June. The initial draw is from Umbagog Lake, which is drawn about 1 to 1.5 ft. The space that creates allows for refilling of storage if the natural run-off increases again. When it becomes necessary to draw from other reservoirs, water is passed through Aziscohos and Middle Dams in about equal amounts and at a rate sufficient to hold Umbagog Lake steady. . . It has been customary to limit any draw on Rangeley lake during the summer months to the needs of the fish hatchery and rearing station located below the dam on the lake outlet and maintain a reasonable minimum flow in Rangeley River. During the fall months, draw from Aziscohos would be reduced and at the same time correspondingly increased from the Rangeley system. Water would first be taken from Rangeley Lake."

More stable flows year round including higher minimum flows and reduced flood flows from the storage system have influenced the development, continued existence and operation of the downstream dams. There is no way to ascertain this directly given the long history of the projects. However, after considering the nature of the downstream dams (see Table 2 for a summary of their characteristics) and the history of their development and redevelopment, the members of the Collaborative Team concluded that the most reasonable assumption was that some of the downstream dams would either not exist at all today (at least not in good enough condition to impound water) or not exist in their present configuration were it not for the upstream

Table 2. Dams on the Mainstem of the Androscoggin River from Brunswick, Maine to Errol, New Hampshire (Source: FERC 1993 and 1996)

River Mile	Project/Dam Name	Owner	Generating Capacity MW	Gross Head (ft)	Pond Area (acres)	Length of River Impounded	Type of Operation
8	Brunswick	CMP	19.00	39.4	12/300	3.84	ROR (>3000 cfs)
13	Pejepscot	Topsham Hydro et.al.	13.88	24	N/A	3.22	ROR
16	Worumbo -East/West	Miller Hydro Group	0.90/19.10	27	N/A	5.49	ROR (>3835 cfs)
31	Lewiston Falls	CMP/UWP	28.44	52.2	200	2.25	ROR (>8835 cfs)
34	Deer Rips/Andro. No. 3	CMP	6.625/3.6	32	130	1.33	ROR
	Gulf Island Pond	CMP	20.90	56	2,862	14.7	Inter./Peaking
61	Livermore Falls	International Paper	8.62	32	46	.74	ROR
62	Otis	Otis Hydro	10.35	26	115	2.10	ROR
64	Jay	International Paper	3.13	14	206	2.67	ROR
67	Riley	International Paper	7.80	22	578	8.00	ROR
87.2	Lower Rumford Falls	Rumford Falls Power Co.	12.80	80	21	.3	ROR
87.4	Upper Rumford Falls	Rumford Falls Power Co.	26.55	97	400	6.69	ROR
128	Shelburne	Crown-Vantage-NH Elec.	3.72	7	210	2	ROR
130	Gorham	PSNH	2.15	18	32	3	ROR
133	Gorham	Crown Vantage-NH Elec.	4.80	9	45	2.6	ROR
135.6	Cascade	Crown Vantage-NH Elec.	7.92	45	28	.5	ROR
136	Cross Power	Crown Vantage-NH Elec.	3.22	20	22	1	ROR
137	J. Brodie Smith	PSNH	15.00	88	8	.8	ROR
137.8	Riverside	Crown Vantage-NH Elec.	7.40	65	3	.2	ROR
138	Sawmill	Crown Vantage-NH Elec.	3.17	17	72	1.7	ROR
	Pontook	Robert Shaw	9.90	67	280	N/A	ROR
	Errol	Swift River	2.03	N/A	N/A	N/A	Storage

N/A = Not Available

storage system. This conclusion is based largely on the fact that the upstream storage system greatly enhances the reliability of flows used by the downstream hydropower projects and increases their energy production potential by increasing low flows during the winter and summer low flow periods. For example, it is estimated that median flows in the Jay area during August and September would be approximately 900 cfs rather than 2300 cfs if the upstream storage system did not exist. The impact on extremely low flows would be far greater, *e.g.* 7Q10 flows in the Jay area would go from 1730 cfs to approximately 300 cfs (LWA, 1996).

Therefore, the area downstream of the upstream storage system (including the APE) has been changed both directly and indirectly as a result of the more stable flows and reduced flooding provided by the upstream storage system. The major positive effects of the storage system on downstream resources include an increased, more reliable supply of clean, renewable energy provided by downstream hydropower projects; and an increased capacity of the river to accept municipal and industrial waste loads. These effects in turn have contributed to dramatic changes in the nature of the rivers ecosystem and its characteristics (see following section for details).

Because the upstream storage system ensured that downstream industries would have reliable flow from which to generate power, it contributed substantially to the early industrial development along the Androscoggin River, and hence, to development within the basin today. The reliable flows that it provided (and continues to provide today) powered the dams that were essential for the growth of the textile industry in Lewiston, Auburn, and Brunswick, and perhaps most significantly, the modern paper industry within the basin which continues as the major economic engine in the region today.

Due to the location of the projects (downstream of the UWPC storage projects) and the Applicant's, and others, financial contributions to UWPC for headwater benefits, there is a relationship between the storage projects, the Riley-Jay-Livermore and Otis Projects, and other water resource projects along the Androscoggin River. Fishery, water quality, geologic and soil, wetland, terrestrial, threatened and endangered species, recreation, land use, aesthetic, and cultural and archeogical resources have been impacted by development of the

upstream storage system and other land development. Changes in operation of the upstream storage system could have additional impacts on these resources.

The effects of operating the upstream storage system (the last section of the basin not covered by environmental assessments) on both the environments within the storage system and areas downstream will be the subject of a separate EA being prepared by UWPC. Reconnaissance level information on the impacts resulting from development of the upstream storage system and current operations is provided under the cumulative impact section of each resource in Section 5.3. The discussion in each resource section is based on a review of existing information on environmental resources and interviews with knowledgeable sources to identify the effects on existing resources in the basin. It is not the intent of this EA to comprehensively evaluate the impacts resulting from the creation or operation of the upstream storage system, but rather to provide qualitative information to assist the reader in understanding the "big picture" on the trade-offs associated resource values within different portions of the Androscoggin River basin.

5.2.2 Upper Androscoggin River

This section of the Androscoggin River basin includes the segment extending from the Errol Project dam located at the outlet of Umbagog Lake downstream approximately 80 miles to the APE. This portion of the river basin contains eleven hydroelectric developments totaling over 101 MW of capacity. In general, this portion of the river is relatively undeveloped, and is predominately heavily forested and mountainous. The most upstream portion of this segment (*i.e.*, the Errol Project dam downstream to the Berlin area) consists of relatively remote sections that are used primarily for timber harvesting purposes. This section of the river provides fishing, whitewater boating and informal camping opportunities along much of its upper length. In addition, that portion of the river basin located downstream of the Berlin-Gorham area (*i.e.*, Shelburne, New Hampshire to Rumford and Rumford to the APE) consists of areas that are relatively remote as well as areas that can be accessed by vehicle. This section is used primarily for timber harvesting and agricultural uses.

Development within this section of the basin is generally focused on a few locations along the river (*e.g.*, Berlin, New Hampshire; Rumford, Maine) where the steep gradient of the river was historically developed for producing mechanical or electrical energy. In turn, several industries developed and prospered by using energy produced by these hydro projects. The industries

formed the backbone of the towns that became Berlin, New Hampshire and Rumford, Maine. These two political subdivisions have since evolved into economic hubs that provide services which supported expansion of the surrounding communities (see Section 5.3.11). The energy generated from the falling water continues to be used to provide power to the mills located along the river in these locations.

These industries continue to provide the major means of economic support, through direct and indirect measures for the local populace in the region. However, the development of hydro projects, industry and the associated communities along the Androscoggin River have affected the resources available in those areas as well as further downstream. For example by 1880, only one of the dams had been constructed along this section of the river impounding less than a mile of river. Shortly after completion of the upstream storage system (circa 1909), the majority of the existing dams were constructed with approximately 36%, or 19 miles of the river being impounded for use in powering machinery in the mills. These dams inundated an unknown amount of wetland and upland habitat and replaced free-flowing conditions along many sections with flat water conditions that benefited some plant and animal species and adversely impacted others. In addition, they eliminated many of the rapids that are important for the aeration of water.

These dams, in addition to the ones located along the lower portion of the river (see following section) have changed the river, fragmented fish and wildlife habitat and converted a free flowing river into a system which now has 45% of its length in impoundments. These impoundments benefit some species of plants and wildlife by creating stable areas for the development of wetlands and favoring warm water fish like the small mouth bass, but they work to the disadvantage of native species such as brook trout. Further, the increased waste load capacity of the river resulting from higher and more stable flows, while benefiting municipalities and industries, has resulted in much higher levels of wastes entering the riverine ecosystem. These are not simply flushed downriver but in some cases are captured by downstream impoundments contributing to water quality problems.

Specific actions within this section of the river that may have affected the resources within the APE include industrial and municipal discharges to the river and non-point discharges. For example, the mills owned by Crown Vantage and Mead Paper in Berlin/Gorham and Rumford, respectively, are currently licensed to discharge 27% and 30% of the total BOD loading for the river by licensed point sources. These discharges have the potential to affect water quality in the APE.

5.2.3 Area of Potential Effect (APE)

The 12 mile portion of the Androscoggin River basin containing the projects, and defined in Section 5.1 as the APE, is the focus of analysis in this EA and is discussed in detail in Section 5.3.

Future actions, not related to the action under review in this document, which could affect environmental resources in the basin include a new gas pipeline proposed by Portland Natural Gas Transmission System (PNGTS), proposed expansions at the Sunday River Resort, and land conservation efforts of various entities along the river.

The proposed facilities for the PNGTS include a new pipeline constructed from Massachusetts through Maine and New Hampshire. The project is scheduled in two phases and includes a 16.6 mile line from Rumford to Jay, and a 26.9 mile line upstream from Rumford to Bethel. The pipeline would cross several waterways. PNGTS has proposed mitigation measures to minimize the potential environmental impacts. The introduction of natural gas to the region will provide a relatively clean fossil fuel that may decrease air pollution in the area from the burning of wood and oil in the future. General procedures and impacts are addressed in the PNGTS/Maritimes Phase I Joint Facilities FEIS.

The Sunday River ski resort is an existing facility located in the Androscoggin River Basin upstream of the APE. There are three major proposed expansions to Sunday River that may affect the environment. First, there will be a hotel expansion and an upgrade to a high speed quad of one of their existing ski lifts. The primary impact of this action, after initial construction, will be the potential for greater influx of people to the region. The other proposal is a golf course which is expected to be completed in the next several years. There has been no formal environmental impact assessment done on any of the Sunday River expansions so potential effects are unknown.

Other actions that are currently known which could affect land use within the APE include the acquisition and protection of riparian lands within the Androscoggin River basin by numerous groups (*e.g.*, Androscoggin Land Trust) and the proposed Lands Agreement between IP, OHC, CLF, AMC and other signatories. These actions will indirectly affect resources within the APE and in the basin by protecting lands adjacent to the Androscoggin River (and in the case of Rangeley, the lands in the headwaters of the Androscoggin River) from future disturbance.

The IP/OHC Lands Agreement includes components which further contribute to other proposed actions for ensuring public access to the waterway; protecting remote recreational and aesthetic values; protecting unique habitats; and protecting water quality (see section 5.3.8.3).

5.2.4 Lower and Coastal Portions of the Androscoggin River

The portion of the basin located downstream of the projects consists of the more coastal sections of the river which include the largest concentration of industrial, commercial and residential uses in the basin. This segment of the Androscoggin River Basin extends from immediately downstream of the Livermore development approximately 61 miles downstream to Merrymeeting Bay. This segment of the basin contains six hydro projects having a total capacity of approximately 110 MW (see section 5.2.2 for environmental effects).

No current actions downstream affect resources within the APE (FERC, 1996). However, the construction of dams and other developments downstream of the APE during the nineteenth century prevented anadromous species from reaching the APE. The effect of this action and the proposed restoration plan is discussed in the fishery resource portion of Section 5.3 of this EA. Detailed studies to assess the effects of actions in this portion of the river have already been completed (*e.g.*, FERC 1996).

5.3 Analysis of Site Specific Resources

5.3.1 Geological/Soils Resources

5.3.1.1 Affected Environment

Topography within the APE (as defined in Section 5.1) ranges from low elevations of 300 ft on the river at the Livermore powerhouse to 360 ft along the river at the upper limits of the Riley impoundment. The areas adjacent to the river have moderate slopes, while local topography north and south of the projects is steep and rolling with hills rising to elevations as high as 1072 feet.

Bedrock Features

The projects are situated in the western portion of the Kearsarge-Central Maine synclinorium, a 100 mile long belt of northeast trending metasedimentary rocks of Silurian to Devonian age (Osberg, *et al.*, 1985). Robert G. Gerber, Inc. (Gerber) performed a Geologic Features Inventory of the study area during 1995 (Gerber, 1995).

The APE is underlain primarily with metamorphic rocks of the Sangerville Formation. To the north, the Sangerville Formation is bounded by Devonian-age metasedimentary rocks of the Seboomook Formation, and to the south by the Silurian-age metasediments of the Waterville Formation (Osberg, *et al.*, 1985). The Sangerville Formation is considered to be Silurian in age (435 to 395 million years before present) based on its stratigraphic position and fossil fauna assemblages. The Sangerville is divided into three members: the Turner member, the Patch Mountain member, and the Anasagunticook Member. The Turner member does not lie within the APE and will not be included in the following discussion.

The Anasagunticook Member of the Sangerville Formation underlies the western portion of the APE, including the Riley impoundment and portions of the Jay impoundment. The Anasagunticook consists of a limestone member, one and possibly two thin (30 m) calc-silicate horizons, and variably bedded biotite-sillimanite-muscovite-garnet schist. The thickness of the Anasagunticook Member is estimated to be 1,000 to 1,200 meters (Pankiwskyj, *et al.*, 1976). Gerber's review did not reveal any significant or unique mineral assemblages in this Member.

The Patch Mountain Member is present at about the middle of the Sangerville Formation and underlies the Livermore portion of the study area. This Member consists of fine-grained, blue-gray limestone and sandy limestone in beds 2 to 10 cm thick. Beds of graywacke, gray siltstone, and gray slate (5 mm to 4 cm thick) are interbedded with the limestone. The thickness of the Patch Mountain Member is not believed to exceed 200 meters (Gerber, 1995).

The metasedimentary rocks within the APE have been intruded by Acadian-age plutonic rocks that consist of granite, granodiorite, quartz monzonite, and pegmatite. Intrusion by such plutonic rocks may have caused localized contact metamorphism which obliterated relic bedding structures in the metasedimentary rocks and caused substantial alteration of preexisting mineralogy.

Surficial Deposits

The surficial geology of the APE reflects the regional glacial history. The APE is below the inland marine limit which represents the maximum extent of sea intrusion after the glacial retreat. The stratigraphic section for this part of the state of Maine generally consists of diamicton over bedrock. The diamict includes bedded sequences of basal or lodgement tills, flow tills

and meltout tills. The diamict may be overlain by glacio-fluvial sands and gravels. These materials may be capped by ablation till and/or glacio-marine deposits. Locally, glacio-lacustrine deposits consisting of inter-bedded sands and silts may be present.

Thompson (1987) mapped the surficial geology of the APE, which consists primarily of recent floodplain and terrace deposits along with older Pleistocene glacial outwash. Ice-contact glaciofluvial deposits (such as eskers), glaciomarine deposits, and stream alluvium deposits are also present in the study area. Underneath the younger sediments, in the southern portion of the study area, fine-grained glaciomarine deposits of sand and silt are present, with some clay and minor amounts of gravel. A thin till layer is sometimes present, especially at higher elevations, and is a heterogeneous mixture of sand, silt, clay, and cobbles directly deposited by glacial ice (Thompson, 1987). In the Riley impoundment, south of Steven's Island, the surficial geology appears to be related to a glacial ice dam that occurred briefly in this area during deglaciation. When the ice dam was breached, a large volume of water was released and formed a series of braided streams. These braided streams are referred to as melt water channels and are not uncommon to the APE.

Soils

The soils in the APE vary along with the changing topography and include the following soil associations found throughout the region: adams-hinckley-ningret, adams-croghan-colton, and skerry-dixfield-becket. The adams-hinckley-ningret association is deep, excessively to moderately well drained, nearly level to moderately steep, coarse and moderately coarse soil. This soil is located on varied topography including bottom lands and terraces, outwash plains, hills, and ridges. These soils have moderately rapid to rapid permeability and vary in their suitability for development. Erodability of the adams and hinckley series is slight due to relatively coarse (sandy) textures. The erodability of the hinckley series varies depending on the specifics of the site. Adams and hinckley soils have only slight limitations for most development uses (*i.e.*, where slopes are 8% or less), while ningret soils contain moderate limitations for development due to a risk of flooding and frost heaves. These soils are used as woodland and urban development areas, with smaller portions used as farmland.

Skerry-dixfield-becket associations are very deep, nearly level to steep, moderately well drained and well drained soils formed in compact glacial till. These soils are low to moderately erodible and have moderate to severe limitations for

commercial or residential development due to problems derived from slope or wetness. Adams-croghan-colton soils are very deep, nearly level to steep, excessively drained to moderately well drained soils formed in glaciofluvial sand and gravel. This soil has low erodability and is often present on deltas, terraces, eskers, and outwash plains. Building limitations on adams and colton soils vary from slight to severe depending on the slope. However, croghan soils have development limitations ranging from moderate to severe due to wetness hazards. Both of these associations are used mostly as woodland with some areas utilized as hayland, pasture, or cropland.

Floodplain soils formed in recent alluvial deposits occupy much of the gently sloping (0 to 3%) areas adjacent to the river in the study area. Fryeburg series, lovewell-cornish association, rumney-podunk-medomak association, ondawa series, podunk series, and sunday series are several types of floodplain soils present in the APE. Predominately in the western portion of the study area, these soils are very deep and range from fine sandy loam to very fine sandy loam. The majority of the soils are moderately to highly erodible, slightly susceptible to slumping, and have moderate to moderately rapid permeability. These soils are mainly covered by woodlands, though some areas are utilized for cultivated crops, pasture, and hay. Residential or commercial development is severely limited due to flooding and frost action.

Further downstream in Franklin County, the lovewell-cornish association (described above) and the lyman tunbridge complex dominate. Permeability of a lyman tunbridge complex is moderate or moderately rapid, with low to moderate erodability. The slope of this soil complex can vary greatly from 3% to 35%. The depth to bedrock, stoniness, and slope can pose problems for development, which is largely residential or commercial.

Hollis and adams soils are predominate along the river in Androscoggin County, in the vicinity of the Livermore powerhouse and areas downstream. These well-drained, shallow soils were formed in glacial till and vary from very fine sandy loam to very rocky fine sandy loam. Slopes range from lightly sloping to steeply sloping with rapid to very rapid permeability and low erodability. These soil areas are used for houses, urban areas, and woodlands.

Hydrologic Features

The sand and gravel aquifers in the study area were mapped by Tepper and Lanctot (1985). The aquifers located in the APE are composed of ice-contact glaciofluvial deposits (including

eskers), glacial outwash, sandy glaciomarine deposits, and stream alluvium. These deposits of coarse-grained sediments can supply economic volumes of ground water to properly constructed wells. Predicted well yields are shown as being 10 to 50 gallons per minute or more.

Unique or Significant Features

There are no registered critical areas located in the APE (Gerber, 1995). In addition, no bedrock, surficial, or hydrologic features were identified in the APE as having significant scientific or educational value, uniqueness to Maine or New England, or were an outstanding example of a particular geologic phenomenon or feature (criteria established by the Maine Critical Areas Program through an Act of the Maine legislature in 1974). The Androscoggin River in the Livermore Falls area was inventoried for whitewater rapids during the Critical Areas initial listing in the late 1970s and early 1980s. This section of the river was not included in the listing because it did not meet whitewater rapid criteria for length and turbulence (McMahon, 1981). However, McMahon did rank Livermore Falls within the top 50% of the 240 waterfalls evaluated by the Critical Areas Program for scenic quality (see Section 5.3.9.2).

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.1.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA may be found in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The No Action Alternative would maintain soil and geologic features in their current condition with no resource enhancements. Based upon normal operating conditions, the existing impoundment shoreline is relatively stable with the majority of the shorelines being vegetated to the water's edge and no large areas of exposed soils.

Proposed Alternative

Redevelopment of the Livermore powerhouse would result in short-term disturbances to soils in the immediate work area. While the majority of the construction activities associated with the redevelopment of the Livermore powerhouse will be contained within the existing footprint of the powerhouse, ancillary activities (*e.g.*, construction lay down areas, construction of

the bypass turbine unit, etc.) would have a short-term impact on soil stability. To ensure that the disturbance and impacts are minimized, both a temporary and permanent soil erosion and sediment control plan should be developed for each component of the project improvements. This plan should be developed using the State of Maine's - Best Management Practices (BMP's) for construction projects to control erosion, and maintain water quality within state standards. The final plan should be based upon site specific improvements and control techniques to manage the activities; some of the specific techniques include: stabilized construction entrance, land grading (terracing, surface treatments, mulching, seeding), temporary silt barriers, stone check dams, hay bale dikes, diversion ditches, sedimentation traps, sedimentation basins, riprap, and bio-engineered streambank stabilization plantings.

The construction and/or enhancement of recreational facilities associated with the projects (see Section 3.3.2.3) will have minimal short-term impact on existing geological features. Construction of the recreation facility at Pine Island will advance the Town of Jay's plans to relocate its winter sand pile to a more suitable upland location.

Minimum flow releases to the Jay and Livermore bypassed reaches would have a negligible effect on the existing geologic resources of the project area. These reaches currently consist mostly of exposed bedrock, cobble, and boulders. These areas have already been scoured clean of fines by high spring flows and will not be adversely affected by the proposed minimum flows.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

Under this alternative, a total of approximately 1.5 miles of currently inundated shoreline (dominated by bedrock substrate covered with boulders or cobble and gravel) would be exposed and subject to potential erosion on a short-term basis until natural erosive and vegetative forces stabilize the area. The initial years will create a sediment load and erosion of nearby shorelines which have not been exposed to streamflow on a continuous basis. The sediment will deposit between the larger boulders and begin the reconstruction of bottom substrate environments. Some minimal increases in river turbidity and sediment load could occur downstream of the Livermore dam following the permanent removal of flashboards as the muck and soft sand substrates which have deposited along the shoreline areas is exposed. Where this increase is likely to occur during flood and other high flow events, this action will not have a significant effect on the environment.

License Denial, Decommissioning and Dam Removal Alternative

This alternative would change approximately 12 miles of impounded river and convert it to free-flowing characteristics. A complete decommissioning could have significant impacts on both existing river bottom composition and impoundment sediments which would likely be redistributed downstream. This could cause a short-term increase in sediment load of the river. Some of the downstream river segments are attempting to meet water quality objectives *(i.e.* Lewiston/Auburn area). A rapid change in hydrology in the APE would have significant short-term effects on the remainder of the downstream watershed by producing erosive velocities on those areas of the APE which have experienced slower moving water for the past century.

5.3.1.3 Cumulative Impacts

Construction of the upstream storage system inundated approximately 11,000 acres of land which included the soils and geologic features contained therein. The construction of 21 hydro projects along the Androscoggin River also inundated an unknown amount of acreage of upland and fringe wetland habitats. There is no information available on the character of those soils or geologic features. The clearing practices for agriculture (with its associated effects of exposing soils to natural erosive forces each year), forestry, and other developments within the basin have likely increased run-off and erosion/sediment characteristics of the basin.

The development of dams along the Androscoggin River and the flow regulation of the upstream storage system have changed the erosion and deposition patterns within the river, which has likely resulted in both positive and negative impacts to geologic and soils resources. However, the nature and magnitude of these impacts is not known with certainty, and hence are only discussed here in very general terms. Under natural conditions, river flows on the Androscoggin fluctuated unpredictably over a much wider range than they do currently. These more dynamic conditions would have resulted in more erosion, accretion, island formation and disappearance, braiding, and floodplain renewal. The more stable flow regime created by the dams and the upstream storage system has likely reduced streambank erosion along the entire length of the river. In addition, the natural processes whereby relatively course materials (known in geologic terms as bedload) are moved downstream would be reduced by diminished flood flows, and the downstream progress of this material is halted or reduced by the existence of dams along the river.

As a result of reduced flooding there is less deposition (renewal) in floodplain areas, while reduced rates of flow in impounded areas has allowed increased deposition in slack water areas. At the same time, the increased development and clearing of land that has occurred in the watershed over the last 100 years or so has resulted in increased erosion, sedimentation, and surface runoff (LWA, 1996). Examples of increased deposition can be found along portions of the shoreline areas of the projects impoundments. Based upon the results of field investigations, it is estimated that approximately 40% of the Riley impoundment shoreline area is composed of fine grain material (soft sand and muck) (NAI, 1995). The relative percentage of shoreline areas of the other impoundments comprised of fine grain materials is 50%, 60%, and 20% for the Jay, Otis and Livermore impoundments, respectively. While the majority of this substrate is less than 3 inches in depth, some locations were noted as being up to 6 to 7 ft in depth. However, the field investigations also concluded that the main channel of the impoundments consist of hard bottom substrates.

In short, erosion, deposition, and stream morphology on the river today is different and less dynamic today than it would be without the upstream storage system, downstream dams and human induced development patterns.

An additional cumulative impact resulting from the construction of dams along the Androscoggin has been the inundation or exposure of all of the major waterfalls. Waterfalls are a common place to site hydro facilities due to the dramatic elevational changes within a short horizontal distance. While the proposed minimum flow in the Livermore bypass is for the protection and enhancement of fishery resources and water quality, it will also, during low flow conditions, slightly enhance the waterfall characteristics for that portion of Livermore Falls located downstream of the Livermore dam.

Operation of the projects as proposed will maintain the existing geologic or soils resources. There are several future actions that are currently known which could affect geologic and soils resources with the APE and within the river basin.

The land protection measures proposed by IP and OHC, as well as the independent conservation efforts of the Androscoggin Land Trust in areas of basin located downstream of the APE, will have the potential to directly or indirectly protect soil resources and reduce erosion and runoff (see Section 5.2.2). The land protection measures would have a cumulative beneficial affect on reducing shoreline erosion and runoff by limiting the amount and types of activities, including development and timber harvesting,

that occur on affected parcels. In general, the protected parcels of land will promote the growth of natural vegetation which will stabilize the shorelines and protect them from natural erosive forces.

The proposed construction of a natural gas pipeline through a portion of the basin may affect the soil resources in the basin during the clearing and construction phases. It is anticipated that the applicable regulatory agencies will require appropriate measures to minimize soil erosion and sedimentation.

In conclusion, the impacts to geologic and soils resources in the APE, as a result of the proposed and other future actions are expected to be minimal. The original construction of the projects dams has altered the sediment transportation characteristics of the river to some degree, due to the creation of the impoundments, and these impacts will continue.

5.3.1.4 Unavoidable Adverse Effects

No unavoidable adverse effects to geologic/soils resources are associated with the proposed action and continued operation of the projects.

5.3.2 Water Resources

The quantity and timing of water flow along the Androscoggin River have been affected over time by the construction and management of the upstream storage system, other hydro projects along the river and land development activities throughout the basin. Changes in landscape and vegetative cover that have occurred as a result of development in the basin has likely increased the amount and rate of surface runoff. In contrast, development of the upstream storage system has moderated flow patterns to produce a more consistent flow pattern throughout the year than what would have occurred under natural conditions or prior to regulation (LWA, 1996). The resulting effect is that river flows in the Androscoggin River in the vicinity of the projects under natural conditions were likely lower than the existing regulated flow during the months of January, February, March, June, July, August, September, October and December and higher than the existing regulated flow for the months of April, May, and November. Under natural conditions median flows during the months of July, August and September may have been 50 to 60% lower than existing regulated flows during these months (LWA, 1996).

Water quality for the Androscoggin River under natural conditions is likely to have been considerably less turbid with

lower levels of dissolved constituents, particularly in the summer (LWA, 1996). As manufacturing and industry developed, the river was used as a source of power and to dispose of manufacturing by-products, including dyes, wool and cotton fiber particles, and chemical wastes (LWA, 1996). The decade of the 1880's saw the introduction of the sulphite pulping process, which had additional long-term effects on water quality in the basin. Agricultural run-off also became a significant contributor to non-point source pollution along the river. As a result of these discharges, the Androscoggin River suffered from a severe D.O. deficit problem and was once considered one of the ten most polluted rivers in the nation (New England River Basins Commission, 1981). However, over the last 20 years the water quality of the Androscoggin River has improved considerably due to collective efforts on the part of Federal, state, and local resource agencies, several large paper companies (*e.g.*, Mead Paper (formerly Boise Cascade), Crown Vantage (formerly James River) and IP), and CMP (FERC, 1996).

5.3.2.1 Affected Environment

River Flow

River flow in the APE is dependent upon the upstream drainage area, which includes 1,045 square miles of drainage controlled by UWPC's operation of the upstream storage system and 1,375 square miles of uncontrolled drainage. In accordance with the 1909 operating agreement and the current Androscoggin River Headwater Benefits Agreement, UWPC tries to maintain a summer target flow of 1,550 cfs at Berlin, NH (see Figure 1). The regulated 7Q10 flow for the Applicant's projects is 1,730 cfs. The projects' impoundments do not contain sufficient storage capability to significantly influence river flows. Normal operation of the projects is a run-of-river mode, such that inflow equals outflow, except during flashboard replacement. Each of the four developments is required by Article 39 of their existing Commission license to pass a minimum instantaneous flow of 1,245 cfs or inflow, minus any process-cooling water withdrawn, whichever is less. This minimum flow is based on the ABF (equivalent to 0.5 cubic feet per second per square mile of drainage area) as determined by the USFWS.

Monthly and annual flow duration curves for the projects were generated using mean flow data for two USGS gages located in the vicinity of the projects (see Exhibit B of the license applications). A review of the gaging station upstream from the projects indicated that the USGS gage #01054500, Androscoggin River at Rumford, accounts for 2,068 square miles of the total drainage (see Figure 1 for location). The remaining watershed

downstream of this gage is unregulated and fairly mountainous in nature. The mean daily flow data from the USGS gage #01055000, Swift River near Roxbury, Maine was used to represent this additional unregulated contributing watershed (see Figure 1 for location). Current water quantity conditions in the APE were determined by adding the mean daily flows from the gage on the Androscoggin River at Rumford to the pro-rated mean daily flows from the Swift River gage (KA, 1994).

Table 3 shows the volume of flow that is available at the projects on a monthly and annual basis. For example, on an annual basis, flows exceed 9,433 cfs 10% of the time, and 3,191 cfs 50% of the time. The data also indicate that the highest flows occur in April (8,487 cfs exceeded 50% of the time) and lowest flows occur, on average, during August (2,409 cfs exceeded 50% of the time).

Table 3. Monthly and annual flow duration data for the project sites (1970-1991). (Source: USGS Flow Data for gages 0105400 plus gage 0105500 prorated by a factor of 3.65)

	PERCENT EXCEEDENCE (%)								
MONTH	10	20	30	40	50	60	70	80	90
Jan.	5,353	3,927	3,231	3,024	2,863	2,686	2,518	2,344	2,091
Feb.	5,066	4,289	3,798	3,493	3,148	2,890	2,620	2,331	1,958
March	9,198	6,205	5,318	4,305	3,853	3,523	3,221	2,791	2,238
April	20,403	15,172	12,016	10,020	8,487	7,054	5,897	4,792	4,089
May	17,970	13,542	10,699	8,438	6,874	5,667	4,937	4,042	3,455
June	7,810	5,395	4,407	3,890	3,509	3,167	2,909	2,619	2,354
July	4,040	3,320	2,954	2,651	2,488	2,367	2,249	2,108	1,955
Aug.	3,893	3,068	2,707	2,550	2,409	2,272	2,139	2,037	1,960
Sept.	3,568	2,939	2,743	2,577	2,449	2,350	2,239	2,107	1,991
Oct.	6,477	4,260	3,531	3,132	2,802	2,658	2,530	2,435	2,284
Nov.	7,671	5,807	4,866	4,256	3,622	3,176	2,912	2,687	2,350
Dec.	5,929	4,279	3,688	3,390	3,153	2,971	2,723	2,501	2,077
ANNUAL	9,433	5,788	4,386	3,665	3,191	2,869	2,603	2,375	2,098

Water Quality

The Androscoggin River in the vicinity of the projects is a Class C waterbody as established by Maine statute (38 MRSA section 467). Class C waters are defined by the state as being suitable for the following designated uses: "drinking water supply after treatment, fishing, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation (except as prohibited under Title 12, section 403 of

the State's regulations), and navigation." Maine's water quality classification law includes several narrative and numerical standards applicable to Class C waters for specific water quality parameters, including that these waters shall have a D.O. content of not less than 5 parts per million (ppm) or 60% saturation, whichever is higher (38 MRSA section 465-A). In addition, Class C waters shall support all indigenous species of fish and the structure and function of the resident biological community must be maintained. The Androscoggin River in the project's vicinity is not attaining Class C standards for the designated use of fishing. A fish consumption advisory is currently in effect due to the presence of dioxin in fish tissue (MDEP, 1996).

Water uses by the general public in the APE include recreational fishing, boating, and canoeing. There are no known consumptive uses of the projects' waters where water is removed for irrigation or domestic water supply. IP's non-project mill withdraws approximately 30 to 40 million gallons of water per day (*i.e.*, 46.5 cfs to 62.0 cfs) from an intake located in the forebay of the Riley development (see Exhibit F of application). This water is then treated at the mill's wastewater treatment plant and returned to the river several hundred feet upstream of the Jay dam.

IP's discharge is licensed by the USEPA (NPDES permit No. ME0001937), the State of Maine (Wastewater Discharge License No. 623) and the Town of Jay (Permit No. 2). IP is licensed to discharge a monthly average of 18,000 lbs/day of BOD. This is approximately 33% of the total BOD loading for the river by licensed point sources. The BOD license limit during the summer (June 1 through September 30) is 10,900 lbs/day monthly average and 18,000 lbs/day daily. The Livermore Falls municipal wastewater treatment plant is licensed to discharge 250 lbs of BOD which is less than 0.5% of the total BOD loading to the river by licensed point sources. The Crown Vantage (formerly James River) and Mead Paper (formerly Boise Cascade) mills are two major point sources located upstream of the APE. These sources are licensed to discharge approximately 27% and 30% of the total BOD loading to the river by licensed point sources, respectively. The remaining 10% of the licensed BOD loading to the river is from mostly municipal treatment plants located downstream of the APE (FERC, 1996).

IP is currently licensed by the USEPA, MDEP and the Town of Jay to discharge a maximum of 71,500 lbs/day and a monthly average of 38,000 lbs/day of solids. During the summer of 1996 (June through September), during the period when a polymer was added to the treatment process as part of the Phase II water quality study, the monthly average volumes of solids discharged

ranged between 14,800 and 24,900 lbs/day.

The most comprehensive water quality data set that exists for the Androscoggin River in the vicinity of the projects was the result of a survey conducted during August, 1984. Spatial profiles of river D.O., temperature, and BOD were presented in the survey report, along with measurements of sediment oxygen demand, nitrogen, phosphorous, chlorophyll-a, pH, conductivity, total suspended solids, total dissolved solids, fecal coliform bacteria, and total coliform bacteria (NAI, 1985). Data collected during the 1984 survey were used in combination with data collected by the MDEP in 1980-1982 to construct a mathematical water quality model of the Androscoggin River.

According to the 1984 survey data, the water quality standards for D.O. set by the state were being attained throughout the APE. These data suggested that there was little variation in the levels of D.O. above and below the projects' dams. In addition, D.O. readings taken over the course of a day (August 29, 1984) showed, at most, a minimal increase in D.O. which indicated very low levels of algal photosynthesis. Other water quality parameters measured during surveys of the Androscoggin River revealed the following data: the pH averaged 6.5 and was typically within the range of 6.0 to 8.5 specified in MDEP Class C standards; and concentrations of suspended solids showed levels less than 10 mg/l and turbidity less than 10 NTU.

More recent water quality data has been collected in the Jay impoundment by a 3-parameter monitor. This monitor is owned by the Town of Jay and maintained by the USGS. D.O., water temperature, and conductivity measurements are logged continuously at a depth of approximately 17 ft. Due to low D.O. measurements recorded at the monitor on four occasions during 1994, MDEP raised concerns during the scoping process regarding the attainment of water quality standards (specifically D.O.) in the Jay impoundment and bypassed reach. MDEP also raised concerns about D.O. in the Livermore bypassed reach because of high temperatures and low summer flows in that reach.

In response to MDEP's concern regarding maintenance of the Class C water quality standards in the APE, water quality sampling was undertaken by NAI during low flow, high temperature conditions in August and during the summer of 1996. The results of the 1995 and 1996 water quality studies can be found in IP's study reports (NAI, 1995 and KA, 1996).

When evaluating the results of these studies, it is important to note that the weather and river hydrology were very different in 1995 and 1996. During the summer of 1995, the

region experienced little precipitation; the Androscoggin River flows in the APE were below 7Q10 intermittently during July and August, which included the period of study. Therefore, 1995 data is believed to be representative of near "worst-case" conditions. In contrast, during 1996 unusually rainy weather throughout most of early to mid-summer resulted in higher than normal flows, and lower water temperatures for most of the study period. Therefore, although the studies were delayed and conducted in late August/early September under controlled flow situations to compensate for the earlier weather conditions, the summer's data (*e.g.*, the Jay 3-parameter data) as a whole is representative of a high water year.

1995 Water Quality Studies

Water quality was monitored in the Jay and Livermore bypassed reaches and in the Jay impoundment near the Town of Jay's 3-parameter monitor. Water samples upstream from the Riley impoundment and downstream from the Livermore dam were also collected and analyzed for color, and the settling and accumulation of sediments in each of the impoundments was investigated. For the latter effort, suspended solids and turbidity were measured at 15 stations, and sediment was systematically characterized in the four impoundments along 68 transects and a total of 273 sites (NAI, 1995).

The study concluded that the chemical and physical characteristics of waters in the APE (as determined by D.O., bacteria, and pH data) meet Maine water quality standards with the following exceptions: 1) D.O. levels in the Jay impoundment at the 3-parameter monitoring station fell below standards during June and July, and 2) low D.O. levels (below 5 mg/l) were observed at the bottom of the deepest pools of the south bypass at Jay and of the Livermore bypass during one of seven monitoring events conducted over a 3 1/2-day period of leakage-only flows.

1996 Water Quality Studies

The objectives of the 1996 Water Quality Study were to identify: 1) whether D.O. in the Jay impoundment stratifies vertically or varies laterally during low flow and high temperature conditions; 2) whether directing or siphoning flow from the lower Jay impoundment to the bypassed reach would improve D.O. near the Jay 3-parameter monitor during critical low flow periods; and 3) the amount of flow needed in the Jay and Livermore bypassed reaches to increase D.O. during low flow, high temperature periods to comply with the State's D.O. standards. An additional objective was to evaluate/corroborate D.O. data reported from the Jay 3-parameter monitor.

Monitoring the Jay impoundment from August through early September showed that D.O. concentrations were in compliance with state criteria. The data also documented that the impoundment did not stratify vertically, nor were lateral differences appreciable. Minimum flow releases between 5 and 40 cfs at the south spillway of the Jay dam did not increase D.O. levels in the Jay impoundment. However, D.O. concentrations in the south bypass pool did improve at a bypass flow of 5 cfs. Higher flows (10 to 40 cfs) did not raise the D.O. in the bypass pool any further than the 5 cfs release (KA, 1996).

A similar bypassed reach minimum flow study was done at Livermore Falls. A flow release of 50 cfs from the Livermore dam improved D.O. concentrations in the bypass; additional flow beyond 50 cfs did not improve the D.O. levels. (KA, 1996). In addition, angler access was optimized at 50 cfs, and gains in trout habitat associated with flows higher than 50 cfs would result in decreased angler access.

1995 TSS and Turbidity Sampling

Total suspended solids (TSS) and turbidity sampling showed decreasing trends from upstream to downstream within the APE (NAI, 1995). In general, TSS levels tended to decline in each impoundment from the upper reaches to the dams, but rose significantly below each dam. Except for the Jay impoundment, which receives input from the Androscoggin Mill's discharge, results indicated some settling of suspended solids from the water column to the sediments. Given the flocculent nature of the organic layer overlying the harder substrate and the lack of appreciable accumulation, it is probable that these impoundments only trap fine sediments during low flow periods.

Based upon observations conducted during the 1995 and 1996 macroinvertebrate studies (EcoAnalysts, 1995; 1997), it was concluded that this fine organic material is removed during periods of high flow, resulting in no net sediment accumulation on an annual basis. However, during low flow periods, there is an incremental increase in sediment accumulation until it is removed by the next high flow period. The source and amount of accumulation is governed by river flows and the efficiency of the waste discharge treatment processes in removing solids.

Turbidity measurements also showed decreasing trends in the impoundments, but the trends were significantly different from the suspended solids trends. Turbidity levels declined only slightly in the Riley impoundment, but dropped sharply immediately after the Riley dam and in each of the other impoundments. The drop was not closely correlated with suspended

solids in the Riley or Jay impoundments, but was more so in the Otis and Livermore impoundments. The reason for this discrepancy is unknown, although changes in particle size and dissolved color both affect turbidity measurements.

1995 Macroinvertebrate Sampling

As part of Maine's water quality certification program, the MDEP requires analysis of aquatic macroinvertebrates (*e.g.*, aquatic insects, worms, crustaceans, snails, etc.). For each water quality class (*e.g.*, A, B, C), the MDEP has established minimum biological standards based on the abundance and kinds of aquatic macroinvertebrates in the streambed or lake sediments.

According to MDEP (1993), the five-mile segment of the Androscoggin River downstream of Jay did not attain aquatic life standards due to the combined effects of industrial discharge and impoundments. Therefore, macroinvertebrates in each of the impoundments and in the Jay bypass were examined during the summer of 1995 (EcoAnalysts, 1995). The Livermore bypassed reach had already been sampled in recent years and was found to have macroinvertebrate populations consistent with the Class C standards.

The macroinvertebrate communities in the Riley impoundment and in the upper Jay impoundment were found to be healthy, showed little sign of stress, and indicated good water quality. Those samples were determined to be consistent with the Class C standards. In contrast, the macroinvertebrates in the lower portion of the Jay impoundment and the Otis and Livermore impoundments (which are downstream of the IP's Mill wastewater discharge) did not attain Class C aquatic life standards and showed signs of an impaired biological community. The primary indicators were low total abundance and a large proportion of stress tolerant worms and snails (EA Engineering, 1995).

1996 Macroinvertebrate Sampling

The study included monitoring four sites that did not attain Class C criteria in 1995 to evaluate whether variables such as flow, depth, and the amount of solids discharged from the IP's Androscoggin Mill treatment plant were affecting the attainment of Class C criteria. In addition to mid-channel sampling, monitoring was also conducted in the littoral zones of the lower Jay, Otis and Livermore impoundments to evaluate whether depth (light penetration) or other factors affect attainment of the criteria. Three control sites above the Jay diffuser were also monitored (two mid-channel and one littoral zone). Concurrent with the benthic macroinvertebrate sampling period, IP's mill

experimented with the use of a polymer settling agent to reduce the volume of solids discharged from the treatment plant.

All four mid-channel sites located downstream of the mill's discharge were in compliance with the State of Maine Class C aquatic life criteria, and all sites except the lower Otis impoundment attained the higher Class B criteria. Mid-channel sites upstream of the discharge also attained Class C criteria; the lower Riley and upper Jay impoundment sites where also in compliance with Class B criteria (EcoAnalysts, 1997).

Littoral zone sampling results11/ showed that the littoral zone of the Jay impoundment resembled the mid-channel communities in that impoundment and attained Class B criteria. The littoral zone communities in the Otis and Livermore impoundments were quite different and did not resemble the mid-channel communities. These sites were populated by species that are more generally adapted to a variety of habitats, although not necessarily indicative of a stressed community. It is believed that this is related to the type of habitat and substrates in these areas (EcoAnalysts, 1997).

IP utilized settling agents (polymers) during August and September 1996 to reduce the volume of solids discharged by the wastewater treatment plant (see Table 4). The trial resulted in an improvement in the solids removal efficiency of the wastewater treatment plant, as compared to the previous two months from 95% and 97% efficiency to 98% efficiency. As shown below, this resulted in a substantial reduction in the average lbs/day of solids discharged to the river. The average lbs/day solids discharged during the two months (June and July) preceding polymer use was 22,300 lbs/day as compared to 15,300 lbs/day during the polymer use period. This 7,000 lbs/day reduction represents 31% less solids discharged to the river.

The improvements in the benthic macroinvertebrate communities throughout the APE that were documented by the 1996 study are believed to be attributable to a combination of flow and the reduction in solids discharged by the IP Mill. During the summer of 1995 the Androscoggin River flows in the APE were below 7Q10 intermittently during July and August, which included the period of study. Since 1995 was a "near worst case" water year, the results of the macroinvertebrate study conducted under those conditions probably were influenced. Unusually rainy

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11/ The littoral zone testing results should not be used to assess attainment or non-attainment. Maine DEP utilizes mid-channel sampling and the model used to assess attainment is not particularly suited for use with littoral zone data.

weather throughout most of the early to mid-summer of 1996 resulted in much higher that normal flows for most of the study period, which likely benefited the resident macroinvertebrate community.

Table 4. Results of 1996 Polymer Tests (Source: IP, 1996)

Month	Influent Solids (average lbs/day)	Effluent Solids (average lbs/day)	Removal Efficiency (average %)
June	492,000	24,900	95
July	678,000	19,700	97
August	616,000	14,800	98 (with polymer use)
September	752,000	15,900	98 (with polymer use)

Toxins

The portion of the Androscoggin River within the APE is not currently attaining water quality standards due to a fish consumption advisory that has been issued due to the presence of dioxin in fish tissue (MDEP, 1994). Existing information on the presence and concentrations of selected contaminants in fish tissue, water, and sediments in the Androscoggin River were compiled and evaluated (EA Engineering, 1995). Existing data were obtained for eight general areas on the Androscoggin River between Errol, New Hampshire and Brunswick, Maine. Study data were presented separately for nine general areas including three locations upstream of the projects impoundments, stations in the APE, and at least five stations downstream of the Livermore development. Contaminant data were also gathered for relatively unpolluted "control" sections on the Presumpscot River. The report compared concentrations identified in the APE to screening levels, including Federal or state criteria, regulatory guidance levels, U.S. Food and Drug Administration (USFDA) action levels (USFDA, 1992), USEPA risk-based concentrations (RBC's), and background fish tissue concentrations at uncontaminated control sites sampled in a national study of chemical residues (USEPA, 1992; 1994; and 1995).

The survey confirmed that dioxin levels in fish tissue collected in the APE are elevated and exceed state of Maine fish screening levels. In addition, fish tissue samples collected in

1994 had concentrations of certain pesticides, mercury, and arsenic which exceeded state screening levels.

Based upon the results of the 1995 study, the Applicants undertook additional monitoring to determine the effect of the project impoundments on the accumulation of toxic compounds in fish tissue. Representatives of the MDEP collected 20 white suckers from the Otis impoundment and 20 white suckers downstream of the Livermore development. The results showed there were no significant differences in the concentration of dioxins between fish found in either location. The analysis also showed there were consistently higher levels of furans in suckers from the Otis impoundment. The levels of furans were still below the threshold for fish consumption advisories currently used by the Maine Bureau of Health. The study indicates the possibility that the project dam may be a contributing factor to raising concentrations of at least some toxic compounds (e.g., furans) in fish.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.2.2 Effects of Alternatives

A description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The no action alternative would maintain water resources in their current condition. Studies indicate that the projects and other adjacent uses are affecting water resources individually and cumulatively. Specifically, water resources in the upper portion of the APE (*i.e.*, Riley impoundment and the upper portion of the Jay impoundment) would likely continue to meet state water quality standards for D.O. and aquatic life (NAI, 1995). However, the lower Jay impoundment and the Jay and Livermore bypassed reaches would continue to experience periods when D.O. levels are below the State Class C standard (*e.g.*, during low flow and high temperature periods). Macroinvertebrate studies further show that, under low flow and high temperature conditions, various sites below the Androscoggin Mill's outfall diffuser may not attain Class C Aquatic Life Criteria (Eco Analysts, 1995).

Proposed Alternative

This alternative includes redevelopment of the Livermore powerhouse and several improvements which are either aimed

specifically at improving water quality in the APE or which will indirectly affect this resource, as discussed below.

The Applicants conducted macroinvertebrate studies in 1995, 1996 and 1997. IP, as part of its Town of Jay permit, is proposing to implement improvements at its wastewater treatment plant to reduce the discharge of solids, and make further adjustments as part of an operational plan to meet the Class C standards.

Due to the unknowns of the Town of Jay gage accuracy under low flow, high temperature conditions, the Applicants propose to maintain a D.O. and temperature monitor in the Jay impoundment upstream of the Jay powerhouse intake structure during the period of June 15 through September 15 to monitor water quality conditions and adjust project operation if necessary to meet state standards (see Section 3.3.2.1 for details).

The Applicants are proposing to implement certain improvements which will allow the southern bypassed reach at the Jay development and the Livermore bypassed reach to attain state standards. A minimum flow of 5 cfs downstream of the southern section of the Jay dam would be provided during July and August for the purpose of maintaining D.O. levels in the pool downstream of the southern segment of the Jay dam in compliance with state Class C standards (see Section 3.3.2.1 for details). In addition, the Applicants propose to release a minimum flow into the Livermore bypassed reach to protect and enhance water quality and fishery resources (see Section 3.3.2.1 for details).

Redevelopment of the Livermore powerhouse could result in some minimal short-term disturbances to existing water quality. During construction, a greater proportion of the river flow would be diverted through the existing bypass to permit construction to proceed on all or a portion of the powerhouse facility and generating units (see Exhibit C of the license application for details). If construction occurs during the summer the diversion of all flow to the bypass will improve water quality, particularly D.O. and temperature, in the bypassed reach for the duration of the redevelopment. Also, during construction, the placement and removal of cofferdams could have a short-term effect on sediment loading in the river downstream. With the implementation of an acceptable soil and erosion control plan, these impacts should be minimal. To ensure that the disturbance and impacts are minimized, both a temporary and permanent soil erosion and sediment control plan will be utilized to control erosion, and maintain water quality within state standards.

The construction and/or enhancement of recreational facilities associated with the projects (see Section 3.3.2.3), could cause some short-term construction-related disturbances to water quality. With implementation of appropriate soil and erosion control measures as noted above, these impacts will be minimized. Construction of the recreation facility at Pine Island will involve the Town of Jay relocating its winter sand pile to a location away from the river. This will have an indirect effect of improving water quality by eliminating potential non-point source pollution related to sand and salt runoff from the facility.

Increased recreational use of the projects impoundments due to the construction of improved access facilities may increase boating use of the impoundments. This could cause a minimal increase to shoreline erosion and sediment loading to the river.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

Under this alternative, a total of approximately 1.5 miles of currently inundated shoreline (dominated by bedrock substrate covered with boulders or cobble and gravel) would be exposed and subject to potential erosion on a short-term basis until it becomes revegetated and stabilized. Initially, water quality will be affected by sedimentation associated with the short-term erosion of newly exposed shoreline, which do contain some fine grain material (see Section 5.3.1.2). Some minimal increases in river turbidity and sedimentation could occur downstream of the Livermore dam following the permanent removal of flashboards. Since this increase is likely to occur during flood and other high flow events, the effect of this action on resources in the APE would be minimal.

Continuous river flows to the Livermore bypassed reach would improve summer water quality (D.O. and temperature). In addition, more consistent flows in the bypassed reach could improve the conditions for the macroinvertebrate community preferring higher velocities.

License Denial, Decommissioning, and Dam Removal Alternative

Sediment cores analyzed (NAI, 1995) showed that substrates behind the dams consisted primarily of sand and gravels, not fines (see Section 5.3.1.2). The amount of fine sediment accumulation behind the dams themselves is minimal, due to the annual flushing of the impoundments during spring high flows. However, several inches (with several feet noted in some areas) of muck and silty sand were found to exist in many near shore

areas of the impoundment and sediments have accumulated in areas protected from the erosive spring flows. Converting approximately 12 miles of impounded water to a free flowing river would subject these areas to more erosive riverine and flood flows. These deposits, which may contain accumulated toxins, would likely be redistributed or transported downstream. This could cause a short term increase in the sediment load of the river and the downstream transport of toxins.

Similar to the proposed alternative, this alternative would also restore continuous, although much greater, flows to the Livermore bypass, which could improve summer water quality and some of the species of the macroinvertebrate community in that reach.

Removal of the dams would have an unknown effect on the capacity of the river to accept current wastewater discharges.

5.3.2.3 Cumulative Impacts

The hydrology and quality of the water resources of the Androscoggin River basin have been changed by the settlement of the basin and development of dams in the upstream storage system and along the river. Water quality for the Androscoggin River as a whole under natural conditions is likely to have been considerably less turbid with lower levels of dissolved constituents, particularly in the summer (LWA, 1996). As a result of the construction of dams on the river, many of the rapids that are important for river aeration and waste assimilation were eliminated, and impounded sections replaced free flowing environments. Compared with this effect, the waste assimilation capacity of the river had been increased through upstream storage management that provided consistent and generally higher flows than existed under natural low flow conditions, especially during the summer.

Among the earliest and most significant changes to the water resources of the basin was the development of the upstream storage system operated by UWPC. The construction of the upstream storage system inundated approximately 11,000 acres of land and approximately 37 miles of river and an unknown number of miles of tributary streams. This added approximately 645,000 acre-ft of water storage to contain spring runoff and to release it more gradually than would occur under more natural, unregulated conditions. This regulation enabled and supported the development and continued existence of downstream dams for waterpower, and later hydroelectric power. As a result, the construction of the upstream storage system had effects not only on the lakes and rivers managed for storage purposes, but also on

the river downstream of UWPC's storage dams, due to both direct hydrologic and water quality effects and indirect effects caused by the downstream dams and the development they supported.

Even before the upstream storage system was built, the river had been affected by land use changes, timber harvesting, and agricultural runoff, and had been used as a source of power and for waste disposal. However, the onset of substantial industrialization of the watershed occurred just after the 1880's, the same time period in which the dams and water rights to the upstream storage system had transferred hands from the lumber interests (the original constructors of the storage dams) to the manufacturing interests in Lewiston, and hence, was already being regulated by the precursors of the present UWPC for downstream manufacturing beneficiaries.

As manufacturing and industry developed, the river was used not only as a source of power, but also to dispose of manufacturing by-products, including dyes, wool and cotton fiber particles, and chemical wastes (LWA, 1996). The decade of the 1880's saw the introduction of the sulphite pulping process, which had additional long-term effects on water quality in the basin, including the APE. As a result of these discharges, the Androscoggin River suffered from a severe D.O. deficiency problem and was once considered one of the ten most polluted rivers in the nation (New England River Basins Commission, 1981). However, over the last 20 years the water quality of the Androscoggin River has improved considerably due to collective efforts on the part of Federal, state, and local resource agencies, several large paper companies (*e.g.*, Boise Cascade (now Mead Paper), James River (now Crown Vantage), and IP), and CMP (FERC, 1996).

Today, the ongoing cumulative impacts resulting from the changes to the river from the above mentioned developments include continuing water quality and hydrologic effects which are both positive and negative. The impacts to water quality along a large portion of the Androscoggin have already been investigated and are addressed individually in several EAs and EISs (FERC 1981, FERC 1983, FERC 1992, FERC 1993a, FERC 1993b, and FERC 1996). The nature and magnitude of impacts on water quality relating to the existence and operation of the upstream storage system (the last large section of the basin not currently covered by environmental assessments) is currently being studied by UWPC.

Water quality in the Androscoggin River basin has been affected, primarily through temperature changes and changes in the fate and transport of materials between air, land and water systems. It is suspected that mercury, that has accumulated in lake sediments from atmospheric deposition, is more bioavailable

in lake systems that experience water level fluctuations as compared to lakes with more stable water levels. A study conducted by UWPC included nine lakes (four reservoirs and five natural lakes) in the upper Androscoggin watershed. Preliminary results of this study indicate that water level fluctuations may affect the bioavailability of mercury, although many other variables, including water quality, depth, watershed area, age, etc. may be equally or more important factors either individually or synergistically. There are other ongoing studies (including those being conducted by UWPC on the upstream storage system) that are addressing how mercury levels in the biota are affected by lake level management.

The storage of flows by the upstream storage system, in conjunction with the development of dams along the Androscoggin River, has had the effect of moderating flow patterns of the Androscoggin River to produce more consistent flows throughout the year. Runoff from spring rains and snowmelt is stored, reducing flood potential in downstream areas, and that runoff is released over the course of the summer to augment naturally occurring low flows. The result of this modification is a significant difference in flow patterns over the course of the year from flow patterns that would have occurred under natural conditions, or prior to regulation (LWA, 1996). LWA (1996) reports that in the Jay, Maine area, typical mean monthly flows under unregulated conditions would be 30% to 40% higher than present day flows during the months of April and May, and 86% higher during November. Comparing estimated median flows12/ under unregulated conditions to long-term median monthly flows for the regulated river indicates that during July, August, and September natural, unregulated flows would be 50% to 60% lower than those occurring under regulated conditions for these months (LWA, 1996). In January and February, another low flow period under natural conditions, the median flows are estimated to be roughly 40% lower than those occurring under the current regulated condition (LWA, 1996). Using a regression analysis developed by the USGS, the unregulated 7Q10 is estimated to be 300 cfs compared to a calculated 7Q10 of 1730 cfs for the river under existing conditions (LWA, 1996).

12/ Estimated median monthly flows under natural, unregulated conditions show a greater degree of variability from regulated flows than what is indicated by the mean monthly flows, particularly in the low flow months. Mean flows during the low flow months are more subject to skew from an occasional high runoff event. Therefore, median monthly flows are better representative of natural flow conditions during low flow months and are used for comparison in this report. Refer to LWA (1996) for additional details regarding the methodology used to approximate monthly flows under natural, unregulated conditions.

Augmentation of low flows during extremely low flow periods as reflected by the changes in the 7Q10 numbers allows sewage treatment plants and industrial waste discharges to be designed for higher levels of dilution. This has resulted in higher levels of pollutants being discharged to the river, some of which are then captured at downstream impoundments, in particular at Gulf Island Pond where resulting depressed D.O. conditions have prompted remediation with aerators. Another example of the effects of treatment plants discharges on water quality can be found in the APE. The Androscoggin Mill's wastewater treatment plant, which discharges into the lower Jay impoundment has an impact on water quality in the APE. This discharge is currently licensed by the USEPA (NPDES permit No. ME0001937), the State of Maine (Wastewater Discharge License No. 623) and the Town of Jay (Permit No. 2) and is currently in compliance with the solids discharge limits established in each of these licenses. Solids discharged from this facility accumulate in the projects' impoundments and are believed to affect the resident macroinvertebrate communities. However, these augmented flows have also allowed for the construction of less expensive treatment plants which have economically benefited some of the local municipalities and industries along the river as compared to the costs that would have been needed to construct more efficient treatment plants.

Augmentation of flows also has supported the use of the river for hydropower development, which has also altered the river hydrology. Dams downstream of the upstream storage system have impounded over 45% of the length of the river. The creation of impoundments within the basin has likely increased surface water temperatures during the summer. This warming is likely to have enhanced conditions for warm water fisheries. Higher temperatures in the impoundment surface waters could, in turn, affect the temperatures and D.O. levels of the rivers below the lakes. At the same time low flows on the riverine sections have typically been augmented during summer low flow periods. This may have enhanced conditions for the coldwater fish in these reaches, particularly in the upper portion of the basin. In addition, water temperatures on the river tend to be more constant than would be the case without the upstream storage system. That is, there is less diurnal fluctuation which reduces the availability of temperature refuges for fish and other aquatic organisms. However, during extremely low flow periods as indicated by 7Q10 flows, the higher flow levels resulting from the upstream storage system likely moderate the high temperatures that would otherwise occur.

Another cumulative effect to the river has been the reduction in D.O. Higher temperatures, increased levels of waste

loads to the river from industries along the river, and the elimination of rapids and falls by the construction of dams have contributed to reduced D.O. levels in the river. This effect varies in degree by location on the river. The higher temperatures and lower D.O. levels are reflected by the presence of fish species more tolerant of warm water, and the absence of native coldwater species requiring higher D.O. levels from the river. This effect is riverwide, not just in the impounded areas. For example, brown trout and rainbow trout which can tolerate warmer water temperatures are now the species of choice for management of the upper river rather than the brook trout which were native to the area and which prefer cooler water.

Operational changes and increased minimum flow releases in the bypassed river sections at other hydro projects on the river will improve the overall water quality in the Androscoggin River (FERC, 1993a and FERC, 1993b). Water quality improvement measures currently being implemented at Gulf Island Pond, located downstream of the projects, may not benefit water resources in the APE, but will benefit water resources along the lower portion of the river. Improvements proposed by the Applicants, including minimum flow releases and IP's proposal to reduce the volume of solids discharged by the Androscoggin Mill wastewater treatment plant, may aid water quality downstream, including in the vicinity of Gulf Island Pond. The continued land conservation efforts of several groups (*e.g.*, Androscoggin Land Trust), as well as the Land's Agreement proposal by IP and OHC will benefit water quality by precluding development adjacent to the waterway. Therefore, it is expected that the operation of the projects as proposed and other actions occurring in the basin will improve water quality in the basin and would not contribute to any future adverse cumulative impacts to water resources.

In summary, the original construction of the projects' dams resulted in the modification of free-flowing riverine segments that are useful for aeration to impounded segments which do not provide as much reaeration potential. The presence of the projects dams will continue this effect.

5.3.2.4 Unavoidable Adverse Effects

None. Operation of the projects, as proposed, would not cause any significant unavoidable adverse effects to existing water resources. In some cases, such as improving minimum flows in Livermore and Jay bypassed reaches, the proposed action will provide beneficial measures to the existing environment.

5.3.3 Fishery Resources

Fish species naturally present in the river during precolonial times varied between sections defined by major waterfalls which acted as barriers to fish migration and passage. Generally, above Rumford Falls there were no anadromous fish, but a mixture of cold and warmwater resident species including brook trout, white sucker, burbot, fallfish, various minnow species, and catadromous American eel. Below Rumford Falls (including the APE) the river had the above species as well as runs of anadromous Atlantic salmon. Brook trout also probably occurred in this section, except during summer low flows when warm water temperatures probably forced this species to retreat to cooler tributaries (LWA, 1996). Anadromous species such as American shad, alewives, blueback herring, and striped bass were historically limited by Lewiston Falls, a natural falls located 30 miles downstream from the APE. Atlantic sturgeon and rainbow smelt were historically limited to the lowermost river section downstream from Brunswick Falls, which is approximately 52 miles downstream from the APE.

Although the composition of the fish assemblage of the upper portion of the river may not have been appreciably altered by 1880, fishing pressure, logging activity, development, and water level management probably had reduced many fish populations, especially in the headwater lakes and tributaries (LWA, 1996). South of Berlin, New Hampshire (including the APE), sawmill wastes entering the river caused the destruction of stream invertebrates and reduced available fish spawning substrates (Atkins, 1887). By 1880, the salmon fishery in the river, which had existed as far up on the mainstem as Rumford Falls, had virtually disappeared (LWA, 1996). The distribution of American shad, striped bass, alewives, and blueback herring was also limited to the section below the most downstream dam (Brunswick).

5.3.3.1 Affected Environment

The projects provide approximately 12 miles of impounded riverine habitat. Each of the four impoundments are long, narrow ponds that are about 400 to 1,000 ft in width throughout their length. The largest, the Riley impoundment, extends for 7.3 miles and is generally 10 to 15 ft deep throughout most of its area, with main channel depths ranging from 5 to 31 ft (KA, 1994). The 1.5 mile long Jay impoundment is somewhat deeper, with average depths of about 15 to 20 ft and channel depths ranging from 8 ft to 25 ft (KA, 1994). The Otis impoundment provides 2.5 miles of riverine habitat with average depths ranging from 10 ft to 20 ft, and a maximum depth of 25 ft (IA, 1995). The smallest of the four impoundments, the Livermore

impoundment, extends only 0.75 mile with a maximum depth of about 16 ft (IA, 1995).

Habitat diversity and quality for warmwater species are generally high for all impoundments except Livermore, which has limited habitat types due primarily to its small size and steep banks. The impoundments' shorelines can be characterized as generally steep sided with minimal shallow (1.5 ft deep) habitats and substrates that alternate between highly embedded gravel and mud.

Substrates in the Riley impoundment consist primarily of a mixture of gravel and sand, with very little coarse substrate available. The upstream portion of the Jay impoundment is predominately sand mixed with silt, while the lower portion consists mainly of bedrock overlain with cobble and boulder. Both the Riley and Jay impoundments contain a series of small (approximately 20 to 30 ft wide artificial islands) boom piers that were originally constructed for the assistance of driving logs downstream. The boom piers provide areas of low current velocity during periods of high flow, and provide cover and substrate for resident fish and macroinvertebrates.

Substrate in the Otis impoundment consists primarily of sand and silt with scattered areas of bedrock, cobble, and occasional boulders. The Livermore impoundment substrate is predominately bedrock covered with either boulder or cobble and gravel. A variety of cover types are present in the impoundments and include areas of bedrock ledge, undercut banks, overhanging terrestrial vegetation, brush, downed trees, and boulders. Beds of rooted aquatic vegetation are more common in the Riley and Jay impoundments, while emergent vegetation is limited and patchy throughout the impoundments.

Resident Fish Species

The Riley, Jay, Otis, and Livermore impoundments support relatively diverse, self-sustaining warmwater fish assemblages (IA, 1995). The relative abundance of forage fish, panfish, and game species varies between the impoundments, but all groups are well represented. The principal game species in the APE is the smallmouth bass. Common shiner, spottail shiner, yellow perch, and white sucker are also common in the impoundments. Table 5 lists all of the resident fish species that have been found in the projects' impoundments.

Based on the size distribution of collected individuals, most species showed evidence of recent reproductive success. Exceptions were the golden shiner, of which only one adult

specimen was collected, and brown bullhead, of which five adults were collected. Largemouth bass was the only species for which only young-of-year (YOY) were collected.

With the exception of the Livermore impoundment, fish species richness in the impoundments was similar to that reported for other impoundments on the Androscoggin River and other northern impoundments (IA, 1995). The relatively low species richness (five species) in the Livermore impoundment was attributed to the small impoundment size and relatively limited habitat diversity. The relative abundance of smallmouth bass in the APE was considerably higher than that reported for other reaches of the Androscoggin River (IA, 1995). The high percentage of smallmouth bass indicates that this species is a dominant component of the fish assemblage.

Table 5. Common and scientific names of fish species collected from the projects impoundments (Source: IA, 1995)

Common Name	Scientific Name	Riley	Jay	Otis	Livermore
[redacted]	[redacted]	X		X	X
[redacted]	[redacted]	X			
[redacted]	[redacted]		X		
[redacted]	[redacted]	X	X	X	
[redacted]	[redacted]	X	X	X	
[redacted]	[redacted]	X	X		
[redacted]	[redacted]	X			
[redacted]	[redacted]	X			
[redacted]	[redacted]	X	X	X	
[redacted]	[redacted]	X	X	X	X
[redacted]	[redacted]	X	X	X	X
[redacted]	[redacted]	X	X	X	X
[redacted]	[redacted]	X	X	X	X

The Livermore bypassed reach provides the most significant free-flowing habitat in the APE. This reach is approximately 1,600 ft long and 500 ft wide. Habitat conditions are distinctly different in the upstream and downstream portions of the bypass. The approximately upper 2/3 of the bypass (the section between the dam and the end of the forebay wall) has a predominantly bedrock-large boulder substrate that contains several large deep pools' whereas the lower section (approximately downstream from the reach bordered by the forebay wall) is a wide riffle with a

predominantly cobble and small boulder substrate. Under existing conditions, the largest pool in the upper section provides the most significant fishing opportunity in the bypass. During the baseline fisheries survey only two fish species were collected in the bypass. Smallmouth bass represented 89.7% of the catch, and white sucker constituted the remainder of the catch (IA, 1995). Several year classes of smallmouth bass were collected, including YOY. Each of the white suckers collected were adults over 12 inches. According to local anglers, the pools within the bypass supports an attractive bass fishery (Gomez and Sullivan, 1995b).

An instream flow study employing the Instream Flow Incremental Methodology (IFIM) was conducted for the Livermore development bypass (Gomez and Sullivan, 1995b). Based upon the desire to enhance habitat for the existing and potential fisheries, habitat-flow relations were developed for lifestages of brown trout, rainbow trout, smallmouth bass, Atlantic salmon, and three aquatic macroinvertebrate taxa (*Acroneuria, Stenonema,* and *Baetis*). The collaborative study team overseeing this assessment concluded that the IFIM study was useful for evaluating flow needs for the bypass's lower section, which consists primarily of a wide shallow riffle. However, the study team determined that the IFIM study results were less useful for evaluating flow needs for the upper section, which contains large deep pools and extensive, complex ledge formations. Therefore, the collaborative study team conducted an additional flow assessment for the upper bypass (KA, 1997a).

The IFIM study report consolidated and summarized habitat-flow relations in the lower (riffle) section of the bypass in terms of the maximum achievable weighted usable area for each evaluation lifestage (Table 6). Optimal flow for trout and macroinvertebrate production in the lower reach is in the range of about 750 cfs to 1200 cfs. However, 450 cfs to 550 cfs provides at least 80% of maximum Weighted Usable Area (WUA) for each macroinvertebrate and salmonid lifestage, except for adult rainbow trout and the stonefly, *Acroneuria*. Rainbow trout were included in the analysis at the request of NGOs interested in possible introduction of this species to the APE; however, fisheries management agencies identified brown trout as the salmonid species more likely to be managed in the APE, given the previous introductions of brown trout and low gradient habitats immediately downstream from the APE. The study results also indicated that the bypass provided insignificant quantities of salmonid spawning habitat, and that, for the bypass as a whole, high quality habitat for smallmouth bass is confined to the large pools in the upper section.

Flow needs for the upper section of the bypass were determined based on habitat-flow relations in the large pools and on the quality of fishing opportunity provided by alternative flows. A study team comprised of aquatic/fisheries biologists observed and measured or rated habitat changes, wading safety, fishability, and experience required for fishing in the three principal pools in the upper bypass. That evaluation determined that flows of about 100 cfs to 150 cfs provide the best balance between habitat quality and angler access to the pools providing the principal fishing opportunity in the upper bypass.

In addition to the mainstem of the Androscoggin River, six tributaries to this river in the vicinity of the projects were investigated to determine habitat characteristics and species composition of these waters (IA, 1995). The studied tributaries included Newton Brook, Ludden Brook, Childs Brook, Bog Brook, Ridley Brook, and Sevenmile Stream (see Figure 2). Fish movements within these tributaries and access to the tributaries from the Androscoggin River are generally unimpeded; however, low flow conditions coupled with high gradient zones may naturally limit movement in upstream sections of several of the streams (IA, 1995). With the exception of the lower reaches of Sevenmile Stream and Childs Brook, habitats at nearly all sites visited on the selected tributaries were generally good to excellent for coldwater salmonid populations (IA, 1995). Five of the six tributaries sampled support self-sustaining brook trout populations in at least their upper reaches, and Sevenmile Stream supports at least a limited population of brown trout.

Anadromous and Catadromous Fish Species

The Androscoggin River in the vicinity of the projects does not currently support runs of anadromous species. Current state fish management objectives call for restoring anadromous fish runs, primarily American shad and alewife to the Androscoggin River upstream as far as Lewiston Falls (the fourth dam on the river) in the cities of Lewiston and Auburn.13/ Upstream passage facilities at the three lowermost mainstem dams already provide opportunities for passage up to Lewiston Falls (*i.e.*, Brunswick, Pejebscot, and Worumbo). There are currently no fish passage facilities at Lewiston Falls, Deer Rips and Gulf Island dams (the fourth, fifth and sixth dams on the river, respectively). The Maine Department of Marine Resources (MDMR), which oversees all state anadromous fisheries programs, except for Atlantic salmon, has no plans for introducing anadromous species to the

13/ Lewiston Falls is a natural barrier to upstream migration of anadromous fish, except for Atlantic salmon, which historically occurred upstream of the projects to Rumford Falls (FERC, 1996).

Androscoggin River in the area of the projects. However, the Androscoggin River in the vicinity of the projects is within the historic range of the Atlantic salmon, and the projects' dams are included in the New England Atlantic Salmon Restoration Program as sites potentially requiring passage facilities for Atlantic salmon (USFWS, 1989). These dams are respectively the seventh, eighth, ninth, and tenth mainstem dams on the Androscoggin River.

Table 6. Percentage of the maximum weighted usable area (WUA) for each evaluation lifestage at alternative flows in the lower (riffle) section of the Livermore bypass (Source: Gomez and Sullivan, 1995b).

SPECIES/ LIFESTAGE	Flow at Max. WUA	FLOW (cfs) 20	350	450	550	650	750	850
Brown trout								
Late fry	350	40	100	92	83	77	71	66
juvenile	750	15	70	82	92	99	100	99
adult	1150	11	62	73	82	90	94	97
Rainbow trout								
juvenile	850	15	66	79	89	96	99	100
adult	1800	5	40	48	57	65	72	78
Atlantic salmon								
fry	450	22	99	100	94	88	79	71
juvenile	750	12	75	87	94	99	100	99
Macroinvertebra								
Baetis	1150	1	70	84	91	95	98	99
Acroneuria	1500	1	57	71	81	87	91	94
Stenonema	850	4	76	86	94	98	99	100

The Androscoggin River supports runs of Atlantic salmon of "non-wild origin". However, the Androscoggin River has not been stocked with Atlantic salmon for over 100 years and currently sustains a small run (25 to 100) annually originating from naturally spawning fish and hatchery-origin strays (Baum, 1997). The Maine Atlantic Salmon Authority (MASA) has created a 10-year restoration goal for the Androscoggin River which is to maintain existing runs and increase them if possible by initiating a restoration program in the lower Androscoggin River watershed downstream of the APE (*i.e.*, below Lewiston Falls) (Baum, 1997).

With regard to catadromous species, a 1987 survey conducted by MDIFW documented American eel in Webb Lake, northwest of the projects. This species is considered at least transient at the projects.

Resident fish populations consist primarily of smallmouth bass and yellow perch and the population appears to be healthy even though they are currently fragmented such that upstream movement is prevented by the project dams. Downstream movements past the dams is possible for fishes passing through the powerhouses or over spillways during high flow periods.

Fishery

Regional fisheries biologist with the MDIFW indicate that overall, riverine fisheries appear to receive "high" use, except for the stretch from Livermore to Dixfield on the Androscoggin (which includes the projects), where a bass fishery exists. Based upon the results of the recreational use study conducted in 1995-96, it is estimated that the APE currently receives between 155 and 315 angler days of use per year (KA and LWA, 1996). The results of the 1995 creel survey estimated that 314 angler days of use occurred during the 1995 open water season (IA, 1995). Interviews conducted during the creel survey indicate that smallmouth bass is the principal sport fish caught by anglers (83% of all fish reported to the survey clerk), although 97% of all legal sized bass were released. Other species caught included largemouth bass, chain pickerel, yellow perch, and fallfish. Details of the 1996 Toxins study relative to the projects' impacts on the fishery is discussed in Section 5.3.2.1.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.3.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The no action alternative would maintain the existing fishery resource. The projects' impoundments support relatively diverse, self-sustaining warmwater fish assemblages. Operating the projects in a run-of-river mode with regular maximum impoundment fluctuations of approximately 6 inches does not negatively affect the fish community (IA, 1995). Stable water levels in the impoundments have also allowed extensive aquatic plant growth in shallow backwater areas and side channels. This

vegetation has increased habitat diversity and has provided abundant high quality nursery habitat for young fish. Production of benthic invertebrates that serve as forage for fishes is also increased by the presence of the aquatic vegetation in these areas. The presence of the four impoundments has some potential to impact macroinvertebrate production in the APE (see section 5.3.2.1). This could indirectly affect fishes that use these organisms as food. However, fisheries data for the APE suggest that during the past several years the effects of the projects' dams on macroinvertebrates have not appreciably affected the warmwater fishery associated with the impoundments (IA, 1995).

Smallmouth bass nests, which are generally located in water depths of one to three feet, are vulnerable to the effects of impoundment drawdowns during the replacement of flashboards, if that action occurs during the spawning period (late May to late June) in high water years. However, flashboards are typically replaced in late April in normal water years.

Despite the good quality habitat and relatively robust population of smallmouth bass, the value of the fishery is diminished by elevated dioxin levels in fishes in the project's impoundments. Fish consumption advisories have been issued for the projects' vicinity and elsewhere downstream. Therefore, the APE would continue to support a good quality catch-and-release fishery. Presence of the existing project dams would continue to fragment resident fish populations by reducing or preventing upstream movement.

Proposed Alternative

Continued operation of the projects in a run-of-river mode would have no significant adverse effects on existing fishery resources in the APE (see discussion above). The redevelopment of the Livermore powerhouse would have minimal effect on existing fisheries during the placement and removal of cofferdams in the intake canal immediately upstream from the powerhouse and in the tailrace immediately downstream from the powerhouse. Given their design, the cofferdam construction and removal should result in minimal sedimentation in the river. During the two-year construction phase, only one half of the turbines would be operable at any time (the remaining turbines would be dewatered by the cofferdams). Therefore, during redevelopment flow through the powerhouse would be reduced by approximately one half, and the remaining flow would be diverted through the Livermore bypass. This increased flow for a two-year period would benefit those aquatic macroinvertebrates and riffle-dwelling fish species preferring faster water and access and opportunities for fishing in the bypassed reach would likely be reduced.

The proposed minimum flow releases (see Sections 3.3.2 and 7) would enhance riffle-pool habitats for aquatic life including brown trout, juvenile Atlantic salmon, and aquatic macroinvertebrates. A more stable flow regime in the Livermore bypass would increase wetted area and usable habitat for brown trout, smallmouth bass, and aquatic macroinvertebrates in both the upper and lower section of the bypass. Forage species such as white sucker and minnow species (*e.g.*, fallfish, spottail shiner, and blacknose dace) would also likely benefit from the increased flow. WUA for adult brown trout, and the juvenile stage of brown trout, and Atlantic salmon would increase from less than 20% of maximum WUA to 82 to 94% of maximum WUA in the lower bypassed section (see Table 6). In the upper section, the proposed plan for seasonal releases of 100 and 150 cfs will maintain near optimal conditions for the evaluation species in the upper portion of the bypassed reach (KA, 1997a).

Interior has not prescribed upstream or downstream fish passage facilities for the projects at this time, however, fish passage facilities may be needed in the future. Such facilities would enable migrating Atlantic salmon to ascend the river past the projects and provide an additional means for fish to pass downstream (*i.e.*, in addition to passage over the spillways or movement through the powerhouses). The program to restore Atlantic salmon to the Androscoggin River is presently limited to the area below Lewiston Falls. Restoration of self-sustaining runs of Atlantic salmon to its historic range in the Androscoggin River drainage would require an active fry or smolt stocking program for the river, monitoring activities, upstream fish passage facilities to enable returning adults to reach significant spawning and nursery habitats, and downstream fish passage facilities at several dams. The four project dams are respectively the seventh, eighth, ninth, and tenth mainstem dams on the Androscoggin River. Fish passage currently exists at the first three dams on the river. Unless a trap and truck operation were implemented, returning adult salmon would encounter an additional three dams before reaching the four dams in the APE.

The experimental stocking of brown trout downstream of Livermore will help assess whether the re-establishment of a cold water fishery in the approximately nine-mile long segment between the Livermore development and Gulf Island Pond is viable. Initial reconnaissance by the MDIFW indicates that this segment contains about 50 acres of adult brown trout habitat that may support a put-grow-and-take fishery for about 250 annually stocked fall yearlings. Angler access to this segment is very limited, and development of a viable recreational fishery will require substantially improved access (IA, 1995). Water temperatures in this reach have been shown to approach the upper

tolerance limits of brown trout (IA, 1995); however, the MDIFW already manages an experimental stocking program for brown trout in Gulf Island Pond. In addition, the MDIFW successfully established a highly valued brown trout fishery on the lower Kennebec River, where summer water temperatures are comparable to those below the Livermore development. Thus, it appears possible that the segment proposed for stocking will support at least a seasonal fishery for brown trout.

The MDIFW currently stocks brown trout in the river below the APE at Auburn and in Gulf Island Pond; above the APE in Bethel and Newry the river supports a moderately popular brown trout fishery. In 1997, MDIFW stocked that portion of the Androscoggin River located below Livermore with excess stocks of brown trout. The success of this effort will be evaluated after five years and a decision on whether to abandon, continue, or modify the program will be made.

Erosion protection measures during construction of the proposed recreational facilities will mitigate minor, short-term effects of construction or improvement of these new facilities. The improvements to and the construction of recreational access facilities may have an indirect effect on the existing fisheries by increasing fishing pressure and potentially increasing shoreline erosion along the Riley impoundment. Designated access points and the small size and limited use of small boats would minimize shoreline erosion. Increased access could increase fishing pressure that may increase the mortality of catchable sized fishes. Harvest restrictions and other state fisheries management actions including periodic monitoring of the fisheries should protect the fisheries resource from over exploitation.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse

This alternative would have a negligible effect on the existing fishery resources in the impoundments. Assuming a constant shoreline slope, the width of the littoral zone would remain constant. The maximum depth in the steep-sided Livermore impoundment would decrease only slightly, from 16 feet to 14 feet. In the Livermore bypassed reach, continuous flows would result in greater current velocities and depths, thereby reducing angling access and fishing opportunity in the bypass.

License Denial, Decommissioning, and Dam Removal Alternative

This alternative would have the effect of removing approximately 12 miles of impounded river and converting it to free-flowing riffle-pool habitats. Riverbed gradients in areas

impounded by the Livermore, Otis, Jay, and Riley dams have been estimated to be 25.7, 11.4, 4.9, and 2.9 ft/mi., respectively (LWA, 1996). Given these gradients and substrate data (IA, 1995; EA Engineering 1995), the reach between the Otis and Livermore impoundments would probably become a nearly continuous riffle with appreciable amounts of ledge substrate. The segment at the Otis impoundment would probably become a riffle-pool with a ratio of approximately 1:1 or 1:2. Segments in the area of the Jay and Riley impoundments would probably have lower riffle-pool ratios.

Production of riffle-dwelling macroinvertebrates in the APE would be substantially increased in newly created riffle habitats. The quality and quantity of habitat for fish species in the projects' impoundments that prefer or are well adapted to lotic habitats (*e.g.*, fallfish, white sucker) would likely be more abundant. Species common in tributaries entering the projects waters, such as blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), and possibly slimy sculpin (*Cottus cognatus*), would probably become established in the river's mainstem. Elevated water temperatures during the summer would probably confine brook trout to the tributaries, although during late fall some brook trout may drop downstream to overwintering areas (Chapman and Bjornn, 1969; Bjornn, 1971). However, the incidence of brook trout in the mainstem may be minor, if there is sufficient wintering habitat in the tributaries. Also, brook trout are territorial and do not typically migrate long distances (Fausch and White, 1981; Cunjak and Power, 1986; McNicol and Noakes, 1984).

Habitats for lacustrine fish species such as chain pickerel, golden shiner, brown bullhead, lake chub, and yellow perch would be greatly reduced in the APE. Total usable habitat for all lifestages of smallmouth bass, a habitat generalist and the principal game species in the impoundments, would likely be reduced from that present in the existing impoundments due to reduced surface area. However, macroinvertebrate forage for juvenile smallmouth bass and trout species would likely be enhanced in the altered environment.

Removal of the dams would result in the release of sediments presently deposited behind each of the four dams (see Section 5.3.1.2 for a description of these sediments). Water currents would transport these sediments downstream where they would be redeposited in low gradient areas. Much of those materials would probably settle in Gulf Island Pond. These impacts of released sediments would be short-term, lasting approximately one to three years. The actual duration would be dependent on the frequency and magnitude of flows.

5.3.3.3 Cumulative Impacts

Before the river was developed, the fishery in the APE was likely comprised of a mixture of cold and warmwater species that are associated with free-flowing habitats. During the early nineteenth century, fish species resident in the APE and the lower portion of the Androscoggin River likely included Atlantic salmon, white sucker, burbot, brown bullhead, chain pickerel, pumpkinseed sunfish, yellow perch, slimy sculpin, American eel, and various minnow species including longnose dace, blacknose dace, creek chub, fallfish, and common shiner. In addition, brook trout would likely have been found in this section, except during summer when water temperatures would probably have limited suitable habitat and forced this species to retreat to cool waters in adjacent tributaries (LWA, 1996). Species in the upstream portion of the Androscoggin River likely consisted of brook trout, white sucker, blacknose dace and longnose dace. Landlocked salmon were stocked in Rangeley Lake.

The historic and existing impacts to the fishery resource along a large portion of the Androscoggin River have already been investigated and are addressed individually in several EAs and EISs. The nature and magnitude of the impacts on the fishery resource related to the existence and operation of the upstream storage system (the last section of the basin not currently covered by environmental assessments) is currently being studied by UWPC and will be reported in a separate EA.

The development of hydropower, other developmental activities, and the introduction of species such as smallmouth and largemouth bass have had both positive and negative effects on the type and number of fish species present in the Androscoggin River. Among the earliest changes to the fishery resource along the Androscoggin River was the development of the upstream storage system operated by UWPC. Prior to the construction of the upstream storage system, the lakes were interconnected and supported natural populations of brook trout and blue back trout. Construction of dams located at the outlets of the Aziscohos, Richardson, Mooselookmeguntic, Umbagog, and Rangeley Lakes collectively eliminated an estimated 37 miles of riverine habitat and created an additional 11,000 acres of lake habitat which presently supports fisheries for landlocked salmon, brook trout, and lake trout.

In addition, the construction of hydropower dams along the Androscoggin River downstream of the upstream storage system transformed the river from a free-flowing riverine environment with runs of anadromous Atlantic salmon (along the lower portion of the river) and resident fish species characteristic of natural

riverine habitats to a series of impoundments with warmwater fisheries separated by dams that obstruct upstream movements of fishes. The series of dams along the entire Androscoggin River collectively have had a significant, adverse effect on runs of anadromous fish species to the river fragmenting fish habitat on the river, which already had the formidable natural barriers of Rumford Falls and Great Falls in Lewiston. Lost nursery habitat and potential losses or delays of upstream or downstream migrating Atlantic salmon at the dams along the river have likely been one of many cumulative developmental factors that have contributed to the extirpation of the Atlantic salmon population in the Androscoggin River.

In addition, creation of impoundments along the river produced warmer environments with slow moving water which changed the nature of the fish and macroinvertebrate community. In essence, the conversion of the riverine ecosystems to impoundments has enhanced conditions for introduced warmwater species, primarily smallmouth bass, at the expense of native species. Smallmouth bass introduced to this system currently support a good quality fishery. Even where the river has not been impounded, changes in temperature and flow regimes favor other introduced species such as rainbow trout and brown trout at the expense of the native brook trout which prefer cooler, higher velocity water. On the other hand, augmented low flows from the upstream storage systems could enhance conditions for the passage of migratory species where they can negotiate around natural and man made barriers.

The introduction of new species to the Androscoggin River drainage has also affected the fishery resources. For example, landlocked salmon were first stocked in Rangeley lakes in 1875. Other introduced species to the Androscoggin River include smallmouth bass, smelt, and landlocked salmon. It is unknown what effect the introduction of these species had to the fishery resource.

Perhaps the most radical change in the riverine environment resulting from the development of dams on the river has been the creation of dryways or bypassed reaches. In cases where flows have been significantly reduced or eliminated, fisheries habitat has been diminished.

In the early 1900's and until the late 1960's, water quality degradation caused by municipal and industrial discharges "virtually destroyed the natural environment for all game species" downstream of Berlin, NH (DeRoche, 1967). DeRoche noted that small populations of brook, brown, and rainbow trout resided in this stretch of the river at the mouths of tributaries where

cool water and high D.O. levels are found, and a limited warmwater fishery for bass and pickerel existed in some of the coves and backwater areas, but that in general "no appreciable fishery of any kind exists in the Androscoggin River from Berlin, NH to Brunswick, Maine". The cumulative impact of these discharges in combination with the dams, which slowed the flow of the Androscoggin River, adversely affected the river's water quality, and negatively affected the fisheries resources.

The current operation of the upstream storage system and dams along the Androscoggin affect the fishery resource in different ways. For example, those impoundments that are operated to maintain relatively stable water levels (*i.e.*, the majority along the Androscoggin River) have created additional habitat for warmwater fish species. In addition, augmentation of low flows from the upstream storage system has enhanced conditions for certain species of fish and other aquatic species during low flow times of the year within some riverine segments (primarily in the upper segment of the river). However, in order to provide these stable river flows, these impoundments are drawn down on a seasonal basis. This drawdown reduces littoral zone productivity and has other adverse impacts on the fish and aquatic life in these impoundments. Some of these lakes are currently dependent on stocking to sustain brook trout and landlocked salmon populations. Based upon a HEP analysis, the peaking operation of the downstream Gulf Island Project adversely affects impoundment habitats used by smallmouth and largemouth bass. However, it was concluded that this habitat loss was not significantly limiting the black bass growth (FERC, 1996). The operation of some of the dams along the river to maintain stable water levels also affects those species preferring riverine conditions.

Other existing actions along the Androscoggin River that may be affecting the fishery resource include: fish passage construction, run-of-river operations, increased bypassed flows, water quality improvements, and stocking programs. Since 1977, the MDMR has been engaged in a cooperative effort with CMP to restore anadromous fish, primarily American shad and alewives, to the Androscoggin River and its tributaries below Lewiston Falls. Recent efforts include construction of an upstream fishway at the Brunswick dam located downstream of the APE (*e.g.*, lower Androscoggin River basin) which allows for the trapping and trucking of anadromous species (*e.g.*, alewives, shad) to upstream locations and other river basins (FERC, 1996). If runs of Atlantic salmon were to return to the APE, the Applicants proposal to construct fish passage facilities at the projects when required by the Commission, would likely further mitigate historic impacts to that species. However, migration delays to

both upstream and downstream migrating salmon would likely continue.

Recent FERC licenses issued and EISs for the Androscoggin River recommend continued run-of-river operations (*e.g.*, FERC 1993, and FERC 1996) to protect conditions for existing impoundment fisheries. The Applicants' proposal to continue run-of-river operations and avoid impoundment drawdowns for flashboard replacement during the bass spawning period should provide near optimal conditions for sustaining the warmwater fishery in the APE.

These same licenses and EISs provide for the establishment of minimum bypass flows (*e.g.*, FERC 1993a and FERC 1996) at numerous dams along the Androscoggin River which will enhance, depending upon its location in the river basin, habitat conditions for rainbow trout, brook trout and landlocked Atlantic salmon. The proposed alternative provides for significant enhancement of the area's existing free-flowing habitat through increases in the minimum flow in the Livermore development bypass which will enhance conditions for smallmouth bass and brown trout.

Water quality improvements since the early 1970's have substantially improved conditions for fish on much of the Androscoggin River, although residual contaminants continue to be present in significant concentrations in the river. Fish consumption advisories have been issued by the Maine Bureau of Health. With recently implemented pollution control measures, concentrations of dioxin will gradually decrease and enhance the value of the fishery. The Applicants' proposal to enhance water quality will provide additional benefits to the fishery.

It is not known to what extent the impediments to fish movement created by the dams and the effects of the drawdowns have contributed to present status of the fish resources as compared to other factors such as introduction of competing species and over-fishing.

The land conservation efforts of the land trusts along the Androscoggin River downstream of the APE and conservation measures proposed by IP will provide an indirect benefit to the fisheries of that area by protecting lands adjacent to the Androscoggin River from future disturbance (see Section 5.2.2). These land conservations will protect fish habitats from adverse effects of shoreline development, such as increased erosion, nonpoint source pollution from runoff of yard fertilizers, herbicides and pesticides, dock construction, shorefront property beach construction, riprapping, additional points of access, and

increased boat traffic. Such activities typically increase sedimentation and turbidity and can significantly increase or decrease submerged aquatic vegetation that provides important cover and substrates for aquatic organisms.

Future actions regarding construction of the PNGTS gas pipeline could indirectly affect fishery resources in the APE and elsewhere in the basin on a short-term basis due to disturbances of the river bottom at stream crossings. The impacts of this future action will be addressed by studies and the Federal and state regulatory process that is required prior to construction.

In summary, the cumulative impacts associated with the original development of these projects (*e.g.*, obstruction of upstream fish passage conversion of free flowing river to impounded habitats) would continue.

5.3.3.4 Unavoidable Adverse Effects

Operation of the projects under the proposed mode would not cause significant, unavoidable adverse effects to existing fishery resources. Operation of the projects, as proposed, would provide measures (*e.g.*, bypass flows, potential future fishway construction) which protect and enhance fishery resources.

5.3.4 Wetland Resources

During the early colonial period, coastal wetlands were valued and used as hayland. After that period, inland wetlands were considered worthless parcels of land that could only become "productive" by human induced changes (FERC, 1996). The USFWS estimates that the state of Maine had a total of approximately 6,460,000 acres of original wetlands around 1780; however, by 1980 about 20% of these original wetlands had been lost (Dahl, 1990). Historically, wetland areas were drained and ditched for establishing hay, grain, forage, vegetable crops, and timber harvesting. In addition, activities such as road and highway construction, building construction, and mineral mining have resulted in further loss of wetland areas. Modifications to wetlands include beaver impoundments and impoundments created by dams for water supply and hydroelectric generation, as well as local changes in drainage patterns.

5.3.4.1 Affected Environment

Wetland communities that currently exist in the APE include forested wetlands dominated by silver maple and red maple, shrub wetlands dominated by speckled alder and young silver maple, emergent wetlands dominated by a variety of wetland grasses and

sedges, and aquatic beds dominated by several species of pondweeds (ERC, 1995a). Two large wetland complexes associated with tributaries to the impoundments, Sevenmile Stream and Fuller Brook, abut the APE.

Fifty-two wetland complexes were identified within the APE (ERC, 1995a). In general, each of the complexes was comprised of four principal wetland types: Riverine Lower Perennial Aquatic Bed, Palustrine Emergent, Palustrine Scrub/Shrub, and Palustrine Forested. All four principal wetland types were found in the projects' impoundments. No forested wetlands were identified in the Livermore impoundment, due mainly to steep banks on the south side of the river and development on the north bank. The wetland complexes often consisted of a continuum of wetland types, with aquatic bed occurring in water 1 ft to 6 ft deep, adjoining an emergent wetland at the water's edge, grading to an area of scrub/shrub, and finally, a forested wetland. The total acreage and percent of the total area for each wetland type occurring in the APE is contained in Table 7.

A total of 14 tree species, 30 shrub species, and 116 herbaceous species, of which 15 are aquatic species, were identified. In each of the forested wetlands, species composition and dominance were similar, with silver maple dominating the tree layer and sensitive fern dominating the relatively sparse herbaceous layer. Scrub/shrub wetlands were dominated by speckled alder in the shrub layer, and jewelweed and sedges in the herbaceous layer. Spike rush was the dominant species in all of the emergent wetlands in the APE, although a wide variety of subdominants were also recorded (*e.g.*, rice cutgrass, broadleaved cattail, wool grass, water parsnip, *Iris spp.*, and pickerel weed). Fragrant water lily and pondweed were the dominant species in the aquatic bed wetlands, with other species such as water milfoil, spike rush, pickerel weed, water celery, and arrow head also present.

Topography is the most significant factor governing the distribution of wetlands within the APE (ERC, 1995a). The banks of the river are steep throughout much of the APE and there is no floodplain in many areas. Wetland formation has occurred primarily in those locations where there are low-elevation areas (0 to 3 ft above normal pool elevation), and where mudflats and sand bars have developed at the mouths of tributary streams. Wetlands have also developed at the downstream ends of islands, which are areas of sediment deposition and are also protected from flood flows and ice scour.

Table 7. Acreage and percent total area for each wetland type found in the APE (Source: WA, 1995)

Wetland Type [1]	Area (Acres)	Percent of Total Area[2] (%) (2,120 acres)
Riverine - aquatic bed	38	1.8
Riverine - aquatic bed - emergent	19	0.9
Palustrine scrub-shrub	14	0.7
Palustrine forested (low floodplain)	10	0.5
Palustrine emergent	9	0.4
Palustrine forested - scrub-shrub	5	0.2
Riverine emergent	4	0.2
Palustrine emergent - scrub-shrub	<1	<0.1
Riverine - scrub-shrub	<1	<0.1
Riverine rocky shore	<1	<0.1
Palustrine unconsolidated bottom	<1	<0.1

[1] Each wetland type was classified using the Cowardin system (Cowardin *et al.*, 1979).

[2] The total area of the APE is comprised of approximately 901 acres of open water habitat, 64 acres of riverine habitat, 103 acres of wetlands, and the 1,052 acres of terrestrial resources listed in this table (WA, 1995).

One scrub-shrub wetland complex was identified in the Livermore bypassed reach. This wetland complex was dominated by speckled alder, with subdominant species consisting of wild grape, Japanese knotweed, and saplings of American elm and silver maple. Both American elm and silver maple were also present in the tree layer. Sensitive fern, rice cut grass, Joe pye weed, Japanese knotweed, water parsley, and blue glory iris comprised the herbaceous layer.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.4.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The no action alternative would maintain the wetland resources in their current condition. Existing wetlands in the APE were diverse and thriving under existing conditions (ERC, 1995a). Species variety was particularly high in the emergent wetlands, probably due, at least in part, to maintenance of stable water levels resulting from existing operation of the projects (ERC, 1995a). Stable water levels also prevent the exposure of the shallow littoral zone to desiccation, freezing, and erosion from wind, ice, or other disturbances. A number of relatively rare plants, such as boneset, horehound, blue vervain, and square-faced monkey flower, were common within the APE. These species have specific habitat requirements and are intolerant of unstable environmental conditions (ERC, 1995a).

On average, flashboards atop the project dams fail approximately three times per year during the high spring or fall flows. The periodic flashboard failure and the associated sudden reduction in water level has not had a significant adverse impact on the aquatic and emergent wetlands in the Riley-Jay-Livermore and Otis impoundments due to the frequency and timing typically associated with flashboard failure. A review of the operating records shows that the flashboards tend to fail in late winter and early spring while the wetland plants are still in a dormant state and have not yet emerged. In addition, the flashboards are replaced as quickly as possible, and normal water levels are typically restored before, or early in, the growing season.

Proposed Alternative

Continued operation of the projects in a run-of-river mode would maintain the existing wetland resources in the APE (see discussion above). Redevelopment of the Livermore powerhouse could result in short-term disturbances to existing wetland areas located on the island adjacent to the project tailrace. Reconstruction of the training wall would temporarily displace or disturb those wetland species located on the upstream edge of the island. Less than 0.1 acre of existing scrub-shrub wetland habitat would be affected by the construction.

The proposed minimum flow release to the Livermore bypass (see Section 3.3.2.1), with the exception of high spillage flows in excess of the turbine capacity, would be maintained in the

bypass throughout the wetland growing season, resulting in a source of moisture and nutrients for water sensitive plants. However, the bypassed reach does not contain extensive areas of soft-bottom substrate that are necessary to support wetlands. The increased flow would have a beneficial effect on that portion of the existing scrub-shrub wetland located on the island that separates the bypass and tailrace. The majority of the existing scrub-shrub cover type would persist under the proposed minimum flow release since the island on which this cover type occurs would not become inundated at a frequency or duration which would preclude the growth of woody vegetation (Gomez and Sullivan, 1995b). During the IFIM study, it was determined that the majority of the scrub-shrub island remains above water even during the higher study flows (approximately 1,100 cfs). The additional water provided by the minimum flow could potentially provide hydrologic conditions suitable for development of new wetlands in areas of flat topography and slow moving water.

The conditions necessary for the development of new wetlands (*i.e.*, soil saturation or inundation) will likely develop in narrow areas along the fringes of the existing scrub-shrub island which defines the eastern edge of the bypass downstream of the Livermore powerhouse. Along small portions of the edges of the island, and in microtopographical depressions, there may be a sufficient increase in flooding to result in the conversion of scrub-shrub to marsh and/or the addition of new vegetated wetlands (scrub-shrub or emergent wetland) along the island perimeter. The net effect of the proposed minimum flow release, then, would likely include a small increase in the total area of wetland on the island as well as a possible conversion of a small portion of the existing scrub-shrub to emergent wetland. The precise areas of additional wetland are not possible to quantify based on available information.

The proposed recreational facilities (see Section 3.3.2.3) would result in little direct effect on wetland vegetation. The steep topography of the APE and the absence of boat ramps has limited the use of the impoundments for recreation, which has likely benefited the wetlands (ERC, 1995a). The construction of boat launch facilities and the encouragement of water-based recreation in the impoundments has the potential to cause minor adverse effects to some types of wetland areas. However, given the type of facilities and level of use projected for the projects' impoundments these facilities and use will not (see Section 5.3.7) significantly affect existing wetlands.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

Elimination or relocation of the existing (0.7 acre) emergent and aquatic wetland community, due to reduced water levels, would occur. Under the lowered water levels, periodic flooding along newly exposed low gradient sections adjacent to the river, may provide new potential areas for the development of floodplain communities once sufficient alluvial sediments are deposited to provide a suitable substrate for plant colonization.

License Denial, Decommissioning, and Dam Removal Alternative

This alternative would have the overall effect of converting some existing wetlands to upland terrestrial habitat, and re-establishing other wetland areas that were inundated during original construction of the dams. The overall balance in the distribution of wetland types (emergent vs. shrub/scrub and floodplain) would shift back towards pre-dam conditions with a greater proportion of the total in shrub/scrub wetlands. Dam removal is not specifically exempted from permit requirements under Section 404 of the CWA or Sections 9 or 10 of the Rivers and Harbor Act. This alternative, then, would be subject to permit review by the U.S. ACOE and potential wetland impacts and associated mitigation would need to be determined.

5.3.4.3 Cumulative Impacts

The wetlands occurring before development of the river were likely to have been of three types associated with river beds subject to widely fluctuating flows: 1) aquatic beds in areas which were shallow, of moderate current, 2) shrub/scrub wetlands which formed a band of varying width along the banks except in areas scoured to rock, and 3) flood plain forest on rich alluvial terraces created by frequent flooding. These floodplain forests and wetlands likely supported a number of plant species which are now rare in Maine (*e.g.*, American ginseng, auricled twayblade, white adders-mouth, wild leek and others) (see Section 5.3.6.1 for more details.)

Among the earliest changes to the wetland resources along the Androscoggin River was the development of the upstream storage system operated by UWPC, which created new wetlands while also eliminating or modifying existing wetlands. In addition, the construction of the dams along the Androscoggin River transformed the river ecology from a riverine environment to impoundments with wetlands characteristic of stable water levels (*e.g.*, aquatic bed wetlands). Providing stable water levels and areas protected from the erosive force of flowing water serves to

improve the overall diversity of emergent wetland species (which are not adept at utilizing high energy riverine habitats), dams have contributed to the creation of emergent and aquatic bed type of wetland areas in the basin. Whether the dams along the river submerged any naturally existing floodplain wetlands is not known, but it is likely that where low, flat topography (*e.g.*, terraces) existed adjacent to the original river channel, in those areas which are currently impounded, that floodplain wetlands have been submerged. Such areas may be emergent wetlands, aquatic bed wetlands or other open water cover types in the existing condition. Therefore, it is probable that the dams along the river have increased the availability of emergent or open habitats for many relatively rare plants (*e.g.*, boneset, horehound, blue vervain, and square-stemmed monkey flower). It is likely that the balance has shifted from predominantly scrub/shrub and forested floodplain wetlands with some aquatic bed wetlands to predominantly aquatic bed and emergent wetlands.

Other developmental activities (*e.g.*, logging; agriculture; filling and draining associated with road and railroad construction; and urban, suburban, and rural development) along the Androscoggin River have also potentially had both positive and negative effects on the extent and variety of wetland types found in association with the river. The 1800's marked the beginning of the rise of the modern paper, textile and leather industries in the Androscoggin Valley. The industrial development of the Androscoggin River and its riparian lands, including the associated urban development that provided the population centers and supporting industries, typically resulted in the filling or inundation of wetlands to create suitable upland areas for buildings and surrounding grounds. In addition, the filling of low topography areas needed to build the new roads and railroads to support the new industrial base typically modified existing drainage patterns and directly and indirectly affected wetlands occurring at that time. The clearing and draining of land for farming also had a direct negative impact on wetlands existing at that time. However, the above land disturbing activities increased erosion and sediment transport (see Section 5.3.1), which increased the deposition of fines in low velocity areas, which likely provided additional habitat for some types of wetlands.

Operation of many of the dams along the Androscoggin River benefits emergent wetlands through the establishment of stable water levels during much of the year due to run-of-river operations. A review of the studies of the APE and other Commission analyses (*i.e.*, FERC, 1993 and FERC, 1996) determined that emergent and aquatic bed wetlands benefit from more stable water level regimes under run-of-river modes of operation.

However, in order to provide the stable river flows which supports the run-of-river operation of the downstream dams, the water level in many of the upstream storage impoundments (*i.e.*, Aziscohos and Richardson Lakes) need to be drawn down on a seasonal basis. Other storage impoundments (*i.e.*, Rangeley) may only experience modest drawdowns (*i.e.*, 1 to 4 ft) under typical conditions.

Dewatering of wetlands on the margins for a portion of the year diminishes the vegetative diversity within those wetlands by comparison to wetlands which are not subject to such fluctuations. Drawdowns favor wetlands which are less diverse and have a larger proportion of facultative wetland plants. Thus, the overall effect is to diminish biodiversity within wetlands in the impounded areas (Kallameyn *et al.*, 1988; Renman, 1989; Rorslett, 1984; Rorslett, 1989; Wilcox and Meeker, 1991; Nilsson *et al.*, 1997). This has implications not only for the wetlands themselves but species of fish and wildlife which are dependent upon them. Further, drawdowns diminish the potential acreage of some emergent wetland types, (*e.g.*, those dominated by obligate wetland plants and aquatic beds). Consequently, more emergent wetlands would be expected to occur under a stable water regime than under a significant seasonal drawdown condition.

Other recent actions that may affect wetland resources along the river include a proposal by Crown Vantage to increase the height of the Shelburne Project impoundment (FERC No. 2300). This action will reduce the amount of wetland habitat by 4.3 acres. In this specific case, shrub/scrub and nonpersistent emergent wetlands will decrease in area and aquatic bed, persistent emergent and forested wetlands will increase in area (FERC, 1993). Recent Commission licenses issued and EISs along the Androscoggin River which are recommending or requiring maintenance of run-of-river operations (*e.g.*, FERC, 1993 and FERC, 1996), including the Applicants proposal in this EA, will ensure that existing wetland conditions are maintained. These actions will contribute to a beneficial effect on species of wildlife that prefer aquatic bed and emergent wetlands. Emergent wetlands are generally considered to provide superior waterfowl, wading bird and aquatic furbearers habitat (Golet and Larson, 1974; Weller, 1987). Species which prefer the shrub/scrub cover type (*e.g.*, woodcock) would conversely be adversely impacted.

The land conservation efforts of the land trusts along the Androscoggin River downstream of the APE and other actions by IP will provide indirect benefits to the existing wetlands adjacent to the areas under conservation by protecting lands from future disturbance. These protections will allow these wetlands to continue functioning as an important element in the natural

ecosystem, moderating river flows during storm events, stabilizing riverbanks, trapping sediments, retaining nutrients, facilitating energy and nutrient flows, and providing wildlife habitat. State and local ordinances which are intended to prohibit most development in wetlands, will generally continue to apply to the APE. However, these regulations and ordinances do allow exemptions and variations (*e.g.*, agricultural activities and timber harvesting).

Future actions regarding construction of the PNGTS gas pipeline which includes areas along the Androscoggin River, could indirectly affect wetland resources in the basin through soil erosion and sedimentation of receiving wetlands (during construction), through direct disturbance in those locations where the pipeline crosses wetlands, and through altered drainage patterns (see Section 5.2.2). The impacts of this future action will be addressed by studies and the Federal and state regulatory process that is required prior to construction.

In summary, the original construction of the projects' dams had both positive and negative impacts on wetlands along the river (i.e. loss of some specific wetlands and wetland plant communities and the creation of others). These cumulative impacts will continue with operation of the projects as proposed.

5.3.4.4 Unavoidable Adverse Effects

Operation of the projects run-of-river, as proposed, would not cause any significant unavoidable adverse effects to the existing wetland resources.

5.3.5 Terrestrial Resources

The vegetative and wildlife resources along the Androscoggin River have changed since predevelopment times in response to several developments. During this period, the northern mountainous reaches have remained predominantly forested, while the area from Rumford and south has been altered by settlements (including early Indian settlements), agriculture, and industry. Prior to the arrival of Europeans, the entire Androscoggin River valley was forested except for scattered cornfields cultivated by the Anasagunticook Indians. At the height of the agricultural era (which peaked around 1880) forested land occupied approximately 75% of the area in the northern portion of the drainage (Oxford County, beginning at Livermore) with cleared agricultural land amounting to 24% of the area; while in the southern end of Androscoggin County, forested land was less than half of the land area, and cleared agricultural land amounted to 53% (LWA, 1996). Today approximately 85% of the basin is

forested (NERBC, 1981), while 10% is agricultural (LWA, 1996).

Settlement patterns, timber and firewood cutting, agricultural clearing, industrial development, and the construction of dams along the river all have had an influence on the amounts and types of habitats available for both vegetative communities and wildlife. These influences have shifted in time and space throughout the basin, but overall, the majority of the changes have occurred in the lower basin through settlement, agriculture and industrial development. The upper basin has remained relatively undeveloped, except for commercial timber harvesting. The APE is located in an area which could be considered a transition area, at the edge of the more developed lower basin area, in an essentially rural landscape, not too distant from the relatively undeveloped upper basin.

5.3.5.1 Affected Environment

Vegetation

Today, the APE is dominated by terrestrial vegetation cover types typically found along major rivers in Maine that have been impacted by land use practices for over a century. A total of 16 terrestrial cover types were identified in the APE (WA, 1995). The most common terrestrial cover types that occur in the APE are identified below in Table 8. Many of the forested areas are young, but structurally diverse, and support wildlife populations (WA, 1995).

Upland floodplain forests are also found scattered throughout the APE, with the largest areas in the mid-portion of Riley, in Jay, and below Livermore Falls. In most of the other areas the steep banks exclude any floodplains. Hardwood floodplain forests are classified by the Maine Natural Areas Program as S-3, meaning that the community type is considered rare in Maine with between 20 and 100 known occurrences. In addition, floodplain forests are the most abundant potential rare plant habitat in the APE (two unusual plant species are known to occur, see Section 5.3.6 for details).

Floodplain forest stands in the APE vary in age from less than 20 years to almost 90 years. The largest trees (51 inches in diameter) occur in these floodplain forests. Floodplain forests consist of two types - low floodplain forests which are generally subject to annual floods and high floodplain forests, which are flooded somewhat less frequently, perhaps three out of five years. Neither type of floodplain forest is flooded frequently enough to result in wetland conditions. The low floodplain forests have canopies dominated by silver maple trees,

while the understories contain a mixture of shrubby and herbaceous vegetation primarily composed of red raspberry, spotted touch-me-not, Virginia creeper, sensitive fern, and ostrich fern. Most of the low floodplain hardwood forest floors are densely vegetated, partially due to rich soils that provide a good growth medium.

Table 8. Acreage and percent total area for the most common terrestrial cover types in the APE. (Source: WA, 1995)

COVER TYPE[1]	AREA (ACRES)	% OF TOTAL AREA
Total Terrestrial	1052	49.6
Mixed hardwood forest	250	11.8
Low floodplain forest	155	7.3
High floodplain/sugar maple forest	51	2.4
Agriculture	125	5.8
Red maple/beech/yellow birch forest	123	5.8
White pine/red oak/red maple forest	114	5.4
Open-grasses-shrubs	64	3.0
Urban-industrial	63	3.0
Other	107	5.0
Wetlands	103	4.8
Water[2]	965	45.5
TOTAL AREA	2,120	100

[1] Cover type identification was done according to the forest association levels presented in Eyre (1980) and the Maine Natural Heritage Program (1991).

[2] The total area of the APE is comprised of approximately 901 acres of open water habitat and 64 acres of riverine habitat.

An example of a high floodplain forest was found on Stevens Island in the Riley impoundment, with the dominant canopy species in sugar maple (these trees were about 80 ft tall and about 70 years old), with associates including basswood, American beech, green and black ash, yellow birch, silver maple, and white pine. This community is the largest example of this forest type, and the most significant terrestrial vegetative resource found in the APE (see also Section 5.3.6). The shrub layer in this cover type contains common and red-berried elder, and beaked hazelnut. The herbaceous layer includes Japanese knotweed, crested shield fern, silvery spleenwort, bloodroot, foamflower, trout lily, Canada mayflower, and purple trillium. Several herbaceous species (wild

leek, blue cohosh, and red baneberry) indicate rich soil conditions uncommon in most of Maine.

Red maple - beech - yellow birch forest areas within the APE have an average stand age of 66 years and are most common just upstream and downstream of Steven's Island. This cover type contains the most species diversity and structural diversity of any in the APE. The overstory and sapling strata are dominated by a mixture of red maple, American beech, and yellow birch. Beaked hazelnut, witch hazel, striped maple, Canada mayflower, interrupted fern, New York fern, and sarsaparilla dominate the understory.

The upstream portion of the APE is dominated by agricultural fields, which are either directly contiguous with riverine wetlands, or are separated by a narrow forested or shrub buffer. The middle and lower portions of the APE contain smaller amounts of agricultural land. Open agricultural fields add to the overall diversity of habitat in the APE; however, because most of them are used to grow annually harvested crops (versus hay), they are frequently tilled, limiting their value as wildlife habitat.

White pine - red oak - red maple forests are encountered throughout the APE on well drained sandy soils. The understory vegetation in these areas is composed of a mixture of striped maple, black cherry, and beaked hazelnut saplings, while the forest floor is dominated by leaf litter and poison ivy, bracken fern, Canada mayflower, and tree regeneration. All of the areas visited within this forest type appear to be 50 years old or less.

Open grass and shrub areas account for approximately 64 of the 2,120 acres (3.0%) within the APE and can be found in frequently disturbed areas, such as power transmission lines, railroad tracks, residential housing, or urban-industrial land. Little bluestem was the dominant grass species observed in the dry sand areas. It was usually seen growing with red oak and white pine regeneration, choke cherry, and shrubby gray birch. A few naturally occurring openings dominated by grasses and shrubs were observed on islands in the river that are subject to yearly ice-scouring in the spring.

Urban - industrial lands which comprise approximately 3% of the total acreage within the APE are more commonly encountered in the downstream half of the APE. These lands are either unvegetated or sparsely vegetated with weedy opportunistic species.

Wildlife

Diverse terrestrial and wetland-dependent wildlife species occur in the APE (WA, 1995). Field surveys indicated that available habitats (see section 5.3.5.1) are being utilized by a variety of mammal, reptile, amphibian, and birds that are expected to occur within this region of Maine. The projects' transmission line corridors provide edge habitat as well as a travel corridor for terrestrial wildlife. The unavoidable disturbance resulting from power line right-of-way management efforts (*i.e.*, vegetation management) limits potential use of this habitat during certain times of the year (*e.g.*, for ground nesting birds), but allows for the long term existence of this habitat. Wetland areas directly within the APE are relatively limited but appear to provide high quality nesting, breeding, and/or feeding sites. For those species with less restricted habitat requirements (*e.g.* white-tailed deer, red squirrel, and raccoon), there is an overlap between habitat communities. Species that have a preferred habitat (*e.g.*, many waterfowl, reptiles, and amphibians) are generally found only within that habitat.

A total of 141 wildlife species were observed in the APE, including 3 reptiles, 10 amphibians, 24 mammals, and 104 birds (WA, 1995). Reptiles and amphibians expected to occur along shallow water emergent edges of the impoundments, and in other shoreline habitats, include salamanders, toads, frogs, turtles, and snakes. American toads and wood frogs are also known to occur in mixed hardwood forests and floodplain hardwood forests within the APE. Waterfowl and other bird species observed at the projects include black ducks, wood ducks, mallards, great blue heron, green-backed heron, and spotted sandpipers. Other bird species that were observed using aquatic habitats less routinely or for specific purposes, include bald eagles, osprey, belted kingfishers, killdeer, and bank swallows. In addition, thirty-eight songbird species (including finches, sparrows, flycatchers, and warblers) were documented throughout the APE. Many of the 24 mammal species are quite common and were observed throughout the APE in a variety of habitats. Four aquatic furbearers (beaver, muskrat, otter, and mink) are known to occur in the APE, along with several large mammals (*e.g.*, white-tailed deer, moose, black bear, and coyote) and a variety of small mammals, including rabbits, shrews, chipmunks, woodchucks, squirrels, mice, fox, raccoon, and skunk.

Noteworthy species that are not commonly encountered in the APE or are species of special concern, but were observed during the investigations include black bear, bald eagle, Cooper's hawk, red-shouldered hawk, magnolia warbler, and American black duck

(WA, 1995). Further discussion of protected and candidate plant and animal species and unusual natural communities is contained in Section 5.3.6.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.5.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The No Action Alternative would cause no change to existing terrestrial resources. Terrestrial species present in the APE are relatively diverse and operation of the projects generally have had a minimal influence on the vegetative resources present in the APE (WA, 1995). However, the presence of the project impoundments and their current operation have influenced wildlife species in the APE by providing habitat conditions more conducive to species preferring impounded habitats with stable water levels over those that prefer flowing water habitats.

Projects water levels are generally maintained to be very stable (less than a six-inch fluctuation) which benefit wetland-related wildlife habitats and waterfowl nesting. The one exception is the high flows and corresponding water level changes associated with the spring run-off period. Flashboard failure (when water levels are 1.5 ft over the top of the flashboards) during flood conditions benefits some species by limiting the total increase in water surface elevation than if the dam was not equipped with flashboards. Conversely, some species are adversely impacted to a limited degree by the subsequent decrease in water levels below normal pool levels (4 ft at Riley and 2 to 3 ft at the other developments) that persist until conditions are safe enough to replace the flashboards. On average, the flashboards tend to fail three times per year. This failure, which typically occurs in the fall and late winter and early spring could adversely affect beavers and muskrats having riverbank dens. However, being located in a riverine setting, these species have likely adapted to these short term conditions. To the benefit of many species, the flashboards are generally replaced as quickly as possible, which restore the normal water levels before the major waterfowl nesting and amphibian breeding seasons.

Proposed Alternative

Continued operation of the projects in a run-of-river mode would maintain the existing terrestrial resources in the APE. Redevelopment of the Livermore powerhouse would result in minor, temporary disturbances to terrestrial resources (*e.g.*, wildlife resources would temporarily leave the construction area and vegetation would be temporarily disturbed). Upon completion of construction, vegetation would be restored.

The proposed recreational facilities (see Section 3.3.2.3) will result in little direct effect on vegetation and wildlife. However, the construction of boat launch facilities and the encouragement of water-based recreation in the projects' impoundments, particularly the Riley impoundment in its more remote sections downstream of Stevens Island, has the potential to cause minor adverse effects to those terrestrial (wildlife) resources that are sensitive to human activity. Construction and use of the boat launch facilities would have a minimal impact to species within the immediate vicinity of the facilities.

The proposed minimum flow release to the Livermore bypass would benefit shorebirds, wading birds, water dependent furbearers (*e.g.*, raccoons) due to improved macroinvertebrate conditions (see Section 5.3.2.2 for details).

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

The reduction in the Livermore water levels would not significantly affect vegetative species due to their current location above the water level. However, some minor impacts to wildlife species that utilize existing wetland areas for nesting, breeding, and/or feeding could occur. If the existing emergent and aquatic bed wetland habitat in the Livermore impoundment is eliminated, populations of wildlife species utilizing these areas would likely be reduced.

License Denial, Decommissioning, and Dam Removal Alternative

This alternative would reduce available habitat in the APE for those plant and animal species preferring impoundments and emergent and aquatic bed wetlands (*e.g.*, waterfowl, beaver, reptiles, amphibians, and wading birds) and increase habitat in the APE for those plant and animal species preferring upland terrestrial, scrub-shrub wetlands, forested floodplains, and flowing water habitats. The resulting shift in forested floodplains would not reestablish pre-development conditions due to land use changes and regulation of river flows. For example,

the reduced frequency of floodplain inundation which has resulted from flow regulation has altered the existing floodplain wetlands so that herbaceous plants are relatively sparse and the species assemblage reflects drier conditions (ERC, 1995b). Dam removal would have no long-term effect on downstream terrestrial resources since the existing mode of operation is run-of-river and the removal of the dams would continue run-of-river flows, and hence the downstream flows or water levels outside of the APE would not be changed. Some minor short-term impacts may occur when the soft substrate that currently exists on the margins of the impoundments are washed downstream during flood events.

5.3.5.3 Cumulative Impacts

As settlers and industry moved into the basin, additional lands were cleared for agriculture while remaining forests were harvested heavily for firewood and the lumber, pulp and leatherboard industries along the river. Upland and floodplain areas were inundated by the construction of dams along the river and new types of habitats for wildlife and plants communities developed, primarily through a shift in the type of wetlands from those associated with flowing rivers to those associated with impoundments. Along with the rise of the paper industry in the late 1800's came the onset of heavy spruce cutting in the upper basin to provide the pulp used by the mills. The building of new roads and railroads to support the new industrial base provided greater access by a larger population to areas which prior to this activity, only experienced minimal visitation by trappers and loggers.

As a result, the forest ecology in the upper reaches (where stands of old growth spruce were located) shifted to younger stands dominated by early successional species (*e.g.*, Aspen and red maple). LWA (1996) reports that by 1880, the diversity of species and the overall abundance of wildlife in the Androscoggin River drainage was reduced significantly. A number of the native animals originally present became extinct from the region, including wolf, mountain lion, and wapiti (elk) (Shelford, 1963), as well as caribou and passenger pigeons (LWA, 1996). These losses were the result of a combination of forces, including the development of a fur trade (1600's to mid-1700's), unregulated hunting throughout the region, timber cutting in the upper regions, and conversion of land to agriculture in the southern reaches of the basin (including the area encompassing the projects) (LWA, 1996). Since 1880, the watershed has continued to undergo changes, with the amount of cleared land declining from a high of 30% in 1880 to about 10% today (LWA, 1996). According to Braun (1950) and Shelford (1963), the second growth forests, or forests that become established following logging or

abandonment of agricultural areas, bear little resemblance to the original forests.

While a number of species were known to have been reduced or eliminated as a result of developmental activities in the basin, certain other species benefitted from these changes. The increase in open land would have favored certain species, such as bird species which use fields and edges of fields and forest (*e.g.*, bluebirds, bobolinks, golden eagles, and peregrine falcons). Certain other species such as moose, deer and many furbearers (*i.e.*, beaver, muskrat, mink, otter, and raccoon) also would have been favored by an increase in open land and early successional forests, although, heavy trapping pressure probably kept furbearer populations contained or even reduced from natural levels (LWA, 1996).

The development of the upstream storage system inundated approximately 11,000 acres of upland and wetland habitat and 37 miles of riverine habitat. Wildlife populations would have been diminished by this habitat loss. The inundation of riverine habitat at Aziscohos and other lakes probably also resulted in the loss of habitat for beaver and river otter. Conversely, wildlife species that are primarily aquatic may have benefitted from the increase in wetland and lake habitat.

Terrestrial resources have also been affected by development activities that occurred in the basin since settlement of the area (e.g., logging, agriculture, the paper industry), by altering terrestrial habitats in the basin. The 1800's marked the beginning of the rise in the modern paper, textile, and leather industries in the Androscoggin Valley. The industrial development of the Androscoggin River and its riparian lands, including associated urban development that provided the population centers and supporting industries, typically resulted in the loss or modification of terrestrial habitats and species utilizing those habitats. The clearing and draining of land for farming also affected terrestrial resources by transforming formerly forrested areas into cultivated fields.

The construction of the dams along the Androscoggin River transformed the river ecology by eliminating an undetermined amount of wetland and terrestrial habitat and the wildlife and plant communities utilizing them. Beyond this, the creation of dams along the river (including those operated by the Applicants) eliminated wildlife travel corridors along the edge of the river for species which prefer to travel along the river bed, as the forest now extends generally right to the normal high water mark rather than having a band of shrub-scrub wetland such as typical of unregulated systems. The riparian ecology of the river, while

changed from its natural condition, has achieved stability under the existing regime. Although there are no data available to indicate the acreage of the vegetative species or number of specific wildlife species that may have existed in the basin prior to the development of the dams, it is likely that the balance has shifted from predominantly riverine related species to species adapted to impoundment habitats and stable water levels.

The current operation of dams along the Androscoggin River impacts the terrestrial resources in different ways. There are benefits for those species which utilize emergent vegetation and impounded waters resulting from the establishment of stable water levels during much of the year due to run-of-river operations. For example, wood duck benefit from the juxtaposition of forested and emergent marsh habitats, and muskrat benefit from the existence of emergent marsh. However, these impoundments and stable water levels adversely impact other species which utilize a riverine environment. Further, in order to provide the stable river flows which help to support the run-of-river operation of the downstream dams, the water level in many of the upstream storage impoundments (*i.e.*, Aziscohos and Richardson Lakes) needs to be drawn down on a seasonal basis. This operation may affect some wading birds, waterfowl, and shorebirds by reducing water levels during critical lifestages (Gibbs and Melvin, 1990; Fair, 1995). Except for those species that often nest at the water's edge (*i.e.*, ring-necked duck), waterfowl would not be significantly affected by gradual drawdown of the lakes during the nesting season. Seasonal drawdowns may actually enhance feeding habitat for nesting waterfowl and wading bird species after the breeding season (and for fall-migrating species) by exposing food sources. However, fluctuating lake levels may negatively affect nesting common loons, either by flooding the nests under rising levels or leaving the nests stranded under drawdowns.

The land conservation efforts of the land trusts along the Androscoggin River downstream of the APE and land protection measures proposed by IP will benefit existing terrestrial resources under conservation by protecting the lands from future development (see Section 5.2.2). Shoreline areas included in these protection measures will provide a buffer against adjacent land disturbances and will continue to serve as travel corridors for various wildlife species. The protected shoreline areas will function to protect vegetated riparian areas which assist in reducing peak river flows by absorbing excess runoff during wet periods and slowly releasing it during relatively dry periods. These land protection measures will be particularly significant

if improved water quality conditions in the future prompt new interest in developing riverside properties.

Future actions regarding construction of the PNGTS gas pipeline, which includes areas along the Androscoggin River, could indirectly affect terrestrial resources in the basin by replacing forested habitat types with maintained (*i.e.*, kept open through mowing and/or herbicides) open habitats (*i.e.*, meadow) along the utility easement. The impacts of this future action will be addressed by studies and the Federal and state regulatory process that is required prior to construction.

In summary, the original construction of the projects' dams likely resulted in the loss of some floodplain habitats and the relocation of associated wildlife species utilizing those habitats. These impacts would continue with continued operation of the projects.

5.3.5.4 Unavoidable Adverse Effects

Operation of the projects, as proposed, would not cause any significant unavoidable adverse impacts to the existing terrestrial resources. The riparian ecology of the river, while changed from its natural condition, has achieved stability under the existing regime.

5.3.6 Threatened and Endangered Species and Unusual Plant Communities

Current state and Federal species lists indicate that 147 rare plant species[14]/ and 41 rare animal species could occur within the APE (WA, 1996). The actual numbers of these species that have occurred in the APE is unknown. However, historical accounts dating back as far as 1878 in some cases have documented 17 rare plants in the towns of Jay, Livermore, Livermore Falls, and Canton. There are no known published accounts of rare animals in the APE (WA, 1996).

5.3.6.1 Affected Environment

The USFWS was consulted on whether any Federally-listed threatened or endangered species and designated critical habitat existed in the APE. The only endangered species known or

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14/ The knowledge of rare plants across Maine varies according to the number and extent of historical and recent investigations. While the record is relatively poor in Androscoggin County, there is a fairly recent record from investigations in the southern part of Oxford County, south of the Androscoggin River (Campbell and Eastman, 1980, as cited in SPO, 1985).

suspected to occur in the APE are "occasional wintering bald eagles (*Haliaeetus leucocephalus*) and transient peregrine falcons (*Falco peregrinus*) (USFWS letter dated January 12, 1994). The Applicants also conducted a field survey to identify potential threatened and endangered species in the APE (WA, 1996).

Plants

No state or Federal threatened or endangered plants were found during field surveys of the APE in 1995. However, several habitats in the APE were identified as having a higher potential than others for rare plants (WA, 1995). Existing cover types and land uses are described in Sections 5.3.5 and 5.3.8, respectively. These habitats include rock ledges and outcrops, forested wetlands, rich alluvial shrub-dominated wetlands, and slow-flowing or impounded waters. Floodplain forests were the most abundant potential rare habitat in the APE. Most of the other habitats that were likely to contain rare plants were not located in the area or were disturbed to such an extent by historical development and use of the land that they had a low likelihood of harboring rare plants (WA, 1996). Extensive areas of urban, residential, and industrial land dominate the lower half of the APE, and in the upper half, agricultural and residential uses have altered habitat conditions. However, several species that are considered 1) rare, 2) candidates for Maine's proposed revised endangered species list, 3) those listed by the USFWS, and 4) unusual natural communities were found in the APE.

Two rare plant species were found, wild leek and spotted wintergreen (WA, 1996). The first species, spotted wintergreen, occurs in a dry pine-oak forest stand that is well above the influence of project-related water level fluctuations. The second rare plant species found, wild leek, were found in high floodplain forest communities located on the Riley and Jay impoundments that are also above the influence of the projects. This unique natural community is dependent on flood events for its formation. Two populations of wild leek were found in high floodplain forest communities located on the Riley and Jay impoundments. The wild leek population on the Riley impoundment consists of several thousand plants, while a much smaller population (approximately 25 plants) exists at the site on the Jay impoundment. Both areas are 6 to 10 ft above the normal full pond elevations of the impoundments and show evidence that flooding occasionally occurs every few years. The spotted wintergreen plants (10 to 15) were found in one location along the Jay impoundment, approximately 15 ft above the normal full pond elevation.

In addition, examples of two plant communities listed by the Maine Natural Areas Program as unusual in Maine were identified in the APE: several examples of a Hardwood Floodplain Forest Community and a single example of a River Beach Community. Hardwood floodplain forest communities occur on three impoundments in the APE as well as below the Livermore dam. Among these is a good example of a high floodplain forest community on the Riley impoundment which includes the larger of the two wild leek populations found in the APE. The river beach community was observed on the north shore of the Riley impoundment, just downstream from Steven's Island, but is a marginal example of this type of plant community (WA, 1996).

Animals

Bald eagles are the only species on the current state or Federal list of threatened or endangered species that were observed throughout the APE. The eagles (both adult and sub-adult) were typically observed perched in trees along the shoreline, and are assumed to be using the APE primarily for feeding purposes. A bald eagle nest has been identified about eight miles from the APE. No sign or direct evidence of peregrine falcons was observed. However, transient occurrences of this threatened species are possible.

Five rare species of amphibians and reptiles, 12 mammal species and 18 bird species have been identified as potentially occurring in the APE (WA, 1995). Although none of the five rare species of amphibians and reptiles identified were observed during the 1995 field surveys, it is possible that northern leopard frogs may be found in the APE. This conclusion is based on the existence of riverine emergent wetlands which are the preferred habitat of this species and which comprise 4 acres of the APE. None of the 12 rare species of mammals that could potentially occur within the APE were observed during field surveys.

Of those species on the Maine State Watch List, one species of waterfowl and two raptors were observed in the APE during the 1995 field surveys. The American black duck was observed as individuals and in broods and post-breeding groups. The study found that marginal nesting and brooding-rearing habitat for black duck exists on all of the impoundments. An active Cooper's hawk, which is currently on the state Watch List and is proposed as a Species of Special Concern, nest was found along the Riley impoundment. One red-shouldered hawk, currently on the state Watch List, was observed along the Riley impoundment. This species prefers moist lowlands and floodplain forest habitats, (Palmer, 1949; DeGraaf and Rudis, 1986) which are available along

the Riley, Jay, and Otis impoundments. Other habitats (deciduous and mixed forests) that support nesting and foraging activities of the Cooper's hawk are available within the APE (Palmer, 1949).

Shells of three rare freshwater mussel species were found during the 1995 survey: heavy-toothed wedge mussel (also known as the triangle floater), squawfoot, and the yellow lamp mussel. Shells of the heavy-toothed wedge mussel were commonly found on the banks of the Riley, Jay, and Otis impoundments. The conservation status of this species is not well known, therefore it is a species of some concern to the MDIFW. It is not however, afforded legal protection under Maine's endangered species law. Less common in the Riley and Jay impoundments, the squawfoot is also a species of some concern to MDIFW until its status can be fully evaluated. A few shells of the yellow lamp mussel were found downstream of the Livermore dam and represented the first documented occurrence of this species in the Androscoggin drainage (WA, 1995). The yellow lamp mussel is currently proposed as a State Threatened Species. The USFWS does not currently list it as a Candidate or Proposed species.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.6.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The two rare plant species, spotted wintergreen and wild leek, that occur in the APE are located above the influence of normal operation of the projects (WA, 1995). In addition, the marginal beach community on the Riley impoundment is located above the normal water surface elevation and is not adversely affected by current operation of the projects. Spring high flows typically scour this community, maintaining its ecological character.

Project-related impacts to rare animal species are primarily limited to those species that use habitats affected by the projects (*i.e.*, wetlands and shallow water areas during flashboard failure/replacement). Rare animal species that would be expected to utilize wetlands and shallow water areas that are influenced by project operation for feeding, breeding or rearing purposes are: Northern leopard frog, black duck, least bitten, sedge wren, dragonflies and various freshwater mussel species (WA, 1995). Foraging black ducks move to new locations or change

their activities when water levels in a feeding area change or cause food to become inaccessible (WA, 1995). Other species observed in the APE, like the bald eagle, may be attracted to the area in the winter for feeding because of the open water habitats that exist downstream of the dams.

The periodic loss of flashboards following high flow events may adversely affect fresh water mussel species. On average, the flashboards fail approximately three times per year. While some mussels may migrate to deeper areas when water levels decrease, they may become stranded if water levels drop too abruptly. However, rapid drawdowns, which could strand mussels, do not occur as part of normal operation of the projects. Replacement of flashboards inundate areas formerly flooded and reestablishes habitat for fresh water mussels (see section 5.3.5).

Proposed Alternative

Continued operation of the projects in a run-of-river mode is not likely to adversely affect federally-listed threatened and endangered species or designated critical habitat in the APE. The Applicants' proposal to implement a lands agreement (see section 5.3.8.3) would protect and enhance the bald eagle and its habitat. If the projects are modified or if new information about the projects become available that indicates the listed or proposed species or critical habitat may be present and/or affected, the Commission would re-initiate consultation with the USFWS. At the May 6, 1998 meeting, the USFWS concurred with the Commission Staff's determination (Gordon Russell, U.S. Fish and Wildlife Service, Old Town, Maine).

Where redevelopment of the Livermore powerhouse would consist of placement of a new facility in the location of the existing powerhouse, no long-term adverse effects on rare, threatened, or endangered species or unusual natural communities would occur. Redevelopment of the Livermore powerhouse could result in minor, temporary, indirect disturbances resulting from construction related noise. The proposed laydown and other construction areas would be located on upland areas adjacent to the powerhouse and do not contain habitats preferred by species identified.

In addition, a greater proportion of the river flow would be diverted to the existing bypassed reach during the construction period. The yellow lamp mussel is believed to be present in the Androscoggin River downstream of the Livermore dam. Additional flow through the bypassed reach during the construction period is not likely to adversely affect the yellow lamp mussel as these flows would produce less substrate scouring and deposition than

that which is normally seen during spring runoff. The minimum flow release to the Livermore bypass will have a beneficial effect on the yellow lamp mussel. The proposed minimum flow release may provide additional habitat favorable to the yellow lamp mussel (*i.e.*, moderate to swift flowing water) in those portions of the lower Livermore bypassed reach, which contain sandy shoals.

With the exception of the boat launch facility and canoe portage at Riley and carry-in access at Livermore, all of the proposed facilities would be located on previously developed land, resulting in little direct effect on vegetation and wildlife (see Section 3.3.2.3). However, the construction of boat launch facilities and the encouragement of water-based recreation in the projects' impoundments has the potential to cause some disruption to those species that are sensitive to human activity and development (*e.g.*, the Federally-listed bald eagle, nesting and brood rearing black ducks, yellow rails, and least bitterns).

Environmental Enhancements Without Redevelopment of the Livermore Powerhouse Alternative

This alternative could eliminate up to 0.7 acre of emergent and aquatic bed wetlands in the Livermore impoundment; however, this is not likely to adversely affect any federally-listed species or unusual plant communities, as none are known to occupy these areas. Further, while some marginal black duck habitat may exist in these wetlands (the black duck is on the Maine State Watch list), they are highly adaptable and there are more extensive and higher quality wetlands in the vicinity of the projects (*i.e.*, those associated with Sevenmile Stream and Fuller Brook). The bird species confirmed to be using the APE (bald eagle, Cooper's hawk, red shouldered hawk) would not be affected since their habitat would not be eliminated. The spotted wintergreen, which uses habitat above the influence of river flow, would be unaffected by this alternative. To the extent that shifts in the frequency and magnitude of flooding resulted in a shift in the hardwood floodplain forest community, there would be a corresponding shift in wild leek populations.

License Denial, Decommissioning, and Dam Removal Alternative

Over time, this alternative would have the overall effect of reestablishing some forested wetland areas that may provide additional suitable habitats for red shouldered hawks, and other listed species that prefer forested floodplains, scrub-shrub wetlands, and free-flowing riverine habitats. Conversely, this alternative would reduce open water aquatic and emergent wetland

types which are currently used by black ducks and bald eagles. The overall shift would be to increase the number of floodplain wetlands which would result in enhanced habitat for wild leek, red-shouldered hawk and Cooper's hawk, since these species utilize floodplains. The remaining rare, threatened or endangered species identified in the APE would not directly benefit from an increase in floodplain wetlands.

5.3.6.3 Cumulative Impacts

Given the types of habitats available today in the APE, up to 147 rare plant species and 41 rare animal species could potentially be present. Overall, many of these species may have always been relatively rare because they are at the periphery of their range, as mentioned previously. In addition, some of these are woodland species (*e.g.*, northern goshawk, lynx, and certain species of bats) which generally have been more abundant throughout the region under pre-European settlement habitat conditions (WA, 1995). A number of environmental changes would have contributed to the decline of these species, including land clearing for agriculture and development, timber harvesting, and inundation of forested areas with impoundments from dams (see also discussion under Terrestrial Resources, Section 5.4.5).

The development of hydropower and other developmental activities have had both positive and negative impacts on species currently listed as being rare, threatened or endangered. Some of the species currently listed on the state and Federal lists are likely to be listed because they are at the periphery of their range; almost one third of Maine's rare plants are at their northern range limit and another one-third are at their southern range limit. Others may be rare because they are associated with habitats that have been become rare due to changes resulting from development, agriculture, forest cutting, pollution, or hydrologic modifications including changes to wetlands, river shores and lakeshores resulting from dams and altered river flows and water levels associated with development of UWPC's upstream storage system. Finally, some may be rare due to over hunting during the early history of the state prior to hunting regulations and from over harvesting by plant enthusiasts and commercial interests.

The construction of the downstream dams along the Androscoggin River eliminated some habitats as a result of the associated impoundments. Species adapted specifically to riverine conditions including floodplain forests and shrub-scrub wetlands (wood turtles, yellow-nosed voles, silver-haired bat and a number of rare plant species with habitat requirements like the furbish lousewort), may have been adversely affected due to

losses in habitat from dam development on the Androscoggin as a whole (WA, 1995). For example, the amount of floodplain forests (the preferred habitats for wild leek and other plant species requiring rich alluvial soils) that existed under natural conditions is likely to have been greater prior to the construction of dams, flow regulation provided by the upstream storage system and other developmental activities in the basin. A review of river profile maps indicate that the construction of dams on the Androscoggin River typically inundated low lying areas upstream of natural falls. It is likely that these low lying areas originally contained floodplain wetlands prior to construction of the dams.

Habitats important to many threatened and endangered species (*e.g.*, forrested wetlands and rich bottom lands, emergent wetlands, marshes and wet meadows) have been affected over time by construction of dams, filling and development, draining and conversion to agricultural uses, and pollution. Some species that are presently rare or endangered and are adapted to extensive open grasslands or successional forests would have been naturally rare in Maine as these habitats were rare prior to European settlement. During the 1800's when agriculture was at its height in Maine, and timber harvesting had altered much of the lower Androscoggin drainage, some of these species would have been more abundant, including bluebirds, golden eagles, and short-eared owls (LWA, 1996; WA, 1995). The decline of agriculture and subsequent reversion to forests would have reduced the abundance of these species to levels closer to the naturally limited populations.

In contrast, it is also likely that some of the species that currently occupy the APE (*e.g.*, white tail deer, moose) were significantly reduced in numbers due to unfavorable habitats under pre-settlement conditions which have since been modified by development to be more conducive to these species.

Widespread pesticide use prior to the early 1970's resulted in the drastic declines of many wildlife species, particularly avian predators such as eagles and peregrine falcons. Since 1971, when persistent pesticides (*e.g.*, DDT) became strictly regulated under the Federal Environmental Pesticide Control Act and were replaced by pesticides which usually break down rapidly into harmless compounds, populations of pesticide-sensitive species have begun to recover (Peek, 1986).

The operation of dams along the Androscoggin River impact species currently listed as threatened or endangered in different ways. Habitats for rare species which require shallow open waters, emergent wetlands, marshes and wet meadows (including the

Northern leopard frog, least bittern, and eagles, and a number of rare plant species) may have either been reduced due to inundation and/or drawdown of the upstream storage system or increased as a result of the dams along the Androscoggin River. Winter habitat conditions have been modified for species such as bald eagles, which are attracted to areas below hydropower dams for feeding in ice free areas and where fish passing through the turbines make easy prey. While these conditions have enhanced opportunities for wintering bald eagles, the quality of their food resource has been compromised by the toxins introduced into the system from increased waste discharges. Operation of the projects as proposed would not contribute to adverse cumulative impacts to these species.

Other actions that may affect threatened and endangered species are the land conservation efforts of the land trusts along the Androscoggin River downstream of the APE and the land protection measures proposed by IP (see Section 5.2.2). These actions will benefit some of the species currently listed as threatened or endangered by protecting the existing terrestrial resources utilized by the species from future disturbance due to adjacent and encroaching land uses (see Section 5.3.8.3). Conservation of these areas would benefit species, such as the wild leek, which use these habitats. All of the listed bird species in the APE (*i.e.*, black duck, bald eagle, Cooper's hawk, red-shouldered hawk) find habitat in the area, including perches and feeding grounds.

5.3.6.4 Unavoidable Adverse Effects

Operation of the projects, as proposed, would result in no effect to federally-listed species or designated critical habitat. In addition, state-listed species and unusual plant communities are not expected to be adversely affected.

5.3.7 Recreation Resources

Little information exists regarding recreation pursuits supported by the Androscoggin River prior to the construction of the projects dams in their present configuration. It is likely that some boating, swimming, and fishing occurred on the river, but a majority of its use was probably more functional in purpose, as a transportation route and food source for the Abenaki Indians and earlier settlers. Later on, the river was likely a source of ice during the winter, and during the industrial age, probably served other municipal purposes including transportation and as a disposal site for waste. There are no known records that indicate that the APE received the type of recreation common during this era (fishing and hunting

expeditions by wealthy individuals from the other parts of the northeast to remote areas).

After industrialization, river-related recreation was most likely limited in scope. Increased use of the river as a disposal site for community and industrial waste, and its use for annual spring log drives made the river an unlikely choice for a desirable recreation experience, probably from the mid 1800's until the 1980's. Log drives on the river were suspended in the mid-1950's, and water quality improvement efforts were underway by the mid-1970s after passage of the CWA in 1972 brought national attention to the importance of water quality issues. These improvements provided opportunities for using the river as a recreational resource for boating, fishing, and scenic viewing.

5.3.7.1 Affected Environment

Regional (APE) Facilities and Use

Recreational opportunities for outdoor recreation within this area abound (KA & LWA, 1996). Popular open water and riverine sites offering both cold and warmwater recreational fisheries are located within a 25 mile radius of the projects (the boundaries of the APE for recreation resources). There are 130 lakes and ponds, and, in addition to stretches of the Androscoggin River outside the projects, portions of seven other rivers and a variety of streams lie within the APE (KA & LWA, 1996).15/ Approximately 56 (41%) of the ponds and lakes within the APE offer at least one public boat access site. Approximately 11 sites located on rivers within the APE also offer public boat access. Study results show these sites offer approximately 65 launches suitable for use with motor boats (KA & LWA, 1996).

Other resources within the APE (but excluding project sites) include approximately 21 miles of nature trails, 77 miles of hiking trails, 200 miles of cross country ski trails, 2,239 miles of ATV or snowmobile trails, and 270 picnic tables (KA & LWA, 1996).

Regional fisheries biologists with the MDIFW indicate that overall, fishing pressure on lakes and ponds within the APE is currently "moderate to light" except for locations where high quality fisheries exist, where pressure is "high." Fishing regulations have been implemented to protect the resource in these areas. Rivers in the APE offer fishing opportunities for

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15/ Other rivers include the Sandy, Kennebec, Swift, Nezinscot, Royal, Little Androscoggin, and Ellis Rivers.

both warm and cold water species including brown and brook trout and smallmouth bass (see Section 5.3.3). Some of these fisheries are naturally reproducing, while others are stocked. Use of the rivers within the APE for fishing is estimated by MDIFW regional fisheries biologists to be "high" for rivers supporting quality stocks. One exception to this level of use is the Androscoggin River from Dixfield to Livermore (which includes the project area), which is noted by MDIFW biologists as supporting a bass fishery that is still only lightly used.

Recreational motor boating within the APE appears to be high only on peak season weekends (KA & LWA, 1996). The Cobbossee and Belgrade Lakes, which lie at the edges of the APE, are the most heavily used, at times beyond capacity. Closer to the projects, use of lakes for motor boating was estimated at 50 to 75% of capacity. Demand for canoeing/kayaking opportunities appears to be much lower than for motorized boating. Lakes, ponds, and riverine waters are utilized at less than 25% of capacity during summertime weekends for these purposes.

Other water-related recreation in the region includes waterfowl hunting and trapping along the shoreline (KA & LWA, 1996). Participation in both of these activities is estimated to be "low" by MDIFW Game Wardens. No comprehensive regional information regarding swimming in lakes, rivers, or streams was reported. Picnicking opportunities within the region is reported to be limited due to lack of available facilities, and those that do exist receive "high" usage. Most recreation sites in Maine open around Memorial Day, when temperatures become more favorable for outdoor events. Many sites close after Labor Day, with the advent of colder weather.

In summary, most water-related recreation resources within the APE are not currently used to capacity. Only a few areas where high quality fisheries exist or where motorized boating is popular receive high demand, but not continuously throughout the year. In addition, there appears to be a need for additional picnic facilities.

Recreational Facilities and Use in the Project Area

A total of 22 recreation sites are associated with the projects. These sites include river access points such as boat launches and fishing trails, as well as
picnic areas, community parks, and hunting, skiing, hiking, and snowmobile trails that abut the river. A majority of the recreation sites associated with the projects are unimproved in that no formal modifications have been made to them. As is common in Maine, many of the fishing and canoe access locations

are simply trails to the shoreline that receive regular, though infrequent use by residents of the local community.

Resources associated with the project provide a variety of recreation opportunities across all seasons. The majority of the recreation occurs during the summer and fall seasons, and the primary activities in which people engage include playing ball, shoreline fishing, and sightseeing. Other activities that may occur during these seasons are picnicking, riding ATVs, walking, and generally just being outside. During the fall some duck hunting occurs as well. During the spring time, the number of people recreating in the vicinity of the projects is minimal, but the activities in which they participate are varied, and include shoreline fishing, riding ATVs, sightseeing, walking, and use of area picnic tables. This is also not unusual since the spring season in Maine (during April and May) is typically short and characterized by cool temperatures, frequent damp weather, a lot of mud, and a preponderance of black flies as the summer nears.

During the winter months, snowmobiling on lands located away from the projects area is the most popular recreational activity. Although people may use the projects resources in the winter for bait fishing, cross country skiing, and snowshoeing, it is on a very limited basis.

In addition to the sites reported on above, there are four other locations that are in the project area and near the projects but are not project-related. These include the Town of Livermore Falls Recreation Area, the Spruce Mountain Ski Area, the Interstate Trail System (ITS) snowmobile trail and French's Falls Ballfield. IP donated the property for the Town of Livermore Falls Recreation Area, which is now municipally owned and offers a picnic area, playground, ballfields, basketball and tennis courts, and walkways. IP also donated water pumping equipment and technical support to Spruce Mountain Ski Area, which is located near the Otis powerhouse. Water pumping equipment is used to pump water from the Androscoggin River to make snow for the ski area. The ITS snowmobile trail, which passes through the projects area in Canton, accounts for approximately 3,000 to 5,000 recreation days annually, as estimated by the Human Resources Committee. French's Falls Ballfield, which is owned and maintained by IP, contains a baseball diamond and is adjacent to an informal hiking trail included as a project related recreation site.

The Riley-Jay-Livermore project-related recreation sites account for approximately 1,000 to 2,000 recreation days annually, and these are primarily attributed to local

citizens.16/ Project-related recreation sites for the Otis Project account for fewer than 1,000 recreation days annually.17/ All recreation days are attributed to daytime use; opportunities for overnight use are not available.

Recreational Use Trends and Projections

Although outdoor recreation did occur in the early 1900's, it wasn't until the post World War II years that demand for such opportunities increased rapidly, and continued to do so until the mid-1960's. Since the early 1970's, however, the amount of leisure time available to the American public has decreased (Maine Statewide Comprehensive Outdoor Recreation Plan (SCORP), 1993). This has resulted in a shift to recreational pursuits of shorter duration. National historical trends show a steady rise in participation rates for recreational fishing, although the level of angler effort in terms of the number of days spent fishing has declined (Flather and Cordell, 1995). For hunting, historical data indicate that participation levels have remained stable since 1975, but that the focus has shifted from migratory waterfowl and small game species to big game species (Flather and Cordell, 1995). Flather and Cordell note that the shift away from waterfowl may be due to a combination of biological and social factors, including smaller populations of ducks, restricted access, crowding, and less leisure time. National historical trends in nonwildlife-related water-based recreation show increases in swimming in natural water bodies, motor boating, water-skiing, and canoeing/kayaking over a 10-year period from 1982 through 1992 (Flather and Cordell, 1995). The data indicate that demand for swimming and motor boating opportunities grew at a faster rate than for water-skiing and canoeing/kayaking and that the annual number of days during which people participated in swimming and motor boating show a higher level of avidity among participants when compared to water-skiing and canoeing/kayaking.

16/ These estimates were developed by the Human Resources Committee based upon data collected during the recreational use study. These estimates exclude use observed at recreation sites (*i.e.*, Livermore Falls Recreation Area and the ITS trail) located in the project area, but not considered to be related to the project (see meeting minutes dated December 4, 1996 for details).

17/ These estimates were developed by the Human Resources Committee based upon data collected during the recreational use study. These estimates exclude use observed at recreation sites (*i.e.*, Spruce Mountain ski area and French's Falls Ballfield (except as access to project area resources)) located in the project area, but not considered to be related to the project (see meeting minutes dated December 4, 1996 for details).

One recent study suggests that, nationwide, participation in both migratory waterfowl hunting and fishing are expected to increase over the next 50 years (Flather and Cordell, 1995). Models suggest that projected increases are associated with increases in income and education, in addition to expected increases in the proportion of the population living in urban areas. Demand for other water-based recreation is expected to increase as well, with the demand being greatest for rafting and tubing opportunities, and a more gradual increase for canoeing/kayaking, swimming and motor boating.

Estimates of future use were prepared based on projections provided in the 1993 Maine SCORP (Maine DOC, 1993). Overall, the projections appear to follow the national expected trends reported above. In Maine, resident participation in cross country skiing, hunting, walking for pleasure, canoeing, kayaking, pleasure boating, and lake and pond fishing is expected to increase through the year 2003 (ME DOC, 1993). During the same time the annual number of recreation days spent picnicking, playing ball sports, snowmobiling, ATV riding, and river or stream fishing, is expected to follow increases in population, or even decease (ME DOC, 1993). With respect to river and stream fishing, however, it is notable that in 1983, the Androscoggin Valley Council of Governments reported that shoreline fishing along the Androscoggin River had increased (Androscoggin Valley Council of Governments, 1983). This is likely due to water quality improvements throughout the 1970's and early 1980's. If river and stream fishing in the APE follow state and national trends, it seems reasonable to expect that the number of anglers targeting this area will eventually level off. At this time, however, we cannot predict at what level that might be or when that might occur.

Estimates of the current number of recreation days were multiplied by the estimated projected increases in annual user days provided in the Maine SCORP, in order to estimate future use of riverine resources in the APE. Overall, the annual recreation user days in the project area are expected to increase by about one percent per year from 3,000 to 3,200 by the year 2003 based on projected rates of increase. The estimate is low because participation in most of the more popular recreation activities that occur in this area are expected to maintain pace with expected population growth or decrease.

However, these estimates may be conservative as fishing may increase at higher than expected rates as the word spreads about the availability of this site. In addition construction of boat launches and a picnic area under the proposed alternatives will likely increase both motorized and non-motorized boating traffic

as well as angler effort at the projects. No motorboat activity was observed during recreation monitoring, although anecdotal information suggests a minimal amount does occur. Waters within the project area are shallow and rocky in places, which will serve to limit use of the river for this activity.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.7.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The No Action Alternative would maintain recreation resources in their current condition with no resource enhancements. Levels of participation in recreation, such as boating, and shoreline fishing, instream fishing, and scenic viewing would likely remain stable or grow along with the state's population.

Proposed Alternative

The Applicants proposed alternative includes development of improved recreation sites in the project area. Construction of new recreation sites and facilities could cause an increase in the recreational use of the projects area.

As a result of increased access, recreational fishing for smallmouth bass would likely increase on all impoundments (see Section 5.3.3.2). Nonmotorized boating traffic may increase slightly, but it would not be substantial as roadside access is already relatively abundant. Given this, people can currently launch canoes and small boats in projects waters. The proposed picnic area on Pine Island would also result in increased participation in scenic viewing. An increase in recreational use would be attributed to a mix of local and nonlocal use of resources. Given the current low use of the projects area for recreation, it seems reasonable to conclude that local use would not increase substantially with an increase in recreation sites. It seems more reasonable to conclude that local use would increase proportionately with population increases. Non-local use would most likely focus on boating or fishing from boats originating from the proposed launch sites, as urban centers grow and the residents seek out additional areas in which to recreate. These conclusions are supported by conversations with recreationists during the study period.

The recreational facilities (including carry-in boat launches) will provide opportunities for the public to view the existing wildlife resources of the area and the surrounding habitat. Constructing boat launches throughout the area will provide increased access for motor boating and canoeing/kayaking, as well as for waterfowl hunting and fishing. If national historical trends and participation forecasts are true for the facilities in the project area, this alternative will provide increased recreation opportunities to aid in meeting future increases in demand.

The proposed minimum flows to the Livermore bypass would provide increased opportunities for fishing by anglers (not from boats) by providing additional pools from which to fish. Although the recreation studies did not capture use of this location as a fishing site, anecdotal information indicates that it is occasionally used. As anglers learn of the improved access, the site will likely receive greater use in the future (see Section 5.3.3.2).

The bypass currently receives minimal and infrequent use as a whitewater practice area by local whitewater kayakers and canoeists during high flow periods. The construction of an informal stream gage will contribute to safer, better informed use of the bypass. IP also recognizes the concern for boater safety when flashboards fail and deposit debris in the river. However, the flashboards are designed to fail during extremely high flood flows when boaters are not likely to be present. It is more realistic that the resulting debris problem, (*i.e.*, pins, canvas) would be of greater concern than the flashboard failure. At this point in time, kayaking use of the Livermore bypass occurs only under spillage conditions after the flashboards have failed. IP will post signs in visible places to inform users of potential hazards.

Redevelopment of Livermore would affect recreation in the short-term by delaying the minimum flow from the Livermore powerhouse. During construction at the powerhouse, a greater proportion of river flow would be diverted to the bypass. Based on the results of the 1996 instream flow study, this would create conditions difficult for anglers to access the pools in the middle of the channel. The construction would also result in additional noise that may reduce recreational use of the shoreline access areas.

The stocking of brown trout in the Androscoggin River downstream of the Livermore development will likely increase fishing use of this riverine segment (see Section 5.3.3.2).

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

IP's recreation study, conducted in 1996, shows only incidental use of the Livermore impoundment for recreation. Study results show no river-related recreation occurring at this location now, although the Livermore Park and Gazebo is used for non-river related events. As a result, this alternative is expected to have no effect on water-related recreation.

As part of this alternative, water flow through the Livermore bypass would be equal to flow in the river, which would provide fewer instream angling opportunities and present more safety problems at some flows as anglers attempt to reach the deep pool areas in the middle of the bypassed reach (KA, 1997a). Use of the bypass for whitewater boating would likely remain minimal unless high water flow events occurred.

License Denial, Decommissioning, and Dam Removal Alternative

This would have the effect of changing approximately 12 miles of impounded water to a free flowing river. Under this alternative, existing informal and proposed recreation facilities would no longer be provided by the Applicants. Local communities would be responsible for the operation and maintenance of any existing facilities, as well as the construction, operation, and maintenance of new facilities. It is likely that removal of the dams would, in the short term, adversely affect recreation resources in the project area because lower water levels would expose a band of muddy substrate, over which users would have to traverse. This would force relocation of recreationists to substitute sites within the region. Over time, however, riverine use may increase as this softer substrate is scoured away. It is uncertain as to whether angler effort would increase or decrease. In one specific case on the Kennebec River, an improvement to the fishery resulted in increased angler effort. However, this case did not involve dam removal. On the other hand, a study conducted for the Maine Legislature found that anglers appear to prefer standing bodies of water over flowing bodies of water (Boyle, *et al.*, 1990). Thus, depending upon the quality of the fishery, creating a free flowing river and eliminating impoundments may actually result in decreased use of the river by anglers.

Riverbed gradients in areas impounded by the Livermore, Otis, Jay, and Riley dams have been estimated to be 25.7, 11.4, 4.9, and 2.9 ft/mi, respectively (LWA, 1996). Given these gradients and substrate data (IA, 1995; EA Engineering, 1995), the reach between the Otis and Livermore impoundments was

probably a nearly continuous riffle habitat with appreciable amounts of ledge substrate; the segment at the Otis impoundment probably had a riffle-pool ratio of approximately 1:1 or 1:2; segments in the area of the Jay and Riley impoundments probably had lower riffle-pool ratios. Given these gradients, it is doubtful that whitewater boating would develop in the stretch of river currently inundated by the Riley and Jay developments. It is unknown whether the gradients associated with the Otis Project and Livermore development, would be sufficient to attract whitewater boating given the urban nature of the surrounding area. While this action would increase opportunities for extended river trips along the 30-mile stretch of river from Rumford to Gulf Island Pond, it is unknown how many people would use the area.

5.3.7.3 Cumulative Impacts

The development and operation of the projects, in combination with other developmental activities in the basin, has resulted in changes to recreational opportunities along the Androscoggin River. Developmental activities since settlement of the area, such as logging, agriculture and the development of dams, altered water quality, fish habitat, lake level regimes, and flow conditions along the Androscoggin River (see Sections 5.3.2 and 5.3.3, respectively), which, in turn has altered the qualities and types of recreation opportunities in the basin. Prior to development along the Androscoggin River, conditions were characterized by falls, rapids and fast flowing environments. Participation in river-related recreation was likely minimal in the 1800's. It is more likely that the river was used as a practical resource for the provision of food and transportation.

The creation of the upstream storage system and development of dams along the Androscoggin River has likely resulted in both positive and negative impacts to recreation resources in the basin. For the most part, there is currently insufficient data to address the specific effects of the upstream storage system on recreation resources in the upper basin and throughout the length of the river. Since these impacts are not known with certainty, they are only discussed in very general terms. Within the upstream storage system, opportunities for lake-related recreation were increased by approximately 11,000 acres due to the expansion of the lakes and creation of Aziscohos Lake. At the same time the mileage of rivers available for riverine related recreation in this area was reduced by approximately 37 miles. Thus river recreation opportunities were lost and impoundment recreation opportunities were gained.

A significant contribution of the upstream storage system on the Androscoggin River (including the APE) is the effects associated with the increased, stabilized river flows provided during naturally occurring low flow periods. The maintenance of relatively uniform flows along the Androscoggin River increased the river's ability to sustain a viable warmwater bass fishery and the creation of impoundments (at the downstream hydro projects) has provided additional flatwater boating opportunities. The recreational value of the river for boaters is benefited by a lengthened season resulting from the increased, stabilized river flows provided by the upstream storage systems during naturally occurring low flows (New England River Basin Committee, 1981). This is especially important in the upper portion of the river, (*e.g.* the 13 Mile Woods area and in the area below Pontook reservoir which provide opportunities for white water boating based on the reliable summer flows). Higher summer flows enhanced a fish habitat for some species and hence fishing for them. At the same time it worked to the disadvantage of some native species such as brook trout. With regard to fisheries, more reliable and consistent river flows improve the amount and quality of warmwater fish habitat along the Androscoggin River by allowing the downstream projects to operate in a run-of-river mode, which benefited recreational fishing opportunities on the river (see Section 5.3.3). Historically, water pollution associated with increased waste loads discouraged recreation on the river. However, with recent improvements in water quality, recreational use of the Androscoggin River is increasing.

Today, an estimated 45% of the river's length from the upstream storage system to Brunswick, Maine is impounded by 21 dams which have developed all the major falls and eliminated all but a few notable stretches of rapids (LWA, 1996). This shift in the river's hydrology and ecology, along with the increased use of the river for disposal of manufacturing by-products and municipal wastes, has affected recreational resources throughout the basin. Water resources of the basin serve statewide, regional, and local recreators primarily in low intensity activities such as camping, fishing, and canoeing. This pattern of low-intensity activity will probably continue in the future. Development of dams along the Androscoggin River has created recreation opportunities while also changing conditions that could benefit other types of recreation. For example, motor boating opportunities, which would not exist in the absence of the dams, are available on the impoundments. Although, the establishment of dams has probably reduced the likelihood of canoeing along some stretches of the river (*e.g.*, between the Rumford and Gulf Island Pond).

Operation of the dams in the upstream storage system currently affect recreational opportunities available there and downstream. For example, water levels in the storage lakes may drop between 4 ft to a maximum of 45 ft from normal high water levels during the course of the entire year. Drawdowns on Richardson Lake (averaging during the summer 4.5 ft but up to 10 ft in extremely low flow years) create beaches that are favored by summer recreationists. On the other hand, summer drawdowns on Mooselookmeguntic (averaging 3.5 ft but up to 7 ft) and Aziscohos (averaging 8 ft but up to 27 ft) can interfere with recreational activities such as boating and use of shorefront property during lower water conditions in late summer, and navigation in some areas may become hazardous with the exposure of rocks or snags. Ice fishing is also prohibited by MDIFW regulations on the storage lakes due to fishery management concerns.

On the other hand, recreational opportunities for white water boating are enhanced on the Rapid River and the portions of the Magalloway River (two riverine segments linking the storage system) due to increased summer flows. Increased summer flows also benefit fisheries habitat and hence opportunities for anglers on these rivers.

Other existing actions along the Androscoggin River that may affect recreational resources include recent proposals to develop additional recreational facilities by other owners of hydro projects along the Androscoggin River and development of Sunday River into a four season resort (see Section 5.2.2). A review of previous EAs and EISs (*e.g.*, FERC, 1993a and FERC, 1996) indicates that portage routes around four developments and two new cartop launches will be constructed. In addition, numerous public access sites, primarily informal, will likely be posted to inform the public of waterfront access for fishing or viewing purposes. Increased boat access may result in an increase in nonmotorized boating on the river. Likewise, increased shoreline access may result in higher angler effort on the river. Results reported in these EISs and EAs, however, caution that local use of riverine resources is already common. Increased use is likely to occur only if individuals from outside these communities are attracted to access points as a result of posting the access areas. Sunday River, located in Bethel, Maine, developed primarily as a ski area but has since expanded into a four season resort. The resort, which is in the process of expanding its hotel capacity, offers mountain biking, guided canoe trips, hiking and fishing opportunities, and a summer day camp for children. Canoe trips are offered primarily on the Androscoggin River. Given Sunday River's recent expansions, it seems likely that boating use of the river will increase with their increase in clientele. Fishing effort may or may not increase depending

on where guests choose to go and what they choose to fish for.

Future water quality improvements may make the river more attractive to recreationists. However, as evidenced by the Town of Jay survey, public perceptions of the historic water quality problems will need to be overcome before any substantial increase in use can be expected.

Finally, land conservation efforts by land trusts and separate efforts of IP along the Androscoggin River will benefit remote and informal recreation opportunities by ensuring that specific parcels of land in the drainage area are protected from development. This may serve to counterbalance some of the developmental forces mentioned above associated with the water quality improvements.

In summary, the original construction of the projects' dams resulted in some loss of land around the river which could have been utilized for recreation. Fishing, boating, public access, and other recreational activities were improved in the basin with development of the project impoundments.

5.3.7.4 Unavoidable Adverse Effects

No unavoidable adverse effects to the recreational resources would occur as a result of continued project operation.

5.3.8 Land Use

The Androscoggin watershed was inhabited by the Anasagunticook Indians, who may have managed the forests through semi-annual (spring and fall) controlled burning (LWA, 1996). Except for scattered cornfields cultivated by the Indians, the Androscoggin River valley was almost entirely forested prior to European settlement in the early 1700s (Atkins, 1887). The development of railroads and dams on the river helped to promote development along the river by utilizing the water to power machinery. In general, the northern mountainous reaches have remained forested and remote, while the area from Rumford to the south has been altered by settlements (including early Indian settlements), agriculture and industry. Since European settlement of the areas along the Androscoggin River, land uses have changed to consist of pockets of industrial, commercial and residential uses (primarily along the lower portions where there were significant drops in water elevation that could be used to power machinery) in amongst stretches undeveloped forest land or agricultural fields.

5.3.8.1 Affected Environment

The existing project boundaries for both the Riley-Jay-Livermore and Otis Projects includes the associated impoundments up to their normal high water elevation, as well as the land which encompasses the powerhouses and transmission line right-of-ways (as defined in Section 5.1). There are approximately 33.3 miles of shoreline in the APE (27.1 miles on the mainland and 6.2 miles on the islands.) Within and adjacent to the APE, IP owns approximately 1,070 acres of land consisting of about 11.9 miles of shoreline (8.5 miles on mainland and 3.4 miles on islands). Included in IP's land holdings is Steven's Island (60 acres), 34 acres of land that is leased to the Town of Jay (including Pine Island) and 284 acres of land in tree growth. Otis Hydroelectric Company owns only 4.2 acres of land, including riparian rights to approximately 0.3 mile of shoreline, within the APE.

Existing Uses and Ownership

There are a wide variety of land uses within the APE, including agricultural (*e.g.*, crop production, cattle raising), industrial, residential, and commercial. The majority of land is rural with concentrated areas of industrial development located adjacent to the Jay and Otis impoundments. The majority of industrial development (*i.e.*, IP's Androscoggin River Mill) is located on the right bank (looking downstream) of the Androscoggin River in the Towns of Riley and Jay. There is also a strip of industrial development (*i.e.*, Otis Specialty Papers) along the left shore in the Town of Livermore. Other types of development, including residential and commercial, tend to be located along the left bank of the river downstream of Riley development. A railroad and state highway have also been built up along the developed left bank.

There are approximately 14.6 miles of mainland and 3.8 miles of island shoreline associated with the Riley development. Approximately 34% of this shoreline (3.9 miles on mainland and 2.4 miles on islands) is currently owned by IP and 66% is privately owned by other landowners. Much of the land upstream from the Riley dam is rural with either residential use, agricultural use, or passive use. There is one small village located on the south side of the Route 140 bridge in Canton, a small cluster of residences located on river left (just south of the Jay and Canton Town line) and Riley Village (another small cluster of residences just downstream of the Riley dam on river right). The only significant agricultural lands within the APE occur on river left in the vicinity of Canton Point. Otherwise, the major land use adjacent to the Riley impoundment is undeveloped woodland.

There are approximately 6.8 miles of mainland and 1.6 miles of island shoreline associated with the Jay development. Approximately 29% of this shoreline (2.2 miles on mainland and 0.3 mile on islands) is currently owned by IP and 71% is privately owned by other landowners. A large portion of the land on the river right between the Riley and Jay dams is made up of IP's Androscoggin Mill site. The left side of the river from the Riley dam downstream to Bean Island in the Jay impoundment has the same rural character as described above. Downstream of Bean Island the land use becomes somewhat more developed up to Jay Village, though remaining generally residential with a few small commercial ventures amongst the residential houses.

There are approximately 4.2 miles of mainland and 0.8 mile of island shoreline associated with the Otis development. Approximately 58% of this shoreline (2.1 miles on mainland and 0.8 mile on islands) is currently owned by IP and 42% is privately owned by other landowners. There are approximately 1.5 miles of mainland shoreline (there are no islands in this area) associated with the Livermore development. Approximately 17% of this shoreline (0.3 mile) is currently owned by IP or Otis Hydroelectric Company and 83% is privately owned by other landowners. Downstream of the Jay dam, the land along the river right is basically undeveloped to the Livermore dam. On river left, between the Jay and Livermore dams, there is a mix of residential and commercial uses. The heaviest development is located along the Otis impoundment in an area known as Chisholm. The Otis Specialty Paper Mill is located on river right at the Otis dam, and a combination of residential housing, much of it apartment buildings, and commercial establishments are located further downstream. On river left below the Livermore tailrace, the immediate shoreline consists of floodplain forest while much of the land further inland is developed as a recreation area.

Existing Zoning

Municipal planning efforts in the adjacent communities have resulted in the adoption of shoreland and municipal zoning ordinances that include criteria for protection of natural resources within a 250 ft zone along the river corridor, consistent with Maine Shoreland Zoning Act which requires municipalities to adopt a 250-ft-wide buffer strip as a minimum standard for local zoning purposes. The Shoreland Zoning Ordinances for the towns of Canton and Livermore restrict all non-passive development (which includes boat houses, residences, barns and other structures, etc.) within 75 feet of the normal high water elevation of the river. In most instances, the Jay and Livermore Falls Shoreland Zoning Ordinance also requires a 75-ft setback for non-passive development. The municipal zoning

ordinances (with a 250 ft-wide buffer) in the APE apply to the lands owned by the Applicants. The Applicants will continue to comply with the local and state mandated zoning ordinances.

Based upon existing zoning, there are three different land use zoning district categories that are currently in force for the mainland shoreline of the APE (the islands are not zoned). These land use districts are: Resource Protection, General Development and Limited Residential.

The Resource Protection District includes areas in which development could adversely affect fish and wildlife habitat, water quality, ecosystems, or scenic and natural values. This includes: lands within 250 ft of wetlands, great ponds or rivers which are rated as "high" or "moderate" value habitat by MDIFW; significant wildlife habitat as defined by MDEP; 100-year floodplains; areas with two or more contiguous acres with a slope of greater than 20%; areas with two or more contiguous acres of wetlands vegetation and hydric soils; and shorelands subject to severe bank erosion or river bed movement. Types of land use allowed in this district (although subject to certain restrictions and local planning board or code enforcement officer approval) include nonintensive recreational activities and facilities, forest management/harvesting, resource exploration, agriculture, fire prevention, and wildlife management practices. Uses which are not allowed include most residential, commercial and industrial development.

The General Development District includes areas in which two or more contiguous acres are currently devoted to commercial, industrial or intensive recreational activities, and may include some residential development. Most activities are allowed in this district, subject to certain restrictions and local approvals.

The Limited Residential District includes areas which are suitable for residential and recreational development, exclusive of areas zoned for Resource or Stream Protection. Most activities, except for commercial and industrial development, are allowed in this district, although subject to certain restrictions and local approvals.

Based upon existing land use zoning maps approximately 15.0 miles (55.4%) of the 27.1 miles of mainland shoreline[18]/ are zoned as Resource Protection, while 8.7 miles (32.1%) are zoned

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18/ There is currently no land use zoning in place for the islands located in the project impoundments. Therefore, all numbers used in this section will be based upon the mainland area.

for General Development, and 3.4 miles (12.5%) are zoned Limited Residential. Table 9 provides a listing of the type of land use zoning by impoundment.

Analysis of Land Use and Protection Needs

In determining the appropriate amount of land necessary for project purposes, including buffers and enhancement, several factors are weighed and examined, including the need for: 1) ensuring public access, 2) protection of recreational values, 3) protection and enhancement of aesthetic values, 4) protection and enhancement of unique habitats and 5) shoreline control.

Table 9. Shoreline Zoning by Impoundment (Source: IP Staff; Main-Land Development Consultants, Inc., 1995)

Impoundment	Resource Protection District (%)	General Development District (%)	Limited Residential District (%)
Riley	97 (14.2 miles)	3 (0.4 mile)	0
Jay	0	59 (4.0 miles)	41 (2.8 miles)
Otis	0	85 (3.6 miles)	15 (0.6 mile)
Livermore	52 (0.8 mile)	48 (0.7 mile)	0

With one notable exception, existing land use conditions around the projects are compatible with the environmental values and recreational uses of the APE. The one exception is public access; which, while it takes place informally at a number of locations, is not guaranteed and does not allow for a number of commonly accepted public uses (*e.g.*, easy portaging around dams, access for boats).

The currently existing land use conditions are rural in the upper portion of the projects (the upper Jay impoundment and above), and even the lower portion of the projects area retain, for the most part, forested undeveloped river banks. For example, water quality is enhanced by this forested buffer between adjacent land uses and the river. However, the public's opportunity to enjoy the fishery resource is currently limited by access. The same is true for the aesthetic resources present at the projects, particularly on the Riley and upper Jay impoundments, as well as the general recreation opportunities the projects provide for a variety of activities.

Furthermore, certain areas in the APE are high priorities for protection efforts either because of their unusual natural values (*e.g.*, the presence of rare or unusual plant communities, large wetland complexes, undeveloped watersheds) and/or because they are vulnerable to the development pressure which may occur as the river becomes more attractive for development. This is likely because of continued improvement in water quality and increasing demand for waterfront property. The areas most likely to be developed include land outside of the floodplain with deep soils and gentle slopes suitable for development.

Table 10 provides a listing of IP's ownership around each of the impoundments.

Table 10. International Paper's ownership of shoreland around the projects (Source: IP Staff)

	Total shoreland (miles)	IP ownership (miles)
Riley	18.4	5.37
Jay	8.4	3.84
Otis	5.0	3.15
Livermore	1.5	0.367

The Applicants have developed plans in order to protect a portion of the shorelands around these projects, through a combination of approaches, including placing selected areas (*e.g.*, new recreational facilities and certain shorelands) within project boundaries. In addition, IP and OHC have established a separate plan for donating non-project lands and placing other lands into a conservation lease to maintain these areas as undeveloped and protect their natural values.19/ Lands to be included within the project boundary include approximately 29 acres (approximately 12,290 ft of shore frontage) of property in the APE. These lands will ensure public access to the Androscoggin River, protect existing recreational values of the area through the construction of low-impact facilities (see Section 5.3 for details) and allow for the enjoyment of aesthetic resources currently found in association with the river.

19/ IP and OHC will enter into a separate agreement with NGOs and other interested parties that addresses land uses on other non-project lands.

A more detailed discussion of IP's and OHC's efforts at protecting undeveloped lands within the Androscoggin River basin from future development and protecting their natural values is contained in Section 5.3.8.3.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.8.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4, and 5.1.

No Action Alternative (Status Quo)

The No Action Alternative would not change the way existing land uses are currently regulated or managed in the APE. The Applicants own approximately 1,070 acres of land along 11.9 miles of mainland and island shoreline within the APE. The Applicants do not control land use activities on non-Applicants owned lands adjacent to the projects (approximately 64% of the shoreline of the APE). In addition, there are state and local regulations20/ and review procedures in place for most development related activities in the APE.

Proposed Alternative

Operation of the projects in a run-of-river mode, as proposed, would not conflict with existing land uses in the APE. Redevelopment of the Livermore powerhouse and increases in the minimum flows at Livermore and Jay will not affect existing land uses. Recreational improvements will have an indirect effect on existing land uses by encouraging additional public uses of the Applicants' lands and projects waters through additional public access points and recreational facilities. The inclusion of improved recreational access facilities within the projects boundaries will increase recreational use, but should not affect existing land uses. Certain non-recreational lands will also be included within the project boundary.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

This alternative would have the same effects as the proposed alternative.

20/ The state administered Natural Resources Protection Act which regulates development adjacent to water bodies and wetlands and the Shoreland Zoning Act which is administered by local governments.

License Denial, Decommissioning, and Dam Removal Alternative

This alternative would have the overall effect of removing the existing projects lands from the Commission's jurisdiction and the Applicants would have the option to convert the lands to other uses. Because the projects' lands would no longer be under Commission jurisdiction, the Applicants would not be responsible for providing recreational access, protecting sensitive habitats or aesthetic values. Therefore, public access and recreational use of the lands would likely decrease and recreationists would utilize other public access areas along the river. Public access and recreational use of lands focussed on riverine related activities may increase once the soft bottom substrate adjacent to the shoreline areas (see Section 5.3.1.2) was scoured away.

5.3.8.3 Cumulative Impacts

Land uses prior to industrial and residential development in the basin were mostly agricultural and undeveloped forested areas. The development of dams along the river as well as other developmental activities (*e.g.*, logging; agriculture; filling and draining associated with road and railroad construction; and urban, suburban, and rural development) in the Androscoggin River basin has potentially had both positive and negative effects on the extent and variety of land uses that occur adjacent to the river. The paper industry and other industrial development in the Androscoggin Valley supported and continue to support a large proportion of the economic activity in the area.

The seasonal drawdowns within the storage system lakes required for stabilizing flows downstream may have made the areas adjacent to the storage impoundments less attractive for development than other lakes with stable water levels. However, decisions of the major landowners (timber and paper companies) have been the dominate factor in maintaining the undeveloped character of the upstream storage system area which is managed for timber production. It is not known whether the operation of the downstream dams has impacted land uses. As illustrated in the Affected Environment section, existing land use regulations have prohibited certain types of uses within the APE and other areas adjacent to the Androscoggin River and have established review procedures for other types of uses.

Future actions that may affect land uses along the Androscoggin River include actions from other recent Commission licensing processes. As a result of the recent licensing of the Gulf Island Project (FERC, 1996) and the Upper Androscoggin River Projects (FERC, 1993a) additional land conservation measures are being investigated.

Other actions which could affect land use within the APE area and within the basin include on-going land conservation efforts by numerous groups (*e.g.*, Androscoggin Land Trust), as well as the Lands Agreement proposed by IP and OHC. These land protection measures will protect those areas from future development.

The proposed transfer of approximately 96 acres of land, with approximately 4,460 ft of frontage on Rangeley Lake (see Section 5.2.2 for details) will greatly enhance remote and informal recreational opportunities at a popular remote recreation designation in the State of Maine (*i.e.*, Rangeley State Park). In addition to the benefit to recreation opportunities, the expansion of Rangeley State Park21/ to include more shore frontage which will also protect existing aesthetic views from the water, protect water quality by precluding development on the largest undeveloped parcel of shoreline in the South Cove area, and protect existing upland wildlife habitat.

The combination of lands transferred in fee to a local land trust (approximately 280 acres with approximately 31,700 ft of shore frontage) and the lands transferred to the land trust for the Conservation Management Lease (approximately 956 acres with almost 6,000 ft of shore frontage) will serve to further protect resource values in the general area of the APE. Aesthetic studies indicated that existing views in the APE were "surprisingly attractive given what little notice it receives among Maine rivers." The majority of the lands in Lands Agreement are located around the Riley impoundment which the aesthetic study concluded contained the most scenic views within the APE.

In addition to the lands contained in the proposed alternative, the proposed Lands Agreement provides for the protection of over 1200 acres of land, having a total shorefront length of over 37,000 ft in the APE from future disturbance. The Lands Agreement will assist in the additional protection of remote, informal recreational opportunities; ensure public access to the waterway, protect existing aesthetic values, protect unique habitats and water quality along the Androscoggin River.

The Lands Agreement will protect existing wildlife habitats by creating buffer zones that help to maintain existing habitats and minimize the potential for development in areas containing sensitive or unique terrestrial resources. The agreement

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21/ If the purchase option for these parcels should be retracted, the Lands Agreement provides for the purchase of other lands having roughly the same size, shore frontage, ecological and monetary value.

protects lands along the Androscoggin River (*i.e.*, Russell parcel) which contain wetlands, the protection of which will allow these areas to continue functioning as an important element in the natural ecosystem, moderating river flows during storm events, stabilizing river banks, trapping sediments, retaining nutrients, facilitating energy and nutrient flows, and providing wildlife habitat. The conservation measures will also protect other unique habitats, such as the Stevens Island parcel which is a high floodplain forest and is considered the most significant terrestrial vegetative resource found in the APE.

The Lands Agreement will protect water quality and fish habitats by protecting lands adjacent to the river from adverse effects of shoreline development, such as increased erosion, nonpoint source pollution from runoff of yard fertilizers, herbicides and pesticides, dock construction, shorefront property beach construction, riprapping, extensive additional points of access, and substantially increased boat traffic. The lands conserved by this agreement are important in maintaining and enhancing the quality of the Androscoggin River basin.

The proposed construction and operation of a natural gas pipeline through a portion of the basin may affect land use during clearing and construction phases (see Section 5.2.3).

In summary, the original construction of the projects' dams may have contributed to a change in land uses within the APE from undeveloped forest lands to the development of the surrounding communities. These impacts will continue with the presence of the project dams.

5.3.8.4 Unavoidable Adverse Effects

None. Operation of the projects, as proposed, would contribute to a cumulative beneficial effect on land use due to the proposed Lands Agreement.

5.3.9 Aesthetic Resources

The construction of dams along the Androscoggin River has impounded approximately 45% of the river's elevation in Maine (LWA, 1996). These impounded conditions eliminated many steeper gradient areas that were responsible for scenic waterfalls as well as more moderate areas that create rapids. Historical impairments to the river's water quality, as evidenced by the odors, discoloration, and surface foam, have impaired the river's aesthetic value. Recent and ongoing efforts to improve the river's water quality contribute to a beneficial effect on the aesthetic quality of the river. However, these impairments have

shaped perceptions about uses of the river. According to the Town of Jay's 1995 comprehensive planning survey, many Jay residents do not use the Androscoggin River for recreational use because of its "unclean and polluted" character.

5.3.9.1 Affected Environment

The results of a visual assessment study conducted in 1995 concluded that the portion of the Androscoggin River from Canton to Livermore Falls was "surprisingly attractive given what little notice it receives among Maine Rivers." However, views of the projects area (river from Canton to Livermore Falls) did not rank as high as other rivers in the APE (defined for this resource as a 25 mile radius from the projects) due to: 1) the natural features being less distinctive, and 2) some detractions (*e.g.*, water quality and odor, industrial and hydro development) having greater impact. The industrial and hydro facility detractions are located primarily downstream of the Riley development.

Along the Riley impoundment in Canton, the river flows through woods and farmland. Logging cribs, a few islands, a beach area, wetlands, and interesting rocks provide visual interest for the canoeist exploring the river (Dominie, 1995). In this stretch, hills rise 500 ft and higher above the river. Canton Mountain, Fish Hill, McCollister Hills, Allen Hill, and other hills grace many views, though sometimes only their tops can be seen (Dominie, 1995). Consisting primarily of mixed species, the wooded shorelines add visual interest along the study corridor, especially during the fall foliage season. Development in this portion of the APE is sparse and relatively unobtrusive, with the exception of the traffic on Route 140 above Canton Point.

Highway Route 140 follows the sparsely populated northern shore along the Riley impoundment, sometimes coming quite close to the river. The most expansive views of the Riley impoundment can be seen from the Route 140 bridge in Canton (Dominie, 1995).

Route 140 continues along the Jay impoundment, with strip residential development that affords only a few clear views of the river. From the perspective of the river user along the Jay impoundment, their views include IP's Androscoggin Mill. The mill and its ancillary features compete for attention with physical features such as ledges, islands, and mountain views. A "graceful old bridge" that extends from the western bank of the river to Pine Island, just downstream from the Jay dam "contributes greatly to the setting" (Dominie, 1995).

The upstream portion of the Otis impoundment is again rural, with views from the water focusing on wetlands, rocks, and an old railroad bridge that provides a focal point downriver (Dominie, 1995). The old timber cribs in the river, a farmhouse, Otis Specialty Paper's mill, and the Otis development add variety and interest to the visual character of the area. Near the Otis dam and powerhouse, residential, commercial, and industrial development predominate. Views of the Otis impoundment from land are generally confined to those members of the public residing at these existing uses.

The stretch of river below Otis is more heavily developed, being adjacent to the Livermore Falls downtown area. The Town's riverside bandstand park and recreation area are prime spots for viewing the river (Dominie, 1995). The Route 4 bridge in Livermore offers an expansive view of the Otis Project upriver and the Livermore development downriver. Although the downstream view is dominated by the structures associated with the Livermore development, the river's ledges, rapids, and flow over the dam are of visual interest.

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.9.2 Effects of Alternatives

A complete description of all alternatives investigated in this EA is contained in Sections 3.3, 3.4 and 5.1.

No Action Alternative (Status Quo)

The no action alternative would maintain the existing aesthetic resources. The river is a locally dominant feature, providing the backdrop for everyday lives of area residents. For this reason, maintaining and enhancing the scenic quality of local views is important. The primary adverse effect on visual quality of the projects and the surrounding landscape are directly related to the industrial development that has occurred throughout much of the Androscoggin River corridor. The existing transmission lines and transmission right-of-way associated with the projects have a negative effect on the aesthetic quality in areas where the visual reference is the natural environment and can be seen by resident and recreationists. In comparison, the transmission lines are unlikely to have a major adverse impact on the visual quality of the industrial areas since residents are accustomed to development and associated machinery.

Proposed Alternative

Continued operation in a run-of-river mode would maintain the existing aesthetic resources in the APE. The redevelopment of the Livermore powerhouse would result in minor short-term adverse effects during construction activities since the presence of construction equipment and related noise would visually detract from the river's ledges, rapids, and naturally vegetated shoreline. However, it would also have the effect of enhancing views in the areas immediately downstream of the dam due to increased spillage flows over the dam. Redevelopment of the Livermore powerhouse would involve upgrading the transmission line to accommodate the increased capacity. Upgrading the line would not affect the existing visual quality at Livermore as it would involve the same corridor and poles, but with a higher capacity line.

Additional recreation facilities and facility improvements throughout the APE (see Section 3.3.2.3 for details) would be designed, to the extent possible, to blend in with the materials and colors of the surrounding environment. By maintaining the natural, rustic character of the APE, any potential for these improvements to negatively affect the visual environment would be minimized. Further, the proposed recreational facilities would provide public access areas for viewing wildlife and the surrounding habitat.

The proposed flow releases in the Livermore bypass would improve the aesthetic character of the Livermore development over present conditions. Views of the bypass are limited and can only be reasonably obtained from the riverbank below the dam. Given the general setting and the limited number of potential viewing audiences (*i.e.*, fisherman), any increase in flow above that which is proposed would not significantly benefit the scenic and aesthetic character of the site.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

This alternative would expose approximately 1.5 shoreline miles along the Livermore impoundment creating a short-term adverse visual effect. The exposed shoreline would be allowed to naturally revegetate, a process that should be completed within two to four growing seasons. Moderate adverse aesthetic impacts would occur if the powerhouse were left to deteriorate over a period of years, since the presence of the deteriorating facility, including rubble in the river and exposed and cracked concrete, would not be harmonious with the character of the natural areas along the river.

License Denial, Decommissioning, and Dam Removal Alternative

This alternative would convert approximately 12 miles of impounded water to a free-flowing river. The river would include several miles of riffles and rapids and at least one waterfall at Livermore Falls. Free flowing river segments, with a waterfall and rapids, are unusual, particularly on the Androscoggin River. The immediate adverse effects on removal of the dams would be the machinery and equipment operation during the facilities' demolition. This process would produce, noise, dust and visual intrusion in the vicinity of the projects. Debris and rubble piles and dewatered impoundment areas exposing soft substrate, would also temporarily degrade the visual quality of the river landscape. Increased water turbidity levels during demolition and dewatering of the impoundments would detract from the river's scenic qualities. Also, increased traffic within the towns adjacent to the projects and on the roads in the vicinity of the towns and disposal sites would adversely impact area residents.

Immediately following removal of the facilities, the visual character of the river landscape would be more natural and undeveloped, however visual evidence of the dams and the development along the shoreline would remain. Also, the dewatered impoundments would expose the soft shoreline substrate and hard bottom substrate. Any debris that would not be moved downstream by the force of the water would detract from the visual character. The dewatered shoreline would be void of vegetation until natural processes of succession begin. The loss of the project impoundments, which may be valued for attracting and observing wildlife and waterfowl and providing wetlands, would have a long-term adverse effect on the aesthetic quality of the area.

Over time, however, continuous free-flowing streamflow patterns would be restored to the projects' areas. The visual qualities of a free-flowing river may provide some recreationists, residents, and passersby with a positive visual experience. However, in response to dam removal and to changes in the river's flow and sediment distribution, the river channel would undergo a series of physical adjustments in order to stabilize itself. In several years, vegetation would cover the shoreline substrate and have a positive effect on the visual quality of the area. From a visual perspective, this would create a number of falls and rapids, but because of the water quality perceptions (at least during the next few years), odor, size, dark color, it would not become a regional focus.

5.3.9.3 Cumulative Impacts

The scenic quality of the APE has changed from exposed steeper gradient areas that hosted scenic waterfalls and moderate rapids surrounded by undeveloped forestlands to stretches of impounded flat water with an interspersion of undeveloped forestlands, agricultural fields and industrial, commercial and residential uses. The aesthetic quality of the river was directly affected by the dams and subsequent residential and commercial development. The construction of the dams and development of the upstream storage system transformed the river ecology from a riverine environment to impoundments.

The development of hydropower as well as other developmental activities (*e.g.*, logging; agriculture; and industrial, urban, suburban, and rural development) along the Androscoggin River has potentially had both positive and negative effects on the extent and variety of aesthetic resources found in association with the river. The Maine State Planning Office Study of Waterfalls for the Critical Areas Program, systematically evaluated and ranked the scenic quality of both unmodified and currently developed waterfalls in Maine. Based on available descriptions and lithographs, this study estimated the scenic quality of the natural falls of Maine's rivers as they appeared prior to modification. Five developed sites on the Androscoggin were evaluated including Livermore Falls, which ranked in the top 50% of the 240 waterfalls evaluated. Its rating qualified Livermore for "state significance." The report from the Critical Areas Program noted that waterfalls are often associated with ecologically significant natural environments (LWA, 1996). However, Livermore Falls was not as significant as Rumford Falls, Aziscohos Falls or Great Falls in Lewiston.

Construction of the Aziscohos reservoirs in 1909 to 1911 affected Aziscohos Falls which consisted of a series of falls, several hundred yards of steep, 35 to 40° pitches over ledge, descending 90 vertical ft for the first 1,000 ft below the head of the falls. In a study of Maine's waterfalls22/, Swonger and Brewer (1988) gave Aziscohos Falls the highest rating of the 240 waterfalls evaluated, judging it to have been highly attractive (actually "awesome") and possessing significant height and flow. It would have been considered significant regionally (northeastern U.S.) and state-wide in terms of scenic quality, but a large surface penstock was installed in the late 1980s along side of the falls to supply water to a generating station

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22/ The evaluations were estimates of the scenic quality of the natural falls as they appeared prior to modification, based on available descriptions and lithographs.

near the base of the falls (FERC No. 4026). This alteration caused Swonger and Brewer to classify the falls as "developed; natural falls was a significant one," and they did not recommend the site for the Register of Critical Areas. Other historical effects on aesthetic resources include the conversion of a presumably scenic 17-mile stretch of the Magalloway River and river valley into Aziscohos Lake. The resulting effect is that all of these waterfalls for which the Androscoggin was known, are now impacted to some degree by hydro developments.

The Maine Land Use Regulation Commission (LURC) inventoried lakes and ponds for a variety of attributes including scenic values and shoreline character. All of the lakes in the upstream storage system except Umbagog (which was not rated for lack of information) received value ratings of either "outstanding" or "significant" (the two highest ratings) for the scenic and shoreline character attributes (LURC 1991). The presence of physical features, such as beaches, islands, cliffs, etc., was one of the main criteria in evaluating scenic values. Beaches were second only to "exceptional relief" in scenic value and the more extensive the beach, the higher the value assigned. Seasonal drawdown of the lakes, particularly Aziscohos with its ability to be drawn 45 vertical ft, produces varying amounts of exposed shoreline that may be aesthetically displeasing to people viewing the lakes during pronounced drawdown (which generally occurs in the winter with ice and snow cover).

Future actions which may beneficially affect aesthetic resources include ongoing land conservation efforts by land trusts along the Androscoggin River (*e.g.*, Androscoggin Land Trust) and those proposed by IP and OHC (see Section 5.3.8.3). These actions will enhance the aesthetic resources of the river by protecting environmentally unique lands and manage the land use activities that occur on those lands. Providing a shoreline buffer and specifying designated uses would ensures that activities occurring within the buffer zone are compatible and would protect and improve the aesthetic quality of the shoreline.

In summary, the original construction of the projects' dams resulted in changes to the overall aesthetic quality within the APE. These impacts will continue with the presence of the project dams and project operation.

5.3.9.4 Unavoidable Adverse Effects

None. Operation of the projects as proposed would have a beneficial effect on the existing aesthetic resources due to the Applicant's Land Agreement Proposal and proposed flow release into the Livermore bypassed reach.

5.3.10 Cultural Resources

Archaeological investigations conducted over the past decade along the Androscoggin River indicate that the area from Rumford Falls to Gulf Island Pond is "culturally rich". These previous efforts have identified over 60 aboriginal sites and have provided valuable information on cultural resources for the interior sections of Maine, which previously had not received much attention. The first humans entered the Androscoggin River basin during the Paleoindian period (ca. 9000 - 7000 B.C.) with occupation being documented in the headwaters of the Androscoggin River (Gramly & Rutledge, 1982) and south of the APE in Auburn (Spiess and Wilson, 1987). Evidence of subsequent Archaic period occupations, ca. 7000 - 1000 B.C., is more common throughout the drainage. The final era in prehistory, the Woodland (Ceramic) period, is more variably represented in the drainage (Cory & Petersen, 1996). At least two of the six prehistoric sites previously recorded in the Canton Point area on the Riley impoundment can be attributed to the Middle and/or Late Woodland periods (Cory & Petersen, 1996). During the contact period, one or several ethnographic populations occupied the Androscoggin River basin some time into the late eighteenth century. In fact, various early historians documented Canton Point as the center of native activities for much of the entire Androscoggin River Valley.

5.3.10.1 Affected Environment

Historic properties associated with the APE include a currently undetermined number of prehistoric archaeological sites that are potentially eligible for inclusion in the National Register of Historic Places (NRHP or National Register). A Phase I archaeology survey and subsequent investigations revealed eight potentially eligible sites that are currently being affected by the projects and would require further investigation to determine their eligibility for the NRHP as well as the nature and severity of any potential adverse effects due to erosion. Phase II investigations conducted during 1996 determined that three of the eight study sites are potential candidates for inclusion in the NRHP. Diagnostic Native American ceramic artifacts and cultural features in the form of fire hearths were identified at two of these sites. Site attributes closely follow the general criteria set forth by the Maine Historic Preservation Commission (MHPC) for inclusion in the NRHP. Phase III mitigation will be necessary at the three sites identified as being significant and adversely impacted.

According to the MHPC, there are no above ground facilities that qualify as historic properties at either project (see

letters dated March 15, 1996 and November 13, 1996).

See LWA (1996) for more complete information on natural and predevelopment conditions regarding these resources.

5.3.10.2 Effects of Alternatives

No Action Alternative (Status Quo)

The no action alternative would not protect the three sites that are currently being affected by project operation.

Proposed Alternative

The proposed operation and maintenance of the projects, including future recreational development and future implementation of fish passage facilities, could adversely affect archaeological sites eligible for listing in the National Register. Therefore, the Applicants propose to implement the provisions of a Programmatic Agreement between the Commission, the Advisory Council on Historic Preservation (Advisory Council), and the MHPC to protect National Register-eligible archaeological sites that may be adversely affected under the terms and conditions of new licences for the projects.

The Programmatic Agreement specifies maximum expenditures for Phase III archaeological investigations and stipulates that the Applicants consult with the MHPC and develop a Cultural Resources Management Plan (CRMP). The CRMP includes procedures for developing and implementing a monitoring plan for any of the currently known and potentially eligible archeological sites. Those sites determined to be in danger due to erosion or development would receive priority treatment for site stabilization or data recovery efforts.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

One moderately sensitive site and five low sensitivity sites were identified adjacent to the Livermore impoundment during Phase "0" investigations. The low sensitivity sites were excluded from further study because the likelihood of finding intact prehistoric cultural material along the previously disturbed bank is greatly reduced. Based upon the results of Phase I testing at similar sites within the APE, the one moderately sensitive site in the Livermore impoundment was reclassified as a low sensitivity site. Therefore, it is not expected to contain any intact cultural artifacts.

License Denial, Decommissioning, and Dam Removal Alternative

This alternative would convert approximately 12 miles of impounded water to a free flowing river. A complete decommissioning would have the potential to adversely affect cultural resources in the APE. Archaeological sites existing in the APE, particularly those protected by being submerged in the projects impoundments, would be exposed to soil erosion until new vegetation stabilized the banks.

5.3.10.3 Cumulative Impacts

Flows in the Androscoggin River fluctuated over a much wider range than they do currently. Cultural resources available along the Androscoggin River prior to European settlement were probably located in high dry areas adjacent to the river and typically at locations with tributaries entering the main river. Cultural resources in the basin prior to European settlement did have the potential of being adversely affected by natural events (*e.g.*, floods). However, since the time of European settlement, the adverse impacts to cultural resources in the basin have been accelerated by the construction of dams (which moved the erosional effect of water much closer to these prehistoric sites), other land disturbing activities (*e.g.*, agriculture, logging, urban development) which exposed the ground protecting of these resources to erosional forces of nature and from people who scavenged artifacts from recently discovered sites.

The original construction of the projects' dams and power generating facilities has resulted in the destruction of cultural artifacts found in close association with the river. Actions in the basin that have affected cultural resources include the construction and management of the upstream storage systems and downstream hydro dams, as well as land development activities (*e.g.*, logging; agriculture; industrial, road and railroad construction; and urban, suburban, and rural development) throughout the basin. Based on a reconnaissance level investigation conducted by WA, it is believed that the creation and operation of the upstream storage system has resulted in the inundation of approximately 11,000 acres of land. This initial inundation and the operation of the impoundments for storage and release purposes has likely resulted in significant damage to archaeological sites (a loss estimated to be as much as 95% of the original record) located in and around the storage impoundments (letter dated September 3, 1996 from Dr. Art Spiess, Archeologist, MHPC, to WA).

The change in flow characteristics brought about by development of dams on the river and the upstream storage system

has also allowed increased deposition in slack water areas (see Section 5.3.1), which would likely serve to protect archaeological sites in those areas. On the other hand, the increased water surface elevation resulting from the development of dams has likely caused some cultural artifacts that would otherwise exist on upland areas to be present at the water/land interface where they are exposed to shoreline erosion caused by high flows, ice, and wave action. Damage to artifacts has also likely resulted from increased development and clearing of land that has occurred in the watershed over the last century by increasing erosion, sedimentation, and surface runoff (LWA, 1996).

The land protection measures of various groups in the basin (*e.g.*, Androscoggin Land Trust and those proposed by IP and OHC) will protect any existing cultural artifacts within the protected areas from future disturbance caused by adjacent and encroaching land uses. IP's proposal to implement the provisions of a Programmatic Agreement will protect cultural resources within the APE.

Recent Commission licenses which require that dam owners along the Androscoggin River protect or recover significant archaeological artifacts being adversely affected by operation of the projects will enhance the knowledge of pre-European cultures that used the Androscoggin River (FERC, 1993; 1996). The Applicant's proposal to recover artifacts from significant sites within the APE being adversely affected by the project will also contribute to this knowledge.

Another known future action relative to archaeological resources is an agreement between IP and the MHPC that provides for the protection of archaeological artifacts that may be impacted by existing agricultural uses and ice scouring on Canton Point. This agreement calls for monitoring exposed soil areas by a qualified archaeologist, reporting requirements, and a consultation process to mitigate any adverse effects found. This future action will benefit archaeological resources in the basin by mitigating any adverse effects.

5.3.10.4 Unavoidable Adverse Effects

The proposed operation and maintenance of the projects, including future recreational development and future implementation of fish passage facilities, could adversely affect archaeological sites eligible for listing in the National Register. Implementing the proposed Programmatic Agreement will help protect the existing archeological resources.

5.3.11 Socioeconomics

The agricultural-based economy in Maine had peaked by the mid-nineteenth century while the industrial economy which replaced it was still in its infancy. Therefore, rural areas along the Androscoggin River, like the APE, experienced a population decline while industrial centers (*e.g.*, Lewiston) grew (LWA, 1996). This reduction in population was typical of many smaller outlying rural settlements due to attrition from the Civil War, outmigration to the more fertile agricultural lands in the Midwest and population shifts to growing manufacturing centers. During this time, populations grew in the flourishing manufacturing Towns of Lewiston and Auburn (11 major textile mills, one machine shop and 8 shoe shops each employing 100 or more persons) and to a lesser extent Lisbon (three major textile mills) and Brunswick (one major textile mill) (LWA, 1996).

By 1880, pulp and leatherboard (cardboard) mills were established in Livermore Falls and Livermore which were the predecessors of the modern day pulp and paper industry on the Androscoggin River, specifically IP. At Livermore Falls, between 1877 and 1880, Alvin Record rebuilt an existing dam (originally built between 1825 and 1845) and added a pulp operation to his leatherboard mill which had been in operation for almost a decade. Also in 1880, directly across the river in Livermore, a small pulp mill went bankrupt and was purchased by Hugh Chisholm. Within a year, Chisholm had established the Umbagog Paper Company and the beginnings of what was later to become IP (LWA, 1996).

5.3.11.1 Affected Environment

Existing land uses at the projects include agricultural (*e.g.*, crop production and cattle raising), industrial, residential, and commercial. The majority of land is rural with concentrated areas of industrial development and is consistent with land use in this portion of the basin. The APE for socioeconomic resources was defined as the Towns of Canton, Jay, Livermore and Livermore Falls (see Section 5.3.8).

The 1990 population, according to the U.S. Census, for the Towns encompassing the projects ranged from a low of 951 persons (Canton) to a high of 5,080 persons (Jay). The Towns of Livermore and Livermore Falls were reported to have 1990 populations of 1,950 persons and 3,455 persons, respectively. The largest percent of residents fell between the ages of 22 to 59 years. However, in Livermore Falls 15.5% of the people were 65 years and over, which is slightly higher than the national figure of 13.9% (U.S. Census Bureau, World Wide Web Site, December 9, 1996).

Table 11 shows the socioeconomic characteristics for the counties and Towns in which the projects are located. The majority of the three counties' residents had a high school diploma (U.S. Census Bureau, World Wide Web site, December 3, 1996). Each of the three counties has either the same or higher unemployment rate than that reported for the state of Maine (5.7%).

Table 11. Socioeconomic Characteristics of Counties and Towns within the APE (Source: U.S. Census Bureau, 1996)

	1994 Population (est.)	1990 - 1994 Percent change in Population	1989 Median Household income ($)	1995 Unemploy. Rate (%)
Maine	_____	____	27,854	5.7%
Androscoggin	103,882	-1.3	26,979	5.7%
Franklin	29,645	2.2	24,432	6.7%
Oxford	53,031	0.8	24,535	7.1%
Livermore	2,086	7.0	27,431	2.8%
Livermore Falls	3,461	7.2	22,446	8.2%
Jay	5,123	7.9	25,769	5.4%
Canton	967	1.7	21,250	8.9%

The economy in the area of the projects is largely supported by the paper and wood products industries, with a small concentration in the retail and agricultural sectors (Jay Comprehensive Plan Committee, 1995). The majority of employment for residents of Jay (and likely the surrounding Towns) is in manufacturing (35%) and professional and related services (20%). Employment in retail trade and service related industries has been steadily increasing (as much as 40% from 1986 to 1992), while manufacturing related jobs have declined by approximately 20% (Jay Comprehensive Plan Committee, 1995).

The largest employers in the area of the projects are IP and Wausau Papers Otis, Inc., with a large percentage of those employed residing locally. IP's Androscoggin Mill employs roughly 1,400 persons, while Wausau Papers Otis, Inc. employs an estimated 300 persons. Both mills contribute to the local tax base and both have a policy to purchase goods and services locally to support the local and regional economy (Jay

Comprehensive Plan Committee, 1995). The IP Mill contributes approximately 82%, 2.6%, and 1% to the tax bases of the Towns of Jay, Livermore Falls and Livermore, while Wausau Papers Otis, Inc. contributes 2.8%, 23%, and 15% to these Towns, respectively.

The Applicants employ a total of six to eight personnel that are directly related to the operation and/or maintenance of the hydro projects. The projects themselves contribute approximately $576,000 additionally to the local tax base while the payroll and benefits for these employees is estimated to be over $365,000 per year.

The residents in the Towns surrounding the projects participate in recreational activities in the APE, such as walking, ATV use, organized sports, fishing, and picnicking. The direct economic impacts resulting from recreational use of the Androscoggin River in the vicinity of the projects are negligible due to current public use and the lack of river-oriented facilities or services (*i.e.*, campgrounds and boat/canoe rentals) from which revenues can be derived. There are few guide services in the tri-county area but overall, the APE is not known for recreational opportunities. The APE is not mentioned in Maine's tourism information and it's likely that people do not choose the APE as a travel destination. Therefore, it's likely that tourism does not have a significant impact on the economy of the surrounding Towns. However, the Jay impoundment is locally known for good bass fishing (see Recreation, Section 5.3.7). Although individuals participating in recreational activities, such as hunting or fishing, may purchase goods at local stores in or adjacent to the APE, such revenues are assumed to be minimal. Other economic impacts commonly associated with recreational use or development, such as seasonal residences, do not occur within the APE.

5.3.11.2 Effects of Alternatives

No Action Alternative (Status Quo)

The No Action Alternative would have no effect on existing socioeconomic resources of the APE. Maintaining the existing projects operations would result in no direct effect on socioeconomic resources within or immediately adjacent to the projects' boundaries.

Proposed Alternative

The proposed alternative involves the continued operation and maintenance of the projects in a run-of-river mode with enhancement measures. Except for the specific effects resulting

from the proposed enhancement measures described below, this alternative would have no effect on existing socioeconomic resources in the APE.

The proposed redevelopment of the Livermore powerhouse and increased minimum flow would have primarily short-term, minor impacts to existing socioeconomic resources. IP is proposing to spend approximately $17 million to redevelop the generating units within the Livermore powerhouse. The redevelopment would occur as a two-phased effort with an expected duration of approximately 24 months. Approximately 50 workers would be employed full-time for the duration of the project at a cost of $6.2 million. Workers involved in the construction modifications and enhancements would be from the local labor markets, with no significant in-migration of workers expected. Therefore, no impact on housing or governments services would be expected. The spending of project construction personnel at area retail locations, eating and drinking establishments, gasoline stations, and other businesses in the Livermore area would provide local, short-term benefits to the area economy. In the long-term, facility operation and maintenance employment needs would not differ from existing staffing levels.

Recreational improvements included as part of this alternative may directly affect socioeconomic resources by encouraging additional public use of the projects' impoundments and may indirectly result in additional expenditures by recreationists in the project area (*i.e.*, bait, gasoline, and food).

Continued generation of hydropower at the projects will offset the need for increased operation at existing baseload facilities, such as coal fueled generation plants. Fossil fueled plants produce atmospheric pollutants which must be controlled at significant costs. The avoided cost of air pollution which can affect society, is a quantifiable benefit of hydroelectric generation.

We estimated the amount of fossil fuels necessary to produce an equivalent amount of electric energy in a steam-electric plant as would be generated annually at Riley-Jay-Livermore Project (105.74 Gwh) and Otis Project (49.6 Gwh). We also estimated the amounts of pollutants -- oxides of sulfur, oxides of nitrogen, carbon monoxide, carbon dioxide, and particulate matter -- produced by burning fossil fuels. In our analyses, we assumed that the coal burned would contain 1.0 percent sulfur and the powerplants would not have state-of-the-art emission control systems. Published cost estimates range from $300 to $700 per ton of sulfur dioxide removed and $210 to $560 per ton of the

oxide of nitrogen removed. Tables 12 and 13 show the results of our analyses.

Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative

This alternative could entail the layoff of up to two individuals that are associated with the operation and maintenance of this facility. In addition, the purchase of approximately 9 MW of electricity from the local utility would be required. This would result in a slight decrease in the competitiveness of the mill resulting from higher costs for electricity.

In addition, it is expected that the local property taxes paid to Livermore Falls would be decreased, which would have a minor indirect effect on the local tax base.

License Denial, Decommissioning, and Dam Removal Alternative

This alternative would significantly affect the commercial and residential land use and the economy of the surrounding Towns. Local residents currently employed by these projects would lose their jobs and any revenues generated as a result of the projects would also be lost. The ability of the Towns to effectively support a variety of programs and services could be limited by the loss of tax revenues ($576,000) derived from the projects.

This alternative would also require the generation of approximately 155,000 MWH's of electricity from other sources of power which could result in additional air emissions.

5.3.11.3 Cumulative Impacts

The development of hydropower (today an estimated 45% of the river's length from the headwater lakes to Brunswick is impounded) as well as other developmental activities *(e.g.*, logging, agriculture, road and railroad construction, and urban, suburban and rural development) in the Androscoggin River Basin has affected the socioeconomic resources of Towns adjacent to the river. For example, many small Towns arose during the agricultural revolution, but with the turn toward the industrial revolution and the development of the railroad, many of these small Towns experienced a major population decline. In 1848 and 1853, the railroad had reached Auburn and Berlin, New Hampshire, respectively, and gave impetus to the rapid development of the lumber and pulp industry at Berlin and the textile industry in

Table 12. Various amounts of fuel, resulting pollutants, and cost removal necessary to produce an equivalent amount of annual generation as Riley-Jay-Livermore Project (105.74 Gwh), for three alternative energy sources.

	COAL (ton)	OIL (barrel)	GAS (mcf)
Fuel Quantity	44,374	179,272	1,091
Pollutants			
Oxides of	865	355	0.30
Oxides of	399	277	225
Carbon	20	19	22
Carbon	102,063	94,118	64,928
Particulate	2,651	--	--
Removal Costs:			
SOX	$411,011	$168,444	$155
NOX	$92,205	$63,867	$52,024

Table 13. Various amounts of fuel, resulting pollutants, and cost removal necessary to produce an equivalent amount of annual generation as Otis Project (49.6 Gwh), for three alternative energy sources.

	COAL (ton)	OIL (barrel)	GAS (mcf)
Fuel Quantity	20,815	84,092	512
Pollutants			
Oxides of	406	166	0.20
Oxides of	187	130	106
Carbon	10	9	10
Carbon	42,875	44,148	30,456
Particulate	1,243	--	--
Removal Costs:			
SOX	$192,795	$79,013	$73
NOX	$43,251	$29,958	$24,403

the Lewiston/Auburn area. In 1880, about 45,000 people inhabited the Towns along the Androscoggin River from Brunswick to Berlin, New Hampshire. Lewiston and Auburn accounted for almost two-thirds of this total, with a combined population of 28,638. Brunswick's population numbered 5,384 while the Towns of Livermore, Livermore Falls, and Jay together had a population of 3,633 (LWA, 1996).

The construction of hydropower dams along the Androscoggin River and upstream storage system in the late 1800's provided the power that supported industrial and residential development along the Androscoggin River. The paper industry mills either directly or indirectly support and continue to support a large proportion of the economic activity in the area. The projects' dams and associated industrial development helped reverse the declining populations in the Livermore Falls area, as these became new economic centers at the turn of the century. The presence of dams has allowed such areas to continue to thrive economically (see Table 14). The development of industry and Towns has encouraged economic activity within the basin and has also encouraged development along the river shoreline. Hydropower production needed to support local industries is enhanced to some degree by the upstream storage systems which provides stable flows year round.

Table 14. Socioeconomic characteristics for population centers along the Androscoggin River. (Source: U.S. Census Bureau, World Wide Web site, January 7, 1997)

Town	1990 Population	1989 Median Household income ($)	1991 Unemployment Rate (%)
Berlin, NH	11,824	25,040	5.37
Gorham, NH	3,152	25,494	7.33
Rumford, ME	5,386	20,700	5.5
Lewiston, ME	39,757	24,031	5.11
Auburn, ME	24,309	27,493	9.2

Additional socioeconomic benefits are realized as a result of the augmentation of summer low flows by the upstream storage system. In the absence of flow augmentation, costs related to industrial and municipal wastewater treatment would be substantially higher because of the need for more technically sophisticated treatment facilities. Such increased costs could

indirectly affect the economy of the region by decreasing the competitiveness of effected industries by diverting capital needed for reinvestment into the facilities to funding for environmental improvements. For municipalities, maintenance of the existing dilution in the river without flow augmentation would require Towns to rebuild sewage treatment plants at great cost which would either result in the raising of taxes or cutting of services, both of which would affect the socioeconomic resources of the basin.

Known future actions that could affect socioeconomic resources of the area include the licensing of the upstream storage system in 2001, the IP/OHC Lands Agreement, the proposed PNGTS gas pipeline, and the expansion of the Sunday River resort area. While the long-term impacts of the proposed gas pipeline is unknown, this action could provide an alternative source of energy for both industry and the local population. In addition, this action will contribute additional short-term revenue to the area in the general vicinity of the projects through both direct and indirect construction expenditures. The expansion of the Sunday River ski resort has the potential of increasing both direct and indirect employment in the general area. The licensing of the upstream storage system, including any modifications, will be addressed by the studies and environmental assessment presently underway as part of the licensing process for those dams. It is currently not known what impact, if any, the proposed Lands Agreement will have on the surrounding socioeconomic resources.

In summary, the original development of the projects likely changed the socioeconomic resources of the Towns within the APE. These economic impacts will continue with operation of the project as proposed.

5.3.11.3 Unavoidable Adverse Effects

Operation of the projects, as proposed, would not cause any significant unavoidable adverse impacts to existing socioeconomic resources of the Towns in the APE.

6. DEVELOPMENTAL RESOURCES

This section contains the engineering and economic analyses of the alternatives described in Section 3.3.23/ The economic benefits and costs of each alternative are compared to existing operations in order to determine the annual net benefit (ANB)24/ of each alternative. The ANBs were estimated using current (1996) energy values. Other market prices and construction costs were adjusted to the year 2000, the next full calendar year following the expected effective date of new licenses. The analysis assumed beginning operations in 2000, amortizing the projects' capital costs over the period of analysis (30 years based upon current Commission practice), and holding power values constant at current levels during the entire term of licenses. The alternatives considered in this analysis were:

(1) No Action Alternative (Status Quo) - Under this alternative, all developments are operated and maintained as needed to continue current levels of energy production.

(2) Proposed Alternative - This alternative included the projects with upgrades and mitigation and enhancement measures as proposed by the Applicants and the Collaborative Team (see Section 3.3 for details).

(3) Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative - This alternative is the same as the Proposed Alternative, except that no upgrade of the Livermore development is proposed. Instead, Livermore is operated until it has no service life left and is then decommissioned.

(4) License Denial, Decommissioning and Dam Removal Alternative - This alternative consists of denial of the licenses, decommissioning of the projects, and removal of the existing dams.

Additional details on each of these alternatives is contained in Section 3.3 of this EA. Key economic parameters used in the developmental analysis are shown in Table 15.

23/ While not all members of the Collaborative Team agree with all elements of the analytical methodology employed here, there is general agreement that this is consistent with the Commission's economic methodology.

24/ The ANB is the annual project benefit minus the annual project cost.

Table 15. Economic analysis parameters for the Riley-Jay-Livermore and the Otis Projects (Source: IP, KA, and FERC Staff)

Parameter	Assumption
Base Year	2000
Term of Analysis	30 years
Financing and Depreciation period for new	30 years
Financing and Depreciation period for other	15 years
Interest Rate and Discount Rate	7.5%
Annual Construction Cost Escalation Rate	2%
Annual Power Value Escalation Rate	0%
Annual Project Costs	Actual
Annual Escalation Rate for Costs (to 2000)	2%
Federal & state tax rate	40%

IP's cost of alternative power will include some energy conservation measures that are less expensive than purchased power. A study performed during the relicensing effort identified 54,432 MWH and 6.2 MW worth of potential energy conservation measures that averaged $25/MWH to implement. The implementation costs for the conservation measures varied from $0.2/MWH to $70/MWH. Using the cost per MWH of potential energy conservation measures in the calculation of the value of alternative power would result in both lower incremental average annual power production losses caused by implementing the enhancement measures (*e.g.*, increased bypass flows) and a lower annual benefit.

6.1 Annual Net Benefits (ANB) of Alternatives

This section describes the ANB of the different alternatives considered in the EA. The ANB is determined from the Annual Value of Generation (*i.e.*, total amount of energy generated at the project multiplied by the current value of that power) minus each component of Annual Project Costs (*i.e.*, annual operations costs and enhancement measures). Table 16 shows the annual value of the power from the Riley-Jay-Livermore Project along with the operating costs, and the environmental costs for each of the alternatives. Table 17 provides the same information for the Otis Project. Sections 6.2, 6.3, and 6.4 show how the values in Tables 16 and 17 were derived.

Table 16. Annual Net Benefits of the Alternatives at the Riley-Jay-Livermore Project.

	No Action Alternative (Status Quo)	Proposed Alternative	Environmental Enhancements w/out Redevelopment of Livermore Powerhouse	License Denial, Decommission, and Dam Removal Alternative
Annual Value of Generation	$3,354,593[29]	$5,054,356[30]	$1,947,567[31]	$0
- Annual Operations Costs	$2,457,864	$4,500,333	$1,911,227	$705,158
- Replacement Power	---	---	---	$3,289,014
- Enhancement Costs[33]	$2,342	$146,249	$146,249	$0
Annual Net Benefit	**$894,387**	**$407,774**	**($109,909)**	**($3,994,172)**

Table 17. Annual Net Benefits of Alternatives at the Otis Project.

	No Action Alternative (Status Quo)	Proposed Alternative	Environmental Enhancements w/out Redevelopment of Livermore Powerhouse	License Denial, Decommission and Dam Removal Alternative
Annual Value of Generation	$2,477,800[32]	$2,415,595[32]	N/A	$0
- Annual Operations Costs	$2,246,920	$2,250,304	N/A	$154,080
- Enhancement Costs[33]	$768	$33,865	N/A	$0
Annual Net Benefit	**$230,112**	**$131,426**	**N/A**	**($154,080)**

[29] Based upon 62,272 MWH of generation per year @ $53.87/MWH (see section 6.2).

[30] Based upon 62,272 MWH of generation per year @ $53.87/MWH, plus 36,148 MWH @ $55/MWH (see section 6.2).

[31] Based upon 36,217 MWH of generation per year @ $53.87/MWH (see section 6.2).

[32] Based upon 49,556 MWH of generation per year @ $50/MWH (see section 6.2).

[33] Enhancement costs include capital costs for all enhancements and annual costs such as fishway operations costs (see section 6.4).

6.2 Annual Value of Project Generation

IP is a net consumer of electricity. Therefore, this analysis uses the least cost alternative power source to determine the value of power generated at the Riley-Jay-Livermore Project. Based upon the amount generated by the project, the lowest cost alternative source of generation is purchased power (KA, 1998). The cost for IP to purchase power is approximately $55/MWH, which is IP's contract rate for firm power which includes a component for energy generation and a small component for capacity benefits. However, the lowest cost alternative for smaller amounts of energy and capacity (*e.g.*, to offset increases in mill demand, bypass flows) could entail energy conservation measures. Based upon conditions in 1996, there were 54,432 MWH (6.2 MW of capacity) worth of potential energy conservation measures that ranged from $0.2 MWH to $70 MWH ($25/MWH on average) to implement. In conjunction with developing alternative generation, IP would most likely implement certain energy conservation measures in order to replace a portion of the lost generation.

Since the objective of replacing the energy and capacity would be to minimize the overall cost of power at the mill, IP would most likely implement all of the energy conservation measures that were less costly than purchased power in the long term2/.

As of September 1996, the mill consumed approximately 864,889 MWH of energy per year. About 62,272 MWH of the mill needs were supplied by the Riley-Jay-Livermore Project, and remaining 802,617 MWH were supplied through other means, including purchased power. Energy use at the mill is escalating at about 1.5% per year. Using this assumption, mill needs in year 2000 is expected to be about 917,962 MWH. About 54,432 MWH of this need will be supplied through energy conservation measures, and the remaining 863,530 MWH would be provided by the Riley-Jay-Livermore Project and purchased power.

The electric utility market is currently beginning the process of deregulation. The effect of deregulation on the costs of reliable energy is not known at this time. Current prices and availability have been used in this analysis. Therefore the current least cost alternative source of generation (both energy

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2/ However, future modernization at the mill has not been evaluated by the Collaborative Team for energy conservation potential. It is believed that additional opportunities exist, although the amount of energy or capacity of those measures is not known. Typically, conservation measures are most cost effective at the time of modernization, equipment upgrade or equipment change out.

and power) is a combination of purchased power from the local utility and energy conservation measures. The blended rate for Riley-Jay-Livermore is $53.87/MWH. The Riley-Jay-Livermore Project currently produces 62,272 MWH per year. At $53.87/MWH this yields generation valued $3,354,593 (see Section 6.3 for a discussion of annual costs).

OHC currently sells its generation to the local utility, Central Maine Power (CMP). Its existing contract expires concurrent with the expiration of the project license. After that, OHC could expect to obtain a new contract from CMP for CMP's avoided costs, which are expected to be less than $30/MWH. However, for this analysis it is assumed that OHC would negotiate a contract to sell and deliver its generation to IP for $50/MWH rather than selling power to CMP for a lower rate. The project currently produces 49,556 MWH per year. At $50/MWH the project power would have a value of $2,477,800.

As discussed in Section 5 of this EA, the Applicants and Collaborative Team investigated several project enhancements. Some of these enhancements would reduce the amount of energy generated by the projects (see Tables 18 and 19). The environmental measures that would affect project generation are described below under each of the alternatives for which they were considered:

(1) No Action Alternative (Status Quo) - This alternative would involve no additional environmental measures that affect energy generation at the projects.

(2) Proposed Alternative - This alternative involves an upgrade at the Livermore development, which increases energy output, and the following environmental benefits which decrease energy output of the projects.

a) Delaying any flashboard installation at Jay dam scheduled to occur during the bass spawning period (June) until after July 15 to protect spawning smallmouth bass.

b) Providing a 5 cfs minimum flow release from the southern section of the Jay Dam between June 1 and September 15 to maintain D.O. levels in the downstream pool.

c) Providing a 150 cfs minimum flow release in the upper portion of the Livermore bypassed reach for the months of May, June and October and 100 cfs for the remainder of the year. The remainder of the minimum flow for the lower portion of the bypass would come from a new generating unit

releasing 400 to 450 cfs at a reduced head.

d) Provide seasonal flows (estimated at 2% of station flow) to upstream and downstream fish passage facilities at the projects' dams, when required by the Commission.

(3) Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative - This alternative is the same as the Proposed Alternative, except that no upgrade of the Livermore development is proposed. Instead, Livermore is operated until it has no service life left. Losses were averaged over the license term to develop an annual average generation, based on the expected deterioration of the Livermore development from full generation in year 1 of the new license to 0 MWH in year 20 of the new license. The entire minimum flow requirement would be released at the dam in the interim period. This alternative is not applicable for the Otis Project.

(4) License Denial, Decommissioning and Dam Removal Alternative - Under this alternative the licenses would be denied and the projects' dams would be removed. Therefore, all generation from the projects would cease.

6.3 Annual Costs of Project Operations

This section identifies the annual costs associated with project operations (*i.e.*, administrative and overhead, operation and maintenance, depreciation and interest, property taxes, insurance, and Federal and state taxes) that are incurred annually by the project. The basis for the estimates of the costs contained in Table 20 (Riley-Jay-Livermore Project) and Table 21 (Otis Project) are described below:

Administration and Overhead Costs: For the Riley-Jay-Livermore Project these costs are actual allocations for the hydro projects, apportioned according to generation. For the Otis Project, actual administrative and overhead charges were used.

Table 18. Average annual power production at the Riley-Jay-Livermore Project and gains/losses in power and dollars for each alternative evaluated.

	No Action Alternative (Status Quo)		Proposed Alternative		Environmental Enhancements w/o Redevelopment of Livermore Powerhouse		License Denial, Decommissioning, and Dam Removal Alternative	
	MWh	$	MWh	$	MWh	$	MWh	$
Status Quo	62,272	3,354,593			62,272	3,354,593	62,272	3,354,593
Jay Bypass Flow	---		62,272	3,354,593	(64)	(3,443)	---	
Livermore Upper Bypass Flow	---		(1,516)	(81,667)	(1,516)	(81,667)	---	
Livermore Lower Bypass Flow	---		(656)	(35,339)	(656)	(35,339)	---	
Delay Jay Flashboard Installation	---		(109)	(5,872)	(109)	(5,872)	---	
Fish Passage Flows	---		(2,143)	(115,443)	(2,143)	(115,443)	---	
Livermore Redevelopment (non-develop)	---		36,041	1,941,527	(21,631)	(1,165,262)	---	
Project Removal	N/A	N/A	N/A	N/A	N/A	N/A	(62,272)	(3,354,593)
Net Project Benefit	62,272	3,354,593	93,825	5,054,356	36,153	1,947,567	0	0

Table 19. Average annual power production at the Otis Project and gains/losses in power and dollars for each alternative evaluated.

	No Action Alternative (Status Quo)		Proposed Alternative		Environmental Enhancements w/o Redevelopment of Livermore Powerhouse		License Denial, Decommissioning, and Dam Removal Alternative	
	MWh	$	MWh	$	MWh	$	MWh	$
Status Quo	49,556	2,477,800	49,556	2,477,800			49,556	2,477,800
Fish Passage Flows	N/A	N/A	(1,131)	(62,205)			---	
Project Removal	N/A	N/A	N/A	N/A	N/A		(49,556)	(2,477,800)
Net Project Benefit	49,556	2,477,800	48,425	2,415,595			0	0

Operation and Maintenance Costs: Actual annual costs (over the past 5 years) were averaged for each development and summed by project.

Depreciation and Interest: Actual investments at the projects were averaged. IP provided an estimate of dam removal costs which were capitalized to determine the depreciation and interest for that alternative. Some environmental measures may be required during the removal (*e.g.*, removal of built-up sediments) to avoid environmental impacts. Therefore, this alternative includes the costs to remove the structures, the costs of environmental measures associated with the removal and continued property taxes for the land. This alternative also includes tax savings incurred from operating the projects at a loss. For the Riley-Jay-Livermore Project, the alternative also includes the costs for purchasing replacement energy.

Property Taxes: Property taxes for the Riley-Jay-Livermore Project are based on the contributing value of the projects. Property taxes at the Otis Project are based on actual property taxes for the site.

Insurance: IP insures its assets with a high-deductible policy. Insurance rates for the Riley-Jay-Livermore Project are a combination of self-insurance (for the deductible) plus premiums (for the insured portion). The cost of property insurance is calculated by multiplying initial (capital) cost times IP's worldwide insurance rate (0.032%). The Otis Project's insurance rate is based on actual costs.

State and Federal Taxes: These costs are estimated based on the estimated net profit from operations for both projects.

6.4 Annualized Costs of Environmental Measures

This section discusses the method used in calculating the annual costs for implementing the environmental measures required for each alternative. Costs under each alternative were based on the assumptions listed in Table 15. Environmental measures consist of two different costs, capital and annual.

6.4.1 Capital Costs of Enhancement Measures

Capital costs (*e.g.*, design and materials for fishway construction, demolition costs for dam removal) are incurred upon implementation of an enhancement measure and were capitalized for a 15-year period and levelized over the term of the new license. By doing so, a levelized annual cost component is determined and combined with the annual costs described below to determine the average annual cost associated with each enhancement measure.

Table 20. Annual Costs of Project Operation for the Riley-Jay-Livermore Project

	No Action Alternative (Status Quo)	Proposed Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning and Dam Removal Alternative
O & M	$519,780	$519,780	$376,373	$0
Depreciation & Interest	$378,478	$1,916,314	$667,298	$935,428
Property Taxes	$239,871	$616,785	$239,871	$239,871
Insurance	$8,384	$14,510	$8,149	$0
State & Federal Income Tax	$596,259	$459,871	($71,300)	($470,106)
Total	$2,457,864	$4,500,333	$1,911,227	$705,193

Table 21. Annual Costs of Project Operation for the Otis Project.

	No Action Alternative (Status Quo)	Proposed Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning and Dam Removal Alternative
Admin. & Overhead	$73,365	$73,365	N/A	$0
O & M	$791,021	$791,021	N/A	$0
Depreciation & Interest	$837,155	$837,155	N/A	$195,929
Property Taxes	$336,246	$336,246	N/A	$60,871
Insurance	$83,430	$83,430	N/A	$0
State & Federal Income Tax	$125,703	$129,087	N/A	($102,720)
Total	$2,246,920	$2,250,304	N/A	$154,080

6.4.2 Annual Costs of Enhancement Measures

Annual costs included additional administrative and overhead, operations and maintenance, property taxes, insurance, depreciation and taxes associated with each enhancement option. These additional annual costs are combined with the levelized capital costs to calculate an annual cost incurred due to each enhancement measure. State and Federal taxes accounted for any tax savings that the Applicants would experience under each capital cost scenario. Taxes were based on the overall annual incremental benefit. Property taxes were assumed to change according to the value of facilities (property tax).

The environmental measures for each alternative are described below. Table 22 shows the annual costs of implementing the environmental measures for the Riley-Jay-Livermore Project and Table 23 for the Otis Project. It should be noted that any operational changes (*e.g.*, bypass flows) resulting from these measures (*e.g.* reduced generation) are summarized in Section 6.2. Other costs associated with the measures (*e.g.*, operation and maintenance, etc.) are addressed in this section.

(1) No Action Alternative (Status Quo) - This alternative does not include any environmental measures, except for the existing requirements to complete Form 80 reporting and to meet Part 8 requirements for recreation access and signs.

(2) Proposed Alternative - Environmental measures included in this alternative include:

a) Minimum flow structures including the cost of implementing the proposed measures (*e.g.*, constructing flow openings in the flashboards, etc.)

b) Construction of upstream and downstream fish passage facilities at all developments in both projects during 2015. Current management plans call for building the salmon population downstream with new fishways and other restoration measures (Baum, *et. al.*, 1997). Therefore, it is unclear whether fishways will be needed at the Riley-Jay-Livermore Project as soon as 2008-2010, as projected in the USFWS EIS. Since the plans may be deferred, IP used the USFWS' estimates of construction and operating costs, escalated to the proposed construction year.

c) Stocking of 250 brown trout downstream of the

project, based on AFS values for the cost of the fish.

d) Implementing the recreation measures described in Section 3, including developing recreation sites, maintaining boater safety devices, and compliance with Part 8 and Form 80 requirements.

e) Conducting Phase III cultural resources mitigation at three sites.

f) Implementing water quality improvements including D.O. monitoring and macroinvertebrate sampling.

(3) Environmental Enhancements without Redevelopment of the Livermore Powerhouse Alternative - This alternative includes all the environmental enhancements described above. The only change is that this Alternative contemplates no redevelopment of the Livermore development.

(4) License Denial, Decommissioning, and Dam Removal Alternative - This Alternative is the removal of the projects' dams. No long term environmental enhancements or mitigation are specifically required as part of this alternative, since the projects would not be under the Commission's jurisdiction if the dams are removed.

Table 22. Annual Costs of Environmental Measures for Riley-Jay-Livermore Projects.*

	Proposed Alternative	Env. Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning and Dam Removal Alternative
Min flow structures at Jay Bypass	$164	$164	--
Min flow structures at Upper Livermore	$273	$273	
Fish Passage Facilities	$45,281	$45,281	--
Brown Trout Stocking	$454	$454	--
Recreation Sites*	$20,799	$20,799	--
Phase 3 Archaeology	$29,762	$29,762	--
Water Quality Monitoring/ Macroinvertebrate Testing	$49,516	$49,516	--
Total	$146,249	$146,249	$0

* Includes lands acquired to ensure public access to the waterway.

Table 23. Annual Costs of Environmental Measures for the Otis Project.*

Fish Passage Facilities	$21,930	N/A	--
Recreation Measures	$10,904	N/A	--
Total	$32,834	N/A	$0

* Annualized costs shown are a combination of capital costs and levelized annual costs for Environmental Measures.

7. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Recommended Alternative

Sections 4(e) and 10(a)(1) of the FPA, 16 U.S.C. 797(e) and 803(a)(1), require the Commission to give equal consideration to developmental and non-developmental uses of the waterway on which a project is located. When the Commission reviews a hydropower project, recreation, fish and wildlife, and other non-developmental values of the waterway are given equal consideration with the project's electric energy and other developmental values. In determining whether, and under what conditions, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved in the decision.

Based on our independent review and evaluation of the various alternatives for the projects as documented in Sections 5 and 6 of this EA, we have selected the Proposed Alternative, with additional staff-recommended measures, as the preferred alternative. We recommend this alternative because:

(1) issuance of new licenses would provide a beneficial, dependable, and inexpensive source of electric energy by providing 49,556 MWh at Otis and 105,739 MWh at Riley-Jay-Livermore, upon redevelopment of Livermore. The energy generated annually at the projects would be from a renewable resource, thereby reducing the use of fossil-fueled, steam-electric generating plants, conserving non-renewable energy resources, and reducing atmospheric pollution;

(2) the recommended environmental measures would mitigate adverse impacts to, protect, or enhance fishery resources, water quality, vegetation, wetlands, wildlife, land uses, recreational resources and cultural resources; and

(3) the proposed projects would remain economical with our recommended environmental enhancement measures.

Our preferred alternative includes the following operational and non-operational enhancement measures, as summarized here for the Riley-Jay-Livermore Project and Otis Project, and discussed in greater detail in Section 3.3.1 of this EA. **Staff-recommended measures, which are in addition to or**

modify the measures proposed by the Applicants in the APEA, are identified with an asterisk.

Riley-Jay-Livermore Project

- Redevelop the generating units at the Livermore powerhouse. The existing 8 turbine and generator units would be replaced by 6 units (3 new units and 3 refurbished units), increasing installed capacity at Livermore from 7.8 MW to 12.26 MW, and annual generation from 23,133 MWH to 66,600 MWH. Staff recommends a final plan and construction schedule for the installation of the generating units at Livermore.*

- Continue to operate the project in a run-of-river mode, such that inflow equals outflow and fluctuations in impoundment water surface elevations, resulting from normal operation, are minimized. Water levels in the project impoundmnents shall be maintained within 1 foot of full pond elevation when the flashboards are in place, and within 1 foot of the spillway crest elevation when flashboards are not in place. During atypical periods of operation (e.g. after flashboard replacement) the flow release from each of the project dams should be 1,245 cfs, or inflow minus process-cooling water withdrawn, whichever is less.

- Implement the following minimum flows, or inflow to the project impoundment, if less:

  5 cfs from June 15 to September 15, downstream of the south side of the Jay dam. The minimum flow should be released from a notch in the flashboards of the Jay Dam. Should high flows prevent replacement of the flashboards prior to June 15, the licensee should wait until after July 15 to replace the flashboards on the southern channel of the Jay dam and minimum flow would not be required until after the flashboards are installed. This flow is needed to maintain D.O. levels at or above the minimum state standard and the implementation dates are based on the needs of the bass fishery and to protect bass spawning.

  100 cfs from July 1 through September 30, and November 1 through April 30; 150 cfs from May 1 through June 30, and October 1 through October 31 in the upper portion of the Livermore bypassed reach. These flows are needed to maintain D.O. levels at or above the minimum state standard and to maintain the brown trout and bass fishery. The flows would be required within 30 days after installing flow monitoring devices as identified in the flow monitoring plan we are recommending.

550 cfs in the lower portion of the Livermore bypassed reach, downstream of the Livermore dam, to improve water quality and fishery habitat. This flow should be released from either the new minimum flow turbine, mechanical valve, or through additional releases from the canal or dam and would be required within 60 days of completing the installation of the new turbines in the Livermore powerhouse.

* Develop a final stream flow gaging and flow monitoring plan to monitor the run-of-river operation and minimum flows we recommend for the Riley-Jay-Livermore Project. The flow monitoring plan should include descriptions of all methods and structures that will be used for providing the minimum flows and maintaining reservoir elevations (within 1 foot of the full pond elevation when flashboards are in place, and within 1 foot of the spillway crest elevation when flashboards are not in place), and the methods for recording and providing data to the Commission on project operation and flows.

- IP should install a D.O. and water temperature monitor upstream of the Jay powerhouse intake structure to monitor water quality conditions3/. D.O. and water temperature should be monitored from June 1 through September 30 each year. (This monitor would be required in addition to an existing D.O. monitor located in the impoundment at the Town of Jay). IP should prepare a final design plan and schedule for installing the D.O. and water temperature monitor.

- IP should develop a final plan and schedule to monitor aquatic macroinvertebrate communities in the lower Jay, Otis, and Livermore impoundments, and the bypassed reach of

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3/ Based upon the requirements of the existing Town of Jay Water Permit, IP (the permittee of the waste discharge facility) is also monitoring the Town of Jay gage, located on river right in the Jay impoundment, daily during the period of June 15 to September 15. If the Jay monitor records a D.O. value of 5.2 parts per million (ppm) or less, IP institutes a manual monitoring program to verify the readings from the Jay monitor. This consists of IP personnel checking the Jay monitor data daily and measuring D.O./temperature in the vicinity of the Jay probe. If Jay's and IP's data show significant differences, IP notifies the Town code enforcement officer to initiate adjustments and recalibration of the Jay monitor. However, if the readings from the Jay monitor are verified or the IP monitoring data shows lower D.O., IP continues its monitoring of the Jay monitor until readings of 5.1 ppm occur. If the readings reach 5.1 ppm, IP implements temporary operational adjustments from the Riley development so that applicable D.O. level standards can be maintained or improved.

the Livermore project.

* Implement the operational measures needed to maintain the minimum state water quality standard (i.e. D.O. concentrations at or above an instantaneous level of 5 mg/l or 60% saturation, whichever is higher, and a 30-day average concentration of 6.5 mg/l). Should monitoring show that D.O. concentrations approach the minimum state standard, then IP should implement operational measures to maintain the minimum state standard. This may include decreasing discharges of BOD from the IP mills, or other measures, as necessary. Action would be required when monthly D.O. concentrations, as measured at the Jay gage, average 6.6 mg/l or the daily D.O. concentration reaches one-tenth of a mg/l or less above the D.O. concentration applicable at that river temperature.

* IP should prepare an annual report which evaluates D.O., water temperature, and macroinvertebrate data and the ability of the Riley-Jay-Livermore project to meet state water quality standards. If monitoring shows that water quality standards have not been met, the report should include a proposal to study and implement additional measures, as needed, to meet or exceed the state standard.

* IP should cooperate with the DEP in collecting and analyzing tissue samples from white suckers and smallmouth bass, from the Otis impoundment and below Livermore Dam, for levels of PCBs and mercury. Sampling is needed to determine whether the presence of the dam is contributing to higher levels of toxins in the river.

* Reserve the Commission's authority to require changes in project operations and/or other environmental enhancements needed to maintain the state water quality standards, ameliorate for cumulative effects identified in the future, due to operating the headwater storage impoundments under alternative operations, and effects on contaminants in the Androscoggin River.

* Reserve the Commission's authority to require the construction, operation, and maintenance of fishways prescribed by the Secretary of the Interior pursuant to Section 18 of the FPA.

• IP should continue to work with the MDIFW and FWS to re-establish a cold water, put-grow-take, brown trout fishery downstream of the Livermore Project. After 5 years, IP should file a report with the Commission which assesses the success of stocking brown trout downstream of the project,

and a proposal to continue, modify, or discontinue this effort, as demonstrated by the success of stocking efforts and recommended by the MDIFW and USFWS.*

- Monitor and report recreational use every six years (FERC Form 80, Recreation Use Assessment) and evaluate the future need for additional recreation facilities to meet user demand.
- Maintain public signage and boater safety devices throughout the project, in accordance with Part 8 of the Commission's regulations.
- Develop and implement a final plan for recreational sites which will provide additional access to the shoreline and project waters as indicated in Section 3.3.2.3. The plan should include: a) a car-top boat launch to provide access for small boats to the river and Riley impoundment, b) a canoe portage/take-out on the river left at the Riley dam, c) improving the existing boat/canoe launch in the Jay impoundment, d) developing a summer day-use facility on Pine Island in the Jay impoundment, e) provide a walk-in angler access trail to the upper Livermore bypassed reach, f) provide a flow gage in the Livermore bypassed reach for use by local kayakers, g) improve the existing trail and carry-in boat/canoe launch sites downstream of the Livermore tailrace, h) maintain existing trails which provide access to the project impoundments, and j) soil erosion and sediment control measures to be used during construction of the facilities and access.
- Implement the provisions of a Programmatic Agreement between the Commission, the Advisory Council, and the MHPC to protect National Register-eligible archaeological sites.4/
- Expand the project boundaries to include lands necessary for public access, recreation, shoreline control and the protection of natural resources.5/
- Before starting construction at the Livermore development, IP should provide the Commission: (1) approved coffer dam

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4/ Separate from these license efforts, IP has entered into an agreement with the MHPC to address impacts on archaeological resources located on non-project lands during high-flow events.

5/ The Applicants will enter into a separate agreement with NGOs and interested parties that addresses land uses, public access, shoreline control and the protection of natural resource on other non-project lands (see Section 5.3.8.3 for more detail).

construction drawings and specifications, (2) final contract drawings and specifications for pertinent features such as water retention structures, power houses, and water conveyance structures, (3) a detailed soil erosion and sediment control plan, and (4) a plan for the disposal of fill or waste materials generated by the expansion.

Otis Project

- Continue to operate the project in a run-of-river mode, such that inflow equals outflow and fluctuations in water surface elevation in the impoundment, resulting from normal operation, are minimized. The water level in the project impoundment shall be maintained within 1 foot of full pond elevation when the flashboards are in place, and within 1 foot of the spillway crest elevation when the flashboards are not in place. During atypical periods of operation (e.g. after flashboard replacement) the flow release from the project dam should be 1,245 cfs, or inflow minus process-cooling water withdrawn, whichever is less.

* Develop a final stream flow gaging and flow monitoring plan to monitor the run-of-river operation and minimum flows recommended for the Otis Project. This report may be developed in cooperation with IP, which has a similar requirement for their Riley-Jay-Livermore Project.

* The Otis Project should operate at all times in a manner which maintains the state water quality standards. In addition, Otis should provide a final plan and schedule for monitoring water quality, including D.O., water temperature, and aquatic macroinvertebrates, in areas affected by the operation of the Otis Project. This monitoring plan may be developed in cooperation with IP, which has a similar requirement for the Riley-Jay-Livermore Project.

* IP should prepare an annual report which evaluates D.O., water temperature, and macroinvertebrate data and the ability of the Otis Project to meet state water quality standards. If monitoring shows that water quality standards have not been met, the report should include a proposal to study and implement additional measures, as needed, to meet or exceed the state standard. This report may be developed in cooperation with IP, which has a similar requirement for the Riley-Jay-Livermore Project.

* Reserve the Commission's authority to require changes in project operations and/or other environmental enhancements needed to maintain the state water quality standards, ameliorate for cumulative effects identified in the future,

due to operating the headwater storage impoundments under alternative operations, and effects on contaminants in the Androscoggin River.

* Reserve the Commission's authority to require the construction, operation, and maintenance of fishways prescribed by the Secretary of the Interior pursuant to Section 18 of the FPA.

- Monitor and report recreational use every six years (FERC Form 80, Recreation Use Assessment) and evaluate the future need for additional recreation facilities to meet user demand.
- Maintain public signage and boater safety devices throughout the project, in accordance with Part 8 of the Commission's regulations.
- Develop and implement a final recreation plan for recreational sites which will provide additional access to the shoreline and project waters as indicated in Section 3.3.2.3. This recreation plan may be developed in cooperation with IP, which has a similar requirement for the Riley-Jay-Livermore Project.
- Implement the provisions of a Programmatic Agreement between the Commission, the Advisory Council, and the MHPC to protect National Register-eligible archaeological sites.6/
- Expand the project boundaries to include lands necessary for public access, recreation, shoreline control and the protection of natural resources.7/

Evaluation of Measures Recommended

Table 24 summarizes a comparison of environmental effects of the various alternatives for the projects.

In addition, the environmental effects of other known actions within the basin were assessed for the resources in the APE and qualitatively for those resources located elsewhere along

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6/ Separate from these license efforts, IP has entered into an agreement with the MHPC to address impacts on archaeological resources located on non-project lands during high-flow events.

7/ The Applicants will enter into a separate agreement with NGOs and interested parties that addresses land uses, public access, shoreline control and the protection of natural resources on non-project lands (see Section 5.3.8.3 for more detail).

the Androscoggin River (see cumulative impact sections of Section 5 of this EA). This analysis was done to provide the reader with an assessment of the indirect and cumulative impacts associated with the regulated flow and other known actions on resource values.

The resource enhancement measures addressed in this EA fall into two categories: those measures that affect project operation and those measures that require a capital cost to implement or an annual cost to administer. Some of the enhancement measures reduced the economics of the projects. However, the economic value derived by these enhancements were also considered. Most of the enhancement measures affect multiple environmental resources and therefore, those measures and their effects must be considered concurrently.

The Preferred Alternative includes the Applicants' Proposal with additional staff-recommended measures. Implementing the additional measures in Preferred Alternative would require a capital investment on the part of IP; however, we expect these costs would be minimal and would have little effect on the overall project economics. The economic benefits for the Preferred Alternative would be similar to the Applicants' proposal.

Water Resources

Bypass flows: As discussed in Section 5.3.2, various flows were considered at Jay and at Livermore to improve water quality, specifically D.O. Based on the study results, a seasonal minimum flow of 5 cfs is recommended downstream of the Jay dam because of improved D.O. concentrations in the downstream bypass pool. Flows higher than 5 cfs (10 to 40 cfs) did not improve the D.O. in the bypass pool over the 5 cfs minimum flow, and increased the operational losses to the Applicant. The loss in generation and annual project cost to provide this minimum flow is estimated to be $3,607 per year.8/ This measure will improve water quality and is needed to maintain the State's water quality standards.

A seasonal minimum flow of 100/150 cfs in the upstream portion of the Livermore bypassed reach and a total minimum flow of 550 cfs in the lower portion of the Livermore bypassed reach is also recommended to improve water quality. Although the studies showed that a seasonal flow release of 50 cfs improved

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8/ The annual costs to provide flows is dependent upon the source of replacement energy used to calculate it. For example, $55/MWH is used for purchase power, where $25/MWH was determined to be the cost for 6.1 MW of identified energy conservation measures at the IP's mill.

D.O. in the bypass, higher flows are recommended to be released to improve fisheries and macroinvertebrate habitat. These measures will have a beneficial cumulative effect on water quality in the Androscoggin River and this flow is needed to meet the minimum state standard for water quality. The estimated annual capital and operating costs for the water quality portion of the proposed flow releases is $117,279.

Macroinvertebrate and Seasonal Monitoring of the Jay Water Quality Monitor: As discussed in Section 5.3.2, a two year study was conducted to determine the cause and corrective action for the periodic low D.O. levels in the Jay impoundment near the Town of Jay water quality monitor during some low river flow, high temperature periods. In addition, a three year study was conducted to determine whether the existing macroinvertebrate community in the projects impoundments met water quality requirements and the variables that could be affecting the community. Due to unusually low river flows during the first year of study and unusually high river flows during the second year of study, the cause of the reduced macroinvertebrate community were not determined conclusively.

We agree that the existing record shows that the projects, if operated as proposed, would likely meet the state water quality standards. However, the period of record for the data is not extensive, and more information would be helpful to validate this conclusion. Thus, it would be appropriate for the Commission to require additional water quality monitoring and a periodic review of the adequacy of project operation in meeting the state water quality standard. We recommend IP prepare a final plan for installing D.O. and temperature monitors at the Jay station intake, and final plans for continued monitoring of macroinvertebrate populations. In addition, IP should provide an annual report to the Commission, developed in coordination with the MDEP and FWS, which evaluates the water quality data collected and makes a determination on the ability of the project to meet state water quality standards. Should the results of this monitoring show that the water quality standards are not being met in the project area, we recommend that IP's report include a proposal to study and implement additional measures, as needed, to meet or exceed the state standard.

The monitoring report would provide a formalized mechanism for initiating additional measures to protect and enhance water quality in the project area. In the event that, some time in the future, the licensed project operation is shown to be inadequate to meet the state water quality standards for the Androscoggin River, the MDEP or FWS could petition the Commission for a change

in any requirement in the license which affects water quality. Alternatively, water quality monitoring and annual reports may be discontinued if monitoring data show that water quality standards are consistently met or exceeded in the project area. Upon review of the conditions and facts at the time, the Commission would make a decision whether to amend the license. It is important to note that individual groups or any agency may still act independently to petition the Commission for any changes in project operation they believe necessary to protect water quality.

This approach is the simplest and most cost-effective method for protecting water quality. The estimated annual operating costs for undertaking these tasks are $49,516. The potential benefits to water quality makes this expenditure worth the costs.

Fisheries

Minimum Flows: As summarized above and discussed in Section 5.3.3, IFIM and flow demonstration studies were conducted to determine the amount of flow needed at the Livermore development to increase fishery habitat in the Livermore bypassed reach. Brown trout, juvenile salmon, and macroinvertebrates were selected as possible species to meet state fishery management goals for this stretch of river. Atlantic salmon do not currently reside in this portion of the river. The inclusion of them as evaluation species is solely contingent upon their potential restoration to this portion of the river.

The proposed minimum flows would increase Weighted Usable Area (WUA) for the evaluation species and lifestages from less than 20% of maximum WUA to 82% to 92% for the various lifestage of brown trout, 94% for juvenile salmon, and 81% for various species of macroinvertebrates in the lower bypassed section (see Table 7, Section 5.3.3). The minimum flow releases would enhance riffle-pool habitats for aquatic life including existing and future population of brown trout, juvenile Atlantic salmon, and aquatic macroinvertebrates. Also, the continuous flow through the Livermore bypass would appreciably increase wetted area and would increase usable habitat for brown trout, smallmouth bass, and aquatic macroinvertebrates in both the upper and lower section of the bypass. Forage species such as white sucker and minnow species (*e.g.*, fallfish, spottail shiner, and blacknose dace) would also likely benefit from the increased flow. The cost to provide the minimum flows at Livermore are discussed above in the water quality discussion. Based upon the benefits of providing the minimum flow to the fishery resource at the projects and on the Androscoggin River, the costs are reasonable.

Flashboard Replacement: The Applicants' proposal to delay replacement of flashboards at the Jay dam would benefit the bass fishery by not dewatering the nests and desiccating the eggs during those high water years when the flashboards are not able to be installed until June (the beginning of the bass spawning period). Therefore, under these circumstances, the Applicants have proposed to delay flashboard replacement until July 15. This would not be an annual event but rather, would be dependent on run-off conditions. The delay in replacement of flashboards at the Jay dam is estimated to cost $5,872 per year. The cost of the lost generation resulting from this delay is worth the expected benefit to the fishery which will become increasingly important to the public once the new recreational access facilities are constructed (see discussion below).

Fish Passage: Although fish passage facilities are not proposed, nor recommended at this time by any resource agency, the Applicants have agreed to provide fish passage facilities, including the necessary attraction flows, when required by the Commission. Based on today's costs, IP estimated that the cost of constructing upstream and downstream fish passage facilities and providing the associated attraction flow would be $244,859 annually.

Fish Stocking: As discussed in Section 5.3.3, the Applicants agreed to consult with the MDIFW regarding the stocking of 250 catchable sized yearling brown trout in the Androscoggin River downstream of the Livermore development to provide a fall and spring fishery. This enhancement is estimated to cost $1.82 per fish ($454 on an annual basis) and result in an increase in the area available to fishermen preferring cold water species. The cost is minor. If stocking is successful, it would increase local riverine recreational use because few other cold water fishing opportunities are available within 25 miles of the projects (see Section 3.3.2.2).

Sampling toxins in fish: The Applicants agreed to cooperate with the MDEP in collecting and analyzing tissue samples for PCBs and mercury in white suckers and smallmouth bass from the Otis impoundment and the river below Livermore Dam. The MDEP states analysis is warranted to further determine whether the presence of the dams is contributing to the need for fish consumption advisories on the river (i.e., results in higher levels of toxins in the river).

A study conducted by IP in 1997 shows the concentration of dioxin and furans are below the threshold for fish consumption advisories currently used by the Maine Bureau of Health. However, concentrations of furans in suckers collected in the

Otis impoundment were higher than those from the river below Livermore Dam. Thus, it is reasonable for IP to continue their cooperative effort with the MDEP in monitoring fish in the project area for toxins such as Mercury and PCBs to identify if the dams contribute to higher levels of toxins in the project area. Monitoring toxins in fish is a condition of the WQC which will become part of any licenses issued for the projects.

Recreation

Part 8 and Form 80 Compliance: As discussed in Section 5.3.7, the Applicants have agreed to erect signs identifying the projects and the availability of recreation sites that are open to the public, maintain public safety devices (*e.g.*, boater barriers), prepare public use safety plans, perform recreational monitoring of the recreational facilities every six years and report the results to the Commission. These measures will consist of both initial capital costs to erect the Part 8 signs, yearly maintenance activities (*e.g.*, installation and removal of the boat barriers), and periodic monitoring and reporting requirements (*e.g.*, Form 80 monitoring). In total these measures are expected to have an annual levelized cost of $3,110. Due to the value to the public associated with these facilities (*e.g.*, safety) and the fact that they are required by regulation, we believe that these measures are in the public interest.

New Recreation Facilities: As discussed in Section 5.3.7, the Applicants propose to construct or improve recreational facilities and make improvements to other areas of the project (*e.g.*, Livermore bypass flow board). These facilities will provide new opportunities for the public to utilize the resources provided by the projects and are expected to meet the future recreational demand of the area. In total, these facilities are expected to have an annual levelized cost of $31,703. It is believed that the cost of providing these facilities is reasonable given the relatively few existing formal facilities in the area and the expected future increase in demand associated with clean-up of the river.

Cultural Resources

Phase III Mitigation: As discussed in Section 5.3.10, the Applicants propose to undertake Phase III mitigation at three sites within the APE that have been determined to be adversely affected by the projects and of potential National Register status. Undertaking these activities, pursuant to Section 106 of the NHPA, will prevent the gradual loss of information on pre-European contact settlement of the area. The expected annual levelized costs of these measures is $29,762.

Continued Operation of the Projects with Operational Improvements

As discussed in Section 3.3, the Applicants are proposing to continue to operate the projects in a run-of-river mode. Continued operation of the projects with the proposed enhancements has the best annual net benefit of the alternatives studied and provides for the enhancements identified above.

Redevelopment of Livermore: As discussed in Section 3.3, the Applicants propose to redevelop the generating units in the Livermore powerhouse to allow reliable continued and increased generation of energy. After this redevelopment, the projects will provide 142,250 MWh of clean, renewable energy on an average annual basis, while providing other environmental enhancements (*e.g.*, Livermore bypass flows). The expected annual benefit of this measure (including the substraction of operational costs and enhancement costs) is $539,200.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Geology/ Soils	• Maintain the existing soils and geologic features. • Maintain the shoreline stability. • Maintain the existing areas of soft sand/muck deposition along shoreline areas of the impoundments.	Same effects as no-action alternative plus: • Short-term minor disturbances to soils in the immediate work areas would occur during redevelopment of Livermore and construction of recreation areas. A soil erosion and sediment control plan would reduce erosion and sedimentation. • Construction of the Pine Island recreation facility would expedite the Town of Jay's plan to relocate the winter sand pile which would reduce salt and sand run-off into the Androscoggin River.	• Upon removal of the flashboards, there would be a temporary and slight increase in river turbidity downstream of Livermore and an increase in sediment load during high flow events until the exposed 1.5 miles of shoreline area stabilizes.	• May affect the existing river bottom composition (particularly along existing shoreline areas). Temporary increase in sediment loads on downstream river segments during floods until existing backwater areas are flushed out.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Water Resources	• Maintain the existing impoundments. • Water quality problems during some times of the year would continue to exist in isolated areas in the APE. • No effort to reduce accumulation of solids would occur. • No construction activities would occur so the possibility of increased erosion would not occur. • Continuing ROR operation with 1,245 cfs (ABF) or inflow if lower during atypical operation will continue to protect aquatic resources.	• Maintain the existing impoundments. • Releasing 5 cfs minimum flow downstream of the Jay dam will improve water quality in that section of the river and comply with Class C water quality standards. • Releasing minimum flows in the Livermore bypass reach will improve water quality conditions in that reach resulting in a beneficial cumulative effect. • Monitoring of D.O. and macroinvertebrate community in Jay impoundment and developing an operational plan will help ensure compliance with water quality requirements.	• Same effects as proposed action except water quality may be adversely affected on a short-term basis during high flow periods until exposed shoreline stabilizes due to removal of the flashboards.	• An increase in erosion and sedimentation would occur in areas that are currently impounded. • Temporary adverse effects to water quality may occur as a result of sediment transport, as possible spread of toxins downstream in the basin. • Dam removal would restore continuous flows to the entire river reach (including the Livermore bypass) which may improve summer water quality and macroinvertebrate community in that reach.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Water Resources (cont.)		• ROR operation with 1,245 cfs (ABF) or inflow if lower during periods of atypical operation will continue to protect aquatic resources. • Increasing recreational use may have minor, adverse effects on water quality from erosion. • Short term disturbances during construction activities may have a minor adverse effect on water quality. The diversion of flow during construction to the bypassed reach will improve water quality in that area.		

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Fisheries	• Continue diverse, self sustaining warmwater fish assemblage. Existence of dams and ROR operations would continue to have beneficial effect on existing fish assemblage. • The existing impoundment drawdowns associated with flashboard replacement may have a short-term adverse impact on smallmouth bass spawning. • Upstream movement is blocked by projects dams.	• Continue diverse, self sustaining warmwater fish assemblage. Existence of dam and ROR operations would continue to have beneficial effect on existing fish assemblage. • Delay in placement of flashboards at Jay dam during bass spawning season will increase bass production. • Minor sedimentation may have short-term impacts on fish habitat during the placement and removal of the cofferdams at Livermore. • Proposed minimum flows in Livermore bypass reach would have a beneficial effect on the fisheries by increasing habitat and encouraging a more diverse fish community.	• Continue diverse, self sustaining warmwater fish assemblage. Existence of dam and ROR operations would continue to have beneficial effect on existing fish assemblage. • Upon removal of the flashboards, there would be the loss of approximately 100 acre-feet of water in the Livermore impoundment resulting in a minimal impact on existing community. • Delay in placement of flashboards at Jay dam during bass spawning season will increase bass production. • Increased flow to existing bypass flow equaling entire regulated river flow would decrease habitat preferred by management species but increase habitat for species preferring higher velocities. • Construction of upstream/downstream fish passage facilities when need is demonstrated and required by FERC will provide opportunity for passage.	• Establishing 12 miles of free flowing river may change the overall diversity and structure of fish assemblage to favor riverine versus impoundment species.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Fisheries (cont.)		• Estimated to provide habitat for about 100 brown trout. • Stocking of brown trout downstream of the projects would have a beneficial cumulative effect on the fishery resources. • Construction of upstream/downstream fish passage facilities when need is demonstrated and required by FERC will provide opportunity for passage. • Additional recreation facilities would increase opportunities for anglers.	• Stocking of brown trout downstream of the projects would have a beneficial cumulative effect on the fishery resources. • Additional recreation facilities would increase opportunities for anglers.	

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Terrestrial- Vegetation	• No impacts to the existing vegetative populations. • Continue original inundation of terrestrial lands.	Same effects as no action alternative plus: • Redevelopment of the Livermore powerhouse may result in short-term disturbance to vegetative resources. • Improved recreation facilities may have minor impact by disrupting some species located in immediate area of proposed facilities.	Same effects as no action alternative plus: • Improved recreation facilities may have minor impact by disrupting some species located in immediate area of proposed facilities. • Exposed shoreline may provide additional area for terrestrial vegetative species.	• Increase habitat for upland species. See wetland section for increase in wetlands habitats.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Wetlands	• Existence of dam and ROR operations would continue to have a beneficial effect on the emergent and aquatic bed wetlands in the impoundments and continue original inundation of river wetlands.	Same effects as no action alternative plus: • Redevelopment of the Livermore could have a temporary adverse effect on an existing 0.1 acre wetland (scrub-shrub) located on the island adjacent to the developments tailrace. • Proposed min. flows would provide a continuous source of moisture and nutrients to the aquatic plants in the bypass. Small increase in the total area of wetland on the island. Possible conversion of a small portion of the existing scrub-shrub to marsh may occur. • Minimal effects on wetlands due to use of recreational facilities particularly if horsepower on boats are maintained at low levels.	Same effects as no action alternative plus: • Elimination or relocation of the existing (0.7 acre) emergent and aquatic bed wetland community due to reduced water levels. • Minimal effects on wetlands due to use of recreational facilities particularly if horsepower on boats are maintained at low levels.	• Convert some wetlands to upland habitat and reestablish other wetland areas that were inundated during the original construction of the dams. • An increase of shrub/scrub and forested floodplain wetlands would likely occur. Aquatic bed and emergent wetland cover types would likely decrease.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Wildlife	• Continue original inundation of terrestrial lands. • No impacts to existing wildlife populations would occur. Species which currently benefit from the cover types encouraged by the impoundments (i.e. aquatic bed, deep water and emergent) would continue to benefit. • Continued short-term adverse impact to wildlife species affected by flashboard failure (lowering of the impoundments).	Same effects as no action alternative plus: • Redevelopment of the Livermore powerhouse may result in short-term relocation of wildlife (*e.g.*, small urban mammals) to other areas during construction. • Proposed minimum flow releases to the Livermore bypass would benefit shorebirds, wading birds, and water dependent furbearers. • Recreation development may have a minor adverse impact on species that are sensitive to human activity (primarily in area of Riley impoundment downstream of Steven's Island).	• Continue original inundation of terrestrial lands. • There would be minor impacts to wildlife from the loss or temporary relocation of 0.7 acre of emergent and aquatic bed habitat. • Exposed shoreline areas would revegetate and provide new riparian habitat for wildlife species.	• Change in habitat type would cause shift and relocate species utilizing existing aquatic bed and emergent habitats to other areas and increase habitat for species preferring forested floodplain and scrub-shrub wetlands.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
T&E Species and Unusual Plant Communities	• Maintain the existing conditions for threatened and endangered plant species. • Flashboard failure may have a short-term adverse impact on the fresh water mussel species.	Same effects as no action alternative plus: • Minor, temporary displacement may occur to species sensitive to noise during the redevelopment activities at Livermore. • Minimum flows may benefit yellow lamp mussel by providing additional habitat in the lower Livermore bypass reach. • Proposed recreational facilities on the projects' impoundment may have an adverse effect on those state listed species sensitive to human activity and development.	Same effects as no action alternative plus: • Increased river flow in existing Livermore bypass reach would not likely impact existing threatened or endangered species. • Proposed recreational facilities on the projects' impoundment may have an adverse effect on those state listed species sensitive to human activity and development.	• Reestablish some forested wetland habitat for red shouldered hawks and other species. • Adverse impact on species such as black ducks due to the reduction of open water and aquatic bed wetland habitat. • Decreased feeding opportunities for overwintering bald eagles. • May provide additional habitat for yellow lamp mussel.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Recreation	• Maintain the existing informal facilities and access. • Levels of recreation use such as boating, shoreline fishing, instream fishing, and scenic viewing would likely remain stable or increase with the state's population. • Maintain existing impoundments and recreation opportunities.	Same effects as the no action alternative plus: • New recreation sites would provide additional access to the shoreline and project waters which is likely to increase use of the projects area. • The proposed minimum flows to the Livermore bypass may increase instream fishing effort by recreational anglers by providing pools from which to fish while continuing to provide safe access. • The recreational facilities (including carry-in boat launches) will also provide opportunities for the public to view the existing wildlife resources of the area and the surrounding habitat.	• New recreation sites would provide additional access to the shoreline and project waters which is likely to increase use of the projects area and opportunity for the public to view the area. • No effect on water-related recreation on the Livermore impoundment since there is currently no river-related recreation at this location. • Compared to the proposed action, increased flow over the dam would provide fewer instream angling opportunities and present more safety problems at some flows as anglers attempt to reach the deep pool areas in the middle of the bypass reach. • Use of the bypass for whitewater boating would be available although use is likely to be minimal unless high water flow events occurred.	• Proposed recreation facilities would not be provided by the Applicants. • Short term, adverse effects on recreation resources would occur due to lower water levels which would expose a band of muddy substrate, over which users would have to traverse. • Dam removal would result in a relocation of recreationists that prefer impoundment recreation to substitute sites within the region, potentially impacting the recreational experience at other sites. • Eliminating the impoundments may increase or decrease angler use due to the free-flowing characteristics of the river and change in species composition and abundance. • Over time, riverine use may increase as the softer substrate is scoured away and recreationists that prefer longer stretches of free-flowing bodies of water for recreation activities discover the area. • Includes one major falls and a number of rapids.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Land Use	• Continue existing land uses on projects lands. • State and local regulations and review procedures would provide shoreline resource protection	• Recreational improvements and flows in the Livermore bypass reach would directly affect land uses by encouraging additional public use of the Applicants' lands and project waters through additional public access points and recreational facilities. • Land protection measures will provide public access, shoreline control, recreation and/or the protection of aesthetics and natural resources.	• Same effects as the proposed action.	• Require rezoning by local planning boards of new lands that are exposed. • Once re-established with vegetation, the exposed shorelines may allow for expansion of existing uses.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Aesthetics	• Maintain existing aesthetic resources. • Existing project transmission lines and transmission right-of-way would continue to adversely affect the aesthetic quality in areas where the visual reference is the natural environment and can be seen by area residents and recreationists	Same as no action alternative plus: • Redevelopment of the Livermore powerhouse would result in minor short-term adverse effects during construction due to the presence of construction equipment and related noise. • Proposed recreation facilities would blend in with the environment and provide public access areas for viewing wildlife and the surrounding habitat. • Upgrading the transmission line would not affect the existing visual quality at Livermore as it would involve the same corridor, and poles with a higher capacity line. • Min. flows in the bypass would improve the areras aesthetic character.	• Expose approximately 1.5 miles of shoreline which would have a temporary adverse impact on visual resources until the exposed shoreline naturally revegetated (2 - 4 growing seasons) • Proposed recreation facilities would be designed to blend in with the environment and would provide public access areas for viewing wildlife and the surrounding habitat. • Moderate adverse aesthetic impacts would occur if the powerhouse were left to deteriorate over a period of years, since the presence of the deteriorating facility--including rubble in the river and exposed and cracked concrete--would detract other views of the area.	• Provide continuous free-flowing streamflow patterns to the projects' areas and have a positive effect for recreationists and residents that prefer riverine conditions. • Loss of the project impoundments, which may be valued for attracting and observing wildlife and waterfowl and providing wetlands, would have an adverse effect on persons who prefer impoundments. • Restore the waterfall at Livermore Falls and rapids elsewhere in the APE. • Short-term adverse impact on the local area due to noise, dust, increased traffic and visual intrusion in the vicinity of the projects during demolition and removal. • Dewatered impoundment areas would expose soft substrate and temporarily degrade the visual quality of the river landscape • Short-term increased water turbidity levels during demolition and dewatering of the impoundments would detract from the river's scenic qualities • Over time, vegetation would cover the shoreline substrate and have a positive effect on the visual quality of the area.

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Cultural	• No resource enhancements would occur, which may continue adverse affects to three sites eligible for the National Register.	• The Applicants proposal to implement the provisions of a Programmatic Agreement between the Commission, the Advisory Council, and the MHPC would have a beneficial cumulative effect on National Register-eligible archaeological sites that have the potential to be adversely affected by the issuance of new licences for the projects.	• Exposure of 1.5 miles of shoreline to potential erosion on a short-term basis until it becomes revegetated and stabilized. • The Applicants' proposal to implement the provisions of a Programmatic Agreement between the Commission, Advisory Council, and MHPC would have a beneficial cumulative effect on National Register-eligible archaeological sites that have the potential to be adversely affected by issuance of new licences for the projects.	• Unvegetated banks that may hold eligible archaeological properties would be subject to increased erosion and vandalism until new vegetation stabilized the banks • No Federal protection of National Register eligible historic facilities and archaeological properties

Table 24. Comparison of Alternatives for the Riley-Jay-Livermore and Otis Projects.

Resource	No Action Alternative (Status Quo)	Proposed Action Alternative	Environmental Enhancements w/o Redevelopment of Livermore Powerhouse	License Denial, Decommissioning, and Dam Removal Alternative
Socioeconomics	• Maintain existing socioeconomic resources including existing contributions to the local tax base. • Continued employment of six to eight individuals responsible for operating and maintenance of the hydrosystem. • Continued production of 111.8 GWHs of lower cost electricity which benefits the mill, the people it employs, and the community.	• Redevelopment of Livermore would have minor, beneficial impacts to socioeconomics due to short-term employment and expenditures of 50 full-time workers. • Continued employment of six to eight individuals responsible for operating/maintaning the hydrosystem. • Production of 155.3 GWHs of lower cost electricity (currently 111.8 GWHs) which benefits the mill in remaining competitive, the people it employs, and the community. • Since the workers will be from local labor markets, a beneficial economic impact on local communities would occur. • Decrease in emissions if other sources of power (*e.g.*, oil, nuclear).	• Layoff of up to two individuals associated with the operation and maintenance of the Livermore facility. • Long-term adverse impact associated with purchase of approximately 9 MW of electricity from the local utility at a higher cost, resulting in a slight decrease in the competitiveness of the mill.	• Local residents currently employed by these projects would lose their jobs and revenues generated as a result of the projects would also be lost. •Could affect profitability of mill to some degree as more expensive power would be required. •The Towns may not effectively support a variety of programs and services due to loss of tax revenues ($576,117 as currently developed and $953,031 based on proposed redevelopment) derived from the projects. • Existing and proposed recreational areas would no longer be provided by IP; thus, the towns would have to financially support (build and maintain recreational areas) the recreational needs of the residents. • The generation of 155.3 GWHs of electricity from other sources of power could result in additional air emissions, producing an adverse effect.

8. CONSISTENCY WITH FISH AND WILDLIFE RECOMMENDATIONS

Section 10(j) of the FPA requires the Commission to include in each license issued, conditions for the protection, mitigation, and enhancement of fish and wildlife resources based upon recommendations from the resource agencies, unless it believes that the recommendations are inconsistent with Part I of the FPA or other applicable laws. In those instances where the Commission believes an inconsistency exists, the agencies and the Commission will try to resolve the inconsistency.

During the course of the Collaborative process, the USFWS and MDIFW provided recommendations to the Applicants. The proposed alternative offered by the Applicants incorporates all of the recommendations provided by the USFWS and MDIFW. In addition, Federal and state fish and wildlife agencies that responded to the Commission's Notice Requesting Final Terms and Conditions, issued on October 14, 1997, are identified in Section 4.1. We have addressed the concerns of the Federal and state fish and wildlife agencies and made recommendations consistent with those of the agencies.

9. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with Federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the projects. Under Section 10(a)(2) of the FPA, Federal and state agencies filed 10 plans that address various resources in Maine. Of those, 8 are relevant to the Riley-Jay-Livermore and Otis Projects.9/ The Collaborative team reviewed these plans and no conflicts were found (KA, 1995d). We agree with this conclusion.

9/ Atlantic Sea-Run Salmon Commission. 1984. Strategic Plan for Management of Atlantic Salmon in the State of Maine. Augusta, Maine. July 1984. 52 pp. and Appendices.

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10. FINDING OF NO SIGNIFICANT IMPACT

On the basis of our independent analysis, the issuance of new licenses for the Riley-Jay-Livermore and Otis Projects, with our recommended environmental measures, would not constitute a major Federal action significantly affecting the quality of the human environment.

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12. LIST OF PREPARERS AND CONTRIBUTORS

As discussed in Section 4.0, a Collaborative Team was assembled to assist the Applicants'. This assistance included attendance at meetings, review and comment on project studies, and preparation of the projects' documents, including the APEA. The following is the list of contributors and preparers of the APEA and the Commission's EA. Collaborative Team members are indicated by an asterisk.

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APPENDIX A: LETTERS OF COMMENT ON THE DRAFT ENVIRONMENTAL ASSESSMENT AND STAFF RESPONSES

Commentor	Date of Letter
Town of Jay	May 7, 1998

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May 7, 1998

COPY
office of
SELECTMAN
ASSESSORS
TOWN MANAGER
TREASURER
TOWN CLERK
PLANNING BOARD
ENVIRONMENTAL CODE
ADMINISTRATOR

David P. Boergers, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.,
Washington, D.C. 20246

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OFFICE OF THE SECRETARY
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FEDERAL ENERGY REGULATORY COMMISSION

Subject: Comments on Draft Environmental Assessment
International Paper Company Project; FERC No. 2375-013
Otis Hydroelectric Company Project; FERC No. 8277-008

Dear Mr. Boergers:

The Town of Jay, Maine presents the following comments on the Draft Environmental Assessment for the above captioned projects.

1. Section 4.2 (Page 4-26) states that the Maine State Planning Office, the USEPA and the Town of Jay have intervened in this proceeding and that these agencies have concerns regarding the 401 Water Quality Certification. The Town of Jay's interest in the project is not limited to water quality issues, but includes a wider range of matters including, but not limited to, land use, aesthetics, fisheries, wildlife, recreation and energy production. 1

2. Section 3.3.2.3 Paragraph c. iv) (Page 3-19) states that among the improvements to provide recreational opportunities IP shall provide a summer day-use facility in Pine Island in the Jay Impoundment, based upon conditions of the site. The conditions of the site favorable for development and use of recreational facilities not only include the Town's removal of it's sand-salt pile, but also the successful acquisition by IP of the right of way through the island currently owned by the Town and the IP's successful acquisition or other appropriate arrangements for the use and maintenance of the existing bridge to the island which is owned by the Town. 2

3. Section 5.3.1.2 (Page 5-45) states that construction of recreational facilities on Pine Island will result in removal of the Town salt pile "to a more suitable upland location". Section 5.3.2.2 (Page 5-59) further states that this removal "will have an indirect effect of improving water quality by eliminating potential non-point source pollution related to sand and salt runoff from the facility". There is no record evidence of any current or potential effects of the sand/salt pile on water quality. IP once placed a monitoring well on the Island near the sand/salt pile, but we have never seen the any 3

1. Section 4.2 has been modified to reflect this information.

2. Section 3.3.2.3 has been modified to reflect this information.

3. We agree that there is currently no record of evidence of any negative effects of the sand/salt pile on water quality. However, the mere presence of the sand/salt pile in the proximity of a water body results in a potential for impact to water quality which should be monitored and evaluated on a periodic basis. Any relocation of the salt pile to an upland site would be comparatively "more suitable" than the current location, with respect to potential environmenal impacts. We believe the EA accurately reflects this position.

monitoring data. The Town calculates that any leachate or runoff from the cu ·nt salt pile would have no discernable effect on the quality of adjacent groundwater or . rface water resources.

4. Several sections of the Draft EA refer to provisions of the Town of Jay's Water Permit issued to IP for discharge from its wastewater treatment facility immediately upstream of the Jay Dam (see, for example, Section 3.3.2.1, Page 3-16). These references appear to accurately reflect the provisions of the Town's permits. We would further note that none of the provisions of the environmental assessment or FERC License shall supercede or in any other way effect the requirements of IP's Jay Water Permit or any other actions by the Town pursuant to the Jay Environmental Control and Improvement Ordinance. 4

Thank you very much for this opportunity to comment. Please contact me if you have any questions.

Sincerely,

Mark B Dawson

Mark B. Dawson
Environmental Code Administrator

Cc: IP FERC Collaborative Team

4. This is a legal issue beyond the scope of this NEPA document.