Brookfield
Renewable

April 3, 2020

VIA E-FILING

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Pejepscot Hydroelectric Project (FERC No. 4784)
Draft License Application

Dear Secretary Bose:

Pursuant to the Commission's regulations at 18 C.F.R. § 5.16(c), Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro) herein files the Draft License Application (DLA) for the relicensing of the Pejepscot Hydroelectric Project (FERC No. 4784). The DLA is being filed in accordance with the Integrated Licensing Process (ILP) and consists of the following exhibits:

- Initial Statement
- Exhibit A – Project Description
- Exhibit B – Project Operation and Resource Utilization
- Exhibit C – Construction History
- Exhibit D – Statement of Costs and Financing
- Exhibit E – Environmental Report
- Exhibit F – General Design Drawings and Supporting Design Report
- Exhibit G – Project Maps
- Exhibit H – Description of Project Management and Need for Project Power

The draft Exhibit F contains Critical Energy Infrastructure Information (CEII) and will be filed under separate cover.

As discussed in the enclosed DLA, Topsham Hydro is proposing to continue the fundamental operation of the Project under the new license. In support of this proposal, Exhibit E evaluates the potential impacts to environmental and recreational resources that may occur as a result of the continued operation of the project under a new license. As appropriate, Exhibit E also includes Topsham Hydro's preliminary proposals for the protection and mitigation of effects on, or enhancement to, resources that are associated with the continued operation of the Project.

In accordance with 18 C.F.R. § 5.16(e), participants and Commission staff may submit comments regarding the DLA to Topsham Hydro within 90 days of this filing (i.e., July 2, 2020).

Any participant whose comments request new information, studies, or other amendments to the approved Study Plan must include a demonstration of extraordinary circumstances, pursuant to the requirements of 18 C.F.R. § 5.15(f).

If there are any questions or comments regarding the DLA, please contact me by phone at (207) 755-6505 or by email at Randy.Dorman@BrookfieldRenewable.com.

Sincerely,

Randy Dorman
Licensing Specialist
Brookfield Renewable

Attachment: Draft License Application for the Pejepscot Hydroelectric Project

cc: Distribution List

DISTRIBUTION LIST
Pejepscot Hydroelectric Project (FERC No. 4784)
Draft License Application

I, Randy Dorman, Licensing Specialist, Brookfield Renewable, hereby certify that copies of the foregoing document have been transmitted to the following parties on April 3, 2020.

Randy Dorman Licensing Specialist	April 3, 2020

One copy, via e-filing to:

Ms. Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, N.E.,
Dockets Room
Washington, D.C. 20426

Via email or electronic link, or one copy on compact disc,
Regular mail, postage paid to:

Federal Agencies	
Mr. Ryan Hansen Federal Energy Regulatory Commission 888 First Street, NE Washington, DC 20426	Wendi Weber Regional Director U.S. Fish and Wildlife Service 300 Westgate Center Dr. Northeast Regional Office Hadley, MA 01035
Mr. John Spain Regional Engineer Federal Energy Regulatory Commission Division of Dam Safety and Inspections New York Regional Office 19 W 34th Street, Suite 400 New York, NY 10001	Mr. Antonio Bentivoglio U.S. Fish and Wildlife Service Maine Field Office 4 Fundy Road #R Falmouth, ME 04105

Mr. Nicholas Stasulis Data Section Chief USGS New England Water Science Center 196 Whitten Rd. Augusta, ME 04333	Mr. Harold Peterson Bureau of Indian Affairs Eastern Regional Office 545 Marriot Drive, Suite 700 Nashville, TN 37214
Mr. Sean McDermott National Marine Fisheries Service 55 Great Republic Drive Gloucester, MA 01930	Mr. Andrew L. Raddant Regional Environmental Officer U.S. Fish and Wildlife Service Office of Environmental Policy and Compliance Northeast Region 15 State Street, Suite 400 Boston, MA 02109
Mr. Matt Buhyoff National Marine Fisheries Service Atlantic Salmon Recovery Coordinator 17 Godfrey Drive Orono, ME 04473	Mr. John T. Eddins Office of Project Review Advisory Council on Historic Preservation 401 F Street NW, Suite 308 Washington, DC 20001-2637
Mr. Ralph Abele Instream Flow Coordinator Region 1- Office of Ecosystem Protection US Environmental Protection Agency 5 Post Office Square, Suite 100 Mail Code: OEP06-2 Boston, MA 02109-3912	Mr. Kevin Mendik Hydro Program Manager Northeast Region National Park Service 15 State Street, 10th Floor Boston, MA 02109-3572
Mr. Bryan Rice Director Bureau of Indian Affairs U.S. Department of the Interior MS 4606 MIB 1849 C Street NW Washington, DC 20240	
Maine Agencies	
Ms. Kathy Howatt Hydropower Coordinator Maine Department of Environmental Protection 17 State House Station 28 Tyson Drive Augusta, ME 04333-0017	Mr. Nick Livesay, Director Bureau of Land Resource Regulation Maine Department of Environmental Protection 17 State House Station 28 Tyson Drive Augusta, ME 04333-0017

Dr. Arthur Spiess Maine Historic Preservation Commission 55 Capitol Street 65 State House Station Augusta, ME 04333-0065	Mr. Jim Vogel Maine Department of Agriculture, Conservation and Forestry Bureau of Parks and Lands 22 State House Station 18 Elkins Lane Augusta, ME 04333-0022
Ms. Kathleen Leyden Maine Coastal Program Department of Marine Resources 21 State House Station Augusta, ME 04333-0021	Mr. John Perry Environmental Coordinator Maine Department of Inland Fisheries and Wildlife 41 State House Station 284 State Street Augusta, ME 04333-0041
Mr. James Pellerin Regional Fisheries Biologist – Region A Maine Department of Inland Fisheries and Wildlife RR1, 358 Shaker Road Gray, ME 04039	Mr. Scott Lindsay Regional Wildlife Biologist – Region A Maine Department of Inland Fisheries and Wildlife RR1, 358 Shaker Road Gray, ME 04039
Ms. Gail Wippelhauser Maine Department of Marine Resources 21 State House Station Augusta, ME 04333-0021	Mr. Paul Christman Maine Department of Marine Resources 21 State House Station Augusta, ME 04333
Mr. Kirk Mohney Director and State Historic Preservation Officer Maine Historic Preservation Commission 55 Capitol Street 65 State House Station Augusta, ME 04333-0065	
Municipal Government	
Town of Topsham 100 Main Street Topsham, ME 04086	Town of Brunswick 85 Union Street Brunswick, ME 04011
Town of Durham 630 Hallowell Road Durham, ME 04222	Town of Lisbon 300 Lisbon Street Lisbon, ME 04250

Cumberland County Government 142 Federal Street Portland, ME 04101	Sagadahoc County Government 752 High Street Bath, ME 04530
Androscoggin County Government 2 Turner Street Auburn, ME 04210	
Non-Government Organizations	
Mr. Brian Graber Director American Rivers Northeast Field Office 516 West Hampton Road Southampton, MA 01062	Ms. Landis Hudson Executive Director Maine Rivers P.O. Box 782 Yarmouth, ME 04096
Mr. John R.J. Burrows Atlantic Salmon Federation Fort Andross, Suite 406 14 Maine Street Brunswick, ME 04011	Mr. Bill Oleszczuk Chair Maine Council of Trout Unlimited 185 Tobey Road New Gloucester, ME 04260
Orman Hines Trout Unlimited Merrymeeting Bay Chapter PO Box 6, Sebasco Est., ME 04565	Mr. Ed Friedman Friends of Merrymeeting Bay PO Box 233 Richmond, ME 04357
Mr. Jeffrey Reardon Maine Brook Trout Program Director Trout Unlimited 9 Union Street Hallowell, ME 04347	
Native American Tribes	
Chief Edward Peter Paul Aroostook Band of Micmacs Micmac Cultural, Community and Educational Center 7 Northern Road Presque Isle, ME 04769	Ms. Jennifer Pictou THPO Aroostook Band of Micmacs 7 Northern Road Presque Island, ME 04769

Distribution List
Pejepscot Project (FERC No. 4784)
Draft License Application

Chief Kirk Francis Penobscot Indian Nation 12 Wabanaki Way Indian Island, ME 04468	Mr. Christopher Sockalexis THPO Penobscot Indian Nation Cultural & Historic Preservation Department 12 Wabanaki Way Indian Island, ME 04468
Chief William J. Nicholas, Sr. Passamaquoddy Tribe Indian Township P.O. Box 301 Princeton, ME 04668	Mr. Donald Soctomah THPO Passamaquoddy Tribe PO Box 159 Princeton, ME 04668
Chief Brenda Commander Houlton Band of Maliseet Indians 88 Bell Road Littleton, ME 04730	Ms. Susan Young Houlton Band of Maliseet Indians 88 Bell Road Littleton, ME 04730
Licensee	
Mr. Randy Dorman Licensing Specialist Brookfield Renewable 150 Main Street Lewiston, ME 04240	Mr. Steven Murphy Director, Licensing Brookfield Renewable 33 West 1st Street South Fulton, NY 13069
Ms. Kelly Maloney Manager, Compliance - Northeast Brookfield Renewable 150 Main Street Lewiston, ME 04240	Mr. Matthew Leblanc Compliance Specialist Brookfield Renewable 3 Company Road Hollis, ME 04042
Mr. Kirk Smith Gomez and Sullivan Engineers, D.P.C. 41 Liberty Hill Road PO Box 2179 Henniker, NH 03242	

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

DRAFT LICENSE APPLICATION

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC No. 4784)

Submitted by:

Brookfield Renewable
Topsham Hydro Partners Limited Partnership
150 Main Street
Lewiston, ME 04240

Prepared by:

Gomez and Sullivan Engineers

April 2020

Brookfield

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

CONTENTS

This Application for New License for the Pejepscot Hydroelectric Project (FERC No. 4784) consists of the following:

BEFORE THE

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

Topsham Hydro Partners Limited Partnership	**)**	**FERC Project No. 4784**
	)	**Pejepscot Hydroelectric Project**
	)	

APPLICATION FOR NEW LICENSE
FOR A MAJOR WATER POWER PROJECT – EXISTING DAM

INITIAL STATEMENT

1. Topsham Hydro Partners Limited Partnership (hereinafter the "Applicant" or "Licensee") applies to the Federal Energy Regulatory Commission (FERC or the Commission) for a New License for the Pejepscot Hydroelectric Project (Project), an existing licensed major project, as described in the attached exhibits. The Project is licensed as Project No. 4784. The current license for the Project was issued by order dated September 16, 1982. The effective date of the license was September 1, 1982 for a period of 40 years. The current license expires on August 31, 2022. The Applicant is the only entity that has or intends to obtain and will maintain any proprietary right or interest to construct, operate, or maintain the Project.

2. The location of the Project is:

State	Maine
Counties	Cumberland, Sagadahoc, Androscoggin
Township or nearby towns	Village of Pejepscot, Towns of Topsham, Lisbon, Durham, Brunswick
Stream or other body of water	Androscoggin River

3. The exact name and business address of each person authorized to act as agent for the applicant is:

Mr. Tom Uncher
Vice President
Topsham Hydro Partners Limited Partnership
339B Big Bay Rd
Queensbury, NY 12804Telephone: 1-518-743-2018
Thomas.Uncher@brookfieldrenewable.com

Copies of all correspondence should also be sent to:

Randy Dorman
Licensing Specialist
Brookfield Renewable
150 Main Street
Lewiston, ME 04240
Telephone: (207) 755-6505
Randy.Dorman@BrookfieldRenewable.com

Kirk Smith
Project Manager
Gomez and Sullivan Engineers, D.P.C.
PO Box 2179
Henniker, NH 03242
Telephone: (603) 428-4960
ksmith@gomezandsullivan.com

4. The Applicant is:

   Topsham Hydro Partners Limited Partnership – Licensee for the water power project designated as Project No. 4784 in the records of the Federal Energy Regulatory Commission. The Licensee is not claiming preference under section 7(a) of the Federal Power Act, 16 U.S.C. § 796.

5. (i) The statutory or regulatory requirements of the State of Maine, in which the Project is located, which would, assuming jurisdiction and applicability, affect the Project as proposed with respect to bed and banks and the appropriation, diversion, and use of water for power purposes, and with respect to the right to engage in the business of developing, transmitting, and distributing power and in any other business necessary to accomplish the purposes of the license under the Federal Power Act are:

   (1) Maine Waterway Development and Conservation Act, Maine Revised Statutes Annotated Title 38, § 630 et. seq.

   (2) Mill and Dam Act, M.R.S.A. Title 38, § 651 et seq.

   (ii) The steps which the Applicant has taken or plans to take, to comply with each of the laws cited above are:

   (1) The Maine Waterway Development and Conservation Act (MWDCA), enacted in 1983, regulates certain construction or reconstruction of hydropower projects which change water levels or flows above or below a dam. The Applicant is not proposing as part of the relicensing any construction or changes in water levels that would require approval under the MWDCA.

(2) The Mill Act, essentially enacted in 1821, allows riparian owners to maintain dams and raise water. The statute does not require any permits and has been interpreted by the Maine Supreme Judicial Court to apply to hydroelectric generating plants. See Veazie v. Dwinel, 50 Me. 479 (1862). Maine case law has also held that owners of the riverbed have the right to the natural flow of a stream as it passes through their land, Wilson & Son v. Harrisburg, 107 Me. 207 (1910). Licensee either owns or has easement or flowage rights to all Project lands and waters.

6. The Project generally consists of the dam, spillway, fish passage facilities, two powerhouses, a sheet-pile floodwall, ancillary equipment, and a 225 acre impoundment. The original powerhouse contains three rehabilitated horizontal Francis units, with a combined output capacity of 1.588-MW. The new powerhouse (circa 1987) contains one propeller type (Kaplan) turbine-generator unit rated at 12.3-MW. The Project generation facilities tie to the electric grid at the local utility's non-project sub-station located adjacent to the Project boundary. See Exhibit A – Project Description and Exhibit F – General Design Drawings for a complete description of the Project.

7. No lands of the United States are affected by the Project.

8. This is an existing Project and no new construction is planned in association with this relicensing.

9. Topsham Hydro Partners Limited Partnership owns, and, as Licensee for the Project, will maintain any proprietary right necessary to construct, operate, and maintain the Project.

10. The names and mailing addresses of:

(i) Every county in which any part of the project, and in which any federal facility that is used or to be used by the project, is located:

Androscoggin County Government
2 Turner Street, Unit 2
Auburn, Maine 04210

Cumberland County Government
142 Federal Street
Portland, Maine 04101

Sagadahoc County Government
752 High Street
Bath, Maine 04530

There are no federal facilities used by the project.

(ii) *Every city, town, or similar local political subdivision in which the project is located and in which any federal facility that is used by the project is located, or that is within 15 miles of the project dam and has a population of 5,000 or more people is:*

City of Auburn
60 Court Street
Auburn, Maine 04210

City of Bath
55 Front Street
Bath, Maine 04530

Town of Brunswick
85 Union Street
Brunswick, Maine 04011

Town of Cumberland
290 Tuttle Road
Cumberland, Maine 04021

Town of Freeport
30 Main Street
Freeport, Maine 04032

Town of Gray
24 Main Street
Gray, Maine 04039

City of Lewiston
27 Pine Street
Lewiston, Maine 04240

Town of Lisbon
300 Lisbon Street
Lisbon, Maine 04250

Town of New Gloucester
385 Intervale Road
New Gloucester, Maine 04260

Town of Sabattus
190 Middle Road
Sabattus, Maine 04280

Town of Topsham
100 Main Street
Topsham, Maine 04086

Town of Yarmouth
200 Main Street

Yarmouth, Maine 04096

(iii) *Every irrigation district, drainage district or similar special purpose political subdivision in which any part of the project is located and in which any federal facility that is used by the project is located or that owns, operates, and maintains or uses any project facility:*

There are no irrigation, drainage, or special purpose political subdivisions associated with the Project.

(iv) *Every other political subdivision in the general area of the project that there is some reason to believe would likely to be interested in, or affected by, the notification:*

There are no other political districts or subdivisions that are likely to be interested in or affected by the notification.

(v) *All Indian tribes that may be affected by the project:*

Topsham Hydro is not aware that the Project affects any Native American tribe. The following is a listing of Native American tribes that may have some level of interest in the area surrounding the project:

Aroostook Band of Micmacs
7 Northern Road
Presque Isle, Maine 04769

Penobscot Indian Nation
12 Wabanaki Way
Indian Island, Maine 04468

Passamaquoddy Native American Nation
Pleasant Point Reservation
Tribal Building Office
9 Sakom Road
Perry, Maine 04667

Passamaquoddy Tribe
Indian Township
PO Box 301
Princeton, ME 04668

Houlton Band of Maliseet
88 Bell Road
Littleton, Maine 04730

11. *The Applicant has in accordance with 18 CFR Section 4.32(a)(3) made a good faith effort to notify, by certified mail, the following entities of the filing of this application:*

(a) Every property owner of record of any interest in the property within the bounds of the Project;

(b) The entities identified in paragraph (10) above;

(c) Other governmental agencies that would likely be interested in or affected by the application.

A Certificate of Service is attached to the transmittal letter for this Application for New License.

12. *In accordance with 18 C.F.R §4.51 and 16.10 of the Commission's regulations, the following Exhibits are attached to and made a part of this application:*

Exhibit A – Project Description
Exhibit B – Project Operation and Resource Utilization
Exhibit C – Construction History and Proposed Construction Schedule
Exhibit D – Statement of Costs and Financing
Exhibit E – Environmental Report
Exhibit F – General Design Drawings and Supporting Design Report (CEII filed under separate cover)
Exhibit G – Project Map
Exhibit H – Description of Project Management and Need for Power Project

SUBSCRIPTION

To Be Signed in Final Application

This Application for New License for the Pejepscot Hydroelectric Project, FERC No. 4784, is executed in the State of New York, County of Warren, by Thomas Uncher, Vice President of Topsham Hydro Partners Limited Partnership, 339 Big Bay Road, Queensbury, NY 12804, who, being duly sworn, deposes and says that the contents of this application are true to the best of his knowledge or belief and that he is authorized to execute this application on behalf of Topsham Hydro Partners Limited Partnership. The undersigned has signed this application this ___ day of ____________, 2020.

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

By _________________________

Thomas Uncher
Vice President
Topsham Hydro Partners L.P.

VERIFICATION

Subscribed and sworn to before me, a Notary Public of the State of New York, this ___ day of ______________, 2020.

____
(Notary Public)

(My Commission Expires ________________)/seal

EXHIBIT A
PROJECT DESCRIPTION

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT A
PROJECT DESCRIPTION

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PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT A
PROJECT DESCRIPTION

1 INTRODUCTION

Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro) owns and operates the Pejepscot Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC or the Commission) Project No. 4784. The 13.88-megawatt (MW) Project is located on the Androscoggin River in the village of Pejepscot and the Town of Topsham, Maine (ME) to the east, the Town of Lisbon, ME to the north, and the Town of Durham, ME and the Town of Brunswick, ME to the west. The Project straddles the border between Cumberland and Sagadahoc counties and extends into Androscoggin County.

The Project is the second dam on the Androscoggin River located at approximately river mile (RM) 14. The Project dam is approximately 4 miles upstream of the Brunswick Hydroelectric Project and 3.25 miles downstream of the Worumbo Hydroelectric Project. In total, the Project is the second of 22 hydroelectric projects on the mainstem Androscoggin River. The Androscoggin River basin above the dam has a drainage area of approximately 3,420 square miles (mi^2). The Project boundary extends approximately 3 miles upstream from the Pejepscot Dam.

Table 1-1 provides a summary of pertinent Project information.

Table 1-1: General Project Information

General Information	
Owner	Topsham Hydro Partners, L.P.
FERC Project Number	4784
Current License Term	September 1, 1982 – August 31, 2022
Counties	Sagadahoc, Cumberland, Androscoggin
General	
Nearest Town(s)	Topsham, Brunswick, Durham, Lisbon
River	Androscoggin
Drainage Area	3,420 mi^2
Normal Full Pond Elevation	67.5 ft.
Normal Pond Elevation	67.2 ft.[1]
Normal Tailwater Elevation	43.7 ft.
Impoundment Length	~3 miles
Gross Storage	3,278 acre-ft.
Surface Area at Normal Full Pond	225 acres
Average Annual Inflow at Pejepscot Project	7,000 cfs
Structures	
Dam	Pejepscot
Construction	Timber crib and concrete gravity
Total Length	560 ft.
Spillway Length	480 ft.
Powerhouses	Original (1898) New (1987)
Turbine / Generator Units	4 units
Turbine Manufacturer / Type	Unit 1: Kaplan Units 21/22/23: Horizontal Francis
Turbine Capacities	Unit 1: 7,550 cfs Unit 21: 350 cfs Unit 22: 350 cfs Unit 23: 350 cfs Total: 8,600 cfs

[1] Programmable Logic Controller setting.

Generator Capacities	Unit 1: 12,300 kW Unit 21: 490 kW Unit 22: 545 kW Unit 23: 545 kW
Total Authorized Installed Capacity	13.88 MW

2 PROJECT STRUCTURES

2.1 Existing Structures

Existing Project structures generally consist of a dam, spillway, fish passage facilities, two powerhouses, a sheet-pile floodwall, an interconnection with the local utility's transmission system, and ancillary equipment. Figure 2.1-1 depicts the general Project layout.

2.1.1 Dam

The Pejepscot Dam is a 560-foot-long, 47.5-foot-high, rock- and gravel-filled, timber-crib, overflow structure with a sheet-pile cutoff to bedrock along the upstream side (Figure 2.1.1-1). The cribs are topped with a 5-foot-thick reinforced concrete slab to protect the dam from erosion during periods of high river flow. At the right (west) end of the dam where the abutment rock level is high, there is no cribwork, and the dam consists of a low, mass-concrete section. The dam is abutted on the right by a high bedrock outcrop and on the left (east) by a mass-concrete and stone-masonry pier.

Spillway capacity is provided by operating the gates on the crest of the dam. The crest is equipped with five, 96-foot-long by 3-foot-high, hydraulically operated, bascule gates separated by concrete piers. The gates can be operated automatically or manually. The hydraulic pump units that operate the gates are contained in the mass-concrete pier forming the left abutment of the dam. The crest gate seals are heated to permit operation of the gates during cold weather, including movement when subjected to heavy ice pressure. The Project has a spillway discharge capacity of 95,000 cubic feet per second (cfs). Overtopping of the dam does not occur until the headwater reaches elevation (El.) 81 feet (ft.)[2], at which point the spillway discharge is approximately 110,000 cfs.

2.1.2 Powerhouses and Intake Structure

The powerhouses at the Project include an original powerhouse (Figure 2.1.2-1) that was constructed in 1898, and a newer powerhouse that was constructed from 1985 to 1987 (Figure 2.1.2-2). The combined FERC-authorized capacity of the four generating units is 13.88-MW. The Project has two separate intake structures, the old powerhouse intake and the new powerhouse intake, both of which are integral with the powerhouses. The old powerhouse intake

[2] Unless otherwise noted, all elevations referenced throughout the DLA refer to the National Geodetic Vertical Datum of 1929 (NGVD29), U.S. Survey feet – also known as "mean sea level" or MSL.

has 1.5-inch bar spacing on the trashrack. The bar racks have a top elevation of 69.7 ft. and extend down to an elevation of 43.3 ft. The racks are approximately 71.4 ft. wide. The new powerhouse has 1.5-inch bar spacing at the top of the trashrack and 2.5-inch bar spacing at the bottom. The bar racks have a top elevation of 61.35 ft. and extend down to an elevation of 36.0 ft. The racks are approximately 91.6 ft. wide. The 1.5-inch bar spacing extends from elevation 61.35 ft. to elevation 55.1 ft. (total of 6.25 ft.). The remaining portion of the bar rack from elevation 55.1 ft. down to elevation 36.0 ft. (total of 19.1 ft.) has a clear-bar spacing of 2.5-inches.

The original (northerly) powerhouse contains three rehabilitated horizontal Francis units (identified as Nos. 21, 22, and 23) with a combined output capacity of about 1.58-MW. Each unit has four 36-inch Francis runners attached to a single turbine shaft, each with a rotational speed of 180 revolutions per minute (rpm). The maximum flow through each turbine is 350 cfs. These units do not have the ability to selectively operate with fewer than four turbine runners. However, one of the Francis units was damaged several years ago and the turbine shaft was cut so that only two runners on that particular unit are now in operation. Each of the units has an intake gate for dewatering, which is operated with a rack-and-pinion gear-type hoist. The tailrace water passage for the three units can be isolated from the downstream tailwater by means of a bulkhead-type gate, which is operated from the new powerhouse intake deck using a mobile crane. Wicket gates are used to adjust the flow settings of the units.

The newer powerhouse contains a vertical-shaft, low speed, adjustable-blade, propeller type (Kaplan) turbine-generator unit (identified as Unit No. 1) rated at 12.3-MW, with one runner containing four blades and 18 feet in diameter; it rotates at 81.8 rpm. The minimum and maximum flow through the turbine is 1,170 and 7,550 cfs, respectively. The rated head of the unit is 24 ft. Wicket gates are used to adjust the flow settings of the unit.

2.1.3 Fish Passage Facilities

2.1.3.1 Upstream Fish Passage Facilities

The upstream fish passage facility is a vertical lift (elevator) that lifts migratory fish in a hopper about 30 feet vertically from near the powerhouse tailrace to the impoundment level behind the dam (Figure 2.1.3.1-1). The lift hopper is about 20 feet long and 7 feet wide with a sloping bottom that assists in removal of the fish from the hopper. The inlet to the hopper is a V-trap about 8 inches wide by 8 feet high. In front of the entry gate there are four attraction pumps under a grating that create an additional flow up to 160 cfs through the entry channel to attract the fish to the lift. These pumps can be sequenced to change the volume of water passing through the entry channel, depending on the flow out of the powerhouse tailrace. The lift basket discharges the fish into a metal channel about six feet wide and eight feet high. The channel is approximately 110 feet long from the lift hopper to the gate at the dam. Along the channel is a viewing window to observe the fish along with a crowding panel that moves the fish closer to the window for viewing. There is a continuous flow of about 30 cfs from the impoundment to the lift basket to attract the fish to the impoundment.

The upstream fish passage is operated annually from April 15 to November 15. The lift is operated automatically to lift the fish hopper every two hours beginning at 8 a.m. for a total of five lifts per day. The four attraction pumps are operated by station technicians; the number of pumps operating is determined based on the flow coming through the turbine and out the tailrace. When river flows are less than 1,700 cfs, one pump is operated (total attraction flow 70 cfs). When river flows are between 1,700 and 3,500 cfs, two pumps are operated (total attraction flow 110 cfs). When river flows are between 3,500 and 5,200 cfs, three pumps are operated (total attraction flow 150 cfs). Finally, when river flows are greater than 5,200 cfs, four pumps are operated (total attraction flow 190 cfs). The total of 190 cfs (attraction flow from four pumps (160 cfs) plus an additional 30 cfs provided from the impoundment via the exit trough) represents approximately 2.2% of the Project maximum turbine discharge capacity (8,600 cfs). When river flows are 15,000 cfs (impoundment El. of approximately 69.5-70.0 feet) or higher the fishway is shut down.

A preset weir in the channel provides an attraction flow through the channel and hopper. The channel from the hopper to the impoundment is opened when the seasonal operation is started for passage of diadromous fish. The gates in the channel that allow fish to be counted through the observation window are left open unless they are being used for counting. Fish within the lift are not actively counted and, historically, the counting facilities have only been used for efficiency tests of the lift.

2.1.3.2 Downstream Fish Passage Facilities

The downstream fish passage facilities consist of two entry weirs, one on either side of the Unit 1 turbine intake (Figure 2.1.3.2-1). Each entry weir has an invert elevation of 65.5 ft. From each weir, an outlet pipe conveys downstream migrating fish in water down to the tailwater. The weir gates are four feet wide and are part of an inlet box with the outlet pipe located on the side opposite the weir. The right-side weir has a 30-inch diameter transport pipe and the left-side weir has a 24-inch diameter transport pipe (Figure 2.1.3.2-2). Both pipes have a free discharge to the water below the dam. Each downstream bypass can pass approximately 13 cfs, 29 cfs, and 87 cfs at headpond elevations of 66.5 ft. (low), 67.2 ft. (normal), and 69.0 ft. (high), respectively. This assumes that the entrance gate at each downstream bypass is in the fully opened position. The clear spacing of the grizzly racks at the entrance to the downstream bypasses is approximately 7 inches. There is one horizontal steel member on the grizzly racks at an approximately elevation of 67.3 ft.

The downstream fishway is currently operated from April 1 to December 31, as river conditions allow. The downstream fishways are shutdown when debris loading occurs as a result of high flows. The fishways are cleaned and restored to operation as flow conditions allow.

2.1.4 Switchyard / Transmission Lines

Main and secondary substations are located to the north and south of the powerhouse, respectively. These substations are outside of the Project boundary. However, the Project works do include 900-foot-long, 15-kV cable connections to the substations. An electrical single-line diagram showing the Project's connection to the transmission system is presented in Exhibit H.

2.1.5 Project Boundary

The Project boundary generally follows the contour level of El. 75.0, except in the vicinity of the dam and powerhouse, at the upstream limit of the boundary, and downstream of the dam. The Project boundary extends approximately 3 miles upstream from the Pejepscot Dam to the vicinity of the Route 125 bridge. The upstream extent of the Project boundary is approximately 0.25 miles downstream of the Worumbo Dam and 0.3 miles upstream of the Little River confluence. The Project boundary terminates approximately 260 feet downstream of the Pejepscot Dam. Project boundary drawings are presented in Exhibit G.

2.2 Proposed Structures

There are no new structures being proposed in this application.

Brookfield

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 2.1-1.
Project Features

Path: P:\1925\maps\dla\exhibit_a\figure_a_2_1-1_facilities.mxd

Figure 2.1.1-1: Pejepscot Dam

Figure 2.1.2-1: Original Powerhouse and Intake

Figure 2.1.2-2: New Powerhouse and Intake

Figure 2.1.3.1-1: Upstream Fish Passage Facility

Figure 2.1.3.2-1: Downstream Fish Passage Facility Entry Weir

Figure 2.1.3.2-2: Downstream Fish Passage Facility Transport Pipes

3 IMPOUNDMENT DATA

3.1 Surface Area and Elevation

The Pejepscot Project impoundment encompasses approximately 225 acres at elevation of 67.5 ft.

3.2 Storage Capacity

The reservoir has an estimated gross volume of 3,278 acre-feet. The Project impoundment has no significant usable storage capacity due to the Project's run-of-river operational mode.

4 TURBINES AND GENERATORS

4.1 Existing Turbines and Generators

There are three rehabilitated horizontal Francis units (identified as Nos. 21, 22, and 23) in the original powerhouse (circa 1898). The combined output capacity of these units is approximately 1.58-MW. Units 21, 22, and 23 have generator capacities of 490 kilowatts (kW), 545 kW, and 545 kW, respectively.

The new powerhouse (circa 1987) contains one vertical-shaft, low speed, adjustable-blade, propeller type (Kaplan) turbine-generator unit (identified as Unit No. 1). The unit contains four blades, is 18 feet in diameter, is rated at 17,000 horsepower, and rotates at approximately 82 rpm at a head of 24 ft. The generator capacity of Unit 1 is 13,000 kilovolt-ampere (kVA) at 0.95 power factor. The rated discharge for Unit 1 is 7,000 cfs. The total maximum Project flow is 8,600 cfs. Unit 1 is limited by the authorized generator rating of 12.3-MW.

The total installed capacity of the Project, as limited by the generator nameplates for each unit, is 13.88-MW.

4.2 Proposed Turbines and Generators

There are no proposed changes to the existing turbines and generators.

5 TRANSMISSION LINES

Main and secondary substations are located to the north and south of the powerhouse, respectively. These substations are outside of the Project boundary. However, the Project works do include 900-foot-long, 15-kV cable connections to the substations. An electrical single-line diagram showing the Project's connection to the transmission system is presented in Exhibit H.

6 ADDITIONAL EQUIPMENT

The Project also has appurtenant facilities, such as cranes, trash rakes, and other equipment necessary for day-to-day operations and maintenance.

7 LANDS OF THE UNITED STATES

There are no lands of the United States within the Project.

EXHIBIT B
PROJECT OPERATION AND RESOURCE UTILIZATION

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT B
PROJECT OPERATION AND RESOURCE UTILIZATION

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PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT B
PROJECT OPERATION AND RESOURCE UTILIZATION

1 PROJECT OPERATION

1.1 Operating Mode

The Pejepscot Hydroelectric Project (Project) is operated as a run-of-river facility. The main turbine generator unit (Unit 1) is operated on pond level control. Unit 1 controls the turbine wicket gates to maintain a preset pond level which is normally at about elevation (El.) 67.2 feet (ft.) or 0.3 feet below the top of the spill gates. When Unit 1 nears its maximum flow capacity of 7,550 cubic feet per second (cfs), one or more of the three small units (Units 21, 22 and 23) is manually started. The small units are mainly operated during high spring runoff and after large storm events that increase river flow.

Inflows in excess of the hydraulic capacity of the units are passed at the dam spillway. Inflows to the Project exceed the maximum capacity of the units approximately 25 percent of the time, on average. When the pond level reaches El. 69.0 (1.5 feet above the spill gates), the gates begin to lower starting with Gate 1, closest to the powerhouse. The gates operate on pond level control and as flow increases, they maintain the pond level of El. 69.0 until all five gates are open. When the flow starts decreasing and the pond level drops to El. 68.0 the gates start to close to maintain a level above El. 68.0. When all five gates are closed, the pond is again on turbine pond level control until the pond level exceeds El. 69.0.

The Project is required to release a continuous minimum flow of 1,710 cfs, as measured immediately downstream from the Project powerhouse, or inflow to the impoundment, whichever is less, minus process water (approximately 5 million gallons per day (MGD) or 9.3 cfs) and 100 cfs for pond level control. Flows may be modified temporarily if required by operating emergencies beyond the control of Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro), or for short periods upon mutual agreement between Topsham Hydro, Maine Department of Marine Resources (MDMR), and Maine Department of Inland Fisheries and Wildlife (MDIFW).

1.2 Future Operations

Topsham Hydro proposes to maintain a year-round minimum flow of 1,710 cfs or inflow, whichever is less[1], and continue to operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates [2] during the term of the new Project license (Appendix E-3). Topsham Hydro is not proposing any operational changes at this time.

1.3 Annual Plant Factor

The average annual plant factor is determined using the following equation:

$$\frac{\text{Average Annual Output}}{\text{Licensed Capacity x 8760 hours/year}} = \text{Average Annual Plant Factor}$$

The Project currently has a gross average annual energy production of approximately 68,516 megawatt hours (MWh) a year and an annual plant factor of approximately 56 percent based on its current capacity of 13.88-MW. Table 1.3-1 provides monthly generation for the period 2009 through 2019.

[1] Minimum flow requirements under the current license are described as "continuous," but Brookfield proposes that the requirement in the new license be instead based on the hourly average. This change would capture the intent of the minimum flow measure, but would avoid unnecessary reporting of very short term excursions due to unplanned events such as extreme weather, equipment failure, and so on. A similar change was adopted in 2011 for the Gulf Island-Deer Rips Hydropower Project (FERC No. 2283).
[2] Brookfield also proposes that, for compliance purposes, the pond level elevation also be based upon hourly average, for similar logic as the minimum flow requirement.

Table 1.3-1. Annual and Monthly Gross Generation (MWh) for the Project (2009-2019)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	7,048	5,736	8,351	8,123	8,606	6,809	7,089	6,874	3,610	6,182	6,966	8,246	83,640
2010	7,833	6,376	8,513	8,412	7,559	5,269	3,792	3,298	2,858	7,624	7,900	7,668	77,102
2011	7,160	5,556	8,232	7,443	8,675	6,693	3,882	3,469	6,316	8,439	7,411	7,846	81,122
2012	6,664	5,282	7,909	5,985	8,704	7,819	4,821	4,775	4,402	6,414	6,636	7,191	76,602
2013	6,786	6,375	8,196	9,141	7,915	8,488	8,164	5,962	5,756	4,164	4,764	5,865	81,576
2014	7,492	5,522	6,084	7,486	9,447	7,400	7,292	6,610	3,023	4,993	5,261	6,660	77,270
2015	4,257	5,359	5,922	7,325	9,265	7,292	7,221	6616	2,967	4,826	5,797	6,660	73,507
2016	6,697	7,182	8,198	8,551	6,983	3,198	3,048	1,905	1,728	2,119	4,741	5,331	59,681
2017	6,244	5,552	6,169	6,161	8,570	6,193	5,538	3,381	2,467	2,157	6,399	5,715	64,546
2018	6,733	6,476	7,548	7,016	6,840	2,298	1,017	777	981	975	788	723	42,172
2019	572	575	747	419	5,224	7,562	4,786	2,246	1,955	5,833	6,540	--	36,459
Mean	**6,135**	**5,454**	**6,897**	**6,915**	**7,981**	**6,275**	**5,150**	**4,174**	**3,278**	**4,884**	**5,746**	**6,191**	**68,516**

1.4 Project Operation During Adverse, Mean, and High Water Years

1.4.1 River Basin Operations

The Androscoggin River flow regime is set by the Upper Androscoggin River Storage System, which consists of a series of headwater storage reservoirs located in Maine and New Hampshire. Outflow from the storage reservoirs is set in accordance with various legal agreements. The upper portion of the Androscoggin River contains 16 run-of-river hydroelectric projects until reaching the Gulf Island Hydroelectric Project. The Gulf Island Project then re-regulates downstream flow for the lower Androscoggin River. The lower portion of the Androscoggin River contains 5 run-of-river hydroelectric projects, including the Pejepscot Project which is the second dam upstream of the Androscoggin River's confluence with Merrymeeting Bay.

Given that the Pejepscot Project is operated as a run-of-river facility, the Project impoundment experiences little fluctuation during normal operations. Annual and monthly flow duration curves for the period January 1987 through December 2019 are provided in Appendix B-1. Daily flow data prorated from the Auburn, ME U.S. Geological Survey (USGS) gage (No. 01059000) were utilized to develop the flow duration curves.[3]

1.4.2 Operation During Adverse Conditions

With the existing regulation of the upstream storage facilities, the reduction in river flows due to adverse water conditions is generally minimal and infrequent. During low inflow conditions, Topsham Hydro operates the Project to maintain the impoundment level near 67.2 feet and to provide the required minimum downstream releases and flows necessary for operation of the fish passage structures. The minimum downstream releases are provided through turbine operations and fish passages when in operation. During the rare occasions when inflows to the impoundment are less than the minimum hydraulic capacity of the Project's turbines, the minimum downstream flow release is provided over the spillway.

1.4.3 Operation During High Water and Flood Conditions

Under higher river flow conditions, water in excess of the hydraulic capacity (8,600 cfs) of the generating units is spilled at the dam. It is estimated that the Project is operated in this manner approximately 25 percent of the year. High flows in the Androscoggin River Basin occur annually during the spring and fall run-off periods. The magnitude of spring flows may vary considerably depending on the water content of the melting snow cover, the occurrence of coincidental heavy spring rainfall, and warm temperatures.

Under flood conditions, in addition to spillage and maximum unit operation, the spill gates on the dam spillway are lowered to help control upstream water levels. When the pond level reaches

[3] A proration factor of 1.05 was used as a result of the difference in drainage area at the Project (3,420 mi^2) as compared to the USGS gage (3,263 mi^2).

El. 69.0 (1.5 feet above the spill gates), the gates begin to lower starting with Gate 1, closest to the powerhouse. The gates operate on pond level control and as flow increases, they maintain the pond level of El. 69.0 until all five gates are open. When the flow starts decreasing and the pond level drops to El. 68.0 the gates start to close to maintain a level above El. 68.0. When all five gates are closed, the pond is again on turbine pond level control until the pond level exceeds El. 69.0.

2 DEPENDABLE CAPACITY AND AVERAGE ANNUAL ENERGY PRODUCTION

2.1 Project Hydrology

The Androscoggin River flows about 169 miles from its headwaters at Umbagog Lake in Errol, NH to Merrymeeting Bay. The drainage area at Merrymeeting Bay, where the Androscoggin River ends, is approximately 3,470 mi^2. Conversely, the drainage area at the Project is approximately 3,420 mi^2. The Project impoundment has surface area of approximately 225 acres at the full pond elevation of El. 67.5. While the Project has a gross storage capacity of 3,278 acres at the full pond elevation, the Project has negligible usable storage capacity as a run-of-river Project. The vast majority of the inflow to the Project impoundment is provided by the upstream Worumbo Project, which is located approximately 3.4 miles upstream and has a drainage area of approximately 3,382 mi^2. Inflow is also provided by the Little River, Meadow Brook, and Pinkham Brook, as well as several smaller streams, between the Worumbo and Pejepscot Dams.

Annual and monthly flow duration curves based on prorated data from the Auburn, ME USGS gage are included in Appendix B-1. The mean daily inflow for the period examined is approximately 7,000 cfs. The peak streamflow at the impoundment during this period was approximately 108,000 cfs on April 2, 1987. The peak streamflow for the period of record at the USGS gage is approximately 141,500 cfs on March 20, 1936.

2.2 Dependable Capacity

The dependable capacity is defined as the load carrying ability of a power plant under adverse load and flow conditions. The dependable capacity (seasonal claimed capability) for the Project is 5.566 MW (summer) and 7.941 MW (winter). These are calculated based on a 5-year average (2013-2017) to determine qualified capacity; for summer (June –September) for the 5 hours between 1 p.m. and 6 p.m.; and for winter (October-May) for the 2 hours between 5 p.m. and 7 p.m.

2.3 Area-Capacity and Rule Curve

Because the Project has no useable storage capacity, there is no area capacity curve or formal rule curve for the Project.

2.4 Estimated Hydraulic Capacity

The Project has a combined estimated maximum hydraulic capacity of 8,600 cfs.

2.5 Tailwater Rating Curve

The normal tailwater elevation at the Project is El. 43.7. Appendix B-2 contains the tailwater rating curve for the Project.

2.6 Power Plant Capacity vs. Head

At a gross head of 24 ft., the Project has a total authorized nameplate capacity of 13.88-MW. Appendix B-3 contains the plant capability curve for the Project.

3 USE OF PROJECT POWER

Topsham Hydro is an independent power producer and does not provide electric service to any particular group or class of customers or prepare and submit load and capability forecasts or resource plans to any regulatory body.

The Project generates renewable power for Maine and the regional power pool administered by ISO New England. Currently, output is sold on the open market through bidding into the New England Power Pool (NEPOOL) market administered by ISO New England., the non-project independent system operator for New England. ISO New England administers all significant aspects of the NEPOOL market.

4 PLANS FOR FUTURE DEVELOPMENT

Topsham Hydro has no plans to alter Project operations at this time nor does Topsham Hydro have any future development plans at the Project.

APPENDIX B-1 – ANNUAL AND MONTHLY FLOW DURATION CURVES

Figure B1-1. Annual Flow Duration Curve (1987-2019)

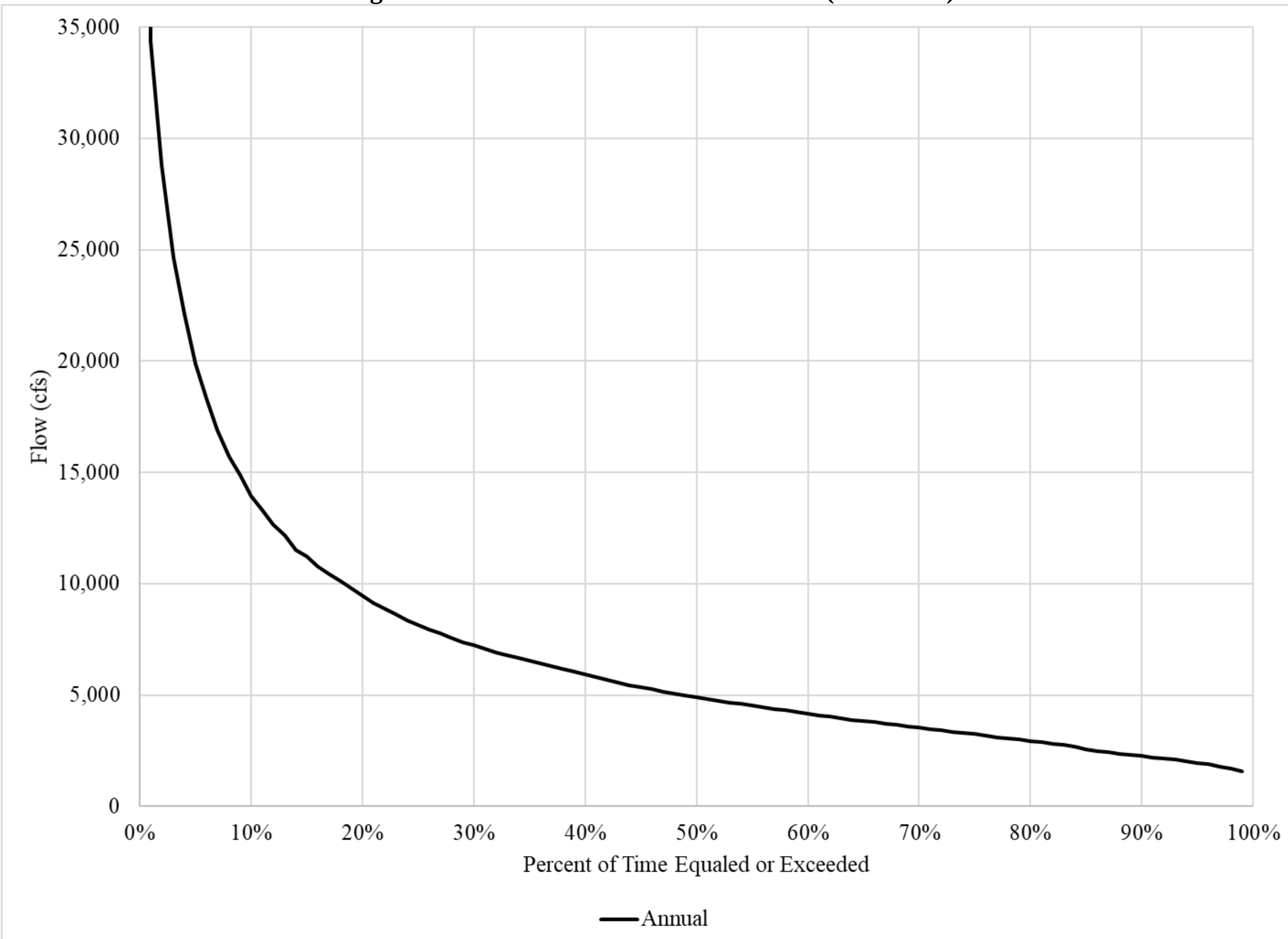


Figure B1-2. January, February, and March Flow Duration Curve (1987-2019)

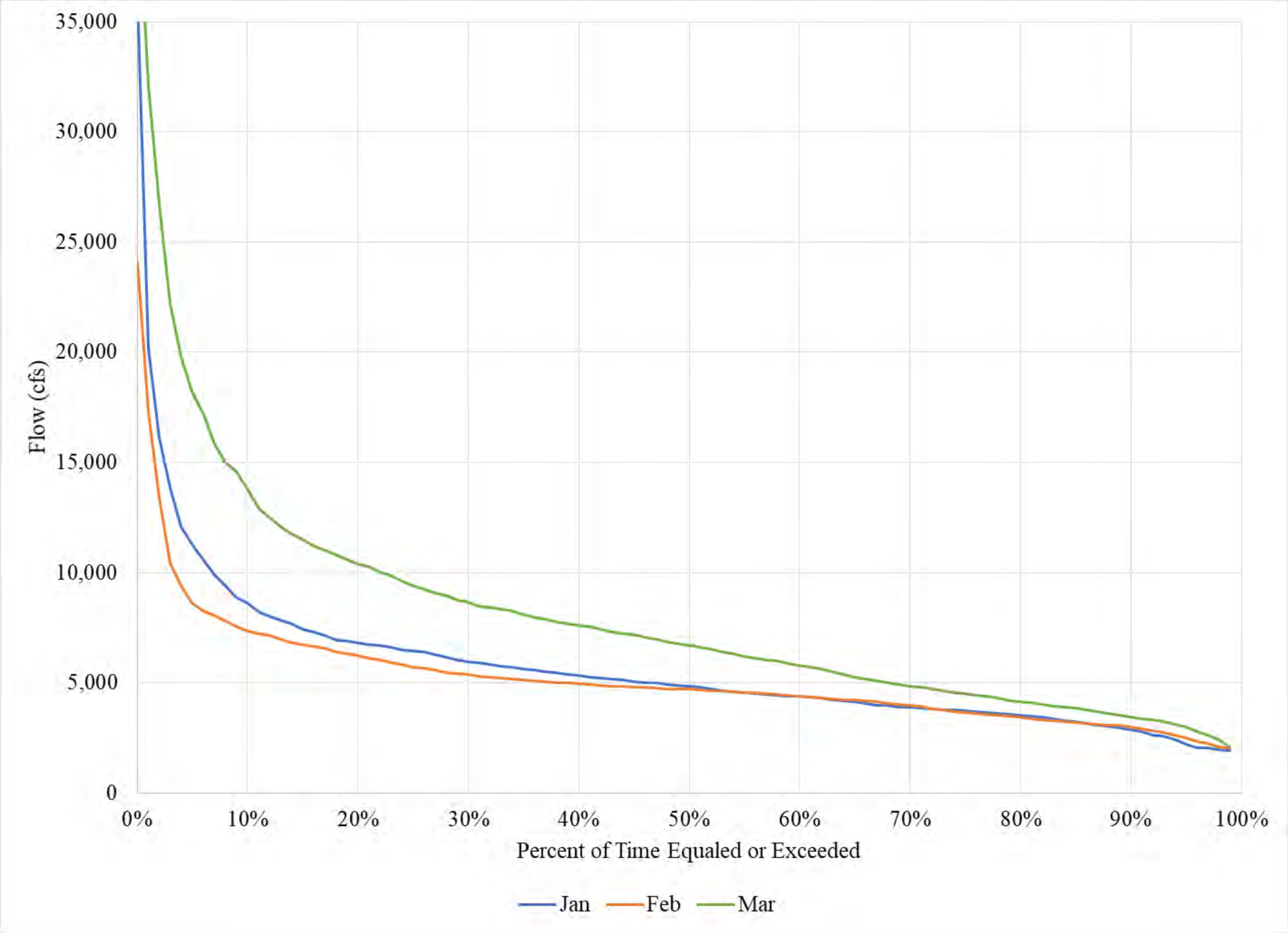


Figure B1-3. April, May, and June Flow Duration Curve (1987-2019)

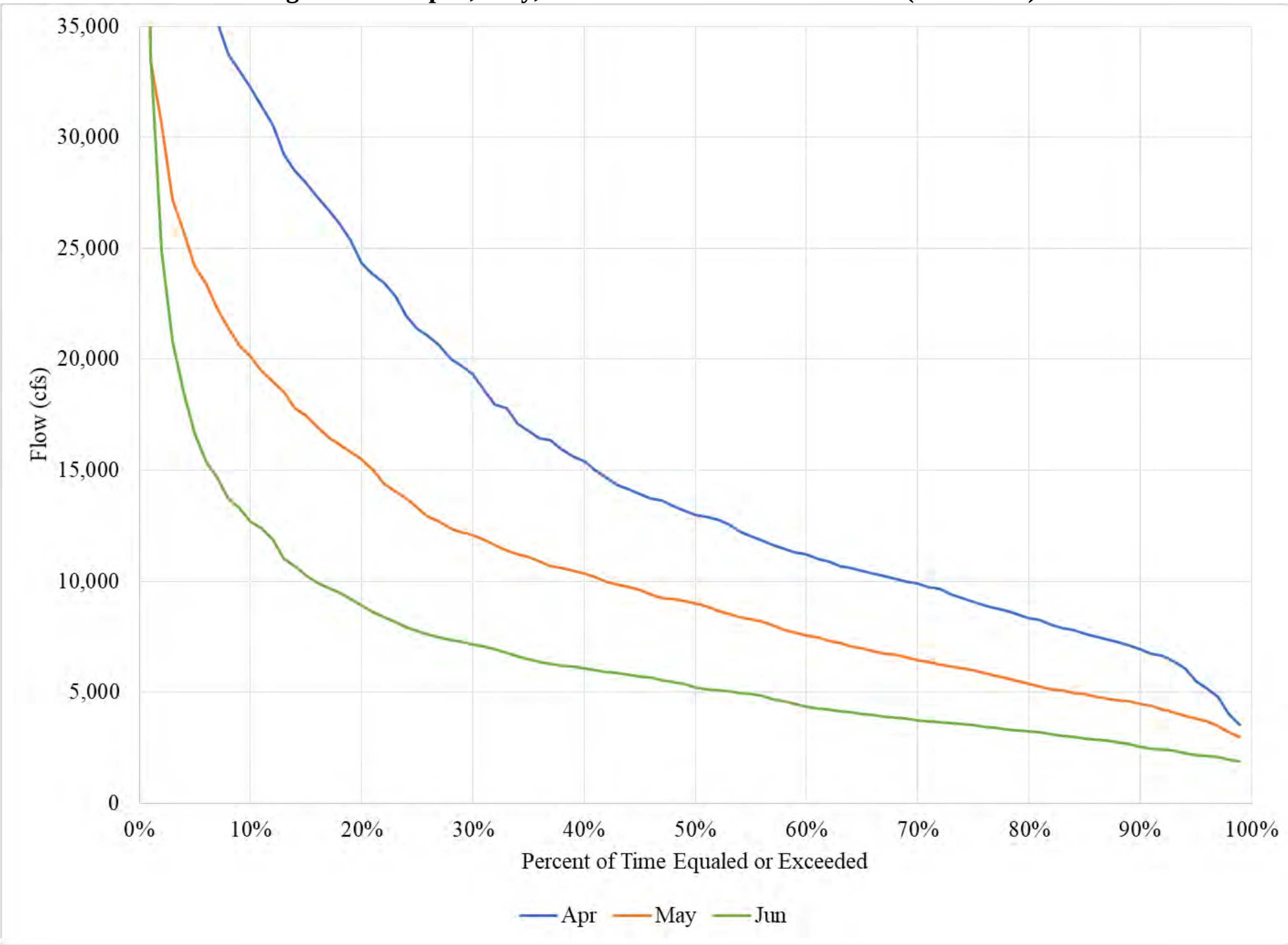


Figure B1-4. July, August, and September Flow Duration Curve (1987-2019)

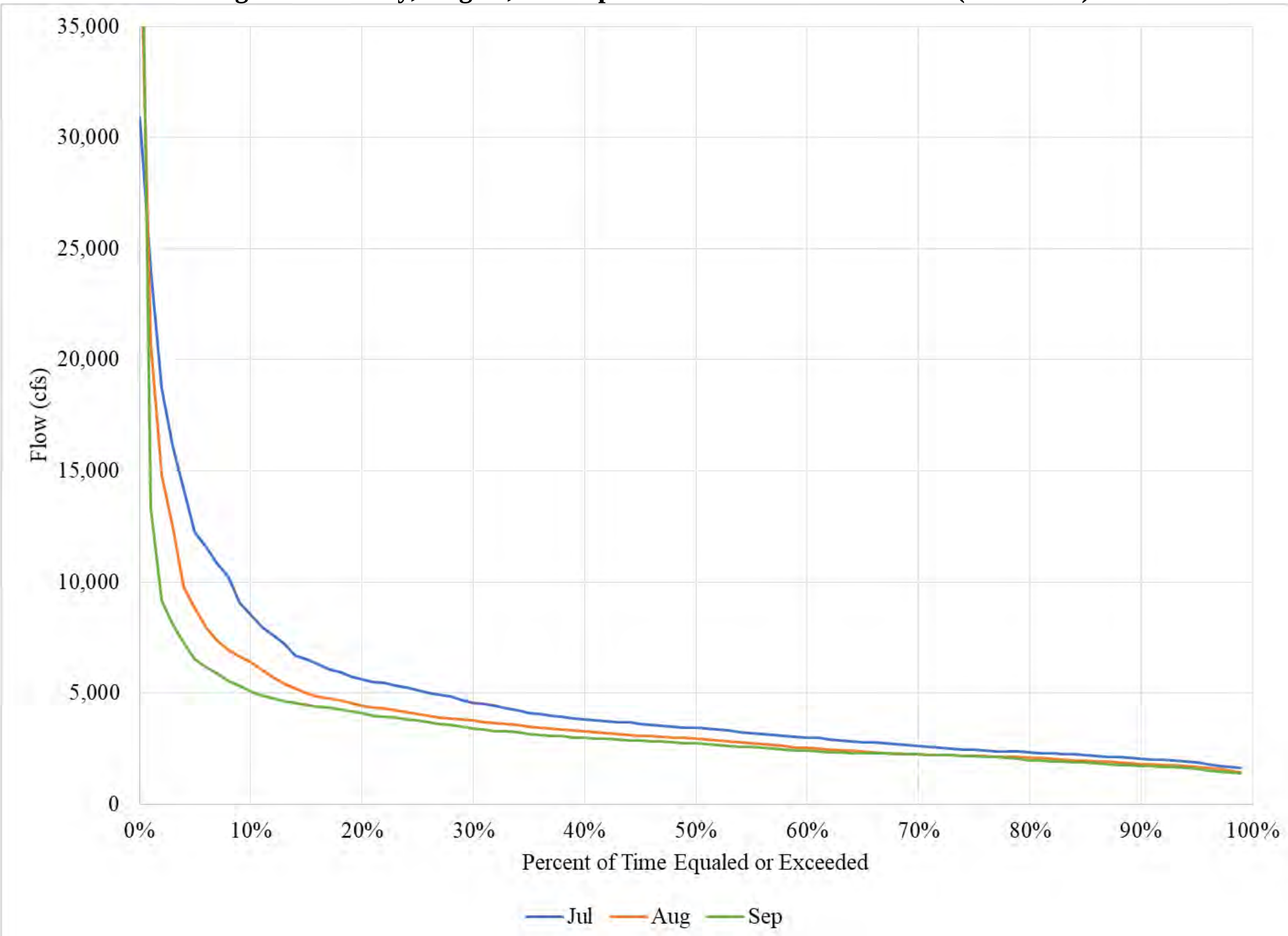
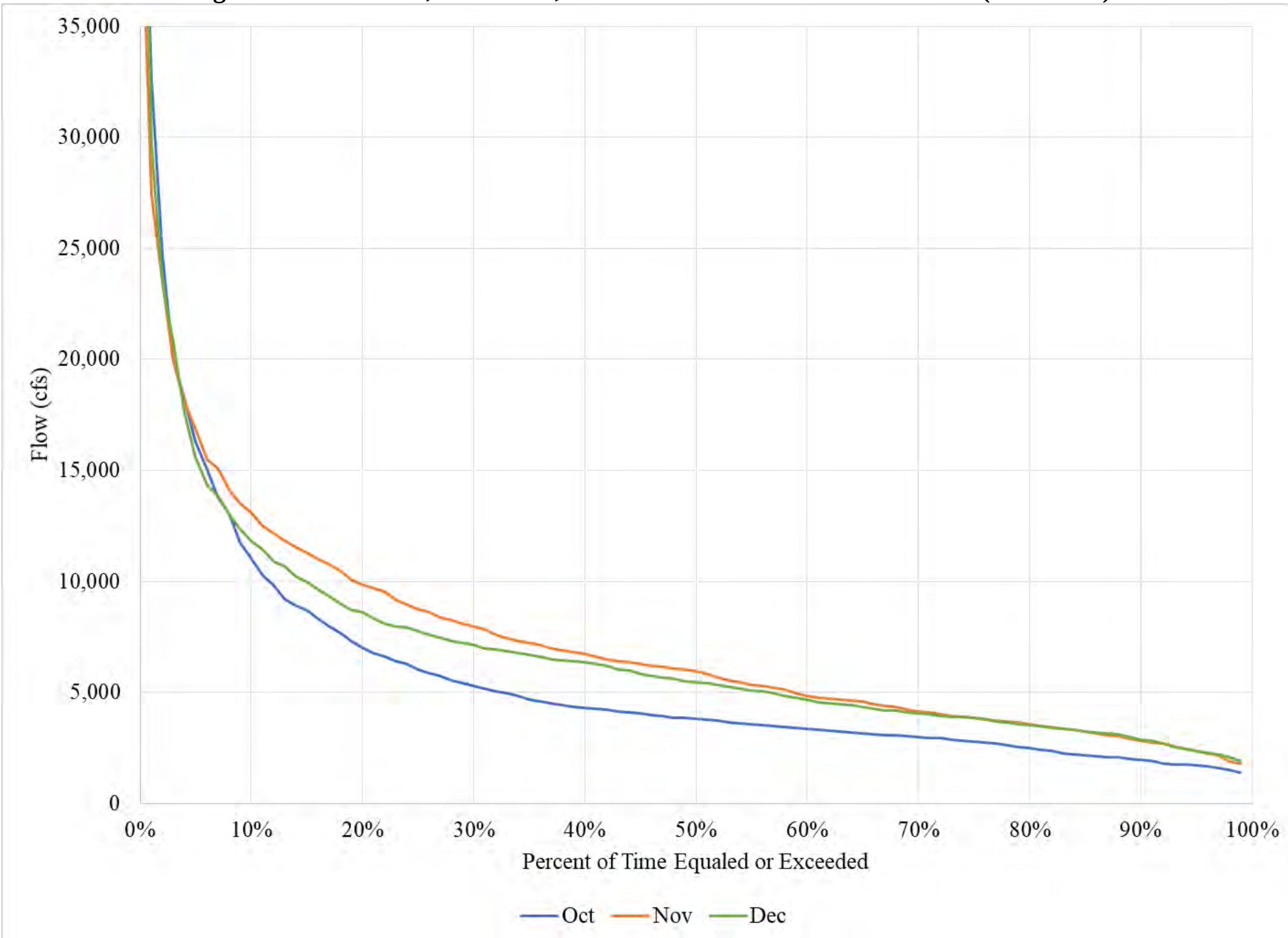
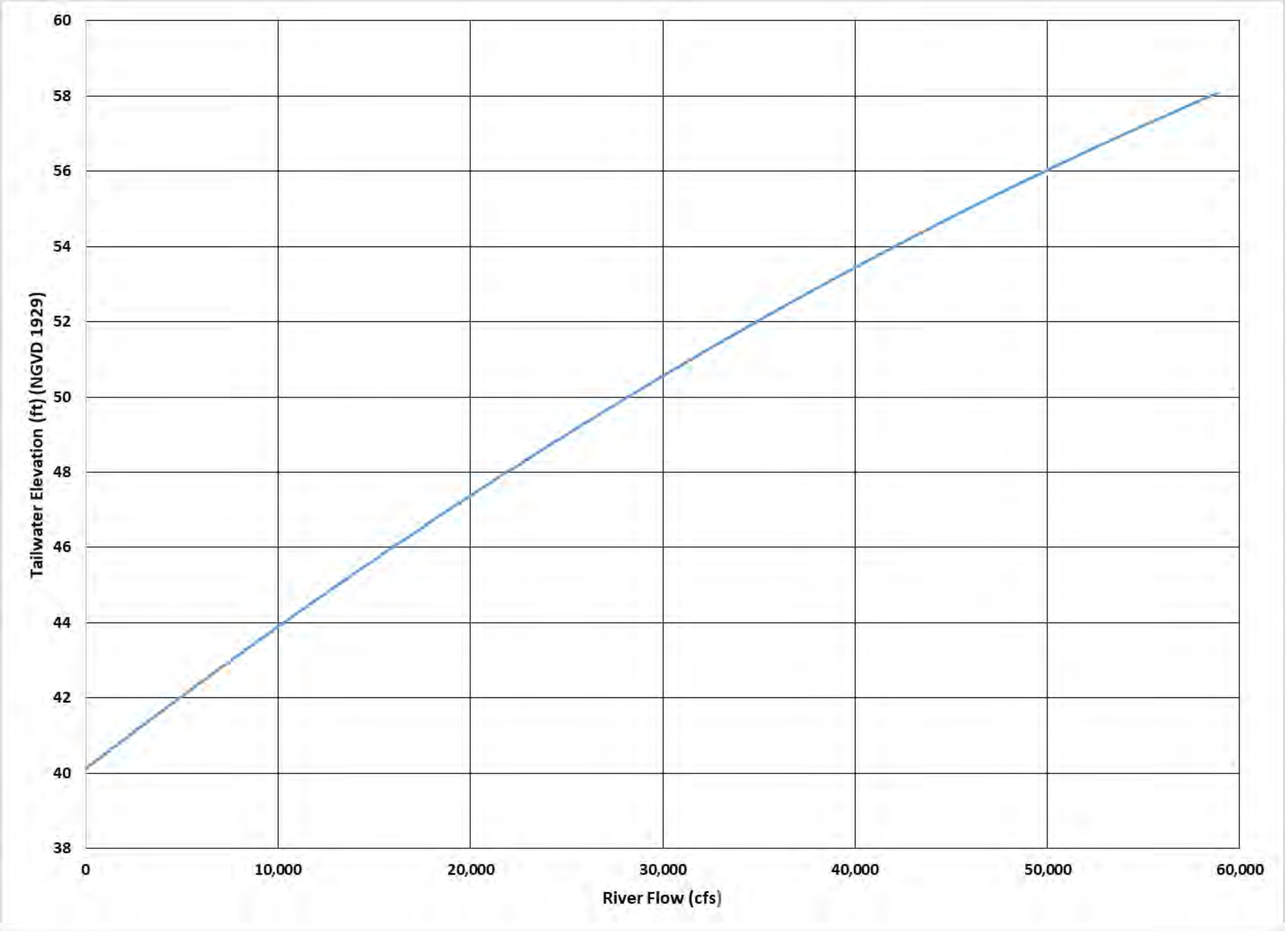


Figure B1-5. October, November, and December Flow Duration Curve (1987-2019)



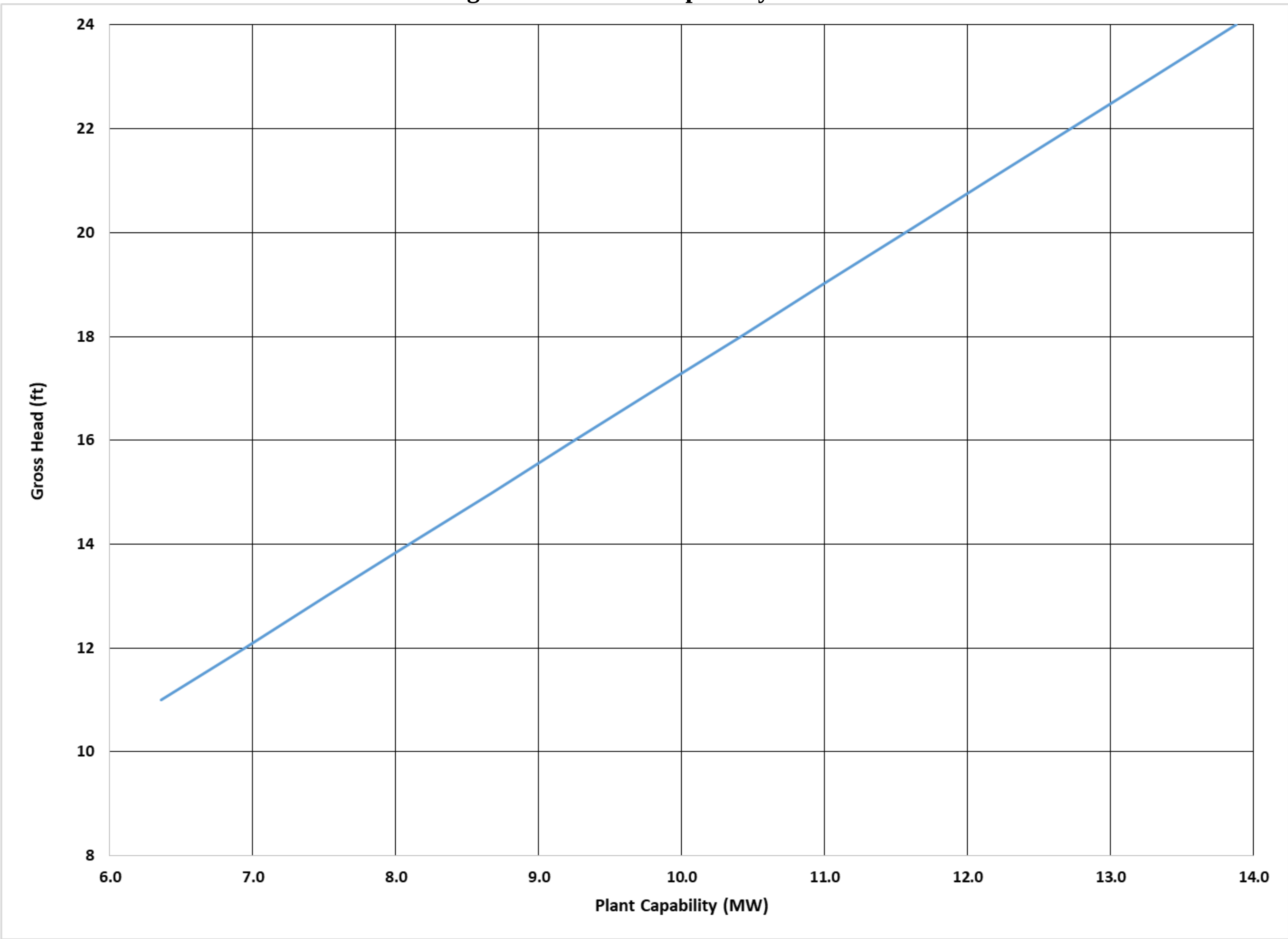
APPENDIX B-2 – TAILWATER RATING CURVE

Figure B2-1. Tailwater Rating Curve

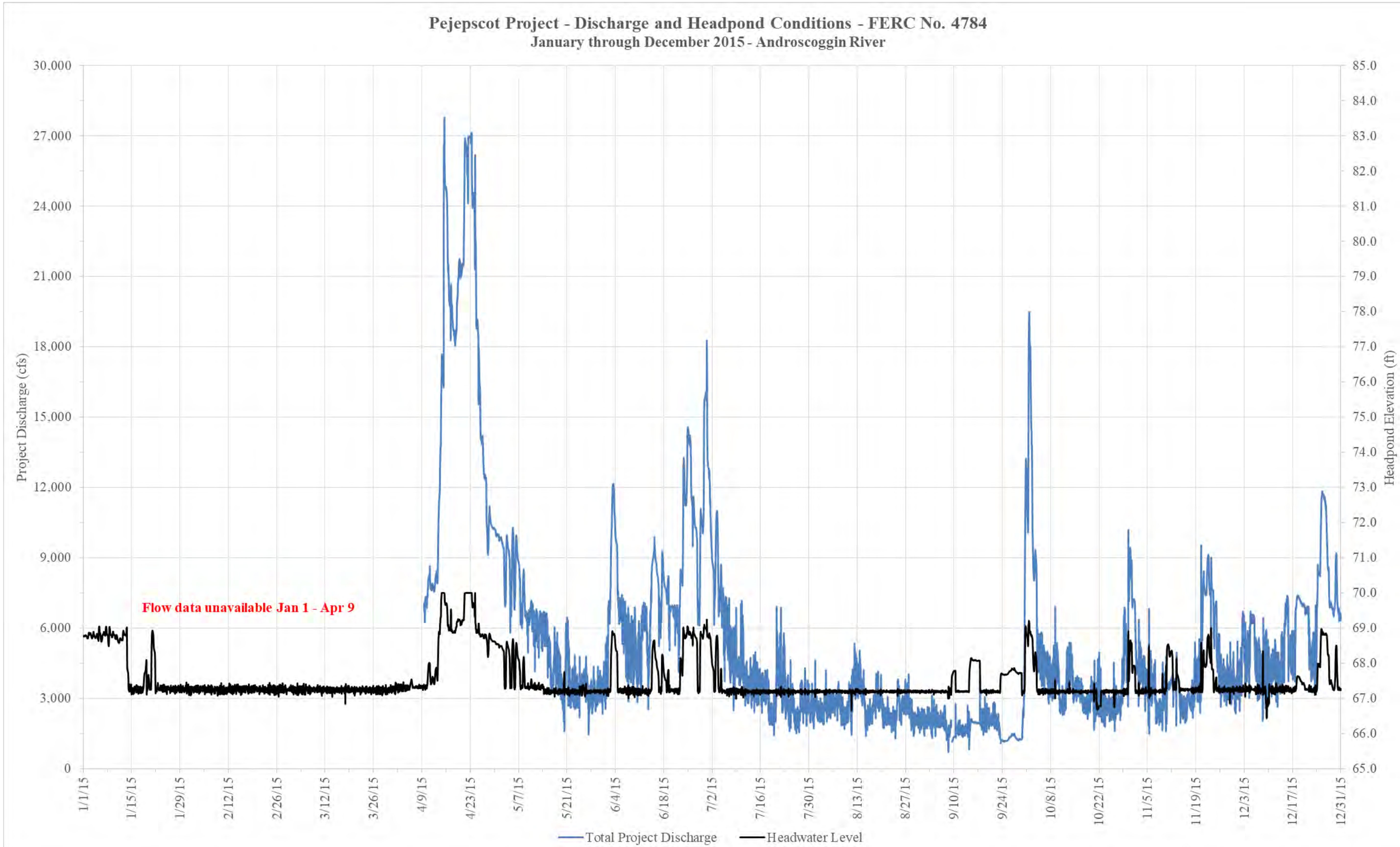


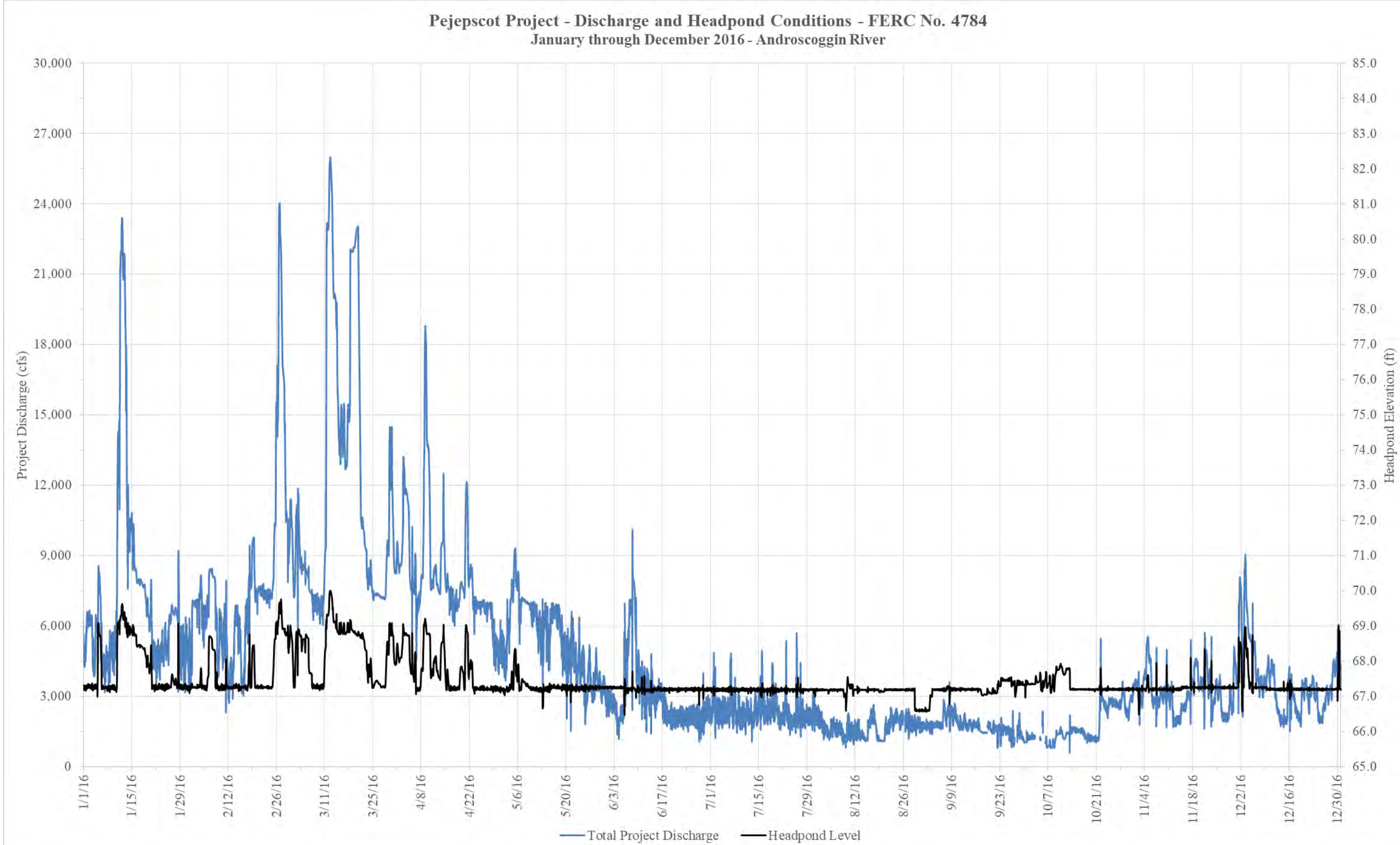
APPENDIX B-3 – PLANT CAPABILITY CURVE

Figure B3-1. Plant Capability Curve



APPENDIX B-4 – FLOW AND IMPOUNDMENT WATER LEVEL DATA (2015-2019)


Pejepscot Project - Discharge and Headpond Conditions - FERC No. 4784
January through December 2015 - Androscoggin River
Flow data unavailable Jan 1 - Apr 9
Project Discharge (cfs)
Headpond Elevation (ft)
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
0
85.0
84.0
83.0
82.0
81.0
80.0
79.0
78.0
77.0
76.0
75.0
74.0
73.0
72.0
71.0
70.0
69.0
68.0
67.0
66.0
65.0
1/1/15
1/15/15
1/29/15
2/12/15
2/26/15
3/12/15
3/26/15
4/9/15
4/23/15
5/7/15
5/21/15
6/4/15
6/18/15
7/2/15
7/16/15
7/30/15
8/13/15
8/27/15
9/10/15
9/24/15
10/8/15
10/22/15
11/5/15
11/19/15
12/3/15
12/17/15
12/31/15
Total Project Discharge
Headwater Level


Pejepscot Project - Discharge and Headpond Conditions - FERC No. 4784
January through December 2016 - Androscoggin River
Project Discharge (cfs)
Headpond Elevation (ft)
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
0
85.0
84.0
83.0
82.0
81.0
80.0
79.0
78.0
77.0
76.0
75.0
74.0
73.0
72.0
71.0
70.0
69.0
68.0
67.0
66.0
65.0
1/1/16
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2/26/16
3/11/16
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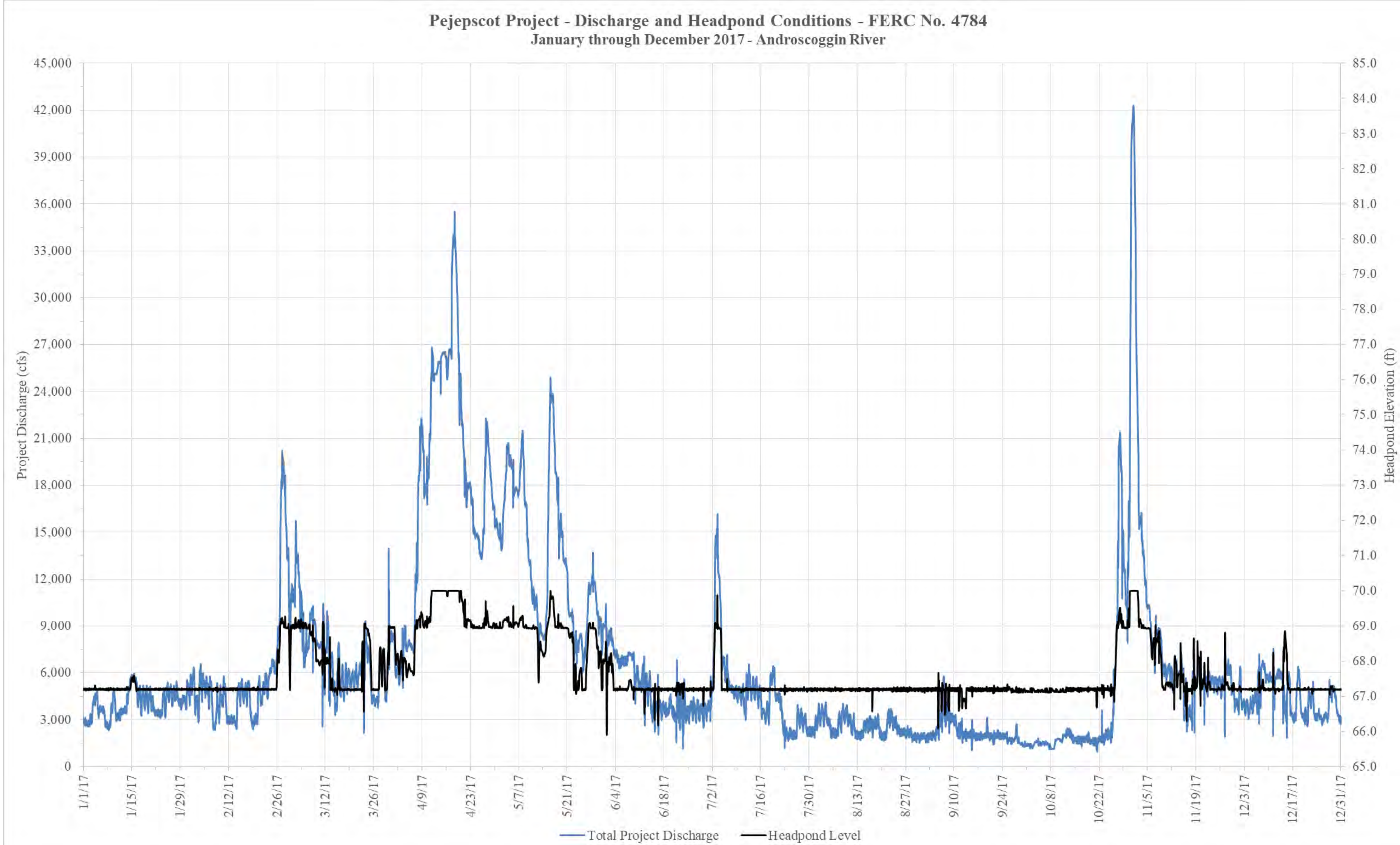
5/6/16
5/20/16
6/3/16
6/17/16
7/1/16
7/15/16
7/29/16
8/12/16
8/26/16
9/9/16
9/23/16
10/7/16
10/21/16
11/4/16
11/18/16
12/2/16
12/16/16
12/30/16
Total Project Discharge
Headpond Level


Pejepscot Project - Discharge and Headpond Conditions - FERC No. 4784
January through December 2017 - Androscoggin River
Project Discharge (cfs)
Headpond Elevation (ft)
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42,000
39,000
36,000
33,000
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
0
85.0
84.0
83.0
82.0
81.0
80.0
79.0
78.0
77.0
76.0
75.0
74.0
73.0
72.0
71.0
70.0
69.0
68.0
67.0
66.0
65.0
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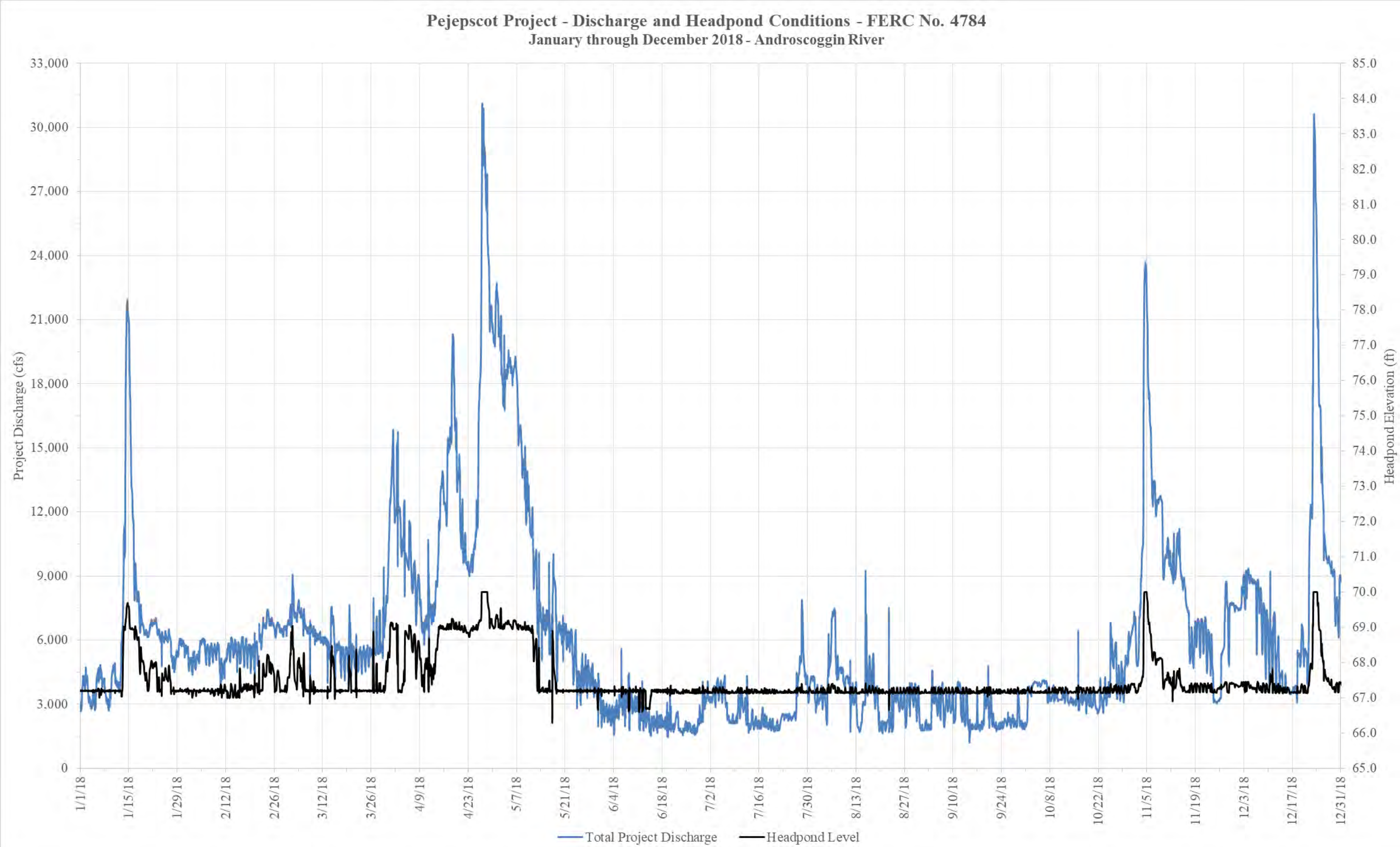
5/7/17
5/21/17
6/4/17
6/18/17
7/2/17
7/16/17
7/30/17
8/13/17
8/27/17
9/10/17
9/24/17
10/8/17
10/22/17
11/5/17
11/19/17
12/3/17
12/17/17
12/31/17
Total Project Discharge
Headpond Level


Pejepscot Project - Discharge and Headpond Conditions - FERC No. 4784
January through December 2018 - Androscoggin River
Project Discharge (cfs)
Headpond Elevation (ft)
33,000
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
0
85.0
84.0
83.0
82.0
81.0
80.0
79.0
78.0
77.0
76.0
75.0
74.0
73.0
72.0
71.0
70.0
69.0
68.0
67.0
66.0
65.0
1/1/18
1/15/18
1/29/18
2/12/18
2/26/18
3/12/18
3/26/18
4/9/18
4/23/18
5/7/18
5/21/18
6/4/18
6/18/18
7/2/18
7/16/18
7/30/18
8/13/18
8/27/18
9/10/18
9/24/18
10/8/18
10/22/18
11/5/18
11/19/18
12/3/18
12/17/18
12/31/18
Total Project Discharge
Headpond Level

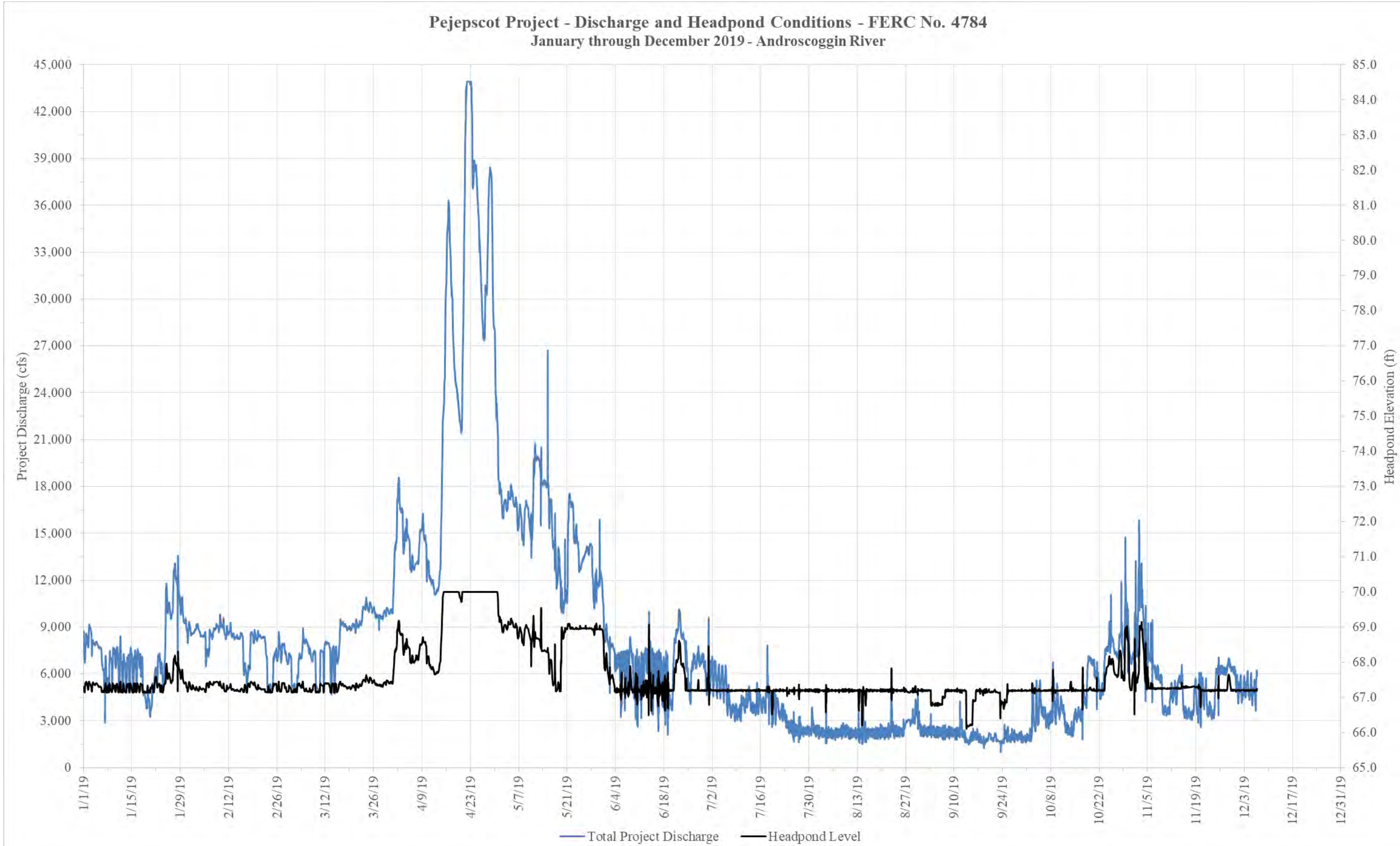

Pejepscot Project - Discharge and Headpond Conditions - FERC No. 4784
January through December 2019 - Androscoggin River
Project Discharge (cfs)
Headpond Elevation (ft)
45,000
42,000
39,000
36,000
33,000
30,000
27,000
24,000
21,000
18,000
15,000
12,000
9,000
6,000
3,000
0
85.0
84.0
83.0
82.0
81.0
80.0
79.0
78.0
77.0
76.0
75.0
74.0
73.0
72.0
71.0
70.0
69.0
68.0
67.0
66.0
65.0
1/1/19
1/15/19
1/29/19
2/12/19
2/26/19
3/12/19
3/26/19
4/9/19
4/23/19
5/7/19
5/21/19
6/4/19
6/18/19
7/2/19
7/16/19
7/30/19
8/13/19
8/27/19
9/10/19
9/24/19
10/8/19
10/22/19
11/5/19
11/19/19
12/3/19
12/17/19
12/31/19
Total Project Discharge
Headpond Level

EXHIBIT C
CONSTRUCTION HISTORY

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT C
CONSTRUCTION HISTORY

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(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT C
CONSTRUCTION HISTORY

1 CONSTRUCTION HISTORY

1.1 Original Construction

The Pejepscot Hydroelectric Project (Project) was originally constructed in 1893 as part of a paper mill and consisted of a horseshoe shaped timber crib spillway and grinder room, referred to as the wheel pit. It appears that the original timber crib dam failed between 1893 and 1896. The spillway was rebuilt in 1896 on the current straight alignment.

The Project was extensively redeveloped between 1985 and 1987, which included rehabilitation of the dam, the addition of a new powerhouse and fish passage , and modifications to the original powerhouse. Actions taken to rehabilitate the dam included: (1) permanently raising the crest from elevation (El.) 62.5 to 64.5 feet (ft.); (2) installation of five, 96-foot-long by 3-foot-high spillway crest gates; (3) installation of a steel sheet-pile membrane on the upstream face of the existing dam; (4) the addition of new timber cribbing at the toe of the dam to increase the width of the dam from 68 to 82 ft.; (5) replacing the unreinforced crest and apron with a new reinforced concrete crest supported on H piles, and a 5-foot-thick reinforced concrete apron; and (6) installation of four, reinforced, concrete piers and two reinforced concrete retaining walls at the dam abutments.

1.2 Modification or Additions to the Existing Project

The Project has remained largely unchanged since its extensive rehabilitation in the mid- to late-1980's. Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro) has made various equipment improvements and upgrades to the Project over the term of the current license, including rebuilding the intake/trash rack structure for the original powerhouse in 2009. Within the last ten years, the Topsham Hydro has completed the major capital projects shown in Table 1.2-1.

Table 1.2-1. Major Capital Projects, Pejepscot 2010-2019

Project Name	Cost
Fishway Hopper Repair	$224,000
Topsham Roof Repair	$127,000
Unit 1 Stator Rewind	$2,443,000

2 PROJECT SCHEDULE OF NEW DEVELOPMENT

Topsham Hydro proposes no new development (e.g., additional generating units) at the Project.

EXHIBIT D
STATEMENT OF COSTS AND FINANCING

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
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DRAFT EXHIBIT D
STATEMENT OF COSTS AND FINANCING

1 ORIGINAL COST OF EXISTING UNLICENSED FACILITIES

This section is not applicable to the Pejepscot Hydroelectric Project (Project) as Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro) is not applying for an initial (original) license.

2 ESTIMATED AMOUNT PAYABLE UPON TAKEOVER PURSUANT TO SECTION 14 OF THE FEDERAL POWER ACT

Under Section 14(a) of the Federal Power Act (FPA), the Federal government may take over any project licensed by the Federal Energy Regulatory Commission (FERC or the Commission) upon the expiration of the current license. The Commission may also issue a new license in accordance with Section 15(a) of the FPA. If such a takeover were to occur upon expiration of the current license, Topsham Hydro would have to be reimbursed for the net investment, not to exceed fair value, of the property taken, plus severance damages. To date, no agency or interested party has recommended a federal takeover of the Project pursuant to Section 14 of the FPA.

2.1 Fair Value

The fair value of the Project is dependent on prevailing power values and license conditions, both of which are currently subject to change. The best approximation of fair value would likely be the cost to construct and operate a comparable power generating facility. Because of the high capital costs involved with constructing new facilities and the increase in fuel costs associated with operation of such new facilities (assuming a fossil fueled replacement), the fair value would be considerably higher than the net investment amount. If a takeover were to be proposed, Topsham Hydro would calculate fair value based on then-current conditions.

2.2 Net Investment

The net book investment for the Project is approximately [To be provided in FLA] as of the end of 2019.

2.3 Severance Damages

Severance damages are determined either by the cost of replacing (retiring) equipment that is "dependent for its usefulness upon the continuance of the License" (Section 14, Federal Power Act), or the cost of obtaining an amount of power equivalent to that generated by the Project from the least expensive alternative source, plus the capital cost of constructing any facilities that would be needed to transmit the power to the grid, minus the cost savings that would be realized by not operating the Project. These values would need to be calculated based on power values and license conditions at the time of project takeover. However, Topsham Hydro believes that potential severances inflicted by a takeover of the Project would be significant. Therefore, given the challenges of estimating damages associated with severance, Topsham Hydro is reserving the right to provide the Commission with such an estimate should the Commission consider federal takeover of the Project.

3 ESTIMATED COST OF NEW DEVELOPMENT

3.1 Land and Water Rights

Topsham Hydro is proposing no expansion of its land or water rights as a consequence of this license application.

3.2 Cost of New Facilities

Topsham Hydro is not proposing any capacity-related developments at the Project at this time.

4 ESTIMATED AVERAGE ANNUAL COST OF THE PROJECT

This section describes the annual costs of the Project as proposed. The estimated average cost of the total Project will be approximately $903,000 a year, based on a 5-year period of analysis. This estimate includes costs associated with existing and projected project operations and maintenance[1], as well as local property and real estate taxes, but excludes income taxes, depreciation, and costs of financing.

4.1 Capital Costs

Topsham Hydro uses a [To be provided in FLA]-percent rate to approximate its average cost of capital. Actual capital costs are based on a combination of funding mechanisms that includes stock issues, debt issues, resolving credit lines, and cash from operations.

[1] Including major maintenance costs.

4.2 Taxes

Property taxes for the 2019 fiscal year are expected to be approximately $209,000. Income taxes for the Project are incorporated into costs Topsham Hydro's consolidated business and are not separated out for the Project.

4.3 Depreciation and Amortization

The annualized composite rate of depreciation for the Project is approximately [To be provided in FLA] %.

4.4 Operation and Maintenance Expenses

The estimated annual operation and maintenance expense at the Project will be approximately $694,000 including corporate support costs.

4.5 Costs of Proposed Environmental Measures

Topsham Hydro proposes several protection, mitigation, and enhancement (PME) measures for inclusion in the new license for the Project. The PME measures would add capital costs, and increase annual operations and maintenance costs for the Project.

Topsham Hydro estimates that the capital cost associated each PME measure will be approximately $161,000 (2020 dollars), and the increased operations and maintenance costs will be approximately $257,300 (2020 dollars).

Table 4.5-1 presents the itemized preliminary costs associated with these PME measures.

Table 4.5-1. Cost Estimate of Proposed PME Measures

Proposed PME Measure	Capital Cost (2020 dollars)	Annual Operations and Maintenance Cost (2020 dollars)
Operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates.	$0	$0
Maintain a minimum flow of 1,170 cfs, or inflow, whichever is less.	$0	$0
Finalize and Implement Operations Monitoring Plan	$2,500	$5,000
Develop, in consultation with stakeholders, a mitigation measure to address potential stranding of fish in the bedrock area below bascule gate No. 5.	$**TBD**	$**TBD**

Proposed PME Measure	Capital Cost (2020 dollars)	Annual Operations and Maintenance Cost (2020 dollars)
Installation and operation of a temporary portable American Eel ramp for three passage seasons (June 1 through September 15) to identify a suitable location for a permanent upstream American Eel ramp. The temporary portable eel ramp will be installed during the first full passage season after the effective date of the new license.	$0	$7,500[2]
Installation and operation of a permanent upstream American Eel ramp based on the results of the temporary portable ramp evaluation. The permanent ramp will be installed during the fourth full passage season after the effective date of the new license.	$50,000	$5,000
Increase the number of lift cycles at the Project fish lift to one lift event per hour (10 lift cycles per day) between the hours of 0800 and 1800, during the peak upstream migration period (May 16 through June 15) for river herring and American Shad.	$0	$10,000
Continue video camera monitoring of Atlantic Salmon utilizing the Pejepscot fish lift.	$0	$7,500
Conduct an Atlantic Salmon radio telemetry study, to determine upstream passage effectiveness at the Pejepscot fish lift, when at least 40 adult Atlantic Salmon of Androscoggin River origin are counted at the Brunswick fishway for two consecutive years.	$0	$75,000[3]
Monitor downstream migrating Atlantic Salmon kelts as part of the adult Atlantic Salmon radio telemetry study described above.	$0	$25,000[4]
Open bascule gate No. 1 (closest to the powerhouse) 50% to provide approximately 500 cfs of spill at night (2000 – 0700 hours) during the month of May.	$0	$0
Finalize and Implement Recreation Management Plan (including annual facility operations and maintenance)[5]	$103,500	$32,300
Finalize and Implement Historic Properties Management Plan	$5,000	$90,000[6]
Total	**$161,000**	**$257,300**

2 Annual cost for each passage season.
3 Cost for 1-season telemetry study.
4 Cost for 1-season telemetry study.
5 Itemized cost for each enhancement is detailed within the Recreation Management Plan.
6 Includes cost ($85,000) of Phase II archaeological investigations in Year 2 of next license term.

5 ESTIMATED ANNUAL VALUE OF PROJECT POWER

Power generated by the Project is sold through the Independent System Operator of New England (ISO New England) at prevailing market rates. Topsham Hydro estimates gross annual energy production of approximately 68,516 MWh. The average monthly Day Ahead Locational Marginal Pricing for the Maine Zone was $30.73/MWh for the period January 1, 2019 to December 31, 2019.

With a current average annual generation of 68,516 MWh, the cost of replacement power would be approximately $2,105,497 annually.

6 SOURCES AND EXTENT OF FINANCING

Topsham Hydro's current financing needs are generated from internal funds. Topsham Hydro is likely to finance major enhancements through earnings retention, equity contributions, and loans made by the corporate parent or some combination of those mechanisms.

7 COST TO DEVELOP THE LICENSE APPLICATION

The approximate cost to date to prepare the application for new license for the Project is $1,300,000.

8 ON-PEAK AND OFF-PEAK VALUES OF PROJECT POWER

Topsham Hydro is proposing to operate the Project in a run-of-river mode; therefore, values of on-peak and off-peak Project power are not applicable, per 18 C.F.R. § 4.51(e)(8).

9 ESTIMATED AVERAGE ANNUAL INCREASE OR DECREASE IN PROJECT GENERATION

Table 9.0-1 presents the decrease in generation resulting from the proposed PME measures for the Project.

Table 9.0-1. Estimate of Reduced Generation of Proposed PME Measures

Proposed PME Measure	Reduced Generation (MWh)	Annual Cost (2020 dollars)
Open bascule gate No. 1 (closest to the powerhouse) 50% to provide approximately 500 cfs of spill at night (2000 – 0700 hours) during the month of May.	307	$9,500
Total	**307**	**$9,500**

EXHIBIT E
ENVIRONMENTAL REPORT

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT

(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT E
ENVIRONMENTAL REPORT

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LIST OF ABBREVIATIONS AND DEFINITIONS

°F	Degrees Fahrenheit
°C	Degrees Celsius
ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
ASMFC	Atlantic States Marine Fisheries Commission
BA	Biological Assessment
B.P.	Before present
BPL	Maine Bureau of Parks and Lands
Brookfield	Brookfield Renewable LLC
CARMA	Cultural and Architectural Resource Management Archive
C.F.R.	Code of Federal Regulations
cfs	Cubic feet per second
Commission	Federal Energy Regulatory Commission
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DLA	Draft License Application
DMP	Dioxin Monitoring Program
DO	Dissolved oxygen
El.	Elevation
EFH	Essential Fish Habitat
EPT	Ephemeroptera, Plecoptera, and Trichoptera
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FLA	Final License Application
FOMB	Friends of Merrymeeting Bay
FPA	Federal Power Act
fps	Feet per Second
GOM DPS	Gulf of Maine Distinct Population Segment
HBI	Hilsenhoff Biotic Index
IPaC	Information for Planning and Consultation
ILP	Integrated Licensing Process
ISR	Initial Study Report
Licensee	Topsham Hydro Partners Limited Partnership

L.P.	Limited Partnership
MBEP	Maine Bureau of Environmental Protection
MDACF	Maine Department of Agriculture, Conservation, and Forestry
MDDS	Maine Damselfly and Dragonfly Survey
MDEH	Maine Division of Environmental Health
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
ME	Maine
MGD	Million gallons per day
mg/L	Milligrams per liter
MHPC	Maine Historic Preservation Commission
mi^2	Square mile
ml	Milliliter
MPN	Most probable number
MRSA	Maine Revised Statute Annotated
MSZA	Maine Mandatory Shoreland Zoning Act
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NH	New Hampshire
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Agency
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
OPM	Office of Policy and Management
PAD	Pre-Application Document
PCB	Polychlorinated biphenyls
PCU	Platinum cobalt units
Pejepscot Project	Pejepscot Hydroelectric Project (FERC No. 4784)
PME	Protection, mitigation, and enhancement
POTW	Publicly Owned Treatment Works
ppm	Parts per million

Project	Pejepscot Hydroelectric Project (FERC No. 4784)
PSP	Proposed Study Plan
QHEI	Qualitative Habitat Evaluation Index
RM	River Mile
RMP	Recreation Management Plan
RSP	Revised Study Plan
SCORP	Maine Statewide Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
SHPO	State Historic Preservation Officer
SPP	Species Protection Plan
sqm	Square mile
SWAT	Surface Water Ambient Toxics
TBSA	Turbine Blade Strike Analysis
TE	Threatened and Endangered
TMDL	Total Maximum Daily Load
Topsham Hydro	Topsham Hydro Partners Limited Partnership
UMF ARC	University of Maine at Farmington Archaeology Research Center
U.S.C.	United States Code
us/cm	MicroSiemens per centimeter
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VRMP	Volunteer River Monitoring Program

PEJEPSCOT HYDROELECTRIC PROJECT

(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

EXHIBIT E
ENVIRONMENTAL REPORT

1 INTRODUCTION

Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro or Licensee) is licensed by the Federal Energy Regulatory Commission (FERC or Commission) to operate the Pejepscot Hydroelectric Project (Pejepscot Project or Project) (FERC No. 4784). The 13.88 megawatt (MW) Project is located on the Androscoggin River in the village of Pejepscot and Town of Topsham, Maine (ME) to the east, the Town of Lisbon to the north, and the Town of Durham and Brunswick to the west (Figure 1-1). The Androscoggin River basin above the Pejepscot Dam has a drainage area of approximately 3,420 square miles (sqm or mi^2). The Project is the second of 28 dams on the mainstem of the Androscoggin River and its headwaters. The Project boundary extends approximately 3 miles upstream from the Pejepscot Dam. The Project does not occupy any federal lands.

1.1 Application

FERC issued a new license to operate the Project to the Androscoggin Water Power Company by Order dated September 16, 1982. The license has been transferred, in full and in part, several times since issuance. Most recently, by order dated September 7, 2011, FERC approved partial transfer of the Project license from Brown Bear Power, LLC, Topsham Hydroelectric Generating Facility Trust No. 1, and Topsham Hydro Partners L.P., jointly, to Topsham Hydro Partners L.P., solely. The current license for the Project expires on August 31, 2022.

As required under the Federal Power Act (FPA), Topsham Hydro must file with the Commission its application for a new license for the Project on or before August 31, 2020. Topsham Hydro is preparing its new license application for the Project in accordance with FERC's Integrated Licensing Process (ILP). Pursuant to the ILP process and schedule requirements (Code of Federal Regulations (C.F.R.) Chapter 18, Part 5), Topsham Hydro is filing a Draft License Application (DLA) with the Commission and other interested parties, including federal and state agencies, tribal organizations, non-governmental organizations (NGOs), local governments, and the public.

The purpose of this draft Environmental Report is to: (1) describe the existing and proposed Project facilities, project lands, and waters; (2) describe existing and proposed Project operations and maintenance; and (3) to provide a draft analysis of the effects of the proposed relicensing on each environmental resource identified during scoping, including protection, mitigation, and enhancement (PME) measures as appropriate for each resource area potentially affected by the relicensing, including an analysis of cumulative effects. Topsham Hydro used the following guidelines provided by the Commission in preparing this Environmental Report:

- Scoping Document 2 (Issued February 5, 2018)
- 18 CFR § 5.18[b] (content requirements for an Exhibit E)
- Preparing Environmental Documents: Guideline for Applicants, Contractors, and Staff (FERC 2008)

1.2 Public Review and Consultation

The Commission requires an applicant for a new license to consult with the appropriate resource agencies, tribes, and other entities before filing the application. The Licensee initiated the relicensing and stakeholder consultation process by submitting a Notice of Intent (NOI) to relicense the Project and a Pre-Application Document (PAD) to state and federal agencies, tribes, NGOs, and other interested parties on August 31, 2017. On October 30, 2017, the Commission began the public scoping process by issuing Scoping Document 1 (SD1) to identify pertinent resource issues related to the relicensing. FERC also used SD1 to solicit comments and suggestions on its preliminary list of resource issues and alternatives to be addressed in the environmental analysis and requested that the stakeholders identify studies needed to provide pertinent information about the resources potentially affected by the relicensing. The Commission then held public scoping meetings and a site visit on November 28 and 29, 2017, to receive input on the scope of the environmental analysis.

Topsham Hydro then received comments on the PAD and/or study requests from the Maine Department of Environmental Protection (MDEP), Maine Department of Marine Resources (MDMR), National Marine Fisheries Service (NMFS), Maine Department of Inland Fisheries and Wildlife (MDIFW), and the U.S. Fish and Wildlife Service (USFWS) on or before January 3, 2018. On February 5, 2018, FERC issued Scoping Document 2 (SD2). In SD2, the Commission identified the potential resource issues to be evaluated during the environmental analysis of the relicensing pursuant to the National Environmental Policy Act (NEPA).

1.2.1 Studies

Topsham Hydro developed a Proposed Study Plan (PSP) based on the PAD comments and/or study requests received. Topsham Hydro filed the PSP with FERC on February 12, 2018 and held its study plan meeting on March 22, 2018. The purpose of the meeting was to provide information on the FERC process plan and schedule, provide additional information on Project operations, review the specific study plans contained in the PSP, and provide an opportunity for meeting attendees to ask questions related to the proposed studies. FERC and Stakeholders attended this meeting. Comments on the PSP were received from MDEP, Maine Historic Preservation Commission (MHPC), NMFS, and the USFWS. Based on comments received on the PSP, Topsham Hydro filed a Revised Study Plan (RSP) with FERC on June 12, 2018. Comments on the RSP were filed by MDEP. On July 3, 2018, FERC issued a Study Plan Determination approving the following studies:

- Water Quality Assessment;
- Tailwater Benthic Macroinvertebrate Study;
- Eel Monitoring Survey;
- Evaluation of Spring Migration Season Fish Passage Effectiveness;
- Evaluation of Fall Migration Season Fish Passage Effectiveness;
- Fish Entrainment and Turbine Survival Assessment;
- Stranding Evaluation;
- Wildlife and Botanical Resources Survey;
- Recreation Facilities Inventory and Use Assessment;
- Historic Architectural Survey;
- Historic Archaeological Phase 1 Survey;
- Precontact Period Archaeological Survey;
- Sediment Storage and Mobility;
- Large Woody Debris;
- Largemouth and Smallmouth Bass Spawning Habitat Survey; and
- Desktop Analysis of the Potential Effectiveness of the Fish Lift for passing adult Atlantic Salmon.

Topsham Hydro filed the Initial Study Report (ISR) on July 12, 2019 and held its ISR Meeting on July 23, 2019 via conference call. Following the meeting, Topsham Hydro filed an ISR Meeting Summary with the Commission on August 11, 2019. No stakeholder comments were received on the ISR filings. The Updated Study Report is scheduled to be filed with the Commission no later than July 12, 2020.

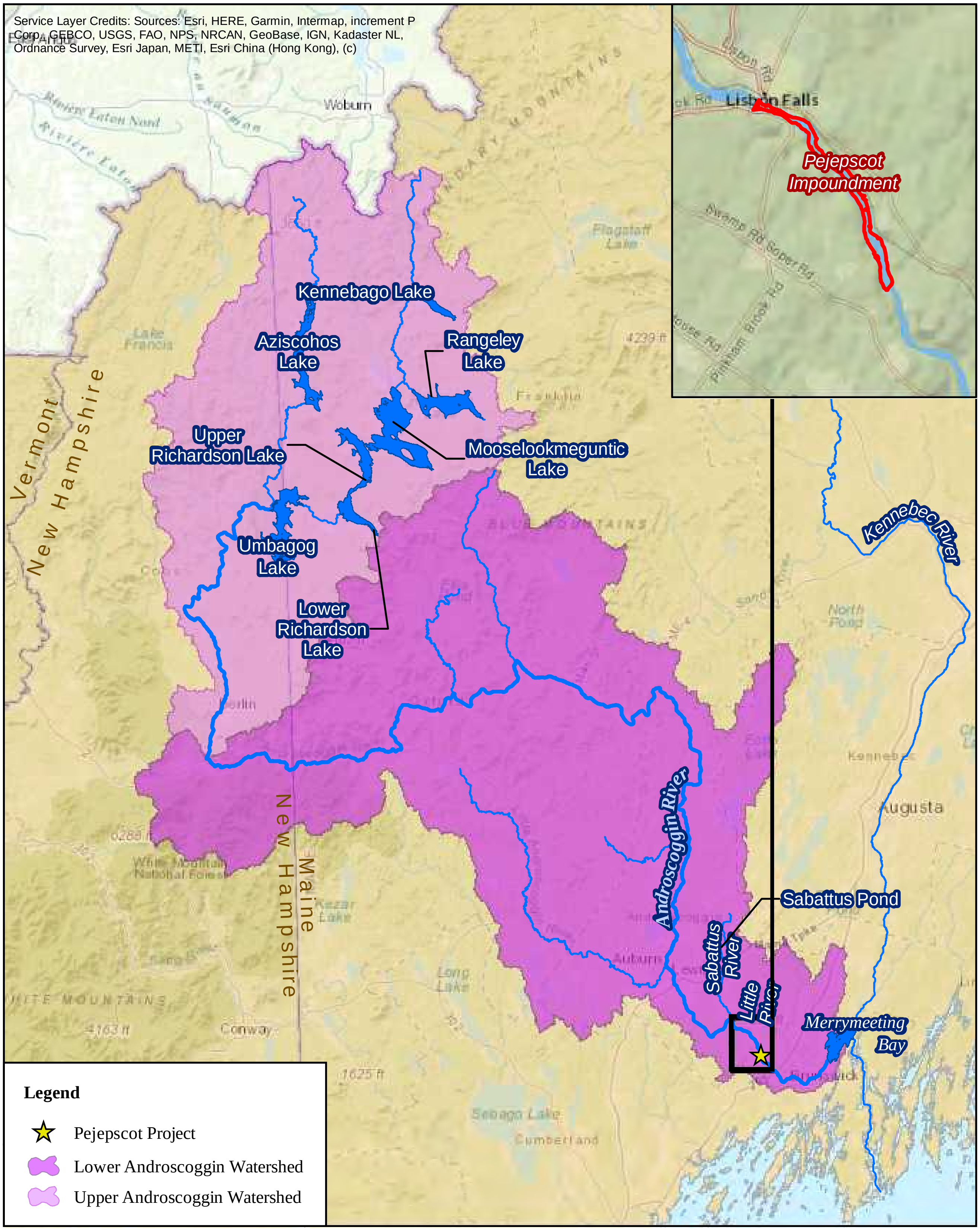
Table 1.2.1-1 identifies the stakeholders that Topsham Hydro consulted during resource issue scoping, study plan development, resource study reporting, and preparation of the license application. Section 4.0 of Exhibit E summarizes the results of the studies and provides an analysis of the effects of the proposed relicensing on resources and issues that the stakeholders identified during scoping.

1.2.2 Comments on the Draft License Application

The DLA is being provided to participating federal and state agencies, tribes, NGOs, local governments, and the public. Comments on the DLA are due on July 2, 2020. Topsham Hydro will address stakeholders' comments on the DLA during preparation of the Final License Application (FLA), which will be filed with the Commission no later than August 31, 2020.

Table 1.2.1-1. List of Consulted Parties

FEDERAL AGENCIES	
ACHP	Advisory Council on Historic Preservation
BIA	Bureau of Indian Affairs
FERC	Federal Energy Regulatory Commission
NMFS	National Marine Fisheries Service
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
STATE AGENCIES	
MDACF	Maine Department of Agriculture, Conservation, and Forestry
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
MHPC	Maine Historic Preservation Council
TRIBES	
Aroostook Band of Micmacs	
Houlton Band of Maliseet Indians	
Passamaquoddy Tribe	
Penobscot Indian Nation	
LOCAL GOVERNMENTS	
Androscoggin County Government	
Cumberland County Government	
Sagadahoc County Government	
Town of Brunswick, ME	
Town of Durham, ME	
Town of Lisbon, ME	
Town of Topsham, ME	
NON-GOVERNMENTAL ORGANIZATIONS	
American Rivers	American Rivers
ASF	Atlantic Salmon Federation
FOMB	Friends of Merrymeeting Bay
Maine Rivers	Maine Rivers
TU	Maine Council of Trout Unlimited and Merrymeeting Bay Chapter of Trout Unlimited



Brookfield

N

0 3.75 7.5 15 Miles

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 1-1:
Androscoggin River Basin

Path: P:\1925\maps\dla\exhibit_e\Figure_1-1.mxd

2 STATUTORY AND REGULATORY REQUIREMENTS

Topsham Hydro, as Licensee for the Project, is subject to the requirements of the FPA as well as other applicable statutes. The major regulatory and statutory requirements are summarized below.

2.1 Clean Water Act – Section 401

Topsham Hydro is subject to the Water Quality Certification under Section 401(a)(1) of the federal Clean Water Act of 1977. The MDEP establishes water quality standards consistent with Maine statute 38 MRSA § 464-70. Topsham Hydro will file an application for 401 Water Quality Certification within 60 days of the Commission's Notice of Ready for Environmental Analysis, as required under Commission regulations.

2.2 Endangered Species Act

The federal Endangered Species Act (ESA) (16 U.S.C. 1531-1544 - Public Law 93-205) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing ESA are the USFWS and National Oceanic and Atmospheric Agency (NOAA) Fisheries. The USFWS maintains a nationwide list of endangered species. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. The law requires federal agencies, in consultation with the USFWS or NOAA Fisheries to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. Section 9 of the ESA prohibits taking endangered species of fish and wildlife; the regulations implementing ESA define "take" as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct.

On August 31, 2017, with the filing of the NOI, Topsham Hydro requested that FERC designate it as the non-federal representative for purposes of consultation under Section 7 of the ESA. On October 30, 2017, FERC granted this request.

Consultation with federal agencies related to the Project's potential effects on ESA-listed Atlantic Salmon has been ongoing. Consistent with this designation, Topsham Hydro will develop a draft Biological Assessment (BA) for the federally endangered Gulf of Maine (GOM) Distinct Population Segment (DPS) of Atlantic Salmon. Through ongoing consultation with NMFS, Topsham Hydro will develop a Species Protection Plan (SPP), which will include passage performance standards and other protection measures for Atlantic Salmon that avoid, minimize, and mitigate impacts related to Project operation. The draft BA and SPP will be presented in Appendix E-1 **[To be included in the FLA]**. Section 4.7 of Exhibit E provides information on other rare, threatened, and endangered species at the Project.

2.3 Coastal Zone Management Act

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

The Pejepscot Project is located on the Androscoggin River in Cumberland, Sagadahoc, and Androscoggin Counties at river mile (RM) 14. The Project is located in the village of Pejepscot and towns of Topsham, Lisbon, Durham, and Brunswick, Maine. The Project is located approximately 14 miles above the head- of-tide in the Androscoggin River basin and inside of Maine's designated coastal zone (MDMR, 2019). Topsham Hydro will provide MDMR with a request for consistency certification concurrent with the filing of the application for 401 Water Quality Certification with MDEP.

2.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, requires FERC to take into account the effect of its undertakings on historic properties, which in this case includes the issuance of a federal license for the continued operation of the Project. Section 106 of the NHPA is implemented through the Advisory Council on Historic Preservation (ACHP) Council regulations "Protection of Historic Properties" (36 CFR Part 800). The regulations implementing Section 106 (36 CFR Part 800) define the process for identifying historic properties, assessing effects, and seeking ways to resolve adverse effects on historic properties in consultation with the State Historic Preservation Officer (SHPO), federally recognized Indian tribes, the public, and other appropriate parties.

Specifically, FERC typically completes Section 106 by entering into a Programmatic Agreement with the licensee, the ACHP, and the SHPO and tribes. FERC typically requires the licensee to develop and implement a Historic Properties Management Plan (HPMP) as a license condition. Through an approved HPMP, FERC can require consideration and management of effects on historic properties for the license term, thus meeting the requirements of Section 106 for its undertakings.

On October 30, 2017, FERC designated Topsham Hydro as the non-federal representative for purposes of initiating day-to-day consultation pursuant to Section 106. Topsham Hydro has consulted with MHPC regarding the Project's Area of Potential Effect (APE). In addition, Topsham Hydro conducted historical and cultural resource studies in consultation with the MHPC, which are described in detail in Section 4.11 of this Exhibit E.

Topsham Hydro prepared a draft HPMP and it is included in Appendix E-2. The HPMP contains specific steps to be taken by Topsham Hydro to protect and preserve the historic properties identified at the Project over the term of the new license. With the implementation of an approved HPMP, the continued operation of the Project as proposed by Topsham Hydro will have no adverse effects on historical or cultural resources at the Project.

2.5 Magnuson-Stevens Fishery Conservation and Management Act

In 1996 the U.S. Congress recognized the increasing pressure on marine fishery resources and addressed these problems in its reauthorization of the Magnuson Fishery Conservation and Management Act, now known as the Magnuson-Stevens Act (16 U.S.C. 1800 – 1891(d)). This act required the eight Regional Fishery Management Councils, in collaboration with National Oceanic and Atmospheric Agency (NOAA) Fisheries, to give heightened consideration to essential fish habitat (EFH) in resource management decisions. Congress defined EFH as “those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity.” The designation and conservation of EFH seeks to minimize adverse effects on habitat caused by fishing and non-fishing activities.

In 1998, NOAA Fisheries designated 11 rivers in Maine, including the Androscoggin River, as EFH for Atlantic Salmon eggs, larvae, juveniles, and adults. Before a federal agency proceeds with an activity that may adversely affect a designated EFH, the agency must (1) consult with NOAA Fisheries and, if requested, the appropriate council for the recommended measures to conserve EFH, and (2) reply within 30 days of receiving EFH recommendations. The agency's response must include proposed measures to avoid or minimize adverse effects on the habitat or an explanation if the agency cannot adhere to NOAA Fisheries' recommendation.

2.6 Wild and Scenic Rivers and Wilderness Acts

Congress created the National Wild and Scenic Rivers System in 1968 (16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Rivers are classified as either wild, scenic, or recreational. No nationally designated wild and scenic rivers or wilderness areas are located within the Pejepscot Project boundary or in the vicinity of the Pejepscot Project (WSR, 2019; NWPS, 2019). The only designated wild and scenic waterway in Maine is a 92.5-mile reach of the Allagash River (WSR, 2019). The Wilderness Act of 1964 [Public Law 88-577 (16 U.S.C. 1131-1136)] was enacted to establish a National Wilderness Preservation System for the permanent good of the whole people and for other purposes. None of the three wilderness areas in Maine are within the Androscoggin River basin (NWPS, 2019).

2.7 Federal Lands

There are no federal lands within the Project boundary.

2.8 References

Maine Department of Marine Resources. 2019. Coastal Zone Map. https://www.maine.gov/dmr/mcp/about/coastal-zone-map.htm.

National Wilderness Preservation System (NWPS). 2019. Wilderness.net. http://www.wilderness.net/map.

Wild and Scenic Rivers (WSR). 2019. National Wild and Scenic Rivers System – Maine. Available online URL: http://www.rivers.gov/maine.php.

3 PROPOSED ACTION AND ALTERNATIVES

3.1 No-Action Alternative

The no-action alternative is the baseline from which to compare the proposed action and all action alternatives that are assessed within this document. Under the no-action alternative, the Project would continue to operate under the terms and conditions of the current license, including maintaining the current Project boundary, facilities, and operation and maintenance procedures. No new environmental protection, mitigation, or enhancement measures would be implemented. FERC uses this alternative to establish baseline environmental conditions for comparison with other alternatives.

3.2 Existing Project Description

The 13.88-MW Pejepscot Project is located on the Androscoggin River in southern Maine at RM 14. The Project is located in the village of Pejepscot and the Town of Topsham, ME to the east, the Town of Lisbon, ME to the north, and the Towns of Durham and Brunswick, ME to the west. The Project straddles the border between Cumberland and Sagadahoc counties and extends into Androscoggin County. The Androscoggin River basin above the Pejepscot Dam has a drainage area of approximately 3,420 mi^2. The Project is the second of 28 dams on the mainstem of the Androscoggin River and its headwaters. The Project boundary extends approximately 3 miles upstream from the Pejepscot Dam. The FERC Project boundary is depicted in the Exhibit G drawings.

3.2.1 Existing Project Facilities

Existing Project structures generally consist of the dam, spillway, fish passage facilities, two powerhouses, a sheet-pile floodwall, an interconnection with the local utility's transmission system, and ancillary equipment. An overview of Project facilities is shown in Figure 3.2.1-1. *Exhibit A – Project Description* provides additional detail about the existing Project facilities.

3.2.2 Existing Project Operation

The Pejepscot Project is operated as a run-of-river facility. The main turbine generator unit (Unit 1) is operated on pond level control. Unit 1 controls the turbine wicket gates to maintain a preset pond level which is normally at about elevation (El.) 67.2 feet (ft.) or 0.3 feet below the top of the spill gates. When Unit 1 nears its maximum flow capacity of 7,550 cubic feet per second (cfs), one or more of the three small units (Units 21, 22 and 23) is manually started. The small units are mainly operated during high spring runoff and after large storm events that increase river flow.

Inflows in excess of the hydraulic capacity of the units are passed at the dam spillway. Inflows to the Project exceed the maximum capacity of the units approximately 25 percent of the time, on average. When the pond level reaches El. 69.0 (1.5 feet above the spill gates), the gates begin to lower starting with Gate 1, closest to the powerhouse. The gates operate on pond level control and as flow increases, they maintain the pond level of El. 69.0 until all five gates are open. When the flow starts decreasing and the pond level drops to El. 68.0 the gates start to close to maintain a level above El. 68.0. When all five gates are closed, the pond is again on turbine pond level control until the pond level exceeds El. 69.0.

The Project is required to release a continuous minimum flow of 1,710 cfs, as measured immediately downstream from the Project powerhouse, or inflow to the impoundment, whichever is less, minus process water (approximately 5 million gallons per day (MGD) or 9.3 cfs) and 100 cfs for pond level control. Flows may be modified temporarily if required by operating emergencies beyond the control of Topsham Hydro, or for short periods upon mutual agreement between Topsham Hydro, MDMR, and MDIFW.

3.2.3 Existing Project Boundary

The Project boundary follows the contour level of 75.0 ft. above mean sea level, except in the vicinity of the dam and powerhouse and at the upstream limit of the reservoir. The Project boundary extends approximately 3 miles upstream from the Pejepscot Dam to the site of the old Route 125 Bridge, which is located approximately 0.25 miles downstream of the Worumbo Dam and 0.3 miles upstream of the Little River confluence. The Project boundary terminates approximately 260 feet downstream of the Pejepscot Dam. The Project boundary encompasses a total of approximately 305 acres. Figure 3.2.3-1 depicts the existing Project boundary.

3.2.4 Existing Environmental Measures

Topsham Hydro currently implements the following environmental measures at the Project.

- Operate the Project in a run-of-river mode, whereby water flowing into the Project impoundment approximates water flowing out in order to protect water resources.
- Maintain a continuous minimum flow of 1,170 cfs, or inflow, whichever is less.
- Fishway Operations and Maintenance Plan.
- Provide public access and use of Project lands and waters; and provide for and maintain the existing Project recreation sites including the Pejepscot Boat Ramp, Pejepscot Fishing Park, and the Lisbon Falls Fishing Park.
- Provide upstream passage for Atlantic Salmon, American Shad, river herring, and other diadromous fish species past the Project via the fish lift.
- Provide downstream passage for diadromous fish via the Project’s downstream fish passage facilities, through spillage, or through the units.
- Species Protection Plan for ESA-listed Atlantic Salmon.

3.3 Proposed Action

The Proposed Action is to continue to operate and maintain the Project and continue the existing environmental measures, as described above, and implement certain environmental Protection, Mitigation, and Enhancement (PME) measures as described in the license application over the term of the new license.

3.3.1 Proposed Project Facilities

Topsham Hydro is proposing no power-related modifications of the existing Project facilities. The existing dam, powerhouse, and appurtenant features are all well maintained and in good working order. No changes to these facilities that are outside normal maintenance practices or the Commission's safety requirements are required or proposed.

3.3.2 Proposed Project Operation

Topsham Hydro is proposing no changes to Project operations and proposes to operate the Project as described in Section 3.2.2.

3.3.3 Proposed Project Boundary

Topsham Hydro is proposing to modify the Project boundary, as reflected in Figure 3.2.3-1, to make several minor corrections and modifications as listed below.

- The Project boundary has been adjusted to fully enclose the Project transmission lines.
- The Project boundary has been adjusted to include the access road to the Pejepscot Fishing Park recreation area located on the western shore of the Androscoggin River.
- The Project boundary generally follows elevation 75 feet, NGVD 1929, along the shoreline of the impoundment. More recent LIDAR data has been used to delineate the 75-foot contour shown for the proposed Project boundary. As such, the location of the contour may differ slightly in some areas, compared to the contour shown for the current Exhibit G drawings on file with the Commission, which were presumably developed with older less accurate mapping technology.
- Both the current and proposed Project boundaries overlap with the project boundary for the upstream Worumbo Project (FERC Project No. 3428). Topsham Hydro is currently in discussions with the owners of the Worumbo Project, Eagle Creek Renewable Energy, in an attempt to resolve this discrepancy before the filing of the Final License Application.

3.3.4 Proposed Environmental Measures

In addition to continuing the existing environmental measures summarized in Section 3.2.4, Topsham Hydro proposes the following PME measures over the term of the Project's new license.

- Operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates.
- Maintain a minimum flow of 1,170 cfs, or inflow, whichever is less.
- Finalize and Implement an Operations Monitoring Plan.
- Develop, in consultation with stakeholders, a mitigation measure to address potential stranding of fish in the bedrock area below bascule gate No. 5.
- Installation and operation of a temporary portable American Eel ramp for three passage seasons (June 1 through September 15) to identify a suitable location for a permanent

upstream American Eel ramp. The temporary portable eel ramp will be installed during the first full passage season after the effective date of the new license.
- Installation and operation of a permanent upstream American Eel ramp based on the results of the temporary portable ramp evaluation. The permanent ramp will be installed during the fourth full passage season after the effective date of the new license.
- Implementation of a Fishway Operations and Maintenance Plan.
- Operate the fish lift on the following lift cycle frequency:
    - April 15 to May 15 and following passage of the first fish at the downstream Brunswick Project, the lift will be operated once every two hours.
    - May 16 through June 15, the lift will be operated once every hour.
    - June 16 through July 1, the lift will be operated every 2 hours.
    - July 2 through November 15, the lift will be operated once a day following passage of salmon at Brunswick if not already identified passing though Pejepscot.
- Implement the following measures from the Species Protection Plan for ESA-listed Atlantic Salmon.
    - Continue video camera monitoring of Atlantic Salmon utilizing the Pejepscot fish lift.
    - Conduct an Atlantic Salmon radio telemetry study, to determine upstream passage effectiveness at the Pejepscot fish lift, when at least 40 adult Atlantic Salmon of Androscoggin River origin are counted at the Brunswick fishway for two consecutive years.
    - Monitor downstream migrating Atlantic Salmon kelts as part of the adult Atlantic Salmon radio telemetry study described above.
    - Open bascule gate No. 1 (closest to the powerhouse) 50% to provide approximately 500 cfs of spill at night (2000 – 0700 hours) during the month of May.
- Finalize and Implement a Recreation Management Plan.
- Finalize and Implement a Historic Properties Management Plan.

3.4 Alternatives Considered but Eliminated from Detailed Analysis

3.4.1 Federal Government Takeover of Project Facilities

In accordance with 18 C.F.R. § 16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric power project with a license that is subject to sections 14 and 15 of the FPA.

FERC indicated in SD2 that it did not consider federal takeover to be a reasonable alternative. Federal takeover of the project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that federal takeover should be recommended by Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

3.4.2 Issuance of Non-Power License

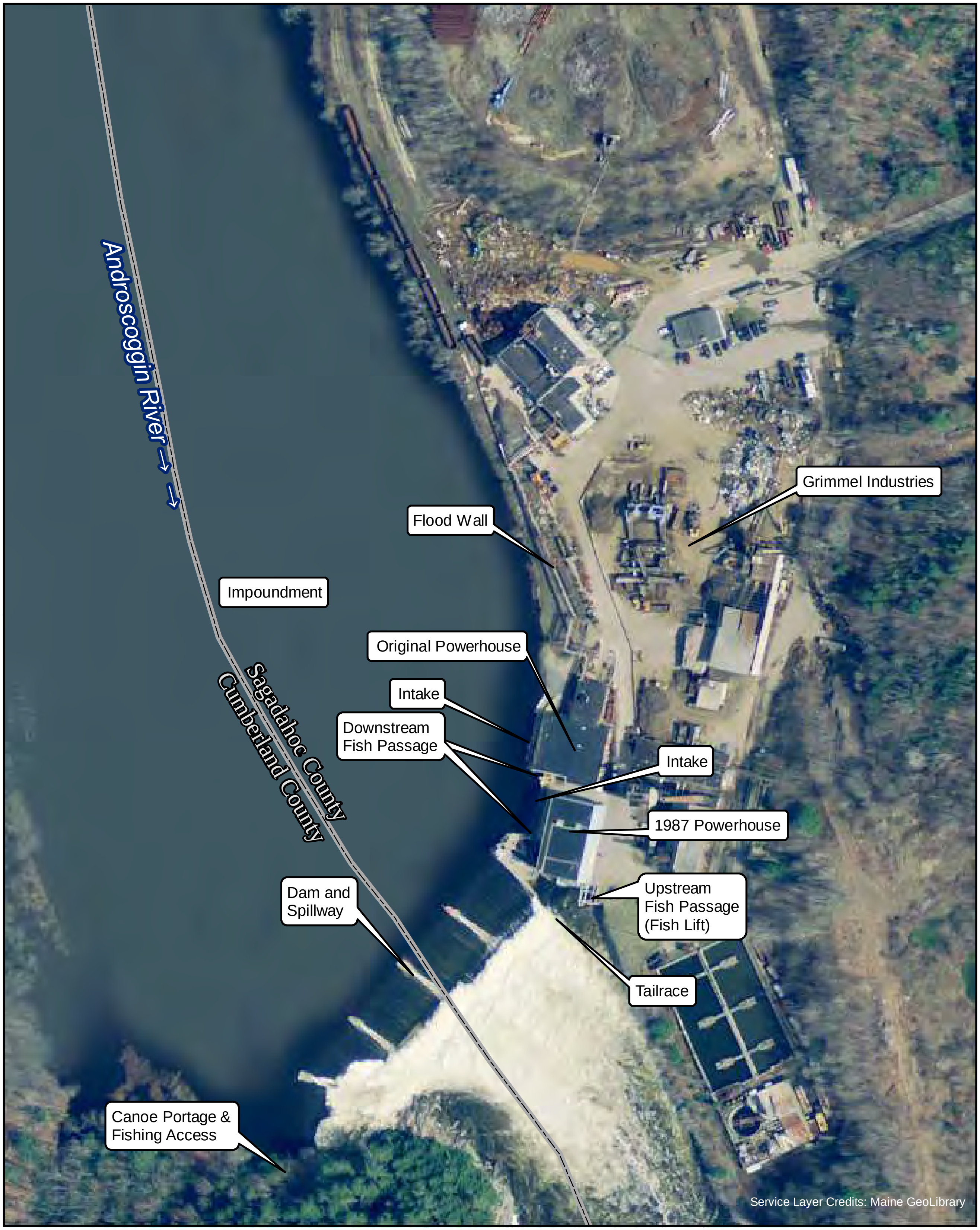
A non-power license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the non-power license.

FERC indicated in SD2 that no governmental agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and FERC has no basis for concluding that the Project should no longer be used to produce power. Therefore, FERC does not consider a non-power license a reasonable alternative to relicensing the Project.

3.4.3 Decommissioning

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

FERC indicated in SD2 that no party has suggested Project decommissioning would be appropriate in this case, and FERC has no basis for recommending it. Thus, FERC does not consider Project decommissioning a reasonable alternative to relicensing the Project with appropriate environmental measures.



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Pejepscot Hydroelectric Project
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Draft License Application

Figure 3.2.1-1:
Project Facilities

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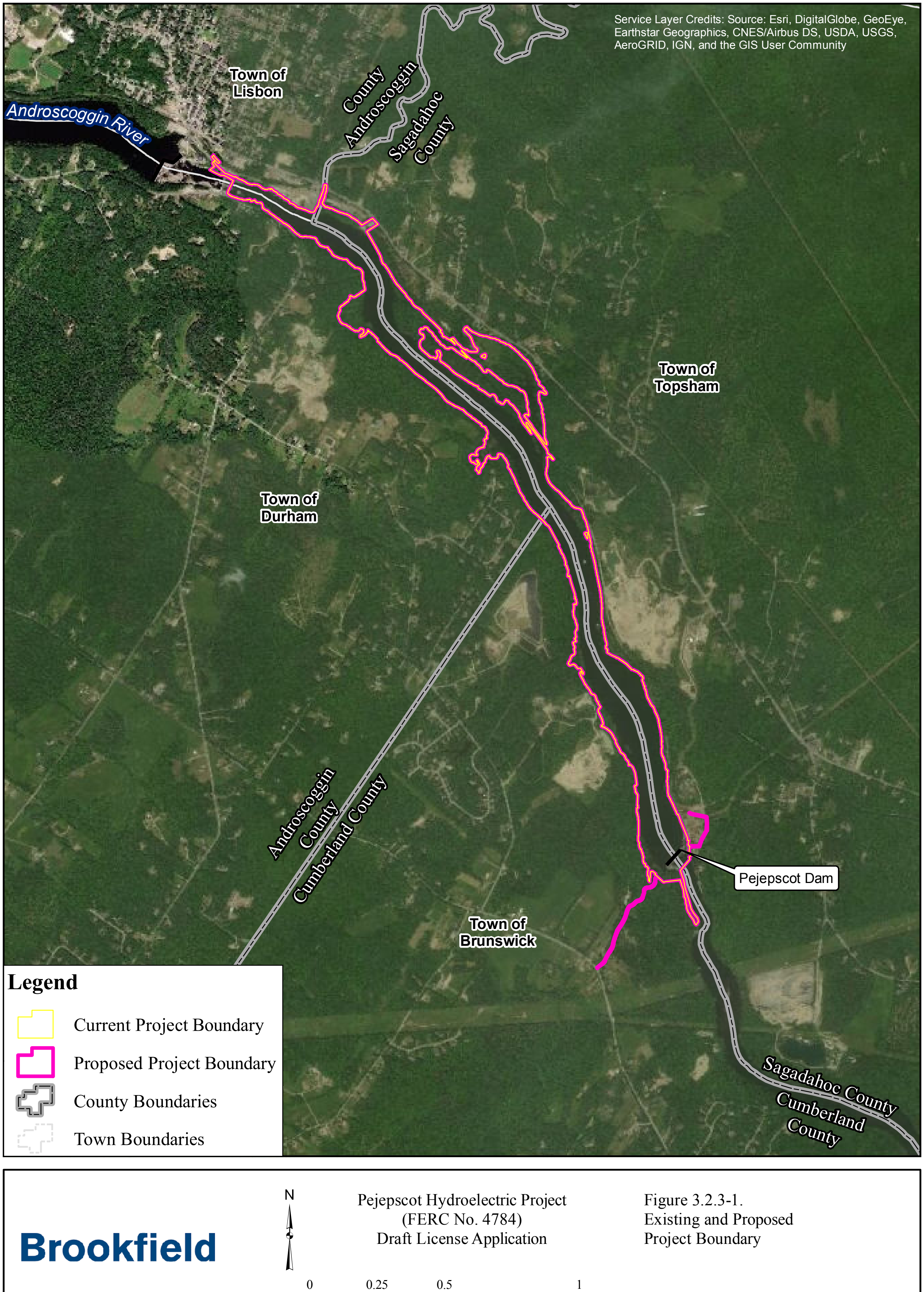

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Figure 3.2.3-1.
Existing and Proposed
Project Boundary

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4 ENVIRONMENTAL ANALYSIS

This section of Exhibit E (1) provides a general description of the Androscoggin River basin, (2) identifies resources that have the potential to be cumulatively affected and identifies the geographic and temporal scope of the cumulative effects analysis, (3) provides a description of the environment for resources that have the potential to be affected by the proposed action, (4) provides an environmental analysis of the effects (positive or negative) of the proposed action and proposed PME measures, and (5) describes any unavoidable adverse effects that may still remain after implementation of PME measures. The Commission defines unavoidable adverse effects as "any adverse environmental effects that cannot be avoided should the proposal be implemented, including effects of protection, mitigation, and enhancement measures".

As noted in Section 1.2.1, Topsham Hydro prepared or is completing 13 individual comprehensive studies that were developed in consultation with the active stakeholders to address specific resource issues and to collect up-to-date baseline information on resources in the Pejepscot Project area. In addition to updating baseline resource information, Topsham Hydro performed the studies to aid in evaluating the effects, if any, of continued project operation and maintenance on the human and natural environment. The resource descriptions in the following sections summarize the existing conditions and results of the studies. The environmental analysis is based largely upon the information that Topsham Hydro collected during study implementation in 2018- 2019, supplemented with information originally reported in the PAD.

4.1 Cumulative Effects

According to the Council on Environmental Quality's regulations for implementing NEPA (40 C.F.R. 1508.7), an action may cause cumulative effects if its effects overlap in space and or time with the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

4.1.1 Resources that could be Cumulatively Affected

In SD2, the Commission identified water quality and aquatic organisms (to include migratory and resident fisheries) as resources that could be cumulatively affected by the continued operation and maintenance of the Pejepscot Project in combination with other hydroelectric projects and other activities in the Androscoggin River Basin. The effects analyses for the resources identified as having the potential to be cumulatively affected appear in the applicable resource area sections.

4.1.2 Geographic Scope of Cumulative Effects Analysis

The geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources, and (2) contributing effects from other hydropower and non-hydropower activities within the Androscoggin River Basin. In SD2, FERC identified the geographic scope for water quality to include the Androscoggin River from the upstream extent of the Pejepscot impoundment to the Brunswick Dam. FERC noted that this geographic scope was chosen due to the operation and maintenance of the Pejepscot Project in combination with other developments in the Androscoggin River Basin that may affect water quality of this segment of the river. This reach of the Androscoggin River contains the Pejepscot Project, a metal recovery and recycling facility, several active rock and gravel pits, and the Brunswick Hydroelectric Project approximately 4.7 miles downstream of the Pejepscot Project, all of which may cumulatively affect water quality conditions below the Pejepscot Dam.

FERC identified the geographic scope for aquatic organisms to include the Androscoggin River Basin. FERC chose this geographic scope because the operation and maintenance of the Pejepscot Project, in combination with other hydroelectric projects and other types of development in the Androscoggin River Basin may affect aquatic organisms in the Androscoggin River Basin. There are no less than 28 dams on the mainstem Androscoggin River from its headwaters to the point where it flows into Merrymeeting Bay.

4.1.3 Temporal Scope of Cumulative Effects Analysis

The temporal scope of the cumulative effects analysis will include a discussion of past, present, and reasonably foreseeable future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of a new license, the temporal scope will look 30 to 50 years into the future[1], concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource. The quality and quantity of information, however, diminishes as FERC analyzes resources further away in time from the present.

4.2 Resource Issues

FERC identified a list of environmental issues to be addressed in the Environmental Assessment in their SD2. This list is not intended to be exhaustive or final, but contains those issues raised to date that could have substantial effects. Issues denoted with an asterisk [*] are to also be considered for cumulative effects.

4.2.1 Geology and Soils Resources

- None

[1] SD2 identifies a temporal scope of 30-50 years, however, a 2017 Policy Statement (161 FERC ¶ 61,078) sets the default license term for hydropower projects at 40 years.

4.2.2 Aquatic Resources

- Effects of continued Project operation on water quality from the Project headwaters downstream to the Brunswick Dam.*
- Effects of continued Project operation on aquatic habitat in the Project area for aquatic organisms.*
- Effects of continued Project operation on passage of migratory fish species in the Androscoggin River including upstream passage of adult fish and downstream passage of smolts and juveniles.*

4.2.3 Terrestrial Resources

- Effects of continued Project operation and maintenance on riparian, littoral, and wetland habitats and associated wildlife.

4.2.4 Threatened and Endangered Species

- Effects of continued Project operation on the federally endangered Atlantic Salmon and its critical habitat and the northern long-eared bat.

4.2.5 Recreation and Land Use

- Effects of continued Project operation on recreational use in the Project area, including the adequacy of existing recreational access.

4.2.6 Cultural Resources

- Effects of continued Project operation on historic properties and archaeological resources.

4.2.7 Developmental Resources

- Effects of proposed environmental measures and associated costs on Project economics.

4.3 General Description of the River Basin

4.3.1 Androscoggin River Basin

The Androscoggin River Basin (Figure 1-1) has a total drainage area of 3,470 sqm and is generally bounded on the west by the Connecticut, Saco, and Presumpscot River Basins and on the east by the Kennebec River Basin. The Androscoggin River originates at the outlet of Umbagog Lake in northern New Hampshire and flows south and east in New Hampshire and Maine about 169 miles to the tidal portion of the Kennebec River in Merrymeeting Bay along the coast of Maine (FERC, 1996). The Pejepscot Dam is about 155 river miles downstream of Umbagog Lake and has a drainage area of 3,420 sqm. The Project impoundment extends about 3 miles upstream from the dam to just downstream of the Worumbo Dam tailrace. The river can be tidally influenced up to the Brunswick Project's tailwater, which is located approximately 4.7 miles downstream of the Pejepscot Project.

The river basin at Umbagog Lake has a drainage area of about 1,045 sqm and includes portions of the rugged and heavily forested northeastern New Hampshire and northwestern Maine. Upstream of Umbagog Lake, are large reservoirs including Kennebago, Mooselookmeguntic, Upper and Lower Richardson, and Aziscohos which are primarily operated as storage reservoirs. Umbagog Lake and these reservoirs have a combined storage capacity of about 644,000 acre-feet and account for most of the regulated storage in the basin. Major tributaries to the Androscoggin River include the Swift, Little Androscoggin, Ellis, and Nezinscot rivers (USGS, 1985). There are approximately 16 tributaries within the Androscoggin watershed that have drainage areas ranging from 60 to 470 sqm each (ENSR, 2007). Figure 1-1 presents a map of the Androscoggin River watershed.

4.3.2 **Topography**

The Project is located within the New England physiographic province, which is part of the Appalachian Highlands physiographic division. More specifically, the Project lies within the Seaboard Lowland section of the New England province. The Seaboard Lowland section encompasses most of the coastal region of Maine, up to the St. Croix River bordering Canada. This section is lower in elevation and less hilly than the bordering New England Upland physiographic section. Elevations found throughout the Seaboard Lowland section can range from 0 to 500 ft.; however, topographic relief is limited to less than approximately 200 ft. in most places. The Seaboard Lowlands are often considered as the sloping margin of the New England Uplands and coincide with the area inundated by the ocean and areas of large pro-glacial lakes during the last glacial retreat (Flanagan *et al.*, 1999).

Although the Androscoggin River in the vicinity of the Project is located in the Seaboard Lowlands, the topography of the river basin varies greatly from its headwaters at Lake Umbagog (El. 1250) to the Project (El. 67.5) before continuing to the river mouth at Merrymeeting Bay at sea level. Consistent with the characteristics of the Seaboard Lowlands, elevations surrounding the Pejepscot Impoundment typically remain below El. 200 and decrease gradually to the impoundment shoreline (normal pool elevation 67.5 ft). The general topography of the Androscoggin River watershed in the vicinity of the Project is shown in Figure 4.3.2-1.

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Figure 4.3.2-1.
Topography in the Vicinity of the Project

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4.3.3 Climate

The Androscoggin River basin has mild and humid summers and cold and snowy winters. At Durham, ME, near the Project, July temperatures range from a daily average maximum of 78°F to a daily average minimum of 57°F. January temperatures range from a daily average maximum of 28°F to a daily average minimum of 7°F. The upper part of the watershed has generally lower temperatures, especially during the winter with January temperatures in Rangeley, ME ranging from a daily average maximum of 22°F to a daily average minimum of -1°F. The basin averages between 40 and 50 inches of precipitation per year, which is, on average, relatively evenly disturbed throughout the year. Much of the precipitation falls as snow in the colder months, with the total average annual snowfall at Durham, ME about 70 inches per season. Annual snowfall in the northern part of the watershed exceeds 120 inches (NOAA, 2017).

4.3.4 Major Land Uses

The Androscoggin River watershed is primarily undeveloped. Based on review of the available land-use data, approximately 74% of the watershed upstream of the Project is classified as mixed forest (30%), deciduous forest (24%), or evergreen forest (21%). Woody wetlands, shrub/scrub, and open water collectively account for 16% of the upstream land. The remaining 9% is a mix of various categories (e.g., developed/open space, pasture/hay, etc.), none of which individually account for greater than 3% of the land area (USGS, 2019). Table 4.3.4-1 provides a breakdown of the various land-use classifications found throughout the Androscoggin River watershed upstream of the Project, while Figure 4.3.4-2 shows the location of the various land-use classifications in relation to the Project.

Within 1,000 feet (ft) of the Project boundary, the land-use is dominated by various forest classifications (i.e., mixed (29%), evergreen (10%), or deciduous (10%)), open water (18%) (i.e., the Pejepscot Impoundment), barren land composed of rock, sand, or clay (11%), and land with various degrees of development (10%). Significant commercial and industrial land uses in the Project vicinity include a metal recovery and recycling facility immediately adjacent to the Project powerhouses, and several active rock and gravel pits in proximity to the Project. The remaining land use classifications found within 1,000 ft of the Project boundary are shrub/scrub, types of wetlands, pasture/hay fields, cultivated crops, and grassland/herbaceous land (USGS, 2019).

Table 4.3.4-2 provides a breakdown of the land-use classifications found within 1,000 ft of the Project boundary, and Figure 4.3.4-2 shows the location of the land-use classifications in this same area. Additional information pertaining to land use near the Project is discussed in Section 4.9.

Table 4.3.4-1. Androscoggin River Watershed Land-Use Upstream of the Project

Land Use Classification	Area (acres)	Total (%)
Mixed Forest	671,618.0	30%
Deciduous Forest	538,698.0	24%
Evergreen Forest	464,595.9	21%
Woody Wetlands	140,031.9	6%
Shrub/Scrub	109,753.9	5%
Open Water	104,963.1	5%
Developed, Open Space	64,295.0	3%
Pasture/Hay	56,851.1	3%
Grassland/Herbaceous	37,639.0	2%
Developed, Low Intensity	30,180.3	1%
Developed, Medium Intensity	11,935.1	1%
Emergent Herbaceous Wetlands	11,925.1	1%
Barren Land (Rock/Sand/Clay)	6,148.2	0%
Cultivated Crops	4,332.2	0%
Developed High Intensity	4,120.1	0%
Mixed Forest	671,618.0	30%

Source: USGS 2019

Table 4.3.4-2. Land-Use within 1,000 ft. of the Project Boundary

Land Use Classification	Area (acres)	Total (%)
Open Water	1298.1	27%
Mixed Forest	1282.8	27%
Evergreen Forest	1162.9	25%
Pasture/Hay	242.0	5%
Barren Land (Rock/Sand/Clay)	209.1	4%
Deciduous Forest	153.9	3%
Developed, Open Space	94.7	2%
Developed, Medium Intensity	71.4	2%
Developed, Low Intensity	68.3	1%
Grassland/Herbaceous	49.6	1%
Woody Wetlands	43.4	1%
Developed High Intensity	20.9	0%
Shrub/Scrub	15.8	0%
Emergent Herbaceous Wetlands	10.5	0%

Source: USGS 2019

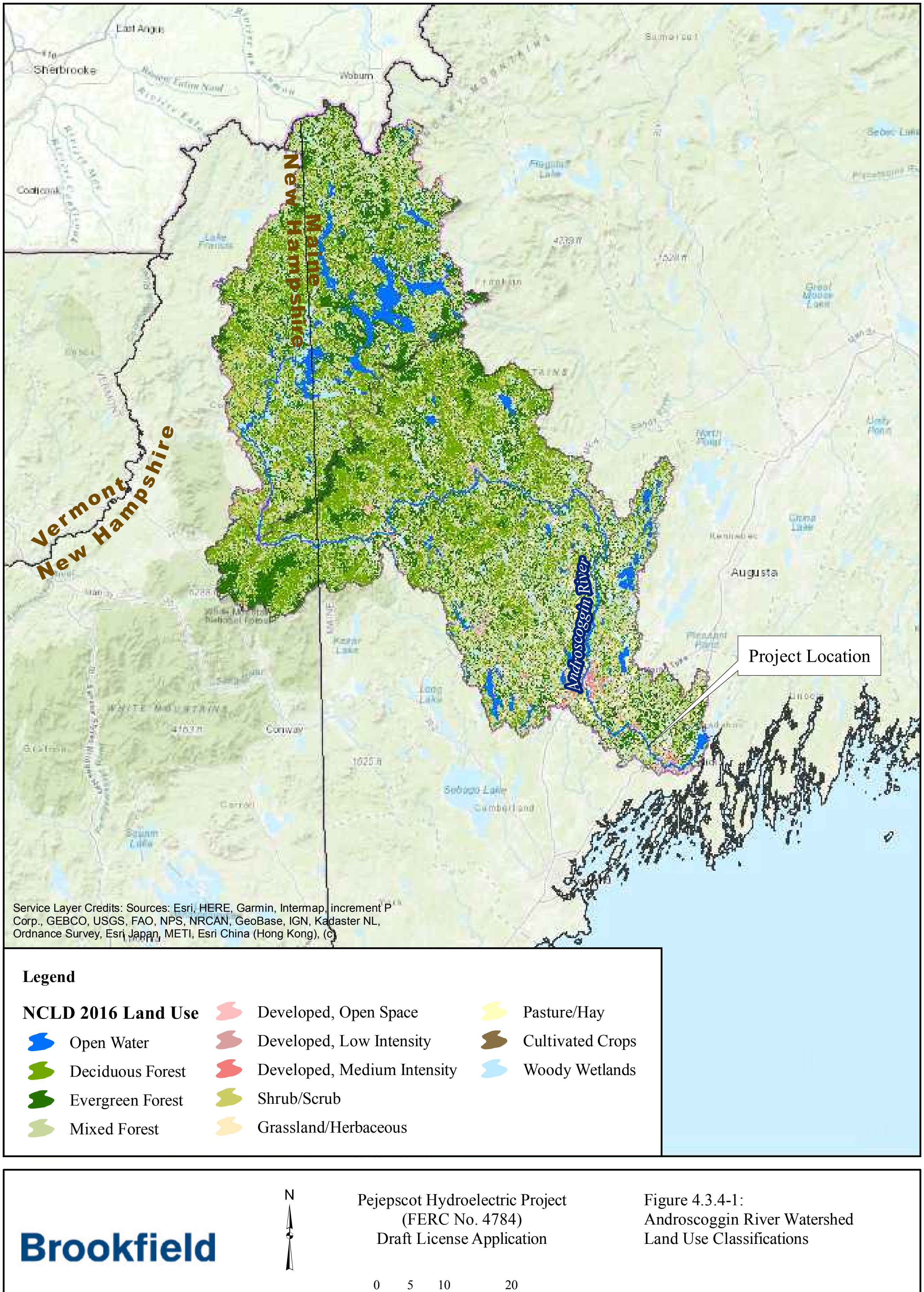

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Figure 4.3.4-1:
Androscoggin River Watershed
Land Use Classifications

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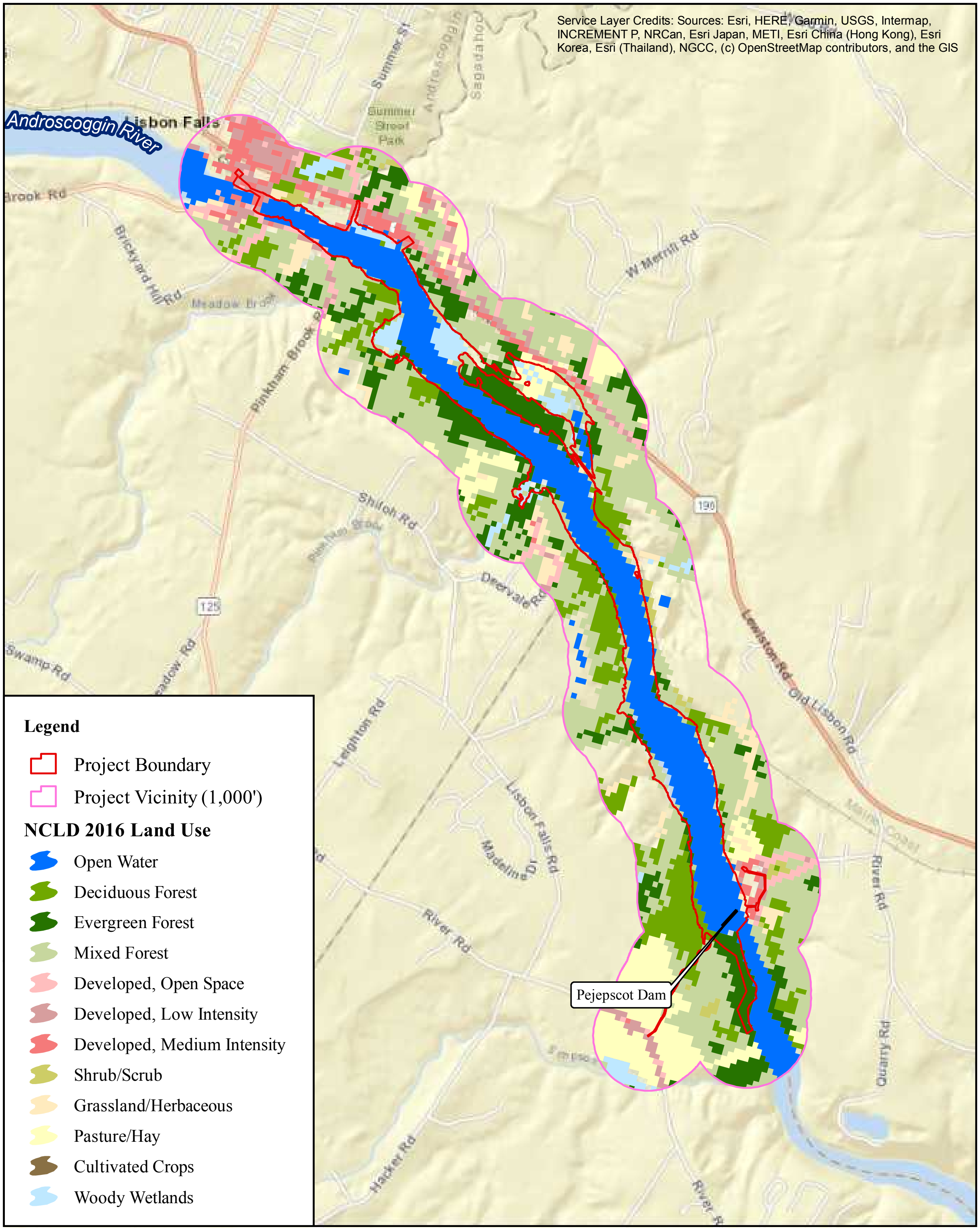

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Figure 4.3.4-2:
Land Use Classifications
within 1,000 Feet of the
Project Boundary

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4.3.5 Major Water Uses

Historically, the Androscoggin River served as Maine's primary industrial river with industries being developed along the river in towns such as Gorham, NH, Bethel, Rumford, Jay, Topsham and Mechanic Falls, ME (Turkel, 1977). In the early 1800's, mill dams had been constructed in Brunswick, Topsham and Lisbon Falls. By the 1930's Central Maine Power had completed several large hydroelectric dams on the river. Like other rivers in Maine, the Androscoggin River historically had been used for log conveyance of pulp and timber which was used at pulp and lumber mills for processing. The Androscoggin River had some of the largest paper mill companies in the world by the end of the 19^{th} century (McFarlane, 2012), with other industries including lumber and textile mills. Today, there are very few paper mills still operating along the river. Discharging of pollutants to the river became regulated with the passage of the Clean Water Act of 1972, with significant improvements to and recovery of water quality in the ensuing period.

Along the Androscoggin River, there are numerous facilities that hold individual National Pollutant Discharge Elimination System (NPDES) permits allowing them to discharge treated wastewater. In the vicinity of the Project, the Town of Lisbon has a permit to discharge 2.025 MGD (3.8 cfs) of secondary treated municipal sanitary wastewater to the Little River, of which the confluence with the Androscoggin River is located in the upper reaches of the Project impoundment. There are no Drinking Water Treatment Plants along the river (EPA, 2016a & 2016b).

In 2015, approximately 62.35 million gallons of Combined Sewer Overflows (CSO) were discharged into the Androscoggin River from the watershed (MDEP, 2016). CSO's discharge untreated wastewater from municipal sewage systems and may include a mixture of sanitary sewage, storm water, and industrial waste.

The mean annual daily flow into the Project is estimated to be 7,000 cfs, pro-rated from the USGS Gage No. 01059000 Androscoggin River near Auburn, ME (USGS, 2017). The maximum peak flow recorded during the period of record (January 1987 to December 2016), as measured at the USGS Gage No. 01059000 upstream of the Project, was approximately 103,000 cfs, which occurred in April 1987. The lowest annual water year peak flow recorded during that time period was approximately 17,800 cfs, which occurred in March 1995 (USGS, 2017).

4.3.6 Basin Dams

The Androscoggin River basin contains over 200 dams according to a combination of data from the NH GRANIT and Maine GIS dams' layers. While many of these dams are on tributaries, there are 21 dams on the mainstem of the river below Errol, NH.

The Pejepscot Hydroelectric Project is the second dam upstream on the Androscoggin River, with the Brunswick Hydroelectric Project (FERC No. 2284) approximately 4.7 miles downstream. The Worumbo Hydroelectric Project (FERC No. 3428) is located approximately

3.4 miles upstream of the Pejepscot Project. Both the Worumbo and Brunswick Projects are operated as run-of-river.

The FERC licensed hydroelectric projects on the mainstem of the Androscoggin River and the headwater storage dams are provided in Table 4.3.6-1. This table does not include the six developments on the Lewiston Canal System which are part of Lewiston Falls, nor numerous dams and FERC licensed hydropower projects on tributaries to the Androscoggin River. Figure 4.3.6-1 provides a map of the hydroelectric projects and key features within the vicinity of the Project along the lower mainstem of the Androscoggin River.

Table 4.3.6-1. Dams on the Mainstem of the Androscoggin River and the headwaters above Umbagog Lake (Upstream to Downstream)

Project Name	State	FERC No.
Mahaney	ME	4413
Kennebago Falls	ME	4413
Rangeley	ME	N/A
Upper Dam	ME	11834
Middle Dam	ME	11834
Aziscohos	ME	4026
Errol	NH	3133
Pontook	NH	2861
Sawmill	NH	2422
Riverside	NH	2423
J. Brodie Smith	NH	2287
Cross Power	NH	2326
Cascade	NH	2327
Gorham	NH	2311
Gorham (Eversource)	NH	2288
Shelburne	NH	2300
Upper Rumford Falls	ME	2333
Lower Rumford Falls	ME	2333
Riley	ME	2375
Jay	ME	2375
Otis	ME	8277
Livermore Mills	ME	2375
Gulf Island	ME	2283
Deer Rips / Androscoggin No.3	ME	2283
Lewiston Falls	ME	2302
Worumbo	ME	3428
Pejepscot	ME	4784
Brunswick	ME	2284

Notes: 1) Headwater Storage Reservoirs include: Umbagog, Aziscohos, Middle Dam, and Upper Dam.
2) This list does not include the developments on the Lewiston Canal System which are currently part of the Lewiston Falls Project.

Source: (FERC, 2017)

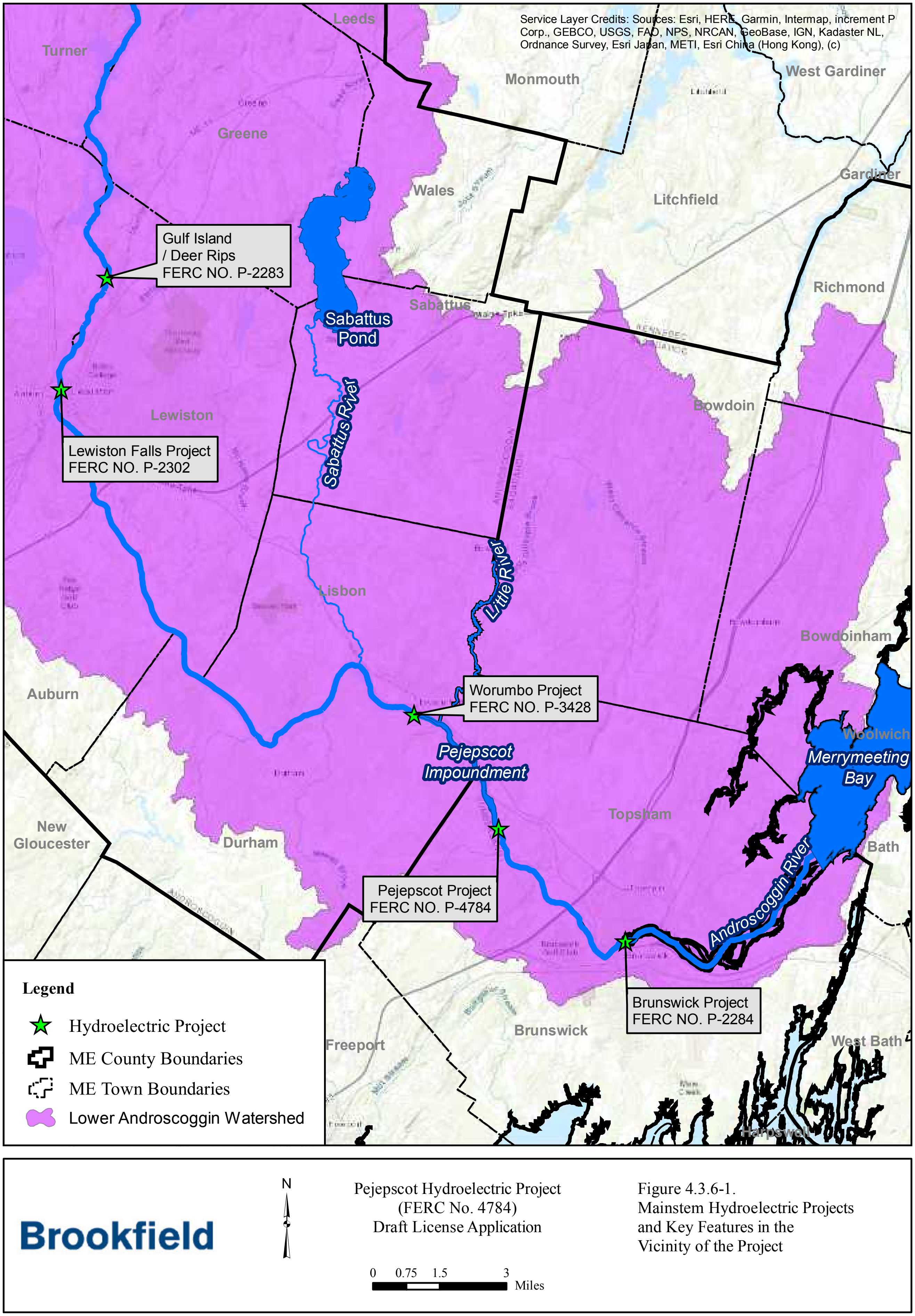

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Figure 4.3.6-1.
Mainstem Hydroelectric Projects and Key Features in the Vicinity of the Project

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4.4 Geology and Soils

4.4.1 Affected Environment

4.4.1.1 Existing Geological Features

4.4.1.1.1 Bedrock Geology

The bedrock geology found at the Project and surrounding area consists of the Silurian-Ordovician Vassalboro Formation. The geologic age of the formation ranges from Silurian (443 million years old) to Ordovician (488 million years old). The Vassalboro formation is usually made up of sandstone, is massive in size, and bluish-gray in color. It is locally quartzite with shaly layers that have been transformed to pyritiferous mica schists and contains numerous calcareous beds. The lithologic constituents include sandstone (major), limestone (minor), and quartzite and schist (incidental) (USGS, 2016).

4.4.1.1.2 Surficial Geology

The surficial characteristics observed near the Project Area are dominated by the Presumpscot foundation, thin-drift areas, and Marine nearshore deposits, which collectively account for 67% of the total area analyzed. The remaining 33% is composed of a variety of surficial classifications. Summary statistics for all surficial characteristics found near the Project are provided below; descriptions of the dominant classifications (i.e., accounting for greater than 10% of the area) are also provided. Figure 4.4.1.1.2-1 depicts the surficial characteristics which exist near the Project and surrounding area.

- Presumpscot foundation (Pp): 31%
- Thin-drift areas (Ptd): 27%
- Marine nearshore deposits (Pmn): 9%
- Stream alluvium (Ha): 7%
- Braided-stream alluvium (Pa): 8%
- Pejepscot fan (Pmfp): 8%
- Cox pinnacle fan (pmfcp): 4%
- Artificial fill (af): 3%
- Freshwater wetlands (Hw): 2%
- Eolian deposits (Pe): 1%
- Cox pinnacle moraines (Pemcp): 1%

Presumpscot foundation: Presumpscot foundation, also known as the Presumpscot formation or "blue clay," is a glacial marine mud containing ground-up minerals that make up bedrock found in Maine (MGS, 2000). It can be a massive to laminated layer with occasional shelly horizons that lie over rock and till. It is interbedded with marine fan deposits as well as end moraines.

Thin-drift areas: Thin drift areas generally have less than ten feet of drift over the bedrock it covers and can be found on ridge crests and hillslopes (MGS, 1997).

Marine nearshore deposits: Marine nearshore deposits are composed of Pleistocene gravel, mud and sand deposits resulting from wave activity in nearshore or shallow-marine environments. It is unrelated to beach morphology (MGS, 1997).

4.4.1.1.3 Soils

Adams loamy sand, 0 to 30 percent slopes, is the dominant soil type found in the vicinity of the Project Boundary. Other prominent soil types found in this area include: Hartland very fine sandy loam; Hinckley gravelly sandy loam; Suffield silt loam; and Windsor loamy sand. Collectively, these five soil types account for 75% of the area analyzed. The remaining 25% is comprised of a combination of 25 other soil types. Summary statistics and descriptions of the prominent soil types found in the Project Area (i.e., those soils which account for greater than 5% of the area analyzed) are provided below. Figure 4.4.1.1.3-1 depicts the soil types near the Project.

- Adams loamy sand, 0 to 30 percent slopes (AaB-AaD): 34%
- Hartland very fine sandy loam, 2 to 25 percent slopes; eroded (HfB, HfC2, HfD2): 9%
- Hinckley gravelly sandy loam, 0 to 25 percent slopes (HkB, C, D): 6%
- Suffield silt loam, 8 to 15 percent and 25 to 45 percent slopes, eroded (SuC2, SuE2): 8%
- Windsor loamy sand, 0 to 8 percent and 15 to 35 percent slopes (WmB & D): 5%

Adams: The Adams series slopes between 0 and 30 percent within the vicinity of the Project but may slope up to 70 percent elsewhere. It is formed in glacial-fluvial or glacio-lacustrine sand and can be found within Northern New York and New England. It is an excessively drained soil series present on outwash planes, kames, terraces, eskers and lake planes. The thickness of upper layer ranges from 16 to 35 inches. The depth to bedrock is over 72 inches (NRCS, 2016).

Hartland: The Hartland series slopes between 2 and 25 percent within the vicinity of the Project but may slope up to 50 percent elsewhere. It consists of coarse to silty mix of well drained soils that can be found very deep in glacial lake plains and terraces. The upper layer ranges in thickness from 14 to 40 inches and has a depth to bedrock greater than 60 inches (NRCS, 2016).

Hinckley: The Hinckley series slopes between 0 and 25 percent within the vicinity of the Project but may slope up to 60 percent elsewhere. It consists of mixed sandy to skeletal sand excessively drained soils that were formed very deep in glaciofluvial materials. They can be found on outwash deltas, outwash planes, outwash terraces, kames, kame terraces and eskers. The upper layer ranges in thickness from 12 to 34 inches (NRCS, 2016). The depth to bedrock is over 10 inches (USDA et. al, 1974).

Suffield: The Suffield series are gently sloping to very steep soils on tops and sides of ridges in dissected marine and lacustrine plains. Slope gradients are commonly 8 to 20 percent, but they may range from 3 to 45 percent or more on ridge sides and escarpment margins. The soils are formed in marine or lacustrine sediments consisting of a silt loam mantle over silty clay loam or silty clay materials (NRCS, 2016).

Windsor: The Windsor series slopes between 0 and 35 percent within the vicinity of the Project but may slope up to 60 percent elsewhere. It consists of a mixed, excessively drained soil and can be found very deep in sandy outwash or eolian deposits. The upper layer ranges in thickness from 10 to 36 inches. Areas associated with this series may be forested or used for agriculture (NRCS, 2016). Depth to bedrock is 5 feet or more (USDA et. al, 1974).

Soil Erodibility

Erosion factors for the soils identified above were gathered from the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS, 2017). The erosion factor, or K factor, indicates the susceptibility of a soil to sheet and rill erosion by water and is one of several factors used in the Universal Soil Loss Equation and the Revised Universal Soil Loss Equation to predict the average annual rate of soil loss. K factor values range from 0.02 to 0.69, with the higher the K factor value typically indicating a higher susceptibility to erosion (NRCS, 2017). Table 4.4.1.1.3-1 shows the K factor for the fine-earth fraction of the prominent soils found in the vicinity of the Project (also referred to as the Kf factor). As shown in the table, these soils are characterized as having low to moderate erodibility. The Adams series, the most common soil type found in the Project Area, was found to have the lowest erodibility, while the Hartland and Suffield series were found to have moderate erodibility.

4.4.1.1.4 Impoundment Shoreline and Streambanks

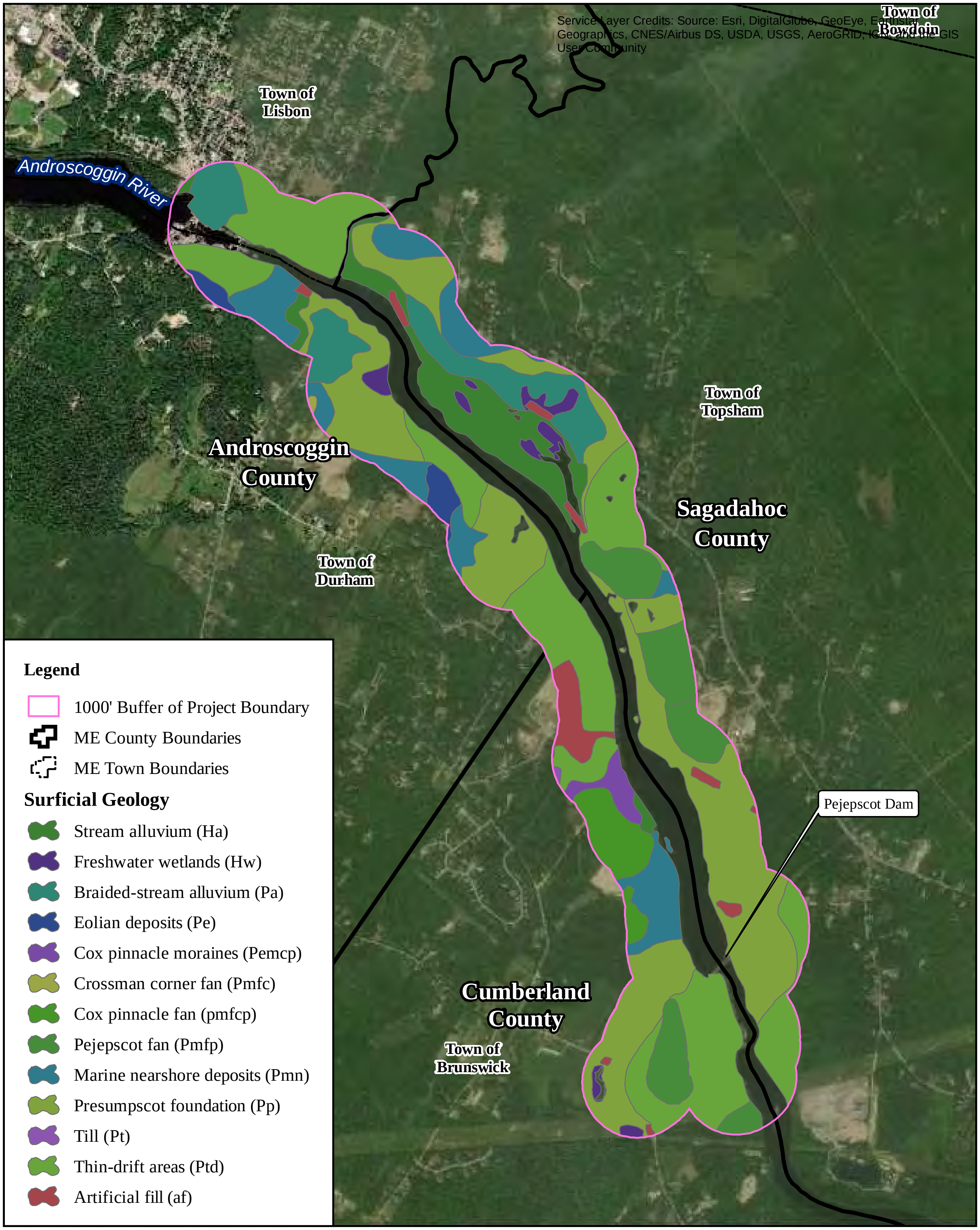
The Project impoundment extends approximately 3 miles upstream of the Pejepscot Dam and includes approximately 6.6 miles of shoreline. In general, the shoreline is mostly forested with a mixture of evergreen and deciduous trees; however, shoreline characteristics, including sediment composition, topography, and vegetative cover, tend to vary. Shoreline soils found in the upper portion of the impoundment are dominated by the Adams series, which has a low erodibility factor. Shoreline soils found throughout the middle and lower portions of the impoundment are a combination of the Adams, Hartland, Hinckley, Windsor, and Suffield series, which have low to moderate erodibility factors (Table 4.4.1.1.3-1). In general, erosion is not a concern along the impoundment.

The area from the Pejepscot Dam to the downstream extent of the Project boundary includes approximately 475 feet of shoreline, which consists almost entirely of rock outcrops, ledge, or stone masonry and concrete walls.

Table 4.4.1.1.3-1. Erodibility of Soils in the Vicinity of the Project

Soil Series	Kf Factor
Adams	0.10
Hartland	0.32-0.37
Hinckley	0.17
Suffield	0.28-0.32
Windsor	0.15

Source: NRCS, 2017



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N

0 0.125 0.25 0.5 Miles

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Figure 4.4.1.1.2-1.
Surficial Geology in the Vicinity of the Project

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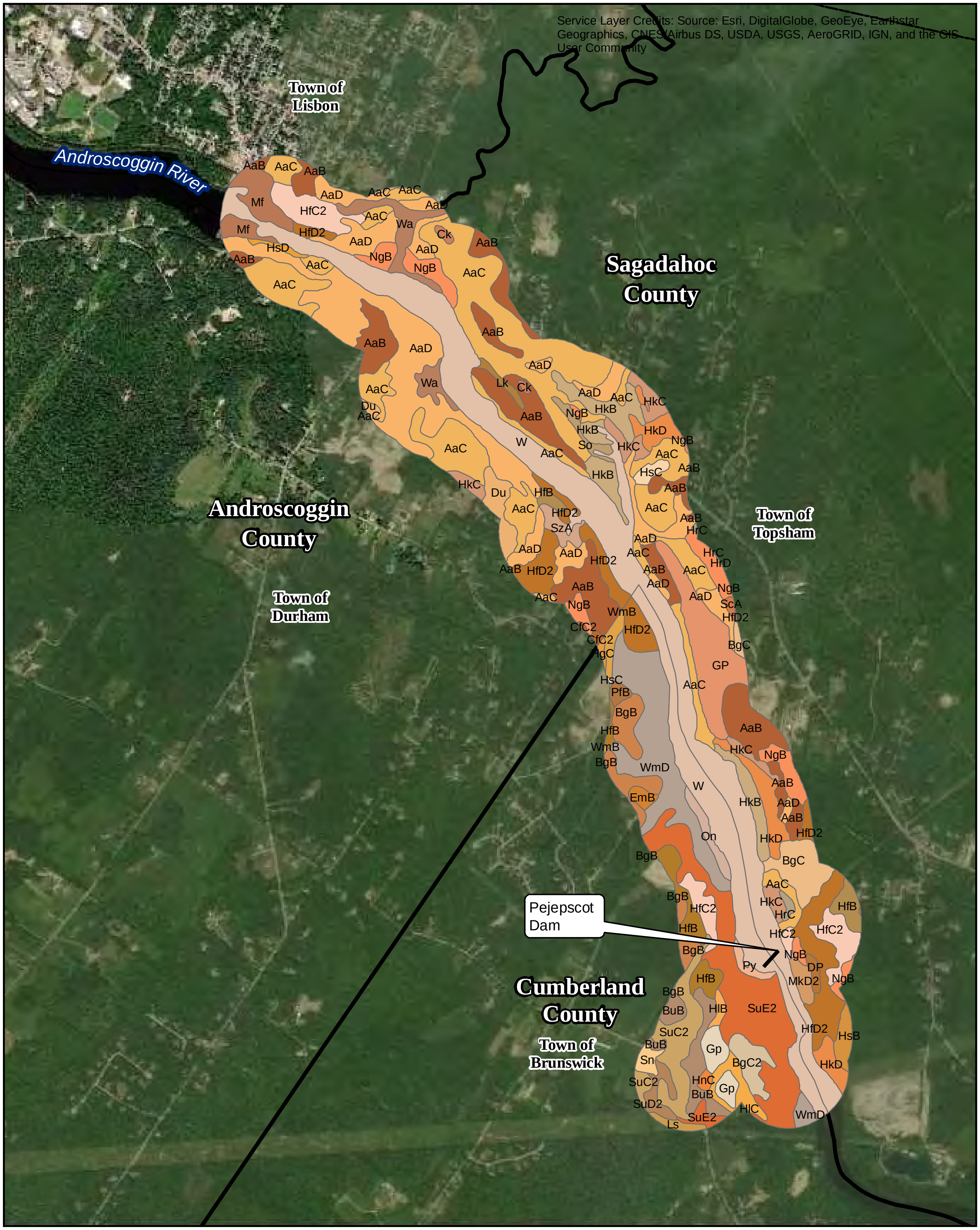

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Figure 4.4.1.1.3-1.
Soils in the
Vicinity of the Project

0 0.125 0.25 0.5
Miles

Legend

ME County Boundaries

ME Town Boundaries

NRCS Soils

AaB;Adams loamy sand, 0 to 8 percent slopes
AaC;Adams loamy sand, 8 to 15 percent slopes
AaD;Adams loamy sand, 15 to 30 percent slopes
BgB;Nicholville very fine sandy loam, 0 to 8 percent slopes
BgC2;Nicholville very fine sandy loam, 8 to 15 percent slopes
BgC;Nicholville very fine sandy loam, 8 to 15 percent slopes
BuB;Lamoine silt loam, 3 to 8 percent slopes
CfC2;Charlton fine sandy loam, 8 to 15 percent slopes, eroded
Ck;Coastal beach
DP;Dumps
Du;Dune land
EmB;Elmwood fine sandy loam, 0 to 8 percent slopes
GP;Sand and gravel pits
Gp;Gravel pits
HfB;Hartland very fine sandy loam, 2 to 8 percent slopes
HfB;Hartland very fine sandy loam, 3 to 8 percent slopes
HfC2;Hartland very fine sandy loam, 8 to 15 percent slopes, eroded
HfD2;Hartland very fine sandy loam, 15 to 25 percent slopes, eroded
HgC;Hermon sandy loam, 8 to 15 percent slopes
HkB;Hinckley gravelly sandy loam, 0 to 8 percent slopes
HkC;Hinckley gravelly sandy loam, 8 to 15 percent slopes
HkD;Hinckley gravelly sandy loam, 15 to 25 percent slopes
HlB;Hinckley loamy sand, 3 to 8 percent slopes
HlC;Hinckley loamy sand, 8 to 15 percent slopes
HnC;Hinckley-Suffield complex, 8 to 15 percent slopes
HrC;Lyman-Tunbridge complex, 8 to 15 percent slopes, rocky
HrD;Lyman-Tunbridge complex, 15 to 35 percent slopes, rocky
HsB;Lyman-Abram complex, 0 to 8 percent slopes, very rocky
HsC;Lyman-Abram complex, 8 to 15 percent slopes, very rocky
HsD;Lyman-Abram complex, 15 to 35 percent slopes, very rocky
Lk;Charles silt loam, 0 to 2 percent slopes, occasionally flooded
Ls;Limerick-Saco silt loams
Mf;Made land, sanitary fill
MkD2;Merrimac fine sandy loam, 15 to 25 percent slopes, eroded
NgB;Ninigret fine sandy loam, 0 to 8 percent slopes
On;Ondawa fine sandy loam, 0 to 3 percent slopes, occasionally flooded
PfB;Paxton very stony fine sandy loam, 3 to 8 percent slopes
Py;Podunk fine sandy loam, 0 to 3 percent slopes, occasionally flooded
ScA;Scantic silt loam, 0 to 3 percent slopes
Sn;Scantic silt loam, 0 to 3 percent slopes
So;Scarboro fine sandy loam
SuC2;Suffield silt loam, 8 to 15 percent slopes, eroded
SuD2;Suffield silt loam, 15 to 25 percent slopes, eroded
SuE2;Suffield silt loam, 25 to 45 percent slopes, eroded
SzA;Swanton fine sandy loam, 0 to 3 percent slopes
W;Water
Wa;Walpole fine sandy loam
WmB;Windsor loamy sand, 0 to 8 percent slopes
WmD;Windsor loamy sand, 15 to 35 percent slopes

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0 0.125 0.25 0.5 Miles

Figure 4.4.1.1.3-1.
Soils in the
Vicinity of the Project

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4.4.2 Environmental Analysis

FERC's SD2 did not identify any specific resource issues relating to geologic or soil resources. Project operations appear to have limited impacts to geology and soils. Erosion is to be expected along the shoreline of any dynamic river system regardless of whether it is dam-controlled or not. The rates of active erosion observed, as part of other relicensing studies, in the vicinity of the Project do not appear to exceed background rates that would be anticipated to occur in the absence of the Project. Topsham Hydro operates the Project in run-of-river mode and has maintained stable impoundment levels during normal operations, outside of maintenance and high flow situations. It appears that the stable impoundment levels and the slowing of the water velocity caused by the impoundment helps to lessen potential riverbank erosion. Downstream of the Project, the past and proposed run-of-river operation does not alter flow or velocity in the river, or their effects on erosion.

4.4.3 Proposed Environmental Measures

Topsham Hydro is proposing to maintain the run-of-river mode of operating the Project, which targets stable headpond elevations. No other specific environmental measures are proposed for geological and soil resources.

4.4.4 Unavoidable Adverse Effects

Some small amounts of erosion and sedimentation may occur within the Project boundary or in downstream reaches as a result of the normal river flows.

4.4.5 References

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4.5 **Water Resources**

4.5.1 **Affected Environment**

4.5.1.1 Water Quantity

The Androscoggin River flows about 169 miles from its headwaters at Umbagog Lake in Errol, NH to Merrymeeting Bay (FERC, 1996). Approximately one-fifth of the watershed (approximately 716 sqm) is in New Hampshire (NHDES, 2008). The Androscoggin watershed is surrounded by the Kennebec River watershed to the east, the Upper Connecticut, Saco, and the Presumpscot River watersheds to the west. The northern edge of the watershed lies on the international boundary between the United States and Canada. The drainage area at Merrymeeting Bay where the Androscoggin River ends is 3,470 sqm (FERC, 1996). The following sections discuss the hydrology and hydraulics of the Pejepscot Project including its drainage area, flow statistics, and operations.

4.5.1.1.1 Drainage Area

The Pejepscot Project has a reservoir of approximately 225 acres at the full pond elevation of 67.5 feet. The drainage area of the Project is approximately 3,420 sqm. The normal tailwater elevation is about 43.7 feet. While the Project has a gross storage capacity of 3,278 acres at the full pond elevation, the Project has negligible usable storage capacity as a run-of-river Project.

4.5.1.1.2 Streamflow, Gage Data, and Flow Statistics

The vast majority of the inflow to the Pejepscot impoundment is provided by the Worumbo Project approximately 3.4 miles upstream. The Worumbo Project has a drainage area of approximately 3,382 sqm. Between the Worumbo and Pejepscot Dams, inflow is also provided by the Little River, Meadow, and Pinkham Brooks as well as several smaller streams.

The USGS operates a streamflow gaging station (No. 01059000 Androscoggin River near Auburn, ME) approximately 17 miles upstream of the Pejepscot Dam. This gage has a drainage area of 3,263 sqm and has been in operation since 1928. Annual and monthly flow duration curves are presented in Figures 4.5.1.1.2-1 thru 4.5.1.1.2-5. Daily flow data from the Auburn gage was prorated by the ratio of drainage areas[2]. Table 4.5.1.1.2-1 shows an annual and monthly summary of this data. The mean annual daily inflow for this period is approximately 7,038 cfs. The peak streamflow at the impoundment during this period was approximately 108,000 cfs on April 02, 1987. The peak streamflow for the period of record at the USGS gage is about 141,500 cfs on March 20, 1936. Streamflow is normally at its peak throughout the spring freshet during snowmelt, while short-term inflow depends in part upon upstream hydropower project storage operations and in part upon numerous intervening tributary river and stream inflows to the mainstem of the river.

[2] The proration factor is 1.05 as a result of the drainage area of Pejepscot Dam (3,420 sqm) divided by the drainage area of the gage (3,263 sqm).

4.5.1.1.3 Existing and Proposed Uses of Water

The Project is operated as a run-of-river facility and does not have a bypass reach. As discussed in Section 3.2.2, the Kaplan unit is operated on pond level control and controls the turbine wicket gates to maintain a normal pond elevation. The Francis units are operated when the river flow is near or above the capacity of the Kaplan, typically during large flow events or during maintenance of the Kaplan (NMFS, 2012). The required minimum flow is 1,710 cfs, or inflow, whichever is less (FERC, 2016). There are no currently documented withdrawals of water within the impoundment.

4.5.1.1.4 Existing Water Rights

Topsham Hydro holds all of the flowage rights necessary to operate the Project. There is no development within the Project boundary other than the Project facilities. There are no streams located within the Project boundary or within the vicinity of the Project that are significantly affected by headpond operations or by generation releases.

Table 4.5.1.1.2-1. Daily Average Streamflow (cfs) at Pejepscot Dam January 1987 – December 2019

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Min	1,667	1,782	1,897	2,861	1,782	1,708	1,342	1,331	1,321	1,289	1,646	1,604	1,289
Max	36,160	24,107	41,401	104,392	64,878	61,210	30,919	40,667	47,899	48,108	42,449	51,043	104,392
Median	4,863	4,706	6,697	12,997	9,003	5,225	3,427	2,945	2,736	3,826	5,953	5,450	4,916
Average	5,603	5,133	8,006	16,601	10,774	6,887	4,681	3,842	3,331	5,614	7,204	6,808	7,039

Figure 4.5.1.1.2-1. Annual Flow Duration Curve (1987-2019)

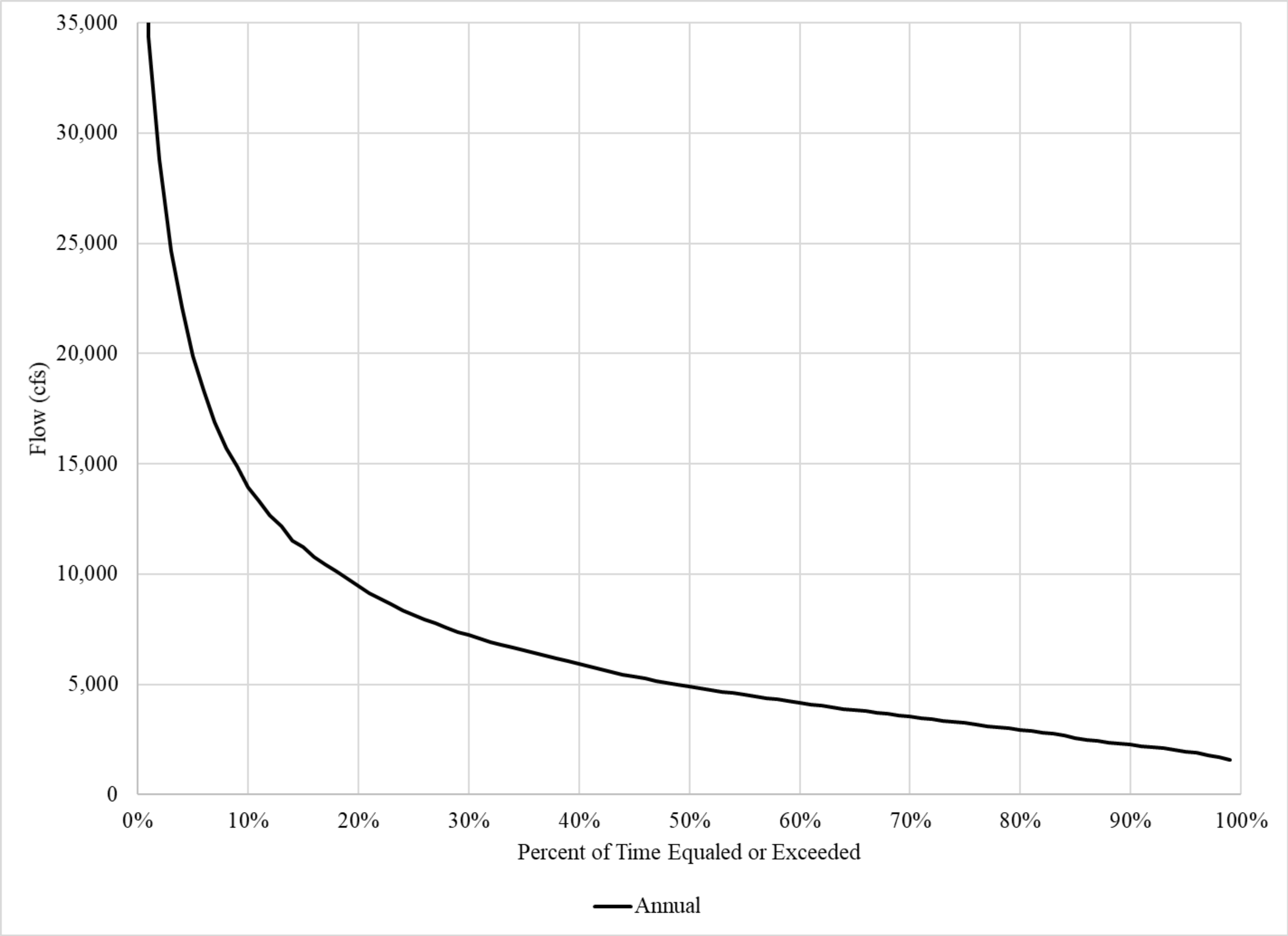


Figure 4.5.1.1.2-2. January, February, and March Flow Duration Curve (1987-2019)

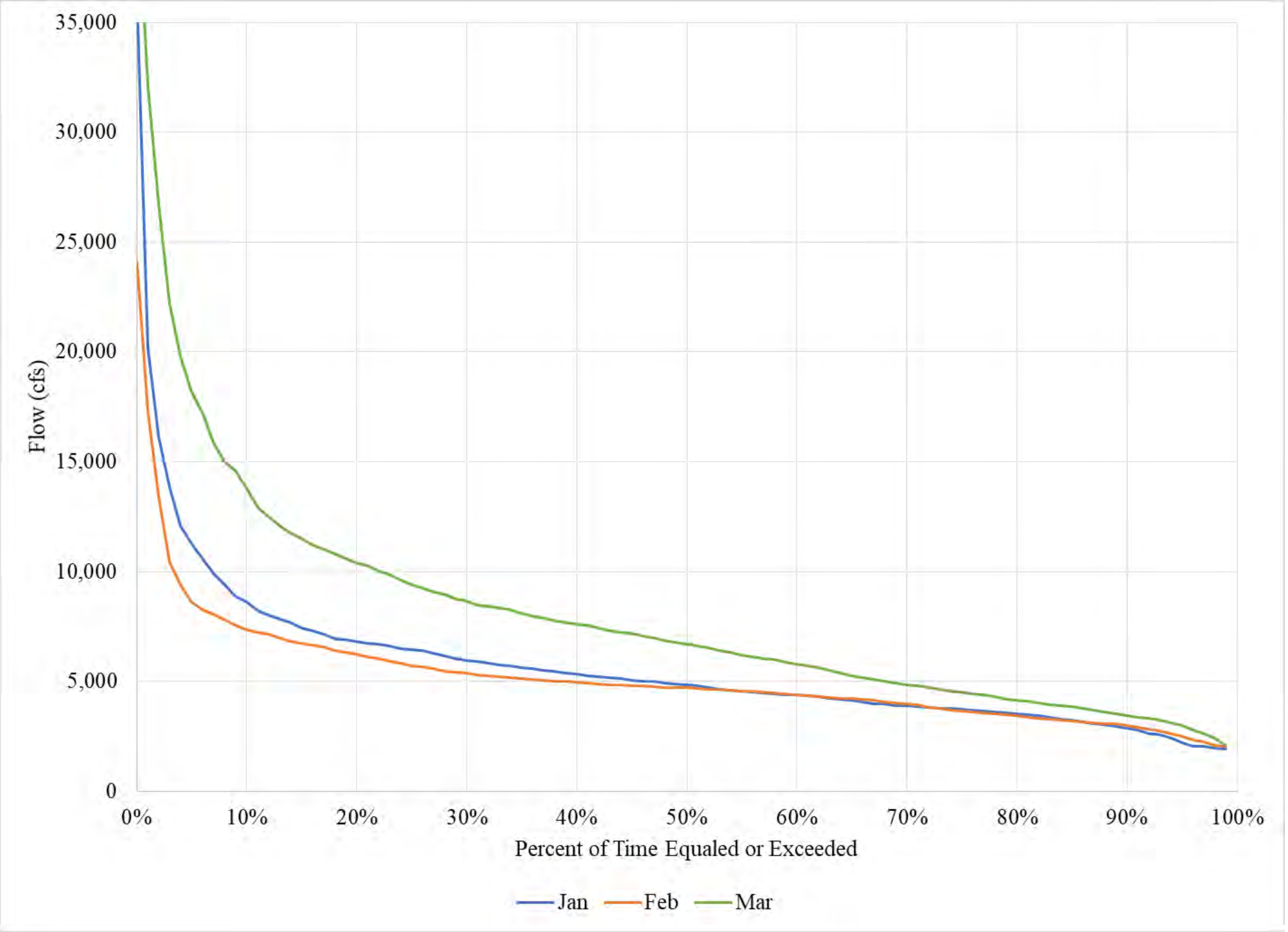


Figure 4.5.1.1.2-3. April, May, and June Flow Duration Curve (1987-2019)

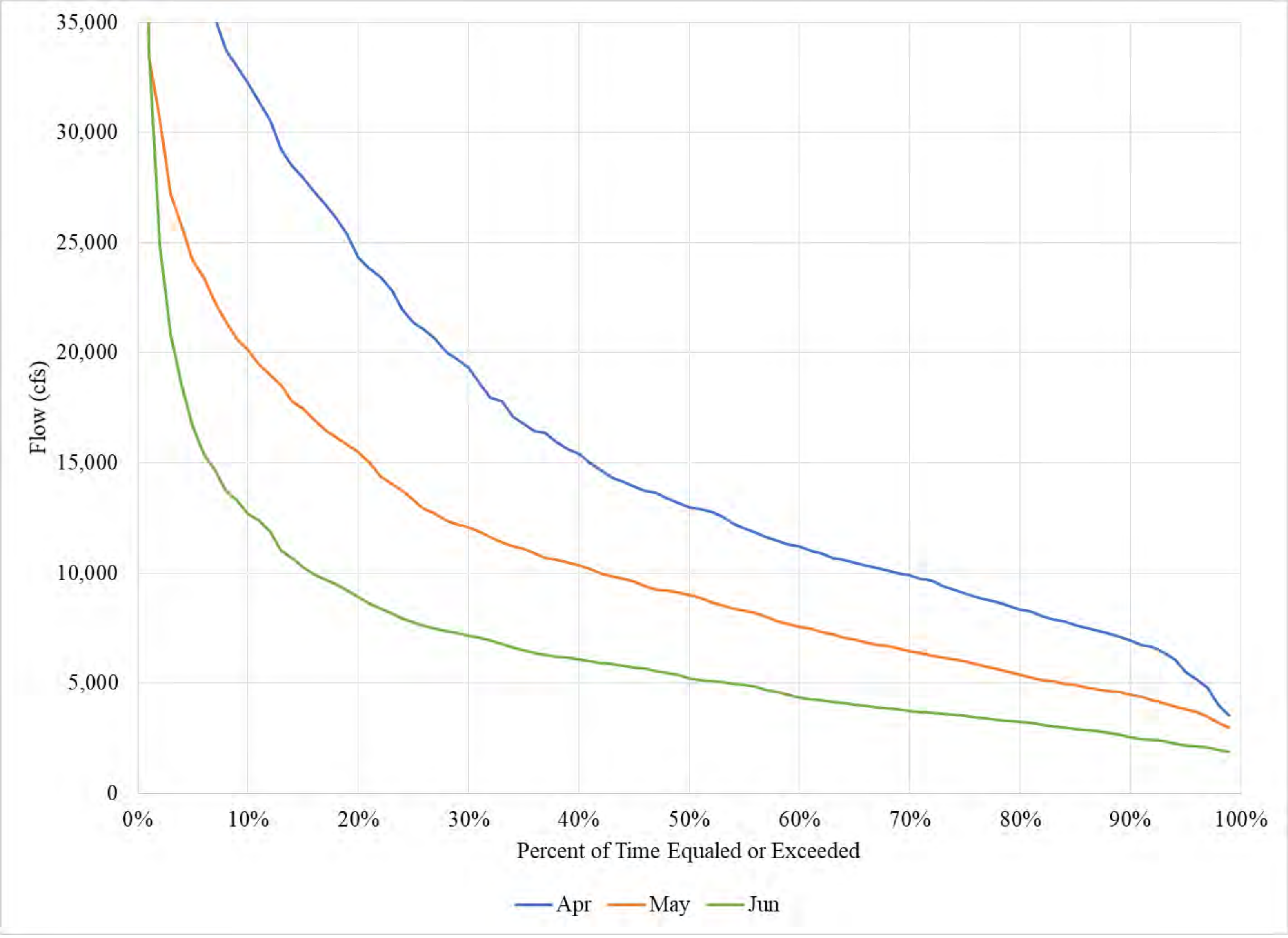


Figure 4.5.1.1.2-4. July, August, and September Flow Duration Curve (1987-2019)

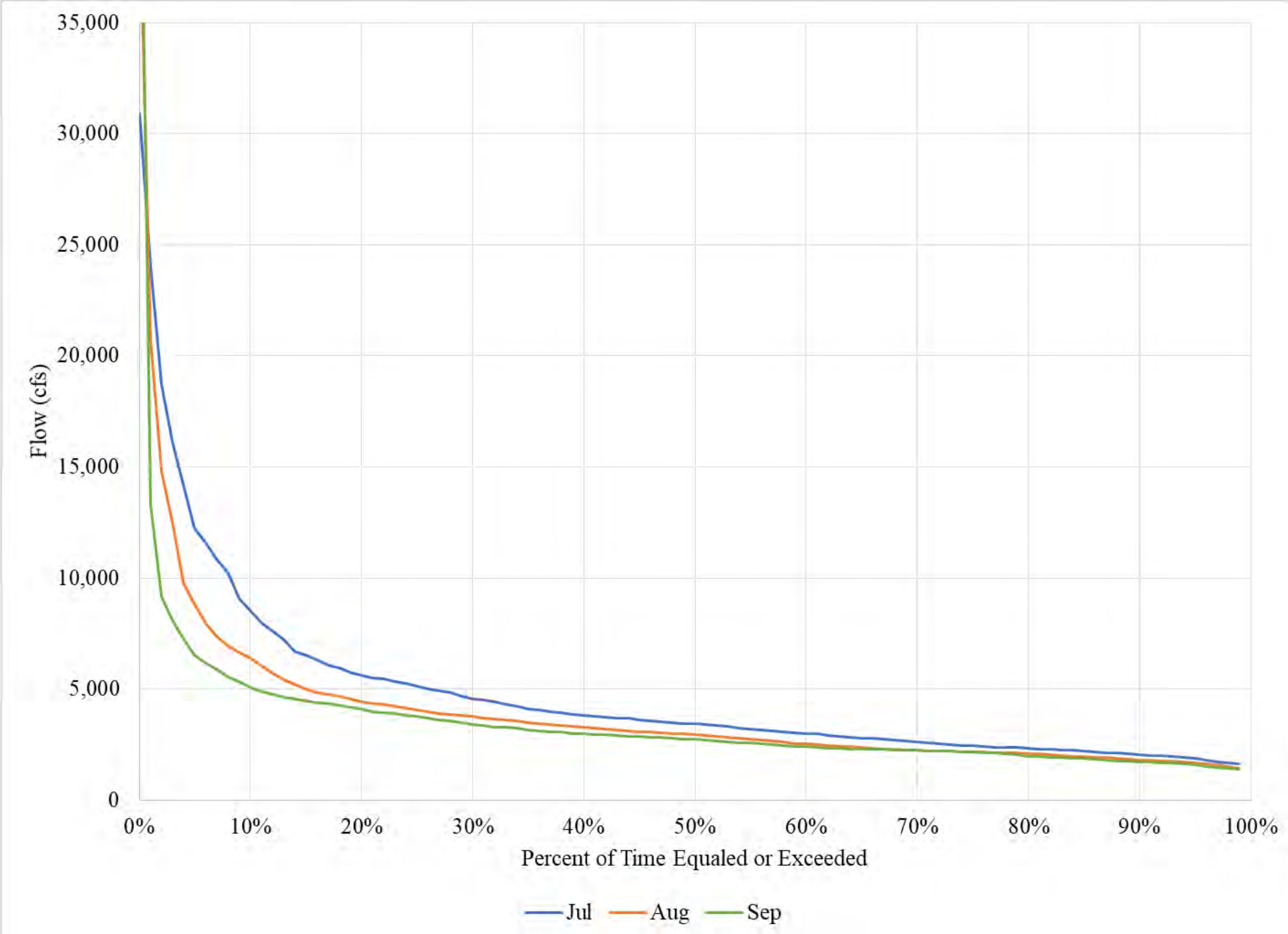
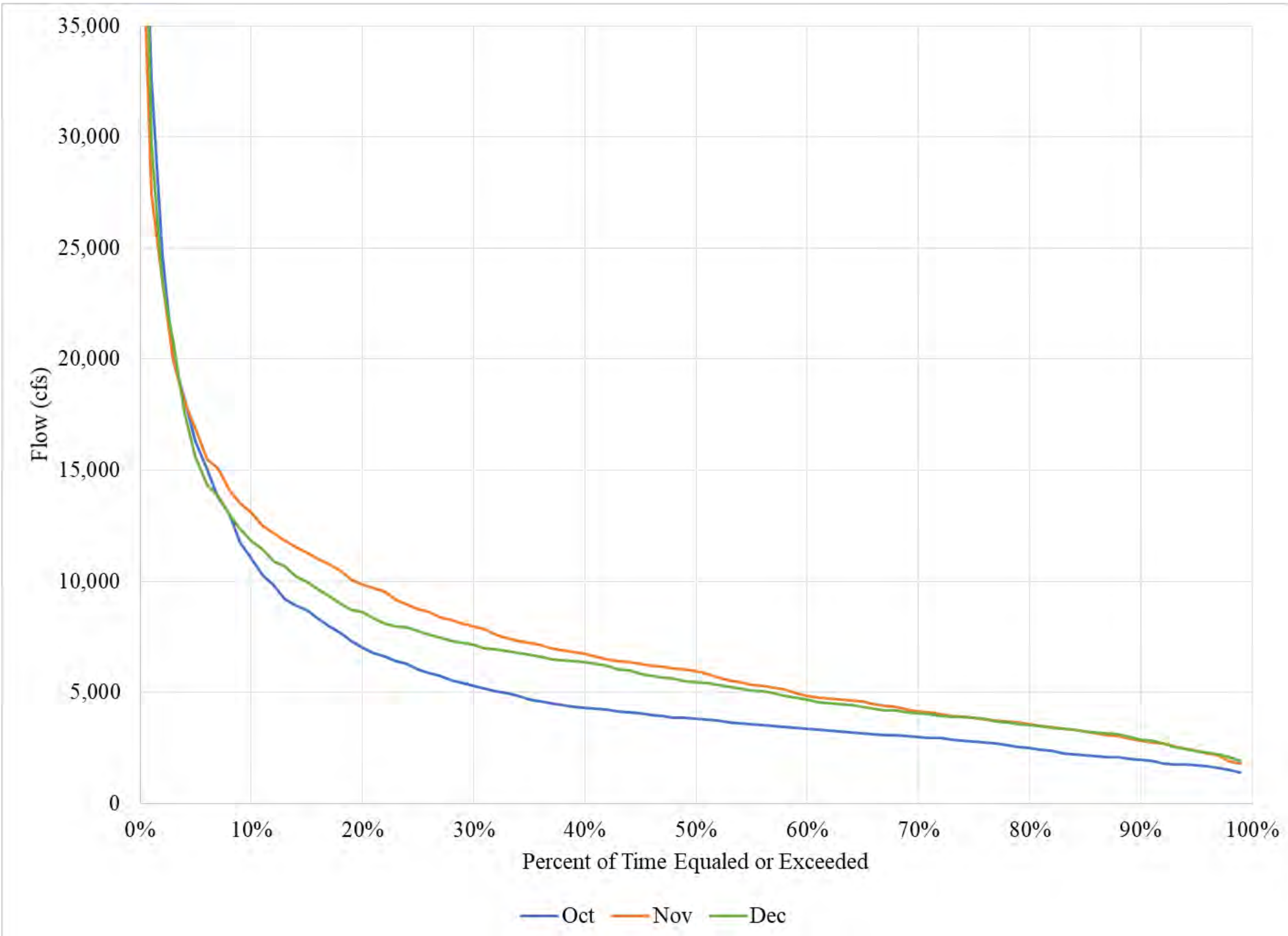


Figure 4.5.1.1.2-5. October, November, and December Flow Duration Curve (1987-2019)



4.5.1.2 Water Quality

The following sections discuss water quality standards and classifications applicable to waterbodies in the Project vicinity. The results from water quality investigations that pertain to the waterbodies at the Project area also discussed.

4.5.1.2.1 Water Quality Standards

Federal Clean Water Act

In 1972, the Federal Water Pollution Control Act Amendments established the Clean Water Act (CWA) as the foundation of modern surface water quality protection in the United States. Sections 303 and 305 of the CWA guide the national program on water quality. Three subparts of Section 303 are relevant to this water quality discussion – Sections 303(a-c), which discuss the process by which all states are to adopt and periodically review water quality standards. Section 305(b) directs states to periodically prepare a report that assesses the quality of waters in the state.

State Water Quality Standards

Maine statute 38 MRSA §464-470 establishes the State’s classification system of surface waters. The classifications and details of major river basins are covered in §467. The mainstem of the Androscoggin River is a Class C waterbody from its confluence with the Atlantic Ocean at Merrymeeting Bay, through Project waters, upstream until its confluence with the Ellis River about 100 miles upstream of the Project at Rumford Point in Maine. The Androscoggin becomes Class B from its confluence above the Ellis River until the ME/NH border (Maine, 2016a). The upper drainage of the Androscoggin River in Maine, above Umbagog Lake are classified as Class A or AA. Most minor tributaries to the Androscoggin River are Class B waters with some exceptions. A water quality certificate under Section 401 of the CWA was issued by MDEP for the Pejepscot Project in 1982.

The waters on the mainstem of the Androscoggin River in the vicinity of the Project are classified as Class C. Class C waters must meet standards ensuring suitability for the following: drinking after treatment, agriculture, fishing, recreation in and on water, industrial process and cooling water supply, navigation, as habitat for fish and other aquatic life, and hydroelectric power generation, except as prohibited under Title 12, section 403. Dissolved oxygen (DO) must meet a minimum of 5 ppm (mg/L) or 60% saturation, whichever is greater. Table 4.5.1.2.1-1 details standards of Class C waterbodies.

Waterbodies that fail to meet water quality standards are placed on the 303(d) impaired waterbodies list as required under the CWA. The 303(d) list assesses the attainment criteria of water bodies and determines whether designated uses are threatened, or the waterbody is impaired by bacteria, mercury, or a legacy pollutant such as polychlorinated biphenyls (PCBs), dioxins, dichloro-diphenyl-trichloroethane (DDT), and others (MDEP, 2014). The CWA requires

Total Maximum Daily Loads (TMDL), the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards, be calculated for identified pollutants. There are no waterbodies within the Project boundary, or that feed directly into the Project impoundment, currently on the 303(d) list of impaired waters under the CWA that require a TMDL (MDEP, 2014). However, several waterbodies in the vicinity of the Project are listed as impaired under Section 305(b) of the CWA. Section 305(b) of the CWA requires states to assess the condition of their waters toward meeting designated uses, as well as TMDLs, and to prepare a report biannually to Congress. Table 4.5.1.2.1-2 defines the various categories used to describe the status of waterbodies as stated in the biannual "Integrated Water Quality Monitoring and Assessment" reports.

Based on the most recent water quality assessment, several sections of the Androscoggin River watershed in the vicinity of the Project are listed under Category 4 (some impaired use) and Category 5 (uses are attained but one or more uses may be impaired) (Table 4.5.1.2.1-2). The mainstem Androscoggin River from the Little Androscoggin confluence (located about 18 miles upstream of the Pejepscot Dam) to the Pejepscot Dam is listed under Category 5-D for being impaired due to legacy PCBs found in fish tissue and Category 4-B for dioxin contamination (MDEP, 2014). Downstream of the Project, the mainstem Androscoggin River from the Pejepscot Dam to the Brunswick Dam is listed as Category 4-B river due to dioxins, Category 5-D for legacy PCBs, and Category 4-C for aquatic life impairment due to inadequate fish passage for American Shad at Brunswick Dam (MDEP, 2014).

Table 4.5.1.2.1-1. MDEP Water Quality Standards for Class C Waterbodies

Parameter	Standard
Dissolved oxygen	Minimum of 5 ppm (mg/l) or 60% saturation, whichever is greater, except in identified salmonid spawning areas
E. coli (human and domestic origin)	May not exceed a geometric mean of 126 per 100 milliliters or an instantaneous level of 236 per 100 milliliters between May 15th and September 30th. There must be provisional periodic review of designated salmonid spawning areas.
Discharges	Discharges to Class C waters may cause some changes to aquatic life, except that the receiving waters must be "of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community."

Source: Maine, 2016b

Table 4.5.1.2.1-2. Integrated Water Quality Report category definitions

Category	Definition
Category 1	Rivers and streams fully attaining all designated uses
Category 2	Rivers and streams attaining some designated uses - insufficient information for other uses
Category 3	Rivers and streams with insufficient data or information to determine if designated uses are attained (one or more uses may be impaired)
Category 4-A	Rivers and streams with impaired use other than mercury, TMDL completed
Category 4-B	Rivers and streams impaired by pollutants - pollution control requirements reasonably expected to result in attainment
Category 4-C	Rivers and streams with impairment not caused by a pollutant
Category 5-A	Rivers and streams impaired by pollutants other than those listed in 5-B through 5-D, TMDL required
Category 5-B	Rivers and streams impaired for bacteria only, TMDL required
Category 5-C	Waters impaired by atmospheric deposition of mercury
Category 5-D	Rivers and streams impaired by legacy pollutants

Source: MDEP, 2014

4.5.1.2.2 Historic Water Quality Data

In the recent past, many segments of the Lower Androscoggin River near the Project have been monitored by several organizations (including water quality data collection) as part of the following programs:

- MDEP 2010 Lower Androscoggin River Basin Water Quality Study Modeling Report;
- Volunteer River Monitoring Program (VRMP); and
- Dioxin Monitoring Program (DMP) fish toxic information and Surface Water Ambient Toxics (SWAT).

The existing water quality monitoring data indicates that the Project Area meets the Class C water quality classification. Figure 4.5.1.2.2-1 provides a map of the water quality monitoring locations. The water quality data from these monitoring programs is summarized below.

MDEP 2010 Lower Androscoggin River Basin WQ Study Modeling Report

In 2010, MDEP implemented a water quality sampling program for the Lower Androscoggin River to determine if the section of river from Worumbo Dam to Merrymeeting Bay could be expected to meet criteria for reclassification from Class C to Class B. Waters were sampled during low flow, high temperature conditions in 2010 on July 13 to 16 and August 2 to 5 (MDEP, 2011).

This data was used to help develop a Water Quality Analysis Simulation Program[3] water quality model for the freshwater section of the river from a location just downstream of the Little Androscoggin River in Auburn, through the Project Area, to below the Brunswick Project. Sampling locations were chosen to also incorporate point source discharges from Publicly Owned Treatment Works (POTWs); Lewiston-Auburn Water Pollution Control Authority, and the Lisbon Wastewater Treatment Facility. The model was used to simulate effects of nutrients and other pollutants on the Androscoggin River during low river flow and maximum licensed discharge from the POTWs to predict water quality conditions during a 7Q10 low flow (occurring 7 consecutive days, once every 10 years) (MDEP, 2011).

Sampling locations near the Project included:

- S-858, 3.15 miles upstream of the Pejepscot Dam in the Little River 0.2 miles from Androscoggin mainstem;
- S-956, 0.45 miles upstream from the Pejepscot Dam in the impoundment;
- S-A47, just upstream of the Pejepscot Dam in the impoundment; and
- S-954, about 0.15 miles downstream of the Pejepscot Dam.

[3] The Water Quality Analysis Simulation Program was developed by the EPA and is a commonly used model to interpret and predict water quality responses to natural phenomena and manmade pollution.

Macroinvertebrates were analyzed at S-956 and S-954 in July and August of 2010 (MDEP, 2011 & MDEP, 2016b). Field collected water quality data from the macroinvertebrate analysis deployment indicated water temperatures between 22.3 and 25.2ºC, DO levels between 7.2 and 7.9 mg/L, and specific conductivity between 79 and 103 us/cm.

Based on field sampling and modeling, MDEP stated that the Pejepscot Dam river segment exhibits DO concentrations that met the Class C criterion. Due to the increased depth and volume, MDEP stated that the impoundment creates a slower moving body of water, decreasing reaeration rates and potentially allowing organic sediment to accumulate. MDEP stated that a narrow diurnal range is the result of greater depths and lower oxygen (MDEP, 2011).

The Aquatic Life Classification Attainment study, also performed by MDEP for the 2011 model report, indicated that the upstream Worumbo Impoundment, and the Pejepscot Impoundment itself, had aquatic communities that met Class C criterion, as indicated by communities of macroinvertebrates collected at these locations. Alternatively, at the sampling location downstream of the Project, aquatic communities attained Class B aquatic life criteria due to the majority of organism's present being sensitive to organic pollution (MDEP, 2011).

Volunteer River Monitoring Program 2010 - 2015

DO, temperature, pH, specific conductance, and *E. coli* are currently monitored along the Androscoggin River by the VRMP. Friends of Merrymeeting Bay (FOMB) joined the VRMP in 2009. Monitoring is generally performed once a month from May to September or October at 8 different locations (MDEP, 2016c).

Sample locations which the FOMB monitor regularly within the Project Area include the Pejepscot boat launch and Fish Park Upstream, data is also occasionally monitored at Fish Park Downstream:

- Pejepscot Boat Launch is in the impoundment about 850 feet downstream of the Little River confluence and half a mile below the Worumbo Project;
- Fish Park Upstream is in the impoundment, just upstream of the Pejepscot Dam; and
- Fish Park Downstream is about 330 feet downstream from the Pejepscot Dam.

Water quality data for each of these locations, from 2010 to 2015 were obtained from Mary-Ellen Dennis (VRMP Program Coordinator). Figure 4.5.1.2.2-1 shows each of the 3 the locations in relation to the Project.

Based on the monitoring by the VRMP for Pejepscot Boat Launch, Fish Park Upstream, and Fish Park Downstream the lowest DO measurements observed for all 2010 and 2015 VRMP monitoring were 6.3 mg/L and 72.2%. Both *E. coli* criteria (instantaneous geometric mean concentration of 236 Most Probable Number (MPN)/100 ml, or 126 MPN/100 ml maximum average between May 15 and September 30) were met for 2010 through 2015 data at Fish Park Upstream and Fish Park Downstream. The Pejepscot Boat Launch exceeded the 236 MPN/100 ml instantaneous maximum on May 18, 2014 with a sample concentration of 435 MPN/100 ml. However, the duplicate concentration for this sample was 48 MPN/100 ml (Dennis, 2017). The water quality samples were usually collected 3 feet below the surface of the water but were also collected at 1.5 feet or mid-depth from the bank (if non-wadeable) or via wading (Dennis, 2017).

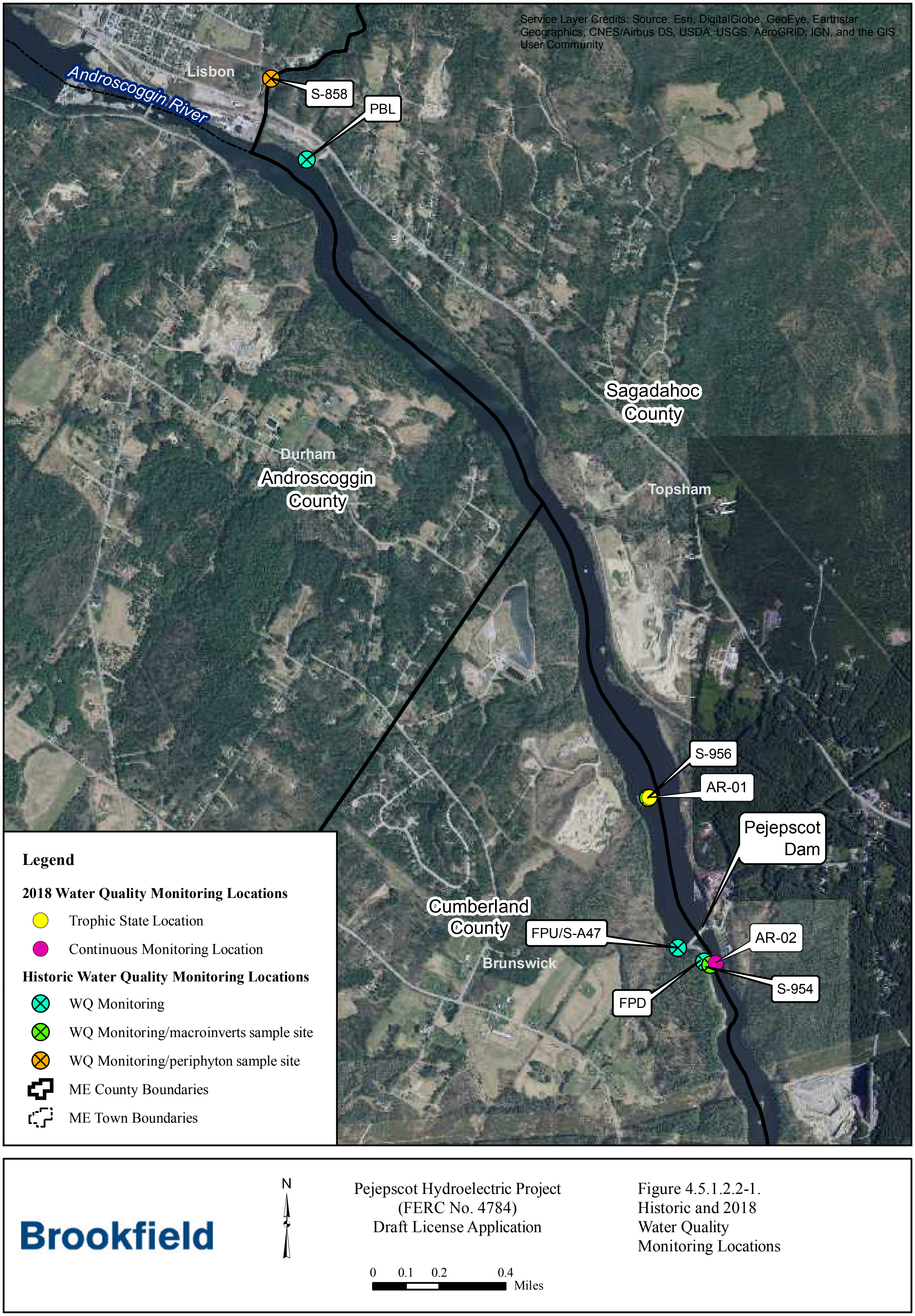
At the Fish Park Upstream location, vertical profiles were recorded twice a day, once in the morning and once in the afternoon during each of the July and August 2010 field sampling events. The depth of the Fish Park Upstream profile location ranged from 13 to 18 feet with measurements taken roughly every 3 feet, starting near the water's surface. Recorded parameters include specific conductivity, pH, DO concentration, and DO saturation. A secchi depth was also recorded during each profile. Results of the Fish Park Upstream vertical profiles indicate that the water column is well-mixed with little, if any variation in temperature, pH, DO or specific conductivity for July and August. Specific conductivity remained the most consistent for each profile with no change in concentration over depth. DO concentration remained above 7 mg/L and DO saturation remained above 87.9% in each profile. Temperature ranged from 24.3 to 27^{o}C and pH ranged from 7.0 to 7.5. Secchi depths ranged from approximately 9.8 ft. to 12.5 ft. (MDEP, 2016c).

Dioxin Monitoring Program fish toxic information and Surface Water Ambient Toxics

The DMP has been in place since 1987 (as per 38 MRSA §420-A). It was merged with the SWAT monitoring program in 2007 for dioxin monitoring. Dioxins and furon congeners have been monitored in fish tissue where rivers have been suspected to receive dioxin-related discharge pollution. Fish sampling locations along the Androscoggin River that have been monitored under this program include locations between Gilead, ME (near the border of NH) downstream to Lisbon, ME (bordering the northern end of the Pejepscot Impoundment) (MDEH, 2008).

Sources of dioxin contamination within the Androscoggin River watershed include industrial discharges from paper mills, other municipal and industrial effluents, and nonpoint sources such as landfill leaches, runoff and spills (MDEP, 1990). Re-suspending sediments may affect dioxin levels as dioxins tend to associate with solids and may accumulate in soil.

The Maine Center for Disease Control and Prevention Division of Environmental Health (MDEH) advises eating just 6 to 12 fish meals a year if the fish have been caught in the Androscoggin River from Gilead (ME/NH border) to Merrymeeting Bay due to chemical contamination that may include high levels of PCBs, Dioxins, or DDT (MDEH, 2013). They also recommend limiting or eliminating the consumption of fish, especially older fish or fish higher in the food chain, due to mercury contamination in all of Maine's freshwater bodies.



Brookfield

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 4.5.1.2.2-1.
Historic and 2018
Water Quality
Monitoring Locations

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4.5.1.2.3 2018 Water Quality Monitoring

In 2018 as part of the relicensing of the Pejepscot Project, Topsham Hydro conducted the following water quality assessments: (1) trophic state study of the Pejepscot impoundment, and (2) riverine sampling of the Project tailwater. The objectives of the water quality study was to (1) collect periodic water quality data in the Project impoundment, and (2) collect continuous water temperature and DO data in the Androscoggin River downstream of the Project dam during low flow, warm water temperature conditions (Topsham Hydro, 2019a). Figure 4.5.1.2.2-1 shows each of the two sampling locations in relation to the Project.

The results of the 2018 study indicate that water quality at the Project was within MDEP's state water quality standards (Topsham Hydro, 2019a).

Impoundment Sampling

Water temperatures and dissolved oxygen were relatively uniform throughout the water column within the Project impoundment, which resulted in no summer stratification (Figure 4.5.1.2.3-1 – 4.5.1.2.3-3). Over the study period, water temperature within the Project impoundment ranged from 12.0ºC (October) to 26.9ºC (August). DO concentrations ranged from 7.0 mg/L (July) to 9.9 mg/L (October) and were above the minimum state standard for Class C waters (5.0 mg/L). The DO percent saturation in the Project impoundment ranged from 82.2 percent (July) to 103.6 percent (September) throughout the monitoring period. The DO percent saturation in the Project impoundment exceeded the established state standard of 60 percent saturation for Class C waters.

Total phosphorus ranged from 13 to 23 ug/L with an average 19 ug/L. Total phosphorus levels were below the proposed state standards upper limit of 33 ug/L for Class C waters. Color ranged from 28 to 46 platinum cobalt units (PCU), with an average of 35 PCU suggesting that the impoundment was slightly colored. Chlorophyll-a ranged from 0.001 mg/L to 0.004 mg/L, with an average of 0.003 mg/L. Chlorophyll-a was below the proposed state standard upper limit of 0.008 mg/L. Total alkalinity ranged from 14 mg/L to 22 mg/L, with an average of 18 mg/L. Water bodies with alkalinity values less than 10 mg/L are considered poorly buffered. pH ranged from 6.9 to 7.2, with an average of 7.1. All pH values were within the recommended range of 6.0 to 8.5 for Class C waters. Secchi disk transparency ranged from 2.42 to 4.66 meters, with an average of 3.98 meters. The secchi disk transparency was above the proposed standards of 2.0 meters throughout the sampling period (Table 4.5.1.2.3-1).

Total phosphorus, chlorophyll-a, and secchi disk transparency are often used as indicators of trophic state, or the biological productivity in a water body, particularly a lake. An oligotrophic lake is characterized as having low productivity, a mesotrophic lake has medium productivity, and a eutrophic lake is highly productive. The Project impoundment has relatively low levels of nutrients and does not support high densities of algal populations. Sampling data suggest that the Project impoundment is mesotrophic (Maine Trophic State Index of 36).

Table 4.5.1.2.3-2 lists the concentrations of metals and nutrients from the August 21, 2018 sampling event within the Project impoundment. Iron (0.27 mg/l) and chloride (9.1 mg/l) concentrations were below the established state standards, which are 1 mg/l and 230 mg/l, respectively. Aluminum (0.050 mg/l) was below the standard of 0.087 mg/l. All other parameters do not have an established standard.

Riverine Sampling

The water temperature in the Project tailwater ranged from 16.8ºC (October) to 27.3ºC (August) with an average of 23.5ºC. DO concentrations in the Project tailwater ranged from 7.8 (August) to 9.7 mg/L (October) with an average of 8.5 mg/L. Observed concentrations were above the minimum state standard for Class C waters (5.0 mg/L). DO percent saturation ranged from 94.3 to 106.2 percent with an average of 99.6 percent. These values were above the minimum state standard of 60 percent saturation for Class C waters.

Table 4.5.1.2.3-1: Epilimnetic Core Sample Results

Sample Date	Sample Time	Total Phosphorus (ug/l)	Chlorophyll-a (mg/l)	Total Alkalinity (mg/l)	Color (PCU)	pH	Secchi Disk (meters)
6/27/2018	11:50	19	0.004	18	28	7.1	3.91
7/13/2018	12:07	23	0.003	22	32	7.1	3.89
7/24/2018	13:55	19	0.003	20	32	7.0	4.11
8/7/2018	10:04	19	0.002	14	42	6.9	3.55
8/21/2018	10:27	20	0.002	14	46	6.9	4.30
9/4/2018	11:05	19	0.002	17	30	7.2	4.63
9/17/2018	11:11	13	0.001	18	29	7.2	4.66
10/2/2018	13:25	20	0.002	22	34	7.0	4.34
10/18/2018	12:25	21	0.004	17	40	7.1	2.42
	Average	**19**	**0.003**	**18**	**35**	**7.1**	**3.98**
	Median	**19**	**0.002**	**18**	**32**	**7.1**	**4.11**
	Minimum	**13**	**0.001**	**14**	**28**	**6.9**	**2.42**
	Maximum	**23**	**0.004**	**22**	**46**	**7.2**	**4.66**

Table 4.5.1.2.3-2: Late Summer Sampling Parameter Concentrations in the Project Impoundment, August 21, 2018

Parameter	Units	Value
Nitrate	mg/l	0.14
Dissolved Organic Carbon	mg/l	7.1
Specific conductance	µS/cm	83
Chloride	mg/l	9.1
Sulfate	mg/l	7.6
Total dissolved aluminum	mg/l	0.05
Total Calcium	mg/l	4.6
Total Iron	mg/l	0.27
Total Magnesium	mg/l	0.87
Total Potassium	mg/l	1.0
Total Silica (calculated)	mg/l	4.8
Total Sodium	mg/l	9.8

Figure 4.5.1.2.3-1. Water Temperature Profiles at the Pejepscot Impoundment - 2018

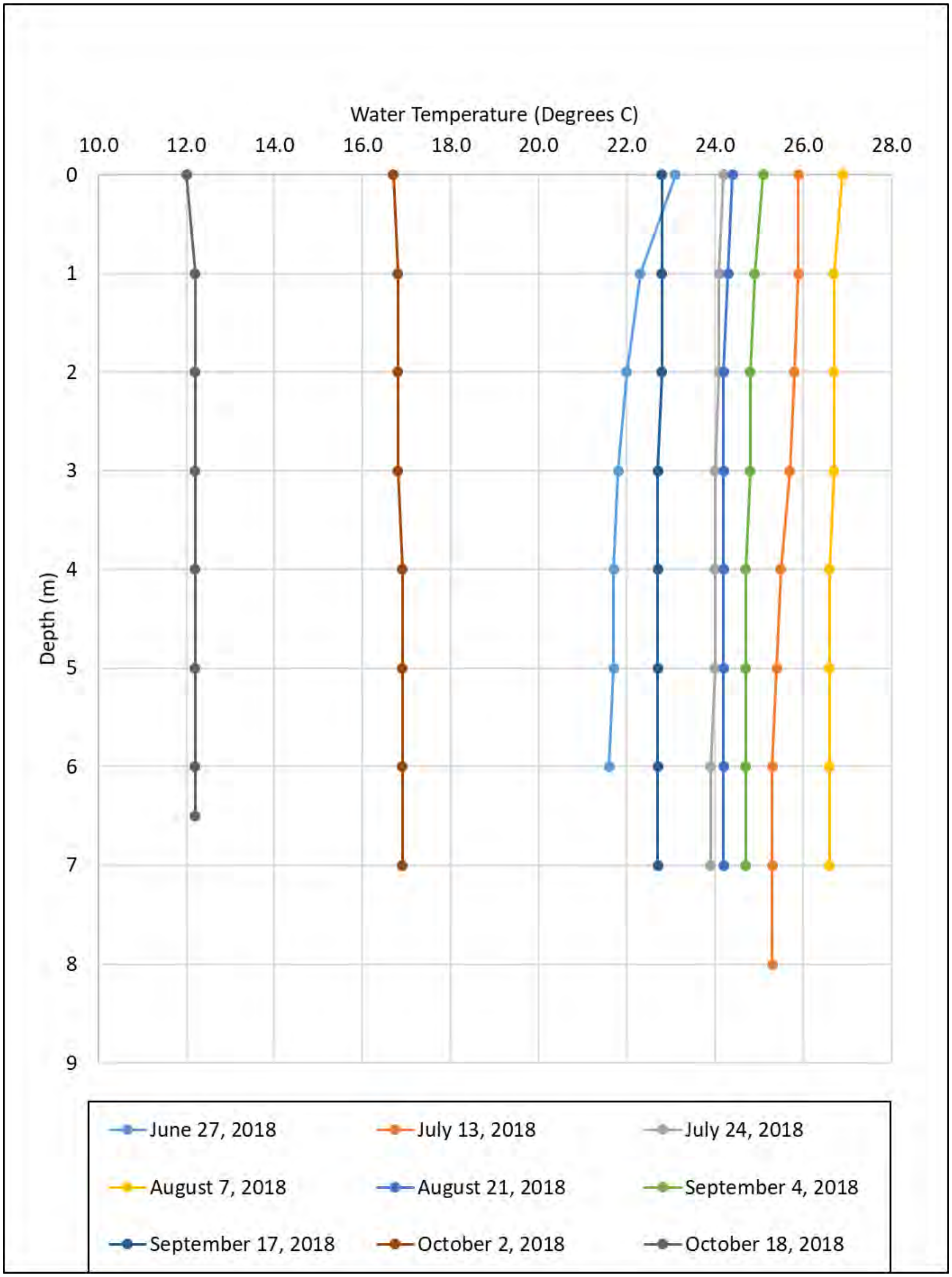


Figure 4.5.1.2.3-2. Dissolved Oxygen Profiles at the Pejepscot Impoundment - 2018

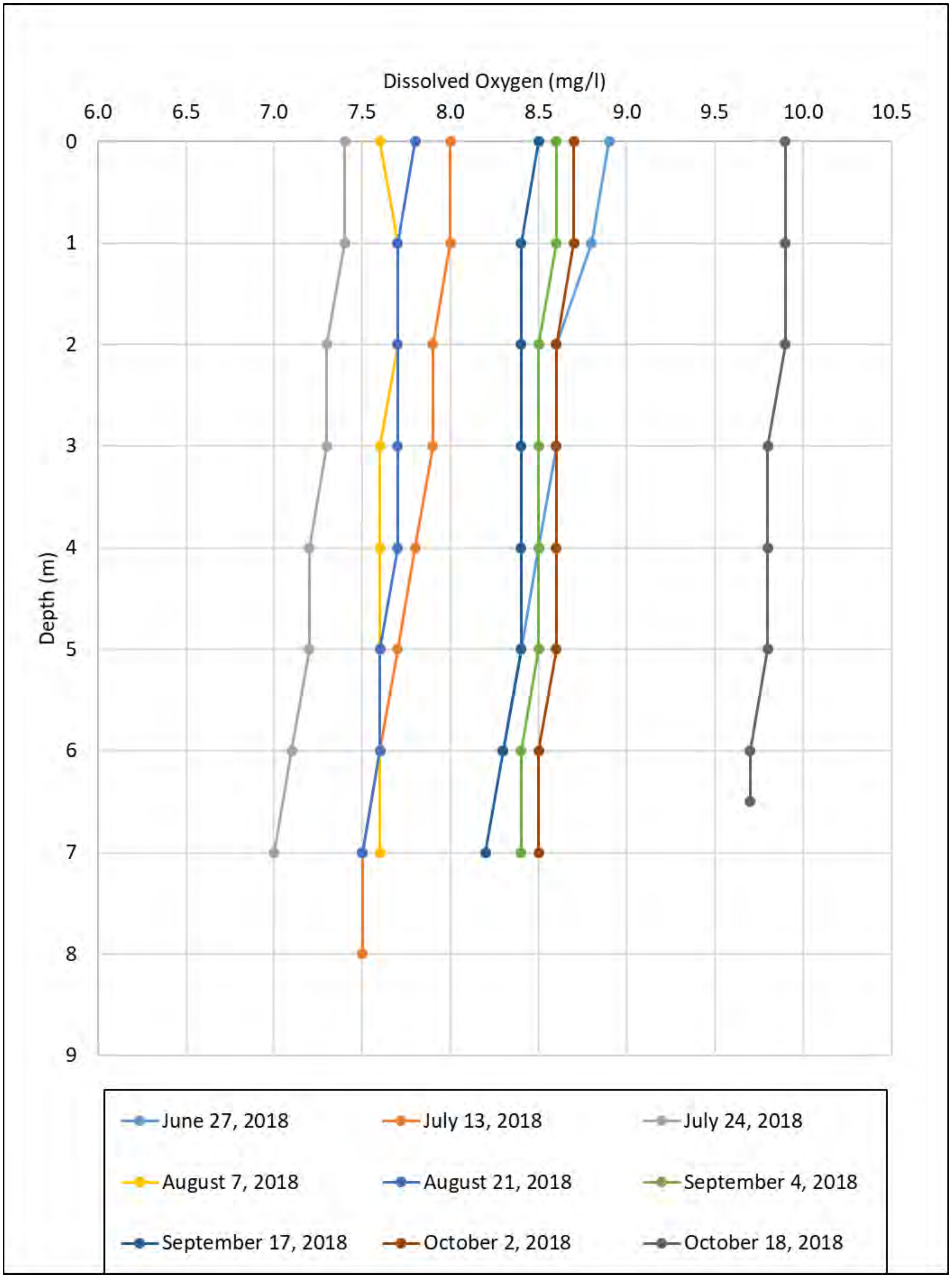
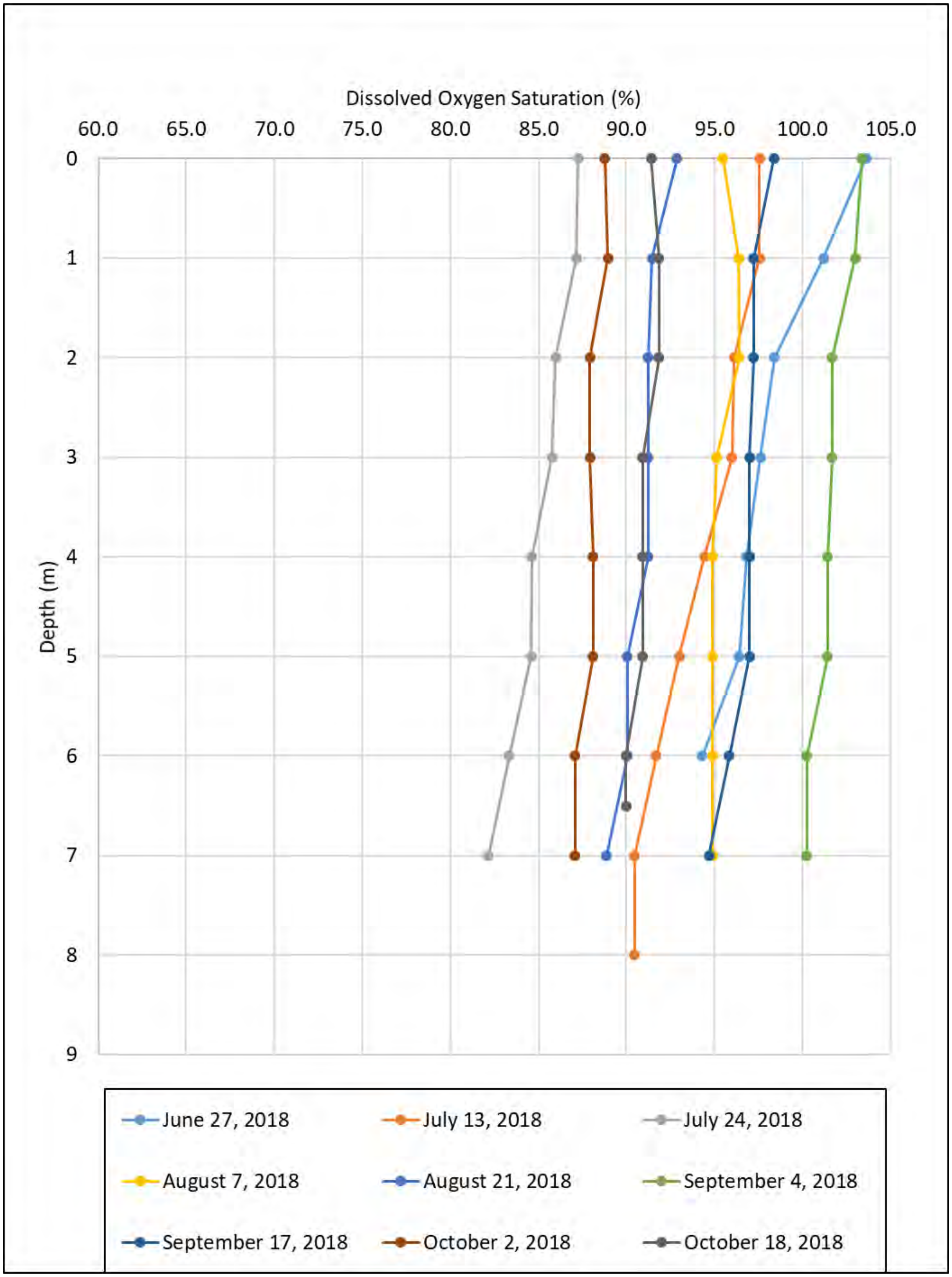


Figure 4.5.1.2.3-3. Dissolved Oxygen Percent Saturation Profiles at the Pejepscot Impoundment - 2018



4.5.1.2.4 2018 Benthic Macroinvertebrate Study

In 2018 as part of the relicensing of the Pejepscot Project, Topsham Hydro conducted a survey of benthic macroinvertebrates in the tailwater of the Project. The goal of the study was to determine if the attainment of Class C habitat and aquatic life criteria is being met in the river reach below the Project dam. The survey objective was to determine the composition of the benthic macroinvertebrate community within the tailrace reach of the dam in accordance with MDEP protocols (Topsham Hydro, 2019b).

Macroinvertebrate samplers were installed at the sampling location downstream of the Pejepscot Dam on August 2, 2018 and were retrieved 27 days later on August 29, 2018. In general, aquatic habitat in the area approximately 660 feet downstream of the Project was primarily a mix of boulder (<10 inch) and rubble (3-10 inch) substrates. Areas of filamentous algae were present on the substrate at the sampling location during both deployment and retrieval of the samplers.

A total of 1,707 individuals representing 43 taxonomic classifications were collected from the three samplers deployed downstream of Pejepscot (Table 4.5.1.2.4-1). Caddisfly species (genus *Hydropsyche*) and the black fly (genus *Simulium*) were the two most dominant members of the benthic macroinvertebrate community and combined to make up approximately 50% of the total number of specimens.

Metrics evaluating community tolerance/intolerance revealed that sensitive genera comprised a measurable proportion of the macroinvertebrate community downstream of Pejepscot. Members of the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT) are considered particularly sensitive to pollution and can provide information important to the condition of the benthic macroinvertebrate community. Individuals from the EPT assemblage were present at the downstream sampling location, comprising 66.3% of the total number of specimens collected.

In addition to evaluation of the EPT contribution to the community, each taxonomic group was assigned a value of tolerance using classifications provided by MDEP. Tolerance values (range = 0-10) were further classified as Intolerant (i.e., sensitive to water quality; values = 0-3), Semi-tolerant (i.e., intermediate in their tolerance to water quality; values = 4-6) or Tolerant (i.e., low sensitivity to water quality; values 7-10). Genera classified as Intolerant to poor water quality comprised 27% of the total number of genera observed at the downstream sampling location (replicates 1-3, combined). Individuals belonging to taxonomic groups considered to be tolerant of low water quality represented only 2.6% of all specimens enumerated at from the samplers located downstream of Pejepscot.

The Hilsenhoff Biotic Index (HBI) rating provides an estimate of the overall tolerance of the community in the sample area. For the sampling location downstream of Pejepscot this value was estimated at 4.19. Values for the HBI index range from 0 to 10 with lower values reflecting a higher abundance of sensitive groups. The estimate for the Pejepscot macroinvertebrate community is supportive of a water quality rating of “very good”.

Taxonomic and habitat information were provided to MDEP on November 28, 2018 after which MDEP returned a Classification Attainment Report on November 30, 2018. The final determination indicated that the macroinvertebrate community sampled downstream of Pejepscot during August 2018 exceeded Class C standards.

Table 4.5.1.2.4-1. Summary of Macroinvertebrate Metrics for Replicates Collected Downstream of Pejepscot, August 2018

Metric	Sample Location 1			
	Rep. 1	Rep. 2	Rep. 3	All
Total Number of Individuals	576	191	940	**1,707**
Total Number of Taxa	29	29	35	**43**
Number of EPT Taxa	16	20	20	**22**
Number of Ephemeroptera Taxa	5	7	8	**9**
Number of Plecoptera Taxa	1	2	2	**2**
Number of Trichoptera Taxa	10	11	10	**11**
Percent EPT	73.4%	85.3%	58.1%	**66.3%**
Percent Ephemeroptera	24.0%	30.9%	10.5%	**17.3%**
Number of Intolerant Taxa	7	10	10	**12**
Percent Tolerant Organisms	3.7%	3.1%	1.9%	**2.6%**
Percent Dominant Taxon	30.9%	23.6%	31.8%	**30.6%**
Hilsefhoff Biotic Index (HBI)	4.24	4.25	4.14	**4.19**
HBI Water Quality Rating	Very Good	Very Good	Very Good	**Very Good**
Shannon Diversity (base e)	2.58	2.71	2.29	**2.55**

4.5.1.2.5 Historical Macroinvertebrate Data

The macroinvertebrate community plays an important role in the composition of an aquatic ecosystem. Macroinvertebrates are a food source for the fishery and other aquatic resources that may be present. Benthic macroinvertebrates are aquatic insects, mollusks, arthropods, snails and other organisms that reside on the bottom of waterbodies. Various taxa groups have wide ranges of pollution tolerances, resulting in macroinvertebrate community composition used as an indicator of water quality. Seventeen common taxa groups of benthic macroinvertebrates have been documented in Maine as part of water quality biomonitoring (Table 4.5.1.2.5-1).

For the majority of benthic macroinvertebrates, there is limited distribution data available, however, dragonflies, damselflies, and freshwater mussels have had specific surveys completed for the creation of a statewide atlas. Other benthic macroinvertebrate data was collected by the Maine Department of Environmental Protection’s Biological Monitoring Program, which assess the health of rivers, streams, and wetlands as part of the Water Classification Program. In the vicinity of the Project, the most recent sampling effort was performed in 2010 at two locations.

Table 4.5.1.2.5-1: Common Types of Benthic Macroinvertebrates in Maine

Common Name	Order
Flatworms	Tubellaria
Aquatic Earth Worms	Oligochaeta
Leeches	Hirudinea
Snails	Gastropoda
Clams & Mussels	Bivalvia
Mites	Acariformes
Aquatic Sow Bugs	Isopoda
Scuds	Amphipoda
Crayfish & Shrimps	Decapoda
Mayfly Larvae	Ephemeroptera
Dragonfly & Damselfly Larvae	Odonata
Stonefly Larvae	Plectopera
True Bugs	Hemiptera
Dobsonfly & Alderfly Larvae	Megaloptera
Water Beetles	Coleoptera
Caddisfly Larvae	Trichoptera
True Fly Larvae	Diptera

Aquatic Insects

Within the Project Area, recent MDEP sampling efforts focused on a location in the Project Impoundment and a riverine location downstream of the Project (S-956 and S-954, respectively). The impoundment and downstream sampling locations had diversity indices that were similar, though the overall macroinvertebrate abundance at the downstream location was considerably higher (Table 4.5.1.2.5-2). Additionally, the downstream location also exhibited higher EPT tolerance, and dominant taxa included *Chimarra*, *Macrostemum*, *Maccaffertium*, *Hydropsyche,* and *Acerpenna*. In the impoundment, the dominant taxa included *Stenacron*, *Oecetis*, *Amnicola*, *Tribelos, and Maccaffertium*. Generic richness, which was defined as "the number of different genera found in all replicates from one sampling site", was similar between the impoundment and downstream locations.

Though the samples were collected as part of water quality biomonitoring, the differences in the macroinvertebrate community between the impoundment and downstream locations is also a function of habitat. The sampling location in the impoundment was deeper, with slow or imperceptible flow and primarily sand substrate. Alternatively, the downstream sampling location was characterized by swift flow and primarily rubble/cobble substrate.

Table 4.5.1.2.5-2: Macroinvertebrate Reported Variables

Variable	Impoundment (S-956)	Downstream (S-954)
Total Mean Abundance	75.33	956.0
Generic Richness	36.0	37.0
Ephemeroptera Mean Abundance	18.0	278.0
Shannon-Wiener Generic Diversity	4.16	3.91
EPT Generic Richness	10.0	21.0
Top Five Dominant Taxa	Stenacron Oecetis Amnicola Tribelos Maccaffertium	Chimarra Macrostemum Maccaffertium Hydropsyche Acerpenna
Dominate Substrate	Sand	Rubble/Cobble

Source: Maine DEP 2010

Dragonflies and Damselflies

Damselflies (Zygoptera) and Dragonflies (Anisoptera) have aquatic and terrestrial life stages. Eggs are deposited in or close to water and several larval growth stages occur before the final metamorphosis into adults. In the 2010 biomonitoring macroinvertebrate surveys discussed above, four genera (Argia, Enallagma, Gomphus, Boyeria) of dragonflies or damselflies were identified in the vicinity of the Project. A Maine Damselfly and Dragonfly Survey (MDDS) was formally conducted between 1999 and 2005, with additional volunteer records added between 2006 and 2016. This dataset provides a county level overview of Damselflies and Dragonflies that may be present in the Project Area. The Maine Damselfly and Dragonfly Survey identified a total of 158 species in 58 genera present in the state. Of the 158 species, 94 species are found in Androscoggin County, 106 species are found in Cumberland County, and 68 species are found in Sagadahoc County. Sixty-three species are found in all three counties. Of the 63 species, there are a total of ten species listed on the Maine Species of Special Concern List, and only one is present in all three counties (MDDS, 2016). Table 4.5.1.2.5-3 displays the ten Species of Special Concern odonates that may be present in the Project Area.

Table 4.5.1.2.5-3: Odonate Species of Special Concern Present in Counties Adjacent to the Project

Common Name	*Scientific Name*	Odonate Type	County
New England bluet	*Enallagma laterale*	Damselfly	Androscoggin/Cumberland
Scarlet bluet	*Enallagma pictum*	Damselfly	Androscoggin/Cumberland
Swamp darner	*Epiaeschna heros*	Dragonfly	Cumberland
Lilypad clubtail	*Arigomphus furcifer*	Dragonfly	Cumberland
Cobra clubtail	*Gomphus vastus*	Dragonfly	Cumberland
Southern pygmy clubtail	*Lanthus vernalis*	Dragonfly	Cumberland
Extra-striped snaketail	*Ophiogomphus anomalus*	Dragonfly	Androscoggin/Cumberland/Sagadahoc
Pygmy snaketail	*Ophiogomphus howei*	Dragonfly	Androscoggin/Cumberland
Common sanddragon	*Progomphus obscurus*	Dragonfly	Cumberland
Arrowhead spiketail	*Cordulegaster obliqua*	Dragonfly	Cumberland

Freshwater Mussels

Freshwater mussels are considered a conservation priority by state and federal agencies due to their role in aquatic food webs, water quality, and nutrient cycling (Nedeau *et al*., 2000). Distribution data was provided by the mussel surveys that were conducted between 1992 and 1997 for the statewide atlas. Freshwater mussels, which are sedentary and found in shallow or shoreline benthic habitats, are dependent on specific freshwater fish species that act as hosts during their larval developmental stage. Mussel larvae (glochidia) are released into the water column and attach to the host (Nedeau *et al*., 2000).

In the Lower Androscoggin River, eight native freshwater mussel species were documented during the statewide mussel atlas surveys (Nedeau *et al*., 2000). These species include: eastern pearlshell, triangle floater, creeper, eastern floater, alewife floater, eastern elliptio, eastern lampmussel, and tidewater mucket. The tidewater mucket is listed as threatened in Maine, and the Creeper is considered a Species of Special Concern. Table 4.5.1.2.5-4 provides detailed information for the species that may exist in the Project Area.

Table 4.5.1.2.5-4: Project Area Freshwater Mussels

Common Name	Scientific Name	Host	County	Substrate	Aquatic Environment	Status
Eastern pearlshell	*Margaritifera margaritifera*	Atlantic Salmon, Landlocked Salmon, Brook Trout, Brown Trout	Androscoggin	Firm sand/ gravel/cobble	Cool fast-flowing mountain streams, small rivers	Not Listed
Triangle floater	*Alasmidonta undulata*	Common Shiner, Blacknose Dace, Longnose Dace, Pumpkinseed Sunfish, Fallfish, Largemouth Bass, Slimy Sculpin, White Sucker	Androscoggin / Sagadahoc	Sand/gravel	Streams, rivers, lakes, ponds Tolerates standing water	Not Listed
Creeper	*Strophitus undulatus*	Largemouth Bass, Creek Chub, Fathead Minnow, Bluegill, Longnose Dace, Fallfish, Golden Shiner, Common Shiner, Yellow Perch, Slimy Sculpin, two-lined salamander, Atlantic Salmon	Androscoggin / Sagadahoc	Sand/fine gravel	Streams, rivers and sometimes impounded river sections	Special Concern
Eastern floater	*Pyganodon cataracta*	White Sucker, Pumpkinseed Sunfish, Threespine Stickleback, carp, Bluegill	All Maine Counties	Sand/mud/deep silt/soft substrates	Slow-moving portions of riverine environments, small streams, ponds, lakes	Not Listed
Alewife floater	*Anodonta implicata*	Alewife, American Shad, Blueback Herring	Androscoggin / Sagadahoc	Silt/sand/gravel	Streams, rivers, lakes	Not Listed

Common Name	Scientific Name	Host	County	Substrate	Aquatic Environment	Status
Eastern elliptio	*Elliptio complanata*	Yellow Perch, Banded Killifish, Largemouth Bass	All Maine Counties	Clay/mud/sand/ gravel/cobble	Small streams, large rivers, freshwater tidal, ponds, lakes	Not Listed
Eastern lampmussel	*Lampsilis radiate radiata*	Yellow Perch, Largemouth Bass, Smallmouth Bass, Black Crappie, Pumpkinseed Sunfish	Androscoggin / Sagadahoc	Sand/gravel	Small streams, large rivers, ponds, lakes	Not Listed

Source: Nedeau et al., 2000; Pers. Comm. Ethan Nedeau, 8/18/2017

4.5.2 Environmental Analysis

FERC's SD2 identified one potential resource issue relating to water resources, which is discussed in greater detail below.

Effects of continued project operation on water quality from the project headwaters downstream to the Brunswick dam (issues denoted with an asterisk [*] are to also be considered for cumulative effects).

Based on available data, the Project has no adverse impacts on river water quality in either the impoundment or the tailwater area and is currently meeting Class C water quality standards both upstream and downstream of the dam and powerhouse. Profile data indicated that the Project impoundment does not stratify; DO concentrations were well above the minimum state criterion (5.0 mg/L) throughout the water column. Trophic data indicated that the impoundment is mesotrophic; therefore, it is unlikely to experience water quality problems typically associated with more productive systems (i.e., algal blooms and oxygen depletion). Similarly, tailwater monitoring demonstrates that the Androscoggin River downstream of the Project dam and powerhouse meets Class C water quality standards for temperature and DO.

Macroinvertebrate community sampling in the Project tailwater further demonstrated that the Project and its operation have little or no impact on the aquatic community. Macroinvertebrate community indices demonstrate that the structure and function of the aquatic community is well maintained and indicative of a healthy aquatic community expected to occur in areas of natural habitat. These results were supported by MDEP's macroinvertebrate community model, which determined the aquatic community exceeded Class C waters standards.

4.5.2.1 Cumulative Effects

In SD2, water quality was identified as a resource that could be cumulatively affected by the proposed continued operation and maintenance of the Project. The geographic scope for water quality was identified as the reach from the Project headwaters downstream to the Brunswick dam.

Based on data from the 2018 water quality study, Project operations do not adversely affect dissolved oxygen concentrations and other water quality parameters in the Androscoggin River upstream or downstream of the Project dam. Topsham Hydro's proposal to operate the Project in a run-of-river mode and provide the minimum downstream flow is not expected to result in cumulative impacts to water resources.

The Project does not result in local impacts to the water quality of the Lower Androscoggin River and, therefore, does not impact the Androscoggin River Basin downstream of the Project. The Proposed Actions of the Project, in combination with other activities within the watershed, will not alter this condition for the reasonably foreseeable future.

4.5.3 Proposed Environmental Measures

Topsham Hydro is proposing the following PME measures to protect water resources.

- Operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates; and
- Maintain a minimum flow of 1,170 cfs, or inflow, whichever is less downstream of the Project.
- Implement an Operations Monitoring Plan (Appendix E-3).

Studies conducted by Topsham Hydro demonstrated that the Project and its continued operation do not adversely affect water resources. Therefore, Topsham Hydro is not proposing additional PME measures specific to water resources within the Project.

4.5.4 Unavoidable Adverse Effects

The continued operation of the Project will not result in new impacts to water resources.

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4.6 Aquatic Resources

4.6.1 Affected Environment

4.6.1.1 Fish Assemblage

The fish assemblage in the Androscoggin River reflects natural and anthropogenic gradients from its upper reaches in New Hampshire to the tidal waters near Brunswick, Maine (Yoder *et al*., 2006). Upstream of Rumford Falls (approximately 75 miles upstream of the Project), the river is referred to as the Upper Androscoggin. This section is managed for recreational cold-water salmonid fishing by the States of Maine and New Hampshire within their respective borders. Though wild populations of Brook Trout (*Salvelinus fontinalis*) and Rainbow Trout (*Oncorhynchus myskiss*) contribute to the fishery, it is dependent upon annual stocking of Brook Trout, Rainbow Trout, Brown Trout (*Salmo trutta*), and landlocked Atlantic Salmon (*Salmo salar sebago*) (Brautigam and Pellerin, 2014).

Downstream of Rumford Falls, including the Project Area, the fish assemblage consists primarily of a warmer-water community, with a greater prevalence of lentic species. Additionally, American Eel (*Anguilla rostrata*) were documented at most locations downstream of Gulf Island Dam, including areas in the vicinity of the Project (Yoder *et al*., 2006). Anadromous migrants such as Atlantic Salmon (*Salmo salar*), American Shad (*Alosa sapidissima*), Alewife (*Alosa pseudoharengus*), Blueback Herring (*Alosa aestivalis*), Striped Bass (*Morone saxatilis*), and Sea Lamprey (*Petromyzon marinus*) are seasonally present in the lower reaches, as a result of fish passage facilities, stocking, and trap and transport programs (Brown *et al*., 2006). The historic extent of upstream passage for shad and herring has been reported to be Lewiston Falls (approximately 17.5 miles upstream of the Project), with some American Eel, Atlantic Salmon, and possibly Sea Lamprey having passed as far upstream as Rumford Falls. However, according to Taylor, 1951, the Androscoggin River may never have been a shad river because of impassable falls at Brunswick, which is located 4.7 miles downstream of the Project.

Electrofishing surveys were performed along 1.0 km of shoreline at each of three sites in the vicinity of the Pejepscot Project by Yoder *et al*., (2006) in late July of 2003. Because of the timing of the surveys, data would primarily be representative of the resident fish assemblage. Overall, 16 species were captured from the areas downstream of Worumbo Dam to the areas downstream of Pejepscot Dam, and relative abundance varied between the sites sampled (Table 4.6.1.1-1). Overall, the catch was dominated by cyprinids and/or centrarchids. The highest abundance was observed in the impoundment, primarily due to large numbers of Spottail Shiner (*Notropis hudsonius*) captured there. All alosines captured in the surveys were young-of-the-year. Because many individuals collected during the surveys were small or juvenile fish, biomass by species shows a different pattern, with Smallmouth Bass (*Microperus dolomieu*) and White Sucker (*Catostomus commersonii*) dominating the overall fish biomass in the riverine areas upstream of the Project Impoundment and below the Project. Smallmouth Bass and Yellow

Perch (*Perca flavescens*), followed by Redbreast Sunfish (*Lepomis auritus*) dominated the fish biomass in the Project Impoundment (Table 4.6.1.1-2).

Though Northern Pike (*Esox lucius*) were not represented in high abundance during the 2003 survey, they have become established in the main-stem Androscoggin River downstream of Turner, ME, and also within many lakes in the watershed over the last 20 years (Brown *et al*., 2006; B. Lewis, MDIFW, pers. comm., 12/13/2016). As a top predator, they have the potential to alter the fish community in the Androscoggin River and also provide recreational fishing opportunities. Fishing reports from message boards and guide services would indicate that populations have expanded such that they provide recreational open water and ice fishing opportunities in the lower main-stem Androscoggin River. According to MDIFW, Northern Pike are well-established, with the river producing some trophy-sized fish (B. Lewis, MDIFW, pers. comm. 12/13/2016). Black Crappie (*Pomoxis nigromaculatus*) are another non-native species that has expanded populations within the Lower Androscoggin (B. Lewis, MDIFW, pers. comm. 12/13/2016); though this species is not a top predator, it may also provide additional recreational fishing opportunities. Additionally, White Catfish (*Ameiurus catus*) have been documented in the fishway at Brunswick Dam, and if populations expand in the Lower Androscoggin, changes to the fish community may occur.

The presence of most diadromous species at the Project can be inferred from passage at the Brunswick Project downstream (Table 4.6.1.1-3), though not all individuals that pass at Brunswick may reach the Project. Diadromous fish that have been captured and counted at the Brunswick Fishway are typically passed upstream into the Brunswick headpond or are transported to a number of areas within the watershed upstream of the Pejepscot Project, depending on the species. Approximately 20,000 river herring are trapped and trucked to upstream locations at the Brunswick Project. The remaining balance of river herring and all other species are passed upstream to the headpond, where they can ascend to the Pejepscot Project Area. Abundance of diadromous fish at the Brunswick Fishway varies from year-to-year.

Currently, fisheries within the Project Area are limited to recreational fishing. River herring are harvested in some areas of Maine for use by the commercial lobster fishery as bait in lobster traps but no directed municipal commercial harvest areas for alosines are present on the Androscoggin River (ASMFC, 2016a). American Eel commercial harvest, in the form of glass eel and elver fisheries, are operating in the State of Maine, but would typically be focused on tidal water areas and would not occur at the Project.

Table 4.6.1.1-1: Abundance of Fish in the Androscoggin River in the Vicinity of the Pejepscot Project

Species	Number of Fish (n/km)				Relative Abundance		
	Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)		Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)
Alewife (*Alosa pseudoharengus*)	288	21	91		44.9%	1.8%	13.9%
American Eel (*Anguilla rostrata*)	2	-	3		0.3%	-	0.5%
American Shad (*Alosa sapidissima*)	-	-	33		-	-	5.0%
Chain Pickerel (*Esox niger*)	2	9	-		0.3%	0.8%	-
Common Shiner (*Luxilus cornutus*)	1	10	-		0.2%	0.8%	-
Fallfish (*Semotilus corporalis*)	5	25	303		0.8%	2.1%	46.2%
Golden Shiner (*Notemigonus crysoleucas*)	-	15	-		-	1.3%	-
Largemouth Bass (*Microperus salmoides*)	1	5	-		0.2%	0.4%	-
Northern Pike (*Esox lucius*)	-	1	-		-	0.1%	-
Pumpkinseed Sunfish (*Lepomis gibbosus*)	5	4	-		0.8%	0.3%	-
Redbreast Sunfish (*Lepomis auritis*)	110	112	111		17.1%	9.5%	16.9%
Smallmouth Bass (*Micropterus dolomieu*)	189	47	95		29.4%	4.0%	14.5%
Spottail Shiner (*Notropis hudsonius*)	2	773	4		0.3%	65.5%	0.6%
White Perch (*Morone americana*)	1	-	-		0.2%	-	-
White Sucker (*Catostomus commersonii*)	25	4	16		3.9%	0.3%	2.4%
Yellow Perch (*Perca flavescens*)	11	154	-		1.7%	13.1%	-

Species	Number of Fish (n/km)				Relative Abundance		
	Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)		Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)
All Species	**642**	**1180**	**656**		**100.0%**	**100.0%**	**100.0%**

Source: Yoder et al. (2006)

Table 4.6.1.1-2: Biomass of Fish in the Androscoggin River in the Vicinity of the Pejepscot Project

Species	Biomass of Fish (kg/km)				Relative Biomass		
	Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)		Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)
Alewife (*Alosa pseudoharengus*)	0.5	0.04	0.15		2.0%	0.2%	0.4%
American Eel (*Anguilla rostrata*)	1.24	-	1.4		5.1%	-	4.0%
American Shad (*Alosa sapidissima*)	-	-	0.01		-	-	0.0%
Chain Pickerel (*Esox niger*)	0.01	2.43	-		0.0%	9.6%	-
Common Shiner (*Luxilus cornutus*)	0	0.02	-		0.0%	0.1%	-
Fallfish (*Semotilus corporalis*)	0.01	0.62	2.98		0.0%	2.4%	8.6%
Golden Shiner (*Notemigonus crysoleucas*)	-	0.25	-		-	1.0%	-
Largemouth Bass (*Microperus salmoides*)	0	0.01	-		0.0%	0.0%	-
Northern Pike (*Esox lucius*)	-	0.08	-		-	0.3%	-
Pumpkinseed Sunfish (*Lepomis gibbosus*)	0.12	0.23	-		0.5%	0.9%	-
Redbreast Sunfish (*Lepomis auritis*)	2.22	4.27	4.85		9.1%	16.8%	13.9%
Smallmouth Bass (*Micropterus dolomieu*)	13.08	6.93	10.56		53.3%	27.3%	30.3%

Species	Biomass of Fish (kg/km)				Relative Biomass		
	Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)		Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)
Spottail Shiner (*Notropis hudsonius*)	0	1.21	0.03		0.0%	4.8%	0.1%
White Perch (*Morone americana*)	0	-	-		0.0%	-	-
White Sucker (*Catostomus commersonii*)	7.08	2.77	14.83		28.9%	10.9%	42.6%
Yellow Perch (*Perca flavescens*)	0.27	6.56	-		1.1%	25.8%	-
All Species	**24.53**	**25.42**	**34.81**		**100.0%**	**100.0%**	**100.0%**

Source: Yoder et al. *(2006)*

Table 4.6.1.1-3: Adult Diadromous Fish Captured at the Brunswick Fishway, 2000-2019.

Year	Atlantic Salmon	American Shad	River Herring	Striped Bass	Sea Lamprey	American Eel
2000	4	88	9,551	95	0	3
2001	5	26	18,196	0	0	5
2002	2	11	104,520	8	3	2
2003	3	7	53,732	4	6	0
2004	12	12	113,686	1	8	2
2005	10	0	25,896	18	0	0
2006	6	3	34,239	75	0	9
2007	21	6	60,662	2	10	4
2008	18	1	92,359	3	19	2
2009	24	0	44,725	0	15	0
2010	9	22	39,689	0	28	0
2011	44	0	54,886	1	19	2
2012	0	11	170,191	3	125	108
2013	2	16	69,104	103	26	100
2014	4	0	55,678	1	45	201
2015	2	53	71,887	1	129	1
2016	7	1,123	121,010	46	132	-
2017	0	1	49,923	2	21	3
2018	0	32	179,040	9	13	1
2019	1	63	81,025	25	48	1

4.6.1.2 Diadromous Species and Fish Passage

4.6.1.2.1 Diadromous Species

Diadromous is a term for describing a species that utilizes both saltwater and freshwater habitats to complete their life cycle. Of the diadromous fish, most are anadromous, meaning that they mature in saltwater but return to freshwater to spawn. Alternatively, catadromous describes a life cycle whereby spawning occurs in saltwater and progeny grow to maturity in freshwater. Further, when all individuals die after spawning, the species is considered to be semelparous; when individuals may survive and return to spawn again, the species is considered to be iteroparous.

Recent fish passage records for the Brunswick Dam indicate that Atlantic Salmon, American Shad, river herring (Alewife and Blueback Herring), Striped Bass, Sea Lamprey, and American Eel utilize the lower Androscoggin River (BWPH, 2016). Though no formal fish passage exists for American Eel at the Brunswick Dam, they have been documented at the Brunswick Fishway and throughout much of the Lower Androscoggin during fisheries surveys (Yoder *et al*., 2006). Atlantic Sturgeon (*Acipenser oxyrhynchus*) and Shortnose Sturgeon (*Acipenser brevirostrum*) are present below the Brunswick Dam, but are not to be passed upstream if captured at the Brunswick Fishway and are therefore not expected to be found at the Pejepscot Project.

Atlantic Salmon

Atlantic Salmon are native to the North Atlantic Ocean; in the western Atlantic, they range from Iceland, southern Greenland, and Ungava Bay, Quebec to the Connecticut River (Danie *et al*., 1984). In the U.S., they historically ranged from Maine to Long Island Sound, but the Central New England and Long Island Sound Distinct Population Segments have been extirpated (NMFS, 2012a). They are an anadromous, iteroparous species. After two years at sea, they average approximately 28-30 inches in length and 8-12 pounds, and can reach 30 pounds (DSF, 2015). Spawning adults return home to their natal rivers and stream, from the spring through fall with peak upstream migration from May through mid-July in Maine (NMFS, 2012a). They spawn in the late fall, and will build nests in suitable substrate. The most suitable substrate is highly permeable gravel and cobble (NMFS, 2012a). Those that return to freshwater after only one year at sea are called “grilse”, and are considered 1-sea-winter fish. Older fish are referred to by the number of winters they have been at sea (i.e. 2-sea-winter, 3 sea-winter). They build nests (redds) in gravel/cobble areas of moving water, and the eggs overwinter, hatching in March/April. After fry emerge from the substrate, they disperse from the redds and feed and grow, developing into a juvenile salmonid (parr). The parr will typically grow for 1-3 years in freshwater, and undergo a physiological transformation that prepares them for life in saltwater, known as smoltification, after which they develop into smolts and emigrate to the ocean during the springtime (NMFS, 2012a). They will reach Newfoundland and Labrador by mid-summer, and spend their first winter at sea to the south of Greenland (DSF, 2015). Some will return to Maine rivers as grilse the following spring, but the majority will continue migrating and feeding to the south of Greenland and along the Labrador coast (DSF, 2015). Most fish will return to

Maine to spawn after their second winter at sea. Post-spawn fish will overwinter in the river as "kelts", and will emigrate the following spring.

Atlantic Salmon are a federally endangered species. The Project Area is within the Gulf of Maine Distinct Population Segment (GOM DPS) as part of the Merrymeeting Bay Salmon Habitat Recovery Unit. The critical habitat designation for the Androscoggin River extends from its confluence with the Kennebec River upstream to Lewiston, with the Lower Androscoggin and Little Rivers designated as sub-basins. Historically, Atlantic Salmon may have passed upstream as far as Rumford Falls. Most of the highest quality habitat for Atlantic Salmon in the Androscoggin River watershed is currently inaccessible, and low quality habitat scores have been assigned to the Lower Androscoggin River areas where the Pejepscot Project is located, though the area is considered an important migration corridor (NMFS, 2012a; NASCO, 2009). No spawning or rearing habitat is expected to occur in the Project impoundment or tailwater areas (NMFS, 2012a; NASCO, 2009).

The numbers of Atlantic Salmon returning to the Androscoggin River have been very low in recent years, and Atlantic Salmon are considered extirpated in waters to the south of the Androscoggin River watershed (NMFS, 2012a). However, returns are currently so low, and the prevalence of hatchery origin fish so high, that the wild population of Atlantic Salmon in the Androscoggin River are essentially no longer present as well.

Atlantic Salmon stocking in the Androscoggin River watershed has been very limited relative to many other large river systems in the GOM DPS, with approximately 18,000 fry stocked since 2001 (USASAC, 2015), the majority of which were stocked into the Little River annually by school groups. Other than this limited stocking, there are no stocking programs or active restoration programs for Atlantic Salmon on the Androscoggin River. The fish entering the fishway at Brunswick are often assumed to be strays from other coastal rivers such as the Penobscot (ASRP, 2015). Since the year 2000, salmon returns at the Brunswick Fishway have ranged from 0 to 44 fish per season, with only 16 salmon captured there from 2012 through 2019 (Table 4.6.1.1-3). The majority of fish returning have typically been 2-sea-winter fish of hatchery origin (Figure 4.6.1.2-1). No 3-sea-winter fish or repeat spawners have been documented since 1999.

Atlantic Salmon passage numbers at the Worumbo Fishway, as reported from years 2003 through 2015, indicate that Atlantic Salmon are passing through the Pejepscot Project (Table 4.6.1.2.1-1). The counts at the Worumbo Fishway do not, however, include fish that may have remained in the Project Impoundment, Worumbo tailwater, or migrated into spawning tributaries such as the Little River. Passage was evaluated at the Project by Maine Department of Marine Resources (MDMR) in 2011; this study found that 43% of the adult Atlantic Salmon passed at the Brunswick Project successfully migrated beyond the Pejepscot Project (MDMR, 2012, as cited in NMFS, 2012b). Nine out of 12 fish that approached the Pejepscot Project passed upstream, for an estimated 75% passage efficiency during that study.

American Shad and River Herring

American Shad are North America's largest species of herring, with spawning populations native to the Atlantic coast from the St. John's River in Florida to the St. Lawrence River in Canada. They are anadromous and iteroparous, though the level of iteroparity varies by latitude with greater survival after spawning and a greater chance of repeat spawning in the northern parts of their range (Limburg *et al*., 2003). In Maine, iteroparity is likely high. They swim into natal rivers to spawn in May and June, and broadcast spawn over suitable substrates, primarily sand, gravel, or a mixture (Limburg *et al*., 2003). Shad will typically make their first spawning run when they are 4-5 years old (Weiss-Glanz *et al*., 1986). Juvenile shad will feed and grow in freshwater habitats until they are triggered primarily by decreasing temperatures to emigrate downstream into estuaries in the late summer and fall (Weiss-Glanz *et al*., 1986). Upon entering the ocean, they will become long-range coastal migrants, with fish originating from different spawning stocks mixing in distinct winter and summer areas. In the summer and fall, they congregate in the Gulf of Maine and the Bay of Fundy (Weiss-Glanz *et al*., 1986). While in the ocean, American Shad filter feed on plankton. Immature shad may also enter estuaries seasonally to feed.

The numbers of American Shad passed at the Brunswick Fishway have ranged from zero to 1,123 fish from 2000-2019 (Table 4.6.1.1-3). It should be noted that the falls at Brunswick may have been an impassible barrier for American Shad, and the Androscoggin River may not have been historically considered a shad river (Taylor, 1951).

River herring is a collective term for anadromous Alewife and Blueback Herring (Fay *et al*., 1983a), both of which are native to Maine, but alewife are typically the most abundant of the two species in Maine waters. Alewife range from Newfoundland to northern South Carolina, whereas Blueback Herring range from Nova Scotia to the St. Johns River in Florida (Fay *et al*., 1983a). They are anadromous, and swim into rivers in the spring to spawn in May and June, with peak spawning of Alewife occurring approximately 2-3 weeks prior to Blueback Herring (Fay *et al*., 1983a). Alewife spawn in a variety of habitats, from mid-river sites to ponds and lakes, whereas Blueback Herring prefer to spawn in areas with current and hard substrates (Fay *et al*., 1983a). River herring are iteroparous, and after spawning, surviving adults migrate back to the ocean relatively quickly. Repeat spawners will return to the same river to spawn again (Fay *et al*., 1983a). Most Alewives have spawned for the first time by four years of age, and mature female Alewives typically produce 60,000 – 100,000 eggs (Fay *et al*., 1983a). After the eggs hatch, the progeny will feed and grow in freshwater habitats before emigrating to estuarine rearing areas in the late summer and fall. Eventually, they will migrate to the ocean where they will mature before returning to freshwater to spawn.

River herring are, by far, the most abundant anadromous fish captured at the Brunswick Fishway (Table 4.6.1.1-3). After being captured, they are transported to locations within the Androscoggin River watershed; during recent years, the number captured at Brunswick has exceeded the MDMR stocking rate targets of 27,358 river herring into 4,562 acres of habitat. Passage facilities are also present at the Pejepscot and Worumbo Projects, allowing fish passed at

Brunswick to migrate as far as Lewiston Falls. Stocking programs of hatchery-reared fish into the watershed since 1983 have also affected abundance and run returns. Based on an Atlantic States Marine Fisheries Commission (ASMFC) estimate, the Androscoggin River could yield 2.3 million fish to the coastal stocks, but only 1/3 of the historic habitat for river herring is currently accessible due to dams without fish passage facilities (ASMFC, 2016a; ASMFC, 2012). The status of the Alewife stock from the Androscoggin River was classified by the ASMFC as stable, with a recent increasing trend, though the status relative to historic levels was classified as unknown (ASMFC, 2012). There is currently no commercial river herring fishery in the Androscoggin River above the head-of-tide. Coast-wide, the Alewife stock is considered depleted (ASMFC, 2016b). Little stock-specific information on Blueback Herring was found, likely due to higher prevalence of alewife in Maine waters.

American Eel

American Eel is the only representative of the family Anguillidae in North America, ranging from the southern areas of Greenland, including all of the U.S. Atlantic coast, and the Gulf of Mexico, southward to the northern portions of the east coast of South America (Facey and Van Den Avyle, 1987). They are catadromous, having been spawned in an oceanic environment in the Sargasso Sea but often living most of their life in freshwater (Facey and Van Den Avyle, 1987). Unlike many of the anadromous species, for which spawning stocks are often segregated by river system, the American Eel population is panmictic, meaning a single population within which individuals from many different areas mix for random mating (Shepard, 2015). Little is known about the exact location of spawning, and is based primarily on the observed distribution of larvae. After hatching, larvae will drift in oceanic currents as planktonic leptocephali before metamorphosing into juvenile eels, commonly known as glass eels due to their lack of pigmentation (Facey and Van Den Avyle, 1987). Glass eels actively swim toward coastal waters, where they will enter estuarine and riverine areas. Some will remain in estuarine waters, but many will swim upstream into freshwater where they may occupy a variety of habitats (Facey and Van Den Avyle, 1987). As they swim upstream, they become pigmented and are typically termed “elvers” when they are still small. As the elvers grow, they are commonly referred to as “yellow eels”. They will reside in freshwater habitats until maturity, which can begin as early as three years, but can take as long as 30 years (Shepard, 2015). When they mature, their body morphology changes to become suited to an oceanic migration, including becoming more robust with a dark gray/silver coloration and enlarged eyes. The spawning migration typically occurs in the late summer or fall in New England and eastern Canada, though migration from lakes that are far inland may occur sooner, such as June – August from Lake Champlain (Facey and Van Den Avyle, 1987). Migration of eels can be initiated by a wide combination of environmental factors (i.e. changing water temperatures, moon phase, photoperiod, atmospheric pressure, turbidity), though runs with the greatest abundance typically occur during periods of increased discharge and low light conditions (Bruijs and Durif 2009). Silver eels may revert back to yellow eels if environmental conditions are not ideal for migration, if migration becomes delayed, or if the fat content of the eel is too low (Shepard, 2015). This species is assumed to be semelparous, with eels dying at sea after spawning given that post-spawn eels have never been observed (Facey and Van Den Avyle, 1987).

The fish assemblage assessment by Yoder *et al*., (2006) found that American Eel were most abundant in the tidal river, downstream of Brunswick Dam. Though eels have been captured in the fishway at Brunswick Dam (Table 4.6.1.1-3), no specific eel passage facilities are operated there, and the existing fishway is not likely to be successful in capturing large numbers of juvenile eel due to their very small size. Eels may also pass the Brunswick Dam by climbing over the spillway, as they often do at many low-head dams. Most eels captured further upstream by Yoder *et al*., (2006) on the Androscoggin River were large specimens. Upstream eel passage measures were installed at the Worumbo Fishway in 2012, after which 17 eels were captured in 2012, 131 eels in 2013, and 25 eels in 2018 according to annual fish passage reports filed with FERC (Miller Hydro, 2013; Miller Hydro, 2014; Brown Bear, 2019); more recent reports were not found.

In 2010, the American Eel was petitioned for listing as threatened under the Endangered Species Act due to coast-wide declines. It was determined that a listing was not warranted in 2015 due to stable populations as a whole (USFWS, 2015a). The stock status of American Eel is considered to be depleted, and quotas restrict the glass eel fishery in Maine (ASMFC, 2016b). Maine has one of the only operating glass eel fisheries remaining in the U.S., with the only other fishery currently in operation in South Carolina (Shepard, 2015).

Striped Bass

Striped Bass range from the St. Lawrence River in Canada to the St. Johns River in Florida along the Atlantic coast, and in areas of the Gulf of Mexico (Fay *et al*., 1983b). They have also been introduced to the North American Pacific coast, and landlocked populations persist in many freshwater impoundments in North America (Fay *et al*., 1983b). On the Atlantic coast, they range from Canada to Florida, but are most prevalent from Maine to North Carolina. They are anadromous and iteroparous. They are a large predatory species, commonly 2-3 feet long and between 10 and 30 pounds, but growing as large as 125 pounds. They swim into rivers and estuaries to spawn in the late spring and early summer. The only known spawning population in Maine occurs in the Kennebec system, due to the large estuarine area in Merrymeeting Bay. After spawning, the eggs drift in currents until they hatch in 1.5 to 3 days. Juveniles will feed and grow in estuaries, typically for at least three years before migrating in the ocean to mature. Females mature in approximately 4 to 6 years (Fay *et al*., 1983b), after which they will return to freshwater to spawn for the first time. Larvae are considered the most important life stage for the future of Striped Bass abundances, given their sensitivity to environmental conditions. High rates of larval success in any given year will yield occasional dominant year classes of adult fish (Fay *et al*., 1983b). After spawning, many fish will leave the spawning grounds and emigrate back to the coastal area, though some may also remain in riverine and estuarine areas through the summer. In the fall, most Striped Bass from New England will migrate south to warmer-water areas off of the mid-Atlantic coast.

Striped Bass are captured at the Brunswick Fishway in relatively low but varying abundance, with zero to 103 individuals counted per season since the year 2000 (Table 4.6.1.1-3). No information was found with regard to stock status in the Androscoggin River specifically, though oceanic stocks as a whole have rebounded from extreme lows in the 1980's. Female spawning stock biomass peaked around 2003 followed by a slow, steady decline, though it remained within the ASMFC targets and the population was classified as "not overfished and overfishing is not occurring" (ASMFC, 2016b). Striped Bass are not currently passed upstream at the Brunswick Project due to concerns about a lack of safe downstream passage for these fish, therefore they would not be currently reaching the tailwaters of the Pejepscot Project.

Sea Lamprey

Sea Lamprey are found on both sides of the Atlantic Ocean, in North America and Europe, including the entire U.S. Atlantic coast as far south as northern Florida, along with areas in the Gulf of Mexico (Kircheis, 2004). They have also become landlocked in many inland waters around the Great Lakes, where they are considered invasive. Sea Lamprey, with respect to the sea-run fish observed at the Project, are anadromous, but unlike the other anadromous species entering the river system, are semelparous and will all die after spawning (Kircheis, 2004). In the ocean, they are predatory and parasitic, latching onto and extracting nutrients and fluids from other fish; however, during their migration into freshwater, they do not feed. Mature adults swim into freshwater habitats in the spring, and typically spawn in late May through early summer in the State of Maine (Kircheis, 2004). They prefer to spawn in areas with flowing water and cobble/gravel substrate, where they modify habitat and build large nests out of gravel and small rocks (Kircheis, 2004). After spawning, the adults die, and the eggs will take approximately 10-13 days to hatch. Larval lamprey (ammocoetes), which lack eyes and teeth, burrow into soft sediments, where they reside and grow, filter feeding for 4-8 years (Kircheis, 2004). They then transform into a juvenile lamprey, developing eyes and working mouth parts, and emigrate to the ocean where they will grow to maturity before returning to spawn after 1.5-2 years at sea (Kircheis, 2004).

Sea Lamprey are passed at the Brunswick Fishway in relatively low but varying abundance, with zero to 132 individuals passed per season since the year 2000 (Table 4.6.1.1-3), with the highest numbers observed during 2015 and 2016. No information on stock status was found, likely because this species has not been important commercially and often received a bad reputation due to its parasitic nature and tendency to become invasive when landlocked in freshwater systems.

Table 4.6.1.2.1-1: Atlantic Salmon reported at the Worumbo Fishway, 2003-2018 (Brown Bear, 2019)

Year	Atlantic Salmon Passed
2003	1*
2004	1
2005	0
2006	2
2007	7
2008	2
2009	1
2010	5
2011	3
2012	1
2013	1*
2014	2*
2015	0
2016	0
2017	0
2018	0

*Reported as landlocked salmon

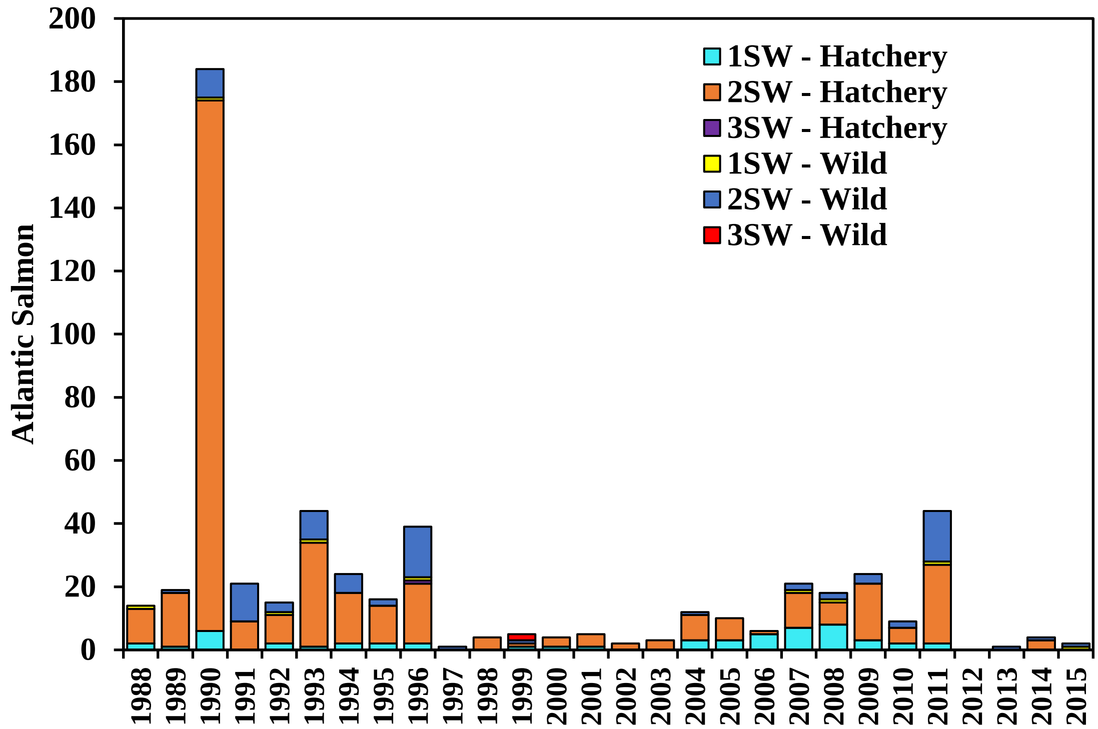


Figure 4.6.1.2.1-1: Atlantic Salmon Captured at the Brunswick Fishway, 1988-2015

4.6.1.2.2 Fish Passage

Several studies have been conducted at the Project to assess both upstream passage effectiveness and downstream passage effectiveness, route of passage, and survival for various diadromous species. These studies were conducted in the early 1990's, shortly after the Project fish lift was constructed, and more recently as part of Topsham Hydro's ESA consultation with resource agencies related to Atlantic Salmon, as well as during the FERC relicensing process. These studies are discussed in more detail below.

4.6.1.2.2.1 Upstream Fish Passage

Atlantic Salmon Upstream Passage Evaluation

Despite low returns to the Androscoggin River, small numbers of adult Atlantic Salmon captured at Brunswick Dam were implanted with radio tags by MDMR for subsequent tracking within the river. This tagging effort was performed in 2013 and 2014.

2013 – Only two adult Atlantic Salmon were captured at the Brunswick Dam. These fish were tagged by MDMR, and were released downstream of Brunswick Dam to evaluate their approach to that fishway. Both fish left the Androscoggin River, migrated to the Kennebec River, and were not available for evaluating passage at the Project (Topsham Hydro, 2014).

2014 – Four adult Atlantic Salmon were radio-tagged by MDMR staff and released upstream of the Brunswick Dam in 2014 (Topsham Hydro, 2015). MDMR performed mobile tracking of these fish, and Topsham Hydro maintained telemetry stations in the forebay and tailrace of the Pejepscot Project to monitor adult upstream passage through the Project. Of the four fish tagged, three were detected in the Project tailrace and one passed upstream of the Pejepscot Project. After release above Brunswick Dam on June 26, 2014, this male salmon spent a considerable amount of time below the Project, milling between the Brunswick and Pejepscot projects prior to passage at Pejepscot on October 3, 2014. It then milled in the upper Pejepscot Project Impoundment and downstream of the Worumbo Project before being tracked into the Little River, where it was observed spawning with an un-tagged female salmon that had passed the Brunswick and Pejepscot fishways undetected. It was confirmed to be in the Project Impoundment by MDMR on December 1, 2014, when this fish was last detected. Two tagged female salmon that were released above Brunswick Dam milled in between Brunswick Dam and Pejepscot, including many movements into and out of the Pejepscot tailrace, but did not pass. One of these fish abandoned migration in the Androscoggin River and swam to the Kennebec River, where it was captured at Lockwood Dam.

Desktop Evaluation of Upstream Passage Effectiveness for Adult Atlantic Salmon

In 2019 as part of the FERC relicensing process, Topsham Hydro conducted a desktop evaluation of upstream passage effectiveness for adult Atlantic Salmon. Studies detailing the timeliness and effectiveness of fish lifts in operation elsewhere in Atlantic Salmon critical habitat in Maine were reviewed. Projects considered included Milford, the first mainstem hydroelectric on the Penobscot River, and Lockwood, the first mainstem hydroelectric on the Kennebec River.

In general, the operation and configuration of the existing Pejepscot fish lift is most similar to the fish lift in operation at Milford. Both structures have 10 foot wide entrances which are located on the shoreline side of the powerhouse and are oriented parallel to the adjacent competing flow. The dam and powerhouse structure at Milford and Pejepscot are positioned linearly with one another. In addition, both structures operate following criteria presented in the most recent USFWS guidelines with regards depth over the entrance weir and entrance/hopper velocities. The lift and project layout at Lockwood differs somewhat from the other two project locations in that the entrance width is slightly narrower. However, the largest difference separating Lockwood from Milford and Pejepscot is the presence of the 1,300 foot long bypassed reach. As a result, the dam and powerhouse structure do not sit linearly across the river but are offset allowing for approaching fish to move past the lift entrance and move upstream into the bypassed reach (Topsham Hydro, 2020).

In general, the fish lift assessments conducted to date for adult Atlantic Salmon at the Milford and Lockwood Projects demonstrate a high overall passage rate coupled with relatively long duration of time from arrival at the Project until recapture. When all adults released at Milford during 2014 and 2015 are considered, 96% of the radio-tagged adults were successfully recaptured at the fish lift. However, values for the median period of residence downstream of the Milford dam following return to the Project area ranged from 1.1 days to 7.8 days depending on the year and investigator (i.e., licensee or the University of Maine). At the Lockwood Project, recapture rates were somewhat lower (79%) and the median period of residence prior to recapture was longer (9.8-16 days) for adult salmon. Based on observations of radio-tagged adult salmon movements within the downstream project area at Lockwood, those rates are very likely a function of false attraction to competing flows present in the extended bypassed reach at that location.

Based on consideration of adult salmon passage study results from elsewhere in Maine as well as the review of the physical and operational designs for those fish lifts relative to the structure at Pejepscot, it is most likely that the Pejepscot fish lift will have a rate of effectiveness for passing adult salmon between that estimated at Milford and Lockwood. Due to the lack of an extended downstream bypass reach it is likely that salmon approaching Pejepscot will pass at a higher rate and in less time than was observed over the two study years at Lockwood. Similarities in entrance width, operating flows, and the spatial layout of the entrance, powerhouse discharge and downstream face of the dam suggest the overall ability of adult salmon to pass at Pejepscot could be similar to the rate observed at Milford. However, it is likely that the time from initial arrival downstream of the Project until recapture in the fish lift at Pejepscot could be longer than durations observed at Milford due to the relative infrequency with which the fish lift is run. The Milford lift runs in an automated mode from 0400 to 2200 with a minimum of two lift events per hour (approximately 36 lift cycles per day). As presently programmed, the lift at Pejepscot runs a total of five lift cycles per day between the hours of 0800 and 1800.

Upstream Passage Evaluation of Alewife

Studies to determine the effectiveness of the Pejepscot fish lift for Alewife were conducted in 1991 and 1992 during non-spill or very limited spill conditions (Charles Ritzi Associates, 1992). Passage rates were determined for five release cohorts based on the success of marked (floy-tagged) Alewife that were tagged at the Brunswick Project, which were then tallied as they passed the Pejepscot fish lift viewing window. Four of the cohorts released were considered suitable for analysis, at an average passage efficiency of 87%. This number was determined to be an underestimate, and resource agencies concluded that the efficiency of the upstream passage facility at the Pejepscot Project was close to the resource agency goal of 90% for Alewife. Rapid passage at Pejepscot was noted, with 90% or greater of the fish passing within 2-6 days of being passed at the Brunswick Project. One of the cohorts exhibited 66% passage from Brunswick through Pejepscot on the first fish lift after release at Brunswick, which was over a span of 20 hours after release

Upstream Passage Effectiveness of Adult River Herring and American Shad

In 2019, Topsham Hydro evaluated the effectiveness of the existing upstream passage facilities for adult American Shad and river herring. Following the release of radio-tagged individuals into the Androscoggin River, their movements were monitored using a series of stationary radio-telemetry receivers in place at the Project as well as at several additional stationary monitoring stations installed at bank-side locations upstream and downstream of the Project to inform on general movements and Project passage success (Topsham Hydro, 2020a).

A total of 102 adult river herring were radio-tagged following collection at the Brunswick fishway during May 2019 and were released into the Androscoggin River for the purposes of evaluating upstream passage at Pejepscot. Four groups of radio-tagged adult herring were released downstream of the Project at the Mill Street boat launch, located approximately 4.35 miles downstream of the Project, over an eight day period from May 22 to May 29. The tagging and release of radio-tagged adult herring downstream of Pejepscot encompassed the range of dates representing the peak of herring returns counted at Brunswick for the 2019 passage season. Each release group of radio-tagged individuals was accompanied by approximately 200 untagged adult river herring. Of the 102 radio-tagged herring released, 79% (81 of the 102) were determined to have approached Pejepscot Dam and were available to assess passage effectiveness of the fish lift.

River herring releases downstream of the Project occurred over four dates between May 22 and May 29, 2019. Ascent from the release location upstream to the Project occurred quickly for most tagged herring (median duration = 10 hours). Spill conditions were present at Pejepscot throughout the tagging and release period with river flows not coming under operational control until early June (June 2, 2019). Tailwater elevation downstream of Pejepscot during that spill period ranged from 43.2-46.4 feet (median = 45.3 feet). Due to the high tailwater elevations, the upstream fish lift was operated manually as conditions permitted. Regardless of tailrace conditions, 93% of radio-tagged adult herring which were determined to have approached the Project were detected on at least one occasion within the entrance to the fish lift. Detections at the Pejepscot lift entrance showed a bimodal distribution with peaks during the hours of 1000 and 1600. The current operational window from 0800 to 1800 encompassed 85% of all detections of radio-tagged river herring at the lift entrance during the 2019 evaluation.

Radio-tagged herring passed upstream of Pejepscot, via the fish lift, over a range of dates from May 25 through June 10 with the majority of those passage events between May 25 and May 30. As a result, spill was present for the duration of the "time at large" for the majority of the river herring which successfully passed upstream. When the cumulative residence duration of tagged river herring downstream of Pejepscot is examined, the competing spill flow attracted most individuals away from the fish lift side for some proportion of time. Radio-tagged adult herring successfully passing upstream at Pejepscot were detected in the tailrace area immediately downstream of the powerhouse and in proximity to the fish lift for an average of 62% of their cumulative residence time, and within the region downstream of the dam spillway for an average of 38% of the time. Radio-tagged adult herring failing to successfully pass upstream at Pejepscot were detected in the tailrace area for an average of 30% of their cumulative residence time, and downstream of the spillway for an average of 70% of the time.

The overall effectiveness of the Pejepscot fish lift for adult river herring passage was estimated at 19.8% (75% CI = 14.8-24.9%). Despite spill conditions during the period of arrival for most radio-tagged river herring at the Project, location and entry into the lower flume of the existing fishway was good (93%).

A total of 129 adult American Shad were radio-tagged following rod and reel collection downstream of the Brunswick Project during June 2019. Tagged shad were trucked and released into the Androscoggin River for the purposes of evaluating upstream passage at Pejepscot. Five groups of radio-tagged adult shad were released downstream of Pejepscot at the Mill Street boat launch, located approximately 4.35 miles downstream of the Project, over a seven day period from June 12 to June 19. Of the 129 radio-tagged adult shad released, 28% (36 of the 129 individuals) were determined to have approached Pejepscot Dam and were available to assess passage effectiveness of the fish lift. The majority of radio-tagged shad released downstream of Pejepscot either partially ascended the approximately four mile reach between release and the Project (22%) or dropped downstream to Brunswick (45%). It is suspected that the extensive handling and transport associated with the use of adult shad from the Androscoggin River downstream of Brunswick negatively affected upstream motivation of test fish during this evaluation.

Releases of radio-tagged American Shad downstream of the Project occurred between June 12 and June 19, 2010. Ascent from the release location upstream to the Project was slower for shad (median duration = 3.3 days) than was observed for river herring (median duration = 10 hours). With the exception of a few relatively short duration spill events, Androscoggin River flows were mostly under operational control during the tagging and release period for shad downstream of Pejepscot. Spill conditions were present at Pejepscot over an approximately four day period immediately following the last release group of adult shad downstream of the Project (June 21-24). During the spring monitoring period, only seven radio-tagged adult shad were determined to have approached the Project and be detected on at least one occasion within the entrance to the fish lift. The current operational window from 0800 to 1800 encompassed 90% of all detections of radio-tagged adult shad at the lift entrance.

There were no recorded upstream passage events for radio-tagged shad during the study period. When the cumulative residence duration of tagged shad downstream of Pejepscot is examined, radio-tagged adult shad were detected in the tailrace area for an average of 1% (range = 0 – 5%) of their cumulative residence time, and downstream of the spillway for an average of 99% (range = 95-100%) of the time. Location and entry into the lower flume of the existing fishway was low for radio-tagged adult shad during this study with only 32% of the individuals detected in the nearfield/tailrace region being subsequently detected at the fish lift entrance. Estimates of internal (i.e., the probability of an adult shad to move from the lift entrance to the lift exit) and overall (i.e., the probability of an adult shad to move from the tailrace/nearfield region to the upstream exit from the fish lift) fish lift effectiveness are 0% due to the lack of observed upstream passage for this species.

2019 Eel Monitoring Surveys

In 2019 as part of the FERC relicensing process, Topsham Hydro conducted juvenile eel monitoring surveys to evaluate the need and potential location for an upstream eel passage facility at the Project.

The study area was restricted to the portion of the Androscoggin River immediately downstream of the Project powerhouse and dam (Figure 4.6.1.2.2.1-1). Areas of specific focus included (1) the spillway as viewed from the east side of the river, (2) the spillway as viewed from the west side of the river (3) the area near the entrance to the upstream fish lift, (4) the wetted area adjacent to the spillway as viewed from the entrance to the counting room, (5) the portion of the upper exit flume associated with the upstream fish lift as viewed from the counting room, and (6) the western shoreline accessed via the Pejepscot Fishing Park canoe portage trail (Topsham Hydro, 2020b).

A total of 14 surveys were conducted over the period from June 17 to August 26, 2019. There were no juvenile eels observed during the visual searches conducted at the Project on any of the survey dates. Survey events were limited to observations of search areas made at distance from several shoreline locations. It is likely that the lack of access within the areas immediately downstream of the Project dam by boat or foot limited the ability to visually detect juvenile eels (Topsham Hydro, 2020b).

As juvenile eels have been documented passing upstream at the Worumbo Project, juvenile eels are present downstream of the Pejepscot Project and some degree of upstream passage at the Project is occurring (Topsham Hydro, 2020b).

4.6.1.2.2.2 Downstream Fish Passage

Atlantic Salmon Smolt Downstream Passage Evaluation (2013-2015)

Radio telemetry tracking studies of Atlantic Salmon smolts were completed in 2013, 2014, and 2015 with the primary goal of evaluating whole-station survival (Topsham Hydro (2014); (Topsham Hydro, 2015); BWPH and BBHP (2016)). The studies incorporated test fish, released upstream of the Project, and control fish, which were released downstream of the Project. Whole-station survival estimates in 2013, 2014, and 2015 were 100%, 91.3%, and 86.3%, respectively; with a 3-year estimate of 92.5%. Passage occurred via different routes, including spill, the downstream fishway, the upstream fishway, and through the powerhouse. The 2014 and 2015 studies differed in the relative number passed through each route, with the majority passing via spill in 2014, and most passing via the powerhouse in 2015 (Tables 4.6.1.2.2.2-1 and 4.6.1.2.2.2-2). Estimated survival was lower through the downstream bypass, but higher through the powerhouse in 2015 relative to 2014. In addition to passage routes and survival, other aspects of migration through the Project were evaluated in 2015, including findings for:

- Temporal Distribution and Diel Timing – Smolts typically passed the Project within 1-2 days after release, primarily during the evening, night, and early morning hours.
- Project Approach Times – Median approach time of 5.3 hours, ranging between 1.9 to 83.8 hours from initial release (2.6 miles upstream of the Project) to detection approximately 656 feet upstream of the dam.
- Project Residence Times – Median residence time of 0.3 hours (ranging from 0.1 to 35.4 hours) from peak signal detection approximately 656 feet upstream of the dam to the last detection through passage routes available. There was no significant difference between residence times for fish passing the Project via Unit 1 versus the downstream bypass fishway.
- Downstream Transit Times – Transit times downstream of the Project for fish passed via different routes did not differ significantly from control fish that were released directly into the tailrace.
- Rates of Movement – Passage did not significantly affect the rate of movement of downstream travel after passage when compared to control fish.

2018 Atlantic Salmon Smolt Downstream Passage Study

During consultation with NMFS after the initial three year (2013-2015) downstream passage study program described above, Topsham Hydro agreed to evaluate downstream passage survival for Atlantic Salmon smolts under modified operational conditions to determine if those operational changes result in project survival estimates which conform to existing take limits. Under the existing SPP period (2017-2022) Topsham Hydro is permitted up to 8% take at the Project (Topsham Hydro, 2019).

Downstream passage survival for Atlantic Salmon smolts at the Pejepscot Project was assessed during spring 2018 using radio-telemetry. Multiple release groups were used to ensure that the study captured a range of Androscoggin River conditions (i.e., flows and temperatures) such that it is representative of the variable conditions that would be faced by naturally-migrating, non-study smolts.

A total of 250 hatchery-reared Atlantic Salmon smolts were surgically tagged and released at two locations on the Androscoggin River during May, 2018. Releases were conducted at the boat launch just downstream of the Lewiston Falls Project, as well as at the Pejepscot boat launch located near the upper extent of the Pejepscot impoundment. Each smolt was equipped with a uniquely coded Lotek radio transmitter. Downstream movements of tagged smolts were monitored via a series of radio receivers installed at fixed locations ranging from the section of the Androscoggin River just downstream of Lewiston Falls to a point approximately 1.9 mi. downstream of Brunswick Dam. Releases were initiated on May 4 and completed on May 14, 2018. (Topsham Hydro, 2019).

During the study, spill flows were provided during the nighttime hours of 2000 to 0700 by opening the bascule gate closest to the powerhouse approximately 50% (~500 cfs). Spill in excess of the 500 cfs was available for nearly the entire downstream passage period at Pejepscot.

Detection information for radio-tagged smolts moving through the Androscoggin River was used to provide information on residence duration within the project area as well as duration and rate of travel through downstream reaches. During the 2018 field study, 92% of smolts that approached Pejepscot passed downstream of the Project within 24 hours of their arrival (Topsham Hydro, 2019). Residence duration values at the Project are comparable to rates observed during previous evaluations (Normandeau 2014; 2015; 2016). During the 2015 study at Pejepscot, 97% of radio-tagged smolts approaching the dam passed within a 24 hour period.

Table 4.6.1.2.2.2-3 summarizes the passage routes radio-tagged Atlantic Salmon smolts used at Pejepscot. Following arrival at the Project during this study, the majority of radio-tagged smolts passed via spill at Pejepscot (41%). The presence of spill flows during the 2018 study likely influenced the probability of smolts passing via that route. Radio-tagged smolts not passing the project on spill utilized Kaplan Unit 1 (31.8%) and the downstream bypass system (14.5%) (Topsham, Hydro 2019).

A paired release-recapture study design was previously used to evaluate Project survival during 2014-2015 and resulted in estimates of 91.3% (2014) and 86.3% (2015) at Pejepscot (Normandeau 2016). The analysis approach was modified for the 2018 study from a paired release-recapture model to a CJS model approach which corrected for background (i.e., natural mortality) in the project reach by incorporating an estimate from radio-tagged Atlantic Salmon smolts passing through an upstream representative reach. Prior to the 2018 study, it was agreed that this representative reach would be located in the stretch of the Androscoggin River downstream of Lewiston Falls and upstream of the Worumbo impoundment. The baseline CJS model relying on the full set of radio-tagged smolts released at all points upstream of the Project is the most robust model as it maximizes the total sample size by relying on all releases and release locations. The point estimates for the adjusted Project survival model were 95.3% (95% Confidence Interval = 90.0-99.8%) (Topsham Hydro, 2019).

Downstream Passage Effectiveness of Adult River Herring and American Shad

In 2019, Topsham Hydro evaluated the effectiveness of the existing downstream fish passage facilities at the Pejepscot Project via radio-telemetry. This effort focused on the downstream passage of radio-tagged adult American Shad and river herring at the Project. Following the release of radio-tagged individuals into the Androscoggin River, their movements were monitored using a series of stationary radio-telemetry receivers in place at the Project as well as at several additional stationary monitoring stations installed at bank-side locations upstream and downstream of the Project to inform on general movements and Project passage success (Topsham Hydro, 2020c).

A total of 99 radio-tagged adult herring were released upstream of the Project at the Pejepscot boat ramp and were monitored for evaluation of downstream passage. In addition to the 99 radio-tagged adult river herring released upstream of the Project, another 16 tagged adult herring released downstream of Pejepscot at the Mill Street boat launch successfully ascended the fish lift and were included in the downstream analysis. When the full time series of detections for all 115 fish was reviewed, a total of 95 radio-tagged adult river herring were determined to have approached the Pejepscot dam and had an opportunity to pass downstream.

Outmigration of radio-tagged adult river herring was observed over a range of dates from May 25 to June 15 with a peak number of events occurring on May 30. The median project residence time prior to downstream passage was 0.9 hours. Of the radio-tagged adult herring that approached Pejepscot Dam, 80% passed in fewer than 24 hours after initial detection and 86% in fewer than 2 days after initial detection. The majority of individuals passed downstream of the dam via Unit 1 (51%) or during periods of spill flow at the bascule gates (27%). Use of the downstream bypass system was observed for 11% of radio-tagged adult river herring. Downstream passage survival for the entire project reach (~650 feet upstream of the dam to the first downstream receiver) was estimated at 80.9% (75% CI = 76.3-85.7%). This estimate of downstream passage survival for adult herring at Pejepscot includes background mortality (i.e., natural mortality) for the species in the project reach, along with any tagging-related mortalities or tag regurgitations. As a result, this estimate should be viewed as a minimum estimate of total project survival (i.e., due solely to project effects) for adult river herring at Pejepscot.

When specific passage routes for adult river herring at Pejepscot are considered, 100% (10 of 10), 85% (22 of 26), and 88% (42 of 48) of individuals respectively passing the dam via the downstream bypass, spill, and Unit 1 were determined to have reached the first receiver below the project. Radio-tagged adult herring which approached Pejepscot but failed to pass downstream (n = 8) represented nearly half of the individual herring lost during the study within the Project reach from the point 650 feet upstream of the dam to the first downstream receiver.

A total of 42 adult American Shad were obtained from the Saco River (Cataract fish lift) and released upstream of the Project at the Pejepscot boat ramp to evaluate downstream passage. Outmigration of radio-tagged adult shad was observed over a range of dates from July 11 to July 22 with a peak number of events occurring on July 17/18. Downstream passage events for radio-tagged shad during those two dates were a function of spill conditions triggered by a brief outage at Unit 1. The median project residence time prior to downstream passage was 5.3 days. Of the radio-tagged adult shad which approached Pejepscot Dam, 9% passed in fewer than 24 hours after initial detection and 26% in fewer than 2 days after initial detection. The majority of adult shad (34%) failed to pass downstream of the Project following their initial detection at the dam. Downstream passage of radio-tagged adult shad which did pass downstream occurred via Unit 1 (31%), spill (26%) and the downstream bypass (9%). Downstream passage survival for the entire project reach (~650 feet upstream of the dam to the first downstream receiver) was estimated at 51.4% (75% CI = 41.6-61.1%). This estimate of downstream passage survival for adult shad at

Pejepscot includes background mortality (i.e., natural mortality) for the species in the project reach, along with any tagging-related mortalities or tag regurgitations. As a result, this estimate should be viewed as a minimum estimate of total project survival (i.e., due solely to project effects) for adult shad at Pejepscot.

When specific passage routes for adult shad at Pejepscot are considered, 33% (1 of 3), 89% (8 of 9), and 82% (9 of 11) of individuals respectively passing the dam via the downstream bypass, spill, and Unit 1 were determined to have reached the first receiver below the project. Radio-tagged adult shad which approached Pejepscot but failed to pass downstream (n = 12) accounted for more losses within the Project reach than did mortality during dam passage.

Downstream Passage Effectiveness of Juvenile Alosines

In 2019, Topsham Hydro conducted an evaluation of the downstream passage effectiveness for juvenile alosines using radio-telemetry during the 2019 fall migration season (October 1 to November 31, 2019). Monitoring of juvenile alosines focused on evaluation of residence time upstream of the project prior to passage and determination of the proportional distribution of use among available passage routes. The study area included the section of the Androscoggin River from RM 6.0 (i.e., the Brunswick Hydroelectric Project (FERC No. 2284) to the upper end of the Pejepscot impoundment located approximately 3.5 miles upstream of the dam (Topsham Hydro, 2020c).

Of the 98 radio-tagged juvenile alosines, 97% continued downstream following handling and tagging and were determined to have approached the Pejepscot Dam. Of those individuals, only one did not pass downstream, resulting in a total of 94 individuals with which to estimate the proportional use of downstream passage routes at the Project. Based on Androscoggin River flows and operational conditions at the station, radio-tagged juvenile alosines approaching Pejepscot during this study were limited to passage via the downstream bypass system, upstream fishway or the operating turbine unit (Unit 1). Although there was spill present during a portion of the overall monitoring period (October 23 to November 5), the onset of that period of spill did not overlap with the presence of any tagged juvenile alosines in the upstream Project area. Under the operational conditions at the Project at the time of arrival for radio-tagged juvenile alosines, the majority passed downstream via the Unit 1 turbine. Downstream bypass effectiveness was estimated at 31% with a nearly even split in entry locations (i.e., entrances adjacent to the Unit 1 intake area to the left or right). Table 4.6.1.2.2.2-4 depicts the distribution of passage routes used by juvenile alosines. Downstream movement for juvenile alosines tagged as part of this study was relatively quick. When the full duration of time from release until arrival at Brunswick (~4.7 miles) is considered, tagged juvenile alosines did so in a median time of 32.4 hours (25^{th} percentile = 21.5 hours; 75^{th} percentile = 50.3 hours).

Downstream Passage Effectiveness of Adult American Eel

In 2019, Topsham Hydro conducted an evaluation of the downstream passage effectiveness for adult American Eel using radio-telemetry during the 2019 fall migration season (October 1 to November 31, 2019). Adult eel monitoring focused on residence time prior to passage, passage route selection and estimation of downstream passage survival at the Project. The study area included the section of the Androscoggin River from RM 6.0 (i.e., the Brunswick Hydroelectric

Project (FERC No. 2284) to the upper end of the Pejepscot impoundment located approximately 3.5 miles upstream of the dam (Topsham Hydro, 2020c).

A total of 50 adult silver eels were obtained from a commercial vendor operating on the St. Croix River, Maine and were transported for evaluation of downstream passage at Pejepscot. All 50 individuals were surgically radio-tagged and were released upstream of the Project on one of two release dates in early October to assess downstream passage. Downstream passage was observed for each of the radio-tagged eels and occurred over a range of dates from October 3 to October 23. The median period of residence for radio-tagged eels upstream of the dam was 2.1 hours with 65% passing downstream within the first 24 hours of their initial detection. Based on Androscoggin River flows and operational conditions at the station, passage route opportunities for radio-tagged adult eels tagged during this study were limited to the downstream bypass system, spillway, upstream fishway or the operating turbine unit (Unit 1). Although there was spill present during a portion of the overall monitoring period (October 23 to November 5), the onset of that period of spill overlapped with the presence of a single tagged eel in the upstream Project area. That individual passed downstream via the spillway shortly after spill flow became available. During the non-spill conditions which characterized the majority of the eel passage period, most radio-tagged eels passed downstream via Unit 1 (Table 4.6.1.2.2.2-5). There were no observations of adult eels passing downstream via the bypass system. Five of the 50 radio-tagged eels which passed downstream at Pejepscot failed to reach the first downstream monitoring station (Station F8). Of the silver eels failing to reach the downstream station, four of the five passed the Project via Unit 1 and the fifth was detected using the upstream fishway. The route-specific estimate of passage survival for silver eels via Unit 1 is 91.7% (75% CI = 87.5-95.8%).

Downstream passage survival for the entire project reach (~650 feet upstream of the dam to the first downstream receiver) was estimated at 90.0% (75% CI =86.0-94.0%). This estimate of downstream passage survival for adult eels at Pejepscot includes any background (i.e., natural) or tagging-related mortality for the species in the reach from the approach receiver to the first downstream receiver. As a result, this estimate should be viewed as a minimum estimate of total project survival (i.e., due solely to project effects) for adult eels at the Project.

4.6.1.2.2.3 Desktop Entrainment and Impingement Study

In 2019 as part of the FERC relicensing process, Topsham Hydro conducted a desktop evaluation of fish entrainment and turbine survival. Target species included American Eel, American Shad, Atlantic Salmon, and river herring. Interactions with the Project for each of the target species and life stages considered during this assessment are unavoidable based on their obligatory seasonal movements (Topsham Hydro, 2020d).

When the calculated minimum exclusion lengths for the target species are considered, all but individuals towards the upper end of the size range for adult Atlantic Salmon, American Eel, and American Shad are susceptible to entrainment based on their ability to fit through trash rack spacing. Intake velocities, a factor impacting involuntary entrainment and impingement, vary depending on the specific unit. The horizontal Francis units have an intake velocity of 0.61 feet per second (fps). At this velocity all target species, regardless of life stage are capable of avoiding involuntary entrainment or impingement. The vertical Kaplan (Unit 1) has an intake velocity of 3.25 fps. Juvenile alosines, unable to produce burst swimming speeds greater than this velocity, are vulnerable to entrainment while all other target species/ life stages are strong enough swimmers to avoid entrainment or impingement.

Survival of entrained fish primarily depends on the size of the individual. A Turbine Blade Strike Analysis (TBSA) assessment was run for fish lengths representative of (1) the size range of target species likely to be present at the Project, and (2) body lengths less than the minimum exclusion length which would be subject to entrainment. The TBSA analysis produced a range of survival estimates for turbine survival through Unit 1. Within that range of estimates, survival increased with decreasing body size, a trend also identified in a review of the 1997 EPRI database by Winchell et al. (2000). TBSA estimates were considered as representative for alosines and Atlantic Salmon but not for American Eel. Desktop estimates of eel passage survival through Unit 1 were performed using a multiple regression equation developed by Alden Labs. Similar to the TBSA, the eel regression analysis also identified a pattern of higher survival with decreasing body size.

A number of radio telemetry studies conducted at Pejepscot have evaluated survival through Unit 1. These studies have included Atlantic Salmon smolts, adult American Shad, adult river herring and adult American Eels. Survival estimates from those studies are presented in Table 4.6.1.2.2.3-1. Passage survival at Unit 1 was higher for eels observed during the 2019 field telemetry evaluation than estimates calculated for similar sized eels using the multiple regression analysis. Adult American Shad and river herring survival rates for Unit 1 estimated during the 2019 spring telemetry study were lower than those calculated during the desktop TBSA assessment. It should be noted that the sample size of adult shad passing downstream via Unit 1 was limited to 11 individuals. The range of estimates for Atlantic Salmon smolt passage downstream through Pejepscot Unit 1 was comparable between the TBSA assessment and previously conducted radio-telemetry evaluations.

A qualitative assessment of entrainment potential and turbine survival was performed for each target species. In general, susceptibility to entrainment is high based on the migratory life histories for each of the target species. However, juvenile alosines were the only species/life stage potentially incapable of avoiding entrainment at the Unit 1 intake due to their relatively limited swim speeds and size relative to the existing trash rack spacing. Although the majority of the target species possess the ability to avoid impingement or entrainment based on burst swim speed estimates, the obligatory migratory requirements for these species may result in voluntary entrainment, particularly during periods of limited to no spill.

Table 4.6.1.2.2.2-1: Summary of Atlantic Salmon Smolt Passage Survival via Different Downstream Passage Routes at the Pejepscot Project, 2014, for all Three Release Groups (Adapted from Table 4, Topsham Hydro (2015))

Passage Route	N	Proportion Passed (%)	Minimum Survival (%)	Portion of River Flow (%)*
Upstream Fishway	1	1.1	100	0.2
Spillway	61	64.9	95.1	32.5
Downstream Fish Bypass	12	12.8	100	0.6
Powerhouse	20	21.3	85	66.7

*Based on average flows recorded at the Project during the study period (May 14 – June 5, 2015)

Table 4.6.1.2.2.2-2: Summary of Atlantic Smolt Passage Survival via Different Downstream Passage Routes at the Pejepscot Project, 2015 (Adapted from BWPH and BBHP, (2016))

Passage Route	Detected (n)	Passed Downstream (n)	Test Survival	Paired-Release Survival (%)*
Upstream Fishway	1	0	0.00	0
Spillway	2	2	1.00	100
Downstream Fish Bypass	15	11	0.73	80
Powerhouse (Unit 1) **	60	51	0.85	92.7

*Calculated as the test survival divided by the tailrace release group survival (0.917) multiplied by 100.
**Reported survival estimate was through Unit 1 only. In total, 76 smolts were reported to have passed through the powerhouse.

Table 4.6.1.2.2.2-3: Summary of Passage Routes at Pejepscot for Radio-tagged Atlantic Salmon Smolts Released at Lewiston Falls and the Pejepscot Boat Launch During Spring, 2018.

Release Group*	Release Date	No. Released	No. Detected	Passage Route					
				Spill	Downstream Bypass	Francis Unit	Unit 1	Unknown Route	No Pass
LF1	4-May	17	10	4	-	-	2	3	1
LF2	6-May	17	12	5	-	-	4	3	-
LF3	8-May	17	14	2	2	-	5	5	-
LF4	10-May	17	11	1	1	-	9	-	-
LF5	12-May	17	11	5	5	-	1	-	-
LF6	14-May	15	10	2	5	-	3	-	-
PJ1	4-May	25	19	13	-	-	5	1	-
PJ2	6-May	25	23	14	-	2	6	1	-
PJ3	8-May	25	18	9	-	1	6	2	-
PJ4	10-May	25	15	8	1	-	5	-	1
PJ5	12-May	25	16	4	6	-	6	-	-
PJ6	14-May	25	14	4	5	1	3	1	-
All Lewiston Falls		100	68	19	13	0	24	11	1
All Pejepscot Launch		150	108	52	12	4	31	5	1
All Releases		250	179	71	25	4	55	16	2
Percentage of Detected			100.0%	41.0%	14.5%	2.3%	31.8	9.2%	1.2%

Table 4.6.1.2.2.2-4: Summary of Downstream Passage Route Distribution for Radio-Tagged Juvenile Alosines at Pejepscot during Fall 2019

Passage Route	No. of Individuals	Percentage
Did not approach	3	-
Did not pass	1	1.1%
Right Bypass	13	13.7%
Left Bypass	16	16.8%
Fishway	0	0.0%
Francis Units	0	0.0%
Unit 1	65	68.4%
Spillway	0	0.0%

Table 4.6.1.2.2.2-5: Summary of Downstream Passage Route Distribution for Radio-Tagged Adult Eels at Pejepscot during Fall 2019

Passage Route	No. of Individuals	Percentage
Fishway	1	2.0%
Unit 1	48	96.0%
Spillway	1	2.0%

Table 4.6.1.2.2.3-1: Survival (%) of Target Species from Radio Telemetry Studies at Pejepscot and from TBSA and Multiple Regression Analysis from Desktop Study

Species	Life Stage	From Pejepscot Telemetry Studies (2015-2019)			Based on TBSA or Multiple Regression	
		# of Fish	Size Range (in)	Survival (%)	Size Range (in)	Survival (%)
American Eel	Adult (silver)	48	26 to 39[1]	91.7% (75% Cl = 87.5-95.8%)	26 to 39	68.2% to 82.9%
American Shad	Adult	11	14 to 23[2]	82%	14 to 23[3]	91.3% to 95.6%
Atlantic Salmon	Juvenile	55/60[4]	6 to 9	92.7% to 100%	6 to 9[5]	96.8% to 97.6%
River Herring	Adult	48	11 to 13[2]	88%	11 to 13[6]	95.5% to 95.6%

1 – From 2019 American Eel fall telemetry study at Pejepscot Project – length range includes all radio tagged fish, not specific to those using U1 for downstream passage.
2 – From 2019 adult American Shad and river herring spring telemetry study at Pejepscot Project – length range includes all radio tagged fish, not specific to those using U1 for downstream passage.
3 – Used TBSA range calculated for 12 and 24 inch fish
4 – Two studies provided survival estimates (2015/2018). The 2015 study estimate used a paired release model while the 2018 study used a CJS model.
5 – Used TBSA range calculated for 6 and 8 inch fish
6 – Used TBSA range calculated for 12 and 14 inch fish.

Brookfield

N

0 37.5 75 150
Feet

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 4.6.1.2.2.1-1:
2019 Locations of Areas Surveyed
During Eel Monitoring Surveys
at the Pejepscot Project

Path: P:\1925\maps\dla\exhibit_e\figure_4_6_1_2_2_1-1.mxd

4.6.1.3 Aquatic Habitat

4.6.1.3.1 Impoundment

The Project boundary upstream of the Pejepscot Dam includes approximately three miles of the Androscoggin River. Upstream of the Project Area, the river flows through the Worumbo Project prior to entering the impoundment. The Pejepscot impoundment has a surface area of 225 acres, and gross storage of 3,278 acre-feet at full pool elevation (El. 67.5 ft.).

The Little River enters the Androscoggin in the furthest upstream areas of the Project Impoundment and is the only major tributary in the vicinity of the Project. The remaining streams (Meadow Brook, Pinkham Brook, two unnamed streams, and an unnamed intermittent stream) entering the Androscoggin River within the Project Area are relatively small and have not been evaluated for habitat suitability.

4.6.1.3.2 Tailwater

The Project does not have a bypass reach. Depending on the river flow and the headpond elevation of the downstream Brunswick Project (which may occasionally backwater to the Pejepscot Dam), the habitat downstream of the dam likely reflects that of a free-flowing section of river until it reaches the Brunswick Impoundment. The river immediately downstream of the dam is approximately 400 feet wide, but quickly narrows downstream to 250-300 feet wide, and is constrained by steep banks. Most of the right bank in the vicinity of the dam is bounded by steep bedrock ledges, and the first ~360 feet of the left bank downstream of the powerhouse consists of bedrock topped with nearly vertical constructed rock walls and concrete walls. Depending on the flow and backwatering effect from the Brunswick Project, most of the downstream areas appear to consist of pool and run habitat, though some shallower riffle areas may be present during certain flow and water level conditions.

Stranding Evaluation Study

In 2018, Topsham Hydro conducted a stranding evaluation study in support of relicensing. The study area for the field survey was focused upon the exposed bedrock area on the right side (looking downstream) of the Project dam, below bascule gate No. 5 (Topsham Hydro, 2020e). The goal of the evaluation was to provide information regarding the potential for fish stranding below the Project spillway. The study objective was to determine if potential stranding pools are present in the ledges immediately below the western end of the Project spillway, after spill operations cease.

The field survey consisted of lowering bascule gate No. 5 to convey all streamflow through the gate, onto the exposed bedrock area below it. After completion of this operation and bascule gate No. 5 was fully lowered, the operation was reversed. Once the reverse operation was complete, the exposed bedrock area on river right was investigated for the occurrence of potential stranding pools. The field survey was photo-documented and videotaped. Figures 4.6.1.3.2-1 through 4.6.1.3.2-4 show the stages of the bascule gate operation (Topsham Hydro, 2020f). Several potential stranding pools were noted in the bedrock outcrop on the right side of the Project dam, below bascule gate No. 5 (Figure 4.6.1.3.2-4).

Figure 4.6.1.3.2-1: Initiation of Bascule Gate Operation

Figure 4.6.1.3.2-2: Bascule Gate No. 5 in Fully Lowered Position

Figure 4.6.1.3.2-3: Exposed Bedrock Area below Bascule Gate No. 5 as Viewed from River Left

Figure 4.6.1.3.2-4: Exposed Bedrock Area below Bascule Gate No. 5 as Viewed from River Right

4.6.1.3.3 Aquatic Habitat Surveys

Habitat in the main-stem river was evaluated by Yoder *et al*., (2006) during the fish assemblage survey in 2003. Each of the sites sampled was assessed using a Qualitative Habitat Evaluation Index (QHEI), whereby the habitat was visually evaluated and based on "good" and "modified" characteristics of lotic habitat. QHEI results from Yoder *et al*., (2006) for the three sites in the vicinity of the Project are shown in Tables 4.6.1.3.3-1 and 4.6.1.3.3-2.

Yoder *et al*., (2006) performed QHEI evaluations at two locations between the Pejepscot and Worumbo Projects and one location in the riverine area downstream of the Pejepscot Project. Of these sites, the furthest upstream location was approximately 3.3 miles upstream of the Pejepscot Project, and was characterized as having all good QHEI attributes, and no modified attributes; as such, this was considered a free-flowing location with good riverine qualities based on the QHEI evaluation. Approximately 2.3 miles upstream of the Pejepscot Project, Yoder *et al*., (2006) evaluated a location that was classified as within the Pejepscot Impoundment; this location was classified as impounded, having slow flow, and no riffle/run habitats, but also possessed good habitat attributes such as extensive to moderate cover, low/normal embeddedness of substrate, and max depths greater than one meter (Tables 4.6.1.3.3-1 and 4.6.1.3.3-2). Approximately 0.4

miles downstream of the Project, Yoder *et al*., (2006) characterized the habitat as riverine, with most of the good habitat attributes and no modified attributes.

Topsham Hydro and Miller Hydro Group completed a habitat survey in the Little River. Most of the lower reach (~6.5 miles) of the Little River was deemed accessible to Atlantic Salmon, though suitable spawning habitat appears to be limited there (HDR, 2011). The area was considered suitable for survival and habitation by Atlantic Salmon, and may provide resting areas in pools for salmon migrating upstream along with rearing habitats, particularly in tributaries. Barriers on the Little River may prevent Atlantic Salmon from migrating to potential spawning areas further upstream (HDR, 2011).

2019 Tailrace Aquatic Habit Study

In 2019 as part of the FERC relicensing process, Topsham Hydro conducted a tailrace aquatic habitat mapping study. The goal of this survey was to gather information on the quality of habitat in the un-impounded river section downstream of the Project dam. The objective included characterizing the aquatic habitat and substrate in the un-impounded downstream reach (Topsham Hydro, 2020f).

The survey was conducted on August 13, 2019 at a river flow of approximately 1,990 cfs, as measured at the Androscoggin River near Auburn, ME USGS streamflow gage (No. 01059000). The aquatic habitat in the un-impounded reach downstream of the Project dam was characterized by mesohabitat types (i.e., riffle, run, pool, etc.) Substrate data (i.e., primary, secondary, and tertiary component types) within the study area were collected based on visual assessment, and delineated using a field computer equipped with GPS and ArcGIS. Areas too deep to evaluate visually, either while wading or using an AquaScope from a boat, were surveyed with probing rods that allowed for substrate identification by feel (Topsham Hydro, 2020f).

Six major mesohabitat categories were identified during the field survey, including backwater, glide, pool, riffle, run, and other. Other was used to denote habitats that were out of the water at the time of the survey. A total of thirty-five individual mesohabitat units were delineated during the field survey. Figure 4.6.1.3.3-1 is a map displaying the location of mesohabitats identified during the field survey. Table 4.6.1.3.3-3 provides information on the percentage breakdown of each mesohabitat type. When possible, maximum and mean depths of each mesohabitat unit were recorded. Maximum depths ranged from less than one foot to fifty feet. (Table 4.6.1.3.3-3)

Primary, secondary, and tertiary substrates for each mesohabitat unit were identified (Table 4.6.1.3.3-4). Of the thirty-five total mesohabitat units, five were unable to have substrate identified (14.3%) due to depth of the mesohabitat unit not allowing for visual observation or probing. Of the remaining thirty mesohabitat units, primary substrates (Figure 4.6.1.3.3-2) were identified: eight were gravel medium (22.9%), seven were cobble (20.0%), six were sand (17.1%), three were complex bedrock (8.6%), three were boulder small (8.6%), two were rubble (5.7%), and one was boulder large (2.9%).

Evidence of potential Sea Lamprey spawning activity was recorded at three locations during the study. All three locations were listed as other, due to being out of water during the summer low-flow period when the survey was conducted (mesohabitat units IDs: 4, 6, and 21). Depressions and mounds of mixed substrates typically cobble, large gravel, small gravel and fine gravel were observed.

Backwaters, pools, and runs made up the majority of mesohabitat identified in the tailrace aquatic habitat survey area. The top three primary substrates identified in the survey area were gravel medium, cobble and sand. Some areas of fine sediments were identified as were areas of mounds and depressions that may represent potential spawning areas.

2019 Largemouth and Smallmouth Bass Spawning Habitat Survey

In 2019 as part of the FERC relicensing process, Topsham Hydro conducted a Largemouth and Smallmouth Bass spawning habitat survey. The goal of the evaluation was to provide information regarding the spawning activities of Largemouth and Smallmouth Bass in the Project impoundment. The study objective was to document bass spawning habitat, and nesting areas with differentiation by species within the Project impoundment. The study area for the field survey was the Project impoundment from the Pejepscot dam boat barrier upstream to the Route 125 Bridge (approximately 600 ft downstream of Worumbo dam) (Topsham Hydro, 2020g).

The field survey took place on June 18, 2019, and visual observations were made by systematically traversing the littoral zone via boat and wading to identify any Largemouth and Smallmouth Bass nests, egg masses/deposits, and spawning habitat (Topsham Hydro, 2020g). A total of 19 individual areas were identified in the Project impoundment as potential bass spawning habitat locations; six of these spawning habitat locations contained nest sites within them. Areas with potential spawning habitat were identified based on habitat suitability criteria such as cover and substrate. Figure 4.6.1.3.3-3 displays the map of recorded nest and potential spawning habitat locations identified during the survey. Thirteen potential spawning habitat locations were located on the left bank (assumes looking downstream) of the Project impoundment and six potential spawning habitat locations were located on the right bank.

There are several suitable spawning habitats in the Project impoundment for bass species, some of which appear to be actively used for spawning. The majority of nest and habitat identified during the survey are presumed to be for Largemouth Bass based on habitat preference. The placement of nests in soft bottom substrate areas (mud, sand, vegetation) are indicators of Largemouth Bass habitat. Only one nest was identified as a possible Smallmouth Bass nest due to the presence of gravel and its location along the impoundment shoreline (as opposed to backwater areas). No bass were observed on the nests, making full identification difficult.

2019 Large Woody Debris Study

To be Included in the FLA

Table 4.6.1.3.3-1: QHEI Results for Good Habitat Attributes at Sites Evaluated on the Androscoggin River in the Vicinity of the Pejepscot Project (Yoder *et al*., 2006)

Good Habitat Attributes	Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)
No Channelization/Recovered	X	-	X
Boulder, Cobble, Gravel Substrates	X	-	-
Silt Free Substrates	X	-	-
Good/Excellent Development	X	-	X
Five or More Substrate Types	X	-	X
Extensive-Moderate Cover	X	X	X
Fast Current/Eddies	X	-	X
Low-Normal Overall Embeddedness	X	X	X
Max Depth > 1m	X	X	X
Low-Normal Riffle/Run Embeddedness	X	-	X

Table 4.6.1.3.3-2: QHEI Results for Modified Habitat Attributes at Sites Evaluated on the Androscoggin River in the Vicinity of the Pejepscot Project (Yoder *et al*., 2006)

Modified Habitat Attributes	Upstream of Project (~3.3 miles upstream)	Project Impoundment (~2.3 miles upstream)	Downstream of Project (~0.4 miles downstream)
Impounded	-	X	-
Channelized or No Recovery	-	X	-
Silt/Muck Substrates	-	-	-
Sparse or No Cover	-	-	-
Max Depth < 70 cm	-	-	-
Recovering Channel	-	-	-
High/Moderate Silt Cover	-	-	-
Fair-Poor Development	-	X	-
Only 1-2 Cover Types	-	-	-
Slow or No Flow	-	X	-
High-Mod Overall Embeddedness	-	-	-
High-Mod Riffle-Run Embeddedness	-	-	-
No Riffle/Run	-	X	-

Table 4.6.1.3.3-3: Distribution of Mesohabitats Types in the Study Area

Mesohabitat Type	Percentage of Total Habitat Area	Total Area (sq. ft.)
Backwater	28.6	390,312
Pool	38.1	520,073
Glide	1.0	14,180
Riffle	6.1	83,136
Run	20.1	274,363
Other	6.1	83,817

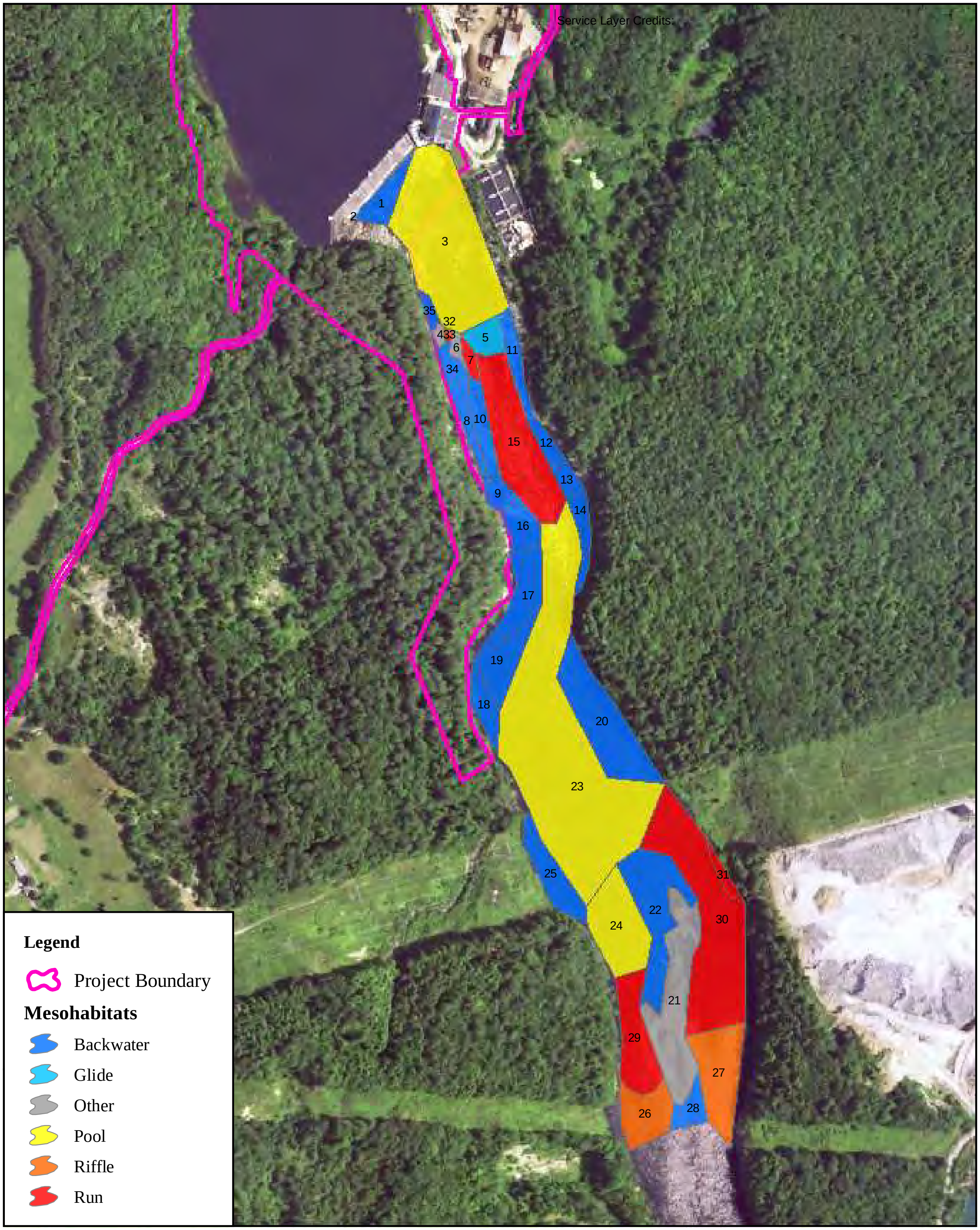
Table 4.6.1.3.3-4: Primary, Secondary, Tertiary Substrate by Mesohabitat Unit

Mesohabitat Unit ID	Mesohabitat Type	Primary Substrate	Secondary Substrate	Tertiary Substrate	Total Area (sq. ft.)	Max Depth (ft)	Mean Depth (ft)
1	Backwater	Sand	Complex Bedrock	Boulder large	18,147	--	12
2	Pool	Complex Bedrock	Boulder large	Sand	153	8	5
3	Pool	--	--	--	157,312	27	15
4	Other	Cobble	Gravel medium	Rubble	2,628	0	0
5	Glide	Cobble	Sand	Boulder small	14,180	8	6
6	Other	Boulder small	Rubble	Boulder large	4,234	--	--
7	Run	Boulder small	Sand	Boulder large	5,226	4	2
8	Backwater	Rubble	Cobble	Boulder small	14,049	5	3
9	Backwater	Complex Bedrock	--	--	8,725	7	3
10	Backwater	Sand	Boulder large	Rubble	18,393	8	6
11	Backwater	Complex Bedrock	Rubble	--	15,979	5	1
12	Backwater	Gravel medium	Cobble	Rubble	9,280	10	6
13	Backwater	Sand	Silt	Cobble	9,211	10	6

Mesohabitat Unit ID	Mesohabitat Type	Primary Substrate	Secondary Substrate	Tertiary Substrate	Total Area (sq. ft.)	Max Depth (ft)	Mean Depth (ft)
14	Backwater	Boulder large	Complex Bedrock	Gravel small	13,661	11	8
15	Run	Boulder small	Sand	--	82,596	16	10
16	Backwater	Rubble	Gravel small	Boulder small	17,924	12	10
17	Backwater	Sand	Silt		33,933	--	10
18	Backwater	Cobble	Gravel small	Sand	16,282	6	3
19	Backwater	--	--	--	27,910	26	15
20	Backwater	--	--	--	68,909	30	15
21	Other	Cobble	Gravel medium	Gravel small	76,956	0	0
22	Backwater	Gravel medium	Cobble	Gravel small	61,292	2	1
23	Pool	--	--	--	306,713	50	35
24	Pool	Cobble	Sand	Gravel medium	55,896	8	6
25	Backwater	Sand	Gravel medium	Cobble	29,239	8	3
26	Riffle	--	--	--	32,814	2	0.5
27	Riffle	Cobble	Gravel medium	Gravel small	49,864	4	1
28	Backwater	Gravel medium	Cobble	Gravel small	13,557	2	0.5
29	Run	Gravel medium	Cobble	Gravel small	44,711	5	3
30	Run	Cobble	Sand	Gravel medium	135,107	8	4
31	Run	Sand	Gravel medium	--	6,095	--	--
32	Riffle	Gravel medium	Cobble	Gravel small	457	1.5	1
33	Run	Gravel medium	Cobble	Gravel small	627	2	1

Mesohabitat Unit ID	Mesohabitat Type	Primary Substrate	Secondary Substrate	Tertiary Substrate	Total Area (sq. ft.)	Max Depth (ft)	Mean Depth (ft)
34	Backwater	Gravel medium	Cobble	Gravel small	9,195	2	1
35	Backwater	Gravel medium	Gravel small	Cobble	4,618	1	0.5

Blanks: Not recorded



Brookfield

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure: 4.6.1.3.3-1:
Delineated Mesohabitats

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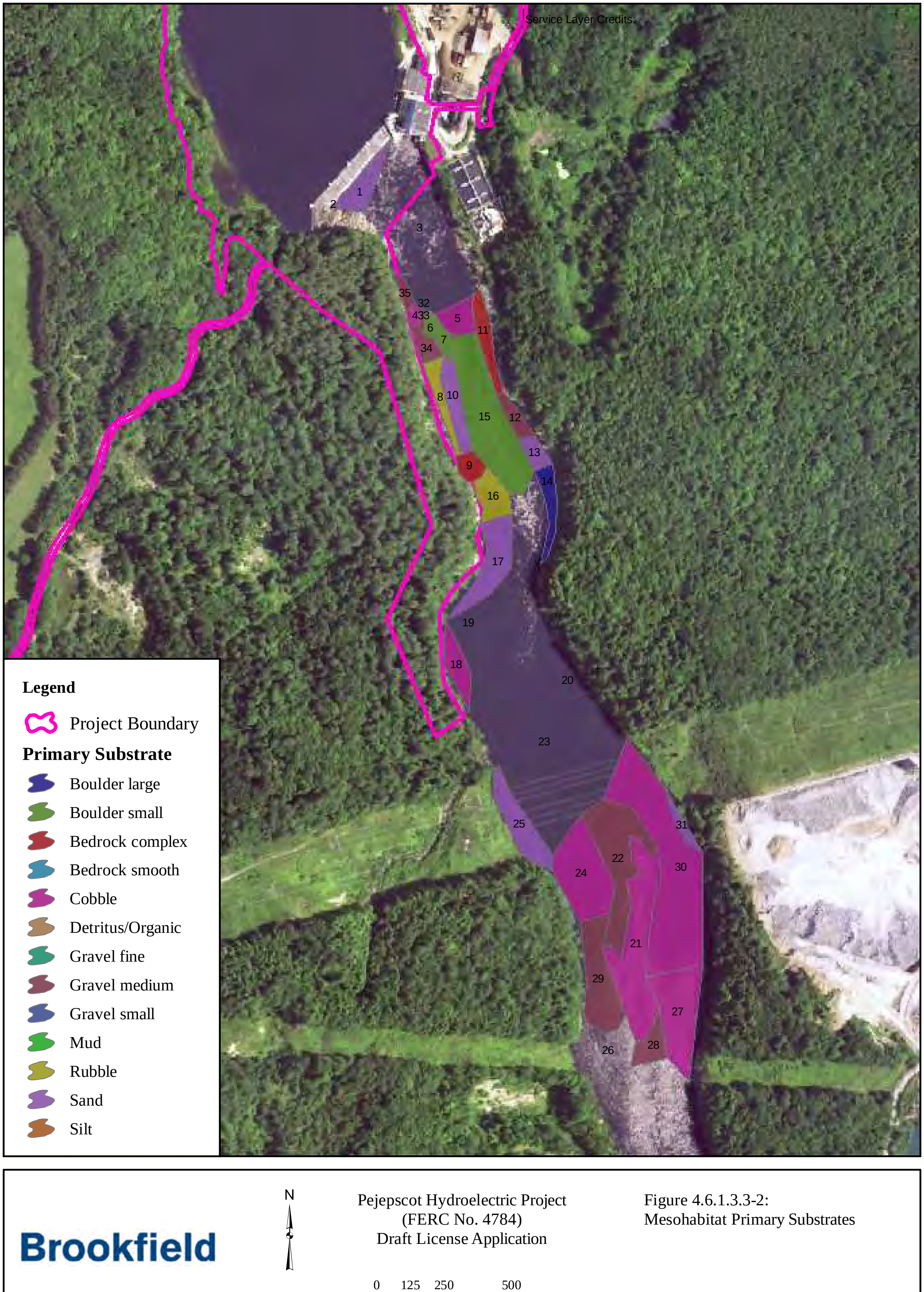

Brookfield

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 4.6.1.3.3-2:
Mesohabitat Primary Substrates

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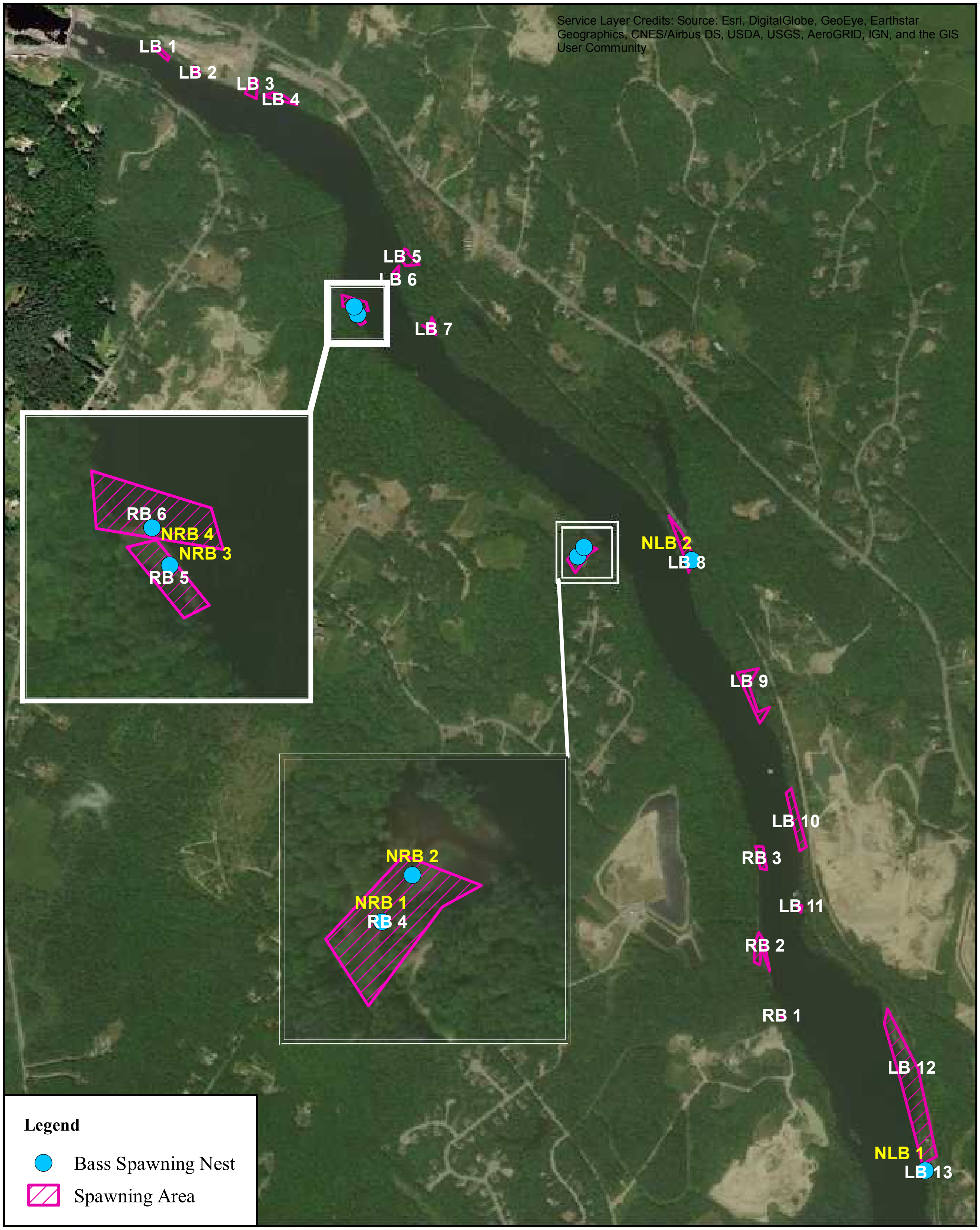

Brookfield

N

0 500 1,000 2,000 Feet

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 4.6.1.3.3-3:
Observed Potential
Spawning Habitat Areas

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4.6.1.3.4 Special Fish Habitats

Critical habitat is designated by the NMFS for the survival and recovery of species listed as threatened or endangered under the Endangered Species Act (ESA), including Atlantic Salmon. Critical habitat includes areas occupied by ESA-listed species and those areas that may require special management considerations or protection or that have been determined to be essential for the conservation of the species. Atlantic Salmon in the Androscoggin are part of the Merrymeeting Bay Salmon Habitat Recovery Unit and portions of the Androscoggin River, downstream of the Lewiston Falls Dam is classified as critical habitat (i.e., critical to the recovery of the species), including the waters of the Pejepscot Project (NMFS, 2009).

The Magnuson-Stevens Fishery Conservation and Management Act and is defined EFH for species managed in Fishery Management Plans as the habitat necessary for managed fish to complete their life cycle such that the fishery can be harvested sustainably. Habitats of particular concern are EFHs that are judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation (NEFMC, 1998). EFH for Atlantic Salmon is described as all waters currently or historically accessible to Atlantic Salmon within the streams, rivers, lakes, ponds, wetlands and other water bodies of Maine, New Hampshire, Vermont, Rhode Island and Connecticut and is defined for each Atlantic Salmon life stage (NEFMC, 1998) as follows:

- Eggs: Bottom habitats with a gravel or cobble riffle (redd) above or below a pool of rivers. Generally, the following conditions exist in the egg pits (redds): water temperatures below 10°C, and clean, well-oxygenated fresh water. Atlantic Salmon eggs are most frequently observed between October and April.

- Larvae: Bottom habitats with a gravel or cobble riffle (redd) above or below a pool of rivers. Generally, the following conditions exist where Atlantic Salmon larvae, or alevins/fry, are found: water temperatures below 10°C, and clean, well-oxygenated fresh water. Atlantic Salmon alevins/fry are most frequently observed between March and June.

- Juveniles: Bottom habitats of shallow gravel / cobble riffles interspersed with deeper riffles and pools in rivers and estuaries. Generally, the following conditions exist where Atlantic Salmon parr are found: clean, well-oxygenated fresh water, water temperatures below 25°C, water depths between 10 cm and 61 cm, and water velocities between 30 and 92 cm per second. As they grow, parr transform into smolts. Atlantic Salmon smolts require access downstream to make their way to the ocean. Upon entering the sea, "postsmolts" become pelagic and range from Long Island Sound north to the Labrador Sea.

- Adults: For adult Atlantic Salmon returning to spawn, habitats with resting and holding pools in rivers and estuaries. Returning Atlantic Salmon require access to their natal streams and access to the spawning grounds. Generally, the following conditions exist where returning Atlantic Salmon adults are found migrating to the spawning grounds: water temperatures below 22.8°C, and dissolved oxygen above 5 ppm. Oceanic adult

Atlantic Salmon are primarily pelagic and range from the waters of the continental shelf off southern New England north throughout the Gulf of Maine.

- Spawning Adults: Bottom habitats with a gravel or cobble riffle (redd) above or below a pool of rivers. Generally, the following conditions exist where spawning Atlantic Salmon adults are found: water temperatures below 10°C, water depths between 30 cm and 61 cm, water velocities around 61 cm per second, and clean, well-oxygenated fresh water. Spawning Atlantic Salmon adults are most frequently observed during October and November. Atlantic Salmon EFH includes all aquatic habitats in the watersheds of the identified rivers, including all tributaries, to the extent that they are currently or were historically accessible for salmon migration. Atlantic Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Atlantic Salmon EFH for eggs and larvae, juvenile and adults is designated for the Androscoggin River, including Project waters (NMFS, 2012a).

4.6.1.4 Benthic Macroinvertebrates

Benthic macroinvertebrates are discussed in Sections 4.5.1.2.4 and 4.5.1.2.5.

4.6.1.5 Amphibian and Aquatic Reptile Resources, Habitats, and Temporal/Life History

Examination of available species distribution maps have determined that there are approximately seventeen amphibian species and approximately thirteen reptile species that may be present in the Project Area (Table 4.6.1.5-1). Based on their life history requirements, the salamander, frog/toad, and turtle species have the potential to utilize the aquatic habitat within the Project Area. Snake species, while not primarily aquatic, may utilize riparian areas for feeding and shelter (MDIFW, 2013).

Table 4.6.1.5-1: Amphibian and Reptile Species Documented in Androscoggin, Cumberland, and Sagadahoc Counties, Maine

Type	Common Name	Scientific Name	Aquatic Habitat Use	Riparian Habitat Use	Status in Maine
Salamanders	Eastern red-backed salamander	*Plethodon cinereus*	Breeding/Larvae	Juvenile/Adult	Not Listed
	Yellow spotted salamander	*Ambystoma maculatum*	Breeding/Larvae	Juvenile/Adult	Not Listed
	Northern dusky salamander	*Desmognathus fuscus*	Breeding/Larvae Juvenile/Adult	Juvenile/Adult	Not Listed
	Northern two-lined salamander	*Eurycea bislineata*	Breeding/Larvae Juvenile/Adult	Juvenile/Adult	Not Listed
	Northern spring salamander	*Gyrinophilus porphyriticus*	Breeding/Larvae Juvenile/Adult	Juvenile/Adult	Special Concern
	Four-toed salamander	*Hemidactylium scutatum*	Breeding/Larvae	Juvenile/Adult	Not Listed
	Eastern newt (red-spotted newt)	*Notophthalmus viridescens*	Breeding/Larvae/ Adult	Juvenile	Not Listed
	Blue-spotted salamander	*Ambystoma laterale*	Breeding/Larvae	Juvenile/Adult	Special Concern
Frogs and Toads	American toad	*Anaxyrus americanus*	Breeding/Larvae	Juvenile/Adult	Not Listed
	American bullfrog	*Lithobates catesbeianus*	All Stages	Adult (breeding movements)	Not Listed
	Gray tree-frog	*Hyla versicolor*	Breeding/Larvae	Juvenile/Adult	Not Listed
	Green frog	*Rana clamitans melanota*	All Stages	Adult (wintering)	Not Listed
	Mink frog	*Lithobates septentrionalis*	All Stages	Juvenile/Adult - occasionally	Special Concern
	Northern leopard frog	*Lithobates pipiens*	All Stages	Juvenile/Adult	Special Concern
	Pickerel frog	*Lithobates palustris*	Breeding/Larvae	Juvenile/Adult (summer)	Not Listed

Type	Common Name	Scientific Name	Aquatic Habitat Use	Riparian Habitat Use	Status in Maine
			Wintering Adult		
	Spring peeper	*Pseudacris crucifer*	Breeding/Larvae	Juvenile/Adult	Not Listed
	Wood frog	*Lithobates sylvaticus*	Breeding/Larvae	Juvenile/Adult	Not Listed
Snake	Eastern milk snake	*Lampropeltis triangulum trangulum*	NA	All Stages	Not Listed
	Northern brown snake	*Storeria d. dekayi*	NA	All stages	Special Concern
	Northern water snake	*Nerodia sipedon*	Adult (feeding)	Juvenile/Adult	Not Listed
	Garter snake	*Thamnophis sirtalis*	NA	Juvenile/Adult	Not Listed
	Eastern ribbon snake	*Thamnophis sauritus*	NA	Juvenile/Adult	Special Concern
	Redbelly snake	*Storeria occipitomaculata*	NA	Juvenile/Adult	Not Listed
	Ring-neck snake	*Diadophis punctatus*	NA	Juvenile/Adult	Not Listed
	Smooth green snake	*Opheodrys vernalis*	NA	Juvenile/Adult	Not Listed
Turtles	Eastern painted turtle	*Chrysemys picta*	Juvenile/Adult	Breeding/Nesting Juvenile/Adult (sunning)	Not Listed
	Snapping turtle	*Chelydra serpentina*	Juvenile/Adult	Breeding/Nesting	Not Listed
	Spotted turtle	*Clemmys guttata*	Juvenile/Adult	Breeding/Nesting	Special Concern
	Musk turtle	*Sternotherus odoratus*	Juvenile/Adult	Juvenile/Adult (hibernation)	Not Listed
	Wood turtle	*Glyptemys insculpta*	Juvenile/Adult	Juvenile/Adult (summer)	Special Concern

4.6.1.5.1 Salamanders

Eight species of salamander could potentially use aquatic or terrestrial habitats in the Project Area. Of these, the blue-spotted salamander and the northern spring salamander are listed as Species of Special Concern in Maine (MDIFW, 2013). The other six species are: eastern newt (also known as the red-spotted newt), eastern red-backed salamander, four-toed salamander, northern dusky salamander, northern two-lined salamander, and yellow spotted salamander.

The Northern spring salamander, northern dusky salamander, and northern two-lined salamander share similar habitat, reproduction and diet requirements. All three species inhabit terrestrial and aquatic habitats including: clear upland streams, caves, shaded seepages, rocky brooks, springs, seepages, and associated riparian areas. Occasionally they are also found in swamps and lake margins or forested wet areas. They are often found under rocks, logs, leaves, or moss in or around water. Reproduction occurs at various times of the spring, summer, or fall depending on environmental conditions (NatureServe Explorer, 2016).

The eastern red-backed salamander, the four-toed salamander, the yellow spotted salamander, and the blue-spotted salamander share similar habitat, reproduction and diet requirements. These species can inhabit lakes, ponds, swamps, and quiet stream pools, forested wetland, scrub-shrub wetland, riparian zones, and multiple forest types containing damp microhabitats under leaf litter, surface objects, or inside logs. Breeding migration timing varies depending on local conditions and may occur in both spring and fall, with egg laying typically occurring in late winter to mid-summer (NatureServe Explorer, 2016).

The eastern newt, also known as the red-spotted newt, requires both terrestrial and aquatic habitat throughout its life cycle. With the exception of the red eft stage (juvenile), it is primarily aquatic. Aquatic habitats include lakes, ponds, swamps, pools, shallow water, and wetlands. In the red eft stage, the eastern newt is terrestrial. Terrestrial habitats include riparian areas wetlands, forests, and grasslands or herbaceous areas. The red eft stage burrows in soil, under fallen logs, leaf litter, and other forest debris (NatureServe Explorer 2016).

4.6.1.5.2 Frogs and Toads

There are nine species of frog and toad that may utilize habitats within the Project Area. The American toad, spring peeper, wood frog, pickerel frog, gray tree-frog, green frog, and American bullfrog are common species throughout Maine. Two species, the mink frog and the northern leopard frog, are listed as Species of Concern in the State of Maine (MDIFW, 2013).

The mink frog, green frog, and American bullfrog are highly aquatic species that venture onto land if conditions are suitable. They can inhabit ponds, swamps, lakes, reservoirs, marshes, stream margins and are found mainly in waterbodies with abundant floating, emergent, or submerged vegetation along shorelines. During winter, hibernation typically takes place under land objects, underground, or under flowing water. Breeding for all species occurs between May and August. Metamorphosis varies between species, with both the mink frog and American bullfrog developing into the adult stage one to two years after the eggs hatch (NatureServe Explorer, 2016).

The northern leopard frog, pickerel frog, spring peeper, wood frog, and gray tree frog share similar habitat, reproduction, and diet requirements. All of these species utilize both terrestrial and aquatic habitats at various life stages. They can inhabit springs, slow streams, marshes, bogs, ponds, canals, flood plains, reservoirs, lakes, multiple wetland types, and riparian zones. They are usually found near permanent water with rooted aquatic vegetation. During winter, hibernation may take place either underwater or underground. Breeding occurs in the spring (NatureServe Explorer, 2016).

With the exception of the breeding season, the American toad occupies primarily terrestrial areas. They prefer areas with sufficient moisture, food and a suitable breeding location nearby. Common habitats include, but are not limited to, forests of multiple compositions, forested wetlands, herbaceous wetlands, scrub-shrub wetlands, cropland/hedgerows, and riparian zones. Breeding occurs in the spring when they migrate to temporary or permanent pools, or in shallow areas of slow moving waterbodies. Eggs hatch approximately a week after breeding and metamorphosis occurs within two months of hatching (usually June or July) (NatureServe Explorer, 2016).

4.6.1.5.3 Turtles

There are five species of turtle that may utilize habitats within the Project Area. The snapping turtle, eastern painted turtle, and musk turtle are considered common turtle species in Maine. The wood turtle and the spotted turtle are listed as Species of Special Concern in the State of Maine.

Wood turtles can be found in a variety of habitats including creeks, rivers, forested and herbaceous wetlands, and forests. During summer months, they may roam overland in terrestrial habitats alongside streams, such as woodland bogs and marshy fields. Overwintering occurs in bottoms or banks of streams where water flows all winter, even under ice. This species has a wide diet, and could be considered carnivorous, frugivorous, and insectivorous (NatureServe Explorer, 2016).

The spotted turtle is a semi-aquatic turtle species that inhabit woodland streams, wet meadows, creeks, and rivers. They move seasonally between different wetland types and spend time on land. Hibernation occurs in muddy bottoms of waterways or bogs. Breeding occurs between March and May and egg hatching occurs late August to September (NatureServe Explorer, 2016).

The snapping turtle, eastern painted turtle, and musk turtle are aquatic turtles that can inhabit a wide range of waterbody types including: shallow bodies of water with soft bottom and aquatic vegetation, lake margins, vernal pools, swamps, woodland streams, fens, bogs, small marshes and marshy pastures. During winter, hibernation occurs in bottom mud, debris, or bank holes. During breeding season, overland travel may occur (Fuller, 2016, Warner Nature Center, 2016, NatureServe Explorer, 2016).

4.6.1.5.4 Snakes

There are eight species of snakes that may utilize habitats within the Project Area, including the northern water snake, northern brown snake, eastern milk snake, garter snake, eastern ribbon snake, redbelly snake, ring-neck snake and smooth green snake. The northern water snake requires aquatic habitat while the other snake species may make limited use of aquatic environments, primarily riparian zones and immediate shorelines. Two species, the northern brown snake and eastern ribbon snake, are listed as a Species of Special Concern in Maine.

The northern water snake inhabits creeks, rivers, lakes, oxbows, canals, reservoirs, ponds, marshes, bogs, swamps, forested wetlands, herbaceous wetlands, scrub-shrub wetlands, and riparian zones. Basking areas include flood debris piles, logs, or rocks at the water's edge. Hibernation occurs in burrows, rocks or deep crevices either at the water's edge or in upland areas near water. The breeding season typically occurs from late April to early June (NatureServe Explorer, 2016).

The northern brown snake, eastern ribbon snake, garter snake, and redbelly snake inhabit terrestrial and wetland habitats. They hibernate underground or beneath buildings and other structures. These snakes give "live" birth, and therefore do not require habitat for egg protection and development. Their diet includes earthworms, slugs, snails, insects, and small amphibians. (NatureServe Explorer, 2016).

The eastern milk snake, ring-neck snake, and smooth green snake share similar habitat, reproduction, and diet requirements. These snakes inhabit a wide variety of areas including open country, road cuts, powerline rights-of-way, rocky hillsides, grasslands, riparian zones, wetland borders, deciduous forests, and human dwellings. They may be found under objects such as rocks, logs, boards, tin, or building debris. Eggs require a well-drained, protected area with external heat to hatch (MDIFW, 2013, NatureServe Explorer, 2016).

4.6.2 Environmental Analysis

FERC's SD2 identified two potential resource issues relating to aquatic resources, which are discussed in greater detail below.

Effects of continued project operation on aquatic habitat in the project area for aquatic organisms.

Topsham Hydro operates the Project in a run-of-river mode, resulting in very little man-made fluctuation in the Project impoundment, and the operation of the Project has no effect on overall river flow in the lower Androscoggin River. The Project waters are composed of a variety of aquatic habitats that provide nursery, spawning, and rearing opportunities for resident and migratory fish species, including Smallmouth and Largemouth Bass, Yellow Perch, American Eel, river herring, American Shad, suckers, and other important minnow and forage species. The Project waters are also designated as critical habitat for Atlantic Salmon. In addition, several species of amphibians, reptiles, and macroinvertebrates inhabit the Project waters during their life cycles.

Existing information for the Project, along with the results of the studies completed by Topsham Hydro, demonstrate that the current operation of the Project is maintaining and supporting habitat for aquatic species in the Androscoggin River both upstream and downstream of the Project dam.

Topsham Hydro is proposing to continue to operate the Project in a run-of-river mode, which will maintain existing aquatic habitat and angling opportunities in the Project area. Continued operation of the Project is not expected to adversely affect aquatic habitat, including EFH for Atlantic Salmon.

The results of Topsham Hydro's stranding evaluation identified several potential stranding pools in the bedrock outcrop on the right side of the Project dam below bascule gate No. 5. The pools only form when the gate is closed after the cessation of spill events, so their occurrence is relatively rare (i.e., less than 25% of the time annually at least one of the five spill gates is operated). Topsham Hydro will develop, in consultation with stakeholders, a mitigation measure for the Final License Application to address the potential for stranding in pools below bascule gate No. 5.

Effects of continued project operation on passage of migratory fish species in the Androscoggin River including upstream passage of adult fish and downstream passage of smolts and juveniles.

Upstream Fish Passage

Topsham Hydro conducted several radio telemetry studies and desktop analyses to determine the effectiveness of the existing upstream passage facilities at the Project.

Topsham Hydro's desktop evaluation of the fish lift's effectiveness for adult Atlantic Salmon indicated that passage rates could range between 79% and 96%, based on a comparison to similar fish lifts (i.e., Milford and Lockwood Projects) in the area that conducted field-based upstream passage effectiveness testing for this species. Moreover, it is likely that the passage effectiveness would be closer to the higher end of this range, since Pejepscot was more similar in terms of its physical layout to the Milford Project, which had a 96% passage effectiveness for Atlantic Salmon. Topsham Hydro proposes 1) continued video camera monitoring for Atlantic Salmon utilizing the Pejepscot fish lift, and 2) conducting a Atlantic Salmon radio telemetry study, to determine upstream passage effectiveness at the Pejepscot fish lift, when at least 40 adult Atlantic Salmon of Androscoggin River origin are counted at the Brunswick fishway for two consecutive years.

Topsham Hydro's 2019 study results indicate that the overall effectiveness of the fish lift for adult river herring passage is 19.8% (75% CI = 14.8-24.9%). However, 93% of the radio-tagged adult river herring that were determined to have approached the Project were detected on at least one occasion within the entrance to the fish lift. Higher than average flow conditions resulted in a less frequent lift cycle during the study, which may have impacted overall effectiveness. Studies completed in the early 1990's under more typical spring flow conditions, showed that the overall effectiveness for alewife was greater than 87%.

Radio telemetry study results showed that few upstream migrating American Shad neither approached the Project area nor entered the fish lift. Most shad that did approach the Project area spent the majority of their residence time downstream of the Project spillway, rather than in the vicinity of the fish lift, even though the potential for false attraction from spillage was low. It is possible that the extensive handling and transport of the test specimens, which were caught via rod and reel downstream of the Brunswick Project, may have negatively affected upstream motivation of test fish during the study. Very low numbers of American Shad pass at the downstream Brunswick Fishway, as passage has ranged from 0 to 1,123 shad (median = 11) from 2000-2019, so few shad are present in the Pejepscot tailrace under current conditions.

The Pejepscot fish lift currently cycles every two hours during the typical daily operation period of 0800 to 1800 hours (total of five cycles per day) during the peak upstream migration period for river herring and American Shad. In order to enhance passage effectiveness of river herring and American Shad that may be entering the fish lift and congregating within the entrance channel, Topsham Hydro proposes to increase the number of lift cycles to one lift event per hour (10 lift cycles per day) between the hours of 0800 and 1800, during the peak upstream migration period (May 16 through June 15) for river herring and American Shad.

Regarding American Eels, upstream migrating juveniles (elvers and yellow eels) are affected by the presence of the Project. Juvenile eels were not observed during the nighttime eel surveys conducted in 2019 by Topsham Hydro. However, juvenile eels have been documented passing upstream at the Worumbo Project eel ladder, indicating that some degree of upstream passage at the Pejepscot Project is occurring. Topsham Hydro is proposing to install and operate a temporary portable American Eel ramp for three passage seasons (June 1 through September 15). Based on the results of this study, a permanent eel ramp will be installed to enhance the ability of American Eel to make upstream migratory movements passed the Project.

Downstream Fish Passage

Topsham Hydro conducted radio tag telemetry studies and desktop analyses to determine route of passage and survival of diadromous fish that may migrate downstream past the Project.

Based on previous studies conducted by Topsham Hydro from 2013-2015, and 2018, whole-station survival of Atlantic Salmon smolts is expected to meet the specified take limitation of 92 percent survival. To ensure the take limitations are met, Topsham Hydro is proposing to provide approximately 500 cfs of spill at night (2000 – 0700 hours) during the month of May, by opening bascule gate No. 1 (closest to the powerhouse). While some entrainment of salmon smolts may still occur during normal operations, Topsham Hydro expects, based on the results of the 4 years of effectiveness testing, that the SPP take limits will be met over the course of the next license. Topsham Hydro proposes to monitor downstream migrating Atlantic Salmon kelts as part of the aforementioned adult Atlantic Salmon study described above, which will be conducted when at least 40 adult Atlantic Salmon of Androscoggin River origin are counted at the Brunswick fishway for two consecutive years.

Topsham Hydro's study results indicate that juvenile alosines (American Shad and river herring) experience very little delay when migrating past the Project. The preferred routes of passage at the Project for these fish are Unit 1 (68.4%) and the downstream bypasses (30.5%). Estimated turbine survival based on a desktop evaluation ranged from 97.6 to 98.5% (TBSA predicted survival for 4 to 6-inch fish).

Downstream migrating adult river herring experience little or no delay in passing the Project. The preferred routes of passage are via Unit 1 (51%), spill (27%) and the downstream bypasses (11%), with passage effectiveness estimated at 80.9% (75% CI = 76.3-85.7%). Turbine survival was estimated at 88% based on the field based telemetry results. Estimated turbine survival based on a desktop evaluation was approximately 95.5% (TBSA predicted survival for 11 to 13-inch fish).

Study results showed that Adult American Shad experienced some delay when migrating past the Project. The preferred routes of passage are via Unit 1 (31%), spill (26%) and the downstream bypasses (9%), with passage effectiveness estimated at 51.4% (75% CI = 41.6-61.1%). Shad were present in the upstream Project area for extended periods of time (most greater than 96 hours) prior to either passing downstream via Unit 1 or the bypass system. Nearly one third of all observed downstream passage events happened when spill flows were present at the bascule gates. The test specimens were taken from the Saco River during the later portion of the migratory run and transported to the Project for the study. Some of the handling and the overall condition of the test fish may have impacted their passage behavior during the study. Turbine survival was estimated at 82% based on the field based telemetry results. Estimated turbine survival based on a desktop evaluation ranged from 91.3 to 95.6% (TBSA predicted survival for 14 to 23-inch fish).

For American Eel, Topsham Hydro's study results indicate that this species migrates very quickly past the Project, and does not experience significant delay. The preferred route of passage for adult eels is Unit 1, which resulted in a high estimated passage survival of 91.7% (75% CI = 87.5-95.8%). The estimated whole-station survival for adults eels at the Project is high as well at 90.0% (75% CI =86.0-94.0%).

4.6.3 **Proposed Environmental Measures**

Topsham Hydro is proposing the following PME measures to protect aquatic resources.

- Operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates.
- Maintain a minimum flow of 1,170 cfs, or inflow, whichever is less.

- Develop, in consultation with stakeholders, a mitigation measure to address potential stranding of fish in the bedrock area below bascule gate No. 5.
- Installation and operation of a temporary portable American Eel ramp for three passage seasons (June 1 through September 15) to identify a suitable location for a permanent upstream American Eel ramp. The temporary portable eel ramp will be installed during the first full passage season after the effective date of the new license.
- Installation and operation of a permanent upstream American Eel ramp based on the results of the temporary portable ramp evaluation. The permanent ramp will be installed during the fourth full passage season after the effective date of the new license.
- Implementation of a Fishway Operations and Maintenance Plan (Appendix E-4).
- Operate the fish lift on the following lift cycle frequency:
    - April 15 to May 15 and following passage of the first fish at the downstream Brunswick Project, the lift will be operated once every two hours.
    - May 16 through June 15, the lift will be operated once every hour.
    - June 16 through July 1, the lift will be operated every 2 hours.
    - July 2 through November 15, the lift will be operated once a day following passage of salmon at Brunswick if not already identified passing though Pejepscot.
- Implement the following measures from the Species Protection Plan for ESA-listed Atlantic Salmon.
- Continue video camera monitoring of Atlantic Salmon utilizing the Pejepscot fish lift.
- Conduct an Atlantic Salmon radio telemetry study, to determine upstream passage effectiveness at the Pejepscot fish lift, when at least 40 adult Atlantic Salmon of Androscoggin River origin are counted at the Brunswick fishway for two consecutive years.
- Open bascule gate No. 1 (closest to the powerhouse) 50% to provide approximately 500 cfs of spill at night (2000 – 0700 hours) during the month of May.
- Monitor downstream migrating Atlantic Salmon kelts as part of the adult Atlantic Salmon radio telemetry study described above.

4.6.4 Cumulative Effects

In SD2, aquatic habitat and passage of migratory fish species are identified as resources that could be cumulatively affected by the proposed continued operation and maintenance of the Project. The geographic scope for these resources was identified as the entire Androscoggin River basin.

Topsham Hydro’s proposal to continue to operate the Project in a run-of-river mode with no storage or flood control capacity, would continue to have a beneficial cumulative effect on streamflow, aquatic habitat and fisheries in the Lower Androscoggin River by eliminating any impoundment and flow fluctuations associated with the Project. Any other hydropower projects in the Androscoggin River watershed that have peaking operations would continue to influence streamflow, aquatic habitat and fishery resources.

Activities within Androscoggin River basin that may cumulatively affect migratory fish species include the construction and operation of dams within the river basin, which have resulted in migratory barriers and loss of spawning habitat. The resource agencies and Licensees of hydropower projects within the Androscoggin River basin have been addressing upstream and downstream fish passage in the lower Androscoggin River basin within various regulatory proceedings (i.e., ESA consultation, development of SPPs, and FERC licensing proceedings) over the recent years.

Upstream fish passage facilities at the Project are already in place for Atlantic Salmon, river herring, and American Shad. Topsham Hydro completed or will be completing upstream fish passage effectiveness studies to determine whether existing fish passage measures attain established performance standards for upstream and downstream passage of Atlantic Salmon or other effectiveness targets as agreed to with resource agencies for American Shad and river herring. For upstream migrating American Eel, Topsham Hydro is proposing enhancements in the form of an upstream eel ramp, which should help reduce any cumulative effects to this species in the Androscoggin River basin resulting from operation of the Project.

Operation of the Pejepscot Project may, to a limited degree, cumulatively affect adult silver American Eel, adult and juvenile alosines, and Atlantic Salmon smolts and kelts that are migrating to the Atlantic Ocean. Downstream fish passage is currently provided at the Project and effectiveness studies conducted by Topsham Hydro have shown that the Project is effective at passing Atlantic Salmon smolts, adult eels, adult and juvenile alosines. Kelt passage will be evaluated when returning numbers of Atlantic Salmon increase so that a sufficient number of kelts can be radio-tagged.

4.6.5 **Unavoidable Adverse Effects**

Proposed continued operation of the upstream fish passage facilities will provide access to upstream habitat, while continued operations of the downstream passage facilities will reduce the potential for entrainment, and thereby facilitate the safe, timely, and effective passage of migratory fish species. Operation of the Project may continue to result in some level of upstream passage delay or entrainment of individual fish, but these effects are expected to be limited in scope and will not have an effect at the population level.

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4.7 Wildlife and Botanical Resources

4.7.1 Affected Environment

4.7.1.1 Regional Setting

Per the U.S. Forest Service ecoregion classification system, the Pejepscot Project is located in the Laurentian Mixed Forest Province and, more specifically, the Central Maine Coastal and Interior Section. The Laurentian Mixed Forest Province lies between the boreal forest and broadleaf deciduous forest zones and, as such, is considered transitional (Bailey, 1995). The Central Maine Coastal and Interior Section is also regionally described as a transitional zone; from both west to east as well as from south to north. From west to east, the forest transitions from mixed hardwoods typical of the southern New England coastal plain to northern coastal spruce-fir and spruce-fir northern hardwood communities. From south to north, coastal communities typically transition to northern hardwood communities (Bailey, 1995). Within the Central Maine Coastal and Interior Section, the Project lies within the interior transitional zone.

4.7.1.2 Botanical Resources

In 2018, Topsham Hydro conducted a botanical and wildlife resources survey in support of relicensing. The study area included areas enclosed in the current Project boundary as well as adjacent areas within 200 feet of the El. 75 contour. In total, the study area encompassed approximately 514 acres (Brookfield, 2019).

As part of the 2018 survey, existing land use information (Section 4.3.4) was reviewed and confirmed in the field in order to develop cover type maps of the Project Area (Table 4.7.1.2-1 and Figure 4.7.1.2-1). Twenty different cover types were mapped within the study area. The dominant cover types were open water (219.7 acres, 43%), mixed forest (129.4 acres, 25%), and deciduous forest (65.8 acres, 13%). The plant communities were identified using Maine's Natural Heritage Plant Community Classification Index (MDACF, 2018b). The major plant communities found in the mixed forest cover type were hemlock forest (55.8 acres) and oak-pine woodland (47.7 acres) vegetation. The deciduous forest cover type was mostly comprised of oak-pine woodland (26.5 acres) and birch-oak talus woodland (16.5 acres). Common species observed in these forest areas included red maple (*Acer rubrum*), red oak, (*Quercus rubra*), white ash (*Fraxinus americana*), paper birch (*Betula papyrifera*), red pine (*Pinus resinosa*), and eastern hemlock (*Tsuga canadensis*) (Brookfield, 2019).

Emergent wetland plant communities occupied 25.6 acres (5%) and were primarily pickerelweed macrophyte aquatic beds (MDACF, 2018b). The most abundant species in these communities were pickerelweed *(Pontederia cordata*), American bur-reed (*Sparganium americanum)*, and broadleaf arrowhead *(Sagittaria latifolia)*. Forested wetland accounted for 5.3 acres (<1%) of the study area. Other vegetated areas covered 13.8 acres (3%) of the study area (Brookfield, 2019).

The remaining area was comprised of non-vegetated or developed cover types covering 54.4 acres (11%) of the study area (Brookfield, 2019).

The upland vegetation found throughout the study area was dense. Within upland cover types, areal vegetation cover was approximately 80%. The herbaceous plant community found in the more open areas was growing vigorously and included several species of native and naturalized wildflowers such as Joe-pye weed (*Eutrochium purpureum*), common bone-set (*Eupatorium perfoliatum*), and grasses (*Poa* sp.) as well as small populations of reed canary grass (*Phalaris arundinacea*), which is considered invasive by the Maine Department of Agriculture, Conservation, and Forestry (MDACF). Most mature forested areas had well-developed understories with intact shrub and herbaceous layers. Plant species identified during the survey are listed in Table 4.7.1.2-2 (Brookfield, 2019).

4.7.1.2.1 Invasive Plant Species and Noxious Weeds

Invasive species noted within the study area included: flowering rush (*Butomus umbellatus*) purple loosestrife (*Lythrum salicaria)*, Morrow's or Tartarian honeysuckle (*Lonicera morrowii or L. tatarica*), reed canary grass, Japanese knotweed (*Reynoutria japonica*), common buckthorn (*Rhamnus cathartica*), and glossy buckthorn (*Frangula alnus*) (Brookfield, 2019). Each of these species is listed as currently invasive in Maine by the Maine Natural Areas Program (MDACF, 2018a).

Table 4.7.1.2-1. Summary of Cover Type Polygons Mapped During 2018 Botanical Resources Survey

Cover Type	Total Acres	Percent of Study Area	Associated Land Uses	Habitat Type
Open Water	219.7	42.8%	Open Water	Water
Mixed Forest	129.4	25.2%	Deciduous Forest and Mixed Forest	Upland
Deciduous Forest	65.8	12.8%	Deciduous Forest, Mixed Forest, and Shrub/Scrub	Upland
Wetland	25.6	5.0%	Emergent Herbaceous Wetland	Wetland
Railroad	14.6	2.8%	Railroad	Other
Dam and Related Facilities	11.4	2.2%	Developed, High and Low Density	Other
Sand	10.5	2.0%	Barren Land (Rock/Sand/Clay)	Other
Parking	7.2	1.4%	Barren Land (Rock/Sand/Clay) and Developed, Low Intensity	Other
Shrub	6.7	1.3%	Deciduous Forest and Shrub/Scrub	Other
Forested Wetland	5.3	1.0%	Woody Wetland	Upland
Young woods	4.5	0.9%	Deciduous Forest and Mixed Forest	Wetland
Paved/road	3.6	0.7%	Developed, Low Intensity	Other
Rock	2.3	0.4%	Barren Land (Rock/Sand/Clay)	Upland
Residential	2.2	0.4%	Developed, Low Intensity	Other
Quarry	1.7	0.3%	Barren Land (Rock/Sand/Clay)	Other

Cover Type	Total Acres	Percent of Study Area	Associated Land Uses	Habitat Type
Old field	1.2	0.2%	Barren Land (Rock/Sand/Clay) and Shrub/Scrub	Upland
Agriculture	0.9	0.2%	Cultivated Crops	Upland
Water structure	0.7	0.1%	Developed, Medium Intensity	Other
Conifer Plantation	0.6	0.1%	Evergreen Forest	Upland
Boat launch	0.2	<0.1%	Developed, Open Space	Other
TOTAL	**513.9**	**100%**		

Source Brookfield, 2019

Table 4.7.1.2-2. Plant Species Observed in Pejepscot Study Area - 2018

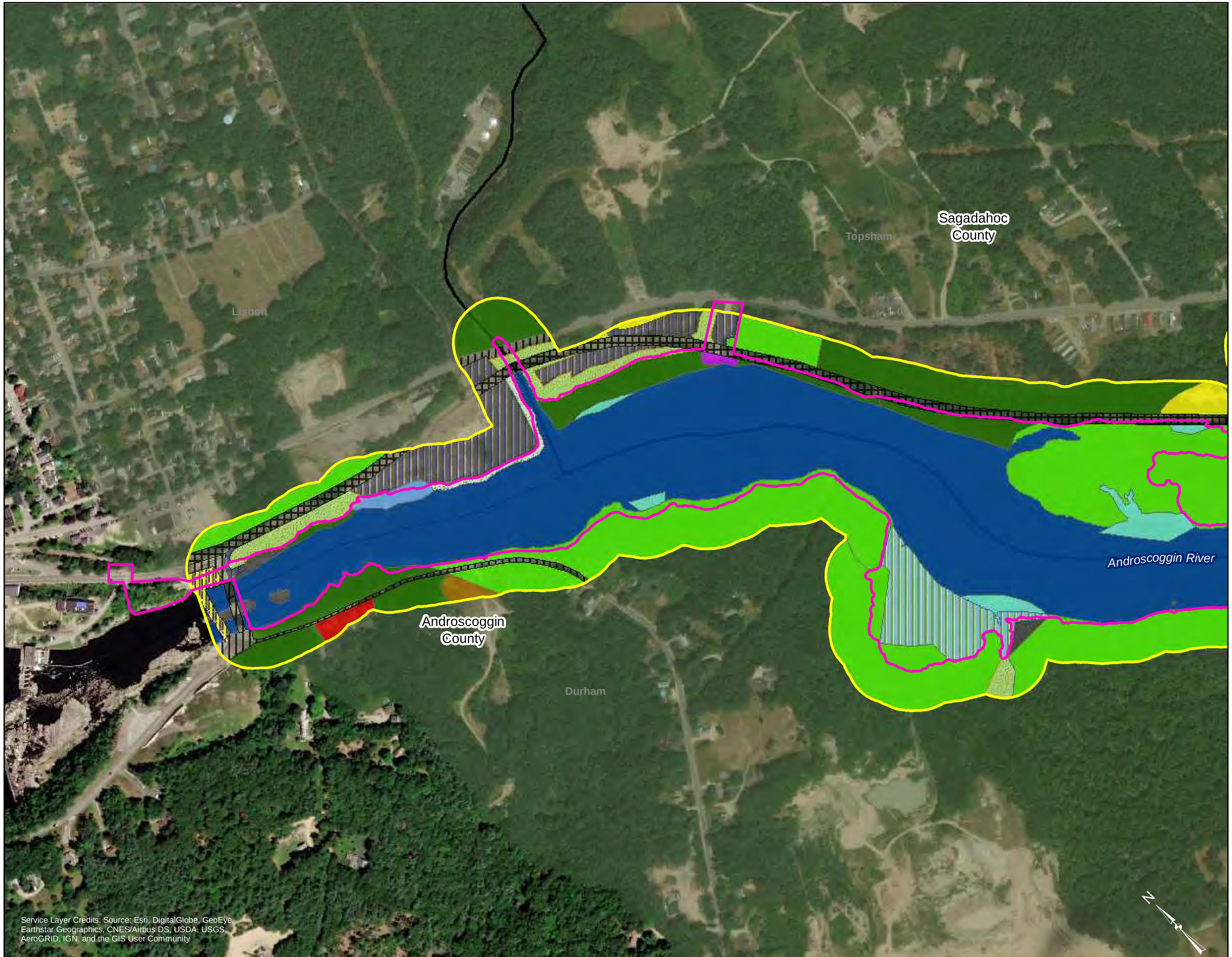
Common Name	Scientific Name	Status[4]
Red maple	*Acer rubrum*	Native
Silver maple	*Acer saccharinum*	Native
Sugar maple	*Acer saccharin*	Native
Mountain maple	*Acer spicatum*	Native
Alder	*Alnus sp.*	Native
Sweet birch	*Betula lenta*	Native
Paper birch	*Betula papyrifera*	Native
Flowering rush	*Butomus umbellatus*	Invasive
Longhair sedge	*Carex comosa*	Native
Hop sedge	*Carex lupulina*	Native
American hornbeam	*Carpinus caroliniana*	Native
Buttonbush	*Cephalanthus occidentalis*	Native
Sweetfern	*Comptonia peregrina*	Native
Silky dogwood	*Cornus amomum*	Native
Red osier dogwood	*Cornus sericea*	Native
Yellow nutsedge	*Cyperus esculentus*	Native and Introduced
Wild carrot	*Daucus carota*	Introduced
Cockspur grass	*Echinocloa crus-galli*	Native and Introduced
Common boneset	*Eupatorium perfoliatum*	Native
Joe-Pye-weed	*Eutrochium purpureum*	Native
Japanese knotweed	*Reynoutria japonica*	Invasive
Glossy buckthorn	*Frangula alnus*	Invasive
White ash	*Fraxinus americana*	Native
Honey locust	*Gleditsia triacanthos*	Native
American witch-hazel	*Hamamelis virginiana*	Native
Woodland sunflower	*Helianthus divaricatus*	Native
Soft rush	*Juncus effusus*	Native
Rice cutgrass	*Leersia oryzoides*	Native
Cardinal flower	*Lobelia cardinalis*	Native
Morrow's honeysuckle	*Lonicera morrowii*	Invasive
Tatarian honeysuckle	*Lonicera tatarica*	Invasive

[4] Sources: (MDACF, 2018 a)

Common Name	Scientific Name	Status[4]
Purple loosestrife	*Lythrum salicaria*	Invasive
Sweet clover	*Melilotus officinalis*	Introduced
Fragrant water-lily	*Nymphaea odorata*	Native
Sensitive fern	*Onoclea sensibilis*	Native
Deer-Tongue Grass	*Panicum clandestinum*	Native
Reed canary grass	*Phalaris arundinacea*	Invasive
Norway spruce	*Picea abies*	Introduced
White spruce	*Picea alba*	Native
Blue spruce	*Picea pungens*	Introduced
Red pine	*Pinus resinosa*	Native
Pitch pine	*Pinus rigida*	Native
White pine	*Pinus strobus*	Native
Meadow-grass, bluegrass, tussock, and speargrass	*Poa* spp.	Native and Introduced
Pickerelweed	*Pontederia cordata*	Native
Quaking aspen	*Populus tremuloides*	Native
Broad-leaved pondweed	*Potamogeton natans*	Native
Black cherry	*Prunus serotina*	Native
Red oak	*Quercus rubra*	Native
White oak	*Quercus alba*	Native
Common buckthorn	*Rhamnus cathartica*	Invasive
Staghorn sumac	*Rhus typhina*	Native
Broadleaf arrowhead	*Sagittaria latifolia*	Native
Black willow	*Salix nigra*	Native
Willow	*Salix* spp.	Native and Introduced
Woolgrass	*Scirpus cyperinus*	Native
Late goldenrod	*Solidago altissima*	Native
Goldenrod	*Solidago* spp.	Native
American bur-reed	*Sparganium americanum*	Native
Prairie cordgrass	*Spartina pectinata*	Native
White meadowsweet	*Spirea alba*	Native
Basswood	*Tilia americana*	Native
Eastern hemlock	*Tsuga canadensis*	Native
Broadleaf cattail	*Typha latifolia*	Native

Common Name	Scientific Name	Status[4]
American elm	*Ulmus americana*	Native
Common nettle	*Urtica dioica*	Native and Introduced
Blueberry	*Vaccinium* spp.	Native
Blue vervain	*Verbena hastata*	Native
Arrowwood viburnum	*Viburnum dentatum*	Native
Downy arrowwood	*Viburnum rafinesquianum*	Native
Unidentified grass	not available	not available

Source Brookfield, 2019



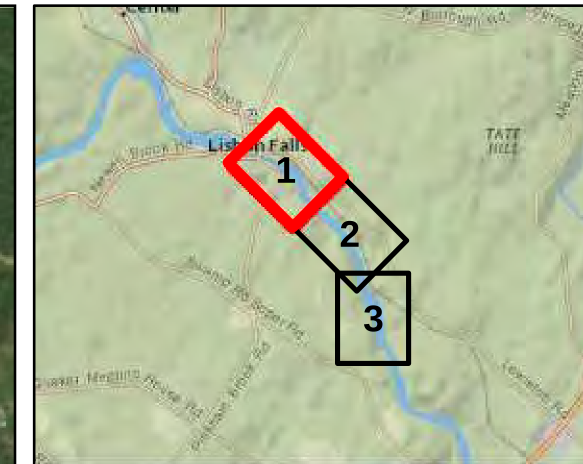


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Figure 4.7.1.2-1: Botanical Resources Cover Types
Page 1 of 3

Legend

- Project Boundary
- Study Area

Cover Type

- Old field
- Shrub
- Deciduous forest
- Mixed forest
- Sand
- Residential
- Boat launch
- Rock
- Parking
- Paved/road
- Railroad
- Dam and related facilities
- Young woods
- Wetland
- Forested wetland
- Water structure
- Open water
- ME County Boundaries
- ME Town Boundaries

0 250 500 1,000
Feet

Brookfield

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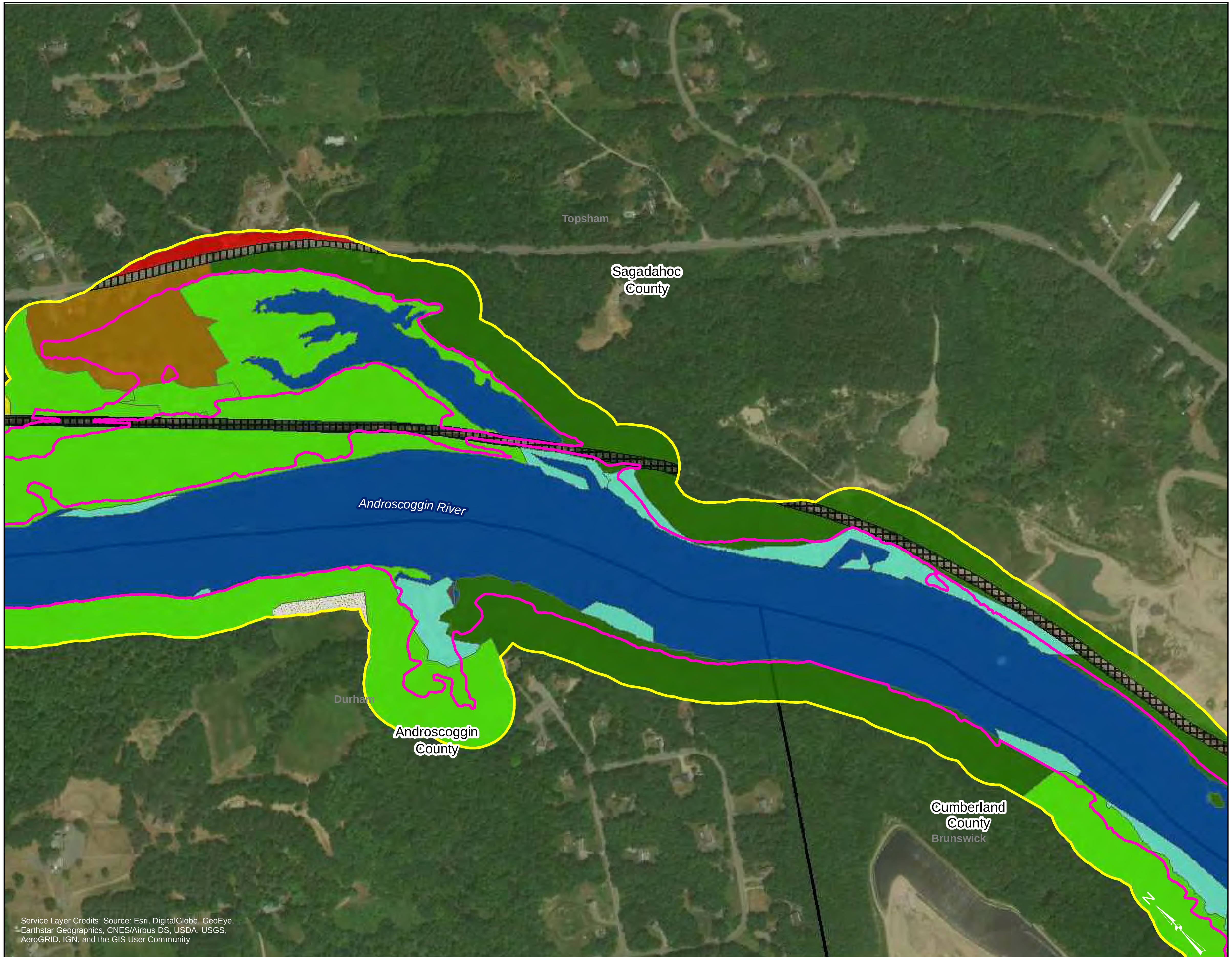

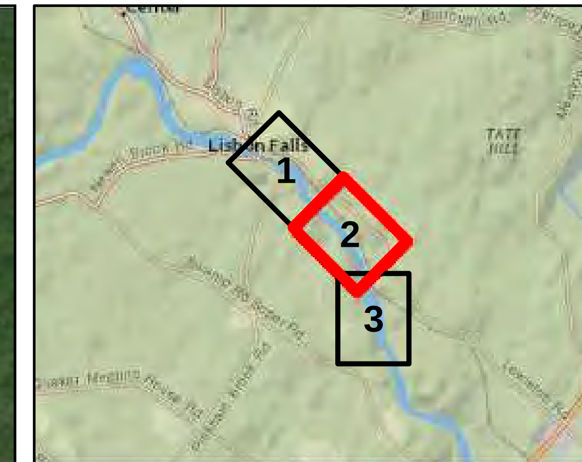

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Figure 4.7.1.2-1: Botanical Resources Cover Types
Page 2 of 3

Legend

- Project Boundary
- Study Area

Cover Type

- Agriculture
- Old field
- Deciduous forest
- Mixed forest
- Sand
- Residential
- Rock
- Paved/road
- Railroad
- Wetland
- Open water
- ME County Boundaries
- ME Town Boundaries

0 250 500 1,000 Feet

Brookfield

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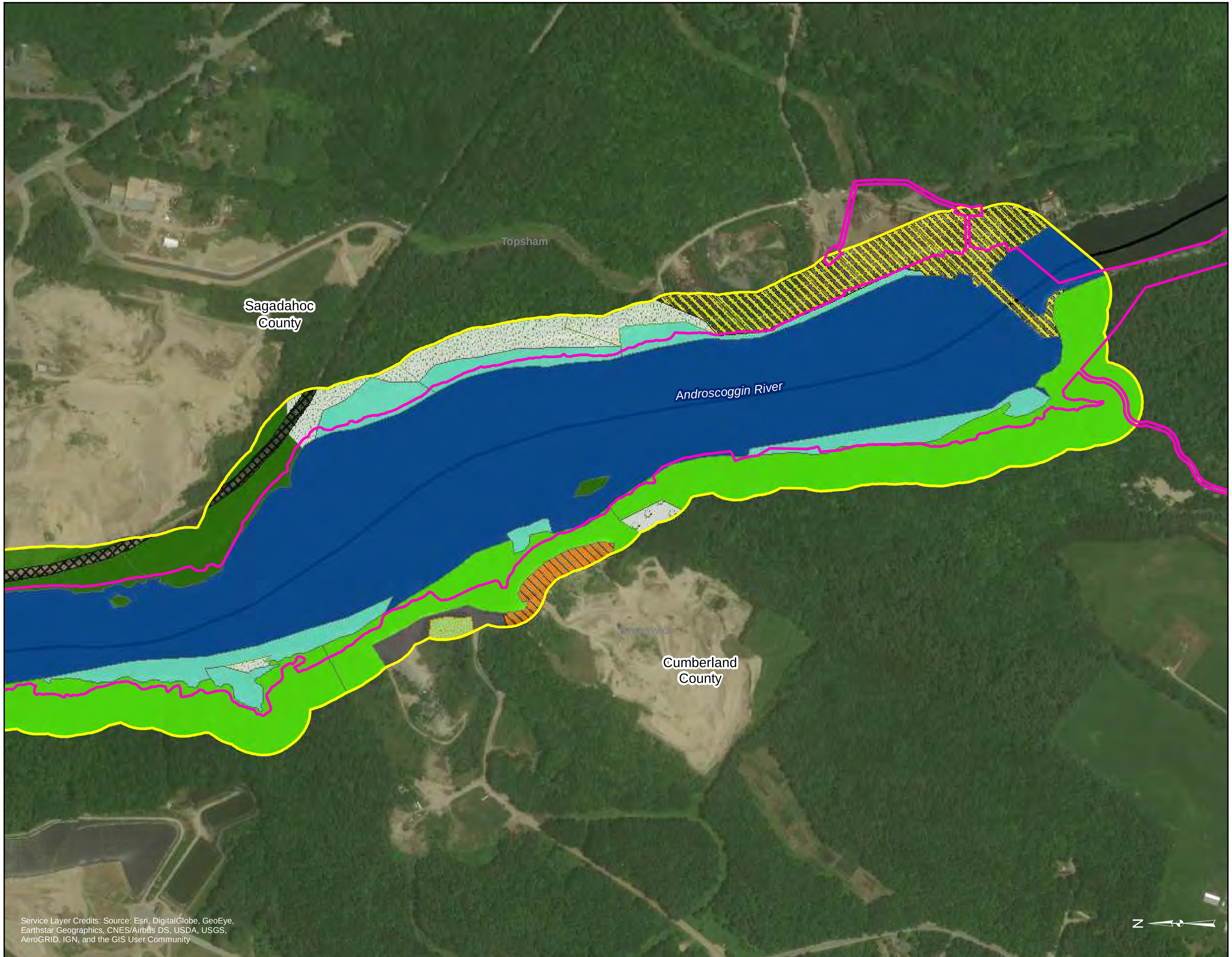

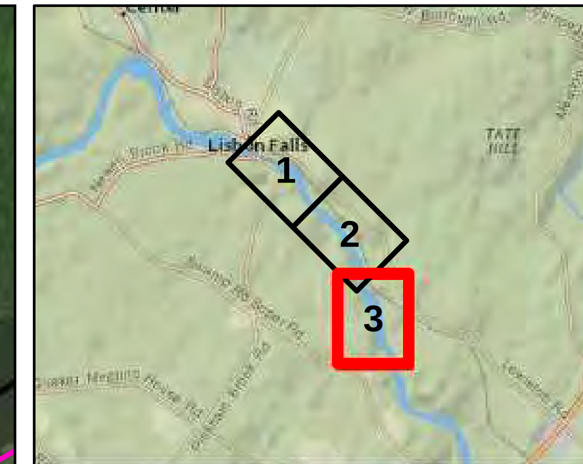

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Figure 4.7.1.2-1: Botanical Resources Cover Types
Page 3 of 3

Legend

Project Boundary
Study Area

Cover Type

Conifer plantation
Shrub
Deciduous forest
Mixed forest
Rock
Quarry
Railroad
Dam and related facilities
Young woods
Wetland
Open water
ME County Boundaries
ME Town Boundaries

0 250 500 1,000 Feet

Brookfield

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4.7.1.3 Terrestrial Wildlife Resources

Along the Project impoundment, the habitat is mostly forested with a mix of conifer and hardwood species. Because of the limited habitat, animals are likely transient individuals that may derive from resident populations in lands surrounding the Project.

Mammals that may utilize forested habitat include Short-tailed Shrew (*Blarina brevicauda*), Star-nosed Mole (*Condylura cristata*), New England Cottontail (*Sylvilagus transitionalis*), Snowshoe Hare (*Lepus americanus*), Southern Flying Squirrel (*Glaucomys volans*), Woodland Vole (*Microtus pinetorum*), Striped Skunk (*Mephitis mephitis*), Northern Raccoon (*Procyon lotor*), North American Porcupine (*Erethizon dorsatum*), Coyote (*Canis latrans*), Red Squirrel (*Sciurus vulgaris*), and Gray Squirrel (*Sciurus carolinensis*). Habitats bordering or close to the Project boundary include developed or agricultural. Many mammals that utilize forested habitats may also utilize these developed or agricultural spaces. Some examples of mammals that may utilize the developed or agricultural areas include: Gray Fox (*Urocyon cinereoargenteus*), Red Fox (*Vulpes vulpes*), Virginia Opossum (*Didelphis virginiana)*, Eastern Cottontail (*Sylvilagus floridanus)* (non-native to Maine), Meadow Vole (*Microtus pennsylvanicus*), Woodchuck (*Marmota mona*x), and White-footed Deermouse (*Peromyscus leucopus*).

Furbearers that may utilize the Project impoundment and the various terrestrial habitats include: American Mink (*Neovison vison*), American Marten (*Martes americana),* Fisher (*Martes pennanti*), North American Beaver (*Castor canadensis*), Common Muskrat *(Ondatra zibethicus*), and Northern River Otter (*Lontra canadensis*). Larger mammals may also utilize the Project Area including White-tailed Deer (*Odocoileus virginianus*), Moose (*Alces alces*), and American Black Bear (*Ursus americanus*). Due to varying forms of development present in this area, as well as other habitat considerations, it is unlikely that large mammals like Moose and Black Bear would be permanent residents and are likely instead limited to transient individuals (Bailey, 1995). However, it is likely that White-tailed Deer have established permanent populations in or around the Project Area. MDIFW has identified deer wintering areas within two-miles of the Project location, indicating that the White-tailed Deer populations may be present year-round (MDIFW, 2016).

There are several bat species that have the potential to occur in the Project Area. These species include the state endangered and federally threatened Northern Long-Eared Myotis (*Myotis septentrionalis*), the State Endangered Little Brown Bat (*Myotis lucifugus*), the state threatened Eastern Small-Footed Myotis (*Myotis leibii*), as well as five species of special concern: Big Brown Bat (*Eptesicus fuscus*), Silver Haired Bat (*Lasionycteris noctivagans)*, Eastern Red Bat (*Lasiurus borealis*), Hoary Bat (*Lasiurus cinereus*), and the Tri-Colored Bat (*Perimyotis subflavus*). The Northern Long-Eared, Little Brown, Silver Haired, Hoary And Tri-Colored Bats all utilize a diversity of forest habitats for roosting, foraging and raising young. The results of the 2018 wildlife survey indicated that habitats for several bat species do exist in the Project Area (Brookfield, 2019). Table 4.7.1.3-1 lists the non-bird wildlife species identified during the 2018 survey.

Regarding bird species, there are multiple avian species that may utilize the Project Area seasonally or year-round. Associated bird species common to the Laurentian-Acadian Pine-Hemlock-Hardwood Forest include: Black-and-White Warbler (*Mniotilta varia*), Blackburnian Warbler (*Setophaga fusca*), Black-Throated Blue Warbler (*Setophaga caerulescens*), Eastern Wood-Pewee (*Contopus virens*), Hermit Thrush (*Catharus guttatus*), Northern Saw-Whet Owl (*Aegolius acadicus*), Northern Waterthrush (*Parkesia noveboracensis*), Ovenbird (*Seiurus aurocapilla*), Pine Warbler (*Setophaga pinus*), Ruffed Grouse (*Bonasa umbellus*), Scarlet Tanager (*Piranga olivacea*), Veery (*Catharus fuscescens*), Wood Thrush (*Hylocichla mustelina*), and Yellow-Bellied Sapsucker (*Sphyrapicus varius*) (Ferree and Anderson, 2013). In addition, the Pejepscot Impoundment and surrounding areas provide habitat for migrating bird species (IPaC, 2016).

During the 2018 survey, a total of 26 bird species were observed during the field survey, including three Species of Special Concern. The Species of Special Concern observed during the survey included Great Blue Heron (*Ardea herodias*), Eastern Towhee (*Pipilo erythrophthalmus*), and Tree Swallow (*Tachycineta bicolor*). Bald Eagles were also observed, which are protected by the federal Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). No threatened or endangered bird species were observed during survey (Brookfield, 2019). Table 4.7.1.3-2 provides a list of bird species identified during the 2018 survey.

4.7.1.3.1 Invasive Wildlife Species

A number of exotic wildlife species are known to occur in Maine. These include bird species such as the Rock Pigeon (*Columba livia*), European Starling (*Sturnus vulgaris*), and House Sparrow (*Passer domesticus*), as well as mammal species such as the House Mouse and Norway Rat (MISN, 2017). Based on the habitat found within and surrounding the Project, invasive insects with the potential to occur within the Project Area and immediate vicinity include the European Fire Ant (*Myrmica rubra*), Gypsy Moth (*Lymantria dispar dispa*r), and Winter Moth (*Operophtera brumata*). The European Fire Ant has been identified in coastal Kennebec County and is known to inhabit areas with urban development. Gypsy Moth infestations are most prevalent in central and southern Maine and generally prefer hardwood trees (i.e., oak, aspen, and birch) for feeding. The Winter Moth occurs along the Maine coast, although may be more widespread and prefers to feed on hardwoods including oak, maple, ash, cherry, and apple trees (MISN, 2017).

Table 4.7.1.3-1. Non-bird Terrestrial Animal Species Observed in the Pejepscot Project Area – 2018

Common Name	Scientific Name	Observation Type		Status[5]
		Seen	Heard	
Bumble Bee	*Bombus* sp.	X		TE and SC
Monarch Butterfly	*Danaus plexippus*	X		Under review
White-tailed Deer (tracks)	*Odocoileus virginianus*	X		No status
Eastern Milk Snake	*Lampropeltis triangulum*	X		No status
Eastern Gray Squirrel	*Sciurus carolinensis*	X		No status
Red Squirrel	*Sciurus vulgaris*	X		No status
Yellow Jacket	*Vespinae* sp.	X		No status

Source Brookfield, 2019

[5] Source: MDIFW, 2015

Table 4.7.1.3-2. Bird Species Observed in the Pejepscot Project Area

Common Name	Scientific Name	Observation Type		Maine Status[6]
		Seen	Heard	
Wood Duck	*Aix sponsa*	X		No status
Mallard	*Anas platyrhynchos*	X		No status
American Black Duck	*Anas rubripes*	X		No Status
Common Egret	*Ardea alba*	X		No Status[7]
Great Blue Heron	*Ardea herodias*	X		Special Concern
Red-tailed Hawk	*Buteo jamaicensis*	X	X	No status
Turkey Vulture	*Cathartes aura*	X		No status
American Crow	*Corvus brachyrhynchos*	X	X	No status
Common Raven	*Corvus corax*	X	X	No status
Blue Jay	*Cyanocitta cristata*	X		No status
Gray Catbird	*Dumetella carolinensis*	X	X	No status
Bald Eagle	*Haliaeetus leucocephalus*	X		Delisted 2009, protected by the federal Bald and Golden Eagle Protection Act
Pileated Woodpecker	*Hylatomus pileatus*	excavation	X	No status
Ring-billed Gull	*Larus delawarensis*	X		No status
Song Sparrow	*Melospiza melodia*		X	No status
Osprey	*Pandion haliaetus*	X		No status
Double-crested Cormorant	*Phalacrocorax auritas*	X		No status
Eastern Towhee	*Pipilo erythrophthalmus*		X	Special Concern
Prothonotary Warbler	*Protonotaria citrea*	X		No status
Common Grackle	*Quiscalus quiscula*	X		No status
Eastern Phoebe	*Sayornis phoebe*		X	No status

6 Source: MDIFW, 2015
7 Removed from MDIFW, 2015

Common Name	Scientific Name	Observation Type		Maine Status[6]
		Seen	Heard	
White-breasted Nuthatch	*Sitta carolinensis*	X		No status
Common Eider	*Somateria mollissima*	X		No status
Tree Swallow	*Tachycineta bicolor*	X		Special Concern
American Robin	*Turdus migratorius*		X	No status
Mourning Dove	*Zenaida macroura*	X		No status

Source Brookfield, 2019

4.7.1.4 Wetlands, Riparian, and Littoral Habitat

4.7.1.4.1 Wetland Habitat and Vegetation

Wetlands are defined by the USFWS as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water." For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of the year" (USFWS, 2016).

Review of the USFWS National Wetland Inventory coverage found that, within 1,000 feet of the Project boundary, there are approximately 291 acres categorized as wetlands (Figure 4.7.1.4.1-1). Of these, 258 acres are considered open water and are split between riverine, lake, and freshwater pond. The remaining 33 acres are considered either freshwater emergent or freshwater forested/shrub wetlands, which are further defined by the MDEP. This is consistent with the results of the 2018 botanical and wildlife survey conducted by the Licensee, which found that emergent wetlands occupy approximately 25.6 acres of the area investigated. As noted in Section 4.7.1.2, emergent wetlands were primarily pickerelweed macrophyte aquatic beds. The most abundant species in these communities were pickerelweed *(Pontederia cordata*), American bur-reed (*Sparganium americanum),* and broadleaf arrowhead *(Sagittaria latifolia)* (Brookfield, 2019).

In addition, forested wetland accounted for 5.3 acres of the survey area (Brookfield, 2019). In general, freshwater forested/shrub wetlands are forested swamp, or wetland, shrub, or bog. In Maine, they may be characterized as deciduous or evergreen, and include: red maple, larch (*Larix laricina*), black ash (*Fraxinus nigra*), yellow birch (*Betula alleghaniensi*s), gray birch (*Betula populifolia*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), white pine (*Pinus strobu*s), black willow (*Salix nigra*), northern white cedar (*Thuja occidentalis*), hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), and black spruce (*Picea mariana*). Associated shrubs include highbush blueberry (*Vaccinium corymbosum*), sheep laurel (*Kalmia angustifolia*), maleberry (*Lyonia ligustrina*), black chokeberry (*Aronia melanocarpa*), mountain holly (*Ilex mucronata*), common elderberry, common winterberry (*Sambucus nigra*), and silky dogwood (*Cornus amomum*). Herbs include skunk cabbage (*Symplocarpus foetidus*), Jack-in-the-pulpit (*Arisaema triphyllum*), Canada mayflower (*Maianthemum canadense*), royal fern (*Osmunda regalis*), cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern (*Onoclea sensibilis*), and marsh fern (*Thelypteris palustris*) (MDEP, 2017).

4.7.1.4.2 Riparian Habitat and Vegetation

Riparian habitat is the specialized zone of vegetation that serves as the interface between the upland vegetation community and the riverine environment. This zone provides numerous valuable functions such as maintaining streambank stability, sediment filtration, and floodplain processes. Riparian zone habitat and vegetation adjacent to the Pejepscot Impoundment is, in general, comprised of forested areas of varying width. In some developed locations, the riparian zone is limited by the presence of roads, railroads, barren areas, and/or industrial and residential areas. In addition, there are relatively small, localized wetlands scattered throughout the Project Area. At the dam, there is little to no riparian zone due to the presence of bedrock and riprap on the west side (right side looking downstream) and the powerhouse, railroad bed, and industrial area on the east side (left side looking downstream). Habitat and vegetation found in the forested or wetland riparian areas are consistent with those discussed in the previous sections.

4.7.1.4.3 Littoral Habitat and Vegetation

The littoral zone is considered to be the transitional area between deepwater, aquatic habitat and the terrestrial wetlands or uplands. It is often comprised of permanently flooded wetlands such as marshes and other shallow water areas that are permanently water covered. The Project impoundment upstream of the Pejepscot Dam includes approximately three miles of the Androscoggin River. The impoundment has a surface area of 225 acres, and gross storage of 3,278 acre-feet at a pond elevation of 67.5 feet. Google Earth images over time did not provide visual information of grass beds or other littoral zone habitat elements. Habitat and vegetation found in the littoral zone is consistent with those discussed in the previous sections.

4.7.1.4.4 Wetland, Littoral, and Riparian Wildlife

Wetland and riparian areas serve as transition zones between aquatic and terrestrial systems, and, as such, support many mammal, bird, reptile, and amphibious species that depend on both habitat types to survive. Sections 4.7.1.3 provides additional information on wildlife that may exist in the Project Area.

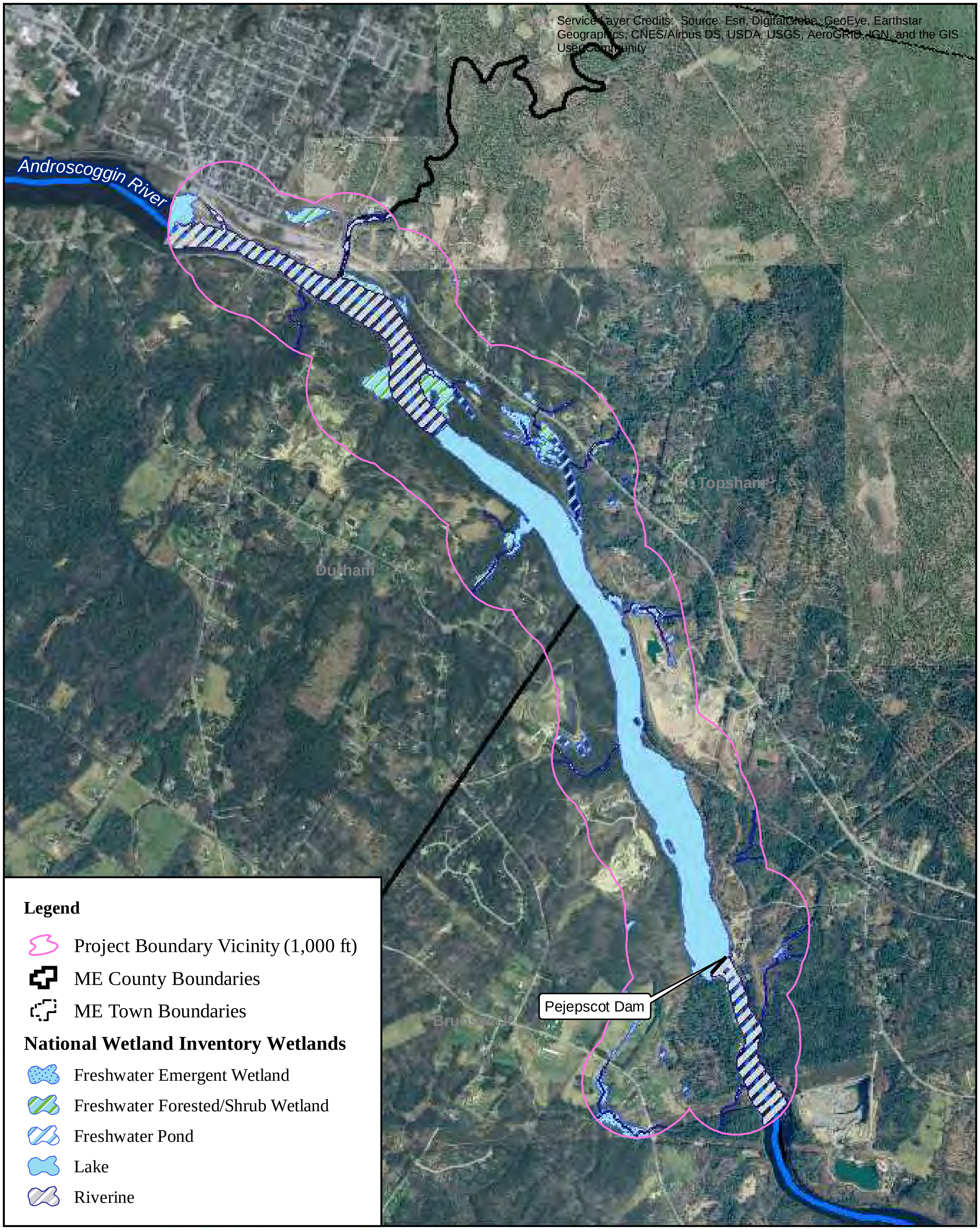

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Figure 4.7.1.4.1-1.
National Wetlands Inventory
Wetlands within 1,000 feet
of the Project Boundary

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4.7.2 Environmental Analysis

FERC's SD2 identified one potential resource issue relating to wildlife and botanical resources, which is discussed in greater detail below.

<u>Effects of continued project operation on riparian, littoral, and wetland habitat and associated wildlife</u>

The Project operates in a run-of-river mode, with Project outflows approximately matching inflows. The Project impoundment has no significant storage capacity. As a result of this operating regime, the Project has no significant effect on the overall river flow of the Androscoggin River. Therefore, impacts that are commonly associated with impoundment water level fluctuations are minimal to non-existent. For these reasons, botanical resources and wildlife habitat within the Project area are not adversely impacted by Project operations.

The occurrence and distribution of terrestrial vegetation cover types in the study area is generally unrelated to Project operations. Based on the results of the 2018 botanical surveys, the wetland communities associated with the Project were found to be healthy, and appeared to be in a state of equilibrium with the current Project operations. The species richness and diversity of all wetland types bordering the Project impoundment generally reflect natural community expectations for this area.

The operation of the Project has limited to no impact on the wildlife resources within and bordering the Project area. Based on the 2018 wildlife surveys and an assessment of habitat conditions within the Project area, there is no evidence of any on-going adverse effects.

4.7.3 Proposed Environmental Measures

Topsham Hydro is proposing no fundamental change in the operation of the Project and proposes to continue:

- Operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates; and
- Maintaining a minimum flow of 1,170 cfs, or inflow, whichever is less downstream of the Project.

Studies conducted by Topsham Hydro demonstrated that the Project and its continued operation do not adversely affect wildlife and botanical resources. Therefore, Topsham Hydro is not proposing additional PME measures specific to wildlife and botanical resources at the Project.

4.7.4 Unavoidable Adverse Effects

Continued operation of the Project, as proposed, will have no significant unavoidable adverse impacts to Project wildlife and botanical resources.

4.7.5 References

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4.8 Threatened and Endangered Species

4.8.1 Affected Environment

Threatened or endangered (TE) species have the potential to utilize both aquatic and terrestrial habitats located in or around the Project Area. The State of Maine also identifies species of special concern; which are species that do not meet the criteria established for being state or federally listed but are considered vulnerable and could become threatened or endangered. Several database searches were performed to assess the TE species that may utilize the Project Area. These databases included USFWS Information for Planning and Consultation (IPaC) and Maine Natural Areas Program. The species discussed in the sections below were determined based on their known species distribution and the potential presence of the species in the vicinity of the Project Area as well as the results of the 2018 botanical and wildlife survey conducted as part of relicensing.

4.8.1.1 Critical and Special Status Habitats

Atlantic Salmon are a federally endangered fish species. Their life history and habitat requirements are discussed extensively in Section 4.6.1. The critical habitat listing for Atlantic Salmon was finalized in June 2009 and includes the Project location as well as areas above and below it and is discussed in Section 4.6.1.2. Likewise, EFH for Atlantic Salmon is discussed Section 4.6.1.3.5.

4.8.1.2 Threatened and Endangered Fish and Freshwater Aquatic Species

Atlantic Salmon are the only federally endangered fish or freshwater aquatic species found in the Project Area. Salmon would typically be found migrating through the Project Area, primarily when pre-spawn adults pass upstream in the spring through the fall, when post-spawn kelts pass downstream in the early spring, and when juveniles (smolts) pass downstream through the area in the spring. Pursuant to the ESA, Topsham Hydro will prepare a BA to assess the potential effects of the proposed relicensing of the Project on Atlantic Salmon and Atlantic Salmon critical habitat; the BA will be included as Appendix E-1 **[To be included in the FLA]**.

There are four species of amphibian and four species of reptile that are state-listed species of special concern, which may be present in the Project Area as well as one mussel species (Creeper) that is state-listed as a species of special concern that may be present in the Project Area. In addition, there are ten odonate species of special concern that may be present in the Project Area. They may be present year-round as juveniles in aquatic habitats or as adults after emerging during the warmer months. Table 4.5.1.5.2-3 provides additional information pertaining to the odonate species of special concern, while Table 4.8.1.2-1 provides a summary of the non-odonate fish and freshwater aquatic species of special concern that may be present in the Project Area. Information on these species can be found in Sections 4.5.1.2.3, 4.5.1.2.4 and 4.6.1.5.

Table 4.8.1.2-1. TE and Special Concern Fish and Aquatic Species

Common Name	Scientific Name	Status
Atlantic Salmon	*Salmo salar*	Federally Endangered
Northern spring salamander	*Gyrinophilus porphyriticus*	State Special Concern
Blue-spotted salamander	*Ambystoma laterale*	State Special Concern
Mink frog	*Lithobates septentrionalis*	State Special Concern
Northern leopard frog	*Lithobates pipiens*	State Special Concern
Northern brown snake	*Storeria d. dekayi*	State Special Concern
Eastern ribbon snake	*Thamnophis sauritus*	State Special Concern
Spotted turtle	*Clemmys guttata*	State Special Concern
Wood turtle	*Glyptemys insculpta*	State Special Concern
Creeper	*Strophitus undulatus*	State Special Concern

4.8.1.3 Threatened and Endangered Wildlife Species

There are several terrestrial species identified by USFWS and MDIFW as TE or Special Concern. The USFWS identified the northern long-eared bat, a threatened species as potentially occurring in the Project Area (USFWS, 2016). In addition, MDIFW has identified nine mammal species that are classified as TE or Special Concern (Table 4.8.1.3-1). The majority of this group is comprised of various bat species. Bat species' populations have been declining due to White Nose Syndrome, a fungal disease. Furthermore, MDIFW has identified 32 bird species that meet Maine's TE or Special Concern requirements (Table 4.8.1.3-2). Several of these bird species are also considered to be Birds of Conservation Concern by the USFWS and are protected under the Migratory Bird Treaty Act.

TE or species of special concern that may be found near the Project can be grouped into two categories; those that may be found in the Project Area year-round (i.e., the mammal species) or those that may be found in the Project Area for shorter periods of time (e.g., migratory birds). The big brown bat, little brown bat, and northern long-eared bat are species that hibernate in Maine during the winter. The silver-haired bat is a tree bat that migrates to warmer locations during winter (MDIFW, 2017). These bat species have the potential to utilize lands around the Project Area seasonally.

Table 4.8.1.3-1. Mammals Identified as State TE or Special Concern that May Occur Near the Project

Common Name	Scientific Name	State Status
Big Brown Bat	*Eptesicus fuscus*	Special Concern
Silver-Haired Bat	*Lasionycteris noctivagans*	Special Concern
Eastern Red Bat	*Lasiurus borealis*	Special Concern
Hoary Bat	*Lasiurus cinereus*	Special Concern
Eastern Small-Footed Myotis	*Myotis leibii*	Threatened
Little Brown Bat	*Myotis lucifugus*	Endangered
Northern Long-Eared Myotis	*Myotis septentrionalis*	Endangered (Federally Threatened)
Tri-Colored Bat	*Perimyotis subflavus*	Special Concern
New England Cottontail	*Sylvilagus transitionalis*	Endangered

Source: SWAP, 2015

Table 4.8.1.3-2. Birds Identified as State TE or Special Concern that May Occur Near the Project

Common Name	Scientific Name	State Status
Northern Harrier	*Circus cyaneus*	Special Concern
Harlequin Duck	*Histrionicus histrionicus*	Threatened
Chimney Swift	*Chaetura pelagica*	Special Concern
Upland Sandpiper	*Bartramia longicauda*	Threatened
Black Tern	*Chlidonias niger*	Endangered
Whimbrel	*Numenius phaeopus*	Special Concern
Common Tern	*Sternula hirundo*	Special Concern
Yellow-Billed Cuckoo	*Coccyzus americanus*	Special Concern
Peregrine Falcon	*Falco peregrinus*	Endangered
American Coot	*Fulica americana*	Special Concern
Grasshopper Sparrow	*Ammodramus savannarum*	Endangered
Canada Warbler	*Cardellina candensis*	Special Concern
Sedge Wren	*Cistothorus platensis*	Endangered
Olive-Sided Flycatcher	*Contopus cooperi*	Special Concern
Eastern Wood-Pewee	*Contopus virens*	Special Concern

Common Name	Scientific Name	State Status
Least Flycatcher	*Empidonax minimus*	Special Concern
Horned Lark	*Eremophila alpestris*	Special Concern
Barn Swallow	*Hirundo rustica*	Special Concern
Wood Thrush	*Hylocichla mustelina*	Special Concern
Orchard Oriole	*Icterus spurius*	Special Concern
Eastern Towhee	*Pipilo erythrophthalmus*	Special Concern
Prairie Warbler	*Setophaga discolor*	Special Concern
Yellow Warbler	*Setophaga petechia*	Special Concern
Northern Rough-Winged Swallow	*Stelgidopteryx serripens*	Special Concern
Eastern Meadowlark	*Sturnella magna*	Special Concern
Tree Swallow	*Tachycineta bicolor*	Special Concern
Brown Thrasher	*Toxostoma rufum*	Special Concern
White-Throated Sparrow	*Zonotrichia albicollis*	Special Concern
Great Blue Heron	*Ardea herodias*	Special Concern
Least Bittern	*Ixobrychus exilis*	Endangered
Black-Crowned Night-Heron	*Nycticorax nycticorax*	Endangered
Great Cormorant	*Phalacrocorax carbo*	Threatened

Source: SWAP, 2015

4.8.1.4 Threatened and Endangered Botanical Resources

Several state-listed plant species were identified in the PAD as potentially occurring in or near the Project area (Table 4.8.1.4-1); however, no TE species were observed during the 2018 botanical survey (Brookfield, 2019). Aquatic species listed in the PAD included comb-leaved mermaid-weed (*Proserpinaca pectinata*, Endangered) and spotted pondweed (*Potamogeton pulcher,* Threatened). Comb-leaved mermaid-weed is an aquatic perennial, with highly dissected leaves and axial flowers with four separate carpels. It flowers and fruits from July through September and may be found in ponds, lakes, and impoundments. No individuals of the species were found during the 2018 survey, but habitat for the plant does exist within the wetlands that lie along impoundment. Spotted pondweed is an aquatic perennial with narrow, lance-shaped submerged leaves, oval floating leaves and black spotted stems. It is found in peaty, tannic waters, and flowers from June to September. No individuals of this species were observed, and the waters within the Project Area do not occur over peaty substrates nor are they particularly tannic. Habitat for this species does not exist within the Project Area.

Two listed species normally found in bogs and fens that were listed in the PAD include showy lady's slipper (*Cypripedium reginae,* Special Concern) and white adder's mouth (*Malaxis* *monophyllos,* Endangered). Showy lady's slipper is an orchid found in more neutral bogs, edges of mossy forests and open wetlands. The species flowers from June through July. White adder's mouth is a small orchid found in wet gravel deposits, calcareous bogs and fens. The plant has a single leaf from which comes a flower stalk with a raceme of greenish-white flowers, which generally appear in July. Neither of these orchids were noted during the 2018 field survey, and there are no bogs, fens or wet gravel deposits within the Project Area (Brookfield, 2019).

Several state-listed species that occur in wetlands or moist woods were listed in the PAD. These included hollow Joe-pye weed (*Eutrochium fistulosum,* Special Concern), smooth winterberry holly (*Ilex laevigata,* Special Concern), spicebush (*Lindera benzoin,* Special Concern), and sweet pepper-bush (*Clethra alnifolia,* Special Concern). Hollow Joe-pye weed is a tall member of the *Asteraceae* found in wet areas. The plant has a hollow, purplish stem with a whitish bloom, and flowers from July through September. A con-generic species, sweet Joe-pye weed (*Eutrochium purpureum*), was found in the Project Area. Sweet Joe-pye weed tends to occur on drier sites than hollow Joe-pye weed and has a solid stem with no whitish bloom. No individuals of hollow Joe-pye weed were found, but habitat for the species does exist within the Project Area in the open wetlands (Brookfield, 2019).

Smooth winterberry is a deciduous holly shrub with shiny leaves. It is found in swamps and dense thickets. Flowers appear from May to June, with berries appearing on female plants in late June. No members of the genus *Ilex* were found, but habitat for the species does exist within the forested and marsh and shrub wetlands of the Project Area. Sweet pepper-bush grows as a small tree or shrub. The plant has alternate, ovate, toothed leaves on short pedicels. Terminal racemes of white flowers with protruding stamens appear in July through August. No individuals were found, but habitat for sweet pepper-bush does exist within the forested and marsh and shrub wetlands in the Project Area (Brookfield, 2019).

Finally, three species found in moist or mesic woods were listed in the PAD. These were spicebush (*Lindera benzoin,* Special Concern), mountain-laurel (*Kalmia latifolia,* Special Concern) and broad beech fern (*Phegopteris hexagonoptera,* Special Concern). Spicebush is an understory tree or shrub found along brooks, in swamps and in the understories of moist forests. Its leaves are ovoid with entire margins. The tree flowers from late April to May but is easily identifiable by the lemony-spicy scent given off from bruised leaves and twigs. Mountain laurel is an evergreen flowering shrub found in rocky or gravelly woods and clearings, clearings in or edges of mesic woods and occasionally swamps. The pink and white flowers have five petals fused into a disc or saucer shape and appear from May through July. Broad beech fern is a large fern with a triangular leaf arrangement, hairy stems, yellowish scales, winged axis and lobed sub leaflets. The fern occurs in sunny openings in moist woods. No individuals of these three species were found in the Project Area, but habitat for each of them does exist within the mesic woods mapped (Brookfield, 2019).

Table 4.8.1.4-1. State-listed Plants Listed in the PAD

Common Name	Species Name	Status	Found in Project Area?	Habitat in Project Area?
Sweet pepperbush	*Clethra alnifolia*	Special Concern	No	Yes, in forested and marsh and shrub wetlands
Showy lady's slipper	*Cypripedium reginea*	Special Concern	No	No
Hollow Joe-pye weed	*Eutrotrichium fistulosum*	Special Concern	No	Yes, in open (non-wooded) wetlands
Smooth winterberry holly	*Ilex laevigatum*	Special Concern	No	Yes, in forested and marsh and shrub wetlands
Mountain laurel	*Kalmia latifolia*	Special Concern	No	Yes, in mesic woods
Spicebush	*Lindera benzoin*	Special Concern	No	Yes, in mesic woods
White adder's mouth	*Malaxis monophyllus*	Endangered	No	No
Broad beech fern	*Phegopteris hexagonoptera*	Special Concern	No	Yes, in mesic woods
Spotted pond weed	*Potamogeton pulcher*	Threatened	No	No
Comb-leaved mermaid weed	*Prosperinaca pectinata*	Endangered	No	Yes, in wetlands along the impoundment

Source Brookfield, 2019

4.8.2 Environmental Analysis

FERC's SD2 identified one potential resource issue relating to wildlife and botanical resources, which is discussed in greater detail below.

Effects of continued project operation on the federally endangered Atlantic Salmon and its critical habitat and the northern long-eared bat

Northern long-eared bat

The northern long-eared bat may occur within the Project area. This aerial insectivore may forage adjacent to Project waters in forested habitats in the summer, but is not expected to be adversely affected as a result of Project operations. The northern long-eared bat roosts in upland areas (live or snag trees, caves, etc.), spends winter months in hibernacula, and is not expected to be adversely affected by Project operations. There are no planned changes in current operating conditions or maintenance activities that would affect this species. There is no indication from field observations that Project operations cause any adverse impacts on northern long-eared bat breeding, roosting, or habitat in the vicinity of the Project.

Atlantic Salmon

The potential effects of the proposed action on Atlantic Salmon and Atlantic Salmon critical habitat are discussed in the BA (Appendix E-1) **[To be included in the FLA]** and in Section 4.6.2.

4.8.3 Proposed Environmental Measures

Proposed PME measures related to Atlantic Salmon are discussed in the BA and SPP (Appendix E-1) **[To be included in the FLA]** and in Section 4.6.3.

The operation of the Project has no effect on the remaining TE species; therefore, the Topsham Hydro is not proposing PME measures for those TE resources.

4.8.4 Unavoidable Adverse Effects

Continued operation of the Project, as proposed, will have no significant unavoidable adverse impacts on TE species.

4.8.5 References

Brookfield Renewable. 2019. Initial Study Report Botanical and Wildlife Resources Survey Pejepscot Hydroelectric Project.

Maine Department of Agriculture, Conservation and Forestry. 2016. *Natural Communities and Ecosystems.* Maine Natural Areas Program. http://www.maine.gov/dacf/mnap/features/community.htm Accessed December 2016

Maine Department of Inland Fisheries & Wildlife. 2015. *Maine's State Wildlife Action Plan* (SWAP). http://www.state.me.us/ifw/wildlife/reports/wap.html. Accessed January 2017.

Maine Department of Inland Fisheries & Wildlife. 2017. *Small Mammals.* http://www.maine.gov/ifw/wildlife/species/mammals/small.html. Accessed April 2017.

United States Fish & Wildlife Service. 2016. *IPaC Trust Resources Report*. https://ecos.fws.gov/ipac/ Accessed December 2016.

4.9 Recreation and Land Use

4.9.1 Affected Environment

Recreational and non-recreational land use in the Project vicinity reflects the generally rural, forested, riverine location. Recreation along the Androscoggin River and surrounding area typically includes hiking, cross-country skiing, snowshoeing, snowmobiling, and mountain biking, as well as fishing, boating, hunting, picnicking, and wildlife watching. Selected recreation parameters for each of the three counties abutting the Project are discussed in Section 4.9.1.1.

Major land use classifications of the river basin and within the immediate Project vicinity are discussed in Section 4.3.4. As previously noted, the Project boundary is within four towns – the Towns of Durham and Lisbon in Androscoggin County, the Town of Topsham in Sagadahoc County, and the Town of Brunswick in Cumberland County (see Figure 3.2.3-1). Non-recreational land uses in the area include industrial, commercial, residential, and agricultural uses. Commercial and residential development is concentrated within town centers and along transportation corridors, industrial development is concentrated near the eastern shore of the Androscoggin River, and agricultural uses are set back from both banks of the river.

No Project lands are included in, or under study for inclusion in, the National Trails System or the National Wilderness Preservation System (UM, 2016). The Project site is not located within or adjacent to any river segment that is designated as a part of, or under study for inclusion in, the National Wild and Scenic River System (NWSRS, 2016) or included in the Nationwide Rivers Inventory (NRI) (NPS, 2009). The downstream tidewater section of the Androscoggin River from Merrymeeting Bay to Brunswick is listed in the NRI for outstanding fish, wildlife, botanical, hydrologic, recreational, and historic values. The river segment roughly 100 miles upstream of the Project in Oxford County, from south of Rumford Center to Hastings Island, is listed in the NRI as "a sparsely developed high order river" with an historic Atlantic Salmon fishery (NPS, 2009).

4.9.1.1 Regional Recreation Opportunities

The Project Area lies within three of Maine's tourism regions: Mid-coast and Islands, Greater Portland and Casco Bay, and Lakes and Mountains (MOT, 2016). The three regions span a large portion of the state and offer an array of recreational opportunities. The Maine Office of Tourism identifies commercial recreational opportunities downstream of the Project in Brunswick, including Thomas Point Beach & Campground and Brunswick Golf Course. Other opportunities listed in the immediate area include Bradbury Mountain State Park (located approximately 9 miles southwest of the Project), Pineland Public Reserved Land (located approximately 11 miles southeast of the Project), Androscoggin Riverlands State Park (located approximately 16 miles northeast of the Project), Outlet Beach (located approximately 16 miles east of the Project), and several private campgrounds. The Merrymeeting Bay area provides numerous recreation opportunities on and off the water, including at John L. Baxter State Forest and the Steve Powell Wildlife Management Area on Swan Island (MOT, 2016).

Bradbury Mountain State Park provides over 800 acres of forested land for camping, hiking, picnicking, horseback riding, biking, snowshoeing, wildlife viewing, and snowmobiling. The park is situated off Route 9 in Pownal and open year-round. There is a small fee for admission to the park. Facilities include a campground, picnic area, group picnic shelter, playground, and showers (MOT, 2016).

Pineland Public Reserved Land, located on both sites of Route 231 in New Gloucester, Gray and North Yarmouth, contains over 600 acres of undeveloped land. Activities include cross country skiing, fishing, hiking, biking, snowshoeing, and wildlife viewing (MOT, 2016).

Outlet Beach is a family-owned beach on the north shore of Sabbathday Lake in New Gloucester. The beach is open for swimming and boating from Memorial Day through mid-September, and offers two floating docks, a floating diving board, an offshore slide, a snack bar, a picnic area, bathhouses, and restrooms. There is a small fee for admission to the beach and boat launch area. Canoes, paddleboats, kayaks and tubes are available for rent (MOT, 2016).

Located north of Lewiston, the 2,675-acre Androscoggin Riverlands State Park offers trails for hiking, cross-country skiing, snowshoeing, snowmobiling, and mountain biking, as well as opportunities for fishing, motorized and non-motorized boating, hunting, picnicking, and wildlife watching. The park has 12 miles of river frontage and is part of the larger Androscoggin Greenway (the southernmost section of the river) and the Androscoggin River Trail (MDACF, 2013). The Androscoggin River Trail connects public river access points along the river from Shelburne, NH, to Rumford, ME, allowing for boating trips of varying lengths along mostly flat water. The Androscoggin Greenway section of the trail provides access sites in the Project vicinity, including in the Towns of Lisbon, Durham, Topsham and Brunswick (ARWC, 2012).

Several smaller parks in the towns surrounding the Project Area provide hiking, biking, snowshoeing and cross-country skiing trails, including Summer Street Park in the Town of Lisbon, Durham River Park in the Town of Durham, and Foreside Trails in the Town of Topsham. Table 4.9.1.1-1 provides an overview of select recreation parameters broken down by county.

Table 4.9.1.1-1. Select Recreation Parameters by County

	Androscoggin County	Cumberland County	Sagadahoc County
Boat Launches – Hand Carry Only	3	6	3
Boat Launches	13	39	11
Trails – ATV (mi.)	67	102	65
Trails – Snowmobile (mi.)	589	640	160
Conservation Land (acres)	9,189	38,163	18,502
Conservation Land - % of County	2.9%	6.5%	11.3%

Source: MDOC, 2009

4.9.1.2 Existing Project Area Recreation Facilities

The Licensee operates the following three FERC-approved Project recreation facilities:

- **Pejepscot Boat Ramp**: located in Topsham off Route 196 on the eastern shore of the Androscoggin River just downstream from Lisbon Falls. The site provides Project impoundment access for trailered and hand-carry boats via a concrete ramp with an asphalt approach.
- **Pejepscot Fishing Park**: located off River Road in Brunswick, on the western shore of the Androscoggin River. The site provides access to the river above and below the dam, as well as a boat landing, trail, and metal staircase for portaging around the dam.
- **Lisbon Falls Fishing Park**: located adjacent to the Route 125 Bridge approximately 600 feet downstream of Worumbo Dam. The Fishing Park includes a parking area on the north side of Route 125 as well as a footpath and a staircase leading to the Androscoggin River.

Figure 4.9.1.2-1 depicts existing Project recreation facilities. The following subsections describe each site in greater detail.

4.9.1.2.1 Pejepscot Boat Ramp

The Pejepscot Boat Ramp is operated by the Licensee and is located approximately 2.5 miles upstream of the dam directly off Lisbon Street/Route 196 in the Town of Topsham. The facility consists of a large gravel parking area, a gated gravel access lane that crosses a railroad track, a gravel turnaround area, and a boat ramp providing access to the Project impoundment. The site is comprised of two parcels divided by the railroad right of way: one parcel holds the parking area and the other holds the boat ramp and gravel turnaround area. The Licensee holds easements on the parking and boat ramp parcels and a private railroad crossing permit to connect them.

Access to the site consists of an approximately 25 foot wide gravel driveway off Lisbon Street/Route 196. The gravel parking area is approximately 115 feet long and 40 feet wide, with space for approximately 12 vehicles with trailers. The access road leading from the parking area to the turnaround area and boat launch is gated; the gate is closed during high flow conditions or as needed for safety considerations based on the discretion of Project operating and safety staff. The access road leads to a gravel turnaround area, large enough to allow for vehicles with trailers to pivot in order to back down the boat ramp. The approach to the boat ramp is a nearly 15 foot wide asphalt road. The ramp itself is composed of two sets of concrete planks each 7.5 feet wide. The total ramp length, including the asphalt approach, is approximately 45 feet.

4.9.1.2.2 Pejepscot Fishing Park

The Pejepscot Fishing Park, also known as the Pejepscot Dam Recreation Area, is located off River Road in the Towns of Topsham and Brunswick. The site is accessed via a long gravel access road and consists of a small parking area with capacity for three vehicles, angler access above and below the dam, and a portage facility. The site is situated on three parcels; the Licensee owns one of the parcels and holds easements on the remaining two.

A large wooden sign at the top of the access road off River Road identifies the site as the Pejepscot Fishing Park. Attached signage indicates that the park is open for public use from one hour before sunrise to one hour after sunset. The access road leads to a small gravel parking area; vehicular access beyond the parking area is blocked by a cable strung between two posts. A trash receptacle is provided near the parking area. Beyond the parking area and adjacent to the portage trail is a flat, open area overlooking the Project dam. Access to and views of the Project are restricted by fencing.

The portage facility consists of an unimproved boat landing area above the dam, a 600-foot-long trail leading around the dam, and a put-in below the dam. The take-out landing is located just above the dam along a steep boulder wall. To access the take-out, boaters pass around the western edge of the upstream boat barrier (installed from May 15 through October 15) and follow the inner canoe barrier along the shore. From the take-out, boaters follow the edge of the fence along an unimproved dirt path indicated by a canoe portage sign. The trail continues up the hill to the dam overlook area and continues along the edge of the fence downhill to a set of steel stairs descending a steep exposed ledge face. Along the stairs is a ramp upon which canoes and kayaks can be slid down. At the bottom of the stairs is a flat rock landing with handrails guiding users down a steep section of ledge to a lower shelf. The lower shelf runs for approximately 55 feet to an area where the slope to water's edge is more gradual. The put-in is located in a gentle backwater with a gradual rocky slope into the water.

Anglers access the shoreline above and below the dam using the portage trail. In addition, there is an informal footpath leading from the parking area to the shoreline approximately 1,300 feet downstream from the dam.

4.9.1.2.3 Lisbon Falls Fishing Park

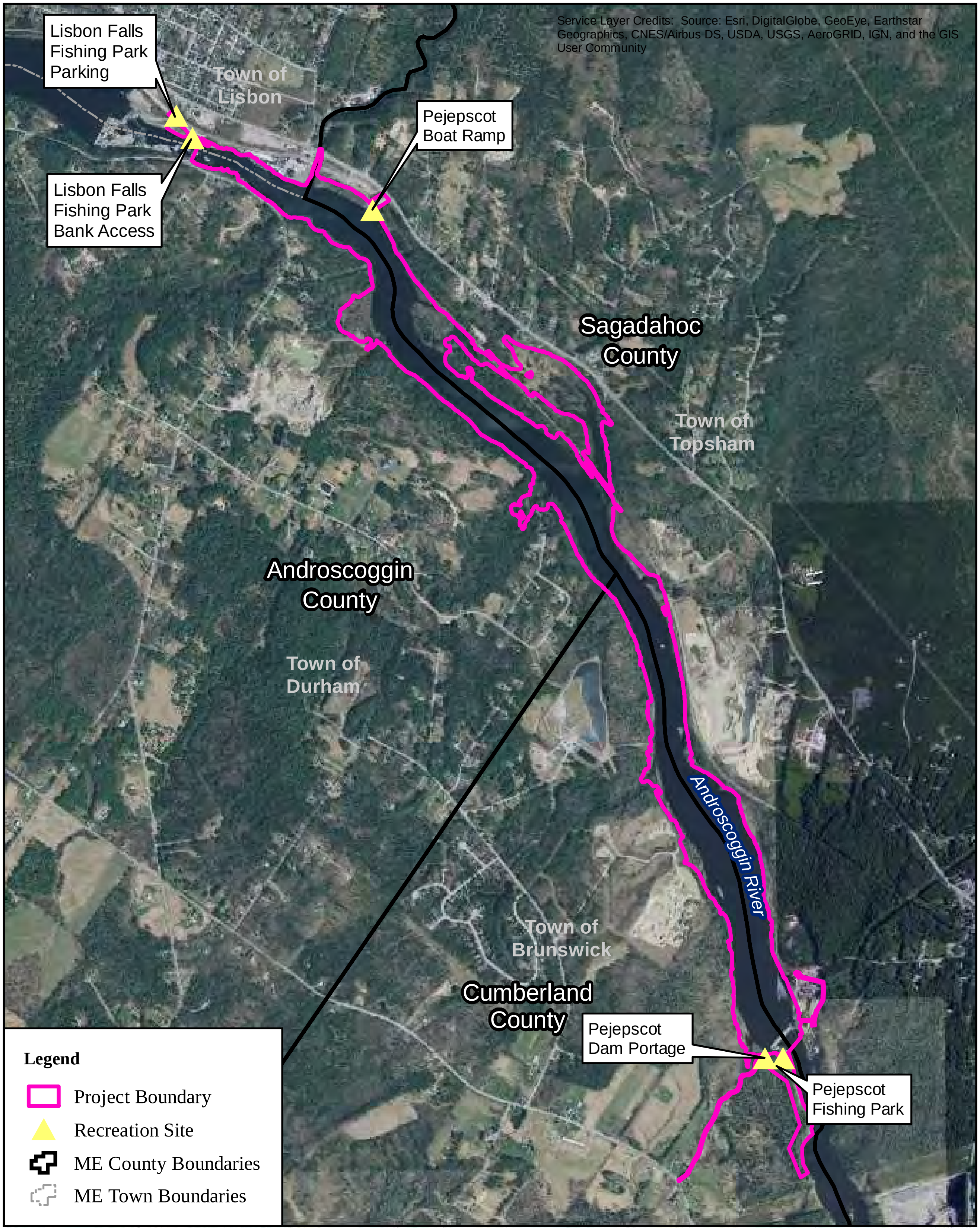
The Lisbon Falls Fishing Park, operated by the Licensee, is located in the Town of Lisbon off Canal Street/Route 125. The site provides angler access to the Androscoggin River approximately 3.2 miles upstream of the Project and immediately downstream from the Worumbo Project (FERC No. 3428). The Licensee holds easements on the parcels comprising the site; these leases expire with the termination of the current license. The site consists of a parking area, a gravel access path leading to the shoreline, and informal access along the shoreline. Canal Street/Route 125 separates the parking area from the recreation area, which is fenced and gated.

The gravel parking area measures approximately 95 by 23 feet, providing space for 10 vehicles without trailers, and is bordered by a large boulder wall approximately 20 feet high. A large sign at the east end of the parking area identifies the site as the Lisbon Falls Fishing Park. A smaller attached sign indicates that the park is open for public use from one hour before sunrise to one hour after sunset.

A crosswalk leads from the parking area to the gated path entrance. The site is also accessible by pedestrians using the sidewalk on the south side of Canal Street/Route 125. A large sign affixed to the fencing identifies the Licensee as the site owner, provides a map of recreation sites in the

Pejepscot Recreation Area, provides contact information and the FERC project number, includes hours of operations, and prohibits overnight camping. The approximately 10 foot wide access path runs on top of the bank along the shoreline downstream to the Route 125 bridge. The access path ends near the upstream bridge abutment, but informal footpaths continue to the top of the rocks downstream from the bridge.

Approximately 70 feet along the access path from the gated entrance, a set of wooden stairs leads down to a narrower trail extending to the shoreline. Several informal footpaths lead along the river to provide angler access to approximately 300 feet of shoreline.



Brookfield

N

0 0.1 0.2 0.4 Miles

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 4.9.1.2-1.
Recreation Sites
in the Vicinity of the
Pejepscot Project

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4.9.1.3 Project Recreation Use

Recreational use of Project recreation facilities was evaluated as part of the *Recreation Facilities Inventory and Public Recreation Use Assessment*. Overall use during the study period was estimated at 5,890 recreation days. Table 4.9.1.3-1 presents recreation use over the study period by site and month, along with estimated average daily use for each site. Figure 4.9.1.3-1 depicts monthly use, with use in May and October extrapolated based on average daily use for those months. As shown, use for all facilities increased as summer progressed, peaked in July, and decreased through October. The Pejepscot Boat Ramp saw the highest use of the three facilities, with an average daily use of 23.1 recreation days. Lisbon Falls Fishing Park and Pejepscot Fishing Park had similar use over the study period, with average daily uses of 10.0 and 8.1 recreation days, respectively. Figure 4.9.1.3-2 depicts use by primary activity at each Project recreation facility, shown as the percentage of total Project recreation use. As shown, fishing was the most popular activity at the Project, accounting for approximately 40 percent of combined use. Hiking was the next most popular activity, accounting for roughly 32 percent of use. Sightseeing and motorized boating are significantly less popular, at 11 and nine percent, respectively. Picnicking, non-motorized boating, and other uses combined comprise less than 10 percent of use at the Project. The following sections discuss use by site, including the primary activities participated in at each facility.

4.9.1.3.1 Pejepscot Boat Ramp

Use at the Pejepscot Boat Ramp over the study period was estimated at 3,299 recreation days. Although on average 35.0 vehicles accessed the site per day, only around 45 percent of these accessed the site for recreational purposes. The remaining 55 percent used the parking area as a turnaround area or for a brief rest stop. On average, 15.9 vehicles accessed the site per day for recreational purposes, with an average of 1.5 people per vehicle. The average duration for recreational visits was 1.8 hours. Table 4.9.1.3.1-1 depicts the percentage of users observed engaged in each activity over the study period. As shown, fishing was the most popular activity at the site, accounting for 30 percent of site use. Anglers were observed fishing along the shoreline at the site as well as walking along the railroad track to offsite locations. Hiking, generally along the railroad track, was the next most popular activity at 25 percent. Boating accounted for 20 percent of overall site use (16 percent of use was attributed to motorized boating and four percent to non-motorized boating).

Based on parking area utilization, the site was used at approximately 25 percent capacity on average non-peak weekends over the study period. Peak use observed was on the Monday of Labor Day weekend, when six vehicles were observed in the lot at one time, for a peak utilization of 50 percent of parking capacity. Table 4.9.1.3.1-2 presents parking area capacity utilization over the study period.

4.9.1.3.2 Pejepscot Fishing Park

Use at the Pejepscot Fishing Park over the study period was estimated at 1,164 recreation days. On average, 4.7 vehicles accessed the site per day for recreational purposes, with an average of

1.7 people per vehicle. The average duration for recreational visits was 2.1 hours. Table 4.9.1.3.2-1 depicts the percentage of users observed engaged in each activity over the study period. As shown, fishing was the most popular activity at the site, accounting for 49 percent of use. The majority of anglers were observed using the portage trail to access the shoreline. A small percentage of anglers were observed using the informal footpath near the parking area for shoreline access. The next most popular activity at the site was hiking, accounting for 36 percent of use. Sightseeing accounted for the remaining 15 percent of use.

Based on parking area utilization, the site was used at approximately 33 percent capacity on average non-peak weekends over the study period. Peak use observed was two vehicles in the lot at one time, for a peak utilization of 67 percent of parking capacity; this occurred during five of the 14 calibration counts. Table 4.9.1.3.2-1 presents parking area capacity utilization over the study period.

Although the portage trail was observed to be used for non-boating activities throughout the study period, only four instances of use for portaging boats around the dam were captured by the trail camera. Three of these occurred in June and one in August. In total, seven people were observed portaging; three were kayaking and four were canoeing.

4.9.1.3.3 Lisbon Falls Fishing Park

Use at the Lisbon Falls Fishing Park over the study period was estimated at 1,427 recreation days. On average, 4.2 vehicles accessed the site per day for recreational purposes, with an average of 2.4 people per vehicle. The average duration for recreational visits was 1.4 hours. Table 4.9.1.3.3-1 depicts the percentage of users observed engaged in each activity over the study period. As shown, fishing was the most popular activity at the site, accounting for 55 percent of use. The remaining 45 percent of users were hiking.

Based on parking area utilization, the site was used at approximately 10 percent capacity on average non-peak weekends over the study period. Peak use observed was on the Saturday of Memorial Day weekend, when three vehicles were observed in the lot at one time, for a peak utilization of 30 percent of parking capacity. Table 4.9.1.3.3-2 presents parking area capacity utilization over the study period.

Table 4.9.1.3-1: Estimated Use, Project Recreation Facilities, May 25 to October 14, 2019

Site	May*	June	July	Aug.	Sept.	Oct.*	Average Daily Use	Total
Pejepscot Boat Ramp	142	741	832	803	566	215	23.1	3,299
Pejepscot Fishing Park	58	270	321	284	167	64	8.1	1,164
Lisbon Falls Fishing Park	82	358	400	334	211	42	10.0	1,427
							Total	**5,890**

*Months with partial data.

Table 4.9.1.3.1-1: Use by Activity, Pejepscot Boat Ramp, May 25 to October 14, 2019

Activity	Percent of Total Use	Estimated Recreation Days
Fishing	30%	994
Hiking	25%	835
Boating (motorized)	16%	517
Sightseeing	14%	477
Other Use[1]	6%	199
Picnicking	5%	159
Boating (non-motorized)	4%	119
	Total	**3,299**

[1]"Other" use includes use that was not identified; this may include both recreational and non-recreational use

Table 4.9.1.3.1-2: Parking Area Capacity Utilization, Pejepscot Boat Ramp, May 25 to October 14, 2019

Available Spaces	Average Non-Peak Weekend		Peak Use Observed	
	Spaces in Use[1]	Percent Capacity	Spaces in Use	Percent Capacity
12	3	25%	6	50%

[1]Rounded up to nearest whole number.

Table 4.9.1.3.2-1: Use by Activity, Pejepscot Fishing Park, May 25 to October 14, 2019

Activity	Percent of Total Use	Estimated Recreation Days
Fishing	49%	567
Hiking	36%	418
Sightseeing	15%	179
	Total	**1,164**

Table 4.9.1.3.2-2: Parking Area Capacity Utilization, Pejepscot Fishing Park, May 25 to October 14, 2019

Available Spaces	Average Non-Peak Weekend		Peak Use Observed	
	Spaces in Use[1]	Percent Capacity	Spaces in Use	Percent Capacity
3	1	33%	2	67%

[1]Rounded up to nearest whole number.

Table 4.9.1.3.3-1: Use by Activity, Lisbon Falls Fishing Park, May 25 to October 14, 2019

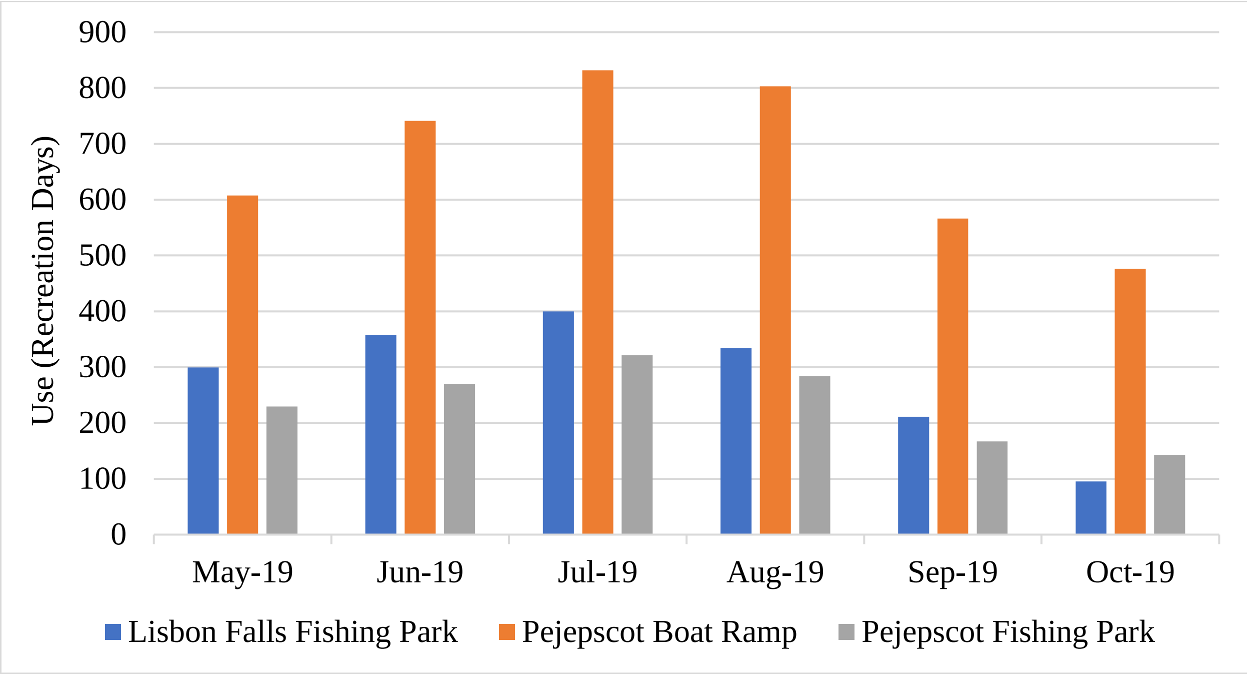
Activity	Percent of Total Use	Estimated Recreation Days
Fishing	55%	786
Hiking	45%	641
	Total	**1,427**

Table 4.9.1.3.3-2: Parking Area Capacity Utilization, Lisbon Falls Fishing Park, May 25 to October 14, 2019

Available Spaces	Average Non-Peak Weekend		Peak Use Observed	
	Spaces in Use[1]	Percent Capacity	Spaces in Use	Percent Capacity
10	1	10%	3	30%

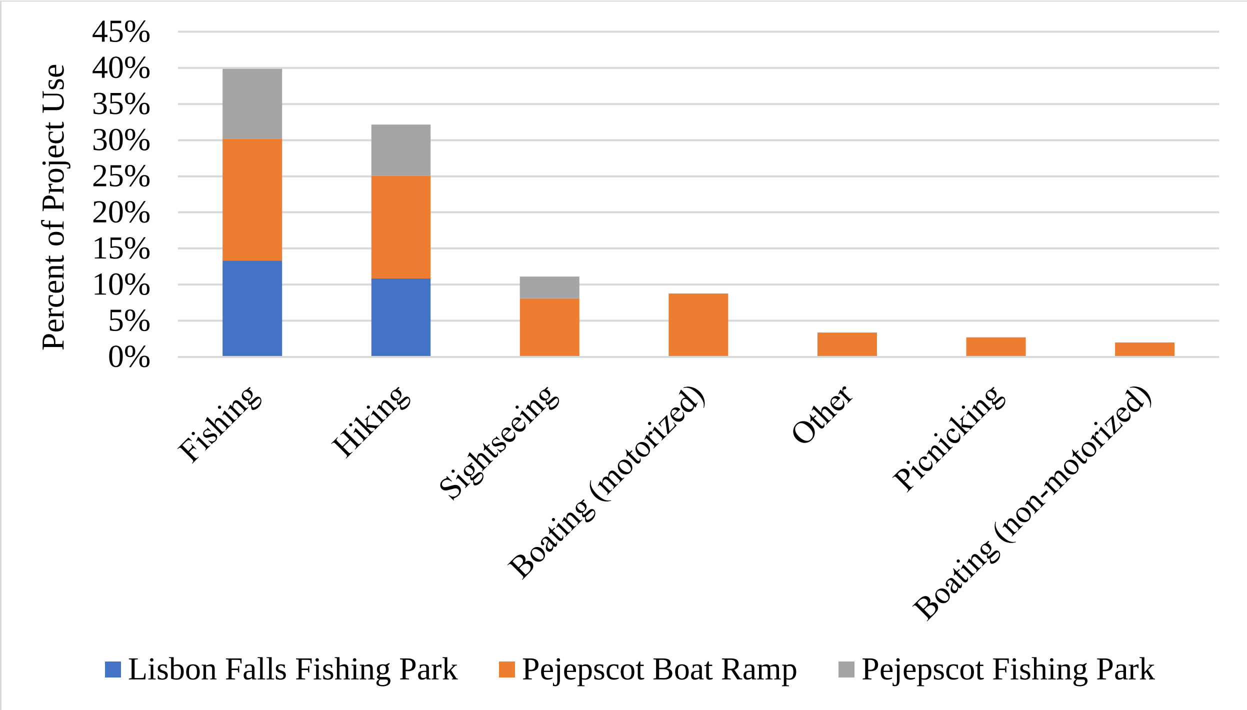
[1]Rounded up to nearest whole number.

Figure 4.9.1.3-1: Estimated Monthly Use* at Project Recreation Facilities, May through October, 2019



*Estimated use for May and October based on average daily use.

Figure 4.9.1.3-2: Use by Facility and Activity, May 25 to October 14, 2019



4.9.1.4 Project Vicinity Recreation Needs Identified in Management Plan

Two statewide plans serve as management plans for recreational needs in the Project vicinity: the Maine Statewide Comprehensive Outdoor Recreation Plan (SCORP) and the Strategic Plan for Providing Public Access to Maine Waters for Boating and Fishing. In addition, each of the towns surrounding the Project has a Comprehensive Plan for the lands within their jurisdiction. A discussion of recreation needs and goals identified in each of these plans follows.

4.9.1.4.1 Maine Statewide Comprehensive Outdoor Recreation Plan

The Maine Bureau of Parks and Lands (BPL) reviews statewide recreational needs at five-year intervals. The most recent review is reported in the 2020-2024 SCORP. Within the SCORP, BPL examines the supply and demand for outdoor recreational opportunities; identifies opportunities, constraints and trends; and devises strategies for implementing statewide recreation priorities. Priority areas for the current SCORP are to support active, engaged communities, address workforce attraction and retention through outdoor recreation, sustain and grow tourism, promote ecological and environmental resilience, and invest in maintenance and stewardship. According to the SCORP, the US Forest Service forecasts that the activities in the northern United States that will see the largest number of new participants are visiting interpretive sites, nature viewing, visiting developed sites, swimming, and motorized water activities. The SCORP did not identify any strategies specific to the Project or in the vicinity of the Project. (BPL, 2019).

4.9.1.4.2 Boating Facilities Strategic Plan

The Maine Department of Agriculture, Conservation and Forestry, in cooperation with MDIFW, produced the Strategic Plan for Providing Public Access to Maine Waters for Boating and Fishing in 1995 (updated in 2000). This plan guides the two agencies in directing their water access programs. The plan does not identify the Androscoggin River in the Project vicinity as needing guaranteed public access or additional access (BPL, 2013).

4.9.1.4.3 Town Comprehensive Plans

The Comprehensive Planning and Land Use Act, adopted by the State of Maine in 1988, requires that towns in Maine have a comprehensive plan consistent with the state Growth Management Act to impose certain ordinances or qualify for certain grant and loan programs.

The Town of Brunswick 2008 Comprehensive Plan Update contains key policies to meet the Town’s overall needs, including a policy to protect open space and natural resources and to provide outdoor recreational opportunities. The Town anticipates needing additional recreational facilities to accommodate population growth. The Comprehensive Plan refers to the Town’s 2002 Parks, Recreation, and Open Space Plan, which includes policies for improving recreation opportunities within the Town, including acquisition and development of additional recreational facilities and provision of water access. A key objective of the Comprehensive Plan is to implement the policies in the Parks, Recreation and Open Space Plan (Town of Brunswick, 2008).

The Town of Durham 2002 Comprehensive Plan establishes methods to strengthen land use and zoning ordinance categories that protect certain areas from new development, allowing for open space and limited recreational use. One of the Town's goals as established by the Plan is to "protect and promote the availability of recreational opportunities for all Durham residents." The corresponding Town policies include creating access to rivers and ponds for minimal-impact uses, with implementation measures specific to the Androscoggin River: (1) support the town's membership in the Androscoggin River Watershed Council; (2) ensure that Durham residents have access to the Androscoggin River by maintaining the existing public boat launch facility and river park; and (3) encourage improved access to rivers, ponds and trails (Town of Durham, 2002).

The Town of Lisbon Comprehensive Plan Update, adopted in 2007 and amended in 2011, identifies a need for additional formal recreation facilities and programs. Policies to meet this need include providing access to the Androscoggin River; encouraging the practice of allowing public access to private lands; and creating a recreation/open space/ball field on the waterfront above the Worumbo Dam. The Plan also recommends a regional approach to water resource management in the Androscoggin River basin (Town of Lisbon, 2011).

The 2005 Town of Topsham Comprehensive Plan acknowledges that the recreational needs of the community are changing; as the population ages, participation in recreational activities has increased. The Plan identifies an adequate supply of outdoor recreation space, but a need for increased indoor recreation space and a recreation master plan to accommodate shifting recreation trends. Specific actions related to recreation include exploring partnership opportunities with private and nonprofit recreation providers to expand the variety of recreation opportunities, creating a Downtown Waterfront Park along the Androscoggin River, and ensuring that existing and new facilities are maintained (Town of Topsham, 2005).

4.9.1.5 Land Use and Management within the Project Vicinity

Land use classifications found throughout the Androscoggin River watershed upstream of Pejepscot Dam as well as within 1,000 ft. of the Project boundary were discussed in Section 4.3.4 and depicted in Figure 4.3.4-2. The majority of land surrounding the Project is privately owned. As previously noted, land adjacent to and within the Project boundary is primarily forested, with limited development within the boundary except Project facilities. Within the Project vicinity, land use is mixed, with significant commercial development concentrated near the centers of the Towns of Lisbon, Topsham, and Brunswick and along the Maine Route 196 corridor. The town of Durham is mainly residential and sparsely developed. There are, however, significant commercial and industrial land uses in the Project vicinity including a metal recovery and recycling facility immediately adjacent to the Project powerhouses, an active railroad line along the eastern side of the impoundment, and several active rock and gravel pits in proximity to the Project. Alternatively, the majority of the southwest Project shoreline within the Town of Brunswick as well as the southeast shoreline of Little River is in conservation (Maine Office of GIS, 2016).

Management of lands external to the Project boundary fall under the jurisdiction of the town in which they are located. The State of Maine's Mandatory Shoreland Zoning Act (MSZA) requires that land within 250 feet of any river be subject to zoning and land use controls, allowing local municipalities authority, with State oversight, to establish shoreline buffer zones and regulations. The Maine Board of Environmental Protection (MBEP) is required to set, and update as needed, minimum guidelines for these municipal zoning and land use controls. The Towns of Lisbon, Durham, Topsham, and Brunswick have adopted Shoreland Zoning Ordinances with shoreline buffer zones meeting MBEP minimum requirements, including setbacks for new construction and vegetation removal (MBEP, 2016).

As required per the MSZA, lands within 250 feet of the Androscoggin River are zoned with a Resource Protection overlay within all four towns abutting the Project boundary; however, the base zoning varies between towns. Only a small portion of the Project boundary is within the Town of Lisbon; these lands are zoned Industrial along the Androscoggin shoreline and Resource Protection along Little River (Town of Lisbon, 2012). Lands in the Town of Brunswick, along the southwestern portion of the Project boundary, are zoned County Residential 1 (Town of Brunswick, 2009). The northwestern portion of the Project boundary, within the Town of Durham, is zoned Rural (Town of Durham, 2004). Within the Town of Topsham, the northeastern portion of the Project boundary is zoned Rural Residential and the southeastern portion is zoned Industrial (Town of Topsham, 2015).

4.9.1.6 Land Use and Management of Project Lands

Topsham Hydro possesses the necessary title, right, or interest to operate the Project on the lands within the Project boundary. These lands are managed in accordance with federal, state, and local regulations. In general, Project operations and maintenance, along with recreation, are the primary activities that occur on Project lands.

4.9.2 Environmental Analysis

FERC's SD2 identified one potential resource issue relating to recreation resources, which is discussed in greater detail below.

<u>Effects of continued Project operation on recreational use in the Project area, including the adequacy of existing recreational access.</u>

Topsham Hydro proposes to continue to operate and maintain the existing formal recreation sites and their associated facilities and amenities, including Pejepscot Fishing Park and the portage trail, Lisbon Falls Fishing Park, and the Pejepscot Boat Ramp. Topsham Hydro also proposes to implement a Recreation Management Plan (RMP) for the Project, which will address management of Project recreation sites over the term of a new license (Appendix E-5).

As discussed in Section 4.9.1, the three Project recreation facilities provide an array of recreational opportunities, including access to the Androscoggin River both above and below the dam for fishing, boating, hiking, and sightseeing. The results of the *Recreation Facilities*

Inventory and Public Recreation Use Assessment demonstrate that there is ample access and capacity for recreational demand in the Project area: all Project recreation facilities were used at 33 percent or less of capacity on average non-peak weekends. The facilities were found to be in fair condition, although maintenance issues were identified at each site. These maintenance issues are discussed in the RMP. Measures to address maintenance issues and to enhance recreation at Project recreation facilities are proposed in the RMP and summarized below.

4.9.3 Proposed Environmental Measures

As part of the RMP, the Licensee proposes the following measures to enhance recreation at the Project. These measures are discussed in greater detail in the RMP, as is the proposed plan for facility operations and maintenance.

Pejepscot Boat Ramp:

- Re-grade the driveway and parking area, including placing and compacting gravel fill to level driveway and provide a safe turnout onto Lewiston Road.
- Clear sediment and vegetation from the surface of the boat ramp in order to restore the full width for use.
- Replace the entrance sign with a similarly sized sign identifying the site.

Pejepscot Fishing Park:

- Re-grade the access road, including placing and compacting gravel fill to repair areas with significant erosion.
- Reroute the portage trail to a less steep put-in area by following the existing informal footpath. A portion of the informal footpath is located on property owned by the Town of Brunswick. Topsham Hydro does not currently have an access easement for this property. However, Topsham Hydro is in consultation with the Town of Brunswick regarding access, operations and maintenance for this portion of the proposed portage trail.
- Remove the steel staircase and extend the existing chain link fence to discourage access to the steep section of ledge.
- Clear the downed trees and other debris from the section of informal trail between the parking area and the shoreline access downstream of the dam.
- Add directional signage leading boaters along the rerouted portage trail.
- Erect an upstream sign indicating the location of the portage take-out.

Lisbon Falls Fishing Park:

- Trim vegetation encroaching on the access path.
- Remove graffiti from the entrance sign.

4.9.4 Unavoidable Adverse Impacts

Continued Project operation will not result in unavoidable adverse impacts to recreation resources.

4.9.5 References

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4.10 Aesthetic Resources

4.10.1 Affected Environment

The Project vicinity is primarily forested and rural, with interspersed areas of industrial, residential and agricultural development. Medium and high intensity development occurs within the centers of the four towns abutting the Project boundary. Forested areas and low hills surround the Project Area. Section 4.3.4 examines land use types and coverage in the Project vicinity and greater Androscoggin River watershed.

Route 196 traverses the eastern side of the Project vicinity, offering limited views of the upper reaches of the impoundment. Route 125 on the western side of the embankment also provides limited views of the upper impoundment area as well as an industrial mill site on the opposite bank. A bridge spanning the river on Route 125 offers views of the Worumbo dam upriver and the Project Area downstream. Industrial development east of the river can also be seen from the Route 125 Bridge. Minor roads serving residential areas in the Project vicinity also offer limited views of the impoundment.

4.10.1.1 Visual Character of Project Lands and Water

The Androscoggin River in the Project vicinity has a history of industrial use. Mill sites line the northeastern portion of the Project boundary, several quarry and gravel pits border the eastern and western Project boundaries, and Grimmel Industries operates a metal recycling facility on Pejepscot Village Main Street just upstream of the dam on the east bank. The Town of Brunswick operates a landfill on Graham Road just west of the Project boundary. A railroad track runs the length of the impoundment on the east bank of the river, splitting upstream of the dam. One track continues southeast into the Town of Brunswick, while the other continues along the river and actively services Grimmel Industries. Transmission lines span the river within the Project boundary downstream of Worumbo Dam and just below the southern Project boundary (Google Earth, 2016). Section 4.4.1.1.4 further characterizes the Project Area shoreline.

Within the Project boundary, the river is wide and calm, with several small islands mid-river. There are no whitewater features (Town of Topsham, 2016a). The shoreline is composed of ledge and rock outcrops immediately above and below the dam.

The Pejepscot Dam and Project facilities are visible from the Pejepscot Dam Recreation Area and from the Grimmel Industries facility. The dam, spillway, fish passage facilities, and powerhouses are described in Section 3.2.1 and depicted in Figure 3.2.1-1. Figures 4.10.1.1-1 through 4.10.1.1-3 provide photos of the area in the vicinity of the Project.

4.10.1.2 Scenic Attractions

Several trails in the area, including the Androscoggin Riverwalk, offer scenic views of the river downstream of the Project, but no official trails provide views of the Project Area (Maine Trail Finder, 2017). The Androscoggin Riverwalk also offers views of the Bowdoin Mill and a swinging pedestrian bridge spanning the river upstream from the Brunswick Dam (Town of Topsham, 2016b). See Section 4.9 for a discussion of recreational opportunities offering scenic views in the Project vicinity.

There are no State or Federal Scenic Byways in the Project vicinity (FHA, 2016). Scenic attractions within a 20-30 minute drive of the Project include Bradbury Mountain State Park, Cathance River Nature Preserve, and numerous parks and features in and around the surrounding bays.

Figure 4.10.1.1-1. View Looking Downstream from Pejepscot Dam

Figure 4.10.1.1-2. View Looking Upstream from Pejepscot Dam

Figure 4.10.1.1-3. View of Powerhouses and Grimmel Industries

4.10.2 **Environmental Analysis**

FERC's SD2 did not identify any potential resource issues related to aesthetic resources.

Continued operation of the Project is not expected to adversely affect aesthetic resources in the Project vicinity. The existing Project operations and facilities are part of the current aesthetic context of the Project vicinity. No material changes to existing Project operations or facilities are proposed, and as such, Topsham Hydro does not expect any adverse effects of the Project on aesthetic resources.

4.10.3 **Proposed Environmental Measures**

Topsham Hydro is not proposing any PME measures related to aesthetic resources.

4.10.4 **Unavoidable Adverse Impacts**

No unavoidable adverse impacts are expected to aesthetic resources at the Project.

4.10.5 **References**

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4.11 Cultural Resources

4.11.1 Affected Environment

The Androscoggin River is Maine's third largest river and was one of its more important waterways historically. While portions of this river valley have been archaeologically investigated, there are still large areas that have received little to no archaeological study. What is known is that the river was a major waterway for Native Tribes throughout much of the Precontact period and continued to be for both them and Euroamerican settlers after contact. In the Post-Contact period, the river served as a means of travel and trade and soon became a source of industrial focus. The Pejepscot area of the Androscoggin River experienced much of this history.

4.11.1.1 Archaeological Resources

4.11.1.1.1 Pre-Contact Period History

Maine's archaeological record dates back more than 11,000 years before the present. Archaeologists have divided the Pre-Contact segment of this record into three major cultural periods: the Paleoindian, Archaic, and Ceramic cultural periods. Traditions within these cultural periods represent subdivisions that can be made based on similarities in artifact forms and cultural adaptations (Spiess, 1990, 1994). Post-Contact history can also be divided into broad time periods reflecting the cultural integration of Euroamerican cultural lifeways and practices into the history of the state. These cultural periods, as displayed in Table 4.11.1.1.1-1, form the basis of archaeological context.

Paleoindian Period (11,500-8,000 B.P.)

As is the case throughout the Northeast, evidence for the earliest period of human occupation in Maine is extremely rare. Most sites of this period have been identified from isolated diagnostic artifact types in the collections of amateur archaeologists, with excavations of Paleoindian sites limited to only a handful in the state. The Paleoindian Cultural Period is the first known period in which humans inhabited the Northeast region.

Evidence from the greater Northeast indicates that Paleoindians first settled in the area not long after the retreat of the Late Pleistocene Wisconsin glacial ice, which vacated New England by around 13,000 B.P. A tundra environment succeeded the Wisconsin glacier, and was, in turn, replaced by a spruce-parkland community (Davis and Jacobsen, 1985; Gaudreau, 1986; Jacobsen *et al*., 1987). They entered the region around 11,500 B.P. Paleoindians living in these post-glacial ecological contexts have traditionally been characterized as hunters and gatherers who subsisted primarily on several large species of animals known to herd in the Northeast, including the mastodon and mammoth. Little evidence of human interaction with these "megafauna" has been forthcoming, however, and more recent interpretations have focused on smaller species, such as caribou and elk as primary food sources (Curran, 1987; Curran and Dincauze, 1977; Dincauze and Curran, 1984; Gramly, 1982). This generalization may over-emphasize the reliance placed on these herding species when a wider range of resources was almost certainly important to Paleoindian peoples. Fluted projectile points are lanceolate in shape and possess a long, groove-like scar caused by a flake struck from their base; they are considered the diagnostic artifact type of this period**.** Archaeological evidence indicates that during the later Paleoindian period, fluted spear points were replaced by smaller, unfluted points or by long, slender lanceolate points with a distinctive parallel flaking technology (Doyle *et al*., 1985; Cox and Petersen, 1997; Will and Moore, 2002). These changes appear to coincide with the succession towards a closed forest environment.

Little has been confirmed concerning the social structures, family life, and religion among the Paleoindians. No house features, burials, or ceremonial objects have been recovered from Paleoindian sites in the Northeast. Based on ethnographic analogy, it is assumed that peoples of this time were seasonally nomadic, following the movement of game with the changing weather conditions of the year. Similarities in artifact forms among Paleoindians all across North America argue for a generalized character of adaptation, with few specializations to local conditions evident (Haynes, 1980:119). A correlate of this fact is that population densities among Paleoindians were almost certainly low. Raw materials utilized by these first inhabitants come from only a few sources, often from relatively distant locations (Spiess and Wilson, 1989). This may indicate a high degree of mobility, established trade networks, and/or a high frequency of interaction among units of population. Sites of this period are sometimes found on hilltops, possibly because of their vantage points, which would have been useful for locating game.

Archaic Period (10,000-3000 B.P.)

The time period following the Paleoindian occupation, but predating the use of pottery and horticulture, has been designated the Archaic period by North American archaeologists. During the Early Archaic Period, profound environmental changes continued in New England, as the landscape adjusted to warmer post-glacial conditions. Lasting effects of melting glaciers included rising sea levels which inundated low-lying coastal plain areas. The regional climate became warmer and drier, and a mixed pine-hardwood forest came to dominate the landscape. Research indicates that Early Archaic social groups moved within smaller territories than their Paleoindian ancestors, practicing an increasingly generalized subsistence strategy based on river and lake systems and particularly wetland mosaic physiographic zones. The megafauna of the late Pleistocene had disappeared, leaving smaller mammalian species, such as moose and beaver. Deer were not likely abundant until the middle of the Archaic period when oak and other mast-producing trees became more numerous. Environmental conditions would have made seasonally available natural food resources somewhat more predictable and abundant than they had been during the Ice Age, allowing human populations to exploit a wider range of territories.

While bifurcate base projectile points are the traditional hallmark artifact of the Early Archaic period in southern New England, cultural adaptations in the region of Maine focused on the manufacture of simple unifacial tools from quartz, crude “chopping tools” of other local stone, and the development of ground stone technology. This early culture is referred to as the Gulf of Maine Archaic tradition, based on its initial association with deeply-buried sites in Maine

(Peterson and Putnam, 1992). Robinson (1992) has documented a complex burial ceremonial aspect of this culture. The Gulf of Maine Archaic tradition continued to develop in northern and eastern Maine through the Middle Archaic period.

Late Archaic Period sites in New England are much more numerous than sites in previous periods and a significant diversity in site type and function is documented. Modern environmental conditions were present by then and the wild resources available were the same as those observed by the early European settlers and explorers. Population densities may have been sufficient to result in the development of multiple ethnic groups in the Northeast (Dincauze, 1974). Three cultural traditions have been identified based on artifact materials: the Laurentian, Susquehanna, and Small Stemmed. Along with the development of multiple traditions, increased specialization and the exploitation of a broad spectrum of resources are interpreted for this time period.

The relationship between the three recognized Late Archaic traditions has been the subject of extensive debate over several decades (Dincauze, 1974, 1975; Ritchie, 1971). It was hypothesized that the three traditions represent different populations, with the Laurentian and Susquehanna consisting of intrusive groups that peacefully coexisted with the indigenous Small Stemmed population for possibly thousands of years (Dincauze, 1974, 1975). However, after many years of research, no documentation of isolated Laurentian or Susquehanna sites has been found in New England, casting doubt that these traditions could therefore represent the existence of communities. Rather more likely is that these traditions represent the use of particular tool types, with technological precedents to the west for the Lake Forest tradition, and towards the southeastern United States for the Susquehanna. Small Stemmed, or Narrow Point tradition, artifacts are widely viewed as a pan-Northeastern phenomenon, probably deriving from the indigenous people of the northeastern Middle Archaic. Therefore, this characterization of the Late Archaic is undergoing a shift away from the idea of three cultural traditions, towards one Algonquian ancestral population of Small Stemmed peoples, with some technological borrowings from neighboring areas.

It is thought that people of the Late Archaic period in New England developed a more locally focused subsistence economy than during previous times. This may be due to increasing population levels, requiring groups to remain in more confined territories to avoid encroaching on others. Some degree of sedentism is suggested by at least the end of the period, based on changes in subsistence strategy. Shell middens dating to this cultural period begin to appear in some coastal locations, indicating increased use of shoreline resources (Bourque, 1976, 1995, 2001).

Woodland Period (3000-500 B.P.)

The cultural period following the Archaic Period and before the Contact Period is generally referred to as the Woodland Period throughout most of the eastern United States. However, in Maine, the same time period is called the Ceramic Cultural Period (Sanger, 1979). While both of these contemporaneous cultural adaptations are signified by the advent of ceramic technology around 3,000 years ago, they differ in their subsistence strategies. Woodland cultures developed a reliance on horticulture and a tendency toward larger, more permanent settlement patterns, while the Ceramic culture continued a hunting and gathering lifestyle.

Ceramic period sites are found along both the coast and in the Maine interior (Sanger, 1979); however, the coast may have been the main area of occupation as the diet of this period indicates a heavy reliance on marine fish (Bourque, 2001). Coastal shell midden sites of this period have long been identifiable due to their highly visible nature. These shell midden sites contain not only discarded marine shells, but also a wealth of data concerning terrestrial and marine animals utilized, pottery technology and sequencing, and stone and bone tools. Preservation of artifacts that in most other environmental locations in Maine would not survive, is a notable feature of these midden sites (Bourque, 2001; Sanger, 1979). Sites in the interior are commonly found close to both moving and non-moving water bodies. The abundance of sites and the intensification of faunal exploitation may indicate population growth over the course of this time period. In addition, artifacts recovered from Ceramic period sites indicate trade and communication with peoples from different regions far outside of Maine (Bourque, 2001). By the end of this period, historical accounts and archaeological evidence suggests horticulture was practiced in southern Maine at least.

The synthesis of the archaeological data from Ceramic period sites appears to indicate cultural adaptations of a people that had lived in an area long enough to exhibit a diversified use of local resources (Bourque, 2001; Sanger, 1979). The Ceramic period ends with European contact around 500-450 years ago, after which many of the artifacts attributable to the Precontact inhabitants of Maine disappear from the archaeological record, replaced instead with European trade goods. While the Native artifacts disappeared, the historical descendants of these cultural peoples remained.

Table 4.11.1.1.1-1. Cultural Period Contexts in Maine, after Spiess 1990, 1994

Cultural Period	Time Period (RCYBP)	Tradition	Time Period (RCYBP)
Paleoindian	11,500 – 8,000	Fluted Point Paleoindian Tradition	11,500 - 10,200
		Late Paleoindian Tradition	10,200 – 8,000
Archaic	10,000 - 3,000	Early and Middle Archaic Traditions	10,000 - 6,000
		Laurentian Tradition	6,000 - 4,200
		Small-Stemmed Point Tradition	6,000 - 2,000
		Moorehead Phase	4,500 - 3,700
		Susquehanna Tradition	3,900 - 3,000
Ceramic Period	3,000 – 500		
Early Contact	500 - 325		
Later Contact and Colonization	325 - 240		
Integration with Euroamerican Life	240 - Present		

4.11.1.1.2 Contact and Post-Contact Period (500-Present B.P.)

European contact with the peoples of the North American continent occurred as early as the 11th century with the Norse exploration of the Canadian maritime provinces. The Norwegian penny recovered at the Precontact Goddard site is evidence that this earliest contact, while not conclusively reaching Maine, had an effect on the peoples of the region (Bourque, 2001). After the European "discovery" of the "New World" in 1492, the coast of Maine was explored as early as 1524 by Giovanni da Verrazano, who made contact with local inhabitants. The same year, Estevan Gomez kidnapped and sold into slavery 58 Maine natives. After this, a long period of Native and European contact occurred off the Maine coast between natives and Basque fishermen, initiating a trade system. European exploration continued into the early 17th century including early attempts by the French in 1604 and the English in 1607 to establish settlements in the region of Maine (Maine History Online, 2017). However, the European introduction of epidemic diseases to the Native people, who had no natural resistance to them, began to take a sudden and terrible toll on the Native population of Maine and New England. This dramatic decrease in the Native population of the region lead the way for European colonization of Maine and New England. The surviving Native populations were too few to be able to resist European settlement. European and Native groups forged trading partnerships, allowing Europeans to acquire furs and Natives to gain European goods which often replaced many of their traditional tools.

Relations with the Native inhabitants and the European explorers alternated between civil partnership and open hostility. By the late 17th century, open hostilities between the predominantly English settlers of the New England region and the remaining Native groups took a toll on both populations, resulting in the English near abandonment of the region of Maine. Hostilities continued off and on until the conclusion of the Seven Years War in 1763. Many of the Native groups in Maine had allied themselves with the French, so with their defeat they were forced to sign treaties with the English settlers that were unfavorable to them. After this period, Native groups in Maine and New England became increasingly marginalized by the European settlers and were either forced onto reservations or to emigrate out of the region. The groups that remained in the Maine region persisted, gaining more political recognition in the latter 20th century (Bourque, 2001). Federally recognized tribes within the State of Maine include the Aroostook Band of Micmac, the Houlton Band of Maliseets, the Passamaquoddy Tribes (Pleasant Point and Princeton), and the Penobscot Indian Nation.

4.11.1.1.3 Identification of Historic and Archaeological Sites in the Vicinity of the Project

Site documentary information was obtained from the MHPC, which is located in Augusta. The MHPC maintains archaeological site files for both Precontact period and Euroamerican (Post-contact) archaeological sites. Use of these files is restricted to archaeologists who are either approved to undertake cultural resources management in Maine or who have legitimate archaeological research projects. Local repositories of historic documents (historical societies and libraries) were also consulted; however, no additional resources have been identified from this information at this time.

Precontact Period Sites

MHPC archaeological site files indicate very few Precontact archaeological sites have been identified within the region of the Androscoggin River watershed in which the Pejepscot Project Area is located. Only three sites have been identified to date within or near to the Project Area, one of which falls within the Project boundary (Table 4.11.1.1.3-1).

The Pejepscot site (ME 14-108) was identified during a 1985 survey of the Pejepscot Dam impoundment and falls within the current Project Area. Phase I and II research was undertaken on the Pejepscot Project by the University of Maine at Farmington Archaeology Research Center (UMF ARC) in 1989 and 1992 (Hamilton et. al., 1985; Hamilton et. al., 1986). This site was found to be either a small camp site or an ancillary activity area of a larger site. Importantly, it was identified as relating to a single occupation belonging to the late Ceramic Period.

Site ME 14-138 is located upstream of the Project Area and consists of a small scatter of Late Ceramic Period ceramic sherds, possibly buried below the ground surface. Site ME 14-152 is located downstream of the Project Area and consists of a small scatter of lithic debitage, from an unknown Precontact cultural period, located at or near the ground surface.

Historical records of the area of Lisbon Falls indicate that there was a Native American village located somewhere close to the present location of the village of Lisbon Falls (Hamilton et. al., 1985). To date, no official record has been made for a possible location of this site, which may span the Precontact to Contact periods.

Euroamerican Sites

While the previous survey within the Pejepscot Project Area did identify 19th and 20th century artifacts, no Euroamerican sites have yet been identified within the Project Area or within a half mile study radius of the Project Area.

Table 4.11.1.1.3-1. Precontact Archaeological Sites within the Project Vicinity

Site Number	Site Name	UTM		Time Period	National Register of Historic Places Status
		East	North		
Topsham, Sagadahoc County					
ME 14-108	Pejepscot Site	416280	4870400	Late Ceramic Period	Insufficient information
ME 14-152		414300	4872000	Unknown Precontact	Insufficient information
Lisbon, Androscoggin County					
ME 14-138		419600	4864800	Late Ceramic Period	Insufficient information

4.11.1.1.4 Prior Cultural Resource Investigations within the Project Area

Prior to relicensing, only one prior cultural resource investigation has taken place within the Project Area, the above-mentioned Phase I investigation of the Pejepscot Dam impoundment by UMF ARC in 1985 (Hamilton et. al., 1985), followed by a Phase II investigation of the only site identified during that previous survey. The Project Area for this investigation was slightly smaller than the current Project Area, totaling only 4.8 kilometers (3 miles) on both banks of the Androscoggin River. The Phase I investigation involved an initial walk-over of the Project Area, through which the investigators looked for surface evidence of archaeological sites and determined areas to test. A total of 135 shovel test pits were excavated on 16 sampling transects. The Phase I survey found a wide scatter of historical artifacts from the 19th and 20th century, which were deemed historically unimportant, and identified the Pejepscot site (ME 14-108) that was later investigated for the Phase II.

4.11.1.1.5 Historic and Precontact Archaeological Resource Surveys Conducted for Relicensing

Phase 0 Archaeological Survey

In August 2018, Topsham Hydro conducted a Phase 0 archaeological sensitivity assessment as part of relicensing. The survey evaluated areas throughout the Project's APE for historic and precontact period archaeological resources and to make recommendations about whether any additional archaeological sites were eligible, or potentially eligible, for listing to the National Register of Historic Places (NRHP) (Gray & Pape, 2019a).

As noted in the preceding sections, background research indicated that at least one Native American archaeological site is located within the Project area – site ME 14.108. During the Phase 0 survey, at least one additional previously unidentified Native American archaeological resource was also identified. At the time of the survey, it was unclear if the newly identified site was associated with site ME 14.108 or a standalone site. No Historical Period archaeological resources were identified during the reconnaissance survey; however, the western terminus of the ferry crossing at Lisbon Falls was identified as needing further investigation to determine if it exists in an intact context (Gray & Pape, 2019a).

Based on the review of historical documentation and the surface reconnaissance conducted of the Project area during the Phase 0 survey, a series of archaeologically sensitive sites were identified. Further subsurface archaeological testing was recommended at the highest probability areas; specifically, at those areas located at the confluence of tributary streams with the Androscoggin River. Additional survey was also recommended to relocate and map to current standards site ME 14.108 and to investigate the newly identified Pre-Contact resource (Gray & Pape, 2019a).

Phase 1 Archaeological Survey

Based on the results and recommendations of the Phase 0 survey, a Phase 1 survey was conducted in September 2019 (Gray & Pape, 2019b). The Phase 1 survey included a total of 31 shovel test pits and seven excavation units within seven testing areas. The investigation included previously tested areas that had the potential for deeply buried cultural deposits, relocation of previously identified site ME 14.108, and delineations of the artifacts recovered during the Phase 0 investigation at newly identified site ME 14.174. Only the testing involved in the relocation of site ME 14.108 and those for the delineation of site ME 14.174 recovered cultural artifacts. Observation of the stratigraphic record presented in these excavations confirms that the areas investigated were alluvial in sedimentary origin, likely having been deposits in the Holocene Epoch. Some sediment was able to be identified as historic to recent sedimentation, occurring in the last 200 years or less.

Previously identified site ME 14.108 was successfully relocated. Newly identified site ME 14.174 was found to include two distinct occupations related to Pre-Contact Native American cultures, one of which includes a cultural feature. The two occupations of this site are stratigraphically separated from one another. The exact ages of these two occupations is currently unknown. Artifacts related to each of the two occupations appear to indicate differences between the activities that may have occurred at the site during these occupations. The upper, younger occupation appears to center around limited activities relating to food production, tool creation, hunting and/or gathering, and thermal production. This site appears well preserved with little to no disturbance to the stratigraphic profile observed.

4.11.1.2 Historic Structures Overview

4.11.1.2.1 Historic Period (Exploration to Present)

The Project Area extends from Pejepscot Village in Topsham, Sagadahoc County, upstream along the Androscoggin River to Lisbon Falls in Androscoggin County. Maine's rivers were vital to the economic success of industry in the state. As Maine's third largest river, the Androscoggin River played a major role in Maine's industrial history. The mainstem of the Androscoggin was too large and powerful to permit the construction of dams and their associated mills prior to improvements in construction technology in the mid-nineteenth century. Prior to that period, development occurred along the river's tributaries and at locations, such as Lisbon Falls and Topsham, where natural rock ledges simplified the task of damming the river.

Within the Project Area, industrial development began in Lisbon Falls, the second falls from the sea, where between 1790 and 1800 six sawmills, a grist mill, and a carding mill operated. These mills largely closed during the period of the War of 1812. Large scale industrial development in Lisbon Falls began in 1864, with the establishment of the Worumbo Manufacturing Company's woolen mill. By the late-nineteenth century, a network of dams, water conveyance systems, and mills lined the length of the Androscoggin where a fall of water offered development potential.

Industrial development at the lower end of the Project Area, at Pejepscot Village, began in the mid-1890s, with the construction of a pulp and paper mill owned by the Pejepscot Paper Company. Owned by F.C. Whitehouse, the Pejepscot Paper Company operated three paper mills on the river with "daily capacity of three hundred and twenty tons of news and wrappers, and three pulp mills able to produce daily three hundred tons of ground-wood and seventy tons of sulphite-fibre" (Weeks, 1916: 321). The mills were located in Topsham, Pejepscot Village, and

Lisbon Falls. Construction began on the mill at Pejepscot, located on the north bank of the river between the firm's Topsham and Lisbon Falls mills, in 1893. The Pejepscot Mill supplied pulp to the firm's Bowdoin Mill in Topsham and was capable of producing seventy tons of ground wood per day. Eventually the mill was expanded to produce paper. The Pejepscot Paper Company mill opened in 1896. Following the ownership of F.C. Whitehouse, the company changed hands several times. The mill at Lisbon Falls closed during the Depression. The Hearst Corporation bought the company in 1947, eventually selling it to the St. Raymond Corporation, which went bankrupt.

A large population of Hungarian-Slovak and Austrian immigrants migrated to the Pejepscot area to work in the mills. At the height of production, in 1898, the mill employed about 180 men. The mill was the backbone of the community, providing housing, education, recreation, and water/sewer systems. The Pejepscot Paper Company constructed all twenty-five of the buildings that constituted Pejepscot Village. Eighteen of these buildings were industrial structures. Between 1896 and 1898, the Pejepscot Paper Company built worker housing near the mill. The Colonial Revival style boarding house, built in 1896, included, "a dining room, parlor, smoking room, barber shop, living room, store room, washroom, 22 bedrooms and a bath" (Proud Pejepscot Village, MHPC vertical files). When the boarding house closed, the building was converted into a Community Hall. The building is currently used as storage.

4.11.1.2.2 Identification of Historic Sites in the Vicinity of the Project

Since the closing of the Pejepscot Paper Company in 1985, the population of Pejepscot Village has dramatically decreased. Today only five mill worker buildings exist, all of which have been significantly altered. The majority of the buildings have been demolished, and those that survive have been converted into storage or function as a scrap metal recycling facility. There are no significant historic resources extant in close proximity to the site. The nearest property noted in the NRHP is the Pejepscot Village School, about 0.5 miles from the river. The Pejepscot Village School was built in 1899 by Joseph Philbrook of Brunswick on land deeded to the town by the Pejepscot Paper Company on November 9, 1899. In addition, the Pejepscot Paper Company donated $400 to the school. The historic schoolhouse is the only remaining community building in the village (Maine Historic Preservation Commission 2007).

MHPC's Cultural and Architectural Resource Management Archive (CARMA) was used to identify historic properties within a half-mile vicinity of the Project Area. Table 4.11.1.2.2-1 below summarizes the historic resources reported in the CARMA database.

Table 4.11.1.2.2-1. Reported Historic Resources within 0.5-mile of the Project Area

Resource Name	Resource Type	Description	Location (Town)	NRHP Status	Notes
823 Newell Brook Road, Route 9	Building	Barn	Durham	Not eligible	One-story connected barn c.1920-1940 located on the south side of the Androscoggin River, outside of the Project boundary.
823 Newell Brook Road, Route 9	Building	1-story residential home	Durham	Not eligible	Single family home with connected barn located on the south side of the Androscoggin River, outside of the Project boundary.
21 Pinkham Brook Road, Route 125	Building	2-story residential home	Durham	Not Determined	The Federal style multi-family home c. 1810-1825 is located on the south side of the Androscoggin River outside of Project boundary.
17 Pinkham Brook Road, Route 125	Building	Garage	Durham	Not eligible	One-story garage c. 1930-1960 is located on the south side of the Androscoggin River outside of Project boundary.
17 Pinkham Brook Road, Route 125	Building	1 ½ story residential home	Durham	Not eligible	Single family home c. 1930-1960 located on the south side of the Androscoggin River outside of Project boundary.
835 Newell Brook Road, Route 9	Building	1 ½ story residential home	Durham	Not eligible	Single-family home c. 1920-1930 is located on the south side of the Androscoggin, outside of the Project boundary.
Durham Bridge	Structure	Bridge	Durham	Not eligible	Steel bridge c. 1937 (Note: was scheduled to be replaced in 2013) on Canal Street crossing over the Androscoggin at the Project boundary line.

Resource Name	Resource Type	Description	Location (Town)	NRHP Status	Notes
Lisbon Falls Fiber Company	Building	2 1/2 -story industrial building	Lisbon	Not eligible	Two-and-a-half industrial building c. 1880-1920. Little is left to the original mill due to significant alterations c. 1960-1980. Building is located on the north side of the Androscoggin River, just outside of the Project boundary.
Worumbo Mill Complex Bridge #2	Structure	Bridge	Lisbon	Listed	Concrete arch bridge c. 1920 on the north side of the Androscoggin River outside of the Project boundary.
Worumbo Mill Bridge Complex, Bridge #1	Structure	Bridge	Lisbon	Listed	Concrete arch bridge c. 1920 on the north side of the Androscoggin River outside of the Project boundary.
Worumbo Mill Complex, Building #1	Building	2-story industrial building	Lisbon	Listed	Built c. 1864-1920, this building is one of four buildings on the NR listing that survived the 1987 fire. Building is located on the north side of the Androscoggin, outside of the Project boundary.
Worumbo Mill Complex, Building #4	Building	3-story industrial building	Lisbon	Listed	Built c. 1920, this Art Deco mill building is on the north side of the Androscoggin River, outside of the Project boundary.
Worumbo Mill Complex	Building	1 ½-story industrial building	Lisbon	Listed	Art Deco mill building c. 1920. that the canal runs under. Located on the north side of the Androscoggin River, outside of the Project boundary.

Resource Name	Resource Type	Description	Location (Town)	NRHP Status	Notes
Worumbo Mill Complex, Office Building	Building	2-story office building	Lisbon	Listed	The 2-story brick Italianate building c. 1864 is on the north side of the Androscoggin River, outside of the Project boundary.

4.11.1.2.3 Historic Architectural Survey Conducted for Relicensing

In August 2018, Topsham Hydro conducted a *Historic Architectural Survey* as part of relicensing. The survey was intended to identify, locate, and evaluate any historic architectural resources within the Project's APE. The results of the survey indicated that no properties eligible for listing on the NRHP were identified within the Project's APE. Survey results were submitted to MHPC via their standard Architectural Survey Report in June 2019. By letter dated June 28, 2019, MHPC concurred with Topsham Hydro's determination that no properties are eligible for listing on the NRHP.

4.11.2 **Environmental Analysis**

FERC's SD2 identified one potential resource issue relating to cultural resources, which is discussed in greater detail below.

Effects of continued project operation on historic properties and archaeological resources.

To protect cultural resources at the Project during the term of a new license, Topsham Hydro is proposing to implement a Historic Properties Management Plan (HPMP), which will provide background information on cultural resources at the Project, including maps of the APE and archaeological and historic sites, preservation goals and priorities, project effects, and consultation requirements. A draft HPMP is attached as Appendix E-2.

One (1) Pre-Contact archaeological site, the Pejepscot Site (ME 14.108), is listed on the NRHP, and one (1) Pre-Contact site, ME 14.174, with undetermined NRHP-eligibility is located within the Project APE. These sites have been incorporated into the HPMP. Topsham Hydro intends to conduct a Phase II Archaeological Site Evaluation of Site ME 14.174 within two (2) years of license issuance to determine its NRHP-eligibility, as described in the HPMP. As part of the HPMP, No Postcontact archaeological sites or historic properties are located within the APE.

The continued operation of the Project, as proposed, will not have an effect on the identified archaeological resources (ME 14.108 and ME 14.174) since the proposed Project would not involve any new construction or ground disturbing activities that would impact these sites. However, in order to protect the sites from the effects of any future modification or activities that could potentially take place at the Project, the HPMP would be implemented in accordance with the conditions of a new license. Therefore, pursuant to the National Historic Preservation Act, Section 106 (16 U.S.C. § 470f), the proposed relicensing of the Project would not have any adverse effects on historic properties and archaeological resources located at the Project.

4.11.3 **Proposed Environmental Measures**

Topsham Hydro has developed a draft HPMP for the Project. The HPMP will ensure that appropriate consultation occurs prior to any future activity that may affect the eligible historic properties associated with the Project. In addition, the HPMP contains specific measures related to known archaeological sites ME 14.108 and ME 14.174. Within two (2) years of license issuance, Topsham Hydro is proposing to conduct a Phase II Archaeological Site Evaluation of Site ME 14.174 to determine its NRHP-eligibility. At site ME 14.108, Topsham Hydro is proposing to conduct streambank erosion monitoring at regular intervals over the course of the license term. The measures are described in more detail within the HPMP. The HPMP is being filed with the MHPC and FERC under separate covers as "privileged," because it contains confidential archaeological site location information.

4.11.4 Unavoidable Adverse Effects

Continued operation of the Project will not result in any unavoidable adverse impacts to cultural resources.

4.11.5 References

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4.12 Socio-Economic Resources

4.12.1 Affected Environment

The Pejepscot Project boundary is within three counties (see Figure 3.2.3-1). Nearly the entire eastern portion of the Project boundary is within Sagadahoc County, which, at 370 square miles, is the smallest county in Maine (Census, 2010). Cumberland County, which encompasses the southwestern portion of the Project boundary, is the most populated county in the state despite a relatively small area of 1,217 square miles (Census, 2010). The remainder of the Project boundary, including the northwestern portion, is within the relatively small 497-square-mile Androscoggin County (Census, 2010). The following sections summarize socioeconomic conditions of the municipalities abutting the Project boundary, including the aforementioned counties and the Towns of Durham, Lisbon, Brunswick, and Topsham.

4.12.1.1 General Land Use Patterns

The municipalities abutting the Project vary from 100% rural to 82% urban, with population densities ranging from just over 100 persons per square mile to well over 434 persons per square mile. Census data depicting general land use patterns for the abutting municipalities are presented in Table 4.12.1.1-1 and discussed below. Land use types and coverage are discussed in Section 4.3.4.

The majority of Androscoggin County is rural, with a population density of around 230 persons per square mile. The urban centers of the County are the Cities of Auburn, which is the County seat, and Lewiston; both are located upriver from the Project. The Town of Durham by contrast is entirely rural, with a much lower density of roughly 100 persons per square mile. The Town of Lisbon, with a density of roughly 395 persons per square mile, is much more urban than either the County as a whole or the neighboring Town of Durham.

Cumberland County is nearly 70 percent urban. The Cities of Portland (the County seat), South Portland, and Westbrook contribute to the County’s relatively high density of around 337 persons per square mile. The mostly urban Town of Brunswick also contributes with a density of 434 persons per square mile, nearly 400 persons per square mile more than the state as a whole.

Sagadahoc County is mostly rural and has a low density of 139 persons per square mile. The Town of Topsham, however, is mainly urban with a higher density of 273 persons per square mile. The City of Bath, roughly 10 miles southeast of the Project, is the only city in Sagadahoc and serves as the County seat.

Table 4.12.1.1-1. Place of Residence and Density, 2010

	Androscoggin County	Town of Durham	Town of Lisbon	Cumberland County	Town of Brunswick	Sagadahoc County	Town of Topsham	State of Maine
Place of residence: Urban[1]	42%	0%	75%	68%	82%	43%	59%	42%
Place of residence: Rural[1]	58%	100%	25%	32%	18%	57%	41%	58%
Population[2]	107,702	3,848	9,009	281,674	20,278	35,293	8,784	1,328,361
Persons per square mile[2]	230.2	100.5	394.8	337.2	434.0	139.1	272.8	43.1
Housing units[2]	49,090	1,548	3,948	138,657	9,599	18,288	4,167	721,830
Housing units per square mile[2]	104.9	40.4	173.0	166.0	205.4	72.1	129.4	23.4

Source[1]: Census, 2000b

Source[2]: Census, 2010

4.12.1.2 Population Patterns

Current and historical populations for the municipalities abutting the Project are presented in Table 4.12.1.2-1. Growth projections from the State of Maine Office of Policy and Management (OPM) are presented in Table 4.12.1.2-2. While cumulative growth rates of the municipalities varied widely from 2000 to 2015, recent data show populations of all four abutting Towns along with Androscoggin County declined slightly, while Cumberland and Sagadahoc Counties continued to grow at very slow rates. OPM projections from 2014 to 2034 show all abutting municipalities growing by a little over 2 percent, with the exceptions of the Town of Durham, which is expected to experience a much higher growth rate, and the Towns of Lisbon and Brunswick, which are expected to experience population declines.

Androscoggin County experienced a 3.8 percent growth rate from 2000 to 2010, followed by a 0.4 percent decline from 2010 to 2015. The County's population is projected to grow slightly and then decline between 2014 and 2034, resulting in zero net growth. The Town of Durham had a much higher growth rate than that of the County, at 12.6 percent from 2000 to 2010, followed by 2.4 percent growth from 2010 to 2015. The Town is projected to grow by 8.1 percent by 2034, which is the largest projected growth rate for all municipalities abutting the Project Area by nearly 6 percent. The Town of Lisbon grew by a modest 0.2 percent from 2000 to 2010, followed by a 2.2 percent decline from 2010 to 2015. The Town's population is projected to decline steadily between 2014 and 2034, with an overall 5.5 percent population decline.

Cumberland County grew by 6 percent from 2000 to 2010, followed by a slower 2.9 percent growth rate from 2010 to 2015. The County's growth is projected to slow and eventually decline from 2014 to 2034, for a total growth rate of 2.3 percent. The Town of Brunswick experienced a 2.9 percent decline from 2000 to 2010, and a slightly lower 0.9 percent decline from 2010 to 2015. Overall, the Town's population declined by 3.9 percent from 2000 to 2015 and is projected to continue declining through 2034.

Sagadahoc County experienced very slight growth at 0.2 percent from 2000 to 2010 followed by a slight decline of 0.4 percent from 2010 to 2015. The County population is projected to grow a total of 2.3 percent between 2014 and 2034. The Town of Topsham's population declined by 1.8 percent from 2000 to 2010 and by 2.3 percent from 2010 to 2015. However, the Town is projected to grow by 2.1 percent between 2014 and 2034.

Table 4.12.1.2-1. Population - 2000 to 2015

Municipality	Census		Population Estimate				
	2000[1]	2010[2]	2011[2]	2012[2]	2103[2]	2014[2]	2015[2]
Androscoggin County	103,793	107,702	107,403	107,558	107,365	107,408	107,233
Change		3.8%	-0.3%	0.1%	-0.2%	0.0%	-0.2%
Cumulative from 2000		3.8%	3.4%	3.5%	3.3%	3.4%	3.2%
Town of Durham	3,381	3,808	3,821	3,853	3,867	3,879	3,902
Change		12.6%	-0.3%	0.1%	-0.2%	0.0%	-0.2%
Cumulative from 2000		12.6%	11.5%	12.3%	12.6%	12.8%	13.4%
Town of Lisbon	9,077	9,092	9,065	9,023	8,957	8,936	8,895
Change		0.2%	-0.3%	0.1%	-0.2%	0.0%	-0.2%
Cumulative from 2000		0.2%	-0.1%	-0.6%	-1.3%	-1.6%	-2.0%
Cumberland County	265,612	281,674	282,758	284,103	285,882	287,875	289,977
Change		6.0%	0.4%	0.5%	0.6%	0.7%	0.7%
Cumulative from 2000		6.0%	6.1%	6.5%	7.1%	7.7%	8.4%
Town of Brunswick	21,172	20,557	20,457	20,376	20,319	20,329	20,378
Change		-2.9%	-0.3%	0.1%	-0.2%	0.0%	-0.2%
Cumulative from 2000		-2.9%	-3.5%	-3.9%	-4.2%	-4.1%	-3.9%
Sagadahoc County	35,214	35,293	35,102	35,114	35,033	35,063	35,149
Change		0.2%	-0.5%	0.0%	-0.2%	0.1%	0.2%
Cumulative from 2000		0.2%	-0.3%	-0.3%	-0.5%	-0.4%	-0.2%
Town of Topsham	9,100	8,938	8,869	8,819	8,750	8,728	8,734
Change		-1.8%	-0.3%	0.1%	-0.2%	0.0%	-0.2%
Cumulative from 2000		-1.8%	-2.6%	-3.2%	-4.0%	-4.3%	-4.2%
State of Maine	1,274,923	1,328,361	1,328,257	1,328,888	1,328,778	1,330,256	1,329,328
Change		4.2%	0.0%	0.0%	0.0%	0.1%	-0.1%
Cumulative from 2000		4.2%	4.0%	4.1%	4.1%	4.2%	4.1%

Source[1]: Census, 2000a

Source[2]: Census, 2015a

Table 4.12.1.2-2. Population Projections to 2034

	Observed	Projected				Percent change from previous period				Total Percent Change
	2014	2019	2024	2029	2034	2014-2019	2019-2024	2024-2029	2029-2034	2014-2034
Androscoggin County	107,408	108,061	108,304	108,118	107,433	0.6%	0.2%	-0.2%	-0.6%	0.0%
Town of Durham	3,906	4,011	4,099	4,172	4,224	2.7%	2.2%	1.8%	1.2%	8.1%
Town of Lisbon	8,880	8,808	8,706	8,568	8,392	-0.8%	-1.2%	-1.6%	-2.1%	-5.5%
Cumberland County	287,875	291,783	294,589	295,441	294,431	1.4%	1.0%	0.3%	-0.3%	2.3%
Town of Brunswick	20,425	20,370	20,207	19,906	19,479	-0.3%	-0.8%	-1.5%	-2.1%	-4.6%
Sagadahoc County	35,063	35,598	35,926	36,005	35,869	1.5%	0.9%	0.2%	-0.4%	2.3%
Town of Topsham	8,720	8,844	8,924	8,942	8,906	1.4%	0.9%	0.2%	-0.4%	2.1%
State of Maine	1,330,256	1,332,944	1,330,903	1,322,023	1,305,910	0.2%	-0.2%	-0.7%	-1.2%	-1.8%

Source: OPM, 2016

4.12.1.3 Households / Family Distribution and Income

Household, income and poverty status data for the municipalities abutting the Project Area are presented in Table 4.12.1.3-1. The data show that all municipalities are comparable to the State of Maine's average household size of 2.32, with the Town of Durham coming in slightly larger at 2.57 and the Town of Brunswick slightly smaller at 2.19 persons per household. All municipalities except Androscoggin County have a higher median household income than the State, with the Town of Durham's coming in over $20,000 higher at $71,908. Androscoggin County's median household income is less than $2,000 lower than that of the State. Each abutting municipality comes within 10 percent of the statewide per capita income with the exception of the Town of Durham and Cumberland County, which come in at roughly 146 and 122 percent of the State's, respectively. With the exception of Androscoggin County, the overall poverty status in each municipality is lower than that of the State, with the Towns of Durham, Lisbon and Topsham at nearly 4 percentage points lower than the statewide percentage of 13.9.

Table 4.12.1.3-1. Income and Poverty, 2015

	Androscoggin County	Town of Durham	Town of Lisbon	Cumberland County	Town of Brunswick	Sagadahoc County	Town of Topsham	State of Maine
Total households	44,315	1,496	3,696	117,339	8,469	15,088	3,720	557,219
Average household size	2.37	2.57	2.43	2.32	2.19	2.32	2.32	2.32
Median household income	$47,537	$71,908	$52,702	$60,051	$53,737	$53,298	$62,404	$49,331
Percentage of State	96.4%	145.8%	106.8%	121.7%	108.9%	108.0%	126.5%	100.0%
Percentage of U.S.[1]	88.2%	133.4%	97.8%	111.4%	99.7%	98.9%	115.8%	91.5%
Per capita income	$25,011	$33,000	$24,676	$34,081	$31,338	$30,062	$32,869	$27,655
Percentage of State	90.4%	119.3%	89.2%	123.2%	113.3%	108.7%	118.9%	100.0%
Percentage of U.S.[2]	86.5%	114.1%	85.3%	117.8%	108.3%	103.9%	113.6%	95.6%
Poverty Status: All People	15.7%	8.4%	8.0%	11.6%	11.4%	12.1%	8.1%	13.9%
Poverty Status: Under 18 yrs.	23.5%	15.2%	6.8%	14.9%	12.4%	19.9%	13.0%	18.6%
Poverty Status:	14.3%	6.5%	8.4%	11.6%	13.4%	11.8%	8.0%	14.0%

	Androscoggin County	Town of Durham	Town of Lisbon	Cumberland County	Town of Brunswick	Sagadahoc County	Town of Topsham	State of Maine
Total households	44,315	1,496	3,696	117,339	8,469	15,088	3,720	557,219
Average household size	2.37	2.57	2.43	2.32	2.19	2.32	2.32	2.32
18-64 years								
Poverty Status: 65 yrs. & over	10.0%	6.4%	7.5%	7.6%	5.4%	4.6%	4.6%	8.6%

[1]*US Median Household Income: $53,889*

[2]*US Per Capita Income: $28,930*

Source: Census, 2015b

4.12.1.4 Project Vicinity Employment Sources

Labor force and unemployment data for each municipality abutting the Project Area are presented in Table 4.12.1.4-1. Roughly 23 percent of Maine's labor force resides in Cumberland County. Androscoggin County contains 8 percent and Sagadahoc contains under 3 percent of the State's labor force. Androscoggin County has the highest unemployment rate of all the municipalities abutting the Project Area, although at 6.8 percent, the County is still over one percentage point lower than the statewide rate.

Table 4.12.1.4-2 presents industry and occupation statistics for the abutting municipalities. For each of the municipalities, the largest industry sector is educational, health and social services, with retail trade coming in as second largest. Manufacturing is the third largest industry sector for all municipalities except Cumberland County, where professional, scientific, management, administrative and waste management services comes in third, and the Town of Brunswick, where arts, entertainment, recreation, accommodation and food services is the third largest sector.

The two most common occupational categories in all abutting municipalities are management, business, science and arts, which is the most common category for all municipalities except the Town of Lisbon, where sales and office is the most common category. Service occupations are the third most common in all abutting municipalities. The 25 largest employers for each of the abutting counties are presented in Tables 4.12.1.4-3 to 4.12.1.4-5.

Table 4.12.1.4-1. Labor Force and Unemployment, 2015

	Androscoggin County	Town of Durham	Town of Lisbon	Cumberland County	Town of Brunswick	Sagadahoc County	Town of Topsham	State of Maine
Labor Force	57,139	2,385	4,624	161,178	10,915	18,835	4,941	697,913
Unemployment	6.8%	2.6%	5.7%	5.4%	6.3%	5.7%	3.7%	8.3%

Source: Census, 2015b

Table 4.12.1.4-2. Industry and Occupation for Civilian Population 16 years and over, 2015

	Androscoggin County	Town of Durham	Town of Lisbon	Cumberland County	Town of Brunswick	Sagadahoc County	Town of Topsham	State of Maine
Occupation								
Management, business, science, & arts	31.5%	44.4%	26.0%	43.3%	43.9%	36.7%	36.4%	35.4%
Service	18.5%	13.1%	19.8%	16.6%	19.0%	19.4%	19.2%	18.5%
Sales & office	25.7%	22.8%	29.6%	24.4%	19.9%	22.9%	22.1%	23.9%
Natural resources, construction, maintenance	10.1%	8.0%	9.9%	7.7%	9.4%	10.4%	7.6%	10.7%
Production, transportation, material moving	14.2%	11.8%	14.7%	8.0%	7.8%	10.6%	11.7%	11.4%
Industry								
Agriculture, forestry, fishing, hunting, mining	1.3%	1.1%	0.5%	1.2%	1.4%	1.8%	0.2%	2.5%
Construction	6.5%	4.3%	6.1%	5.5%	5.8%	6.2%	3.9%	6.9%
Manufacturing	11.8%	12.5%	10.9%	7.2%	5.9%	14.0%	12.2%	9.3%
Wholesale trade	2.0%	1.2%	0.7%	2.6%	1.6%	2.4%	3.0%	2.3%
Retail trade	14.8%	18.5%	19.5%	13.0%	13.5%	15.5%	15.8%	13.4%
Transportation & warehousing, & utilities	4.1%	3.1%	4.2%	3.2%	2.7%	2.7%	2.8%	3.8%
Information	2.3%	5.4%	2.8%	2.2%	1.1%	1.1%	1.3%	1.8%
Finance, insurance, real	6.9%	8.6%	6.8%	9.2%	5.6%	4.4%	4.8%	6.2%

	Androscoggin County	Town of Durham	Town of Lisbon	Cumberland County	Town of Brunswick	Sagadahoc County	Town of Topsham	State of Maine
estate & rental								
Professional, scientific, management, administrative, & waste management services	7.9%	11.6%	7.4%	11.8%	8.6%	8.2%	8.9%	8.6%
Educational, health & social services	27.0%	25.1%	24.7%	27.5%	33.9%	25.0%	28.2%	27.5%
Arts, entertainment, recreation, accommodation & food services	7.7%	4.6%	5.4%	9.4%	11.1%	9.1%	7.5%	8.9%
Other services (except public administration)	4.0%	2.9%	5.1%	4.5%	5.7%	4.4%	3.9%	4.4%
Public administration	3.7%	1.1%	5.8%	2.7%	3.0%	5.2%	7.6%	4.4%

Source: Census, 2015b

Table 4.12.1.4-3. Top 10 Private Employers in Androscoggin County by Average Monthly Employment (1st Quarter 2016)

Rank	Name	Employment Range	Business Description
1	Central Maine Healthcare Corp	2,501 to 3,000	General medical and surgical hospitals
2	TD Bank N A	1,501 to 2,000	Commercial banking
3	St Mary's Regional Medical Ctr	1,501 to 2,000	General medical and surgical hospitals
4	Wal-Mart / Sam's Club	1,001 to 1,500	Warehouse clubs and supercenters
5	Bates College	501 to 1,000	Colleges and universities
6	Murphy Homes Inc, John F	501 to 1,000	Residential developmental disability homes
7	L.L. Bean, Inc.	501 to 1,000	Mail-order houses
8	Pioneer Plastics Corporation	1 to 500	Laminated plastics plate, sheet, and shapes
9	Tambrands Inc.	1 to 500	Sanitary paper product manufacturing
10	P.S.T. Services, Inc.	1 to 500	Other accounting services

Source: MaineDOL, 2016

Table 4.12.1.4-4. Top 10 Private Employers in Cumberland County by Average Monthly Employment (1st Quarter 2016)

Rank	Name	Employment Range	Business Description
1	MaineHealth	8,001 to 8,500	General medical and surgical hospitals
2	L.L. Bean, Inc.	3,501 to 4,000	Mail-order houses
3	Unum Provident	3,001 to 3,500	Direct life insurance carriers
4	Hannaford Bros Co	2,501 to 3,000	Supermarkets and other grocery stores
5	Mercy Hospital	1,501 to 2,000	General medical and surgical hospitals
6	Mid Coast Hospital	1,001 to 1,500	General medical and surgical hospitals
7	Wal-Mart / Sam's Club	1,001 to 1,500	Warehouse clubs and supercenters
8	T D Bank N A	1,001 to 1,500	Commercial banking
9	Bowdoin College	1,001 to 1,500	Colleges and universities
10	Idexx Laboratories Inc.	1,001 to 1,500	Pharmaceutical preparation manufacturing

Source: MaineDOL, 2016

Table 4.12.1.4-5. Top 10 Private Employers in Sagadahoc County by Average Monthly Employment (1st Quarter 2016)

Rank	Name	Employment Range	Business Description
1	Bath Iron Works Corporation	5,501 to 6,000	Ship building and repairing
2	Grace Management Inc.	1 to 500	Continuing care retirement communities
3	Reed & Reed Inc.	1 to 500	Highway, street, and bridge construction
4	Hannaford Bros Co	1 to 500	Supermarkets and other grocery stores
5	Crooker Construction LLC	1 to 500	Highway, street, and bridge construction
6	Target Corporation	1 to 500	Discount department stores
7	Shaw's Supermarkets Inc.	1 to 500	Supermarkets and other grocery stores
8	Bath Area Family YMCA	1 to 500	Civic and social organizations
9	Home Depot USA Inc.	1 to 500	Home centers
10	Computer Sciences Corporation	1 to 500	Computer facilities management services

Source: MaineDOL, 2016

4.12.2 Environmental Analysis

FERC's SD2 did not identify any potential resource issues related to socioeconomic resources. As a generator of electric power, an employer, and a taxpayer in the region, Topsham Hydro contributes to socioeconomic resources of the region. In addition, the Project provides recreational facilities on the Androscoggin River. Topsham Hydro is not proposing any changes to Project operations and the socioeconomic benefits associated with the Project will continue.

4.12.3 Proposed Environmental Measures

Topsham Hydro is not proposing any PME measures related to socioeconomic resources.

4.12.4 Unavoidable Adverse Impacts

No unavoidable adverse impacts to socioeconomic resources are expected to occur as a result of the continued operation of the Project.

4.12.5 **References**

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5 ECONOMIC ANALYSIS

This section presents the estimated annual value of developmental resources associated with the Project under the current license, the cost of operating and maintaining the Project under the existing license, the cost of each PME measure, and the reduction in the value of the developmental resources of the Project attributed to proposed PME measures.

5.1 Costs and Value of Developmental Resources Associated with the Project

Under its approach to evaluating the economics of hydropower projects as articulated in Mead Corporation, Publishing Paper Division (72 FERC §61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of a project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. Table 5-1 presents the value of power for the Project based New England-ISO energy costs for the period January 1, 2019 to December 31, 2019.

Table 5-1: Valuation of the Annual Output of the Project

Description	Energy (MWH)	Average Monthly Day Ahead Locational Marginal Pricing (Maine Zone) January 1, 2019 thru December 31, 2019 ($/MWh)	Average Gross Annual Revenue ($)
Average Annual Generation	68,516	$30.73	$2,105,497

Table 5-2 shows the estimated annual operations and maintenance for the Project.

Table 5-2: Annual Operating Costs of the Project

	Cost
Operation and Maintenance (interim replacements, insurance, administrative and general costs)	$694,000
Property Taxes	$209,000
Depreciation and Amortization	**To be included in the FLA**
Total	**$903,000**

5.2 Costs of Proposed PME Measures

Topsham Hydro proposes several environmental measures (Table 5.2-1) for inclusion in the new license for the Project. The measures would add capital costs, and increase annual operations and maintenance costs for the Project.

Table 5.2-1: Cost Estimate of Proposed Environmental Measures

Proposed PME Measure	Capital Cost (2020 dollars)	Annual Operations and Maintenance Cost (2020 dollars)
Operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates.	$0	$0
Maintain a minimum flow of 1,170 cfs, or inflow, whichever is less.	$0	$0
Finalize and Implement Operations Monitoring Plan.	$2,500	$5,000
Develop, in consultation with stakeholders, a mitigation measure to address potential stranding of fish in the bedrock area below bascule gate No. 5.	$**TBD**	$**TBD**
Installation and operation of a temporary portable American Eel ramp for three passage seasons (June 1 through September 15) to identify a suitable location for a permanent upstream American Eel ramp. The temporary portable eel ramp will be installed during the first full passage season after the effective date of the new license.	$0	$7,500[8]
Installation and operation of a permanent upstream American Eel ramp based on the results of the temporary portable ramp evaluation. The permanent ramp will be installed during the fourth full passage season after the effective date of the new license.	$50,000	$5,000
Increase the number of lift cycles at the Project fish lift to one lift event per hour (10 lift cycles per day) between the hours of 0800 and 1800, during the peak upstream migration period (May 16 through June 15) for river herring and American Shad.	$0	$10,000
Continue video camera monitoring of Atlantic Salmon utilizing the Pejepscot fish lift.	$0	$7,500

[8] Annual cost for each passage season.

Proposed PME Measure	Capital Cost (2020 dollars)	Annual Operations and Maintenance Cost (2020 dollars)
Conduct an Atlantic Salmon radio telemetry study, to determine upstream passage effectiveness at the Pejepscot fish lift, when at least 40 adult Atlantic Salmon of Androscoggin River origin are counted at the Brunswick fishway for two consecutive years.	$0	$75,000[9]
Monitor downstream migrating Atlantic Salmon kelts as part of the adult Atlantic Salmon radio telemetry study described above.	$0	$25,000[10]
Open bascule gate No. 1 (closest to the powerhouse) 50% to provide approximately 500 cfs of spill at night (2000 – 0700 hours) during the month of May.	$0	$0
Finalize and Implement Recreation Management Plan (including annual facility operations and maintenance)[11]	$103,500	$32,300
Finalize and Implement Historic Properties Management Plan.	$5,000	$90,000[12]
Total	**$161,000**	**$257,300**

[9] Cost for 1-season telemetry study.
[10] Cost for 1-season telemetry study.
[11] Itemized cost for each enhancement is detailed within the Recreation Management Plan.
[12] Includes cost ($85,000) of Phase II archaeological investigations in Year 2 of next license term.

6 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. § 803(a)(2)(A), requires FERC to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the Project. A list of existing FERC-approved State of Maine and federal plans was obtained from the Commissions website as of April 2019. FERC currently lists 38 comprehensive plans for the State of Maine. Of the 38 plans listed, 12 are potentially relevant to the Project. Exhibit H provides a review of the proposed relicensing in consideration of any existing FERC approved comprehensive management plans.

APPENDIX E-1: DRAFT BIOLOGOICAL ASSESSMENT AND SPECIES PROTECTION PLAN

{To be Included in the FLA}

APPENDIX E-2: HISTORIC PROPERTIES MANAGEMENT PLAN

{The Historic Properties Management Plan is being filed separately as Privileged (non-public information) in Volume III to protect the location of resources listed on or eligible for the NRHP}

APPENDIX E-3: OPERATIONS MONITORING PLAN

DRAFT OPERATIONS MONITORING PLAN
PEJEPSCOT HYDROELECTRIC PROJECT
(FERC No. 4784)

Submitted by:

Brookfield Renewable
Topsham Hydro Partners Limited Partnership
150 Main Street
Lewiston, ME 04240

Prepared by:

Gomez and Sullivan Engineers

April 2020

Brookfield

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LIST OF ABBREVIATIONS AND DEFINITIONS

cfs	cubic feet per second
FERC	Federal Energy Regulatory Commission
ft	feet
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
ME	Maine
mi^2	square miles
MGD	million gallons per day
MW	megawatt
NASCC	North American System Control Center
NMFS	National Marine Fisheries Service
Project	Pejepscot Hydroelectric Project (FERC No. 4784)
RM	river mile
SCADA	Supervisory Control and Data Acquisition
Topsham Hydro	Topsham Hydro Partners Limited Partnership
USFWS	U.S. Fish and Wildlife Service

1.0 BACKGROUND

Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro) owns and operates the Pejepscot Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC or the Commission) Project No. 4784. The 13.88-megawatt (MW) Project is located on the Androscoggin River in the village of Pejepscot and the Town of Topsham, Maine (ME) to the east, the Town of Lisbon, ME to the north, and the Town of Durham, ME and the Town of Brunswick, ME to the west. The Project straddles the border between Cumberland and Sagadahoc counties and extends into Androscoggin County.

The purpose of this plan is to document how Topsham Hydro will monitor, record compliance with, and report deviations from the requisite minimum flow and impoundment level requirements described below.

2.0 PROJECT DESCRIPTION

The Project is the second dam on the Androscoggin River located at approximately river mile (RM) 14. The Project dam is approximately 4 miles upstream of the Brunswick Hydroelectric Project and 3.25 miles downstream of the Worumbo Hydroelectric Project. In total, the Project is the second of 22 hydroelectric projects on the mainstem Androscoggin River. The Androscoggin River basin above the dam has a drainage area of approximately 3,420 square miles (mi^2). The Project boundary extends approximately 3 miles upstream from the Pejepscot Dam.

2.1 Project Works

Existing Project structures generally consist of a dam, spillway, fish passage facilities, two powerhouses, a sheet-pile floodwall, an interconnection with the local utility's transmission system, and ancillary equipment.

The Pejepscot Dam is a 560-foot-long, 47.5-foot-high, rock- and gravel-filled, timber-crib, overflow structure with a sheet-pile cutoff to bedrock along the upstream side. The cribs are topped with a 5-foot-thick reinforced concrete slab to protect the dam from erosion during periods of high river flow. Spillway capacity is provided by operating the gates on the crest of the dam. The crest is equipped with five, 96-foot-long by 3-foot-high, hydraulically operated, bascule gates separated by concrete piers. The gates can be operated automatically or manually. The Project has a spillway discharge capacity of 95,000 cubic feet per second (cfs).

The powerhouses at the Project include an original powerhouse that was constructed in 1898, and a newer powerhouse that was constructed from 1985 to 1987. The original powerhouse contains three rehabilitated horizontal Francis units (identified as Nos. 21, 22, and 23) with a combined output capacity of about 1.58-MW. These units are typically operated at either 100% gate or completely off. The three units pass approximately 350 cfs each (1,050 cfs total) at 100% gate. The newer powerhouse contains a vertical-shaft, low speed, adjustable-blade, propeller type (Kaplan) turbine-generator unit (identified as Unit No. 1) rated at 12.3-MW. The minimum and maximum flow through the turbine is 1,170 and 7,550 cfs, respectively.

The upstream fish passage facility is a vertical lift (elevator) that lifts migratory fish in a hopper about 30 feet vertically from near the powerhouse tailrace to the impoundment level behind the dam. The upstream fish passage is operated annually from April 15 to November 15. The four attraction pumps are operated by station technicians; the number of pumps operating is determined based on the flow coming through the turbine and out the tailrace. When river flows are less than 1,700 cfs, one pump is operated (total attraction flow 70 cfs). When river flows are between 1,700 and 3,500 cfs, two pumps are operated (total attraction flow 110 cfs). When river flows are between 3,500 and 5,200 cfs, three pumps are operated (total attraction flow 150 cfs). Finally, when river flows are greater than 5,200 cfs, four pumps are operated (total attraction flow 190 cfs). The total of 190 cfs (attraction flow from four pumps (160 cfs) plus an additional 30 cfs provided from the impoundment via the exit trough).

The downstream fish passage facilities consist of two entry weirs, one on either side of the Unit 1 turbine intake. Each entry weir has an invert elevation of 65.5 ft. From each weir, an outlet pipe conveys downstream migrating fish in water down to the tailwater. The weir gates are four feet wide and are part of an inlet box with the outlet pipe located on the side opposite the weir. The right-side weir has a 30-inch diameter transport pipe and the left-side weir has a 24-inch diameter transport pipe. Both pipes have a free discharge to the water below the dam. Each downstream bypass can pass approximately 13 cfs, 29 cfs, and 87 cfs at headpond elevations of 66.5 ft. (low), 67.2 ft. (normal), and 69.0 ft. (high), respectively. This assumes that the entrance gate at each downstream bypass is in the fully opened position. The downstream fishway is currently operated from April 1 to December 31, as river conditions allow.

2.2 Impoundment

The Pejepscot Project impoundment encompasses approximately 225 acres at a full pond elevation of 67.5 ft. The reservoir has an estimated gross volume of 3,278 acre-feet. The Project impoundment has no significant usable storage capacity due to the Project's run-of-river operational mode.

2.3 License Requirements

Based on the Draft License Application and consultation to date, Topsham Hydro anticipates that the new license articles pertaining to minimum flow requirements, impoundment elevation fluctuations, and the existing fish passage structures will remain largely unchanged from the current license, as follows.

- Maintain year-round minimum flow of 1,710 cfs or inflow, whichever is less[1].
- Operate in a run-of-river mode maintaining a normal pond elevation of 67.2 feet or 0.3 feet below the top of the spill gates[2].

[1] Minimum flow requirements under the current license are described as "continuous," but Brookfield proposes that the requirement in the new license be instead based on the hourly average. This change would capture the intent of the minimum flow measure, but would avoid unnecessary reporting of very short term excursions due to unplanned events such as extreme weather, equipment failure, and so on. A similar change was adopted in 2011 for the Gulf Island-Deer Rips Hydropower Project (FERC No. 2283).

[2] Brookfield also proposes that, for compliance purposes, the pond level elevation also be based upon hourly average, for similar logic as the minimum flow requirement.

- Operate the upstream passage facilities from April 15 to November 15.
- Operate the downstream fish passage facilities from April 1 to December 31.

In addition to the existing license requirements listed above, Topsham Hydro anticipates additional operational requirements associated with the proposed measures below.

- Seasonal installation and maintenance of an American eel upstream passage ramp during the fourth full passage season after the effective date of the new license

3.0 OPERATIONS MANAGEMENT

3.1 River Basin Operations

The Androscoggin River flow regime is set by the Upper Androscoggin River Storage System, which consists of a series of headwater storage reservoirs located in Maine and New Hampshire. Outflow from the storage reservoirs is set in accordance with various legal agreements. The upper portion of the Androscoggin River contains 16 run-of-river hydroelectric projects until reaching the Gulf Island Hydroelectric Project. The Gulf Island Project then re-regulates downstream flow for the lower Androscoggin River. The lower portion of the Androscoggin River contains 5 run-of-river hydroelectric projects, including the Pejepscot Project which is the second dam upstream of the Androscoggin River's confluence with Merrymeeting Bay.

3.2 Typical Operations

The Project is operated as a run-of-river facility. The main turbine generator unit (Unit 1) is operated on pond level control. Unit 1 controls the turbine wicket gates to maintain a preset pond level which is normally at about elevation 67.2 feet (ft.) or 0.3 feet below the top of the spill gates. When Unit 1 nears its maximum flow capacity of 7,550 cfs, one or more of the three small units (Units 21, 22 and 23) is manually started. The small units are mainly operated during high spring runoff and after large storm events that increase river flow.

The Project is required to release a continuous minimum flow of 1,710 cfs, as measured immediately downstream from the Project powerhouse, or inflow to the impoundment, whichever is less, minus process water (approximately 5 million gallons per day (MGD) or 9.3 cfs) and 100 cfs for pond level control.

3.3 High Water Operations

Under higher river flow conditions, water in excess of the hydraulic capacity (8,600 cfs) of the generating units is spilled at the dam. It is estimated that the Project is operated in this manner approximately 25 percent of the year. High flows in the Androscoggin River Basin occur annually during the spring and fall run-off periods. The magnitude of spring flows may vary considerably depending on the water content of the melting snow cover, the occurrence of coincidental heavy spring rainfall, and warm temperatures.

Under flood conditions, in addition to spillage and maximum unit operation, the spill gates on the dam spillway are lowered to help control upstream water levels. When the pond level reaches elevation 69.0 (1.5 feet above the spill gates), the gates begin to lower starting with Gate 1, closest to the powerhouse. The gates operate on pond level control and as flow increases, they maintain the pond level of elevation 69.0 until all five gates are open. When the flow starts decreasing and the pond level drops to elevation 68.0 the gates start to close to maintain a level above elevation 68.0. When all five gates are closed, the pond is again on turbine pond level control until the pond level exceeds elevation 69.0. Appendix A contains the rating curve for the spillway gates.

3.4 Low Water Operations

With the existing regulation of the upstream storage facilities, the reduction in river flows due to adverse water conditions is generally minimal and infrequent. During low inflow conditions, Topsham Hydro operates the Project to maintain the impoundment level near 67.2 feet and to provide the required minimum downstream releases and flows necessary for operation of the fish passage structures. The minimum downstream releases are provided through turbine operations and fish passages when in operation. During the rare occasions when inflows to the impoundment are less than the minimum hydraulic capacity of the Project's turbines, the minimum downstream flow release is provided over the spillway and through the fish passages when in operation.

3.5 Routine Maintenance and Operation

The Project is remotely operated using a Supervisory Control and Data Acquisition (SCADA) link from Topsham Hydro's North American System Control Center (NASCC) in Marlborough, Massachusetts. At the control center, dispatchers are on duty 24 hours a day, seven days a week. The Project is normally visited by operations and maintenance personnel each workday. A local operating crew is also available during weekdays and weekends as necessary to perform routine maintenance and operations at the facility. Daily logs of impoundment level, Project outflow, and outages are maintained electronically for the Project.

3.6 Scheduled Maintenance

3.6.1 Minimum Flows

Periodic turbine shutdowns will occur as necessary to perform maintenance activities. Under these circumstances, Topsham Hydro will maintain a minimum continuous downstream flow of 1,710 cfs or inflow, whichever is less, through the turbine units, fish passages, and/or over the spillway as available or appropriate.

During planned maintenance activities or other conditions where temporary changes to the required minimum flows are necessary, Topsham Hydro will consult with the Maine Department of Environmental Protection (MDEP), Maine Department of Inland Fisheries and Wildlife (MDIFW), Maine Department of Marine Resources (MDMR), National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS).

3.6.2 Impoundment Water Levels

Drawdowns of the impoundment may be required from time to time to perform major maintenance on Project structures or to accommodate requests or orders from Federal or state agencies and entities concerned with public safety, construction/maintenance of downstream public works projects, and other similar activities. The impoundment level may be drawn down as low as 64.5 feet for Project maintenance. However, agency consultation will be initiated before the impoundment level is be drawn down below 66.5 feet for more than 1 hour. During planned drawdowns exceeding this level, Topsham Hydro will consult with the MDEP, MDIFW, MDMR, NMFS, and USFWS on impoundment water levels and minimum flows during refill.

3.6.3 Fish Passage Operations

The Project fishways will be operated and maintained, and records maintained, in accordance with the Fish Passage Operations and Maintenance Plan as approved. Any new fishways installed as a result of the new license will be operated in accordance with any updated Fish Passage Operations and Maintenance Plan.

Fishway maintenance is typically addressed prior to spring start-up, but may also be addressed during the operational season (as needed) through brief fishway dewaterings following agency consultation. The upstream fishway and its attraction water pipe are checked periodically to make sure that they are operating properly, and any debris inhibiting fish passage is removed. Maintenance of the downstream fish passage facilities typically consists of periodic inspections of the entrance weirs and their associated trashracks for lodged debris. In addition, repairs are made as needed to broken or malfunctioning components of the system.

3.7 Unscheduled Operations

3.7.1 Minimum Flows

The minimum flow can be maintained by either the large vertical Kaplan unit (Unit 1) running at 3.1 MW (1,710 cfs), or having Unit 1 run at 2.5 MW (1,450 cfs), along with one of the smaller units (either Unit 21, 22, or 23), both passing together approximately 1,830 cfs. The generating unit(s) may occasionally trip unexpectedly (i.e. line fault, equipment failure, etc.). Under these circumstances, Topsham Hydro will maintain the minimum downstream flow of 1,710 cfs or inflow (whichever is less) through the remaining unit(s) or through the spillway gates.

In the event that one of the smaller units (either Unit 21, 22, or 23) is on line and trips, the NASCC will remotely increase generation at Unit 1, as needed, to meet the minimum flow. If Unit 1 is on line and trips, gates operate automatically based on the headpond level. The siren sounds prior to the gates lowering.

If the hourly average flow drops below the minimum, Topsham Hydro will notify MDEP, MDIFW, MDMR, NMFS, and USFWS of the minimum flow excursion within 24 hours (see Section 5.0, Reporting).

3.7.2 Impoundment Water Levels

There may be occasions where Topsham Hydro will need to initiate an unplanned drawdown to respond to emergencies beyond its control, such as dam safety, public safety, or impending electrical system blackout emergencies. Should the hourly average headpond drop below the minimum, Topsham Hydro will notify the MDEP, MDIFW, MDMR, NMFS, and USFWS within 24 hours of such emergencies and include the date, time, and the reason for the emergency drawdown (see Section 5.0, Reporting).

4.0 OPERATIONS MONITORING

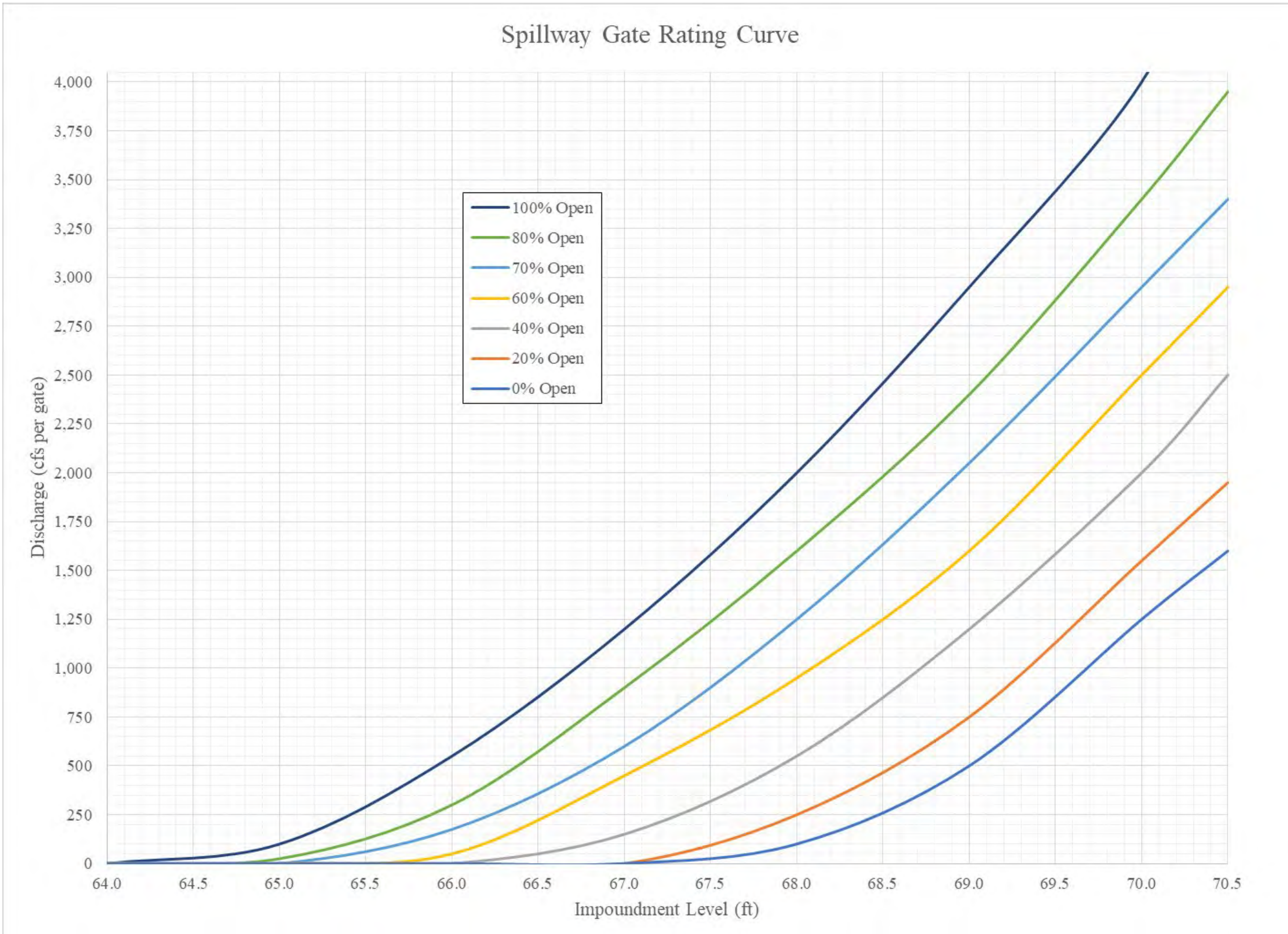
Topsham Hydro will monitor generation at the Project continuously via SCADA. Unit 1 outflow is calculated automatically from the generation readings using a conversion factor based on kW/cfs passed through the unit (Appendix B). Flow through the other Project components including the fish passages, and over the spillway will be determined by reading and recording gate settings and pond level and calculating flow based on the engineering curves for each component (Appendices A and C). A pressure-sensitive headwater sensor (transducer) is in place at the dam and provides real-time impoundment levels. Project outflow and impoundment level will be recorded electronically by the SCADA system at least every 15 minutes and archived for Topsham Hydro's record of compliance with the requirements of the FERC license. Topsham Hydro will provide copies of monitoring data (i.e., flow and impoundment level conditions) to the FERC, MDEP, MDIFW, MDMR, NMFS, and USFWS upon written request.

5.0 REPORTING

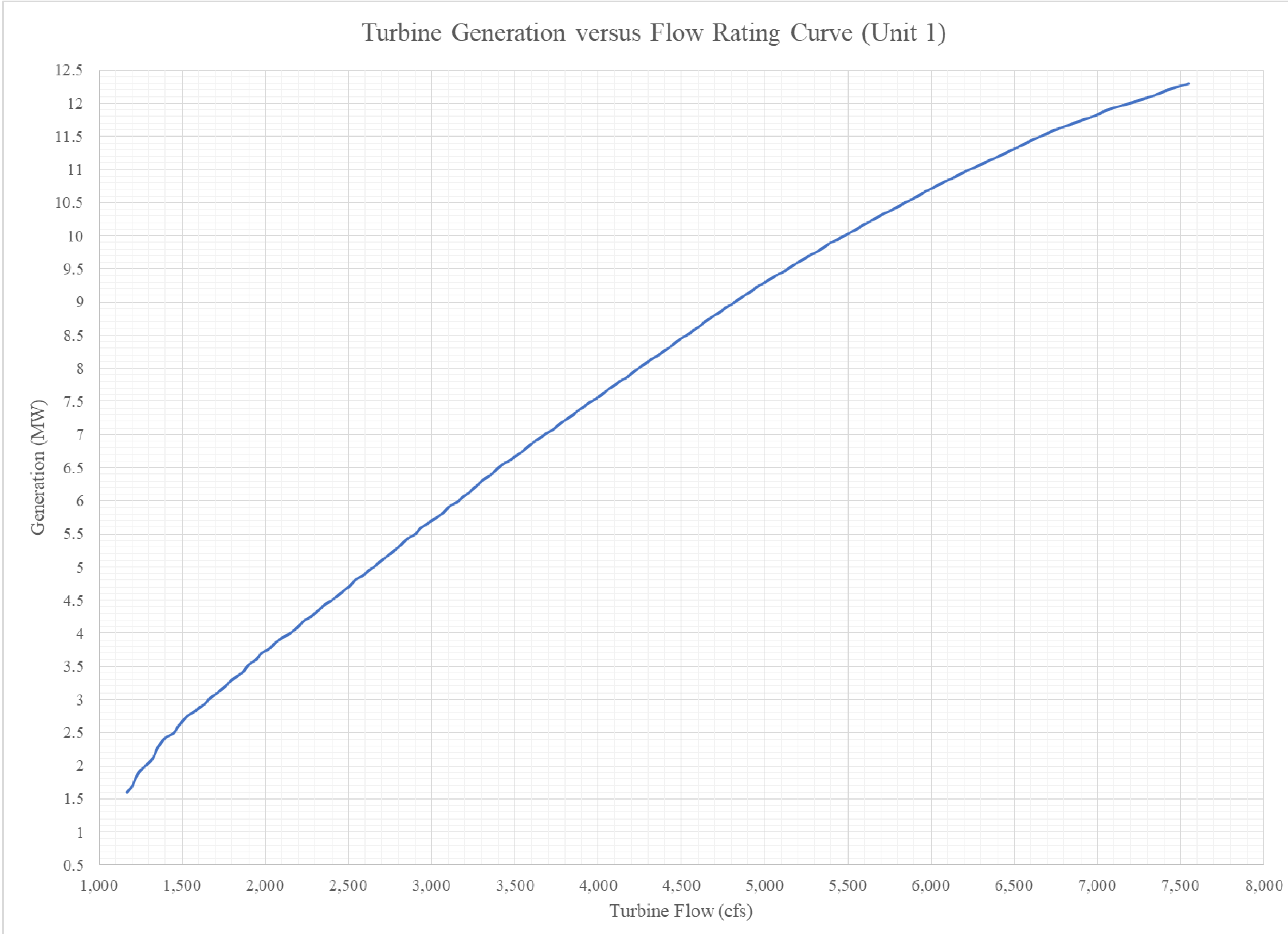
Topsham Hydro will notify the MDEP, MDIFW, MDMR, NMFS, and USFWS within 24 hours of a deviation, as specified herein, from minimum flow or impoundment elevation requirements. The agency notification will include a brief summary of the deviation and observed environmental or public safety effects, if any, resulting from the deviation. The required minimum flow and/or impoundment elevations may also be interrupted for short periods of time upon agreement with MDEP, MDIFW, MDMR, NMFS, and the USFWS.

Topsham Hydro will notify FERC within 10 days of any such deviations from minimum flow or impoundment elevation requirements. The notification will contain, to the extent possible, the cause, severity, and duration of the deviation, and any observed or reported environmental effects resulting from the incident. The report will also provide pertinent Project data, a description of corrective measures, if any, and documentation of consultation with the agencies. A copy of the report will be provided to the resource agencies.

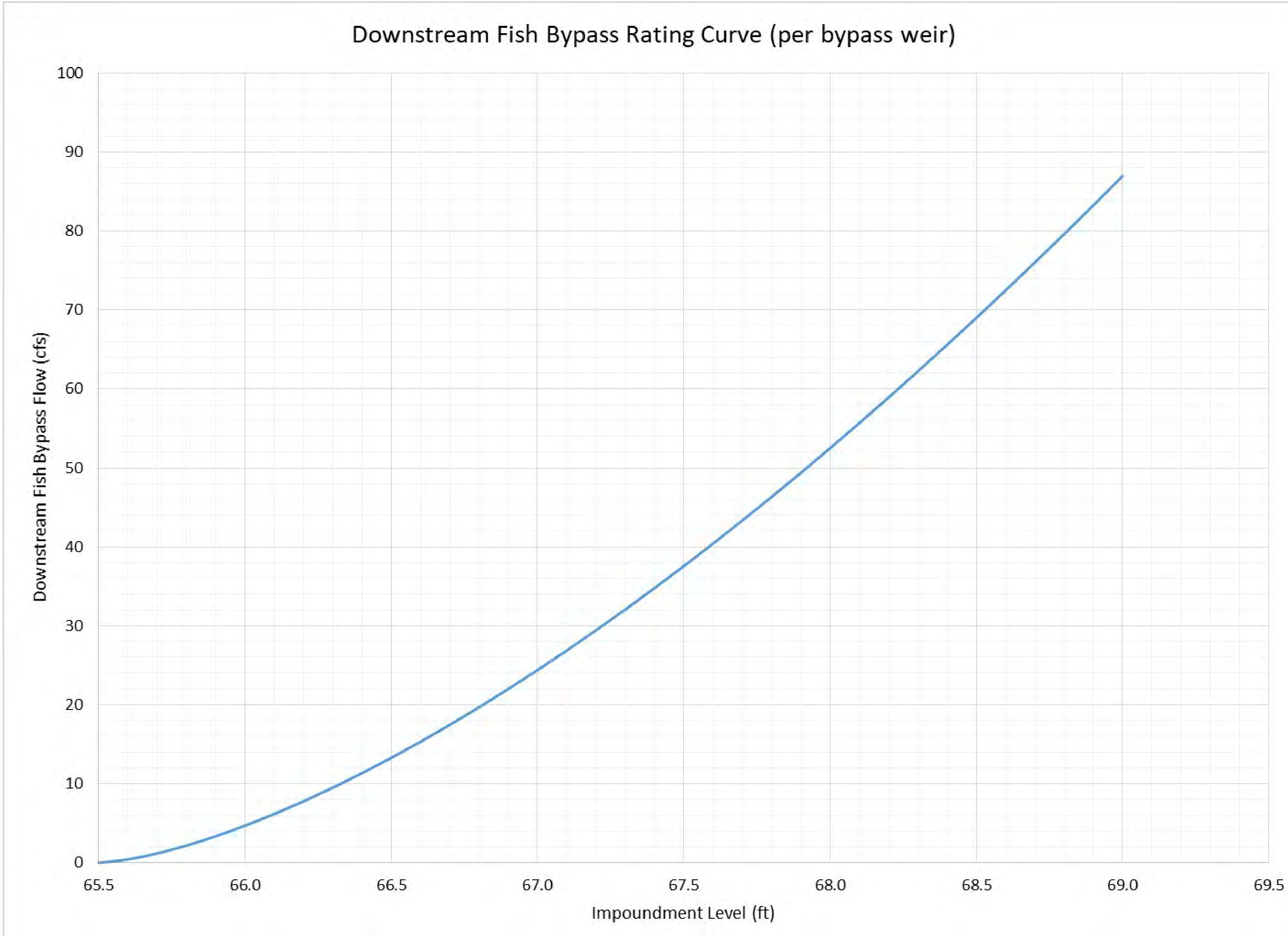
APPENDIX A: SPILLWAY GATE RATING CURVE


Spillway Gate Rating Curve
100% Open
80% Open
70% Open
60% Open
40% Open
20% Open
0% Open
Discharge (cfs per gate)
4,000
3,750
3,500
3,250
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
64.0
64.5
65.0
65.5
66.0
66.5
67.0
67.5
68.0
68.5
69.0
69.5
70.0
70.5
Impoundment Level (ft)

APPENDIX B: TURBINE GENERATION VERSUS FLOW RATING CURVE


Turbine Generation versus Flow Rating Curve (Unit 1)
Generation (MW)
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
12.5
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
Turbine Flow (cfs)

APPENDIX C: DOWNSTREAM FISH PASSAGE FLOW RATING CURVE


Downstream Fish Bypass Rating Curve (per bypass weir)
Downstream Fish Bypass Flow (cfs)
100
90
80
70
60
50
40
30
20
10
0
65.5
66.0
66.5
67.0
67.5
68.0
68.5
69.0
69.5
Impoundment Level (ft)

APPENDIX E-4: FISHWAY OPERATIONS AND MAINTENANCE PLAN

DRAFT FISH PASSAGE OPERATIONS MAINTENANCE PLAN
PEJEPSCOT HYDROELECTRIC PROJECT
(FERC No. 4784)

Submitted by:

Brookfield Renewable
Topsham Hydro Partners Limited Partnership
150 Main Street
Lewiston, ME 04240

Prepared by:

GOMEZ AND SULLIVAN ENGINEERS

April 2020

Brookfield

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LIST OF ABBREVIATIONS AND DEFINITIONS

cfs	cubic feet per second
FERC	Federal Energy Regulatory Commission
FOMP	Fishway Operations and Maintenance Plan
ft	feet
HP	horsepower
Hz	Hertz
MGD	million gallons per day
MW	megawatt
NMFS	National Marine Fisheries Service
Project	Pejepscot Hydroelectric Project (FERC No. 4784)
Topsham Hydro	Topsham Hydro Partners Limited Partnership

1.0 INTRODUCTION

This Fish Passage Operations and Maintenance Plan (FOMP) is intended to define how Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro), owner and Licensee of the Pejepscot Hydroelectric Project (FERC No. 4784) (Project) will operate and maintain the Project fish passage facilities.

The FOMP describes the fish passage facilities that currently exist at the Pejepscot Project, the period in which the facilities are operated, guidance on the annual start-up and shut-down procedures, routine operating guidelines, debris management, and safety rules and procedures that are in place. Along with these defined procedures and guidelines, the FOMP includes the necessary supporting information such as contact information, daily inspection forms, drawings, and spare parts on-site.

2.0 BACKGROUND

The Pejepscot Project straddles the border between Cumberland and Sagadahoc Counties in Topsham and Brunswick, Maine. Existing Project structures generally consist of a dam, spillway, fish passage facilities, two powerhouses, a sheet-pile floodwall, an interconnection with the local utility's transmission system, and ancillary equipment.

The Pejepscot Dam is a 560-foot-long, 47.5-foot-high, rock- and gravel-filled, timber-crib, overflow structure with a sheet-pile cutoff to bedrock along the upstream side. The cribs are topped with a 5-foot-thick reinforced concrete slab to protect the dam from erosion during periods of high river flow. At the right (west) end of the dam where the abutment rock level is high, there is no cribwork, and the dam consists of a low, mass-concrete section. The dam is abutted on the right by a high bedrock outcrop and on the left (east) by a mass-concrete and stone-masonry pier.

Spillway capacity is provided by operating the gates on the crest of the dam. The crest is equipped with five, 96-foot-long by 3-foot-high, hydraulically operated, bascule gates separated by concrete piers. The gates can be operated automatically or manually. The hydraulic pump units that operate the gates are contained in the mass-concrete pier forming the left abutment of the dam. The crest gate seals are heated to permit operation of the gates during cold weather, including movement when subjected to heavy ice pressure. The Project has a spillway discharge capacity of 95,000 cubic feet per second (cfs). Overtopping of the dam does not occur until the headwater reaches elevation 81 feet (ft.)[1], at which point the spillway discharge is approximately 110,000 cfs.

The powerhouses at the Project include an old (original) powerhouse that was constructed in 1898, and a new powerhouse that was constructed from 1985 to 1987. The combined installed capacity of the four generating units is 13.88 megawatts (MW). The Project has two separate intake structures, the old powerhouse intake and the new powerhouse intake, both of which are integral with the powerhouses.

The old powerhouse intake has 1.5-inch bar spacing on the trashrack. The bar racks have a top elevation of 69.7 ft. and extend down to an elevation of 43.3 ft. The racks are approximately 71.4 ft. wide. The new powerhouse has 1.5-inch bar spacing at the top of the trashrack and 2.5-inch bar

[1] Unless otherwise noted, all elevations referenced throughout the DLA refer to the National Geodetic Vertical Datum of 1929, U.S. Survey feet – also known as "mean sea level" or MSL.

spacing at the bottom. The bar racks have a top elevation of 61.15 ft. and extend down to an elevation of 36.0 ft. The racks are approximately 91.6 ft. wide. The 1.5-inch bar spacing extends from elevation 61.35 ft. to elevation 55.1 ft. (total of 6.25 ft.). The remaining portion of the bar rack from elevation 55.1 ft. down to elevation 36.0 ft. (total of 19.1 ft.) has a clear-bar spacing of 2.5-inches.

The original (northerly) powerhouse contains three rehabilitated horizontal Francis units (identified as Nos. 21, 22, and 23) with a combined output capacity of about 1.58-MW. Each unit has four Francis runners attached to a single turbine shaft, each with a rotational speed of 180 revolutions per minute (rpm). These units do not have the ability to selectively operate with fewer than four turbine runners. However, one of the Francis units was damaged several years ago and the turbine shaft was cut so that only two runners on that particular unit are now in operation. Wicket gates are used to adjust the flow settings of the units.

The newer powerhouse contains a vertical-shaft, low speed, adjustable-blade, propeller type (Kaplan) turbine-generator unit (identified as Unit No. 1) rated at 12.3-MW, with one runner containing four blades and 18 feet in diameter; it rotates at 81.8 rpm. The minimum and maximum flow through the turbine is 1,170 and 7,550 cfs, respectively. The rated head of the unit is 24 ft. Wicket gates are used to adjust the flow settings of the unit. The combined maximum capacity of all four units is 8,600 cfs.

3.0 DESCRIPTION OF FISH PASSAGE FACILITIES

3.1 <u>Upstream Fish Passage</u>

The upstream fish passage facility is a vertical lift (elevator) that lifts migratory fish in a hopper about 30 feet vertically from near the powerhouse tailrace to the impoundment level behind the dam. The lift hopper is about 20 feet long and 7 feet wide with a sloping bottom that assists in removal of the fish from the hopper. The inlet to the hopper is a V-trap about 8 inches wide by 8 feet high. In front of the entry gate there are four attraction pumps under a grating that create an additional flow up to 160 cfs through the entry channel to attract the fish to the lift. These pumps can be sequenced to change the volume of water passing through the entry channel, depending on the flow out of the powerhouse tailrace. The lift basket discharges the fish into a metal channel about six feet wide and eight feet high. The channel is approximately 110 feet long from the lift hopper to the gate at the dam. Along the channel is a viewing window to observe the fish along with a crowding panel that moves the fish closer to the window for viewing. There is a continuous flow of about 30 cfs from the impoundment to the lift basket to attract the fish to the impoundment.

The upstream fish passage is operated annually from April 15 to November 15. The lift is operated automatically to lift the fish hopper every two hours beginning at 8 a.m. for a total of five lifts per day. The four attraction pumps are operated by station technicians; the number of pumps operating is determined based on the flow coming through the turbine and out the tailrace. When river flows are less than 1,700 cfs, one pump is operated (total attraction flow 70 cfs). When river flows are between 1,700 and 3,500 cfs, two pumps are operated (total attraction flow 110 cfs). When river flows are between 3,500 and 5,200 cfs, three pumps are operated (total attraction flow 150 cfs). Finally, when river flows are greater than 5,200 cfs, four pumps are operated (total attraction flow 190 cfs). The total of 190 cfs (attraction flow from four pumps (160 cfs) plus an additional 30 cfs provided from the impoundment via the exit trough) represents approximately 2.2% of the Project maximum turbine discharge capacity (8,600 cfs).

A preset weir in the channel provides an attraction flow through the channel and hopper. The channel from the hopper to the impoundment is opened when the seasonal operation is started for passage of diadromous fish. The gates in the channel that allow fish to be counted through the observation window are left open unless they are being used for counting. Fish within the lift are not actively counted and, historically, the counting facilities have only been used for efficiency tests of the lift.

3.2 Downstream Fish Passage

The downstream fish passage facilities consist of two entry weirs, one on either side of the Unit 1 turbine intake. Each entry weir has an invert elevation of 65.5 ft. From each weir, an outlet pipe conveys downstream migrating fish in water down to the tailwater. The weir gates are four feet wide and are part of an inlet box with the outlet pipe located on the side opposite the weir. The right-side weir has a 30-inch diameter transport pipe and the left-side weir has a 24-inch diameter transport pipe. Both pipes have a free discharge to the water below the dam. Each downstream bypass can pass approximately 13 cfs, 29 cfs, and 87 cfs at headpond elevations of 66.5 ft. (low), 67.2 ft. (normal), and 69.0 ft. (high), respectively. This assumes that the entrance gate at each downstream bypass is in the fully opened position. The clear spacing of the grizzly racks at the entrance to the downstream bypasses is approximately 7 inches. There is one horizontal steel member on the grizzly racks at an approximately elevation of 67.3 ft. The downstream fishway is currently operated from April 1 to December 31, as river conditions allow.

4.0 OPERATION AND MAINTENANCE OF FISH PASSAGE FACILITIES

4.1 Upstream Fish Passage Operations and Maintenance

Operational Period

- April 15 to November 15, seven days a week as river conditions allow.

Opening Methods

At least two to three weeks prior to fish lift start-up if river conditions allow:

- If necessary, de-water fish lift lower flume and clear all debris;
- Inspect for any damaged components and repair as necessary;
- Install the 4 Flygt attraction water pumps;
- Test all fishway components and repair as necessary;
- Water up fish lift by fully opening upper flume exit gate and adjust entrance gate for approximately one foot differential between fish lift and tailrace;
- Open valve that provides attraction water behind hopper; and
- Grease fish lift entrance operator stem and exit flume operator stems.

Spare Parts

- 1 hopper wheel;
- 6 hopper wheel bushings;
- 2 drive bushings for entrance gate operator;

- 2 drive bushings for exit gate operator;
- 1 attraction water pump Flygt 20 HP with 60 Hz motor;
- 1 air hose and reel spring for hopper vee gate;
- 1 hopper hoist brake; and
- 1 solenoid for hopper hoist brake.

Workforce Planning

- Staffing Requirements:
  - Start Up - Crew of 3;
  - Routine Operations – Crew of 1;
  - Routine Maintenance - Crew of 2 for standard maintenance, crew of 3 for fish lift entry for cleaning; and
  - Shut Down - Crew of 3.
- Daily basis:
  - The fish lift is inspected for debris accumulation and if debris is found, staff will remove debris from fish lift. If debris is not manageable by hand, operations crew will de-water fish lift and remove debris.
  - The 4 attraction water pumps are inspected for proper operation and proper settings based on unit flows, see Appendix D.
  - The entrance gate is adjusted for proper outflow based on the number of attraction pumps operating, see Appendix D.
  - The fish lift frequency time is set as follows:
    - April 15 to May 15 and following passage of the first fish at the downstream Brunswick Project, the lift will be operated once every two hours
    - May 16 through June 15, the lift will be operated once every hour
    - June 16 through July 1, the lift will be operated every 2 hours.
    - July 2 through November 15, the lift will be operated once a day following passage of salmon at Brunswick if not already identified passing though Pejepscot.
  - The fishway log sheets are completed consistent with Appendices A and C.
- Weekly basis:
  - Facility's lead fishway technician to provide via email a completed Fishway Operations Report consistent with Appendix C to Sean Ledwin of Maine Department of Marine Resources (MDMR) and Jeff Murphy of National Marine Fisheries Service (NMFS) by Monday at 0800 hours.
- Cleaning process:
  - If necessary, de-water fish lift and inspect for stranded fish.
  - Set up fall arrest/fall retrieval device, perform pre-use fall arrest equipment inspection.
  - Prep chainsaw for operation, inspect all chainsaw PPE.
  - Inspect access ladder for damage.
  - Inspect rigging for large debris removal.

- Preventative Maintenance process:
  - Monthly
    - Grease the entrance gate and exit gate operator stems.
    - Inspect and repair as necessary hopper mechanical (cotter pins, turn buckles, cables, limit switches, etc.).
  - Yearly
    - Inspect the fish lift hopper hoist.
    - Change the oil in each attraction pump.
    - Inspect the entrance gate, and exit gate operators.

Winterizing Methods

- Close the exit gate and remove debris from the upper flume.
- Remove the 4 attraction water pumps.
- Lift hopper.

Notice:

- Contact NMFS within 24 hours of any interactions with Atlantic salmon, Atlantic sturgeon or shortnose sturgeon, including non-lethal and lethal take.
- In the event of any lethal takes, any dead specimens or body parts must be photographed, measured, and preserved (refrigerate or freeze) until disposal procedures are discussed with NMFS[2].
- Notify NMFS of any changes in Project and fishway operations (including maintenance activities such as flashboard replacement and draft tube dewatering)[3]
- The first Topsham Hydro point of contact for all fishway related issues is the local Supervisor of Operations.
- Refer to Section 6.0 for contact information.

4.2 Downstream Fish Passage Operations & Maintenance

Operational Period

- The downstream fishway is operated between April 1 and December 31, as river conditions allow.

Opening Methods

- Inspect the surface sluice gates and remove debris.
- Grease surface sluice gate operator stems.
- Open the surface sluice gates to 100%.
- Install cleaning platforms.

Spare Parts

[2] This would typically include date collected, species, measurements, photographs, etc.

[3] This does not include typical operational changes such as generator load swings, putting generators online and offline, normal impoundment and flow fluctuations, and opening/closing gates to control spillage. NMFS should be notified for any fishway dewaterings or maintenance issues, problems meeting fishway operational dates, impoundment drawdowns for flashboard or other maintenance, or any other atypical project operations such as dewatering of tunnels, conduits, or penstocks.

- Due to the design of the downstream fishway, it has been determined that spare parts are not necessary at this time.

Workforce Planning

- Staffing Requirements:
  - Start Up – Crew of 1.
  - Routine Operations – Crew of 1.
  - Routine Maintenance – Crew of 2 for standard maintenance.
  - Shut Down – Crew of 1.
- Daily basis:
  - Inspect the fishway sluice for debris. If debris is present, operations crew will remove debris. Notify agencies if fishway cannot be cleaned the same day. Fishway shall remain closed during this time frame.
  - Verify proper outflow of fishway. If flow is reduced, clear debris and dewater fishway if necessary.
  - The fishway log sheets are completed consistent with Appendices A and C.
- Weekly basis:
  - Facility's lead fishway technician to provide via email a completed Fishway Operations Report consistent with Appendix C to Oliver Cox of MDMR and Jeff Murphy of NMFS by Monday at 0800.
- Cleaning process:
  - Set up fall arrest/fall retrieval device, perform pre-use fall arrest equipment inspection.
  - Prep chainsaw for operation, inspect all chainsaw PPE.
  - Work off of cleaning platforms to remove debris from surface sluice gate trash racks.
- Preventative Maintenance process:
  - Yearly:
    - Grease surface sluice gate operator stems.

Downstream Fish Passage De-watering Method

- Close surface sluice gates.

Winterization Methods

- Close surface sluice gate.
- Remove cleaning platforms.

Notice:

- Contact NMFS within 24 hours of any interactions with Atlantic salmon, Atlantic sturgeon or shortnose sturgeon, including non-lethal and lethal take.

- In the event of any lethal takes, any dead specimens or body parts must be photographed, measured, and preserved (refrigerate or freeze) until disposal procedures are discussed with NMFS[4].
- Notify NMFS of any changes in Project and fishway operations (including maintenance activities such as flashboard replacement and draft tube dewatering)[5].
- The first Topsham Hydro point of contact for all fishway related issues is the local Supervisor of Operations.
- Refer to Section 6.0 for contact information.

5.0 SAFETY

5.1 Safety Rules and Procedures

Pursuant to Topsham Hydro's Safety Procedure SP9, Job Safety and Environmental Plans are completed prior to, and ideally, well in advance of any work at the fishways. Job Safety and Environmental Plans are to be completed using the standard form, which may be updated from time to time. Review of prior Job Safety and Environmental Plans for similar work is encouraged to help capture all safety risks that may be present at the site.

6.0 CONTACT INFORMATION

6.1 Topsham Hydro Contacts

Dick Cole, Supervisor Operations, Brookfield
(w) 207-795-4290 x 11
(c) 207-446-4874
Richard.Cole@brookfieldrenewable.com

Steve Michaud, Senior Operations Manager, Brookfield
(w) 207-629-1881
(c) 207-480-0883
Steve.Michaud@brookfieldrenewable.com

Matt Leblanc, Compliance Specialist, Brookfield
(c) 207-252-4870
matthew.leblanc@brookfieldrenewable.com

6.2 Agency Contacts

Jeff Murphy, Fishery Biologist, NMFS
(w) 207-866-7379
(c) 207-299-7339
Jeff.Murphy@noaa.gov

[4] This would typically include date collected, species, measurements, photographs, etc.

[5] This does not include typical operational changes such as generator load swings, putting generators online and offline, normal impoundment and flow fluctuations, and opening/closing gates to control spillage. NMFS should be notified for any fishway dewaterings or maintenance issues, problems meeting fishway operational dates, impoundment drawdowns for flashboard or other maintenance, or any other atypical project operations such as dewatering of tunnels, conduits, or penstocks.

Sean Ledwin, Director, MDMR
(w) 207 624-6348
Sean.m.ledwin@maine.gov

Gail Wippelhauser, MDMR
(w) 207-624-6349
Gail.Wippelhauser@maine.gov

Don Dow, Hydro Engineer, NMFS
(w) 207-866-3758
(c) 207-416-7510
Donald.Dow@noaa.gov

Dan Tierney, Fishery Biologist, NMFS
(w) 207-866-3755
(c) 207-416-7676
Dan.Tierney@noaa.gov

Antonio Bentivoglio, Fishery Biologist
US Fish and Wildlife Service
(w) 207-866-3344 x151
(c) 207-974-6965
Antonio_Bentivoglio@fws.gov

Bryan Sojkowski, Fish Passage Engineer
US Fish and Wildlife Service
(w) 413-253-8645
Bryan_Sojkowski@fws.gov

John Perry, Environmental Coordinator
Maine Department of Inland Fisheries and Wildlife
(w) 207-287-5254
(c) 207-446-5145
John.Perry@maine.gov

Nels Kramer, Fishery Biologist,
Maine Department of Inland Fisheries and Wildlife
(w) 207-732-4131
Gordon.Kramer@maine.gov

Kathy Howatt, Hydropower Coordinator
Maine Department of Environmental Protection
(w) 207-446-2642
Kathy.Howatt@maine.gov

Notice:

- Contact NMFS within 24 hours of any interactions with Atlantic salmon, Atlantic sturgeon or shortnose sturgeon, including non-lethal and lethal take.
- In the event of any lethal takes, any dead specimens or body parts must be photographed, measured, and preserved (refrigerate or freeze) until disposal procedures are discussed with NMFS[6].
- Notify NMFS of any changes in Project and fishway operations (including maintenance activities such as flashboard replacement and draft tube dewatering)[7].
- The first Topsham Hydro point of contact for all fishway related issues is the local Supervisor of Operations
- Refer to Section 6.0 for contact information

[6] This would typically include date collected, species, measurements, photographs, etc.

[7] This does not include typical operational changes such as generator load swings, putting generators online and offline, normal impoundment and flow fluctuations, and opening/closing gates to control spillage. NMFS should be notified for any fishway dewaterings or maintenance issues, problems meeting fishway operational dates, impoundment drawdowns for flashboard or other maintenance, or any other atypical project operations such as dewatering of tunnels, conduits, or penstocks.

APPENDIX A: DAILY INSPECTION FORM

Pejepscot Daily Fishway Inspection Form

Date: ____________________ Time: ____________________ Inspector ____________________

Upstream Fishway

Flow adequate ____________________

Fish way debris ok ____________________

Attraction water on ____________________

Comments

Downstream Fishway

Flow adequate ____________________

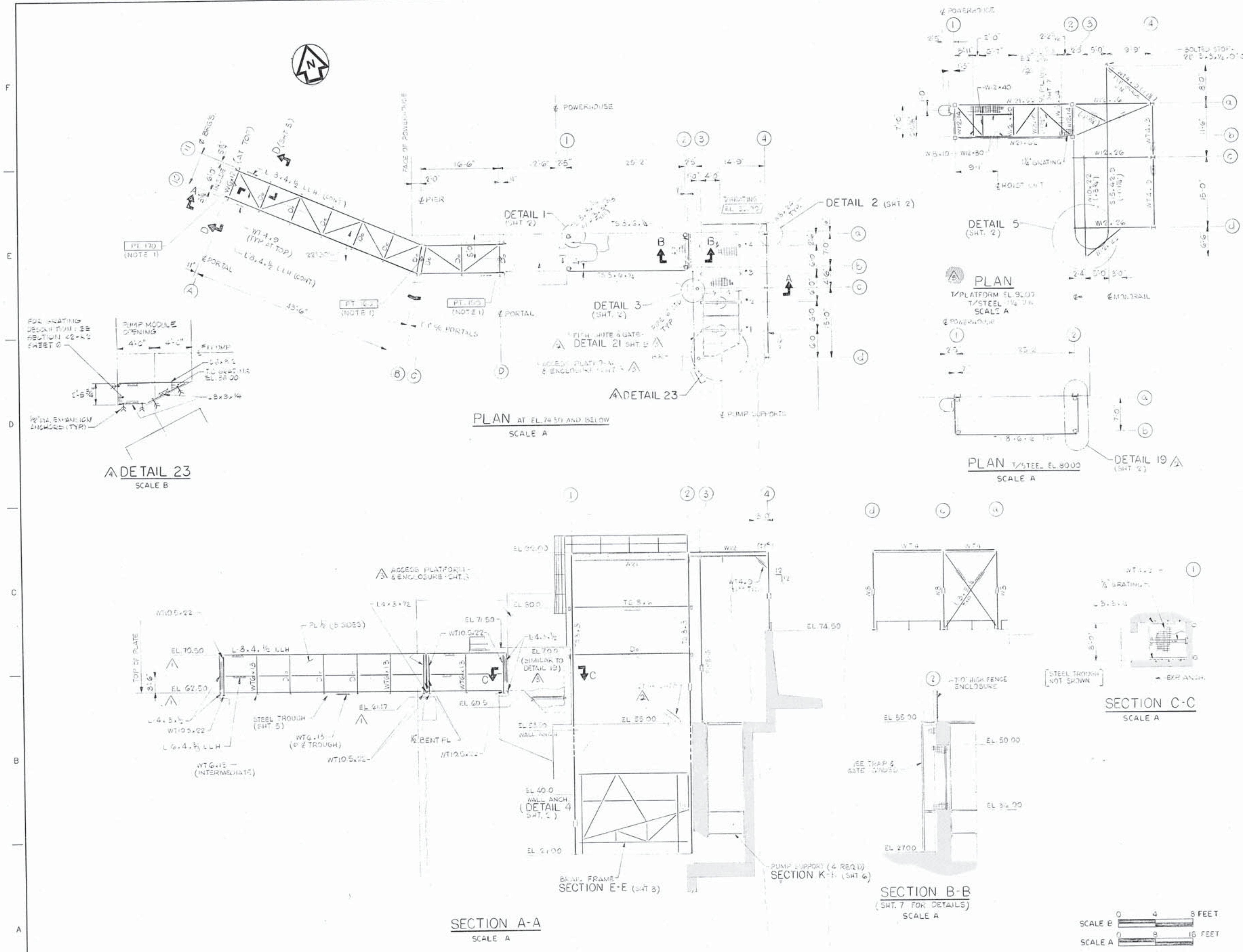
Entrances not blocked by debris ____________________

Comments

Please provide completed inspection forms to the Licensing and Compliance Group every Monday morning

Requirement:

APPENDIX B: FISH LIFT DESIGN DRAWINGS



NOTES

1. COORDINATE POINTS A — PT. 170

PT. NO.	NORTHING*	EASTING*
155	405.000	941.436
160	403.000	974.930
170	424.647	434.749

* BASED ON CONTRACTOR'S COORDINATE SYSTEM.

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT
GENERAL ARRANGEMENT
STRUCTURAL STEEL
PLANS & SECTIONS

DEPARTMENT HEAD	DATE 5-27-86
PROJECT ENGINEER	DATE 5-27-86
PROJECT MANAGER	DATE 5-27-86

ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P7182.02

DRAWING NUMBER 7182C2-156

SHEET 1 OF 10 REV A

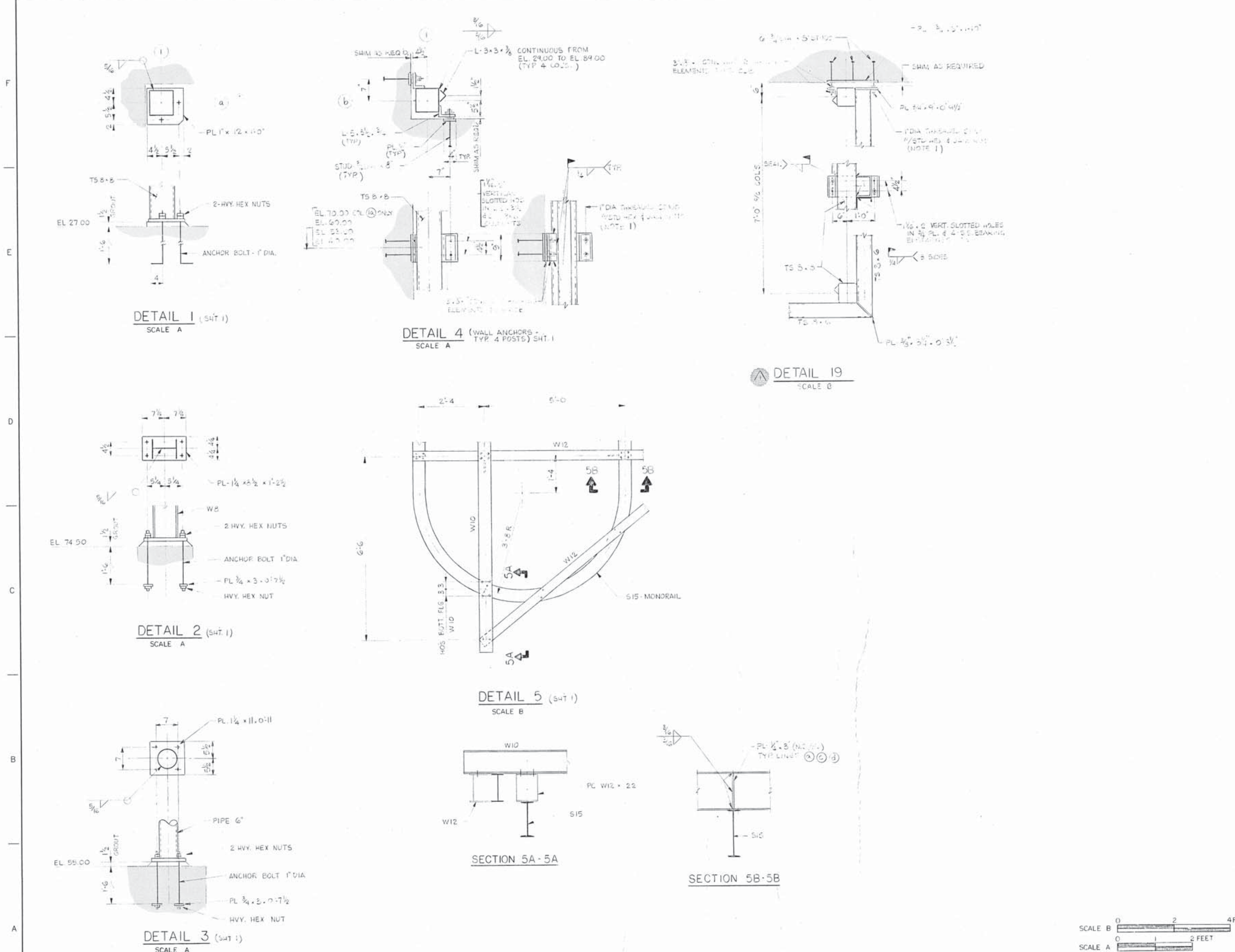
DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
JM, DATE 5/20/86	RCP, DATE 5/27/86	CIVIL	JAA	JAA, DATE 5/27/86	RCP, DATE 5/27/86	—	JAA, DATE 5/27/86	—	—

DATE	REV NO	DESCRIPTION OF REVISIONS
2-18-88	A	AS BUILT, REVISED PLAN (E-3)
11-21-86	A	ADDED DETAIL 23 (D-5&6)
8-7-86	A	REVISED CALL OUT (E6-5,D5), ADDED SHADING @ CONCRETE SECTIONS

SQUAD LEADER	PRIME COORD	PROJ ENGR	DATE	REV NO	DESCRIPTION OF REVISIONS
JM	-	[illegible]	6-13-86	A	REV. DIM (F3), ADD: REF (E6,B5), DET NO (D2) ISSUED FOR CONSTRUCTION
JB	RCP	[illegible]	5/30/86	A	ISSUED FOR F.E.R.C. APPROVAL, REVISED ELEVATIONS (C-6, B-5, B-7)
JB	RCP	[illegible]	5/27/86	A	ISSUED FOR CONSTRUCTION - STEEL TROUGH ONLY

SQUAD LEADER	PRIME COORD	PROJ ENGR
MB	RCP	[illegible]
JB	JAA	[illegible]
MB	JAA	[illegible]

DRAWING NO. 7182C2-156 | SHT. 2 | REV. △ | ACRES PROJ NO. P718202



NOTES

1. FIELD WELD THREADED STUDS (NELSON CPL STUDS) TO EMBEDDED PLATE FOR PROPER ALIGNMENT. PROVIDE TWO NUTS PER STUD: TIGHTEN FIRST NUT TO SNUG SLIDE ELEMENTS, BACK OFF 1/4 TURN, HOLD AND JAM SECOND NUT TIGHT.

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT
STRUCTURAL STEEL
SECTIONS & DETAILS

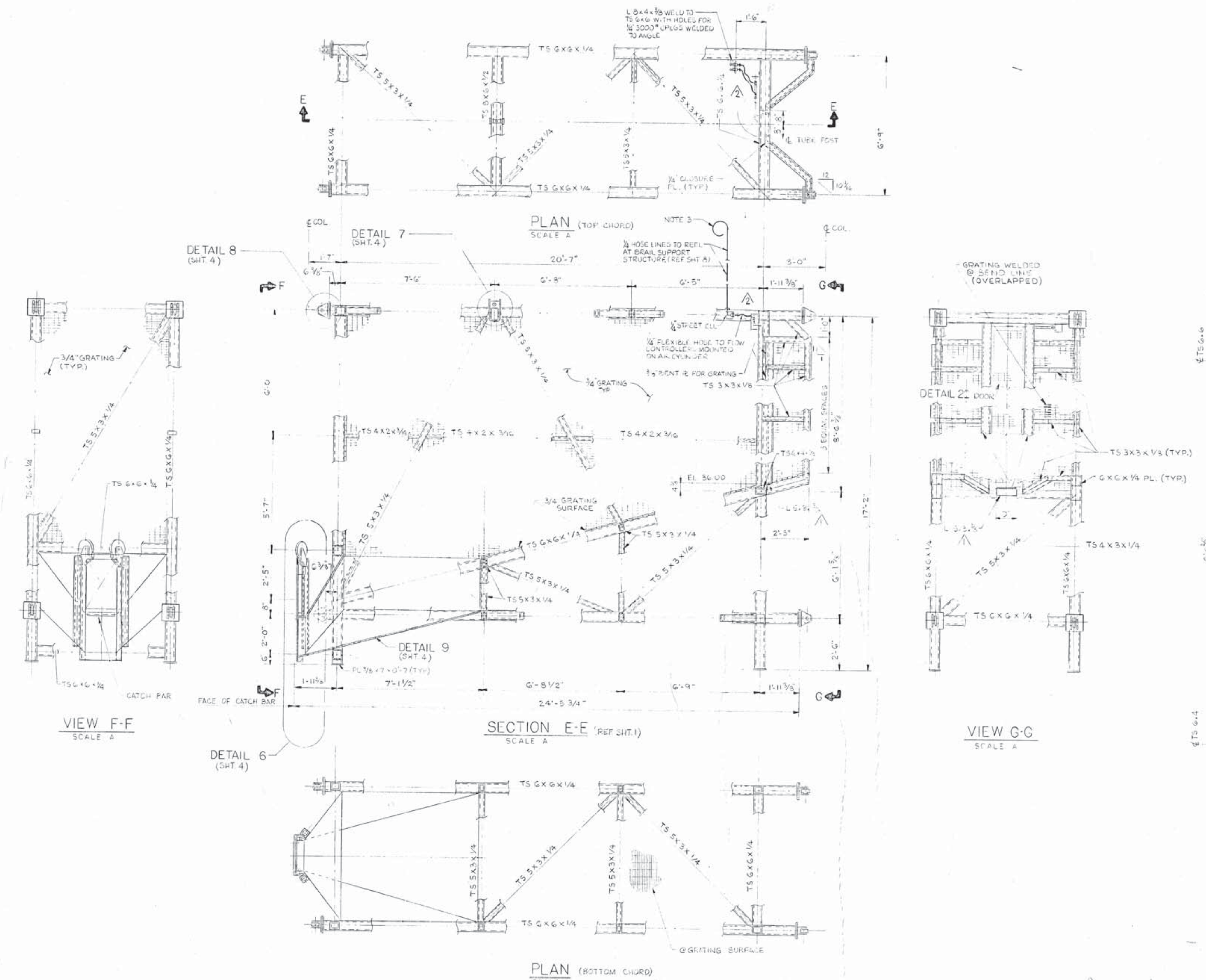
ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P718202 | DRAWING NUMBER 7182C2-156 | SHEET 2 OF 10

DATE	REV	DESCRIPTION OF REVISIONS
2-17-88	△	AS BUILT REVISED DETAIL 19 (D-4S)
6-13-86	△	ISSUED FOR CONSTRUCTION

DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	CIVIL
JEB	JM	CIVIL	JAA		JAA	VAA
				6/13/86		

DRAWING NO. 7182C2-156 | SHT. 3 | REV. 3 | ACRES PROJ NO. P718202



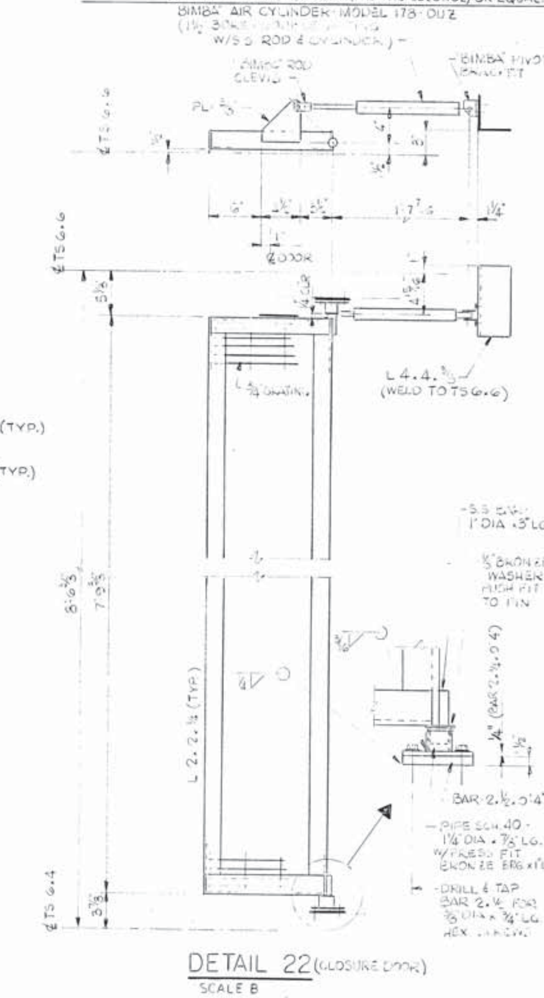
NOTES:

1. ALL WELDED CONSTRUCTION USING CONTINUOUS WELDS. WELD TO BE MINIMUM SIZE PERMITTED BY AISC.
2. DIMENSION TOLERANCES:

BASE OF WHEEL BLOCKS	23'-0-3/4" +0, -1/4"
WHEEL SPAN	6' - 9" ± 1/8"
SQUARENESS -	
- DIAGONAL DIMENSION OF WHEEL ℄	27'-9-7/8" ± 1/4" (FRONT)
	16'-1-3/4" ± 1/4" (END)

ALL OTHER TOLERANCES TO SECTION 1.23 OF AISC.

3. DOUBLE REEL FOR 1/4" HOSE WITH 50 FT. OF HOSE PER REEL MOUNTED ON BRAIL SUPPORT STRUCTURE DIRECTLY ABOVE CYLINDER. MC MASTER-CARR (ITEM NO. 5320K32) OR EQUAL.



SCALE B 0 — 1 — 2 FEET
SCALE A 0 — 2 — 4 FEET

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT
BRAIL FRAME
STRUCTURAL STEEL
PLANS , SECTION & VIEWS

DEPARTMENT HEAD — DATE 6/10/86
PROJECT ENGINEER — DATE 6/9/86
PROJECT MANAGER — DATE 6/9/86

ACRES INTERNATIONAL CORPORATION

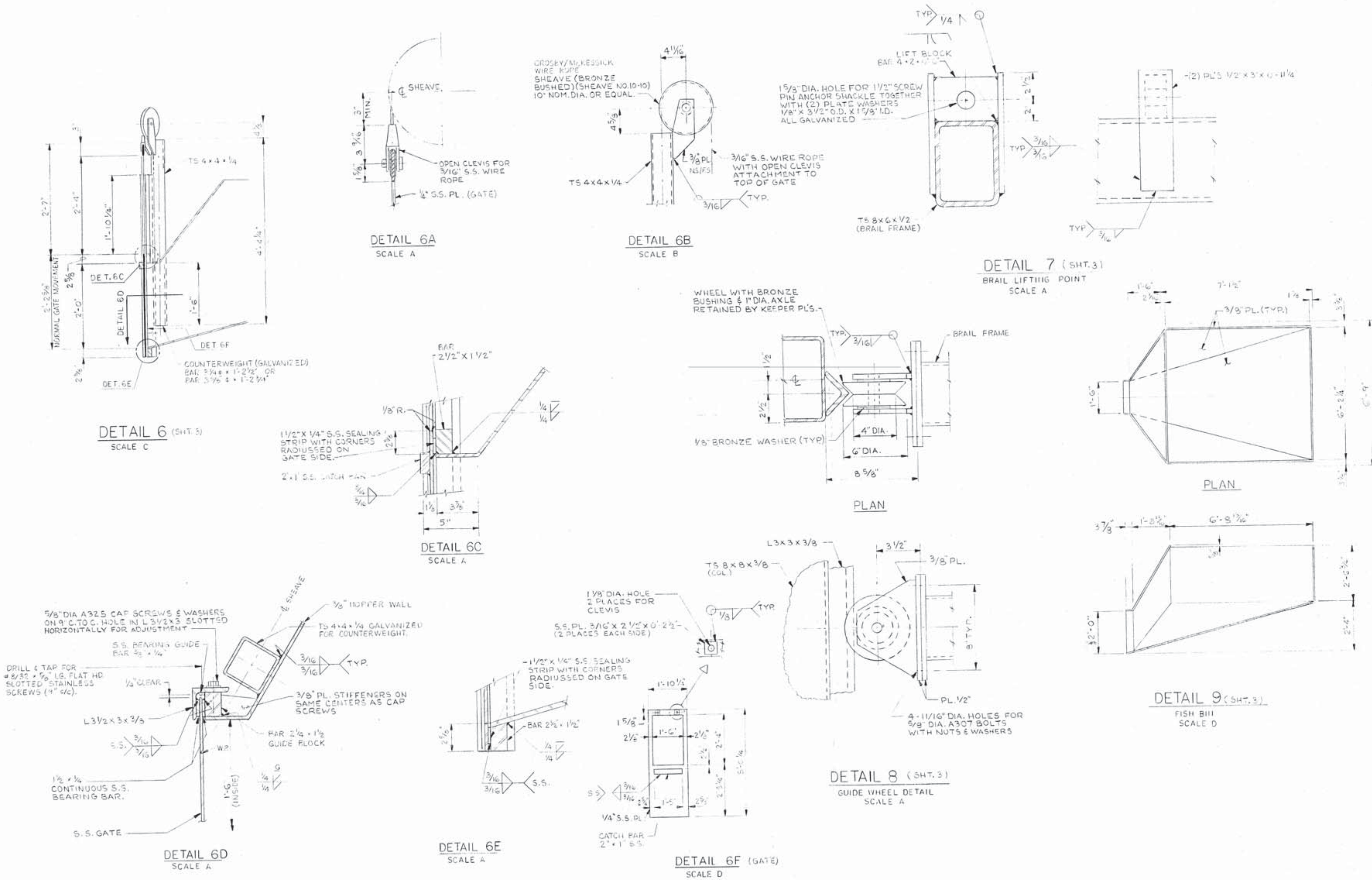
ACRES PROJECT NO. P718202
DRAWING NUMBER 7182C2 - 156
SHEET 3 OF 10 | REV 3

DATE	REV NO	DESCRIPTION OF REVISIONS	SQUAD LEADER	PRIME COORD	PROJ ENGR
9/4/86	3	ADDED CONN. FOR AIR CYLINDER HOSE LINES TO REEL (E,F 4,5) ADDED NOTE 3 (E,12)	TME	RJF	JJS
6/7/87	2	ADDED DETAIL 22 (B-1) CLIP ANGLE (C-3,C4)	JE	RJF	JJS
6/9/86	1	ISSUED FOR CONSTRUCTION	JE	JAA	JJS

DATE	REV NO	DESCRIPTION OF REVISIONS	SQUAD LEADER	PRIME COORD	PROJ ENGR
1-29-88	4	AS BUILT - NO EXCEPTIONS TAKEN	JM	-	JJS

DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
T.E.D. DATE 5-1-86	J.M. DATE 6-4-86	CIVIL	JAA	JAA DATE 6/9/86	JAA DATE 6/9/86		JAA DATE 6/9/86		

DRAWING NO. 7182C2-156 SHT. 4 REV. A ACRES PROJ NO. P7182.02



NOTES:

1. ALL WELDED CONSTRUCTION WITH CONTINUOUS WELDS, UNLESS NOTED.
2. FISH BIN:
   A) ALL DIMENSIONS ARE INSIDE DIMENSIONS.
   B) REFER TO DETAIL 1 FOR GATE
   C) ALL WELDING - CONTINUOUS FULL PENETRATION
   D) WELD BIN TO BRAIL FRAME
3. S.S. DENOTES STAINLESS STEEL.

SCALE C 0 1 2 FEET
SCALE B 0 2 FEET
SCALE A 0 1 FOOT
SCALE D 0 2 4 FEET

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP
PEJEPSCOT HYDROELECTRIC PROJECT

ACRES

FISH LIFT
BRAIL FRAME
STRUCTURAL STEEL
DETAILS

ACRES INTERNATIONAL CORPORATION

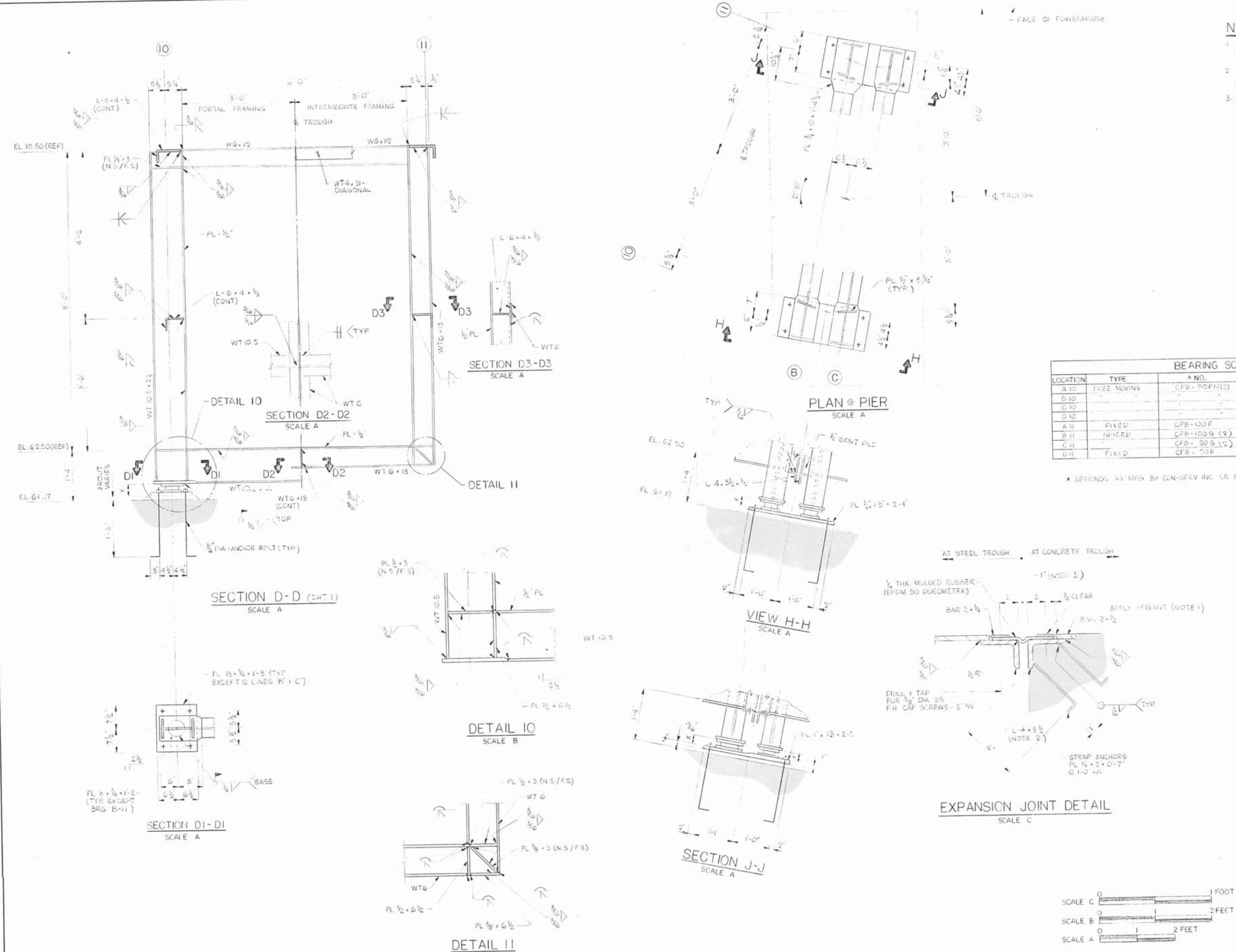
ACRES PROJECT NO. P7182.02
DRAWING NUMBER 7182C2-156
SHEET 4 OF 10 REV A

REV	DATE	DESCRIPTION OF REVISIONS
A	1-29-86	AS BUILT - NO EXCEPTIONS TAKEN
A	6-13-86	ISSUED FOR CONSTRUCTION

DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
T.C.D.	J.M.	CIVIL	JAA	JAA	JAA		JAA		
DATE 6-9-86	DATE 6-9-86			DATE 6/9/86	DATE 6/9/86		DATE 6/9/86		

NOTES

1. APPLY [illegible]CONE SEALANT GENEROUSLY AROUND PERIMETER [illegible] CORNER OF TROUGH [illegible]
2. [illegible] SIDES OF [illegible] AT [illegible] BETWEEN LINES 'B' AND 'C'.
3. DIMENSION [illegible]



BEARING SCHEDULE				
LOCATION	TYPE	* NO.	DIM X	REMARKS
A 10	FREE MOVING	CFB - 50FM(2)	2 3/4"	
B 10	"	"	"	
C 10		"		
D 10		"		
A 11	FIXED	CFB - 100 F	2 3/16"	
B 11	GUIDED	CFB - 100 G (2)	3"	MOVEMENT TO BE PARALLEL TO TROUGH
C 11	"	CFB - 50 G (2)	2 13/16"	MOVEMENT TO BE PARALLEL TO TROUGH
D 11	FIXED	CFB - 50 F	2 1/8"	

* BEARINGS AS MFG BY CON-SERV INC OR EQUAL.

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP
PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT
STEEL TROUGH
STRUCTURAL STEEL
SECTIONS & DETAILS

ACRES INTERNATIONAL CORPORATION

DEPARTMENT HEAD — DATE 5/27/86
PROJECT ENGINEER — DATE 5/27/86
PROJECT MANAGER — DATE 5/28/86

ACRES PROJECT NO. P718202
DRAWING NUMBER 7182C2-156
SHEET 5 OF 10 — REV 1

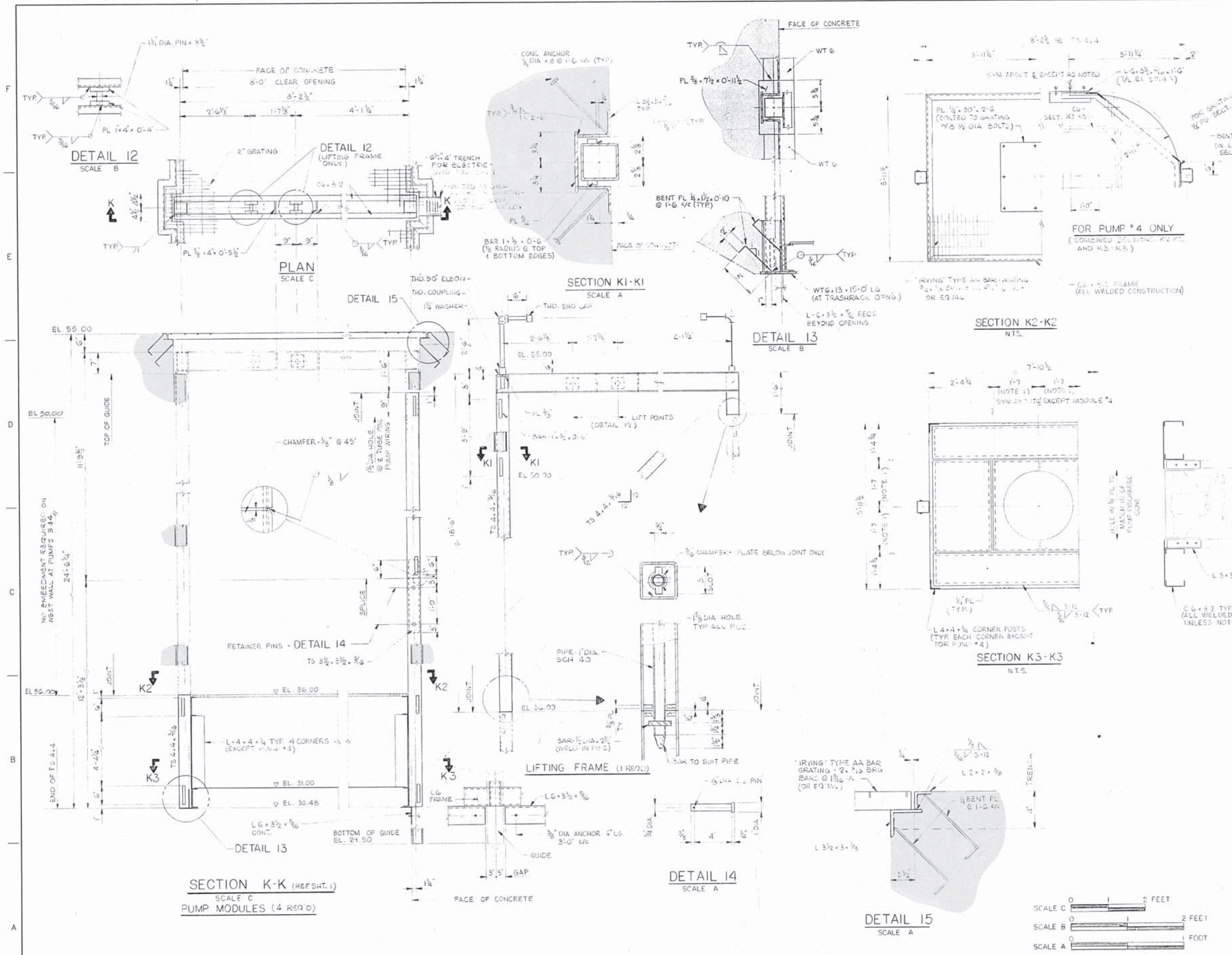
REV NO	DATE	DESCRIPTION OF REVISIONS	SQUAD LEADER	PRIME COORD	PROJ ENGR
1	1-29-88	AS BUILT - NO EXCEPTIONS TAKEN		-	
0		ISSUED FOR CONSTRUCTION	JMB	JAA	

DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
JEB	RCP	CIVIL	JAA	JAA	RCP	—	JAA	—	—
DATE 5/5/86	DATE 5/27/86			DATE 5/27/86	DATE 5/27/86	DATE	DATE 5/27/86	DATE	DATE

DRAWING NO. 7182C2-156 | SHT. 6 | REV. 2 | ACRES PROJ NO. P718202

NOTES

1) PUMP MOUNTING DETAILS TO SUIT ACTUAL PUMP DIMENSIONS AND DETAILS.



THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

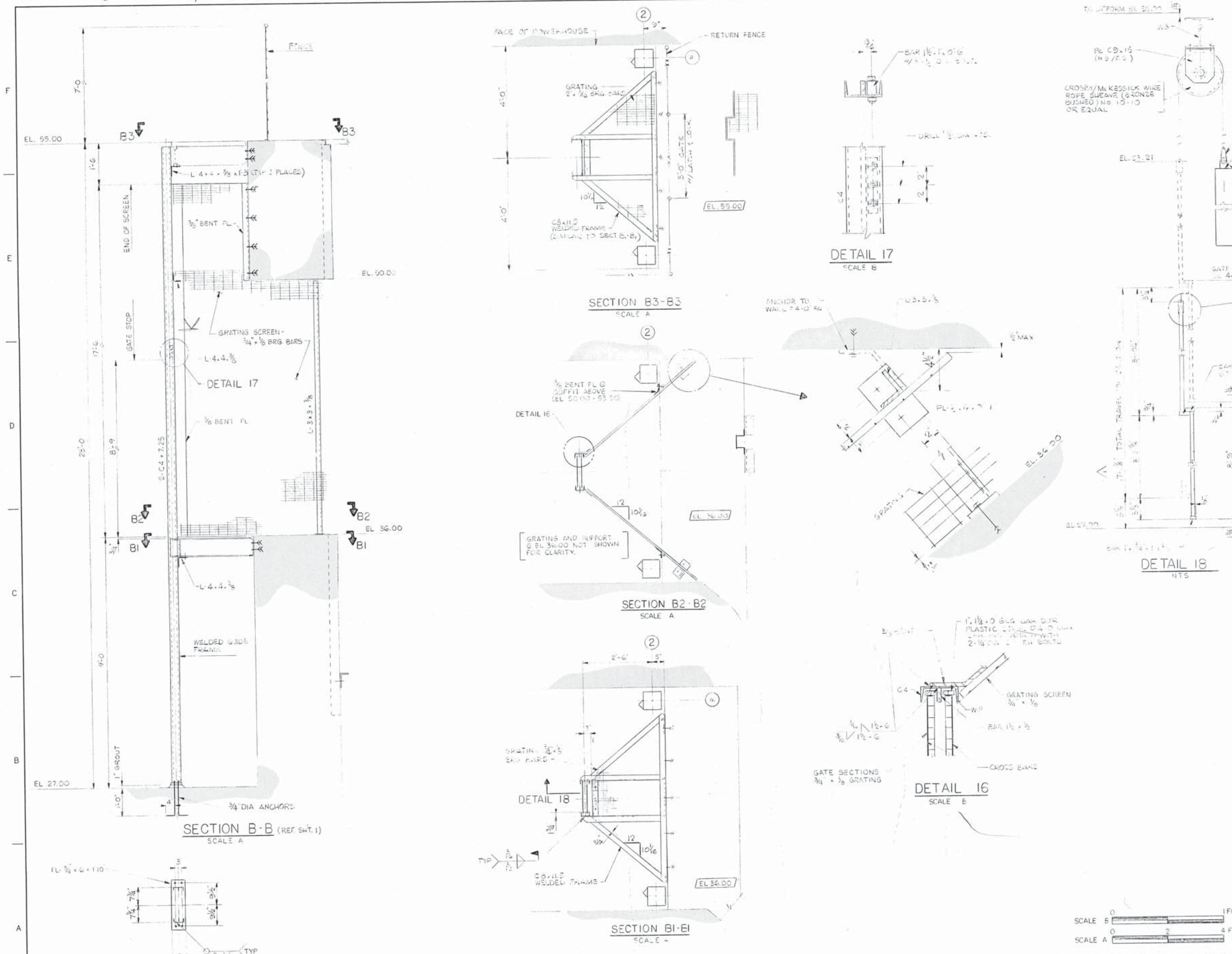
FISH LIFT
PUMP MODULES
STRUCTURAL STEEL
PLAN, SECTIONS & DETAILS

ACRES PROJECT NO. P718202
DRAWING NUMBER 7182C2-156
ACRES INTERNATIONAL CORPORATION
SHEET 6 OF 10

REV	DATE	DESCRIPTION OF REVISIONS
2	1-29-88	AS BUILT - NO EXCEPTIONS TAKEN
1	7-23-86	REVISED - ISSUED FOR CONSTRUCTION
0	6-13-86	ISSUED FOR CONSTRUCTION - EMBEDDED PARTS ONLY

DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
JEB	JAB	CIVIL	JAA	RCP	JAA		JAA		
5/17/86	5/22/86			6/13/86	6/12/86		6/12/86		

DRAWING NO. 7182C2-156 SHT. 7 REV. ACRES PROJ NO. P718202



NOTES:

1. GRATING
   - BEARING BARS TO BE VERTICAL:
   - CROSS BARS
     LOWER GATE TOWARD PUMP MODULES
     UPPER GATE AWAY FROM PUMP MODULES
   - ALL BEARING BARS TO BE FILLET WELDED AROUND ALL CONNECTING END PIECES.
2. FABRICATE & ERECT GUIDE FREE OF WARP AND TWIST FINAL INSTALLATION TOLERANCES.
   - PLUMB ± 1/16" INCH
   - STRAIGHTNESS ± 1/16 IN 10'
   - GAGE -0" ± 1/8"
3. COMPLETE INSTALLATION TO BE INSPECTED BY ENGINEER FOR SMOOTH AND PROPER OPERATION PRIOR TO ACCEPTANCE.

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT V-TRAP STRUCTURAL STEEL PLAN, SECTIONS, & DETAILS

DEPARTMENT HEAD — DATE
PROJECT ENGINEER — DATE 6/9/86
PROJECT MANAGER — DATE 6/9/86

ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P71P202

DRAWING NUMBER 7182C2-156

SHEET 7 OF 10

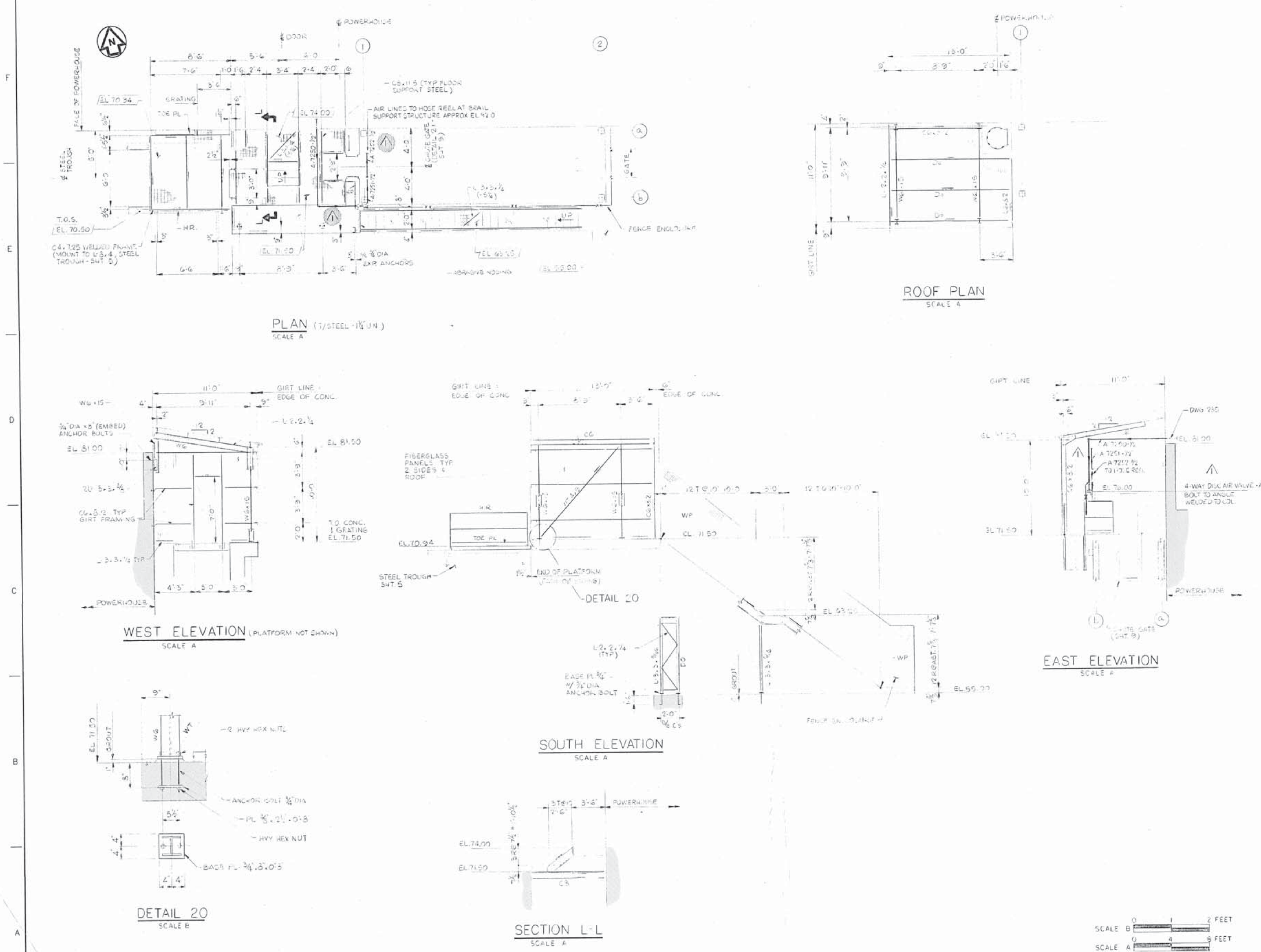
DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
JEB	JM	CIVIL	JAA	JAA	JAA		JAA		
DATE 6-4-86	DATE 6-4-86			DATE 6/4/86	DATE 6/9/86		DATE 6/9/86		

DATE	REV NO	DESCRIPTION OF REVISIONS	SQUAD LEADER	PRIME COORD	PROJ ENGR
2-5-88		AS BUILT. REVISED NOTE (B-2)	JM	-	
8-7-86		REVISED TRAVEL OF GATE COUNTER (D-2)	JMB		
6-9-86		ISSUED FOR CONSTRUCTION	JMB	JAA	

DRAWING NO. 7182C2-156 SHT. 8 REV. 2 ACRES PROJ NO. P718202

NOTE

1. FOR STANDARD STAIR & HANDRAIL DETAILS REFER TO DWG. 160 SHT. 3.



THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT
ACCESS PLATFORM & ENCLOSURE
STRUCTURAL STEEL
PLANS, ELEVATIONS, SECTION & DETAIL

DATE	REV NO	DESCRIPTION OF REVISIONS	SQUAD LEADER	PRIME COORD	PROJ ENGR
1-29-88	2	AS BUILT - NO EXCEPTIONS TAKEN	JM		
9/9/86	1	ADDED PIPING FOR AIR CYLINDER OPERATION AT BRAIL FRAME, LINES A 7250-½", A 7251-½" & A 7252-½" (C-D-2,3), (E-F-6,7)			
7/3/86	0	ISSUED FOR CONSTRUCTION		JAA	

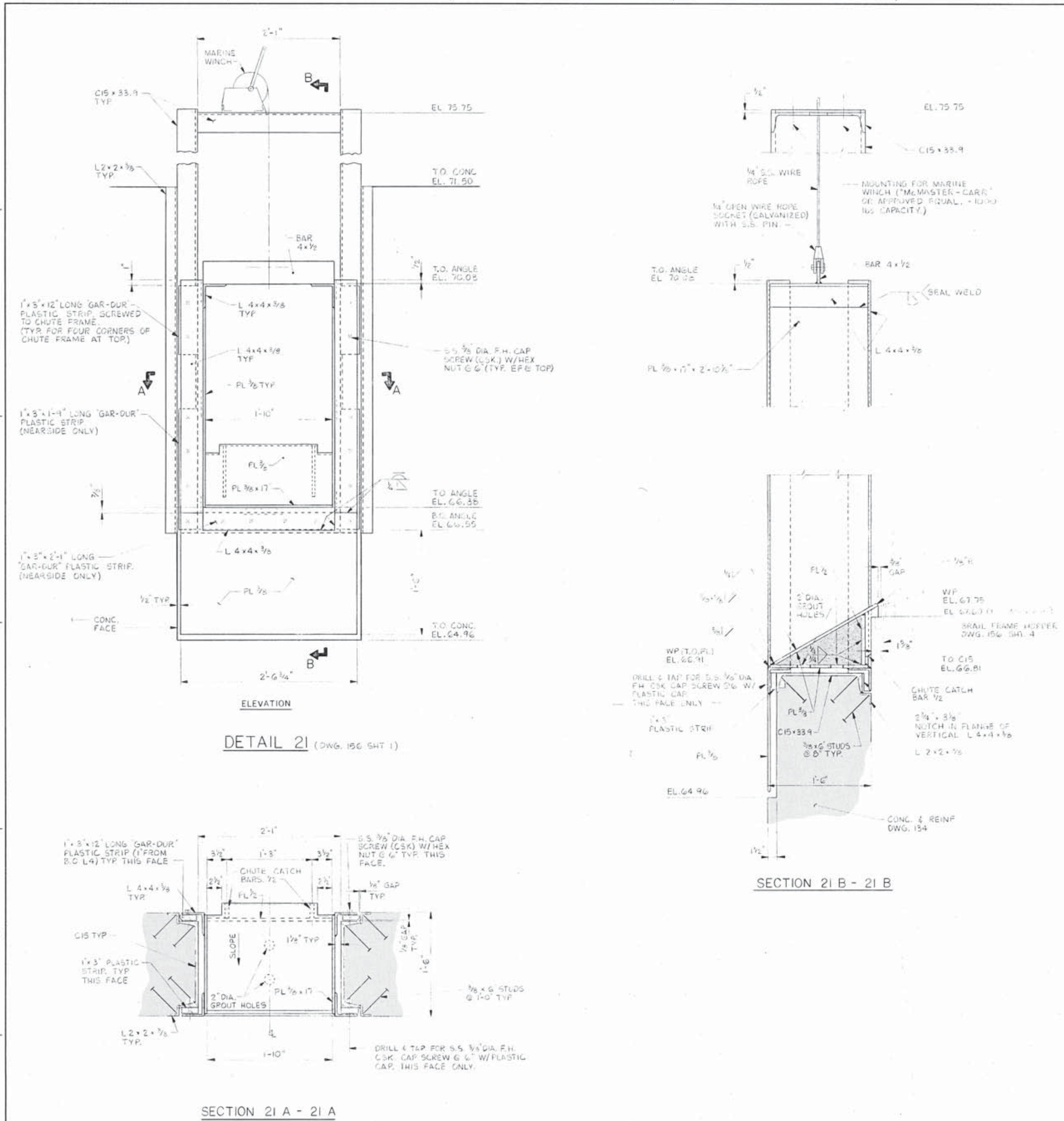
DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
JM	KFS	CIVIL	JLK	JAA	KFS		JAA		GHC
DATE 6/30/86	DATE 7-3-86			DATE 7/2/86	DATE 7-3-86	DATE	DATE 7/3/86	DATE 7/7/86	DATE 7/1/86

DEPARTMENT HEAD — DATE 7-7-86
PROJECT ENGINEER — DATE 7-7-86
PROJECT MANAGER — DATE 7-7-86

ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P7182.02
DRAWING NUMBER 7182C2-156
SHEET 8 OF 10 REV 2

DRAWING NO. 7182C2-156 | SHT. 9 | REV. 1 | ACRES PROJ NO. P718202



NOTE

1. ALL WELDED CONSTRUCTION USING CONTINUOUS WELDS. WELD TO BE MINIMUM SIZE PERMITTED BY AISC UNLESS OTHERWISE SHOWN.

SCALE 0 1 2 FEET

REV	DATE	DESCRIPTION OF REVISIONS
1	1-29-88	AS BUILT - NO EXCEPTIONS TAKEN
0	7/3/86	ISSUED FOR CONSTRUCTION

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT
CHUTE GATE
STRUCTURAL STEEL
DETAILS & SECTIONS

DEPARTMENT HEAD — DATE 7-3-86
PROJECT ENGINEER — DATE 7-3-86
PROJECT MANAGER — DATE 7-3-86

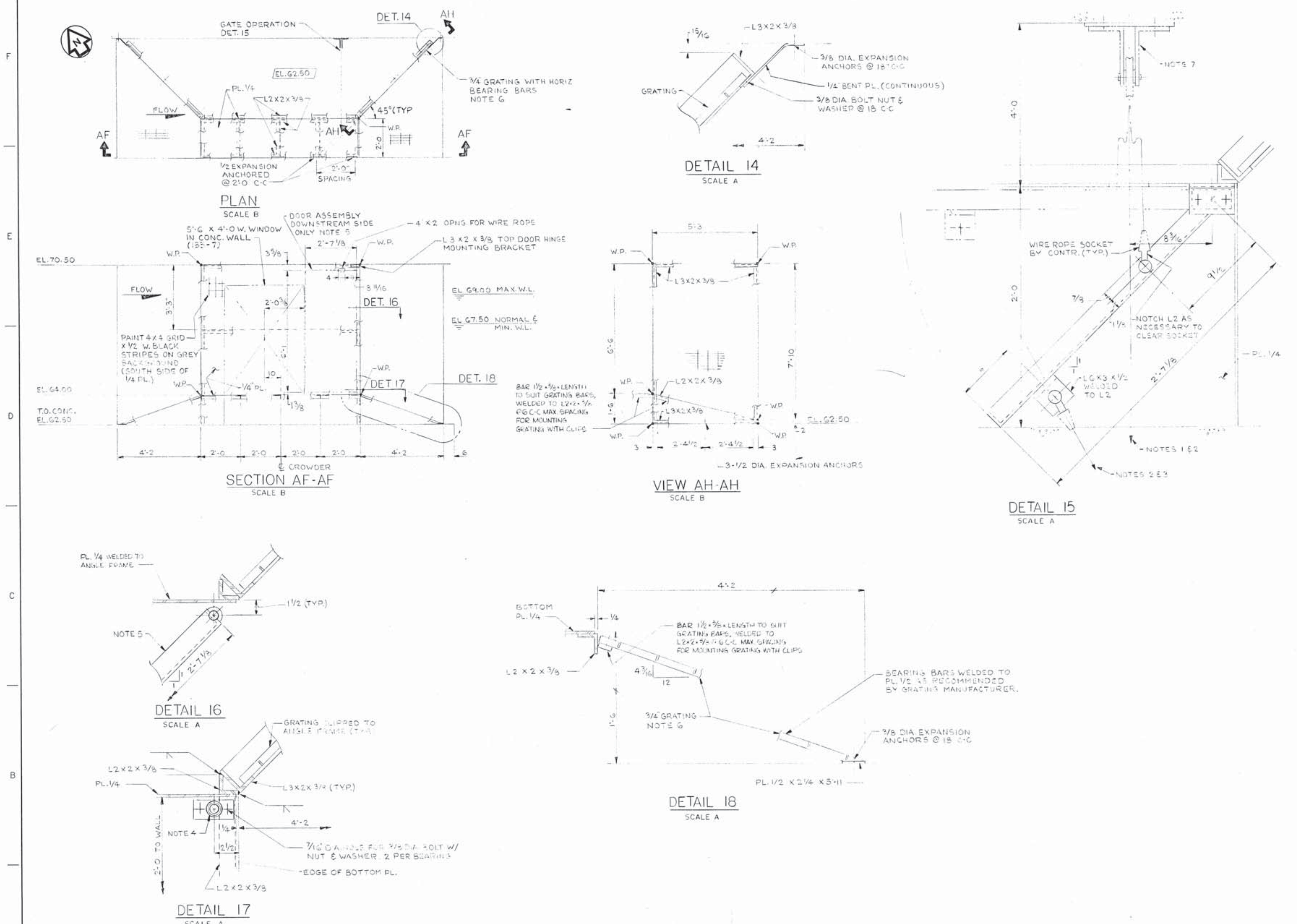
ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P718202

DRAWING NUMBER 7182C2-156

SHEET 9 OF 10 REV 1

DRAWING NO. 7182C2-133 | SHT. 10 | REV. 1 | ACRES PROJ NO. P718202



NOTES:

(D3) 1) STANDARD DUTY SPUR GEAR WINCH; 2000 LBS CAPACITY; 2 SPEED WITH HAND DISC BRAKE WITH MOUNTING TO SUIT WINCH ON WALL INSIDE COUNTING STATION.

(D3) 2) SHEAVE ASSEMBLY FOR MOUNTING ON TOP OF THE COUNTING STATION WALL TO REDIRECT WIRE ROPE VERTICALLY TO THE COUNTERWEIGHT AND WINCH (ONE SHEAVE FOR EACH).

(D3) 3) 50 LB STEEL COUNTERWEIGHT.

(B3) 4) BEARING DETAIL SIMILAR TO BRAIL CLOSURE GATE DWG. 156, SHT 3 WITHOUT 1/2 MOUNTING BLOCK & BOLTS INSTEAD OF SCREWS.

(C8) 5) DOOR DETAILS SIMILAR TO BRAIL CLOSURE GATE DWG. 156, SHT 3 WITH EXTERNAL FRAME DIMENSIONS OF 2'-7x1/8 WIDE X 6'-1 HIGH.

(F6,B5) 6) 3/4" GRATING - IRVING TYPE "A" (1/8 THICK).

(F3) 7) SHEAVE ASSEMBLIES, WIRE ROPE & CLEVISES, WINCH AND COUNTERWEIGHT TO BE SUPPLIED AND INSTALLED BY OWNER.

SCALE B 0 2 4 FEET

SCALE A 0 1 FOOT

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

FISH LIFT
FISH COUNTING STATION
STRUCTURAL STEEL
FISH CROWDER
PLANS SECTIONS & DETAILS

DEPARTMENT HEAD — DATE 8/22/86
PROJECT ENGINEER — DATE 8-22-86
PROJECT MANAGER — DATE 8/22/86

ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P718202

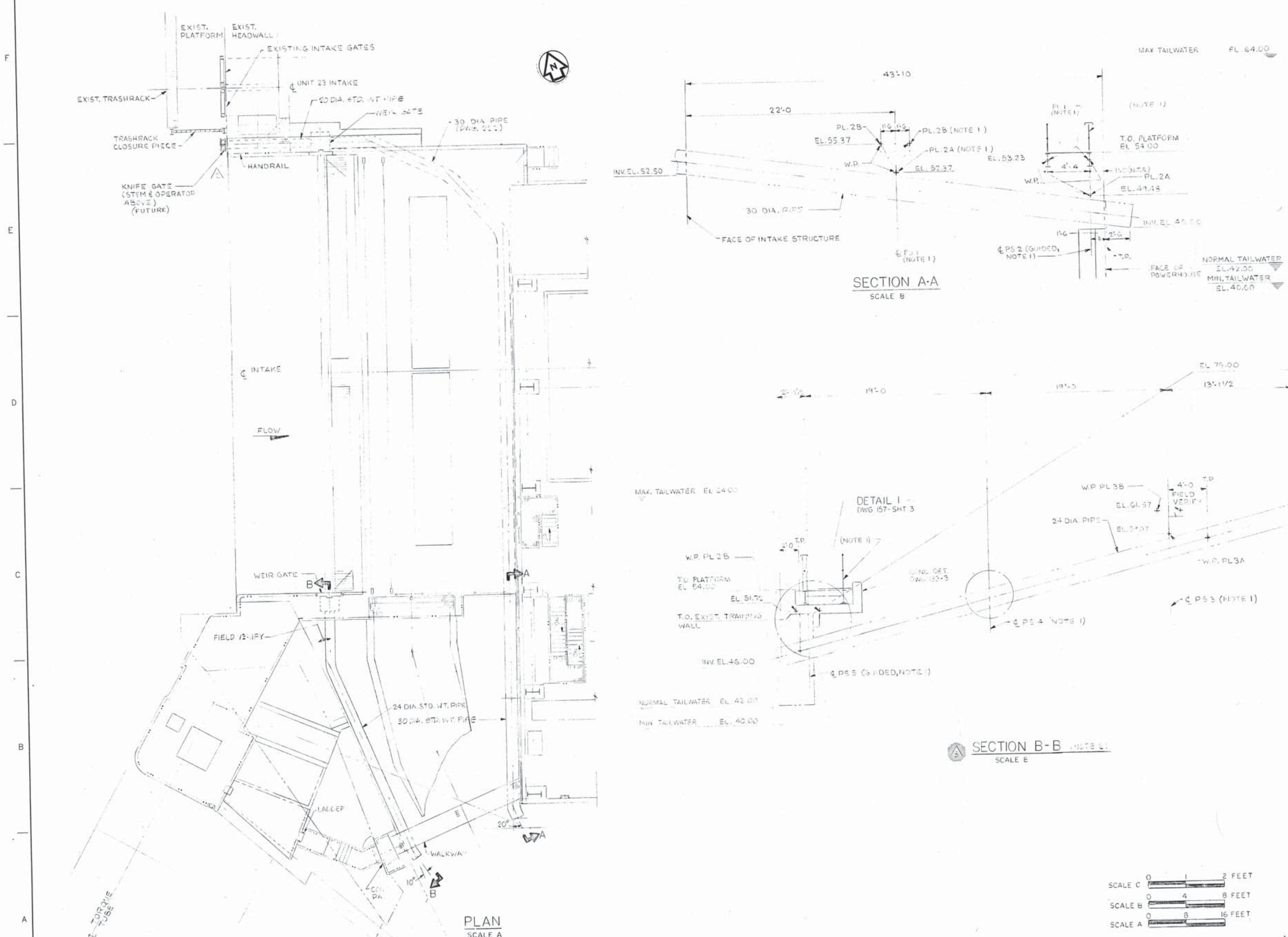
DRAWING NUMBER 7182C2-156

SHEET 10 OF 10 | REV 1

DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
T.E.D. DATE 7-25-86	JMB/SE DATE 8-11-86	CIVIL	CWM	KCP DATE 8/22/86	CWM DATE 8/22/86	DATE	QEN DATE 8/22/86	DATE	GMC DATE 8/22/86

DATE	REV NO	DESCRIPTION OF REVISIONS	SQUAD LEADER	PRIME COORD	PROJ ENGR
2-17-88	1	AS BUILT			
8-22-86	0	ISSUED FOR CONSTRUCTION			

DRAWING NO. 7182C2-157 | SHT. 1 | REV. A | ACRES PROJ NO. P718202



NOTES

1. FOR WALKWAY, PL & PIPE SUPPORT DETAILS REFER TO SHT. 3
2. THE EXISTING TRAINING WALL IS UNLIKELY TO BE PLUMB. SURVEY MEASUREMENTS USED TO VERIFY FIELD DIMENSIONS SHOULD THEREFORE BE TAKEN AT THE ACTUAL EMBEDDED PLATE LOCATIONS, AND NOT AT THE TOP OF THE WALL.
3. FINISH FISH PIPES & PIPE SUPPORTS WITH COATING S-G AS SPECIFIED.

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

ACRES | PEJEPSCOT HYDROELECTRIC PROJECT

DOWNSTREAM FISH PASSAGE
STRUCTURAL STEEL
PLAN & SECTIONS

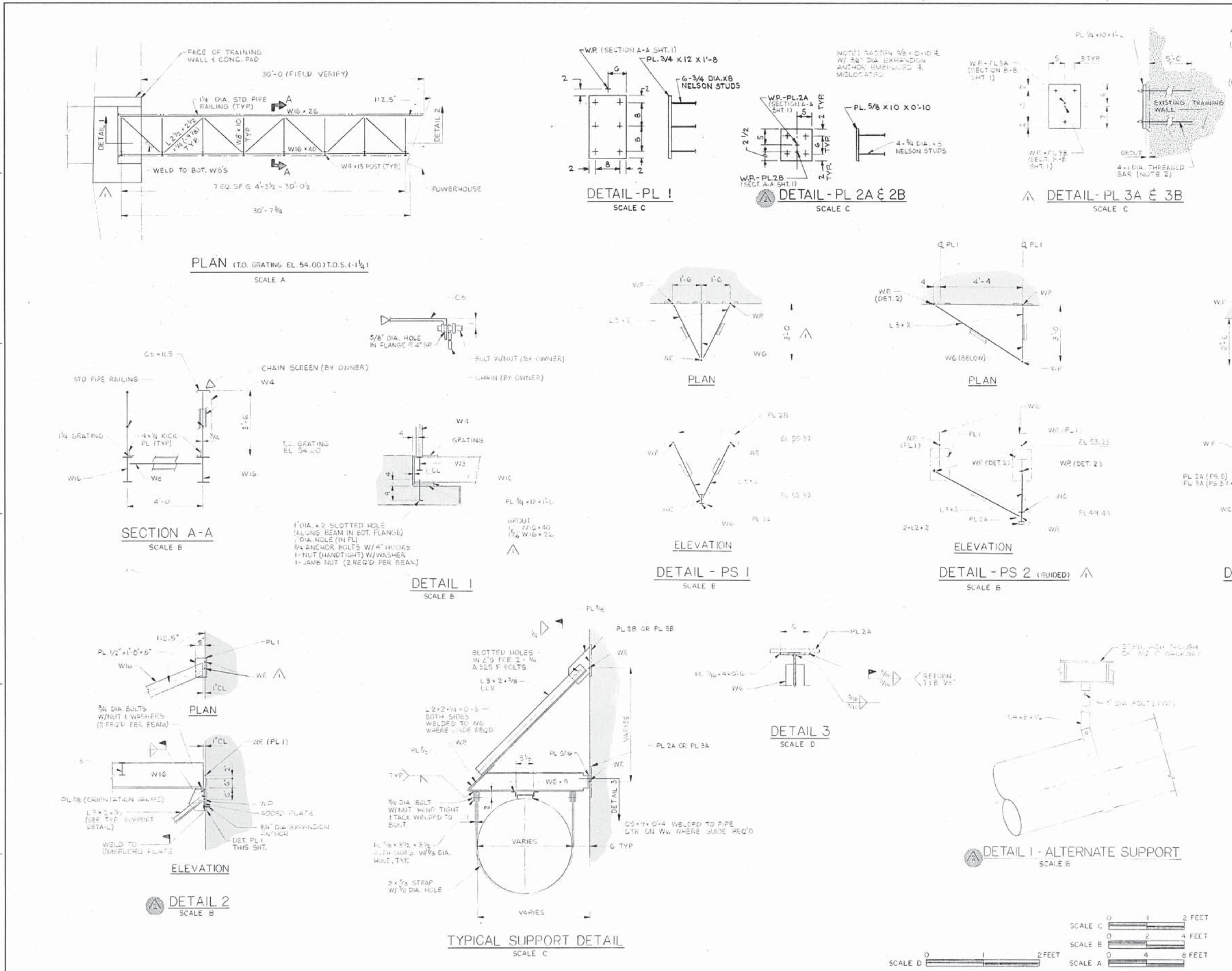
ACRES PROJECT NO. P718202
DRAWING NUMBER 7182C2-157
SHEET 1 OF 5 | REV A

ACRES INTERNATIONAL CORPORATION

DATE	REV NO	DESCRIPTION OF REVISIONS
2/10/88	A	AS BUILT REVISED AS PER CONTRACTOR MARK UPS (B-4)

DATE	REV NO	DESCRIPTION OF REVISIONS
10-7-86	A	REV. PLAN (E7) & SECT. B-B (C2)
9-15-86	A	GENERAL REVISION
6/27/86	A	ISSUED FOR CONSTRUCTION. PIPE SUPPORTS-MOUNTING PLATES

DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
T.E.D. 6/27/86	JMZ 6-27-86	CIVIL	RCP	RCP 6/27/86	RCP 6/27/86		6/11/86		GEC 6/27/86



NOTES

(D-2) 1. FLUSH MOUNT SUPPORT PLATES IN NEW CONCRETE PAD CHIP AS NECESSARY AND GROUT BEHIND SUPPORT PLATES IN EXISTING TRAINING WALL TO ASSURE PROPER ALIGNMENT FOR PIPE.

(F-2) 2. DRILL HOLE FOR THREADED BAR & GROUT. LET IT SET FOR 24 HRS. & REDRILL TO ENSURE COMPLETE GROUTING. IF COMPLETE, REGROUT & INSTALL THREADED BAR. IF INCOMPLETE, REPEAT GROUTING & DRILLING UNTIL GROUT COMPLETELY FILLS HOLE. NOTIFY ENGINEER IF GROUT TAKE IS EXCESSIVE.

DATE	REV NO	DESCRIPTION OF REVISIONS	SQUAD LEADER	PRIME COORD	PROJ ENGR
2/12/88		AS BUILT REVISED AS PER CONTRACTOR MARK UPS (F-4, A-3 ...)	JM		
9-12-86	1	REVISED: CONC. PAD (E-6), GROUT THICKNESS (C-6), WORK POINT (B-7), DETAIL (C-3). ADD: DIMENSION (E-4), DETAILS (F-3)(C-3)(C-2), NOTES 1+2 (F-2).	JB		
7-29-86		ISSUED FOR CONSTRUCTION	JB		

DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
JEB		CIVIL							
DATE 7-16-86	DATE 7-21-86			DATE 7/21/86	DATE 7/21/86		DATE 7/21/86		

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

DOWNSTREAM FISH PASSAGE
STRUCTURAL STEEL
PLAN, SECTION & DETAILS

DEPARTMENT HEAD — DATE 7-21-86
PROJECT ENGINEER — DATE 7-21-86
PROJECT MANAGER — DATE 7-21-86

ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P718202

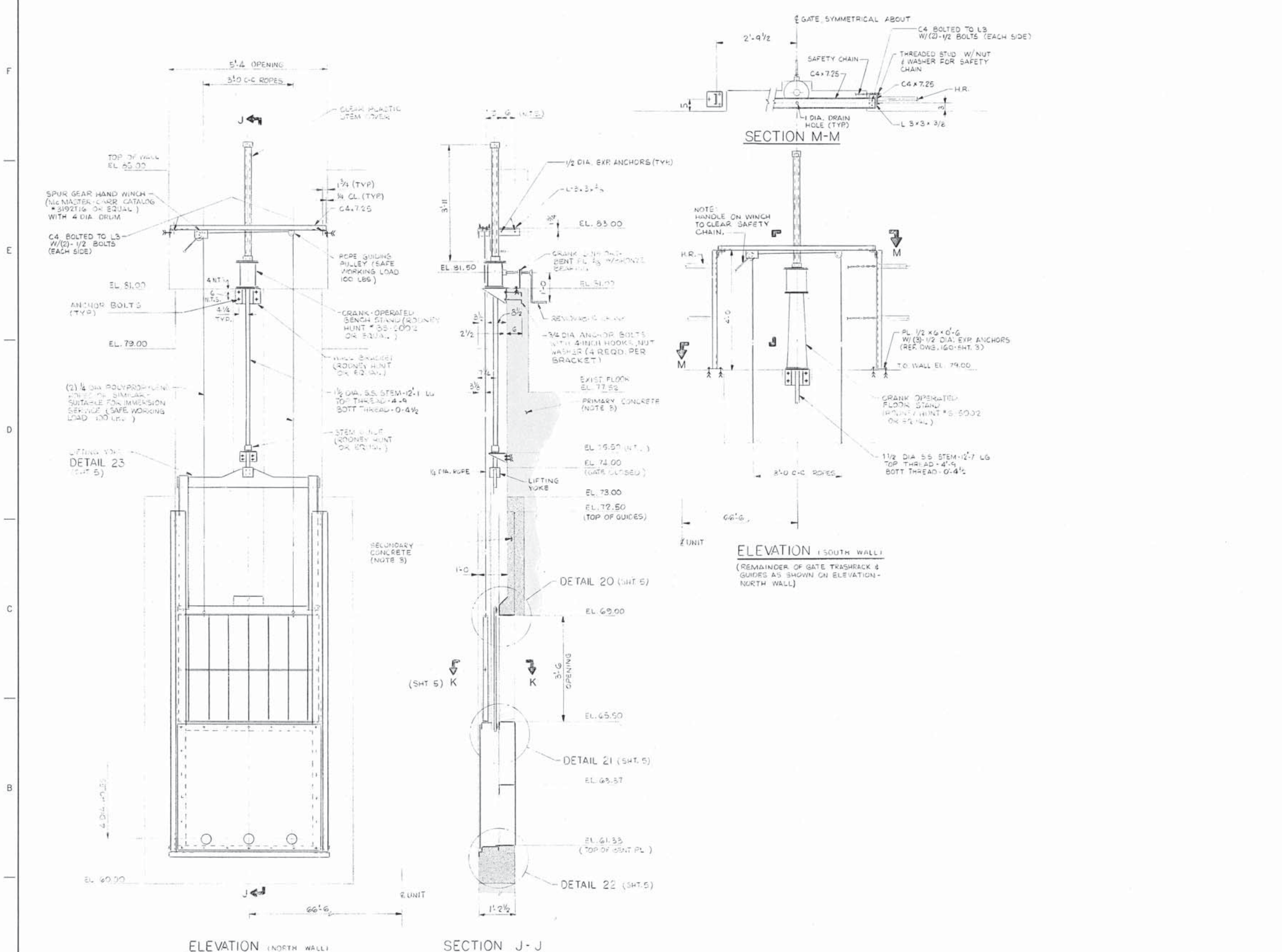
DRAWING NUMBER 7182C2-157

SHEET 3 OF 5

DRAWING NO. 7182C2-157 | SHT. 3 | REV. | ACRES PROJ NO. P718202

NOTES:

1) FOR CONCRETE & REINFORCING AT GATES, REFER TO DWG. 130-SHT. 12.
2) ALL WELDED CONSTRUCTION UNLESS OTHERWISE NOTED. CONTINUOUS WELDS. WELD SIZE TO BE MINIMUM PERMITTED BY AISC.
3) PAINT SYSTEM S-5 AS SPECIFIED.



SCALE 0 2 4 FEET

THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

ACRES | PEJEPSCOT HYDROELECTRIC PROJECT

DOWNSTREAM FISH PASSAGE
WEIR GATES & TRASHRACKS
STRUCTURAL & EMBEDDED STEEL
ELEVATIONS & SECTIONS

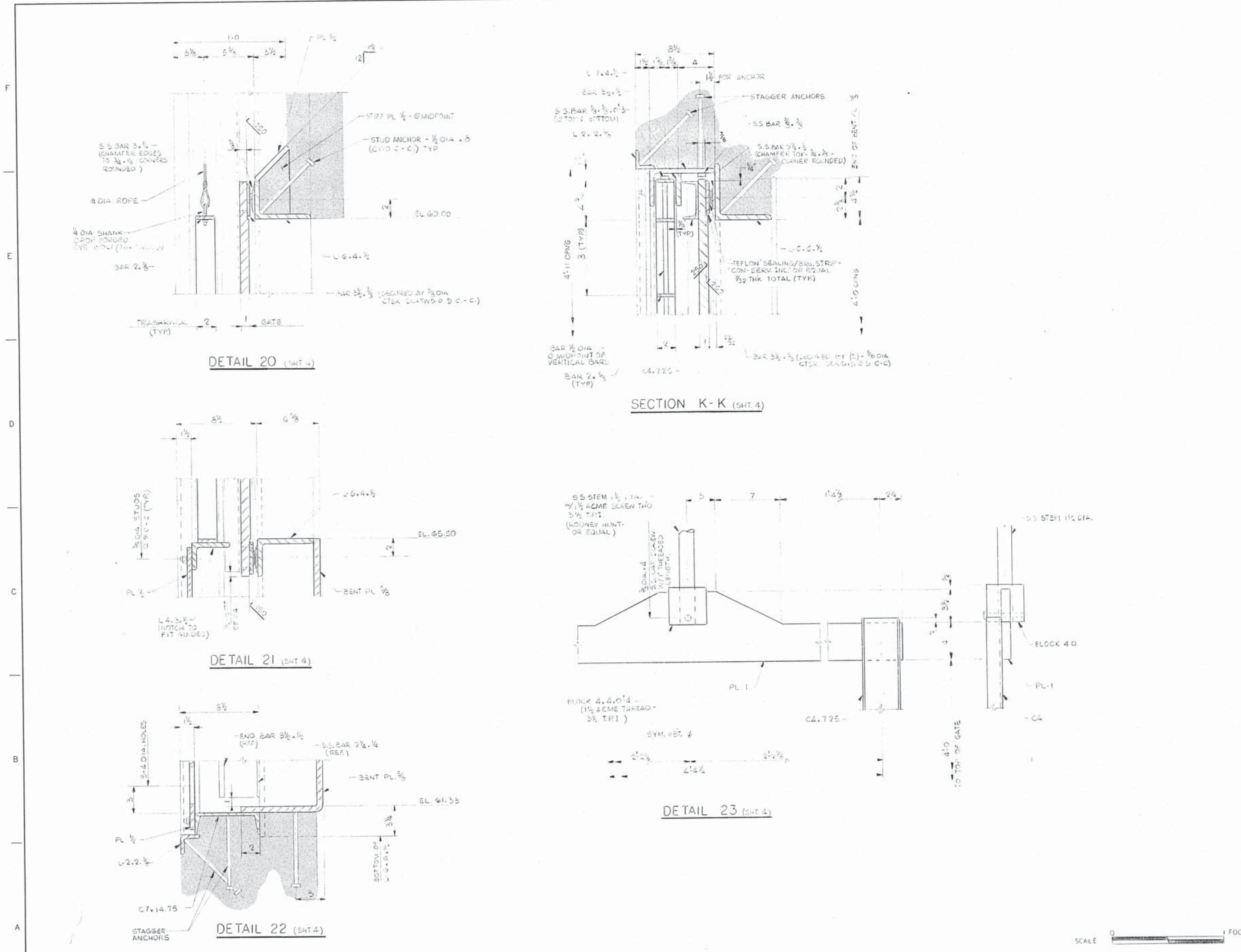
DATE	REV	DESCRIPTION OF REVISIONS
1-29-88		AS BUILT - NO EXCEPTIONS TAKEN

ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P718202

DRAWING NUMBER 7182C2-157

SHEET 4 of 5



THIS DRAWING SHALL BE READ WITH SPEC. NO. 7182-2

ACRES

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

PEJEPSCOT HYDROELECTRIC PROJECT

DOWNSTREAM FISH PASSAGE
WEIR GATES & TRASHRACKS
STRUCTURAL & EMBEDDED STEEL
SECTIONS & DETAILS

ACRES INTERNATIONAL CORPORATION

ACRES PROJECT NO. P718202 | DRAWING NUMBER 7182C2-157 | SHEET 5 OF 5 | REV. A

DATE	REV. NO.	DESCRIPTION OF REVISIONS
1-29-88	A	AS BUILT - NO EXCEPTIONS TAKEN
11/11/86		ISSUED FOR CONSTRUCTION

DRAFTING REVIEW		PRIME DEPARTMENT DESIGN REVIEW				DEPARTMENT DESIGN REVIEW			
DRAWN BY	CHECKED BY	DEPT NAME	DESIGNED BY	COORDINATOR	DWG CHECK	ARCHITECTURAL	CIVIL	ELECTRICAL	MECHANICAL
JM		CIVIL							

APPENDIX C: FISHWAY OPERATION WEEKLY REPORT

Fishway Operation Weekly Report

Fishway Operations Weekly Report

Project Name: ______________________________

Fishway Facility: ______________________________

Date ______________________________

Species	**#'s Detected**
Atlantic Salmon (MSW):	
Atlantic Salmon (1SW):	
River Herring:	
American Shad:	
Striped Bass:	
Sea Lamprey:	

Weekly Operation Status:

Note: Weekly Fishway Operations report to be provided to NMFS and MDMR personnel each Monday by 0800 hours.

APPENDIX D: UPSTREAM FISH PASSAGE OPERATIONS PROTOCOL

UPSTREAM FISH PASSAGE OPERATIONS PROTOCOL

Number of Pumps Operating	Depth Below Tailwater Level (ft)
1	1
2	2
3	3
4	4

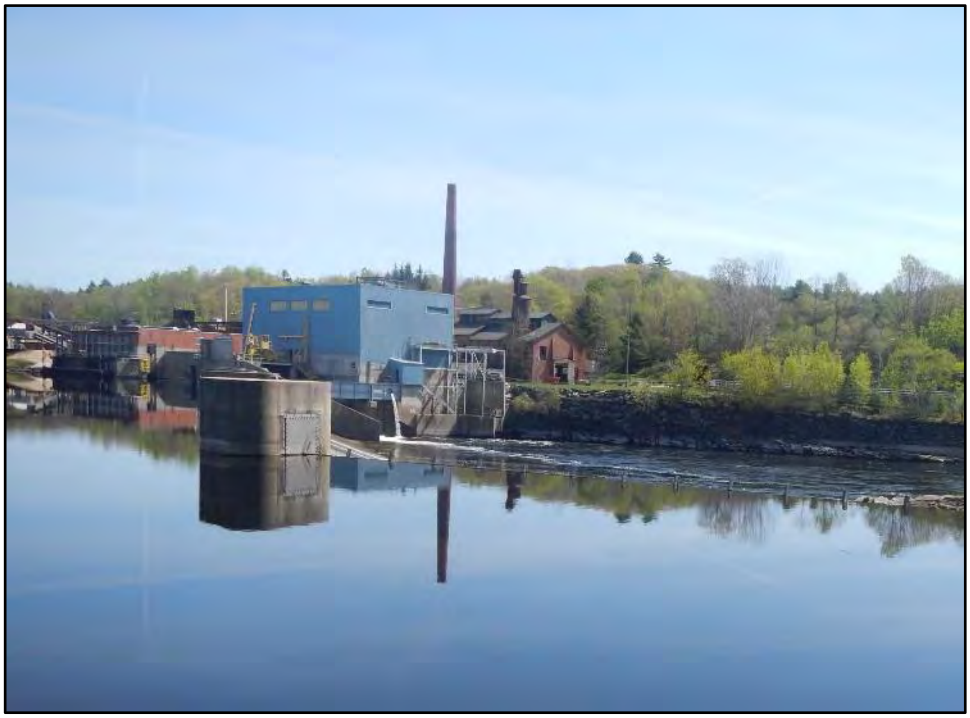
River Flow (cfs)	Kaplan Turbine Gate Setting	Number of Pumps Operating	Total Attraction Flow (cfs)
0 - 1700	0 - 1/4 gate	1	70
1700 - 3500	1/4 to 1/2 gate	2	110
3500 - 5200	1/2 to 3/4 gate	3	150
Over 5200	More than 3/4 gate	4	190

The fish lift frequency time is set as follows:

- April 15 to May 15 and following passage of the first fish at the downstream Brunswick Project, the lift will be operated once every two hours.
- May 16 through June 15, the lift will be operated once every hour.
- June 16 through July 1, the lift will be operated every 2 hours.
- July 2 through November 15, the lift will be operated once a day following passage of salmon at Brunswick if not already identified passing though Pejepscot.

APPENDIX E-5: RECREATION MANAGEMENT PLAN

DRAFT RECREATION MANAGEMENT PLAN
PEJEPSCOT HYDROELECTRIC PROJECT
(FERC No. 4784)



Submitted by:
Brookfield Renewable
Topsham Hydro Partners Limited Partnership
150 Main Street
Lewiston, ME 04240

Prepared by:

GOMEZ AND SULLIVAN ENGINEERS

April 2020

Brookfield

TABLE OF CONTENTS

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LIST OF ABBREVIATIONS AND DEFINITIONS

Brookfield	Brookfield Renewable
CFR	Code of Federal Regulations
Commission	Federal Energy Regulatory Commission
FERC	Federal Energy Regulatory Commission
ILP	Integrated Licensing Process
Licensee	Topsham Hydro Partners Limited Partnership
ME	Maine
MW	Megawatt
NOI	Notice of Intent
PAD	Pre-Application Document
Project	Pejepscot Hydroelectric Project (FERC No. 4784)
PSP	Proposed Study Plan
Recreation Study	Recreation Facilities Inventory and Public Recreation Use Assessment
RSP	Revised Study Plan
Topsham Hydro	Topsham Hydro Partners Limited Partnership
SD1	Scoping Document 1
SD2	Scoping Document 2
SPD	Study Plan Determination

1.0 INTRODUCTION

1.1 Background

Topsham Hydro Partners Limited Partnership (L.P.) (Topsham Hydro or Licensee), an indirect member of Brookfield Renewable (Brookfield), is in the process of relicensing the 13.88-megawatt (MW) Pejepscot Hydroelectric Project (Project) (FERC No. 4784) with the Federal Energy Regulatory Commission (FERC or Commission). The Project is located on the Androscoggin River in the village of Pejepscot and the Town of Topsham, Maine (ME) to the east, the Town of Lisbon, ME to the north, and the Towns of Durham and Brunswick, ME to the west. The Project straddles the border between Cumberland and Sagadahoc counties and extends into Androscoggin County. The original license was issued on September 16, 1982 and expires on August 31, 2022.

The Licensee is using FERC's Integrated Licensing Process (ILP) as established in regulations issued by FERC July 23, 2003 (Final Rule, Order No. 2002) and found at Title 18 Code of Federal Regulations (CFR), Part 5. The Licensee filed a Pre-Application Document (PAD) and Notice of Intent (NOI) to seek a new license for the Project on August 31, 2017.

The Licensee distributed the PAD and NOI simultaneously to Federal and state resource agencies, local governments, Native American tribes, members of the public, and others thought to be interested in the relicensing proceeding. Following the filing of the PAD, FERC prepared and issued Scoping Document 1 (SD1) on October 30, 2017. FERC also held agency and public scoping meetings on November 28, 2017 and a site visit on November 29, 2017. The FERC Process Plan and Schedule provided agencies and interested parties an opportunity to file comments on the PAD and SD1 and request studies by December 29, 2017. FERC subsequently issued Scoping Document 2 (SD2) on February 5, 2018. The Licensee filed a Proposed Study Plan (PSP) on February 12, 2018 and held a Study Plan Meeting on March 22, 2018. In the PSP, the Licensee proposed to conduct a recreation facilities inventory and public recreation use assessment to provide information regarding recreational use and opportunities in the Project vicinity. The Revised Study Plan (RSP) containing the same proposed recreation assessment was filed in accordance with the ILP schedule on June 12, 2018. FERC issued a Study Plan Determination (SPD) on July 3, 2018 approving the Recreation Facilities Inventory and Public Recreation Use Assessment (Recreation Study) without modification. The study was conducted from May to October 2019. The results of the study provide a comprehensive picture of recreational use at the Project, which informed the development of this Recreation Management Plan (RMP). The goal of this RMP is to ensure that adequate and safe public recreational access to Project lands and waters is provided over the term of the new FERC license.

1.2 Project Description

The 13.88-MW Pejepscot Project is located on the Androscoggin River in southern Maine at river mile 14. The Project is located in the village of Pejepscot and the Town of Topsham, ME to the east, the Town of Lisbon, ME to the north, and the Towns of Durham and Brunswick, ME to the west. The Project straddles the border between Cumberland and Sagadahoc counties and extends into Androscoggin County. The Androscoggin River basin above the Pejepscot Dam has a drainage area of approximately 3,420 mi^2. The Project is the second of 28 dams on the main stem of the Androscoggin River and its headwaters.

2.0 EXISTING RECREATION FACILITIES

The Licensee operates the following three FERC-approved Project recreation facilities:

- Pejepscot Boat Ramp: located in Topsham off Route 196 on the eastern shore of the Androscoggin River just downstream from Lisbon Falls. The site provides Project impoundment access for trailered and hand-carry boats via a concrete ramp with an asphalt approach.

- Pejepscot Fishing Park: located off River Road in Brunswick, on the western shore of the Androscoggin River. The site provides access to the river above and below the dam, as well as a boat landing, trail, and metal staircase for portaging around the dam.

- Lisbon Falls Fishing Park: located adjacent to the Route 125 Bridge approximately 600 feet downstream of Worumbo Dam. The Fishing Park includes a parking area on the north side of Route 125 as well as a footpath and a staircase leading to the Androscoggin River.

Figure 2.0-1 depicts existing Project recreation facilities in relation to the Project boundary. Table 2.0-1 provides an overview of each site and associated amenities. The following subsections describe each site in greater detail. Photographic documentation of each site and associated amenities is included as Appendix A.

2.1 Pejepscot Boat Ramp

The Pejepscot Boat Ramp is operated by the Licensee and is located approximately 2.5 miles upstream of the dam directly off Lisbon Street/Route 196 in the Town of Topsham. The facility provides boat launching opportunities for trailered and cartop boats and angler access to the Project impoundment. The site consists of a large gravel parking area, a gated gravel access lane that crosses a railroad track, a gravel turnaround area, and a boat ramp providing access to the Project impoundment. Figure 2.1-1 presents an overview of the facility. The site is comprised of two parcels divided by the railroad right of way: one parcel holds the parking area and the other holds the boat ramp and gravel turnaround area. The Licensee holds easements on the parking and boat ramp parcels and a private railroad crossing permit to connect them.

Access to the site consists of an approximately 25 foot wide gravel driveway off Lisbon Street/Route 196. The gravel parking area is approximately 115 feet long and 40 feet wide, with space for approximately 12 vehicles with trailers. The access road leading from the parking area to the turnaround area and boat launch is gated; the gate is closed during high flow conditions or as needed for safety considerations based on the discretion of Project operating and safety staff. The access road leads to a gravel turnaround area, large enough to allow for vehicles with trailers to pivot in order to back down the boat ramp. The approach to the boat ramp is a nearly 15 foot wide asphalt road. The ramp itself is composed of two sets of concrete planks each 7.5 feet wide. The total ramp length, including the asphalt approach, is approximately 45 feet.

A large sign near the site entrance, visible from traffic passing in both directions on Lisbon Street/Route 196, identifies the site as the Pejepscot Boat Ramp. A smaller attached sign indicates that the park is open for public use from one hour before sunrise to one hour after sunset. A large sign between the parking area and the gated access lane identifies the Licensee as the site owner, provides a map of recreation sites in the Pejepscot Recreation Area, provides contact information and the FERC project number, includes hours of operations, and prohibits overnight camping. Nearby signage contains safe boating guidelines and a Maine Department of Inland Fisheries and Wildlife informational sign.

2.2 Pejepscot Fishing Park

The Pejepscot Fishing Park, also known as the Pejepscot Dam Recreation Area, is located off River Road in the Towns of Topsham and Brunswick. The site provides recreational access to the river above and below Pejepscot Dam, views of the dam and appurtenant facilities, boat take-out and put-in opportunities above and below the dam, and a trail for portaging around the dam. The site is accessed via a long gravel access road and consists of a small parking area, angler access above and below the dam, and a portage facility. Figure 2.2-1 presents an overview of the facility. The site is situated on three parcels; the Licensee owns one of the parcels and holds easements on the remaining two.

A large wooden sign at the top of the access road off River Road identifies the site as the Pejepscot Fishing Park. Attached signage indicates that the park is open for public use from one hour before sunrise to one hour after sunset and that the use of tobacco is prohibited on the property. The approximately 2,000 foot long gravel access road leads to a small gravel parking area with room for approximately three vehicles; vehicular access beyond the parking area is blocked by a cable strung between two posts. A trash receptacle is provided near the parking area.

Beyond the parking area and adjacent to the portage trail is a flat, open area overlooking the Project dam. Access to and views of the Project are restricted by fencing. A large sign posted on the fencing identifies the Licensee as the site owner, provides a map of recreation sites in the Pejepscot Recreation Area, provides contact information and the FERC project number, includes hours of operations, and prohibits overnight camping.

The portage facility consists of an unimproved boat landing area above the dam, a 600-foot-long trail leading around the dam, and a put-in below the dam. The take-out landing is located just above the dam along a steep boulder wall. An informal footpath was observed leading roughly 100 feet upstream to an area with a shallower grade; it was assumed that this area is informally used as a take-out landing.

To access the take-out, boaters pass around the western edge of the upstream boat barrier (installed from May 15 through October 15) and follow the inner canoe barrier along the shore. From the take-out, boaters follow the edge of the fence along an unimproved dirt path indicated by a canoe portage sign. The trail continues up the hill to the dam overlook area and continues along the edge of the fence downhill to a set of steel stairs descending a steep exposed ledge face. Along the stairs is a ramp upon which canoes and kayaks can be slid down. At the bottom of the stairs is a flat rock landing with handrails guiding users down a steep section of ledge to a lower shelf. The lower shelf runs for approximately 55 feet to an area where the slope to water's edge is more gradual. The put-in is located in a gentle backwater with a gradual rocky slope into the water.

Anglers access the shoreline above and below the dam using the portage trail. In addition, there is an informal footpath leading from the parking area to the shoreline approximately 1,300 feet downstream from the dam.

2.3 Lisbon Falls Fishing Park

The Lisbon Falls Fishing Park, operated by the Licensee, is located in the Town of Lisbon off Canal Street/Route 125. The site provides angler access to the Androscoggin River approximately 3.2 miles upstream of the Project and immediately downstream from the Worumbo Project (FERC No. 3428). The site consists of a parking area, a gravel access path leading to the shoreline, and informal access along the shoreline. Canal Street/Route 125 separates the parking area from the recreation area, which is fenced and gated. Figure 2.3-1 presents an overview of the facility. The Licensee holds easements on the parcels comprising the site; these easements expire with the end of the current FERC license.

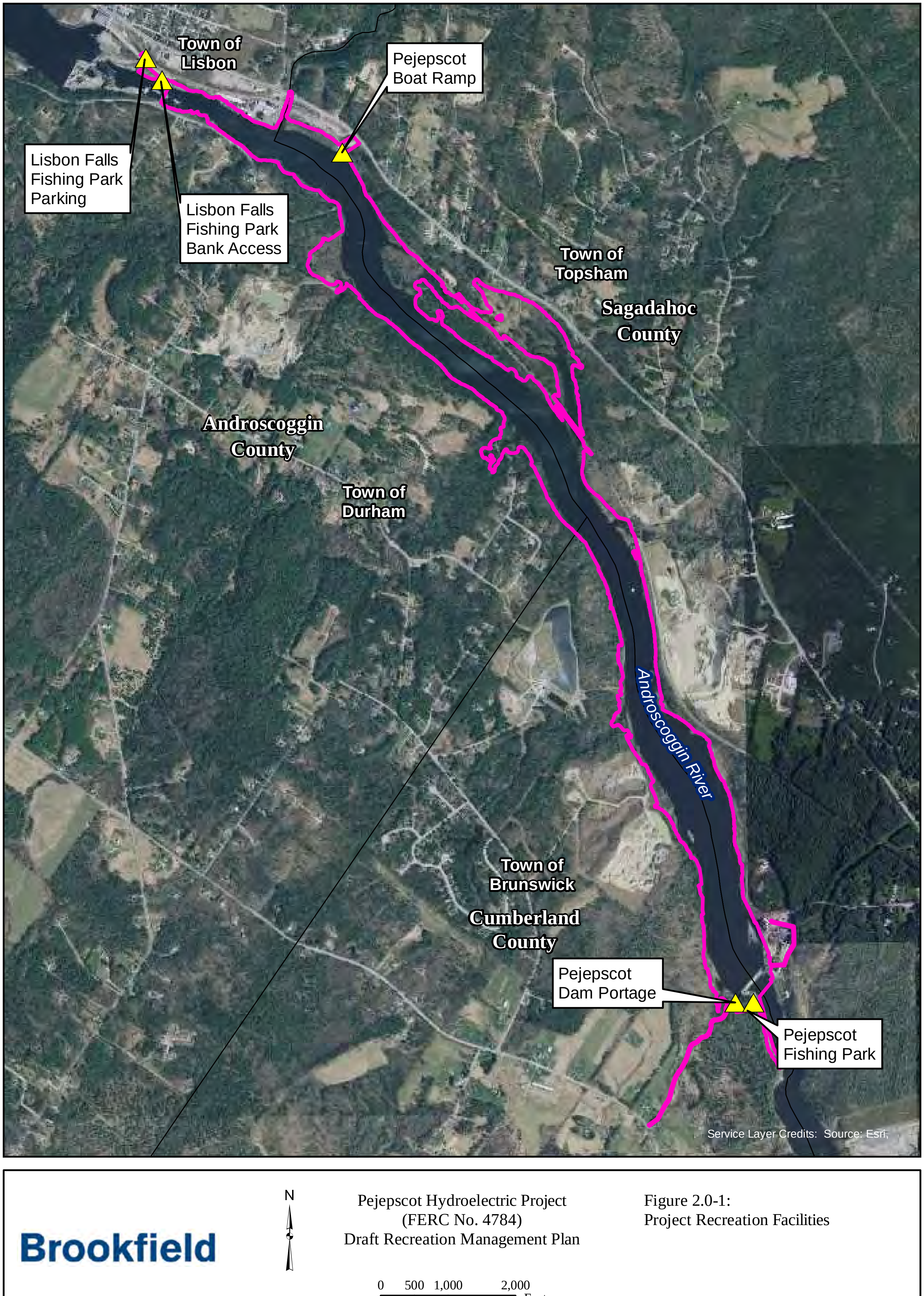
Vehicular access to the site is directly off Canal Street/Route 125. The gravel parking area measures approximately 95 by 23 feet, providing space for 10 vehicles without trailers, and is bordered by a large boulder wall approximately 20 feet high. A large sign at the east end of the parking area identifies the site as the Lisbon Falls Fishing Park. A smaller attached sign indicates that the park is open for public use from one hour before sunrise to one hour after sunset.

A crosswalk leads from the parking area to the gated path entrance. The site is also accessible by pedestrians using the sidewalk on the south side of Canal Street/Route 125. A large sign affixed to the fencing identifies the Licensee as the site owner, provides a map of recreation sites in the Pejepscot Recreation Area, provides contact information and the FERC project number, includes hours of operations, and prohibits overnight camping. The approximately 10 foot wide access path runs on top of the bank along the shoreline downstream to the Route 125 bridge. The access path ends near the upstream bridge abutment, but informal footpaths continue to the top of the rocks downstream from the bridge.

Approximately 70 feet along the access path from the gated entrance, a set of wooden stairs leads down to a narrower trail extending to the shoreline. Several informal footpaths lead along the river to provide angler access to approximately 300 feet of shoreline.

Table 2.0-1: Project Recreation Sites and Associated Amenities

Recreation Site	Facilities/ Amenities	Description
Pejepscot Boat Ramp	Parking Area	Gravel, space for 12 vehicles with trailers
	Boat Ramp	Asphalt approach, ramp consisting of two sets of concrete planks each 7.5 feet wide
	Signage	Entrance sign, Part 8 sign
Pejepscot Fishing Park	Parking Area	Gravel, space for 3 vehicles
	Portage Take-out	Unimproved landing, canoe restraining barrier along right bank, canoe portage sign
	Portage Trail	Dirt, roughly 600 feet long, directional signs
	Portage Put-in	Steel stairs with canoe slide, footpath from stairs to shoreline
	Bank Fishing Access	Shoreline access above and below the dam via portage trail, additional informal footpath
	Signage	Entrance sign, Part 8 sign, portage signs
Lisbon Falls Fishing Park	Parking Area	Gravel, space for 10 vehicles
	Bank Fishing Access	Gravel access path, wooden stairs, informal shoreline footpaths
	Signage	Entrance sign, Part 8 sign



Brookfield

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft Recreation Management Plan

Figure 2.0-1:
Project Recreation Facilities

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Brookfield

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft Recreation Management Plan

Figure 2.2-1:
Pejepscot Boat Ramp
Facility Overview

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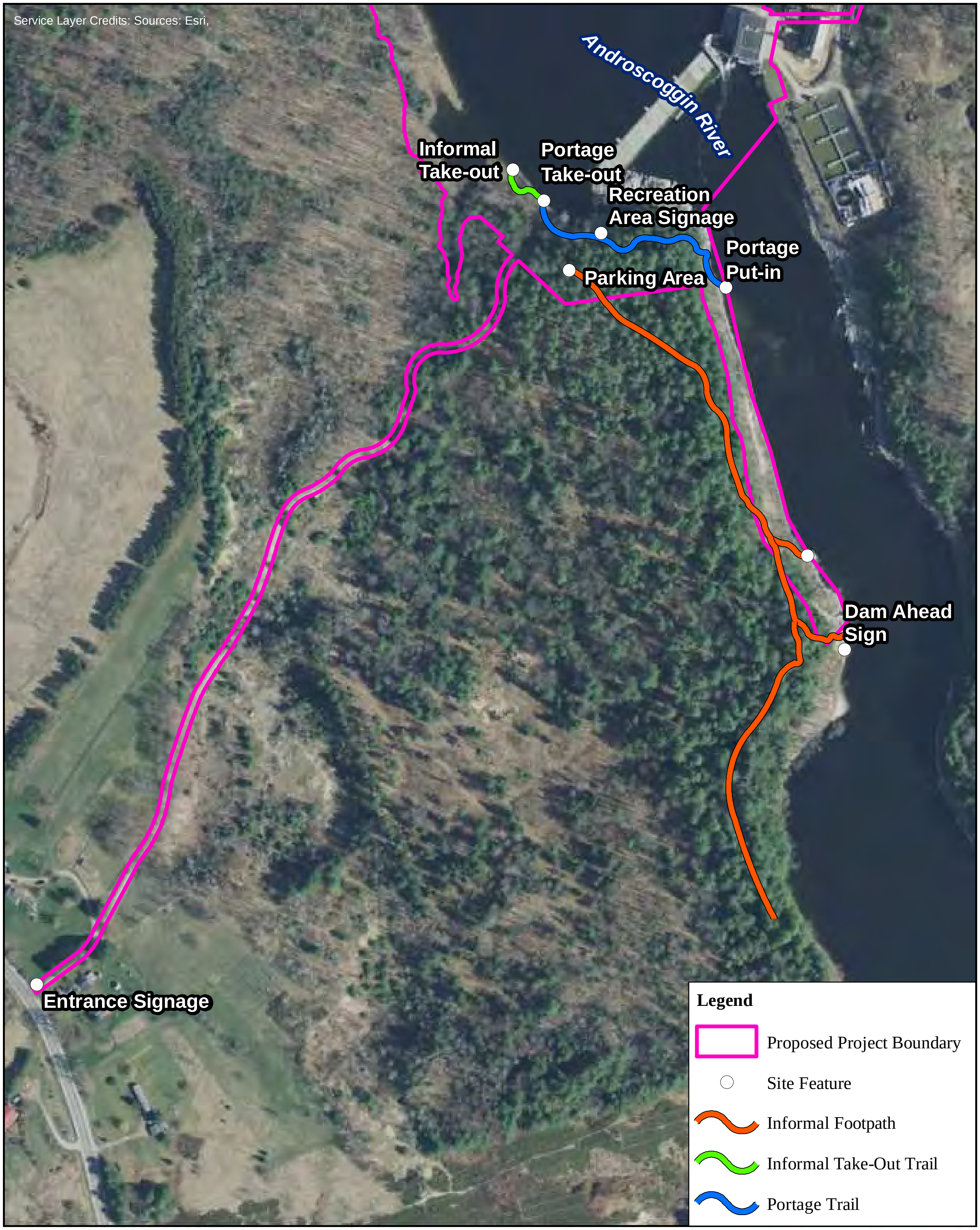

Brookfield

N

0 87.5 175 350 Feet

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft Recreation Management Plan

Figure 2.2-1:
Pejepscot Fishing Park
Facility Overview

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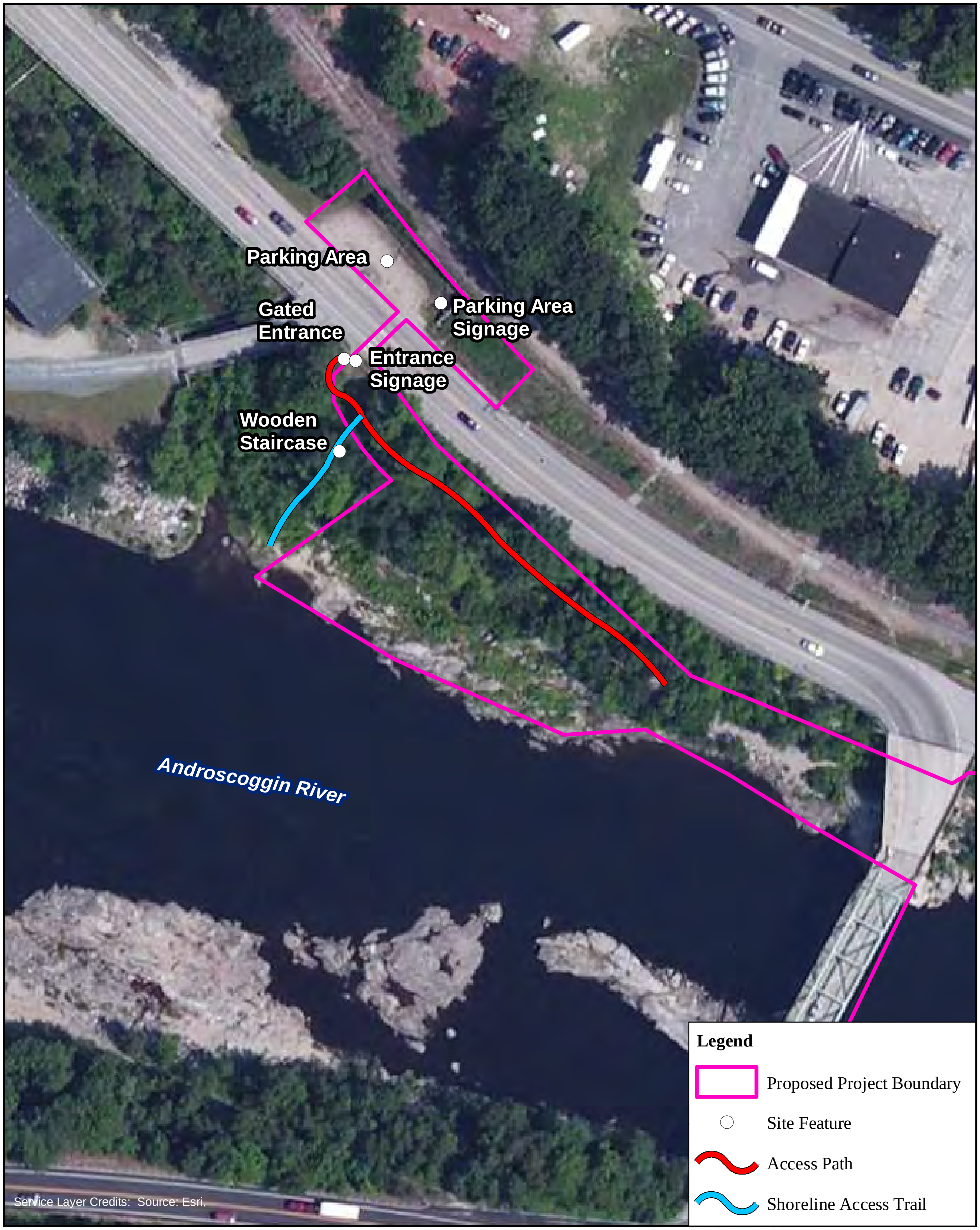

Brookfield

N

0 25 50 100 Feet

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft Recreation Management Plan

Figure 2.3-1:
Lisbon Falls Fishing Park
Facility Overview

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3.0 PROPOSED RECREATION FACILITY IMPROVEMENTS

The results of the Recreation Study provide a comprehensive picture of the recreational opportunities available within the study area, the level of usage at each recreation site, the types of activities engaged in, the condition of the facilities, and the facilities' ability to meet the recreational demand. The three FERC-approved recreation facilities in the study area provide an array of recreational opportunities, including access to the Androscoggin River both above and below the dam for fishing, boating, hiking, and sightseeing. The results of the study demonstrate that there is ample access and capacity for recreational demand in the Project area: all Project recreation facilities were used at 33 percent or less of capacity on average non-peak weekends. The recreation facilities were found to be in fair condition, although maintenance issues were identified at each site. Aside from maintenance considerations, the facilities appear to serve the recreational demand in the Project vicinity.

The following subsections identify measures proposed to address maintenance issues and/or enhance recreation at Project recreation facilities.

3.1 Proposed Measures

3.1.1 Pejepscot Boat Ramp

The Pejepscot Boat Ramp site was found to be in overall fair condition during the Recreation Study site condition assessment. The parking and turnaround areas were in serviceable condition, but general erosion and wear were noted in both areas. At the driveway entrance, a rut approximately three inches deep had formed along the edge of the pavement. The boat ramp was found to be in generally good condition, although encroaching vegetation and sediment have narrowed the effective ramp width. Signage at the site was in overall good condition with the exception of the sign at the entrance, which is cracked and peeling.

The Licensee proposes to implement the following measures at the Pejepscot Boat Ramp:

- Re-grade the driveway and parking area, including placing and compacting gravel fill to level driveway and provide a safe turnout onto Lewiston Road.
- Clear sediment and vegetation from the surface of the boat ramp in order to restore the full width for use. Proposed grades adjacent to the ramp will tie into existing concrete planks and any exposed sediment will be seeded.
- Replace the entrance sign with a similarly sized sign identifying the site.

3.1.2 Pejepscot Fishing Park

With the exception of the steel portage staircase, the Pejepscot Fishing Park is generally maintained in primitive condition. At the time the site condition assessment was conducted, the access road was in serviceable condition. The parking area showed signs of rutting but was generally in fair condition. The unimproved portage trail was flat and of constant grade, although in places roots and boulders projected up from the path and in other portions loose gravel was noted on the path's surface. Downed trees and branches were found across the informal footpaths.

The boat slide adjacent to the steel stairs is constructed of wood and appeared to have originally been topped with a carpet material, which has since worn away. The stairs appeared stable and sturdy; however, at the top right (looking downslope) a support was missing. The bottom of the steps was anchored by rocks placed to provide flat footing, and the railing around this platform had several loose nuts. The transition from the bottom of the stairs to the ledge did not provide stable footing. Downed trees were found across both informal footpaths at the site. Existing signage at the site was in good condition; however, there does not appear to be signage upstream of the portage take-out identifying the facility.

The Licensee proposes to implement the following measures at the Pejepscot Fishing Park:

- Re-grade the 0.5 mile access road, including placing and compacting gravel fill to repair areas with significant erosion.
- Reroute the portage trail to a less steep put-in area by following the existing informal footpath beginning at the back of the parking area (see Figure 3.1.2-1). The Licensee would need to secure an easement from the Town of Brunswick in order to utilize this informal footpath; discussions with Town officials are ongoing.
    - Remove the steel staircase and extend the existing chain link fence to discourage access to the steep section of ledge.
    - Clear the downed trees and other debris from the section of informal trail between the parking area and the shoreline access downstream of the dam.
    - Add directional signage leading boaters along the rerouted portage trail.
- Erect an upstream sign indicating the location of the portage take-out.

3.1.3 Lisbon Falls Fishing Park

The Lisbon Falls Fishing Park site was in overall fair condition at the time the site condition assessment was conducted. The gravel parking lot was generally flat and appeared to drain toward the roadway. A few recent gravel fill deposits were observed as well as minor depressions. The gravel path was of firm and constant grade. Generally, vegetation had started to encroach on all gravel surfaces. The wooden stairs were in serviceable condition, although minor graffiti and settlement or warping of the landing platform was observed. The trail below the stairs was in primitive condition, as were the informal footpaths along the shoreline. Signage at the site was in good condition, aside from the entrance signage identifying the park, which has minor graffiti.

The parcels comprising the Fishing Park are leased to the Licensee under an agreement that terminates with the end of the current FERC license for the Pejepscot Project. The Licensee would need to negotiate a new lease agreement in order to continue utilizing this property as a Project feature. Assuming a successful renegotiation, the Licensee proposes to implement the following measures at Lisbon Falls Fishing Park:

- Trim vegetation encroaching on the access path.
- Remove graffiti from the entrance sign.

Although no improvements to the wooden staircase are proposed at this time, an annual maintenance item has been included in Section 4 to account for maintenance and/or replacement as necessary.

3.2 Cost and Schedule

Proposed recreation improvements will be implemented within two years of license issuance. Estimated costs for proposed improvements are provided in Table 3.2-1.

Table 3.2-1: Estimated Cost of Proposed Recreation Improvements

Recreation Facility	Proposed Improvements	Estimated Cost ($)[1]
Pejepscot Boat Ramp	Re-grade driveway and parking area	18,200
	Parking area fill	8,300
	Clear sediment and vegetation from boat ramp	5,700
	Replace entrance sign	800
	Subtotal	**33,000**
Pejepscot Fishing Park	Re-grade access road	29,600
	Access road fill (8" layer, select portions of road, approx. 600' long)	22,000
	Remove steel staircase and extend chain link fencing at top of ledge	12,100
	Clear informal trail (new rerouted portage trail) between parking area and shoreline access	1,800
	Add directional signage along rerouted trail segment	300
	Add signage upstream of portage	2,400
	Subtotal	**68,200**
Lisbon Falls Fishing Park	Trim vegetation encroaching on the access path	1,700
	Remove graffiti from entrance sign	800
	Subtotal	**2,300**
	TOTAL	**103,500**

[1]Estimate assumes engineering and permitting are not necessary. Costs include an additional 10% for mobilization/demobilization and 40% for contingency.

[2] Engineer's estimate is based on generally available databases (e.g. Means) and in-house pricing information for the local market. Competitive bidding environments, unknown field conditions, and other local market factors may contribute to variances in costs.

Brookfield

N

0 87.5 175 350 Feet

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft Recreation Management Plan

Figure 3.1.2-1:
Proposed Portage
Trail Relocation, Tentative Route

Path: P:\Modeling\Projects\01925\maps\RMP\figure_3_1_2-1_proposed_portage.mxd

4.0 RECREATION FACILITY MAINTENANCE

4.1 Proposed Maintenance

The Licensee proposes to continue to operate and maintain the existing formal recreation sites and their associated facilities and amenities, including Pejepscot Fishing Park and the portage trail, Lisbon Falls Fishing Park, and the Pejepscot Boat Ramp. The Licensee will ensure that the sites and amenities remain usable over the term of the new license.

4.2 Cost and Schedule

Maintenance, improvements, and/or repairs will be conducted on an observed, as-needed basis. Estimated annual operation and maintenance costs are provided in Table 4.2-1.

Table 4.2-1: Estimated Operations and Maintenance Costs

Recreation Facility	Operation and Maintenance Tasks	Estimated Annual Cost ($)
Pejepscot Boat Ramp	Parking lot clean up (weekly trash removal and general upkeep)	6,600
	Parking lot maintenance	2,800
	Boat ramp maintenance/minor trimming/clearing	3,300
	Subtotal	**12,700**
Pejepscot Fishing Park	Parking lot clean up (weekly trash removal and general upkeep)	6,600
	Access road maintenance	3,200
	Portage maintenance/minor trimming/clearing	1,100
	Subtotal	**10,900**
Lisbon Falls Fishing Park	Parking lot clean up (weekly trash removal and general upkeep)	6,600
	Wooden staircase reconstruction (~$10,000 every 10 years)	1,000
	Access path maintenance/minor trimming/clearing	1,100
	Subtotal	**8,700**
	TOTAL	**32,300**

5.0 RECREATION FACILITY MONITORING

As discussed in Section 3.0, Project recreation facilities are currently used at a third or less of capacity. The Project has ample capacity to meet recreational demand; therefore, no formal use monitoring is proposed. As discussed in Section 4.0, the Licensee is committed to ensuring that Project recreation facilities remain usable over the term of the new license, and maintenance, improvements, and repairs will be conducted on an observed, as-needed basis. If observed changes in facility condition or capacity necessitate modification of the RMP, the Licensee will submit proposed modifications to the appropriate agencies for review and comment prior to submittal to FERC. All plans will be submitted to FERC for approval prior to construction.

APPENDIX A – SITE PHOTOGRAPHS

LIST OF PHOTOS

Pejepscot Boat Ramp

Photo 1: Pejepscot Boat Ramp, Entrance Signage

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/15/2019)

Photo 2: Pejepscot Boat Ramp, Parking Area

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/15/2019)

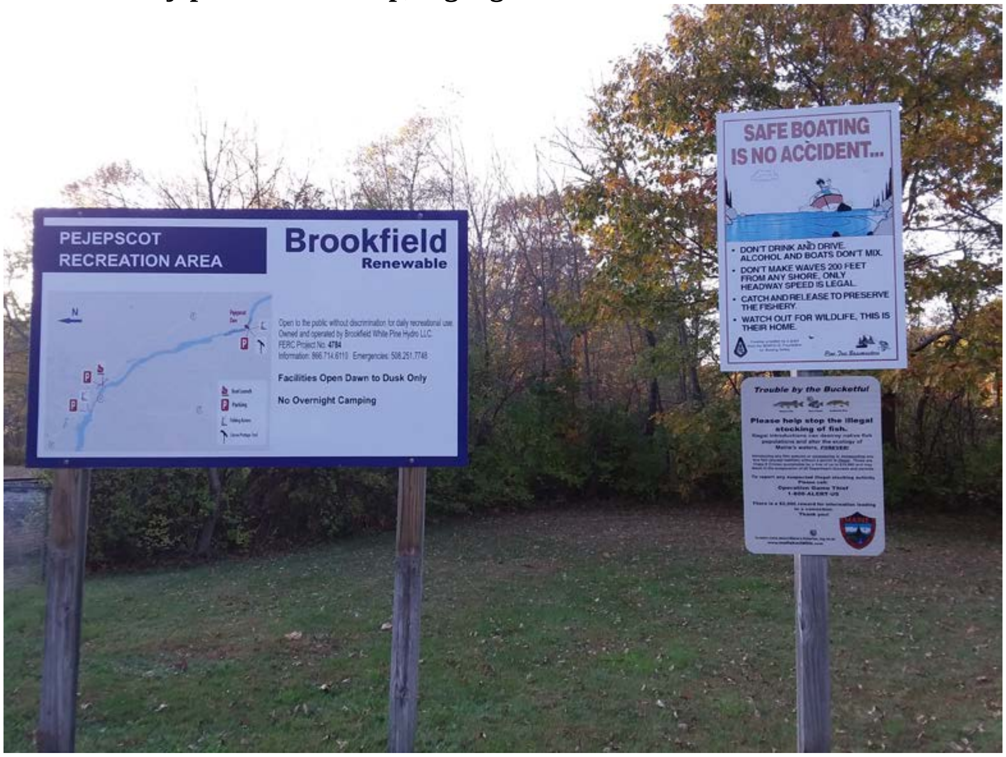
Photo 3: Pejepscot Boat Ramp, Infrared Counter

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/15/2019)

Photo 4: Pejepscot Boat Ramp, Gated Access Road, Signage

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/15/2019)

Photo 5: Pejepscot Boat Ramp, Signage



(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/15/2019)

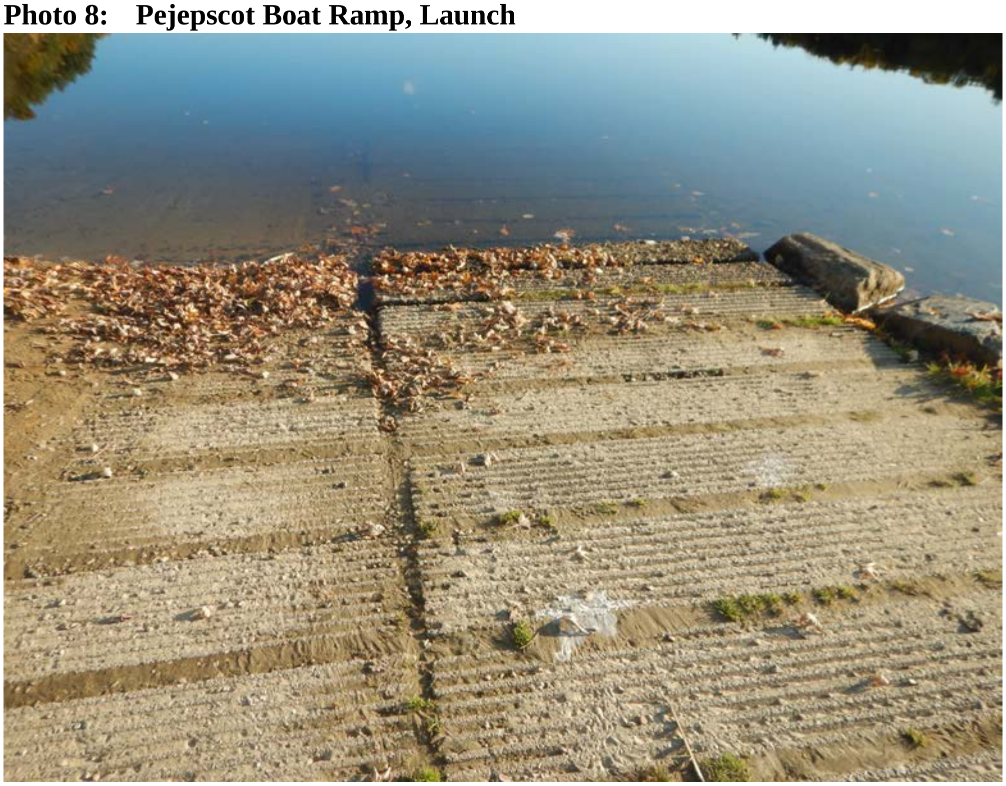
Photo 6: Pejepscot Boat Ramp, Turnaround Area

(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

Photo 7: Pejepscot Boat Ramp, Launch Approach

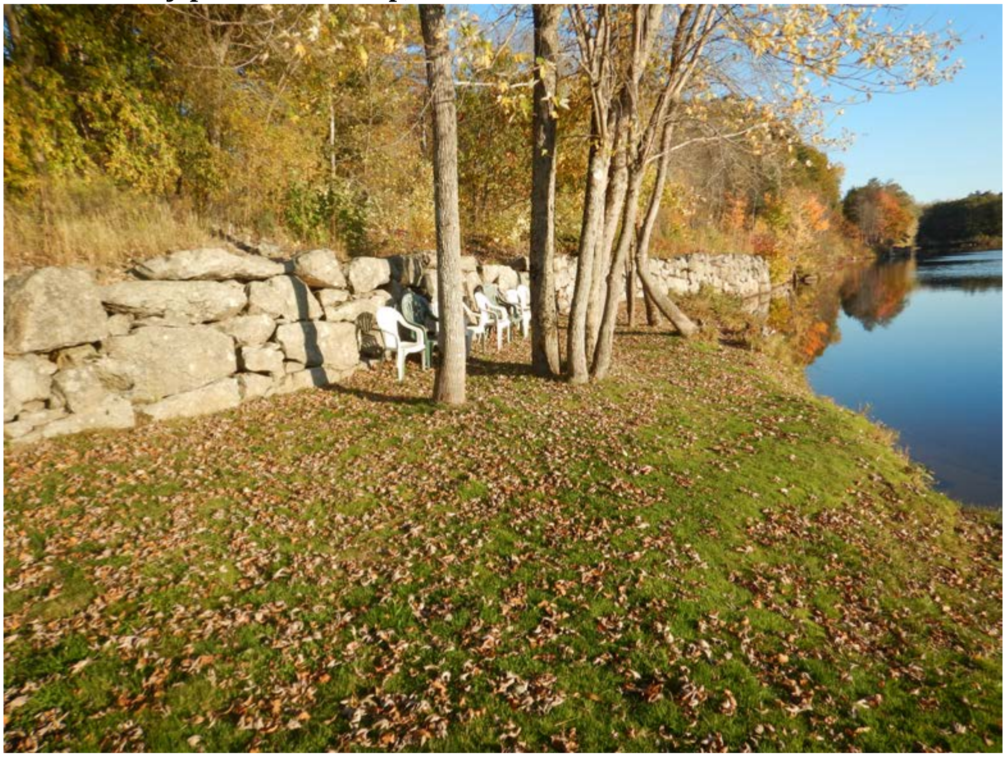
(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

Photo 8: Pejepscot Boat Ramp, Launch



(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

Photo 9: Pejepscot Boat Ramp, Bank Downstream from Launch



(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

Pejepscot Fishing Park

Photo 10: Pejepscot Fishing Park, Entrance Signage

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 11: Pejepscot Fishing Park, Access Road, Vehicle Counter

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 12: Pejepscot Fishing Park, Vehicle Counter

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 13: Pejepscot Fishing Park, Parking Area

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 14: Pejepscot Fishing Park, Cabled Entrance to Recreation Area

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 15: Pejepscot Fishing Park, Dam Overlook Area

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 16: Pejepscot Fishing Park, Dam Overlook Area Signage

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 17: Pejepscot Fishing Park, Portage Take-Out, Top of Bank

(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

Photo 18: Pejepscot Fishing Park, Portage Take-Out, Bottom of Bank

(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

Photo 19: Pejepscot Fishing Park, Canoe Portage Directional Sign

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 20: Pejepscot Fishing Park, Alternate Portage Take-Out

(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

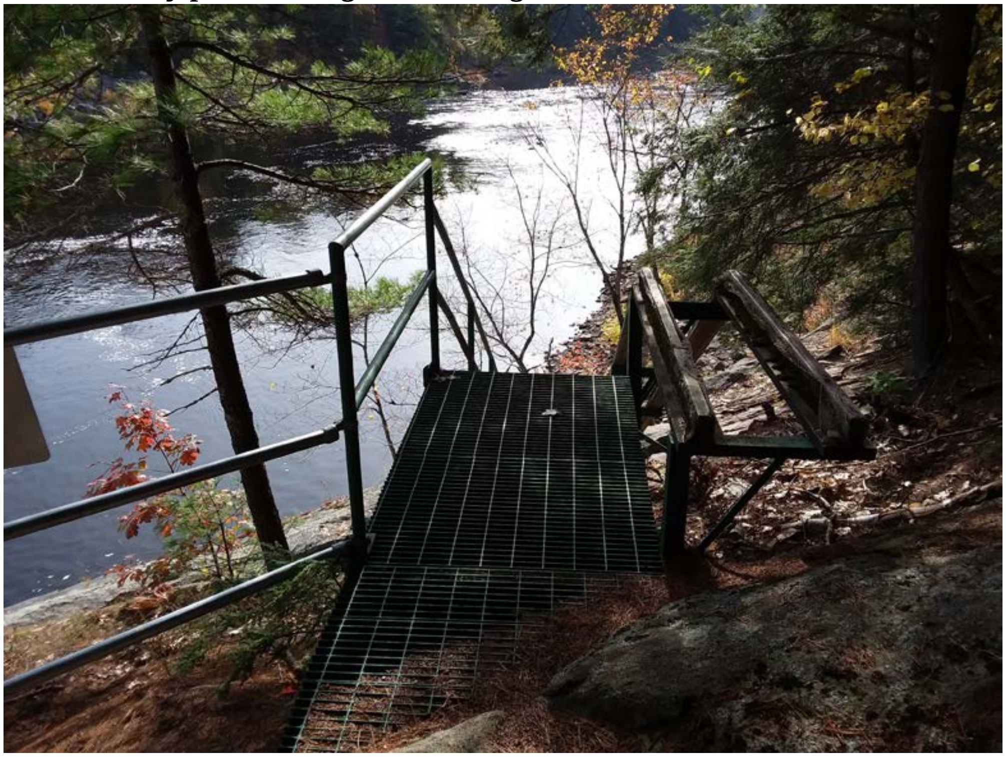
Photo 21: Pejepscot Fishing Park, Alternate Portage Take-Out, Informal Footpath

(Photo taken by J. Commerford, Gomez and Sullivan Engineers, 10/16/2019)

Photo 22: Pejepscot Fishing Park, Portage Trail

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 23: Pejepscot Fishing Park, Portage Trail, Steel Stairs, Boat Slide



(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 24: Pejepscot Fishing Park, Portage Trail, Steel Stairs, Rock Ledge

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 25: Pejepscot Fishing Park, Portage Put-In

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 26: Pejepscot Fishing Park, Informal Angler Access Footpath

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Lisbon Falls Fishing Park

Photo 27: Lisbon Falls Fishing Park, Parking Area Signage

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 28: Lisbon Falls Fishing Park, Parking Area

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 29: Lisbon Falls Fishing Park, Crosswalk to Gated Entrance

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 30: Lisbon Falls Fishing Park, Entrance Signage

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 31: Lisbon Falls Fishing Park, Access Path, Infrared Counter

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 32: Lisbon Falls Fishing Park, Infrared Counter

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 33: Lisbon Falls Fishing Park, Wooden Staircase

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 34: Lisbon Falls Fishing Park, Wooden Staircase, Shoreline Access Trail

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 35: Lisbon Falls Fishing Park, Shoreline Access, Looking Downstream

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

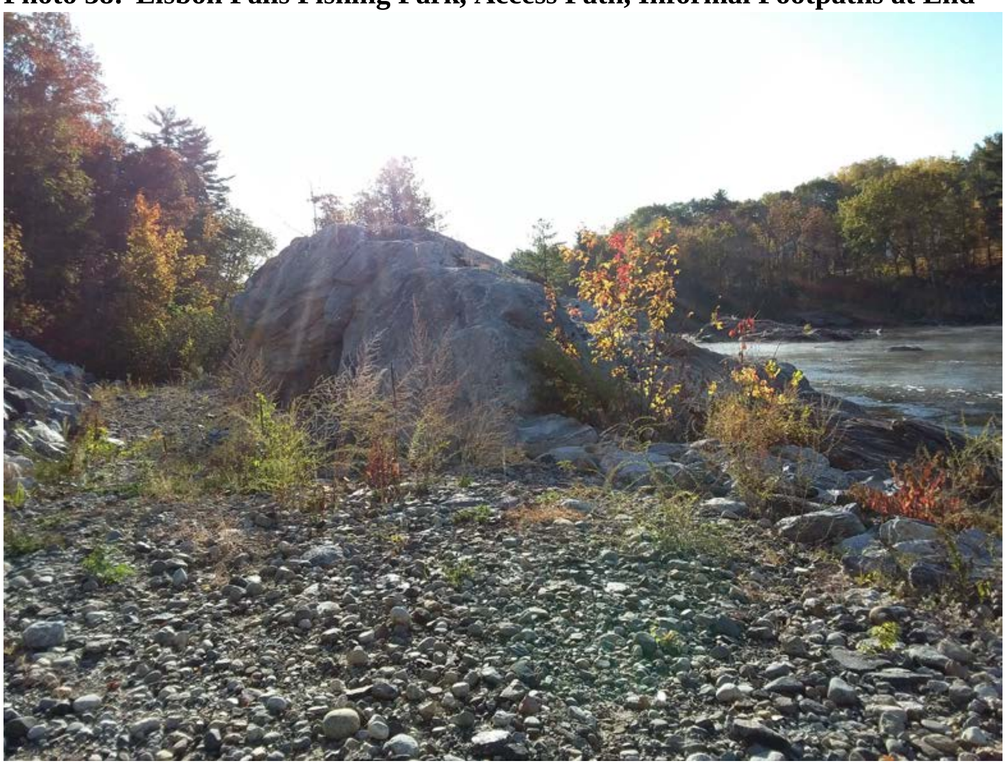
Photo 36: Lisbon Falls Fishing Park, Shoreline Access, Looking Upstream

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 37: Lisbon Falls Fishing Park, Access Path, Bridge Abutment

(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

Photo 38: Lisbon Falls Fishing Park, Access Path, Informal Footpaths at End



(Photo taken by M. Rheaume, Gomez and Sullivan Engineers, 10/16/2019)

EXHIBIT F
GENERAL DESIGN DRAWINGS AND SUPPORTING DESIGN REPORT

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT F
GENERAL DESIGN DRAWINGS AND SUPPORTING DESIGN REPORT

TABLE OF CONTENTS

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT F
GENERAL DESIGN DRAWINGS AND SUPPORTING DESIGN REPORT

1 EXHIBIT F DRAWINGS

The following design drawings showing plan, elevations, and sections of the principal Pejepscot Hydroelectric Project (Project) works are included:

Sheet No.	Title
Sheet 1	General Plan and Sections
Sheet 2	Powerhouse Site Plan
Sheet 3	Unit 1 Powerhouse Floor Plans
Sheet 4	Unit 1 Powerhouse Sections
Sheet 5	Unit 1 Sections
Sheet 6	Unit 21, 22, and 23 Plans and Sections

2 SUPPORTING DESIGN REPORT

18 C.F.R. §4.41(g)(3) requires that an applicant for a new license file with the Commission a Supporting Design Report when the applicant files a license application. The purpose of the Supporting Design Report is to demonstrate that the existing structures are safe and adequate to fulfill their stated functions. Given that as a high hazard facility, the Project falls under the jurisdiction of Commission's Part 12, Subpart D - Inspection by Independent Consultant. Part 12-D Safety Inspection Reports have been filed with the Commission every five years over the term of the current license. The filing date for the most recent inspection report (Fifth) is November 30, 2015. The Applicant believes that this most recent Part 12 report, along with the Supplemental Technical Information Document, the Potential Failure Modes Analysis report and other associated dam safety documentation, fulfills the requirements and intent of 18 CFR §4.41(g)(3) for the Project. All of the Project's Independent Safety Inspection Reports and associated dam safety documents are on file with the Commission.

3 CRITICAL ENERGY INFRASTRUCTURE INFORMATION

In accordance with Federal Energy Regulatory Commission (FERC or the Commission) regulations, certain sensitive information related to this relicensing proceeding is being filed under separate cover with the Commission only. Special handling of this material is required to protect the security of critical energy infrastructure.

In order to protect critical energy infrastructure, the Commission has enacted regulations to govern public access to certain information. The Exhibit F drawings referenced herein contain sensitive and detailed engineering information that, if used improperly, may compromise the safety of the Project and those responsible for its operation. Therefore, the Exhibit F drawings have been labeled "Contains Critical Energy Infrastructure Information – Do Not Release." The drawings have been submitted to FERC under separate cover. Agencies may file a CEII request under 18 C.F.R. § 388.113 or a Freedom of Information Act (FOIA) request under 18 C.F.R. § 388.108 to obtain the Exhibit F drawings.

EXHIBIT G
PROJECT MAPS

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT

(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT G
PROJECT MAPS

TABLE OF CONTENTS

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT G
PROJECT MAPS

1 PROJECT MAPS

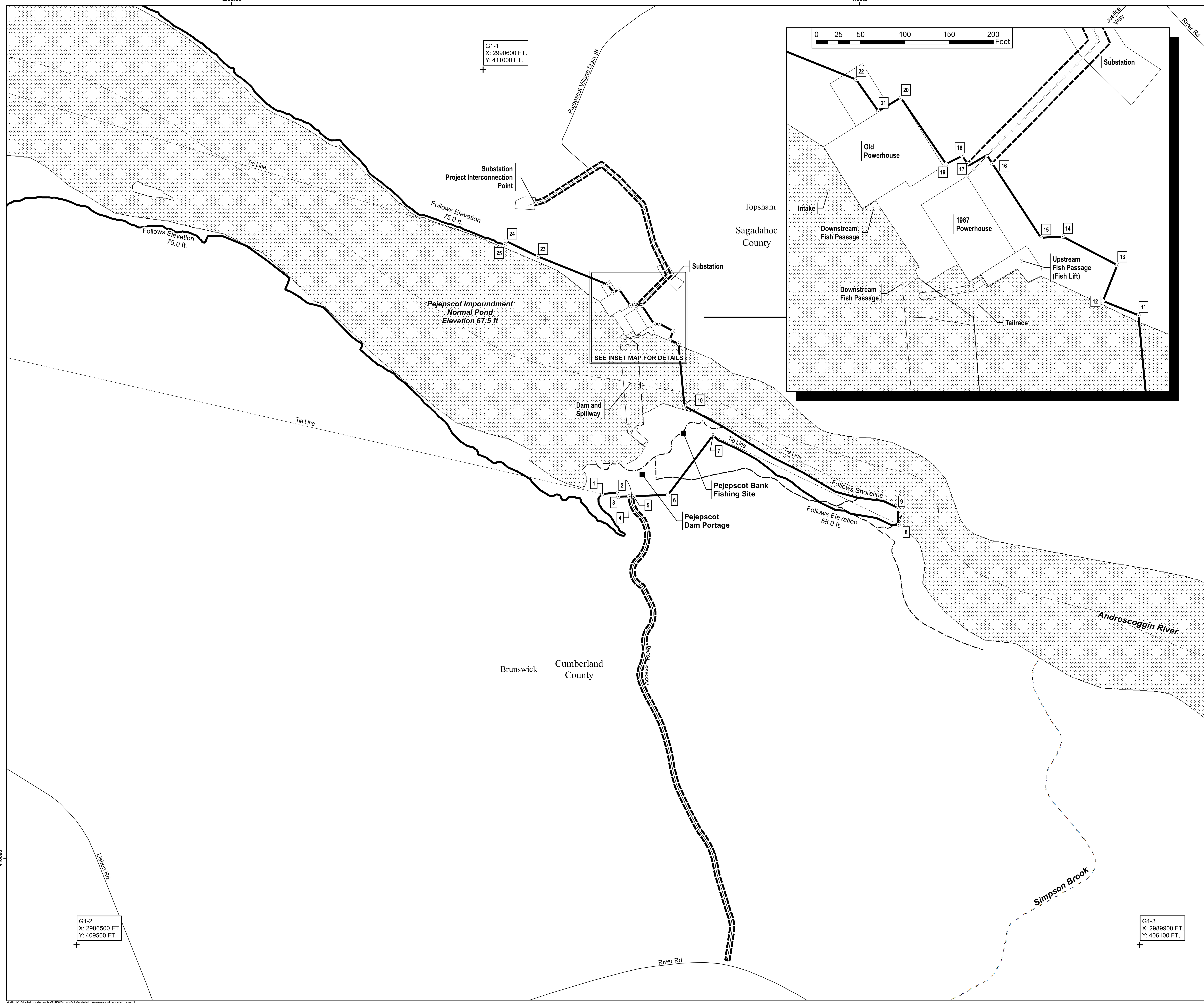
The following maps define the location of the Pejepscot Hydroelectric Project (Project), principal features, and Project boundary:

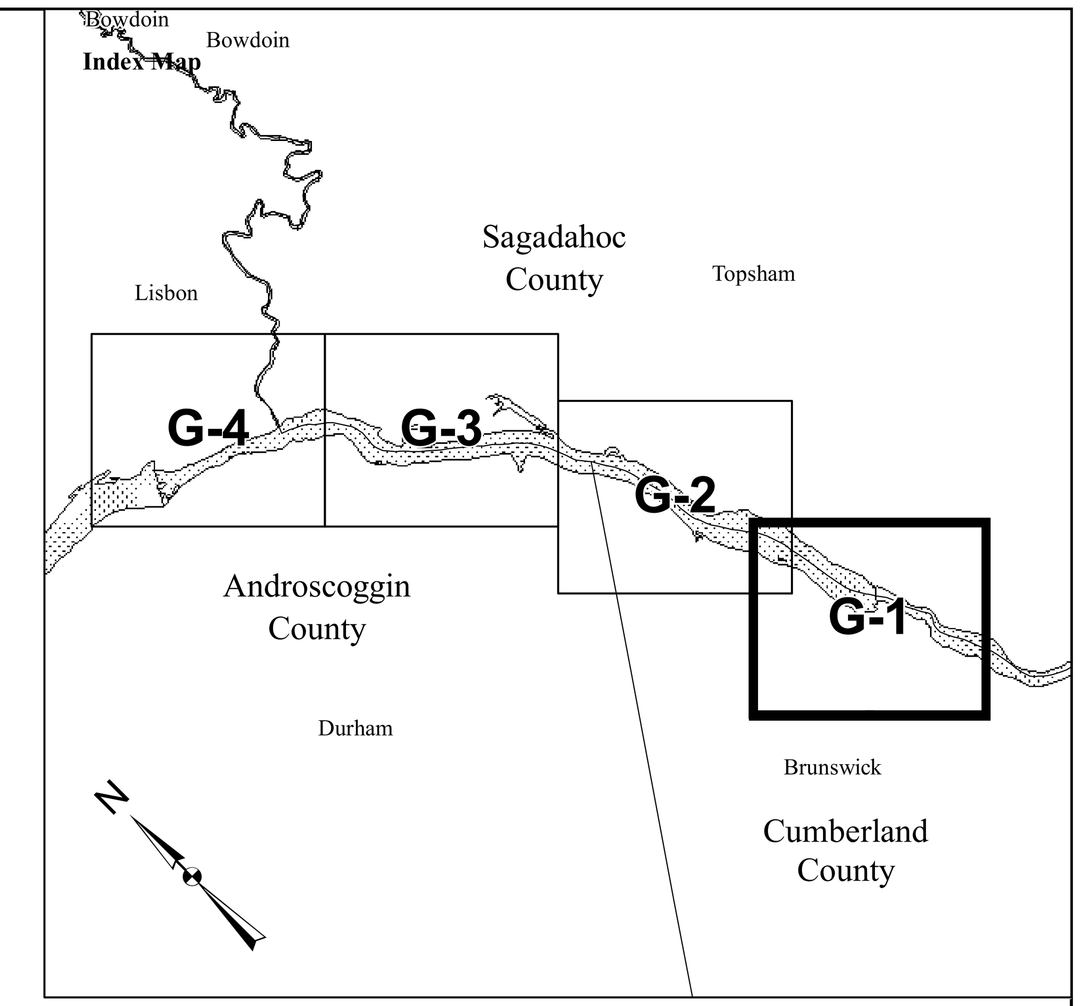
Sheet No.	Title
G-1	Project Boundary Detail Map
G-2	Project Boundary Detail Map
G-3	Project Boundary Detail Map
G-4	Project Boundary Detail Map

The Project boundary maps have been prepared in accordance with the requirements of 18 Code of Federal Regulations (CFR) §§ 4.39 and 4.41(h) and applicable Federal Energy Regulatory Commission (FERC) guidance. The preparation of these boundary maps in support of obtaining a new license for the Project has provided Topsham Hydro the opportunity to make the minor corrections and modifications listed below.

- The Project boundary has been adjusted to fully enclose the Project transmission lines.
- The Project boundary has been adjusted to include the access road to the Pejepscot Fishing Park recreation area located on the western shore of the Androscoggin River.
- The Project boundary generally follows elevation 75 feet, NGVD 1929, along the shoreline of the impoundment. More recent LIDAR data has been used to delineate the 75-foot contour shown for the proposed Project boundary. As such, the location of the contour may differ slightly in some areas, compared to the contour shown for the current Exhibit G drawings on file with the Commission, which were presumably developed with older less accurate mapping technology.
- Both the current and proposed Project boundaries overlap with the project boundary for the upstream Worumbo Project (FERC Project No. 3428). Topsham Hydro is currently in discussions with the owners of the Worumbo Project, Eagle Creek Renewable Energy, in an attempt to resolve this discrepancy before the filing of the Final License Application.

Topsham Hydro possesses the property and/or easement rights associated with all minor corrections and modifications, as well as all areas associated with the defined proposed Project boundary.





Legend

- Reference Point
- Current Project Boundary
- Proposed Project Boundary
- Project Boundary Points (see table in Exhibit G text for description)
- Tie Line
- Recreation Site
- Recreation Trail
- Transmission Line
- Town Boundary
- Waterbody
- River/Creek

GENERAL NOTES:

1. Coordinates shown in NAD83 State Plane Maine West Zone (feet).

2. Vertical datum for all elevations shown is NGVD29.

3. Elevation derived from LiDAR flown November 17 - December 2, 2009, accessed from Maine Geolibrary (https://www.maine.gov/geolib/programs/lidar/index.html).

4. The licensee has acquired rights in fee or easement to all lands necessary for construction, maintenance, and operation of the project.

MN 15° 13' W

Declination changing by 0° 6' E per year

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE PEJEPSCOT HYDROELECTRIC PROJECT (FERC NO. 4784) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE PEJEPSCOT HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

Topsham Hydro Partners Limited Partnership
Pejepscot Hydroelectric Project
FERC No. 4784

SHEET 1 of 4

0 100 200 400 600 800 Feet

EXHIBIT G-1

1 inch = 200 feet

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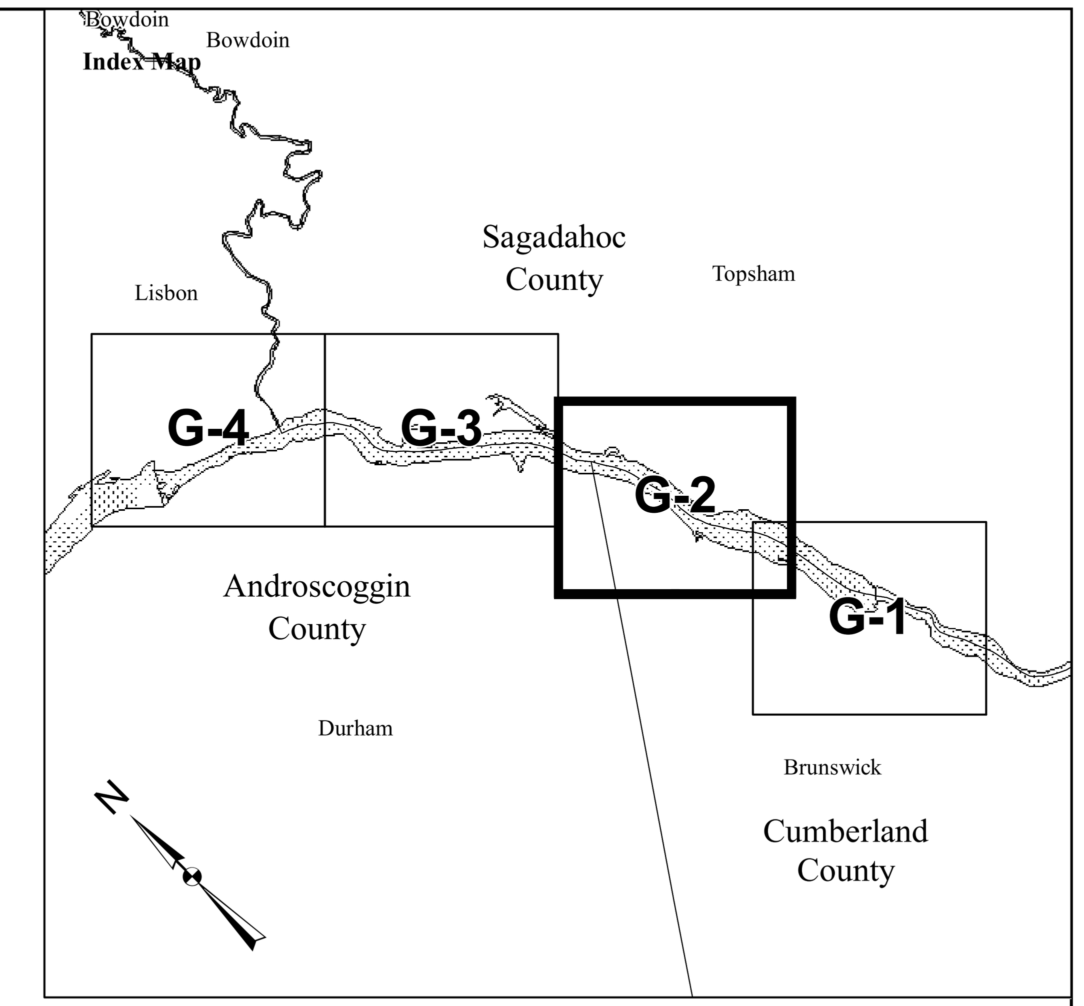

Legend

- Reference Point
- Current Project Boundary
- Proposed Project Boundary
- Project Boundary Points (see table in Exhibit G text for description)
- Tie Line
- Recreation Site
- Recreation Trail
- Transmission Line
- Town Boundary
- Waterbody
- River/Creek

GENERAL NOTES:

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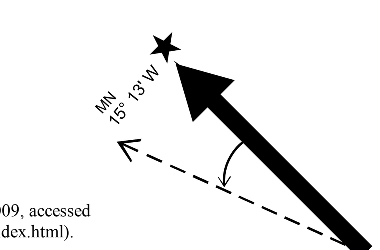
4. The licensee has acquired rights in fee or easement to all lands necessary for construction, maintenance, and operation of the project.



Declination changing by
0° 6' E per year

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Topsham Hydro Partners Limited Partnership
Pejepscot Hydroelectric Project
FERC No. 4784

SHEET 2 of 4

0 100 200 400 600 800 Feet

EXHIBIT G-2

1 inch = 200 feet

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GENERAL NOTES:

1. Coordinates shown in NAD83 State Plane Maine West Zone (feet).

2. Vertical datum for all elevations shown is NGVD29.

3. Elevation derived from LiDAR flown November 17 - December 2, 2009, accessed from Maine Geolibrary (https://www.maine.gov/geolib/programs/lidar/index.html).

4. The licensee has acquired rights in fee or easement to all lands necessary for construction, maintenance, and operation of the project.

I HEREBY STATE THAT THE PROJECT BOUNDARY DELINEATION FOR THE PEJEPSCOT HYDROELECTRIC PROJECT (FERC NO. 4784) AS SHOWN ON THIS EXHIBIT "G" DRAWING IS DEVELOPED WITHIN REASONABLE ACCURACIES AS REQUIRED IN 18CFR4.41 TO THE GEOGRAPHIC LOCATION BASED ON A GRAPHICAL POSITIONING IN REFERENCE TO USGS QUADRANGLE MAPPING WITHIN +/-40 FEET. THE PEJEPSCOT HYDROELECTRIC PROJECT DOCUMENTED PROJECT BOUNDARY LINE WAS ADJUSTED AND OR ROTATED TO BEST FIT WITH THE USGS QUADRANGLE MAP FEATURES GRAPHICALLY AND WAS NOT FIELD SURVEYED.

Topsham Hydro Partners Limited Partnership

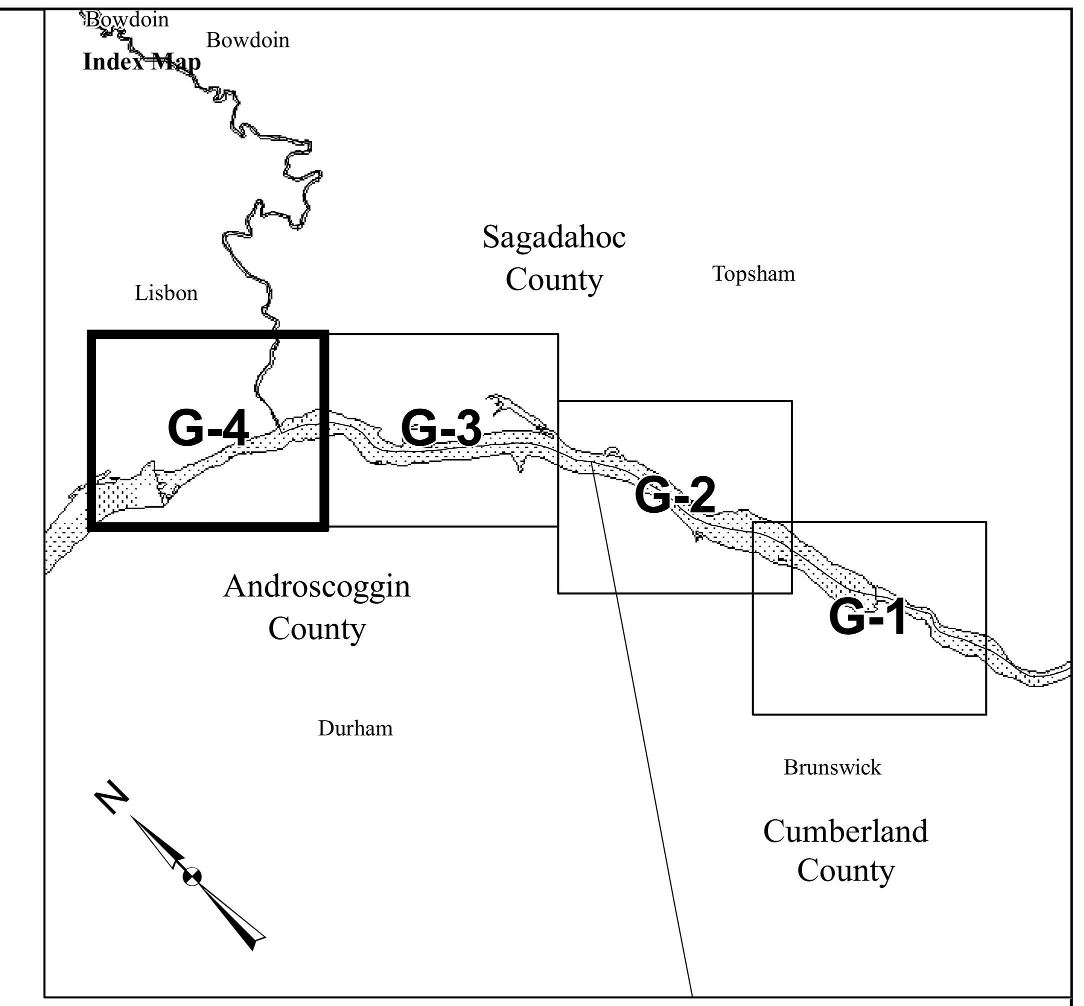
Pejepscot Hydroelectric Project

FERC No. 4784

SHEET 3 of 4

EXHIBIT G-3

1 inch = 200 feet



Legend

- Reference Point
- Current Project Boundary
- Proposed Project Boundary
- Project Boundary Points (see table in Exhibit G text for description)
- Tie Line
- Recreation Site
- Recreation Trail
- Transmission Line
- Town Boundary
- Waterbody
- River/Creek

GENERAL NOTES:

1. Coordinates shown in NAD83 State Plane Maine West Zone (feet).

2. Vertical datum for all elevations shown is NGVD29.

3. Elevation derived from LiDAR flown November 17 - December 2, 2009, accessed from Maine Geolibrary (https://www.maine.gov/geolib/programs/lidar/index.html).

4. The licensee has acquired rights in fee or easement to all lands necessary for construction, maintenance, and operation of the project.

MN 15° 13' W

Declination changing by 0° 6' E per year

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Topsham Hydro Partners Limited Partnership
Pejepscot Hydroelectric Project
FERC No. 4784

SHEET 4 of 4

0 100 200 400 600 800 Feet

EXHIBIT G-4

1 inch = 200 feet

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Project Boundary Description

	NAD83 State Plane Maine West				
Point ID	**Northing**	**Easting**	**Direction**	**Distance (ft)**	**Description**
1	409260.44	2989623.82	S 49-16-7 E	71.96	Point of Beginning
2	409213.48	2989678.35	S 41-52-31 W	17.93	
3	409200.14	2989666.38	S 47-5-30 E	48.49	
4	409167.13	2989701.90	S 47-5-29 E	20.04	Follows 10' buffer of access road centerline
5	409153.48	2989716.57	S 47-5-29 E	156.01	
6	409047.27	2989830.84	N 82-1-12 E	337.34	
7	409094.10	2990164.90	S 19-19-56 E	931.52	Follows elevation 55'
8	408215.11	2990473.28	N 42-0-20 E	71.55	
9	408268.27	2990521.16	N 19-14-36 W	1,071.49	Follows shoreline
10	409279.89	2990168.01	N 39-36-10 E	283.18	
11	409498.08	2990348.53	N 23-15-22 W	43.18	
12	409537.76	2990331.48	N 66-37-59 E	43.81	
13	409555.14	2990371.70	N 17-27-36 W	69.52	
14	409621.45	2990350.84	N 47-51-19 W	24.66	
15	409638.00	2990332.55	N 11-45-13 E	100.63	
16	409736.52	2990353.05	N 44-59-53 W	28.04	Follows 10' buffer of transmission line to project interconnection
17	409756.35	2990333.23	N 10-41-13 E	10.10	
18	409766.28	2990335.10	N 71-16-24 W	20.48	
19	409772.85	2990315.71	N 10-29-59 E	90.26	
20	409861.60	2990332.16	N 75-3-14 W	29.39	
21	409869.18	2990303.76	N 9-51-35 E	43.71	
22	409912.24	2990311.25	N 23-4-35 W	341.70	
23	410226.60	2990177.32	N 19-10-27 W	160.04	
24	410377.75	2990124.75	S 64-19-35 W	16.32	
25	410370.68	2990110.05	N 28-3-32 W	12,943.57	Follows elevation 75'
26	421792.91	2984021.64	N 57-32-44 E	258.68	
27	421931.72	2984239.92	N 42-4-18 W	153.19	

Point ID	NAD83 State Plane Maine West		Direction	Distance (ft)	Description
	Northing	Easting			
28	422045.44	2984137.27	S 57-34-52 W	244.94	
29	421914.13	2983930.51	N 69-21-50 W	2,665.75	Follows elevation 75'
30	422853.62	2981435.79	N 67-35-22 W	196.78	
31	422928.64	2981253.88	N 47-45-19 W	241.06	
32	423090.70	2981075.42	N 36-35-53 W	60.99	
33	423139.67	2981039.06	N 35-12-13 W	17.16	
34	423153.69	2981029.17	N 45-41-14 E	34.99	
35	423178.13	2981054.20	S 45-39-39 E	88.16	
36	423116.51	2981117.26	N 44-2-42 E	36.83	
37	423142.99	2981142.86	N 42-43-10 W	70.38	
38	423194.70	2981095.12	N 40-10-1 W	51.03	
39	423233.70	2981062.20	N 37-48-44 W	60.99	
40	423281.88	2981024.81	S 49-14-55 W	53.86	
41	423246.72	2980984.01	S 45-39-39 E	90.14	
42	423183.72	2981048.48	S 45-23-11 W	63.33	
43	423139.25	2981003.40	S 0-40-18 E	18.11	
44	423121.14	2981003.61	S 30-56-44 E	38.20	
45	423088.37	2981023.25	S 42-7-59 E	30.51	
46	423065.75	2981043.73	S 54-29-28 W	116.16	
47	422998.28	2980949.17	S 59-7-15 E	112.97	
48	422940.30	2981046.13	S 66-7-1 E	129.62	
49	422887.82	2981164.64	N 86-25-24 E	56.72	
50	422891.36	2981221.25	S 61-50-15 E	66.21	
51	422860.11	2981279.62	S 58-12-4 E	69.38	
52	422823.55	2981338.59	S 60-20-44 E	82.47	
53	422782.75	2981410.25	S 25-37-53 W	268.41	
54	422540.75	2981294.14	S 32-5-46 E	15,676.23	Follows elevation 75' to point of beginning

EXHIBIT H
DESCRIPTION OF PROJECT MANAGEMENT AND NEED FOR PROJECT POWER

April 2020

PEJEPSCOT HYDROELECTRIC PROJECT

(FERC NO. 4784)

APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM

DRAFT EXHIBIT H
DESCRIPTION OF PROJECT MANAGEMENT AND NEED FOR PROJECT POWER

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LIST OF ABBREVIATIONS AND DEFINITIONS

ASMFC	Atlantic States Marine Fisheries Commission
cfs	Cubic feet per second
Commission	Federal Energy Regulatory Commission
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
Licensee	Topsham Hydro Partners Limited Partnership
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
ME	Maine
NRI	National Rivers Inventory
Pejepscot Project	Pejepscot Hydroelectric Project (FERC No. 4784)
Project	Pejepscot Hydroelectric Project (FERC No. 4784)
SCORP	Maine Statewide Comprehensive Outdoor Recreation Plan
Topsham Hydro	Topsham Hydro Partners Limited Partnership

PEJEPSCOT HYDROELECTRIC PROJECT

(FERC NO. 4784)

**APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM**

**DRAFT EXHIBIT H
DESCRIPTION OF PROJECT MANAGEMENT AND NEED FOR PROJECT POWER**

1 INTRODUCTION

The Pejepscot Hydroelectric Project (Project) is an existing hydroelectric project owned by, and licensed to, Topsham Hydro Partners Limited Partnership (Topsham Hydro). Topsham Hydro is an independent power producer and, as such, does not provide electric service to any particular group or class of customers. The Project generates renewable power that is currently sold into the New England wholesale market administered by the non-project Independent System Operator for New England (ISO New England). ISO New England administers all significant aspects of the New England Power Pool (NEPOOL) power market including: (i) the NEPOOL Open Access Transmission Tariff; (ii) the dispatch, billing and settlement system for interchange power in NEPOOL; (iii) NEPOOL energy and automatic generation control markets; and (iv) the NEPOOL installed capability market.

2 INFORMATION TO BE SUPPLIED BY ALL APPLICANTS

2.1 Plans and Ability of Owners of Pejepscot Dam to Operate and Maintain the Project

2.1.1 Plans to Increase Capacity or Generation

Topsham Hydro has no current plans to increase the capacity or generation of the Project.

2.1.2 Plans to Coordinate the Operation of the Project with Other Water Resource Projects

The current Federal Energy Regulatory Commission (FERC or the Commission) license requires that the Project be operated in a run-of-river mode. Seasonal flows and daily inflow to the Project impoundment vary almost exclusively upon the operation of upstream storage and hydroelectric projects (see Figure 2.1.2-1) and, to some small degree, inflow from impoundment tributaries. Under typical operations, inflow to the Pejepscot impoundment is relatively steady throughout each day.

Topsham Hydro is proposing to operate the Project in the same manner as it has been operated over the course of its current license. As a result, there will be no change to the Project impoundment or to downstream flows.

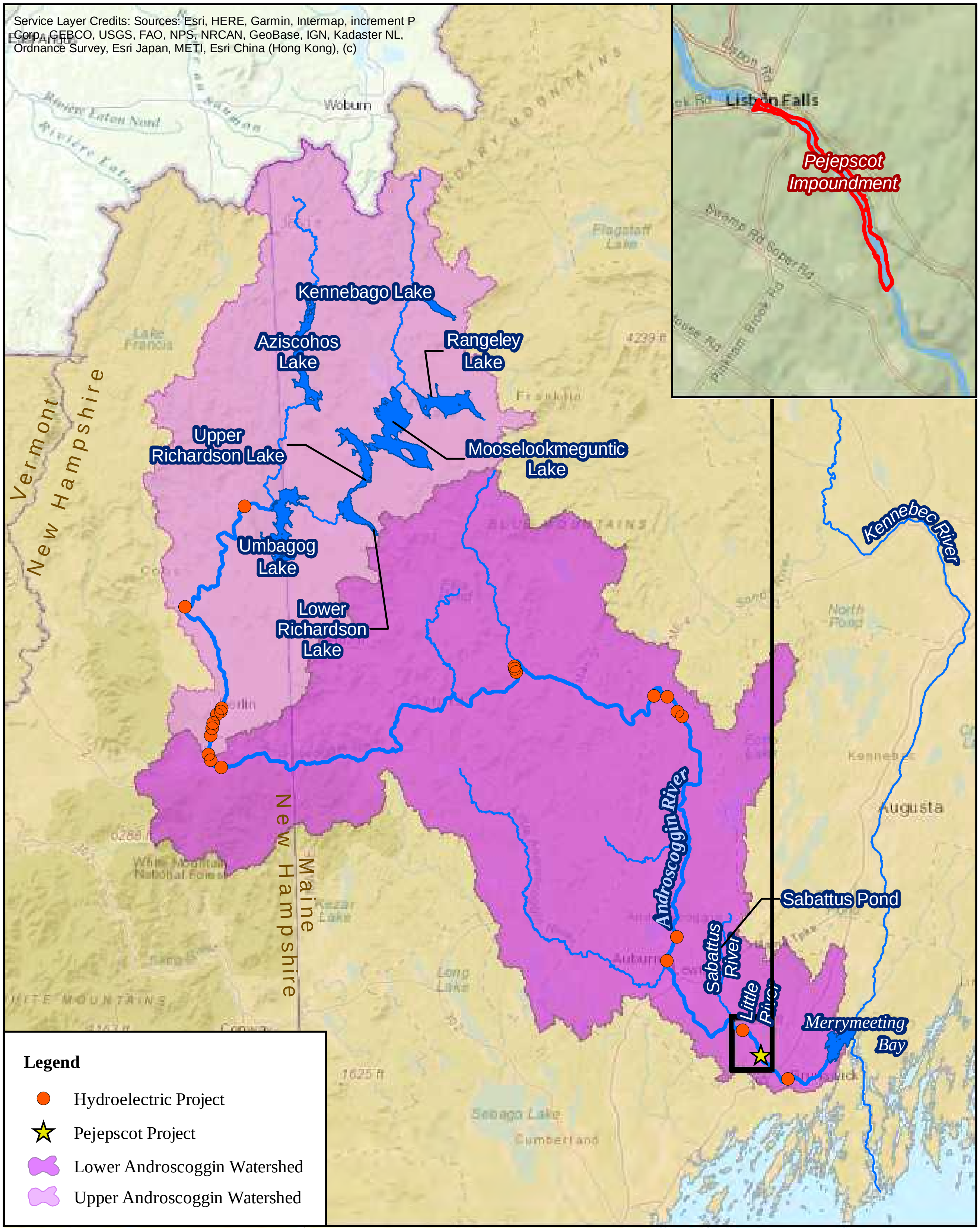
The Pejepscot Project provides 13.88-megawatts of clean renewable power. Average annual generation for the period 2009-2019 was approximately 68,516 megawatt hours per year.

2.1.3 Plans to Coordinate the Operation of the Project with Other Electrical Systems

Topsham Hydro is an independent power producer and member of NEPOOL that currently sells power from the Project wholesale to ISO New England. NEPOOL is a voluntary association whose members include not only traditional vertically integrated electric utilities, but independent power producers such as Topsham Hydro that are participating in the competitive wholesale electricity marketplace. ISO New England serves as the independent system operator to operate the regional bulk power system and to administer the wholesale marketplace. ISO New England's primary responsibilities are to coordinate, monitor, and direct the operations of the major generating and transmission facilities in the region. The objective of ISO New England is to promote a competitive wholesale electricity marketplace while maintaining the electrical system's integrity and reliability. ISO New England seeks to assure both maximum reliability and economy of the bulk power supply for New England.

To this end, the electric facilities of NEPOOL member companies are operated as if they comprised a single power system. ISO New England accomplishes this by central dispatching of available power resources and using the lowest cost generation and transmission equipment available at any given time consistent with meeting reliability requirements. As a result of this economic dispatch, utilities and their customers realize significant savings annually. NEPOOL participants also have strengthened the reliability of the bulk power system through shared operating reserves and coordinated maintenance scheduling.

The ISO New England staff constantly monitors and directs the operation of more than 300 generators and more than 7,600 miles of transmission lines in New England. ISO New England also is responsible for forecasting various levels of daily electricity demand that will occur throughout the region and scheduling resources to meet the demand.



Brookfield

N

0 3.75 7.5 15 Miles

Pejepscot Hydroelectric Project
(FERC No. 4784)
Draft License Application

Figure 2.1.2-1:
Androscoggin River Basin

Path: P:\1925\maps\dla\exhibit_h\figure_h_2_1_2-1_river_basin.mxd

2.2 Need for Electricity Generated by the Project

2.2.1 The Reasonable Costs and Availability of Alternative Sources of Power

The Project generates renewable power. The electrical output from the Project is sold wholesale into the ISO New England administered market.

The replacement of energy and capacity provided by the Project would be met through other sources, likely to be fossil-fired generating units, whose fuel and other viable costs would be significantly higher than those of the Project. As the lowest variable cost resource among power supply alternatives, hydroelectric assets such as the Project can bid energy into the ISO New England market at lower prices than alternative resources. Thus, loss of a low-variable cost resource such as the Project would result in upward pressure on the clearing prices in the NEPOOL market and ultimately paid by electric consumers in New England.

The Project provides renewable power, without the emissions of air pollutants or greenhouse gases that the marginal fossil fuel plants produce. This is an increasingly important fact in New England where all six New England states have enacted legislation to reduce the dependence on fossil fired generation through the introduction of Renewable Portfolio Standards (RPS), or similar legislation, that encourages and requires the use of renewable power sources. Legislation that has been enacted is designed to increase the amount of renewable power supply in the region's mix of generation resources or, alternatively, reduce the amount of fossil fired generation as a percentage of the total resource output.

As these statutes and rules are implemented or adopted in New England, "clean" hydroelectric generation becomes an even more important and valuable part of the fuel mix for electric suppliers in the region.

2.2.2 Increase in Costs if the Licensee is not Granted a License

If Topsham Hydro is not granted a license, this Project would cease to provide affordable and clean electricity to NEPOOL from its generation. An unquantified increase in costs would likely occur to the New England electric consumer if a license for continued operation of the Project was not granted.

2.2.3 Effects of Alternative Sources of Power

2.2.3.1 Effects on Licensee's Customers

This section is not applicable since Topsham Hydro is a wholesale supplier.

2.2.3.2 Effect on Licensee's Operating and Load Characteristics

Topsham Hydro is an independent power producer and, as such, does not maintain a separate transmission system which could be affected by replacement or alternative power sources.

2.2.3.3 Effect on Communities Served by the Project

See the discussion above in Sections 2.2.1 and 2.2.2 regarding the loss of the Project's generation. Because Topsham Hydro cannot predict with any certainty the actual type or location of a potential alternative facility providing replacement power, they cannot specifically discuss potential effects of any particular community.

However, if ISO New England must replace the power benefits generated at the Project, the cost would be significantly more than the projected cost of operating the Project under the new license.

2.3 Need, Reasonable Cost, and Availability of Alternative Sources of Power

Topsham Hydro is an independent power producer and, as such, does not have an obligation or need to prepare load and capability forecasts in reference to any particular group or class of customers. For the region, those obligations and tasks remain within the scope of services provided by ISO New England and NEPOOL.

2.4 Effect of Power on Licensee's Industrial Facility

This section is not applicable to Topsham Hydro, which does not own industrial facilities.

2.5 Need of Indian Tribe Licensee for Electricity Generated by the Project

This section is not applicable to Topsham Hydro.

2.6 Impacts on the Operations and Planning of Licensee's Transmission System

Because Topsham Hydro is an independent power producer and does not own the local transmission system, this section is not applicable. Topsham Hydro maintains a single-line diagram (Appendix H-1) for the Project that is considered Critical Energy Infrastructure Information (CEII) in accordance with the Commission's regulations, and thus Topsham Hydro is filing a copy of the Project's single-line diagram as CEII with the Commission within Volume II of this application.

2.7 Statement of Need for Modifications

Topsham Hydro is not proposing any changes to the Project facilities or operation. Relicensing and the continued operation of the Project will continue to be compatible with the comprehensive development and utilization of the waterway and conform to the various comprehensive natural resource plans developed by resource management agencies, as discussed below.

2.8 Consistency with Comprehensive Plans

Section 10(a)(2) of the Federal Power Act (FPA) requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, and conserving waterways affected by the Project. In accordance with Section 10(a)(1) of the FPA, the list of Commission approved federal and state comprehensive plans was reviewed to determine applicability to the Project. The federal resources agencies, as well as the State of Maine, have prepared a number of comprehensive plans, which provide a general assessment of a variety of environmental conditions in Maine. These plans address water quality, water pollution control, wetlands, recreation, and land management issues. In addition, the State of Maine's plans include policies related to ensuring that the State's energy needs are met and supporting hydropower, a renewable and indigenous source, as a valuable portion of the energy mix. The Project's consistency with pertinent state and federal comprehensive plans is discussed below.

2.8.1 FERC-Approved State of Maine Comprehensive Plans

Note: Unless otherwise noted, these plans have not been updated or updates have not been submitted to FERC for approval since their development dates noted below.

Maine State Planning Office. 1987. Maine Comprehensive Rivers Management Plan. Augusta, Maine. May 1987

In 1982, the Maine State Planning Office (MSPO) submitted to FERC the Maine Comprehensive Rivers Management Plan, which was comprised of two volumes and approved by FERC in October 1982. In 1987, MSPO (eliminated in July 2012) submitted to FERC a three-volume update to the plan. Volumes 1 and 2 of the plan included the Comprehensive Hydropower Plan and Executive Department Orders and other river-related plans. Volume 3 of the Plan, included in the updated submittal in 1987, contained hydro-related core laws, Executive Orders, and other plans. In 1992 and 1993, the State of Maine produced Volumes 4 and 5 of the Comprehensive Rivers Management Plan, respectively. These volumes have also been approved by FERC. Each volume and its respective components are described in greater detail below.

State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 1

Volume 1 contains the Comprehensive Hydropower Plan issued by the Maine Office of Energy Resources (MOER) in October 1982[1]. The Comprehensive Hydropower Plan consists of three parts: Maine Rivers Policy, The Projected Contribution of Hydroelectric Generation to Meeting Maine's Electricity Needs in 1990 and 2000, and the Statewide Fisheries Plan, Summary.

[1] The Office of Energy Resources has since been disbanded. The State Planning Office was responsible for oversight and development of Maine's comprehensive plans until it was disbanded in July 2012, although the Department of Agriculture, Conservation, and Forestry does provide municipal level assistance in municipal level comprehensive planning.

"Maine Rivers Policy," Executive Order No. 1, FY82/83

On July 6, 1982, then Governor Joseph E. Brennan issued the Maine Rivers Policy which designates certain river stretches as meriting special protection. The Order stated that no new dams shall be constructed on these stretches and that additional development or redevelopment of existing dams on these stretches be designated and executed in a manner that either enhances significant resources values or does not diminish them. This policy was adopted legislatively as part of the Maine Rivers Act.

The section of the Androscoggin River on which the Project is located is not one of the listed river segments meriting special protection. Therefore, the Project conforms to this portion of the Plan.

The Projected Contribution of Hydroelectric Generation to Meeting Maine's Electricity Needs in 1990 and 2000 (MOER, October 1982)

Executive Order No. 1, FY82/83 directed MOER to prepare an estimate of the contribution that hydropower could make to meet the State's electricity needs in the years 1990 and 2000. The report was prepared in 1982; therefore, a majority of the information in the MOER report is outdated. However, the report does stress that Maine's energy policy "call for increased reliance on indigenous and renewable resources, such as hydro, in preference to imported and nonrenewable resources, such as oil." This projection does not appear to have been revised or updated since publication.

The Project currently conforms to this portion of the Plan in that it contributes hydroelectric generation (an indigenous and renewable resource) in meeting Maine's electricity needs. The new license for the Project is projected to be issued in 2022. Assuming that the Project will continue to generate electricity, it conforms to this portion of the Plan.

Statewide Fisheries Plan, Summary (Maine Department of Inland Fisheries and Wildlife (MDIFW), June 1982)

The Statewide Fisheries Plan evaluates, by river basin, whether new or improved fish passage facilities may be needed at hydroelectric projects and specifies the fishery agencies management goals, as they existed in 1982. This Plan represents the policies of the three author agencies (MDIFW, Maine Department of Marine Resources, and the Atlantic Sea-Run Salmon Commission (ASC)) regarding conservation, management, and enhancement of river fishery resources in Maine. The Plan also identifies and evaluates significant river fisheries based upon several criteria.

A discussion of existing fishery resources in the Project study area is contained in Exhibit E, Section 4.6.

State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 2

Volume 2 of the State of Maine Comprehensive Rivers Management Plan consists of the 1982 Maine Rivers Study. The Maine Rivers Study, generated by the Maine Department of

Conservation (MDOC) and the National Park Service (NPS), defines a list of unique and natural recreation rivers and classifies them as A, B, C, or D. The mainstem of the Androscoggin River is a Class C waterbody from its confluence with the Atlantic Ocean at Merrymeeting Bay, through Project waters, upstream until its confluence with the Ellis River about 100 miles upstream of the Project at Rumford Point in Maine. Details regarding the unique or significant resources that are located in the Project area can be found in Exhibit E.

State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 3, Part I

Volume 3 of the State of Maine Comprehensive Rivers Management Plan contains two parts. Part I is a compilation of laws which affect the construction, operation, maintenance, and licensing of hydro projects in Maine, including: The Maine Rivers Act 12 M.R.S.A. §401 et. seq.; Maine Waterway Development and Conservation Act (MWDCA) 38 M.R.S.A. §630 et. seq.; An Act Concerning Fishways in Dams and Other Artificial Obstructions in Inland Waterways 12 M.R.S.A. §7701-A; An Act Concerning Fishways in Dams and Other Artificial Obstruction in Coastal Waterways 12 M.R.S.A. §6121; An Act to Amend the Classification System for Maine Waters and Change the Classification of Certain Waters 38 M.R.S.A. §464 et. seq.; Alteration of Rivers, Streams, and Brooks 38 M.R.S.A. §425 et. seq.; Mandatory Shoreland Zoning and Subdivision Control 38 M.R.S.A. §435 et. seq.; Land Subdivision 30-A M.R.S.A. §4401-4407; and Land Use Regulations 12 M.R.S.A. §681 et. seq. The applicability of these Core Laws to the Project is discussed below.

Maine Rivers Act

In the *Maine Rivers Act* 12 M.R.S.A. §401 *et. seq*., the Legislature expressly found:

> …the state's rivers comprise one of its most important natural resources, historically vital to the state's commerce and industry; that the value of the state's rivers and streams has increased due to the growth in demand for hydropower; that the rivers and streams afford Maine people with major opportunities for economic expansion through the development of hydropower; and that "the best interests of the state's people are served by a policy which recognizes the importance that their rivers and streams have for meeting portions of several public needs, provides guidance for striking a balance among the various uses which affords the public the maximum benefit and seeks harmony rather than conflict among these uses." 38 M.R.S.A. §402(6)

Topsham Hydro has consulted with and actively worked to resolve issues as they were raised by appropriate federal and state agencies, tribes, local governments, and non-governmental organizations during the relicensing process. This process has identified the importance of continued operation of the Project while identifying the relative importance of the river and its resources for various uses in providing public health benefits. Where Topsham Hydro has worked with the various interests to develop a proposal that balances all of the applicable needs, the Project conforms to this portion of the Plan.

Maine Waterway Development and Conservation Act (MWDCA) 38 M.R.S.A. §630 et. seq.

The MWDCA replaced several earlier laws and requires the developer to obtain one permit from the Maine Department of Environmental Protection (MDEP). The legislature emphasized the importance of hydropower to the State of Maine when it enacted the MWDCA.

The legislature found and declared that the surface waters of the State constitutes a valuable indigenous and renewable energy resource; and that hydropower development utilizing these waters is unique in its benefits and impacts to the natural environment, and makes a significant contribution to the general welfare of the citizens of the State for the following reasons:

- Hydropower is the State’s only economically feasible, large-scale energy resource which does not rely on combustion of a fuel, thereby avoiding air pollution, solid waste disposal problems and hazards to human health from emissions, wastes, and by-products. Hydropower can be developed at many sites with minimal environmental impacts, especially at sites with existing dams or where current type turbines can be used.
- Like all energy generating facilities, hydropower projects can have adverse effects; in contrast with other energy sources, they may also have positive environmental effects. For example, hydropower dams can control floods and augment downstream flow to improve fish and wildlife habitats, water quality, and recreation opportunities.
- Hydropower is presently the State’s most significant indigenous resource that can be used to free our citizens from their extreme dependence on foreign oil for peaking power.

Topsham Hydro is proposing to continue to operate the Project for power generation in coordination with upstream storage facilities in the Androscoggin River system to provide a source of renewable energy available to the people of Maine and a reliable flow of water to downstream commercial and recreational users. Therefore, the continued operation of the Project is consistent with the policies expressed by the Maine legislature. By continuing to operate the Project, the energy-related benefits noted above will continue, in addition to fish and wildlife habitat, water quality, and recreation opportunities.

An Act Concerning Fishways in Dams and Other Artificial Obstructions in Inland Waterways 12 M.R.S.A. §7701-A

This Act was enacted with the intent of conserving, developing, or restoring anadromous or migratory fish resources by requiring the construction or repair of fishways. Under the Act, the decision to require a fishway at a dam must be based on the restoration of one or more fish species of anadromous or migratory fish to the area upstream of the obstruction. The decision to require a fishway may be justified by the protection or enhancement of any rare, threatened, or endangered fish species.

The Project area contains both riverine and impoundment fisheries habitats (see Exhibit E, Section 4.6). Upstream and downstream fish passage is required at the Project due to the presence of anadromous or other migratory fish runs within the Project area. Continuation of

Project operation will help to maintain upstream and downstream passage of target fish species throughout the Androscoggin River.

An Act Concerning Fishways in Dams and Other Artificial Obstructions in Coastal Waters 12 M.R.S.A. §6121

This Act is not pertinent to the Project given the Project's location along an inland waterway.

The Maine Dam Inspection, Registration, and Abandonment Act 38 M.R.S.A. §815 et. seq.[2]

This law allows MDEP to establish water level regimes and minimum flow requirements for impoundments not within the jurisdiction of FERC.

Topsham Hydro currently holds a valid FERC license for Project operation and is submitting a License Application to FERC for the continued operation of the Project. Therefore, the Project is not subject to MDEP jurisdiction regarding establishment of water levels for non-FERC jurisdictional projects.

An Act to Amend the Classification System for Maine Waters and Change the Classification of Certain Waters 38 M.R.S.A. §464 et. seq.

This Act was enacted to restore and maintain the chemical, physical, and biological integrity of the State's waters and to preserve certain pristine state waters. Water quality standards for fresh surface waters established by the Act that are pertinent to the Project consist of Class C waters. The mainstem of the Androscoggin River is a Class C waterbody from its confluence with the Atlantic Ocean at Merrymeeting Bay, through Project waters, upstream until its confluence with the Ellis River about 100 miles upstream of the Project at Rumford Point in Maine.

Class C waters must be of such quality that they are suitable for the designate uses of drinking water after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life.

The operation of the Project and its consistency with these standards is discussed in Exhibit E, Section 4.5.

Alteration of Rivers, Streams, and Brooks 38 M.R.S.A. §425 et. seq.

This article prohibited the alteration of a river, stream, or brook or areas adjacent to rivers, streams, or brooks due to dredging, filling, or construction such that any dredged spoil, fill or structure may fall or be washed into these waters without first obtaining a permit from the Commissioner. This act was replaced with the Natural Resources Protection Act (NRPA), 38 M.R.S.A.§480-A *et. seq.,* which regulates similar activities along the State's waters. However, projects that are reviewed under the MWDCA are not subject to review under NRPA.

[2] Legislative actions in recent years have changed the scope of this act.

Topsham Hydro is not proposing any construction or redevelopment of the Project that would require an NRPA permit. If any construction is proposed in the future, the appropriate permits will be obtained.

Mandatory Shoreland Zoning and Subdivision Control 38 M.R.S.A. §435 et. seq.

This article requires that lands within 250 feet of the normal high water mark of certain waters or wetlands be subjected to municipal zoning and subdivision control.

The adjoining towns currently have zoning requirements for those lands located within 250 feet of the normal high water mark of the Project impoundment. Topsham Hydro will obtain any required shoreland zoning permits from the adjoining towns, prior to construction of any of the new facilities.

Land Subdivision 30-A M.R.S.A. §4401-4407

This article grants special protection from land subdivisions to particular river reaches identified in the article.

This article does not mention any Project lands. Land use and shoreline issues are discussed in Exhibit E, Section 4.10. The Project conforms to this portion of the Plan.

Land Use Regulations 12 M.R.S.A. §681 et. seq.

This article requires the sound planning, zoning, and subdivision control of the unorganized and organized townships of the State.

The Pejepscot Project is consistent with the Village of Pejepscot and towns of Topsham, Lisbon, Durham, and Brunswick's regulations and zoning. Land use and shoreline issues are discussed in Exhibit E, Section 4.10.

<u>State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume 3, Part II</u>

Part II is a compilation of Executive Department Orders and other plans, including: Maine Rivers Policy Executive Order No. 1, FY82/83; Recreation Management and Resource Protection for Maine's Rivers; Designating the State Agencies Responsible for Water Quality Certification, Executive Order No. 5, FY85/86 Note: Updated Order No. 3, 96/97. (Note: A discussion of revised laws and Executive Department Orders implemented after the submittal of Volume 3 to the FERC in 1987 is contained in Volume 4 of the State of Maine Comprehensive Rivers Management Plan submitted to FERC in 1992, see discussion below.)

Maine Rivers Policy Executive Order No. 1, FY82/83

The Project's compliance with the Maine Rivers Policy has previously been discussed under Part I, Volume 3 of the State of Maine Comprehensive Rivers Management Plan.

Recreation Management and Resources Protection for Maine's Rivers

This is a 1985 summary report of the 1983 study titled "Maine Rivers Access and Easement Plan" by Joseph W. Hardy. This document summarizes a strategy developed in 1983 by the MDOC for protecting unique natural values and for maintaining recreational opportunities along Maine's rivers.

Topsham Hydro's proposal for continued operation of the Project is consistent with this document. Topsham Hydro manages the Project impoundment and tailwater areas to provide fishing, and both motorized and non-motorized boating opportunities for the general public.

Designating the State Agencies Responsible for Water Quality Certification, Executive Order No. 5, FY85/86 Note: Updated Order No. 3, 96/97

This Executive Order identifies the state agencies responsible for reviewing and authorizing water quality certifications for hydropower projects. MDEP has jurisdiction for water quality certification for the relicensing of the Project.

Topsham Hydro will apply for water quality certification from MDEP. Proof of receipt of delivery of the 401 Water Quality Certification Application to MDEP will be filed with the Commission when it is available.

<u>State of Maine Comprehensive River Management Plan – December 1992 – Volume 4, Part I</u>

Volume 4 of the State of Maine Comprehensive River Management Plan consists of three sections. Part I is a summary of the revised Core Hydro Laws subsequent to those contained in Volume 3, which were approved in 1987.

The revisions to the Core Hydro Laws contained in Volume 4 of the Plan are not all pertinent to the Project. The revised Core Hydro Laws that are pertinent to the Project are discussed below.

Special Protection for Outstanding Rivers

This law identifies river segments that are protected from further hydroelectric development in the State of Maine.

The Project is not located on an Outstanding River segment and is therefore compliant with this plan.

Hydropower Relicensing Standards

These standards require that existing hydropower impoundments be managed to protect habitat and aquatic life criteria commensurate with the appropriate water quality classifications. The standards are pertinent to the Project in that the Project area is subject to Class C water quality standards. Maine statutes at 38 M.R.S.A. subsection 464(10) clarifies that hydropower projects with riverine impoundments must satisfy the aquatic life criteria contained in 38 M.R.S.A. subsection 465(4)(c), which states that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

The Project is consistent with the Hydropower Relicensing Standards in that operation of the Project impoundment supports all species of indigenous fish and maintains the structure and function of the resident biological community (see Exhibit E, Sections 4.5 and 4.6 for details).

State of Maine Comprehensive River Management Plan – December 1992 – Volume 4, Part II – Compilation of Executive Orders and Other Plans

Part II is a compilation of Executive Orders and other plans including Maine resource agency policy regarding hydropower. Part II of Volume 4, Implementing Plans and Orders, contains State resource agency plans and policies regarding hydropower. The following plans and orders are discussed:

State of Maine Statewide River Fisheries Management Plan, June 1982

This Plan is discussed previously under State of Maine Comprehensive Rivers Management Plan, May 1987 – Volume I.

Maine Comprehensive Hydropower Plan, July 1992

This Plan assessed the then current and future demand for hydropower in the State of Maine. Hydropower is recognized as a significant resource available for use in meeting current and future energy needs.

Operation of the Project is consistent with this Plan as it will continue to produce reliable, efficient indigenous energy from hydropower to meet the State of Maine energy needs.

Maine State Agency Hydropower Policy Statements

These policy statements provide the basis for agency comments on hydro-project license applications.

These statements are not directly applicable to the Project as they set out the policy for State agencies to follow in commenting on hydro projects in general. Agency comments on the Project are addressed in the appropriate sections of Exhibit E.

Executive Order Designating the State Agencies Responsible for Water Quality Certification

This order identifies MDEP as the agency responsible for reviewing and providing water quality certification.

Topsham Hydro will apply for water quality certification from MDEP. Proof of receipt of delivery of the 401 Water Quality Certification Application to MDEP will be filed with the Commission when it is available.

Feasibility Study of Maine's Small Hydropower Potential

This study was performed for the MOER and examined the potential for development/expansion of hydropower development of Maine's low head dams.

This Plan is not applicable to the Project.

Maine Hydropower Licensing and Relicensing Status Report 1989-1991

These reports update hydropower licensing and relicensing activities in the State of Maine for 1989 through 1991.

The Project relicensing began after this report was written and is not included in this summary of licensing activities.

State of Maine Comprehensive River Management Plan – December 1992 – Volume 4, Part III – Hydropower and Relicensing Reports and Studies

This section of Volume 4 of the State of Maine Comprehensive River Management Plan described the regulations for hydropower relicensing and reported the status of Maine projects with regard to the federal relicensing process.

The studies and reports contained in Part III of the State of Maine Comprehensive River Management Plan are not pertinent to the Project.

State of Maine Comprehensive River Management Plan – February 1993 – Volume 5

Volume 5 of the State of Maine Comprehensive River Management Plan contains the MSPO[3] Natural Resources Policy Division's publication entitled Kennebec River Resource Management Plan: Balancing Hydropower Generation and Other Uses. This document provides a description of the various resources and beneficial uses contained in the Kennebec River Basin and provides recommendations on balancing the needs of these resources and uses. Given that the Project is located on the Androscoggin River, the Plan is not applicable to the Project.

Management of Atlantic Salmon in the State of Maine: A Strategic Plan – July 1984, Maine Atlantic Sea-Run Salmon Commission

This Plan lists as its objectives the maintenance of Atlantic salmon populations in rivers where they currently exist, and the restoration of Atlantic salmon populations in historical salmon rivers. The plan also identifies specific strategies to achieve the stated objectives, including fishway installation or improvement, increased hatchery capacity, and diversion of hatchery stocks once natural reproduction increases in stocked rivers.

[3] The SPO was disbanded in July 2012, although the Department of Agriculture, Conservation, and Forestry does provide municipal level assistance in municipal level comprehensive planning.

Topsham Hydro maintains and operates both upstream and downstream fish passage facilities at the Project and is actively consulting with applicable resource agencies in accordance with the requirements of the Endangered Species Act (ESA).

Maine State Comprehensive Outdoor Recreation Plan (SCORP) 2014-2019, Maine Department of Conservation, Bureau of Parks and Lands

The 2003 - 2008 SCORP is included in the FERC Comprehensive Plan, however, it was updated in 2009 and again in 2014. This Plan serves as the State's official policy document for statewide outdoor recreation planning and for acquisition and development of public outdoor recreation areas and facilities. The plan identifies outdoor recreation issues of Statewide importance based upon, but not limited to, input from the public participation program and also provides information about the demand for and supply of outdoor recreation resources and facilities in the state. The SCORP satisfies the requirements of the Land and Water Conservation Fund (LWCF) Act (P.I. 88-578) which dictates that each state have an approved SCORP available on file with the National Park Service in order to participate in the LWCF program. The SCORP contains an implementation program that identifies the State's strategies, priorities, and actions for the obligation of its LWCF apportionment. The SCORP also includes a wetlands priority component with Section 303 of the Emergency Wetlands Resources Act of 1986. This wetland component provides information on state wetland conservation planning efforts as reflected in the Maine Wetlands Priority Conservation Plan published in 1988.

The SCORP does not contain any recommendations or assessments that are specific to the Project area. Topsham Hydro has consulted with MDIFW on access and other recreation issues in the Project area throughout the relicensing process. Details on proposed recreation enhancements are provided in Exhibit E, Section 4.9.3. Topsham Hydro is in compliance with the strategies outlined in this Plan.

2.8.2 FERC-Approved Federal Comprehensive Plans

Atlantic Salmon Restoration in New England, Final Environmental Impact Statement 1989-2021. U.S. Fish and Wildlife Service, 1989

This document discusses the stated aim of the United States Fish and Wildlife Service relative to Atlantic Salmon (i.e., the restoration of self-sustaining populations of Atlantic salmon by the year 2021 to several rivers).

Topsham Hydro maintains and operates both upstream and downstream fish passage facilities at the Project and is actively consulting with applicable resource agencies in accordance with the requirements of the ESA.

Nationwide Rivers Inventory. National Park Service. January 1982, updated 1995

In 1981, the "Nationwide Rivers Inventory (NRI)," was completed for the New England Region. It is a survey of the nation's rivers conducted to identify segments meeting the minimum criteria for further study and/or potential inclusion into the National Wild and Scenic Rivers System

(NWSRS). Once included on the NRI, a river is protected to the extent pursuant to Section f(d) of the Wild and Scenic Rivers Act, and in accordance with a Presidential Directive and guidance in the form of "Procedures for Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory," issued by the Council on Environmental Quality:

> "Each federal agency shall, as part of its normal planning and environmental review process, take care to avoid or mitigate adverse effects on Rivers identified in the Nationwide Inventory."[4]

This directive gives guidance to federal agencies on protecting the resources that cause the river to qualify for listing on the NRI.

The Project is not located on any of the river segments listed by NRI. Topsham Hydro has maintained the NPS on all distributions throughout the relicensing process.

Fishery Management Report No. 35 of the Atlantic States Marine Fisheries Commission (ASMFC): Shad and River Herring – Amendments 1 thru 3 to the Interstate Fishery Management Plan for Shad and River Herring – 1999 National Marine Fisheries Service; Technical Addendum 1 to Amendment 1 of the Interstate Fisheries Management Plan for Shad and River Herring – 2000 National Marine Fisheries Service

The goal of Amendment 1 of the plan was to protect, enhance, and restore East Coast migratory spawning stocks of American Shad, Hickory Shad, and River Herrings in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass. Objectives identified in the plan were to prevent overfishing of American Shad stocks by constraining fishing mortality; develop definitions of stock restoration; determine appropriate target morality rates and specify rebuilding schedules for American Shad populations within the management unit; maintain existing or more conservative regulations for Hickory Shad and River Herring fisheries until new stock assessments suggest changes are necessary; and promote improvements in degraded or historic alosine habitat throughout the species range.

Technical Addendum 1 addresses clarifications and corrections in Amendment 1. Many of the clarifications and corrections are minor. Amendment 1 was written to "protect, enhance, and restore East Coast migratory spawning stocks of American Shad, Hickory Shad, and River Herrings in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass."

The goal of Amendment 2 to the plan for shad and River Herring is to protect, enhance, and restore East Coast migratory spawning stocks of American Shad, Hickory Shad, Alewife, and Blueback Herring in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass. The management unit under this plan includes all migratory American Shad, Hickory Shad, Alewife, and Blueback Herring stocks of the East Coast. This Amendment prohibited commercial and recreational river herring fisheries in state waters beginning January

[4] Presidential Directive, August 2, 1979.

1, 2012, unless a state or jurisdiction has a sustainable management plan reviewed by the Technical Committee and approved by the Management Board. The Amendment defines a sustainable fishery as “a commercial and/or recreational fishery that will not diminish the potential future stock reproduction and recruitment.” Amendment 2 required states to implement fisheries-dependent and independent monitoring programs. Maine has a sustainable fishery management plan for River Herring that has been approved by the ASMFC.

Amendment 3 to the plan for shad and River Herring was developed to address only measures for American Shad, whereas Amendment 2 addressed measures for Alewife and Blueback Herring (collectively River Herring). The goal of the Amendment is to protect, enhance, and restore Atlantic coast migratory stocks and critical habitat of American Shad in order to achieve levels of spawning stock biomass that are sustainable, can produce a harvestable surplus, and are robust enough to withstand unforeseen threats. This Amendment requires similar management and monitoring as developed in Amendment 2. Specifically, Amendment 3 prohibits shad commercial and recreational fisheries in state waters beginning January 1, 2013, unless a state or jurisdiction has a sustainable management plan reviewed by the Technical Committee and approved by the Management Board. American shad are not commercially harvested in Maine.

Topsham Hydro maintains and operates both upstream and downstream fish passage facilities at the Project and is actively consulting with applicable resource agencies regarding measures to protect and enhance American Shad and River Herring at the Project.

Interstate Fishery Management Plan for American Eel (Anguilla rostrata) (Report No. 36) – 2000 Atlantic States Marine Fisheries Commission

The Atlantic States Marine Fisheries Commission prepared a Fisheries Management Plan for the American Eel fishery in order to protect and restore the species. The Atlantic States Marine Fisheries Commission American Eel Fisheries Management Plan is a working document that describes the goals and objectives for the species, its current status, the ecological challenges affecting the species, and management options and actions needed to reach and maintain management goals. The stated goals of the Fisheries Management Plan are to: (1) protect and enhance the abundance of American Eel in inland and territorial waters of the Atlantic States and jurisdictions and contribute to the viability of the American Eel spawning population, and (2) provide for sustainable commercial and recreational fisheries preventing the over harvest of any eel life stage.

Topsham Hydro maintains and operates both upstream and downstream fish passage facilities at the Project and is actively consulting with applicable resource agencies regarding measures to protect and enhance American Eel at the Project.

2.9 Financial and Personnel Resources

Topsham Hydro is an affiliate of Brookfield Renewable, who has considerable experience operating not only the Pejepscot Project but other hydroelectric and water storage projects as well. Topsham Hydro has a complete staff of engineers, biologists, operators, mechanics, and electricians that are trained and experienced in the operation of hydroelectric projects. For example, along the Androscoggin River there are maintenance/operations personnel, the operations clerk, and the supervisor. If required, Topsham Hydro can also utilize staff from other nearby rivers and projects, or contract with contractors to undertake larger scale maintenance or upgrade projects. In addition, Topsham Hydro has available the administrative, licensing, and support personnel that are needed to maintain compliance with the terms of the license.

Information regarding the Project's expected annual costs and value are provided in Exhibit D of the License Application.

2.10 Notification of Affected Land Owners

Topsham Hydro does not propose to expand Project lands associated with this license application beyond property currently owned by Topsham Hydro.

2.11 Applicant's Electricity Consumption Efficiency Improvement Program

This section is not applicable given that Topsham Hydro is an independent power producer.

2.12 Identification of Indian Tribes Affected by the Project

There are no Indian tribes affected by the Project. The federally-recognized Indian tribes likely to be interested in the relicensing are included on the current distribution list for the Project.

3 INFORMATION TO BE PROVIDED BY AN APPLICANT WHO IS AN EXISTING LICENSEE

3.1 Measures Planned to Ensure Safe Management, Operation, and Maintenance of the Project

The Project is usually operated locally, though it has some ability to be remotely operated using a supervisory control and data acquisition link to Topsham Hydro's control system in Marlborough, Massachusetts. Local operators are available during weekdays and weekends as necessary to perform routine maintenance and operations of the facility. Daily logs of pond level, flow, and outages are maintained electronically for the Project.

Topsham Hydro has a sound compliance history for the Project. Additionally, Part 12 inspections are conducted by FERC's New York Regional Office on a regular basis. Topsham Hydro completes all necessary corrective actions to address comments and recommendations arising from FERC inspections in a timely manner.

The dam is inspected annually by Topsham Hydro's Engineering and Operations staff, as well as after floods in the Project vicinity. In addition, routine repairs are performed as needed. Topsham Hydro maintains an Emergency Action Plan (EAP) for the Project. Topsham Hydro maintains and annually verifies the accuracy of the EAP contact list to be used in the event of a dam failure at the Project. Topsham Hydro's staff reviews the EAP at least annually, and there is annual EAP training for Project personnel.

3.1.1 Existing and Planned Operation of the Project During Flood Conditions

The Project impoundment has no appreciable storage capacity and the Project is operated in run-of-river mode. The impoundment water level is maintained by Project operation. The hydraulic capacity of the generating facilities is approximately 8,200 cfs. Based on the long-term hydrology of the Androscoggin River in the vicinity of the Project, river flows exceed 8,200 cfs approximately 25% of the time. When inflows to the Project exceed this flow level, water in excess of the hydraulic capacity of the generating units is spilled at the dam. A detailed description of the existing and planned operation of the Project during normal and high flow conditions is contained in Exhibit B of this License Application.

3.1.2 Warning Devices Used to Ensure Downstream Public Safety

There are numerous safety devices at the Project and along the Androscoggin River advising the public of the Project and safety considerations. Public safety devices are inspected annually (at a minimum) and more frequently during normal work, especially during the fishing and boating seasons. Project safety signs include the following.

- "DANGER POWER PLANT INTAKE & SPILLWAY RESTRICTED AREA KEEP CLEAR" signs (1) upstream of the dam along the eastern and western banks of the river.

- “DANGER NO TRESPASSING” sign (2) along the western bank of the river at the dam entrance from the fishing park and canoe portage area.
- “CANOE PORTAGE” signs (3) on the western bank of the river upstream of the fishing park and dam.
- “DANGER SPILLWAY AND POWERPLANT UNSTEADY WATER LEVEL If siren activates Leave Area Immediately” sign (4) found along the western bank of the tailrace area of the river, at the end of the canoe portage trail downstream of the dam by the stairs.
- “PEJEPSCOT HYDROELECTRIC PROJECT Welcome to the Pejepscot Fishing Park and Canoe Portage: These facilities are for your use and enjoyment and are made available to all members of the public. PLEASE DO NOT LITTER so that others may also enjoy its natural beauty. The park is closed during winter months and unsafe river conditions.” signs (5) along the western bank of the river from the canoe portage to downstream of the dam.
- “DAM AHEAD DANGER” signs (6) located on the individual buoys that are part of the boat barrier.
- “SPILLWAY RESTRICTED KEEP CLEAR” signs (7) on the eastern and western banks of the river below the dam.
- “WARNING POWER CANAL Current Changes With No Warning No Swimming or Wading.
- BOATS PROHIBITED” sign (8) located powerhouse facing the tailrace.
- “PEJEPSCOT BOAT RAMP NOTICE THIS PARK IS OPEN FOR PUBLIC USE 1 hour before sunrise to 1 house after sunset After hours use is strictly prohibited” sign located upstream of the boat barrier.

Non-signage safety features and measures found at the Project area.

- Boat barrier with signs ("DAM AHEAD DANGER") are located approximately 200 yards upstream of the spillway. The barrier is installed by May 15 and removed after October 15 annually.
- A canoe restraining barrier that runs parallel to the western shore from the boat barrier to the canoe portage area.
- There is one siren at the Project site located at the dam that sounds 90 seconds prior to a spillway gate lowering. A light flashes red and white as a gate lowers as well.
- Spillway gate lowering procedures occur in order, with the first gates to open nearest to the powerhouse and the last gates to open nearest to the western shore.
- Chain link fences, with gates and locks where necessary, are installed to prevent unauthorized access to project facilities.

3.1.3 Proposed Changes Affecting the Existing Emergency Action Plan

Topsham Hydro does not propose any modifications to the EAP as a result of issuance of a new license for the Project.

3.1.4 Existing and Planned Monitoring Devices

Topsham Hydro has deployed water level sensors and staff gauges to monitor the impoundment and tailwater levels associated with the Project. Headpond elevation is monitored remotely by Brookfield Renewable's North American System Control Center on a continual basis. In addition, the aforementioned instrumentation is subject to annual visual inspections.

Additional information regarding dam safety and monitoring devices is classified as CEII and can be found in the Project's Dam Safety and Surveillance Monitoring Plan and Reports, which have been filed with the Commission's New York Regional Office.

3.1.5 Project's Employee and Public Safety Record

No lost-time accidents have occurred at the Project within the last 5 years. There have been no project-related deaths or serious injuries to members of the public within the Project boundary during the past 5 years. No accidents attributable to Project operations have occurred within the period of recordkeeping for the facility.

3.2 Current Operation of the Project

A description of the Project operation is contained in Exhibit B of this License Application.

3.3 Project History

A description of the Project history is contained in Exhibit C of this License Application.

3.4 Lost Generation Due to Unscheduled Outages

Table 3.4-1 lists the record of unscheduled outages and related lost generation during the last five years (2015-2019).

Table 3.4-1. Pejepscot Project Unscheduled Outages and Lost Generation, 2015-2019

Unit	Date / Time Unavailable	Date / Time Available	Estimated MWh lost	Reason for Unit Unavailability
Unit 1	11/25/2019 11:19	11/25/2019 11:35	2.9	Strainer cleaning
Unit 1	11/3/2019 7:29	11/3/2019 7:51	4.6	Clean cooling strainer
Unit 1	11/1/2019 14:25	11/1/2019 14:42	3.6	Clean cooling strainer
Unit 1	10/28/2019 16:07	10/28/2019 16:35	6.7	Clean cooling strainer
Unit 1	10/2/2019 14:16	10/3/2019 8:58	101.0	Shear pin broken
Unit 23	9/23/2019 13:39	9/23/2019 14:06	0.2	Station service switching
Unit 22	9/23/2019 13:29	9/23/2019 14:10	0.3	Station service switching
Unit 22	9/23/2019 8:34	9/23/2019 9:01	0.2	Station service switching
Unit 23	9/23/2019 8:34	9/23/2019 8:46	0.1	Station service switching
Unit 1	9/23/2019 7:00	9/23/2019 19:45		Replace brush holders
Unit 1	9/13/2019 12:44	9/13/2019 14:25	5.2	External power fault
Unit 23	9/13/2019 12:44	9/13/2019 14:25		External power fault
Unit 1	9/11/2019 17:11	9/12/2019 6:57	54.5	Rainwater into control box heavy storm event
Unit 1	8/26/2019 10:17	8/30/2019 12:57	444.0	Annual inspection
Unit 1	7/17/2019 23:24	7/18/2019 10:42	81.4	Exciter problem caused broken wicket shear pin
Unit 1	6/30/2019 13:50	6/30/2019 22:15	98.5	Loss of station service
Unit 1	6/19/2019 6:30	6/19/2019 7:47	8.1	Bad electrical connection to governor bypass solenoid
Unit 1	6/13/2019 15:10	6/13/2019 16:14	3.3	Upstream station trip by CMP outage caused low headpond elevation
Unit 1	5/30/2019 10:34	5/30/2019 10:42	1.8	Tripped during local adjustments
Unit 21	4/23/2019 14:47	9/26/2019 15:00	497.5	Penstock leakage
Unit 22	4/23/2019 14:47	9/9/2019 15:00	331.6	Penstock leakage
Unit 23	4/23/2019 14:47	7/10/2019 13:30	497.5	Penstock leakage
Unit 23	3/5/2019 13:14	3/5/2019 13:51	0.3	Brush inspection
Unit 21	3/4/2019 19:39	3/4/2019 20:22	0.4	Tripped offline due to hydraulic system breaker tripping
Unit 22	3/3/2019 6:39	3/5/2019 11:59	19.2	Burned collector ring and brush rig
Unit 21	1/9/2019 8:21	1/9/2019 13:56	3.0	Station service breaker tripped

Unit	Date / Time Unavailable	Date / Time Available	Estimated MWh lost	Reason for Unit Unavailability
Unit 23	1/9/2019 8:21	1/9/2019 13:45	2.9	Station service breaker tripped
Unit 23	1/7/2019 5:30	1/7/2019 14:13	4.7	Trashrack differential - ice
Unit 21	1/7/2019 5:29	1/7/2019 13:57	4.6	Trashrack differential - ice
Unit 21	12/28/2018 4:38	12/28/2018 8:35	2.1	Trashrack differential from ice
Unit 23	12/28/2018 4:38	12/28/2018 8:05	1.9	Trashrack differential from ice
Unit 21	12/27/2018 6:03	12/27/2018 12:00	3.2	Trashrack differential from ice
Unit 21	12/26/2018 7:36	12/26/2018 10:31	1.6	Trashrack differential from ice
Unit 21	12/26/2018 1:54	12/26/2018 2:06	0.1	Trashrack differential from ice
Unit 23	12/26/2018 1:54	12/27/2018 11:19	18.0	Trashrack differential from ice
Unit 21	12/26/2018 1:29	12/26/2018 1:41	0.1	Trashrack differential from ice
Unit 23	12/26/2018 1:29	12/26/2018 1:53	0.2	Trashrack differential from ice
Unit 21	12/26/2018 0:00	12/26/2018 0:44	0.4	Trashrack differential from ice
Unit 22	12/26/2018 0:00	2/19/2019 11:18	479.3	Tripped offline due to ice exciter problems
Unit 23	12/26/2018 0:00	12/26/2018 1:03	0.6	Tripped offline due to ice
Unit 22	12/26/2018 0:00	2/19/2019 11:18	479.3	Tripped offline due to ice exciter problems
Unit 21	11/23/2018 2:34	11/23/2018 16:32	7.5	Trashrack differential - icing
Unit 22	11/23/2018 2:34	11/23/2018 16:32	5.0	Trashrack differential - icing
Unit 23	11/23/2018 2:34	11/23/2018 16:32	7.5	Trashrack differential - icing
Unit 23	11/4/2018 11:51	11/4/2018 12:29	0.3	Rack cleaning
Unit 21	11/4/2018 11:46	11/4/2018 12:20	0.3	Rack cleaning
Unit 22	11/4/2018 11:46	11/4/2018 12:20	0.2	Rack cleaning
Unit 21	10/30/2018 15:44	10/30/2018 19:48	2.2	Relay testing
Unit 22	10/30/2018 15:44	10/30/2018 19:48	1.5	Relay testing
Unit 23	10/30/2018 15:44	10/30/2018 19:48	2.2	Relay testing
Unit 21	9/20/2018 9:09	9/20/2018 16:42	4.1	Relay testing
Unit 22	9/20/2018 9:09	9/20/2018 16:42	2.7	Relay testing
Unit 23	9/20/2018 9:09	9/20/2018 16:42	4.1	Relay testing
Unit 22	9/20/2018 8:53	9/20/2018 9:08		relay testing

Unit	Date / Time Unavailable	Date / Time Available	Estimated MWh lost	Reason for Unit Unavailability
Unit 21	9/20/2018 8:35	9/20/2018 9:08		offline for relay testing
Unit 21	8/28/2018 10:15	8/28/2018 13:38	1.8	Trashrack differential
Unit 23	8/28/2018 10:15	8/28/2018 13:38	1.8	Trashrack differential
Unit 22	8/9/2018 20:31	8/28/2018 13:59	202.3	Speed sensor issues
Unit 22	8/7/2018 7:59	8/7/2018 10:46	1.0	Speed sensor issues
Unit 22	8/6/2018 7:38	8/6/2018 8:42	0.4	Speed sensor issues
Unit 22	8/6/2018 6:28	8/6/2018 7:05	0.2	Speed sensor issues
Unit 21	6/21/2018 7:14	6/30/2018 7:58	117.0	Exciter belt issue
Unit 1	6/20/2018 8:01	5/10/2019 13:00	61329.2	Stator rewind
Unit 1	6/20/2018 8:01	5/10/2019 13:00	61329.2	Stator rewind
Unit 1	6/14/2018 21:44	6/14/2018 22:12	1.7	Governor potentiometer causing vibration
Unit 1	6/4/2018 6:25	6/4/2018 6:41	1.2	Governor potentiometer
Unit 1	5/31/2018 11:21	5/31/2018 12:29	4.1	Measurement / inspection of stator in preparation for rewind
Unit 1	5/17/2018 8:20	5/17/2018 8:26		Tripped due to low headpond level indicator upstream station trip
Unit 1	5/17/2018 7:37	5/17/2018 7:44		Tripped due to low headpond level indicator upstream station trip
Unit 1	4/27/2018 0:16	4/27/2018 1:31	16.9	Rack differential affecting blades
Unit 21	4/23/2018 11:36	6/6/2018 11:04	256.8	Annual inspection
Unit 23	4/19/2018 12:00	5/1/2018 13:57	156.6	Bearing temperature
Unit 1	4/11/2018 16:32	4/11/2018 16:50	4.1	Unit tripped offline due to vibration
Unit 1	3/2/2018 20:18	3/3/2018 8:00	33.7	Negative prices / DNE
Unit 1	2/20/2018 8:31	2/21/2018 14:38	298.2	Measurement / inspection of stator in preparation for rewind
Unit 1	2/15/2018 22:30	2/16/2018 6:00	18.2	Negative pricing / node DNE
Unit 1	11/21/2017 11:32	11/21/2017 11:48	3.4	Station offline for rack raking
Unit 21	11/21/2017 11:32	11/21/2017 11:48		Station offline for rack raking
Unit 22	11/21/2017 11:32	11/21/2017 11:48		Station offline for rack raking
Unit 23	11/21/2017 11:32	11/21/2017 11:48		Station offline for rack raking
Unit 1	11/14/2017 12:40	11/14/2017 13:52		Taken offline due to loss of inflow from

Unit	Date / Time Unavailable	Date / Time Available	Estimated MWh lost	Reason for Unit Unavailability
				Worumbo station
Unit 1	11/12/2017 17:53	11/12/2017 18:50	6.8	Tripped due to high rack differential
Unit 1	10/30/2017 5:32	11/3/2017 6:35	1222.8	Line bump during storm
Unit 21	10/30/2017 4:56	10/30/2017 5:58	0.6	Loss of external power
Unit 23	10/29/2017 10:41	11/3/2017 6:35	62.6	U23 tripped ofline due to overheated bearing
Unit 23	10/28/2017 16:33	10/29/2017 8:14	8.5	Bearing high temp
Unit 23	10/28/2017 11:24	10/28/2017 12:14	0.5	Bearing high temperature
Unit 22	10/27/2017 9:44	11/3/2017 8:48	60.1	Tripped offline due to faulty oil pressure transducer.
Unit 22	10/27/2017 7:44	10/27/2017 8:01	0.1	faulty oil pressure transducer.
Unit 1	10/23/2017 6:55	10/23/2017 7:07	0.7	Line bump
Unit 22	10/2/2017 1:59	10/4/2017 8:58	29.7	Faulty oil flow switch
Unit 22	9/30/2017 7:56	9/30/2017 8:02	0.1	Low oil pressure
Unit 23	9/28/2017 12:45	9/28/2017 13:17	0.3	Bearing overtemp
Unit 1	9/25/2017 9:06	10/12/2017 8:37	635.4	Annual inspection
Unit 1	9/15/2017 3:52	9/15/2017 4:22	1.8	Station trip due to lightning storm
Unit 21	9/15/2017 3:52	9/15/2017 4:22		Station trip due to lightning storm
Unit 22	9/15/2017 3:52	9/15/2017 4:22		Station trip due to lightning storm
Unit 23	9/15/2017 3:52	9/15/2017 4:22		Station trip due to lightning storm
Unit 1	9/5/2017 10:00	9/5/2017 12:10	9.8	Tripped during drawdown
Unit 1	7/6/2017 6:48	7/6/2017 6:59	2.0	Station tripped off line due to line bump
Unit 21	7/6/2017 6:48	7/6/2017 6:59		Station tripped off line due to line bump
Unit 22	7/6/2017 6:48	7/6/2017 6:59		Station tripped off line due to line bump
Unit 23	7/6/2017 6:48	7/6/2017 6:59		Station tripped off line due to line bump
Unit 1	7/3/2017 11:26	7/3/2017 13:19	23.7	Trashrack raking
Unit 21	7/3/2017 11:26	7/3/2017 13:19	1.0	Trashrack raking
Unit 22	7/3/2017 11:26	7/3/2017 13:19	0.7	Trashrack raking
Unit 23	7/3/2017 11:26	7/3/2017 13:19	1.0	Trashrack raking

Unit	Date / Time Unavailable	Date / Time Available	Estimated MWh lost	Reason for Unit Unavailability
Unit 22	5/30/2017 20:20	5/31/2017 7:34	4.0	Oil pressure
Unit 1	5/28/2017 11:12	5/28/2017 12:29	16.2	Tripped on vibration
Unit 22	5/21/2017 22:34	5/22/2017 8:24	3.5	Hydraulic pressure switch
Unit 22	5/20/2017 23:20	5/21/2017 8:05	3.2	Hydraulic pressure switch
Unit 22	5/2/2017 8:55	5/2/2017 9:32	0.2	Rack differential
Unit 23	4/28/2017 3:02	4/28/2017 7:44	2.5	Rack differential
Unit 21	4/14/2017 6:57	4/25/2017 12:30	145.6	High rack differential
Unit 22	4/14/2017 6:56	4/25/2017 14:39	97.8	High rack differential
Unit 23	4/14/2017 6:56	4/25/2017 14:40	146.7	High rack differential
Unit 22	4/12/2017 5:00	4/12/2017 5:36	0.5	Tripped off line due to rack differential. Called TO.
Unit 1	4/7/2017 9:35	4/7/2017 11:39	26.0	Rack raking
Unit 1	4/3/2017 7:44	4/3/2017 9:29	15.8	Rack raking
Unit 21	4/3/2017 7:44	4/3/2017 9:29		Rack raking
Unit 22	4/3/2017 7:44	4/3/2017 9:29		Rack raking
Unit 23	4/3/2017 7:44	4/3/2017 9:29		Rack raking
Unit 1	3/30/2017 10:04	3/30/2017 12:11	26.7	Rack raking
Unit 21	3/30/2017 10:04	3/30/2017 12:11		Rack raking
Unit 22	3/30/2017 10:04	3/30/2017 12:11		Rack raking
Unit 23	3/30/2017 10:04	3/30/2017 12:11		Rack raking
Unit 1	3/23/2017 6:32	3/23/2017 11:14	50.8	River icing
Unit 1	3/11/2017 20:30	3/12/2017 8:36	139.9	High rack differential due to icing. 86 Mechanical lockout
Unit 1	3/11/2017 5:02	3/11/2017 14:17	116.6	High rack differential. 86 mechanical lockout trip.
Unit 1	3/4/2017 19:20	3/5/2017 15:56	259.6	High rack differential
Unit 1	3/3/2017 8:52	3/3/2017 10:31	20.8	Trashrack debris / icing
Unit 21	3/3/2017 8:52	3/3/2017 10:31	1.5	Trashrack debris / icing
Unit 22	3/3/2017 8:52	3/3/2017 10:31	0.7	Trashrack debris / icing
Unit 23	3/3/2017 8:52	3/3/2017 10:31	1.5	Trashrack debris / icing

Unit	Date / Time Unavailable	Date / Time Available	Estimated MWh lost	Reason for Unit Unavailability
Unit 1	12/30/2016 5:59	12/30/2016 14:05	65.6	Area power outage due to snowstorm
Unit 22	12/3/2016 11:05	12/3/2016 12:57	0.8	high bearing oil temp
Unit 21	10/5/2016 7:40	10/5/2016 14:44		Transformer testing
Unit 22	10/5/2016 7:40	10/5/2016 14:47	2.6	Transformer testing
Unit 23	10/5/2016 7:40	10/5/2016 14:44	5.1	Transformer testing
Unit 1	9/19/2016 7:10	10/7/2016 14:27	126.4	Stator cleaning and inspection
Unit 1	8/9/2016 7:43	8/11/2016 9:15	44.6	Governor maintenance
Unit 1	8/9/2016 7:13	8/9/2016 7:43	1.4	Tripped on low flow
Unit 1	7/27/2016 3:23	7/27/2016 3:57	2.1	Governor oil pressure
Unit 1	7/26/2016 10:02	7/26/2016 10:38	2.3	NERC relay testing
Unit 21	7/26/2016 10:02	7/26/2016 10:38		NERC relay testing
Unit 23	7/26/2016 10:02	7/26/2016 10:38		NERC relay testing
Unit 1	6/13/2016 18:55	6/14/2016 8:18	77.1	Station taken off line in outage by CMP due to local fire. Station in outage PT in route to station.
Unit 21	6/13/2016 18:55	6/14/2016 8:18		Station taken off line in outage by CMP due to local fire. Station in outage PT in route to station.
Unit 23	6/13/2016 18:55	6/14/2016 8:18		Station taken off line in outage by CMP due to local fire. Station in outage PT in route to station.
Unit 1	6/8/2016 8:00	6/9/2016 11:56	301.7	Replace blade angle controller
Unit 1	6/6/2016 1:46	6/6/2016 6:11	15.9	CMP transmission feed form substation to hydro asset down. No time table of return.
Unit 1	3/11/2016 13:37	3/11/2016 13:45	1.7	Ice sheet on racks
Unit 1	3/11/2016 12:18	3/11/2016 12:35	0.2	Tripped on vibration
Unit 21	3/10/2016 8:47	3/10/2016 8:54	0.1	Unit tripped off line due to shutting unit 22 head gate
Unit 23	3/10/2016 8:47	3/10/2016 8:50	0.0	Unit tripped off line due to shutting unit 22 head gate
Unit 22	3/7/2016 7:16	8/5/2016 13:17	421.8	Broken shaft
Unit 1	3/3/2016 6:01	3/3/2016 10:04	51.0	Unit offline due to icing.
Unit 21	3/3/2016 5:16	3/7/2016 7:00		Reserve Shutdown

Unit	Date / Time Unavailable	Date / Time Available	Estimated MWh lost	Reason for Unit Unavailability
Unit 22	3/3/2016 5:16	3/7/2016 7:00		Reserve Shutdown
Unit 23	3/3/2016 5:16	3/7/2016 7:00		Reserve Shutdown
Unit 1	2/27/2016 7:28	2/28/2016 8:01	176.8	Topsham U1 backed down due to icing and rack D/P.
Unit 21	2/27/2016 3:25	2/28/2016 8:20	15.6	Unit off line in outage due to icing
Unit 22	2/27/2016 3:25	2/28/2016 8:13	25.9	Unit off line in outage due to icing
Unit 23	2/27/2016 3:25	2/28/2016 8:19	26.0	Unit off line in outage due to icing
Unit 1	2/18/2016 4:38	2/18/2016 5:01	5.5	Unit Tripped offline due to high vibration.
Unit 1	2/11/2016 10:27	2/11/2016 10:43		Unit off line in outage due to trash racks
Unit 23	4/27/2015 6:38	2/18/2016 7:32	457.9	Unit offline and OOS due to rotor/stator misalignment resulting in contact.

3.5 Licensee's Record of Compliance

The Project has a good record of compliance with the terms and conditions of the existing license. A review of Topsham Hydro's records indicates no violations of the terms and conditions of the license. In addition, Topsham Hydro has not received any communication from the Commission indicating possible non-compliance.

3.6 Actions Affecting the Public

Topsham Hydro generally allows public access to the Project impoundment and the surrounding Project lands. Topsham Hydro will, however, restrict public access to specific areas that pose a threat to public safety. Topsham Hydro provides public recreation access at several formal recreation sites that provide opportunities for bank fishing and motoring and non-motorized boating. A full description of these opportunities and associated recreational facilities provided by Topsham Hydro is contained in Exhibit E of this application.

Generation at hydropower facilities generally offsets the need for increased operation at existing baseload facilities, such as oil or coal-fueled generation plants. Fossil-fueled plants produce atmospheric pollutants that must be controlled at significant costs. The avoided cost of air pollution, therefore, is a public benefit of hydroelectric generation.

Topsham Hydro's regard for public safety is demonstrated by its active program of installing warning signs and safety devices at the Project (Section 3.1.2), and its regular review of its internal Project safety plans.

3.7 Ownership and Operating Expenses That Would Be Reduced if the License Were Transferred

The current Licensee (Topsham Hydro) is applying for a long-term license to continue to maintain and operate the Project. Additionally, there is no competing application to take over the Project. Because there is no proposal to transfer the Project license, this section is not applicable to the Project.

3.8 Annual Fees for Use of Federal or Native American Lands

This section is not applicable to the Project since no Federal or Native American Lands are present in the Project area.

APPENDIX H-1: SINGLE LINE DIAGRAM
(FILED SEPERATELY AS CEII)