



Central Rivers Power

Boott Hydropower, LLC

Subsidiary of Central Rivers Power
US, LLC

670 N. Commercial Street, Suite 204
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Via eFiling

December 2, 2020

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

Re: **Lowell Hydroelectric Project (FERC No. 2790-072)**
Draft License Application

Dear Secretary Bose:

Boott Hydropower, LLC (Boott or Licensee) is the Licensee, owner, and operator of the 20 megawatt Lowell Hydroelectric Project (Project or Lowell Project) (FERC No. 2790). Boott operates the Project under a license from the Federal Energy Regulatory Commission (FERC or Commission). The Project's existing license expires on April 30, 2023. Boott is pursuing a new license for the Project using the Commission's Integrated Licensing Process (ILP) as defined in 18 Code of Federal Regulations (C.F.R.) Part 5. In accordance with 18 C.F.R. § 5.16(a), Boott is filing herewith the Draft License Application (DLA) for the Project.

The DLA is composed of two volumes, as described below. Exhibit E – Environmental Report contains Licensee's analysis of the effects of the Proposed Action, relicensing the continued operation and maintenance of the Project. Based upon the analysis of the effects of the Proposed Action on developmental and non-developmental resources, the Licensee is proposing certain environmental measures consistent with the Project's current license as discussed in detail in Exhibit E. As stated in this application for license, Boott proposes to remove the four mill power stations and associated canal infrastructure from the new FERC license. Nevertheless, Boott will continue to manage the canal structures, water levels and flows using best practices and consistent with current agreements with the National Park Service and other stakeholders.

The DLA consists of the following:

VOLUME I OF II

Volume I contains Public information and exhibits as follows:

- Table of Contents
- Executive Summary
- Initial Statement and Additional Information Required by 18 C.F.R. § 5.18(a)
- Exhibit A – Project Description
- Exhibit B – Project Operation and Resource Utilization
- Exhibit C – Construction History and Proposed Construction Schedule
- Exhibit D – Cost and Financing
- Exhibit F – General Design Drawings
- Exhibit G – Project Maps
- Exhibit H – Description of Project Management and Need for Project Power

VOLUME II OF II

- Part 1 – Exhibit E – Environmental Exhibit
- Part 2 – Exhibit E – Appendices

Please note that Boott is not submitting the portions of the application which would constitute Critical Energy Infrastructure (CEI) at this time. These would include the Exhibit F drawings, Supporting Design Report, and the Single Line Diagram referenced in Exhibit A. Certain information within the DLA is still under development or more appropriately filed with the Final License Application (FLA) in April 2021. Additionally, proposals presented in the DLA are preliminary.

Boott is making the DLA available to resource agencies, Indian tribes, local governments, nongovernmental organizations, and members of the public who are on the Project distribution list. An electronic copy of the DLA can be downloaded from FERC's eLibrary system (<https://www.ferc.gov/docs-filing/elibrary.asp>) by searching under docket number P-2790 (sub docket 072). The DLA will also be available at the Project's public relicensing website at www.lowellprojectrelicensing.com.

In accordance with 18 CFR § 5.16(e), interested parties may file comments regarding the DLA within 90 days of the date of this letter (i.e., by March 2, 2021). All comments must be eFiled with FERC or sent to FERC at the following address:

Hon. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
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Please do not hesitate to contact me at (978) 935-6039 or kwebb@centralriverspower.com if you have any questions concerning this submittal.

Sincerely,
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Draft License Application Volume I of II

Lowell Hydroelectric Project
(FERC No. 2790)

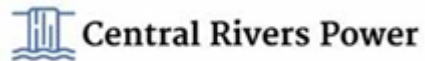
December 2, 2020

Prepared by:



Prepared for:

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List of Acronyms

μS/cm	microsiemens per centimeter
ACHP	Advisory Council on Historic Preservation
ADA	Americans with Disabilities Act
APE	area of potential effects
ASRSC	Atlantic Sea Run Salmon Commission
AW	American Whitewater
Boott	Boott Hydropower, LLC (or Licensee, or Applicant)
CEII	Critical Energy Infrastructure Information
CFPP	Comprehensive Fish Passage Plan
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
Chapter 91	M.G.L. Chapter 91 of the Waterways Act
CMR	Codes of Massachusetts Regulations
CSO	Combined Sewer Overflow
CSPA	Comprehensive Shoreland Protection Act
CWA	Clean Water Act
DDT	Dichlorodiphenyltrichloroethane
DLA	Draft License Application
DMMSPs	Dam Safety Surveillance and Monitoring Plan
DO	dissolved oxygen
EA	Environmental Assessment
E.L. Field	Eldred L. Field
EPT	Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddis flies)
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission (or Commission)
FGMP	Final General Management Plan
FHA	Federal Highway Administration
FLA	Final License Application
FPA	Federal Power Act
GECC	General Electric Credit Corporation
GIS	Geographic Information System
GPS	Global Positioning System

List of Acronyms
Lowell Hydroelectric Project

HAER	Historic American Engineering Record
ILP	Integrated Licensing Process
Integrated List	Integrated List of Waters
IPaC System	Information, Planning and Consultation System
IPANE	Invasive Plant Atlas of New England
ISR	Initial Study Report
kV	kilovolt
LIHI	Low Impact Hydropower Institute
LMRLAC	Lower Merrimack River Local Advisory Committee
LNHP	Lowell National Historical Park
LRWU	Lowell Regional Water Utility
M	magnitude
MADCR	Massachusetts Department of Conservation and Recreation
MADEM	Massachusetts Department of Emergency Management
MADEP	Massachusetts Department of Environmental Protection
MADFW	Massachusetts Division of Fish and Wildlife
MADMF	Massachusetts Division of Marine Fisheries
MNHESP	Massachusetts Natural Heritage Endangered Species Program
MassGIS	Massachusetts Bureau of Geographic Information
MDMR	Maine Department of Marine Resources
MDPW	Massachusetts Department of Public Works
MEOEEA	Massachusetts Executive Office of Energy and Environmental Affairs
MESA	Massachusetts Endangered Species Act
M.G.L.	Massachusetts General Law
mg/L	milligrams per liter
MHC	Massachusetts Historical Commission
MIPAG	Massachusetts Invasive Plant Advisory Group
MOU	Memorandum of Understanding
MRI	Merrimack River Initiative
MRWC	Merrimack River Watershed Council
MW	megawatt
MWh	megawatt hours
NAI	Normandeau Associates, Inc.
NEFMC	New England Fishery Management Council
New Hampshire NHB	New Hampshire Natural Heritage Bureau
NGOs	non-governmental organizations

NGVD 29	National Geodetic Vertical Datum 1929
NHDES	New Hampshire Department of Environmental Services
NHDFG	New Hampshire Department of Fish and Game
NHDHR	New Hampshire Division of Historical Resources
NHDNCR	New Hampshire Department of Natural and Cultural Resources
NHFGD	New Hampshire Fish and Game Department
NHL	National Historic Landmark
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NRPC	Nashua Regional Planning Commission
NTU	Nephelometric Turbidity Unit
NWI	Nation Wetland Inventory
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PAD	Pre-Application Document
PM&E	protection, mitigation, and enhancement measures
Project	Lowell Hydroelectric Project
Proprietors	Proprietors of the Locks and Canals on the Merrimack River
PSP	Proposed Study Plan
Revised PPS	Revised Process Plan and Schedule and Determination on Requests for Study Modifications for the Lowell Hydroelectric Project
RM	river mile
RMC	RMC Environmental Services
ROR	run of river
RSA	Revised Statutes Annotated
RSP	Revised Study Plan
RTE	rare, threatened, and endangered
SAV	submerged aquatic vegetation
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SDR	Supporting Design Report
SD1	Scoping Document 1

List of Acronyms
Lowell Hydroelectric Project

SD2	Scoping Document 2
Section 106	Section 106 of the NHPA
SPD	Study Plan Determination
SHPO	State Historic Preservation Officer
stakeholders	resource agencies, federally recognized Indian tribes, non-governmental organizations (NGOs), and other interested parties
SWQS	surface water quality standards
Technical Committee	Representatives from NHDFG, MADFW, USFWS, USFS, NMFS
THPO	Tribal Historic Preservation Officers
TMDL	total maximum daily loads
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VP	vegetation points
WPA	Wetlands Protection Act
WQC	Water Quality Certification
YOY	Young-of-year

Executive Summary

ES.1 Introduction

The Federal Energy Regulatory Commission (FERC or Commission), under the authority of the Federal Power Act (FPA), 16 United States Code (USC) §791(a), et seq., may issue a license for up to 50 years for the construction, operation, and maintenance of non-federal hydroelectric developments. Boott Hydropower, LLC (Boott or Licensee) is the Licensee, owner, and operator of the 20.164-megawatt (MW) Lowell Hydroelectric Project (FERC No. P-2790).

On April 13, 1983, the Commission issued an original license for the operation of the Lowell Hydroelectric Project (Project) in accordance with the Commission's delegated authority under the FPA. The Project's original license was issued for a term of 40 years and expires on April 30, 2023. On April 30, 2018, Boott initiated the Commission's Integrated Licensing Process (ILP) described at 18 Code of Federal Regulations (C.F.R.) Part 5. In accordance with applicable regulations, 18 CFR §5.17(a), Boott must file its application with the Commission for a subsequent license no later than April 30, 2021.

ES.2 Summary of Lowell Hydroelectric Project

Boott acquired the Project pursuant to the December 15, 1983, Commission order approving the transfer of license¹ for the Project to Boott and General Electric Credit Corporation (GECC) as co-Licensees. By order dated December 23, 1985, the Commission approved a transfer of license² to Boott Hydropower, Inc., General Electric Capital Corporation (formerly, GECC), and Barclays American/Leasing, Inc. On April 1, 2005, FERC approved the transfer of license³ to Boott and the Eldred L. Field Hydroelectric Family Trust. On December 8, 2015, FERC issued an Order Approving Partial Transfer of License⁴, which transferred the license to Boott as sole Licensee of the Project.

The Project is located at the Pawtucket Dam on the Merrimack River in the City of Lowell in Middlesex County, Massachusetts (Figure ES.1-1). The Project generally consists of the Pawtucket Dam topped by 5-foot-high pneumatically-operated crest gates, a 720-acre impoundment, a 5.5-mile-long canal system, the main powerhouse Eldred L. Field (E.L. Field), and four additional powerhouses located throughout the canal system (Assets, Bridge Street, Hamilton, and John Street) (Figure ES.1-2). The E.L. Field powerhouse utilizes the Pawtucket Dam and the first 2,200 feet of the Northern Canal. A 440-foot tailrace channel, surge gate, and fish passage facilities comprise other major E.L. Field powerhouse features. The Project is operated in a run of river (ROR) mode and has no useable storage capacity.

¹ 25 FERC ¶ 61,386 (1983).

² 33 FERC ¶ 62,440 (1985).

³ 111 FERC ¶ 62,001 (2005).

⁴ 153 FERC ¶ 62,173 (2015).

Boott has concluded that the continued operation of the “downtown” mill units is no longer economically feasible. Therefore, Boott proposes to remove the four downtown powerhouses (Assets, Bridge Street, Hamilton, and John Street) and associated canals from the Project’s new FERC license, retaining only that portion of the Northern Canal necessary to operate the E.L. Field powerhouse. Boott will continue to manage the canal structures, water levels and flows using best practices and consistent with current agreements with the National Park Service and other stakeholders. Further details of Boott’s proposal are provided in the following sections of this license application.

Figure ES.1-1. Lowell Project Location Map

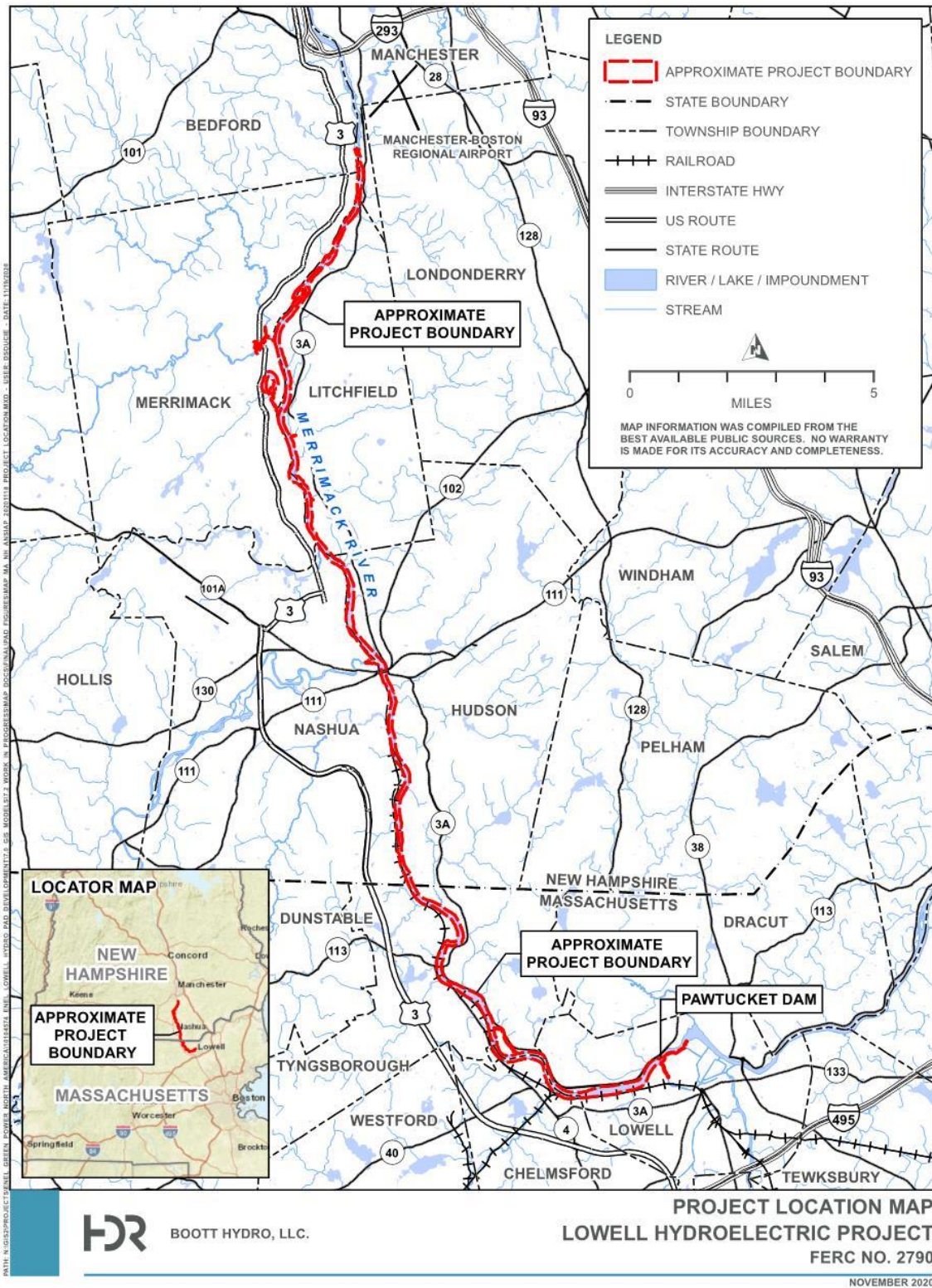
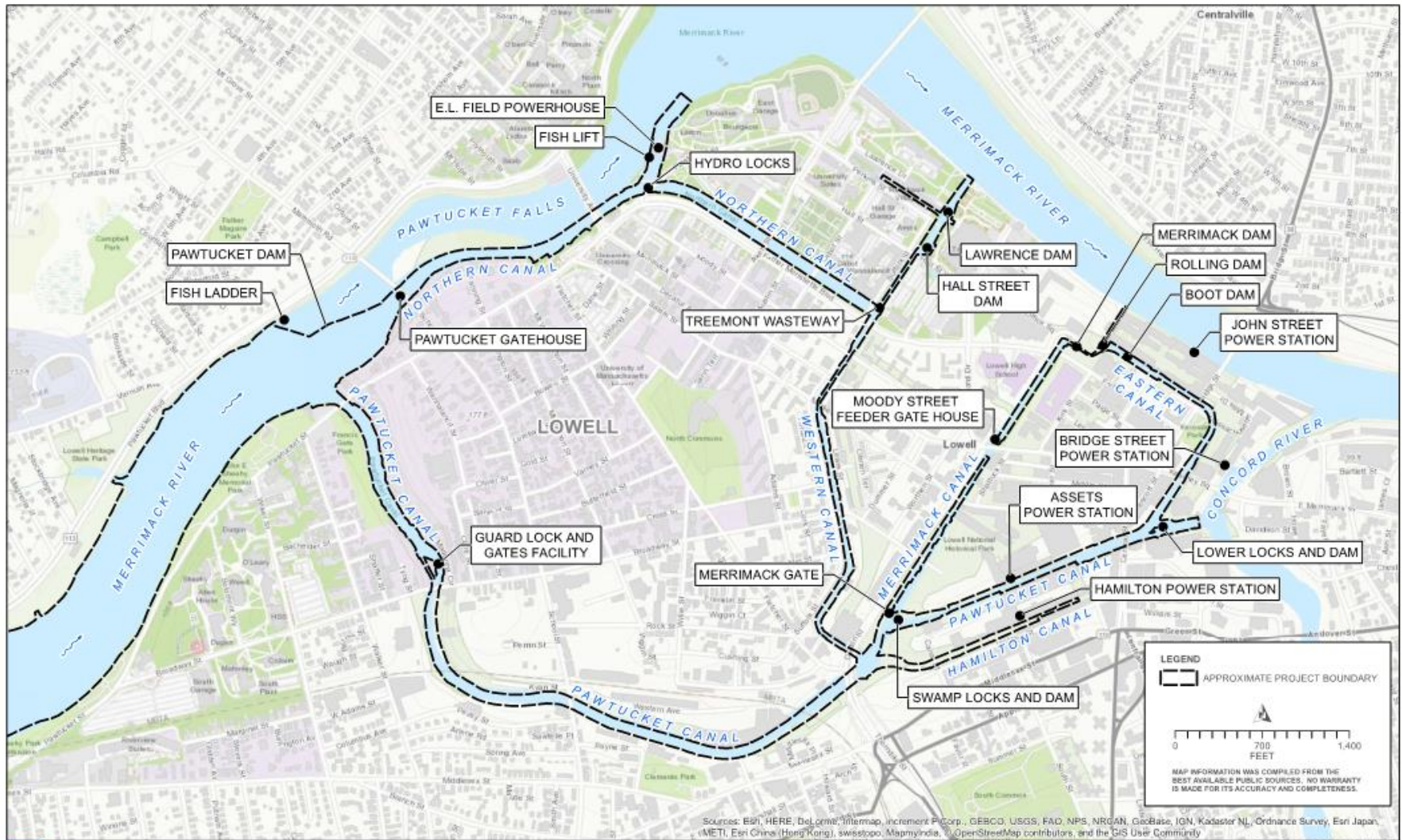


Figure ES.1-2. Lowell Project Existing Facilities



ES.3 Agency Consultation and the Relicensing Process

On April 30, 2018, Boott, as the Licensee, filed a Pre-Application Document (PAD) and Notice of Intent (NOI) to seek a new license for the Project. The PAD provided a description of the Project and summarized existing, relevant, and reasonably available information to assist resource agencies, federally recognized Indian tribes, non-governmental organizations, and other interested parties (collectively, “stakeholders”) in identifying issues, determining information needs, and preparing study requests. A preliminary list of potential studies and information needs was included in the PAD. With the NOI, Boott requested designation as the non-federal representative for informal consultation with relevant agencies under Section 7 of the Endangered Species Act (ESA)⁵ and Section 106 of the National Historic Preservation Act (NHPA)⁶. FERC granted these requests on June 15, 2018.

FERC issued Scoping Document 1 (SD1) on June 14, 2018 (dated June 15, 2018). SD1 was intended to advise stakeholders as to the proposed scope of the Environmental Assessment (EA) and to seek additional information pertinent to the Commission’s analysis of the license application. As provided in 18 C.F.R. §§ 5.8(a) and 5.18(b), the Commission issued a notice of commencement of proceeding concomitant with SD1 and provided stakeholders with a 60-day period to request studies and provide comments on the PAD and SD1. The Commission held two public scoping meetings in Lowell, Massachusetts on July 17, 2018. A site visit at the Project was held on July 18, 2018. FERC received seven comment letters on SD1, including comments from resource agencies. FERC issued Scoping Document 2 (SD2) on September 27, 2018 to reflect issues or alternatives to be considered in the EA based on stakeholder comments and study requests filed in response to SD1.

Pursuant to the requirements of the ILP, Boott developed a Proposed Study Plan (PSP) describing Boott’s intent to conduct 13 relicensing studies to address the comments and study requests submitted by stakeholders related to terrestrial resources, aquatic resources, recreational resources, and cultural resources. Boott’s PSP was filed with FERC on September 28, 2018. In accordance with 18 C.F.R. § 5.11(e), a PSP Meeting was held with stakeholders on October 18 and 19, 2018 in Andover, Massachusetts. The purpose of the PSP Meeting was to clarify the intent and contents of the PSP, explain any initial information gathering needs, and address outstanding issues associated with the proposed studies.

In response to comments from stakeholders, Boott filed a Revised Study Plan (RSP) on January 28, 2019 that included 13 proposed relicensing studies. However, due to the funding lapse at certain federal agencies between December 22, 2018 and January 25, 2019, the Commission extended the comment period on the RSP to February 27, 2019, and the issuance date for the Commission’s SPD to March 14, 2019. FERC issued its Study Plan Determination (SPD) with modifications to the RSP on March 13, 2019. In the

⁵ 16 U.S.C. § 1536(a)(2)

⁶ 54 U.S.C. § 306108

SPD, FERC approved eleven studies as proposed in the RSP and approved two studies with modifications:

1. Downstream American Eel Passage Assessment
2. Juvenile Alosine Downstream Passage Assessment
3. Upstream and Downstream Adult Alosine Passage Assessment
4. Fish Passage Survival Study
5. Three-Dimensional Computational Fluid Dynamics (CFD) Modeling
6. Instream Flow Habitat Assessment and Zone of Passage Study in the Bypassed Reach
7. Fish Assemblage Study
8. Recreation and Aesthetics Study
9. Historically Significant Waterpower Equipment Study
10. Resources, Ownership, Boundaries, and Land Rights Study
11. Water Level and Flow Effects on Historic Resources Study
12. Whitewater Boating and Access Study
13. Operation Analysis of the Lowell Canal Study

In accordance with 18 C.F.R. § 5.15, Boott initiated studies as provided in the study plan and schedule approved by the Commission. On February 25, 2020, Boott filed an Initial Study Report (ISR) with the Commission and distributed the ISR to stakeholders. The ISR described the Licensee's overall progress in implementing the study plan and schedule, the data collected, and any variances from the study plan and schedule. In the ISR, Boott did not propose any modifications to ongoing studies approved in the Commission's March 13, 2019 SPD or any new studies.

Boott held an ISR Meeting on March 11, 2020 to discuss the overall progress in implementing the study plan, data collected to date, variances from the SPD, and an overview of results of the studies to date. Pursuant to the ILP, Boott filed an ISR Meeting Summary with the Commission on March 25, 2020. Stakeholders were provided a 30-day period to provide comments on the ISR Meeting Summary, recommend study modifications, or propose new studies. The Commission issued a Revised Process Plan and Schedule and Determination on Requests for Study Modifications for the Lowell Hydroelectric Project (Revised PPS) on June 12, 2020. The Revised PPS required Boott file a Revised ISR for studies 1, 2, 3, 7, and 8 by September 30, 2020.

In response to the Revised PPS letter from the Commission, Boott filed the results of the five individual study reports that were not included in the February 25, 2020 ISR. Boott held a Revised ISR Meeting to discuss the results of these studies on October 15, 2020. Pursuant to the ILP, Boott filed a Revised ISR Meeting Summary with the Commission on October 30, 2020. Stakeholders were provided a 30-day period (ending on November 29, 2020) to provide comments on the Revised ISR Meeting Summary, recommend study modifications, or propose new studies.

In accordance with 18 C.F.R. § 5.16(a), Boott is filing this DLA with the Commission and making the DLA available to stakeholders. FERC and stakeholders will have 90 days to provide comments on the DLA (i.e., until March 2, 2021). Boott will file a Final License Application (FLA) for the Project no later than April 30, 2021.

ES.4 Summary of Proposed Action and Enhancement Measures

The Project is operated in ROR mode and has no useable storage capacity. The comprehensive studies, consultation, and evaluation of the Project during the original licensing of the Project resulted in the development and implementation of multiple comprehensive protection, mitigation, and enhancement measures (PM&E); therefore, Boott is proposing certain PM&E measures consistent with the measures required by the Project's existing license, as described below. However, Boott notes that studies required by the Commission are on-going, and after completion of the study activities, Boott anticipates additional consultation with stakeholders regarding the potential PM&E measures to be proposed by Boott in the FLA.

Boott currently implements and is proposing the following PM&E measures for the protection of aquatic, water quality, geologic/soil, recreation, and cultural resources pursuant to the existing license for the Project.

Article 33 (amended April 18, 2013 and approved May 18, 2016): Requires the Licensee, prior to the commencement of any construction activities, to cooperate with the Massachusetts State Historic Preservation Officer (SHPO) and the National Park Service (NPS) to carry out a mitigation program for avoiding or minimizing adverse effects on the Locks and Canals Historic District and the Lowell National Historical Park. The license was amended to replace wooden flashboards on Pawtucket Dam with pneumatic crest gate system and mitigation measures were required.

Article 37 (ordered November 27, 1984): Requires the Licensee to discharge an interim continuous minimum flow of 1,990 cfs or inflow, whichever is less, for the purpose of protection of fish and wildlife resources, as measured immediately downstream from the Project.

Boott is also required to adhere to the following plans:

Comprehensive Fish Passage Plan (approved November 28, 2000): Requires the operation of a fish ladder at the Pawtucket Dam. The fish ladder has a total operating flow of 500 cubic feet per second (cfs) including attraction flow. The 500 cfs is the primary source of flow in the bypass reach, other than spillage over the Pawtucket Dam spillway. The fish lift system at E.L Field Powerhouse has a total flow capacity of 180 cfs. Boott is required to operate both the fish ladder and the fish lift daily during spring of each year when a cumulative total of 50 American shad or 200 River herring are passed at the downstream Lawrence Hydroelectric Project. Additionally, Boott is required to operate the downstream bypass facility from April 1 through July 15 and from September 1 through November 15 (Cleantech Analytics 2017).

Since 2013, Boott has worked cooperatively with the United States Fish and Wildlife Service and other state and federal fishery agencies to assess and provide passage for eels moving upstream in the mainstem Merrimack River. The efforts have occurred primarily at the fish ladder at the Pawtucket Dam, from mid-July through September, annually.

Crest Gate Operation Plan (approved March 30, 2015): Requires the Licensee to adhere to the detailed plan for operation of the pneumatic crest gate system filed on July 16, 2013 and revised on July 30, 2014. The plan describes the operation of the pneumatic crest gate system under normal and high-water operations.

The pneumatic crest gate system works in conjunction with the automatic pond level control system at the E.L. Field Powerhouse to maintain consistent headpond level conditions. Under normal operations, the crest gate will be maintained at full elevation, and the E.L. Field control system will adjust the main units' output to match inflow and maintain the impoundment water level at the normal, authorized pond elevation (92.2 feet National Geodetic Vertical Datum [NGVD] 29). When inflows begin to exceed the capacity of the available units, the crest gate control system will automatically adjust the gates to maintain the impoundment elevation no higher than 93.2 feet NGVD 29, or one foot above the normal pond elevation. When under automatic control, the crest gates would all be fully lowered at spillway flows of approximately 35,000 cfs and above (FERC 2015).

Under high-water operations, Boott will fully lower the crest gate system in anticipation of potential flood events in order to minimize the upstream backwater effect of the Pawtucket Dam to the extent possible.

ES.5 Draft License Application Roadmap

This Draft License Application is composed of two volumes.

VOLUME I OF II

Volume I contains Public information and exhibits as follows:

- Table of Contents
- Executive Summary
- Initial Statement and Additional Information Required by 18 C.F.R. § 5.18(a)
- Exhibit A – Project Description: Describes the existing and proposed Project facilities.
- Exhibit B – Project Operation and Resource Utilization: Describes the existing and proposed operation of the Project and how the resource is utilized.
- Exhibit C – Construction History and Proposed Construction Schedule: Provides a construction history and schedule for proposed construction activities.
- Exhibit D – Cost and Financing: Provides information on the cost and financing of the Project; this exhibit is a draft and will be finalized in the FLA.

- Exhibit F – General Design Drawings: this exhibit will be finalized in the FLA.
- Exhibit G – Project Maps: Includes maps showing the Project boundary for the Lowell Hydroelectric Project. Exhibit G is filed as a draft with the DLA; this exhibit will be finalized in the FLA.
- Exhibit H – Description of Project Management and Need for Project Power: Describes the commitment and responsibility of Boott as a Licensee to continue to operate and maintain the Project and the needs and costs for power from the Project or alternate sources. Exhibit H is filed as a draft with the DLA; this exhibit will be finalized in the FLA.

VOLUME II OF II

Volume II contains Public information and includes Exhibit E, the Environmental Exhibit.

ES.6 References

Cleantech Analytics, LLC. 2017. Certification Application to the Low Impact Hydro Institute, Lowell Hydroelectric Facility. July 26, 2017.

Federal Energy Regulatory Commission (FERC). 2015. Order Approving Amended Crest Gate System Operation Plan. Issued March 30, 2015.

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**BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION**

Application for a New License for a Major Waterpower Project – Existing Dam

INITIAL STATEMENT

(1) Boott Hydropower, LLC (Boott or Applicant) applies to the Federal Energy Regulatory Commission (FERC or Commission) for a new license for the Lowell Hydroelectric Project (Lowell Project or Project), FERC No. 2790, as described in the attached Exhibits.

(2) The location of the Project is:

State or Territory:	Massachusetts and New Hampshire
County:	Middlesex County, Massachusetts Hillsborough County, New Hampshire
Township or nearby town:	City of Lowell
Stream or other body of water:	Merrimack River

(3) The exact name, address, and telephone number of the applicant are:

Boott Hydropower, LLC
670 N Commercial Street, Suite 204
Manchester, NH 03101
(978) 935-6039

The exact name, address, and telephone number of each person authorized to act as agent for the applicant in this application are:

Kevin Webb
Licensing Manager
670 N Commercial Street, Suite 204
Manchester, NH 03101
(978) 935-6039

Curt Mooney
Manager, Regulatory Compliance
59 Ayers Island Road
Bristol, NH 03222
(603) 744-0846

(4) The Applicant is a domestic corporation and is not claiming preference under Section 7(a) of the Federal Power Act.

(5)(i) The statutory or regulatory requirements of the State of Massachusetts and New Hampshire that affect the Project as proposed, with respect to bed and banks and to the appropriation, diversion, and use of water for power purposes, and with respect to the right to engage in the business of developing and transmitting power and in any other business necessary to accomplish the purpose of the license under the Federal Power Act are:

Massachusetts

- a. Boott is a limited liability company organized under the laws of the Commonwealth of Massachusetts and registered to do business in Massachusetts, and, as such, can engage in the activities set forth in its organizational documents, which includes the generation, transmission, and distribution of electricity from the Project.
- b. Section 401 of the Federal Clean Water Act, 33 United States Code (USC) § 1341 (Section 401) requires that any applicant for a federal license or permit to conduct an activity that will or may discharge into waters of the United States (as defined in the Clean Water Act) must present the federal authority with a Water Quality Certification (WQC). Pursuant to Massachusetts General Law (M.G.L.) Chapter 27(3), the Massachusetts Department of Environmental Protection (MADEP) is the state agency designated to carry out the certification requirements prescribed in Section 401 of the Clean Water Act for waters of the Commonwealth of Massachusetts. The Massachusetts Clean Waters Act (M.G.L. Chapter 21 §§ 26-53) directs the MADEP to take all action necessary or appropriate to secure to the Commonwealth the benefits of the Clean Water Act, 33 USC § 1251 *et seq.* Regulations promulgated thereunder at 314 Code of Massachusetts Regulations (CMR) 9.00, establish procedures and criteria for the administration of Section 401 of the Federal Clean Water Act within the Commonwealth.
- c. Regulations promulgated under the Massachusetts Clean Waters Act, at 314 CMR 2.00 *et seq.* provide permitting procedures for the MADEP's administration of the National Pollutant Discharge Elimination System (NPDES) permit program under delegated authority from the U.S. Environmental Protection Agency (USEPA).
- d. M.G.L. Chapter 91 (Chapter 91) (Waterways Act) and regulations promulgated thereunder at 310 CMR 9.00 *et seq.*, protects the public's interest in and access to waterways of the Commonwealth, and is intended to ensure that public rights to fish, fowl, and navigate are not unreasonably restricted and that unsafe or hazardous

structures are repaired or removed. Chapter 91 requires a license from the MADEP for certain structures in tidelands, Great Ponds, and rivers and streams, as defined in 310 CMR 9.00 *et seq.*

New Hampshire

- a. NH Revised Statutes Annotated (RSA) Chapter 481. State Dams, Reservoirs and other Water Conservation Projects. Empowers the Department of Environmental Services to provide careful stewardship over all the waters of New Hampshire and to seek the maximum public benefit from the use of the State's water.
- b. NH RSA Chapter 482. Dams, Mills and Flowage. Empowers the Department of Environmental Services, Water Resources Division, to regulate the maintenance and operation of hydroelectric dams.
- c. NH RSA Chapter 482-A. Fill and Dredge in Wetlands. Empowers the Department of Environmental Services to preserve the state's submerged lands under tidal and fresh waters and its wetlands from despoliation and unregulated alteration.
- d. NH RSA Chapter 483. New Hampshire Rivers Management and Protection Program. Empowers the New Hampshire Department of Environmental Service to complement and reinforce existing state and federal water quality laws, to assure that instream flows are maintained along protected rivers and to restore and maintain the scenic beauty and recreational potential of such rivers while respecting riparian interests.
- e. NH RSA Chapter 483-B. Comprehensive Shoreland Protection Act. Empowers the Department of Environmental Services to establish standards for the subdivision, use and development of shorelands of the state's public waters.
- f. NH RSA Section 498:6. Water Rights. Allows a cause of action for riparian rights in equity regardless of available remedies at law.

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

Massachusetts

- a. The Applicant has complied with the requirements of the laws of the Commonwealth of Massachusetts with respect to the right to engage in the business of developing and transmitting power.

- b. The Applicant believes that it has all approvals, licenses, permits, and exemptions that are necessary to continue operating the existing waterpower facility. A request for §401 Water Quality Certification will be submitted to the Massachusetts Department of Environmental Protection. Since this is an application for relicensing of an existing waterpower project and the Applicant does not propose any new construction or significant change in operation of the existing waterpower facility, the Applicant expects to continue to operate the facility pursuant to approvals, licenses, permits, and exemptions already in effect. The Applicant proposes to remove the four downtown powerhouses (Assets, Bridge Street, Hamilton, and John Street) and associated canals from the Project's new FERC license, retaining only that portion of the Northern Canal necessary to operate the E.L. Field powerhouse. Further details of Boott's proposal are provided in the following sections of this license application.
- c. Pursuant to the federal Clean Water Act and the Massachusetts Clean Waters Act, the Lowell Project has four NPDES permits issued under the Massachusetts General Permit no. MAG360000. These are: Permit No. MAG360024 for the Eldred L. Field Powerhouse; No. MAG360026 for the Hamilton powerhouse; No. MAG360025 for the John St. powerhouse; and No. MAG360027 for the Section 8 powerhouse.
- d. The Applicant currently holds four Waterways Licenses issued pursuant to M.G.L. Chapter 91 (Chapter 91) (Waterways Act). These include: License No. 1025 which allows Boott to construct and maintain the E.L. Field powerhouse and the fish passageway structures; License No. 1166 which allows Boott to construct and maintain the submarine power transmission line in the bed of the Concord River; and Licenses No. 1949 and 2200 which each allow Boott to construct and maintain three of the water control weirs in the bed of the Merrimack River within the Project bypass reach, for fish passage purposes.

New Hampshire

- a-f. The Applicant has complied with the requirements of the laws of the New Hampshire Department of Environmental Services. Boott has and will continue to operate the Project pursuant to the regulations of the New Hampshire Department of Environmental Service and is committed to making careful use of the water of New Hampshire.

- (6) Boott owns and operates the Lowell Project and there are no federal facilities or land associated with the Project. Portions of the historic infrastructure and associated property are owned by the Commonwealth of Massachusetts and administered by the Massachusetts Department of Conservation and Recreation.

Additional Information Required by 18 CFR §5.18(a)

- (1) *Identify every person, citizen, association of citizens, domestic corporation, municipality, or state that has or intends to obtain and will maintain any proprietary right necessary to construct, operate, or maintain the project:*

Boott presently holds, and will continue to hold, the proprietary rights necessary to operate and maintain the Project works.

- (2) *Identify (providing names and mailing addresses):*

- (i) *Every county in which any part of the project and any Federal facilities that would be used by the project would be located:*

County Name:	Middlesex County	Hillsborough County
Address:	375 Merrimack Street Lowell, MA 01852	19 Temple Street Nashua, NH 03060

There are no Federal lands or facilities used by the Project.

- (ii) *Every city, town, or similar local subdivision:*

- (A) *In which any part of the project, and any Federal facilities that would be used by the project, would be located:*

City/Town Name:	City of Lowell	City of Nashua
Address:	375 Merrimack Street Lowell, MA 01852	229 Main Street Nashua, NY 03060
	Town of Chelmsford 50 Billerica Road Chelmsford, MA 01824	Town of Litchfield 2 Liberty Way Litchfield, NH 03052
	Town of Hudson, NH 12 School Street Hudson, NH 03051	Town of Merrimack 6 Baboosic Lake Road Merrimack, NH 0305
	Town of Tyngsborough 25 Bryant Lane Tyngsborough, MA 01879	

(B) *That has a population of 5,000 or more people and is located within 15 miles of the project dam:*

City/Town/Name:	City of Lowell	Town of Atkinson
Address:	John Leahy Mayor 375 Merrimack Street Lowell MA, 01852	David Cressmand Town Administrator 19 Academy Avenue Atkinson, NH 03811
	Town of Groton Mark Haddad Town Manager 173 Main Street Groton, MA 01450	Town of Bedford Sarah Stanton Town Manager 10 Mudge Way Bedford, MA 01730
	Town of Ayer Town Manager Robert Pontbriand 1 Main Street Ayer, MA 01432	Town of Billerica John Curran Town Manager 365 Boston Road Billerica, MA 01821
	Town of Littleton Joseph Laydon Town Administrator 37 Shattuck Street 3rd Floor, Room 306 Littleton, MA 01460	Town of Boxford Alan Benson Town Administrator 7A Spofford Road Boxford, MA 01921
	Town of Harvard Timothy Bragan Town Administrator 13 Ayer Road Harvard, MA 01451	Town of Burlington Paul Sagarino Town Administrator 29 Center Street Burlington, MA 01803
	Town of Acton John Mangiaratti Town Manager 472 Main Street Acton, MA 01720	Town of Chelmsford Paul Cohen Town Manager 50 Billerica Road Chelmsford, MA 01824
	Town of Andover Andrew P. Flanagan Town Manager 36 Bartlet Street Andover, MA 01810	Town of Concord Stephen Crane Town Manager P.O. Box 535 Concord, MA 01742

Town of Derry
David Caron
Town Administrator
14 Manning Street
Derry, NH 03038

Town of Lincoln
Timothy Higgins
Town Administrator
16 Lincoln Road
Lincoln, MA 01773

Town of North Andover
Melissa Rodrigues
Town Manager
120 Main Street
North Andover, MA 01845

Town of Dracut
Ann Vandal
Town Manager
62 Arlington Street
Dracut, MA 01826

Town of Litchfield
Troy Brown
Town Administrator
2 Liberty Way Suite 2
Litchfield, NH 03052

Town of North Reading
Michael Gilleberto
Town Administrator
235 North Street
North Reading, MA 01864

City of Haverhill
James J. Fiorentini
Mayor
4 Summer Street
Haverhill, MA 01830

Town of Londonderry
Kevin Smith
Town Manager
268B Mammoth Road
Londonderry, NH 03053

Town of Pelham
Brian McCarthy
Town Administrator
6 Village Green
Pelham, NH 03076

Town of Hollis
Lori Radke
Town Administrator
7 Monument Square
Hollis, NH 03049

Town of Lynnfield
Robert Dolan
Town Administrator
55 Summer Street
Lynnfield, MA 01940

Town of Pepperell
Andrew Maclean
Town Administrator
One Main Street
Pepperell, MA 01463

Town of Hudson
Steve Malizia
Administrator
12 School Street
Hudson, NH 03051

Town of Merrimack
Eileen Cabanel
Town Manager
6 Baboosic Lake Road
Merrimack, NH 03054

Town of Reading
Robert LeLacheur
Town Manager
16 Lowell Street
Reading, MA 01867

City of Lawrence
Dan Rivera
Mayor
200 Common Street
3rd Floor Room 309
Lawrence, MA 01840

City of Methuen
Neil Perry
Mayor
41 Pleasant Street
Methuen, MA 01844

Town of Salem
Christopher Dillon
Town Manager
33 Geremonty Drive
Salem, NH 03079

Town of Lexington
James Malloy
Town Manager
1625 Massachusetts
Avenue
2nd Floor, Town Office
Building
Lexington, MA 02420

Town of Middleton
Andrew Sheehan
Town Administrator
48 South Main Street
Middleton, MA 01949

Town of Shirley
Michael McGovern
Town Administrator
7 Keady Way
Shirley, MA 01464

City of Nashua
Jim Donchess
Mayor
229 Main Street
Nashua, NH 03060

Town of Stoneham
Dennis Sheehan
35 Central Street
2nd Floor
Stoneham, MA 02180

Town of Tewksbury
Richard Montuori
Town Manager
1009 Main Street
2nd Floor
Tewksbury, MA 01876

Town of Westford
Jodi Ross
Town Manager
55 Main Street
Westford, MA 01886

Town of Windham
David Sullivan
Town Administrator
3 North Lowell Street
Windham, NH 03087

Town of Tyngsborough
Matt Hanson
Town Administrator
25 Bryants Lane
Tyngsborough, MA
01879

Town of Wilmington
Jeffrey Hull
Town Manager
121 Glen Road
Room 11
Wilmington, MA 01887

City of Woburn
Scott Galvin
Mayor
10 Common Street
Woburn, MA 01801

(iii) *Every irrigation district, drainage district, or similar special purpose political subdivision:*

(A) *In which any part of the project, and any Federal facilities that would be used by the project, would be located:*

The Project is not located in any irrigation district, drainage district, or similar special purpose political subdivision and does not utilize any federal facilities.

(B) *That owns, operates, maintains, or uses any project facilities or any Federal facilities that would be used by the project:*

There are no irrigation districts, drainage districts, or similar special purpose political subdivisions that own, operate, maintain, or use any Project facilities. The Project does not use any federal facilities.

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

There are no political subdivisions in the general area of the Project that there is reason to believe would likely be interested in, or affected by, the application.

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

Indian Tribes listed in the 2018 Notice of Intent and receiving copies of this application include the following Indian tribes:

Mashpee Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

Narragansett Indian Tribe
PO Box 268
Charlestown, RI 02813

Wampanoag Tribe of Gay Head
(Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

Stockbridge Munsee Tribe of Mohican
Indians
N8467 Moh He Con Nuck Road
Bowler, WI 54416

Penobscot Nation
23 Wabanaki Way
Indian Island, Maine 04468

- (3) For a license (other than a license under section 15 of the Federal Power Act) state that the applicant has made, either at the time of or before filing the application, a good faith effort to give notification by certified mail of the filing of the application.

This section is not relevant because Boott is applying for a new license under section 15 of the Federal Power Act.

Exhibit A. Project Description (18 C.F.R. §4.51(b))

A.1 Project Location and Facilities

The Lowell Hydroelectric Project (Project) is located at the Pawtucket Dam on the Merrimack River in the City of Lowell in Middlesex County, Massachusetts. The Project is located approximately 11 miles upstream of the Lawrence Project (FERC No. 2800) and approximately 30 miles downstream of the Amoskeag Dam (a development of the Merrimack River Project, FERC No. 1893) in New Hampshire. The 116-mile-long Merrimack River begins at the confluence of the Winnepesaukee and Pemigewasset Rivers in Franklin, New Hampshire; flows southward into Massachusetts; and then travels northeast until it discharges into the Atlantic Ocean. The Project includes a single powerhouse, the 15.0-megawatt (MW) Eldred L. Field (E.L. Field) powerhouse constructed in 1985-1986 during Project redevelopment. The total installed capacity of the project is 15,012 kW. A Project location map is presented as Figure A.1-1.

The E.L. Field powerhouse utilizes the existing Pawtucket Dam and the first 2,200 feet of the Northern Canal. The powerhouse is located close to the canal, downstream of the University Avenue Bridge (also called the Moody Street Bridge), with an intake structure drawing water from the Northern Canal. A 440-foot tailrace channel, surge gate and fish passage facilities comprise other major E.L. Field powerhouse features.

The Project also includes the Guard Lock and Gates Facility (“Guard Locks”) and the approximately 1,600-foot-long portion of the Pawtucket Canal leading from the Project impoundment to the Guard Locks.

The Project as described herein, consisting of the 15.0 MW E.L. Field powerhouse and associated structures, is intended to fully develop, conserve, and utilize the water resource of the Merrimack River at the Pawtucket Dam.

Figure A.1-1. Lowell Hydroelectric Project Location Map

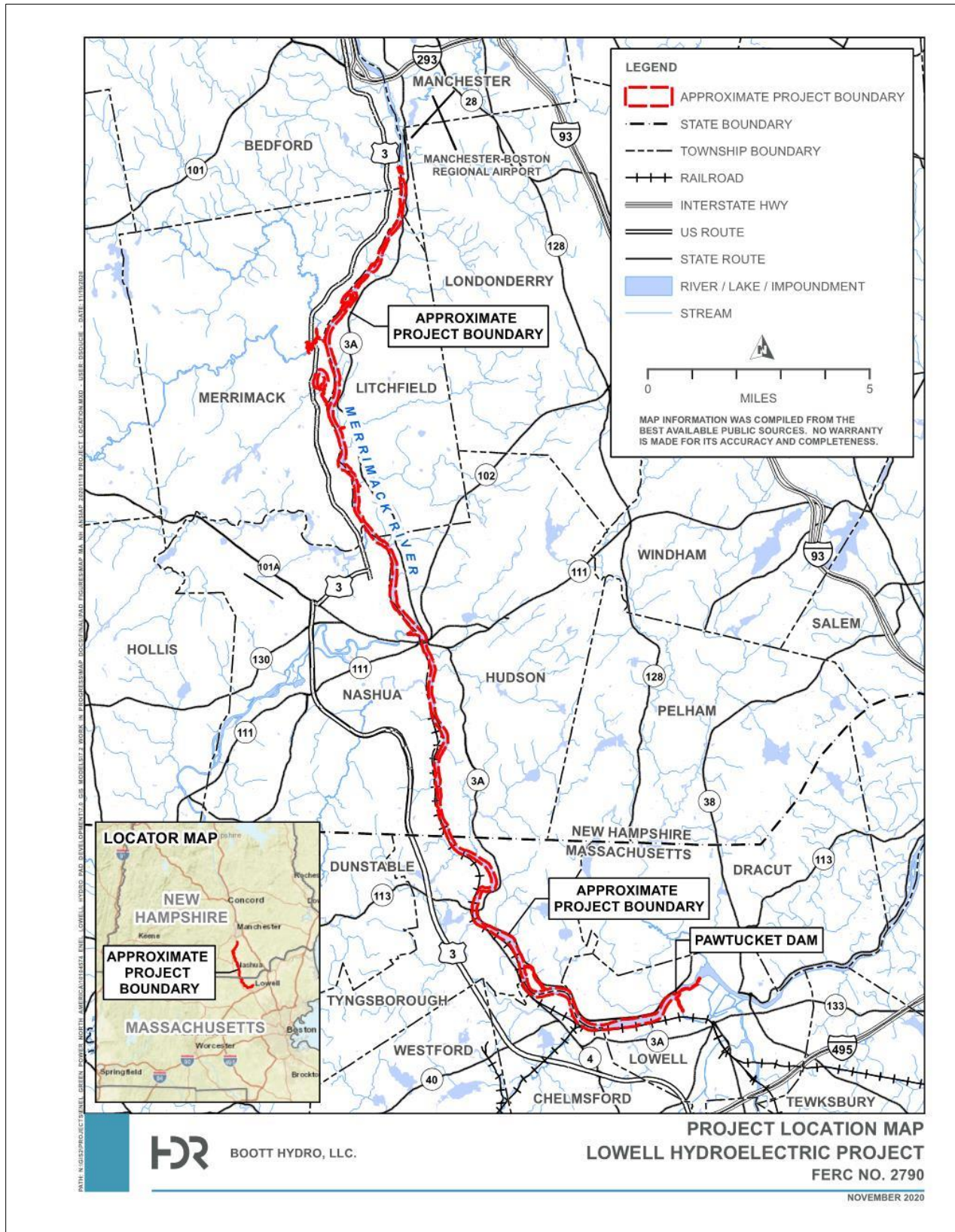
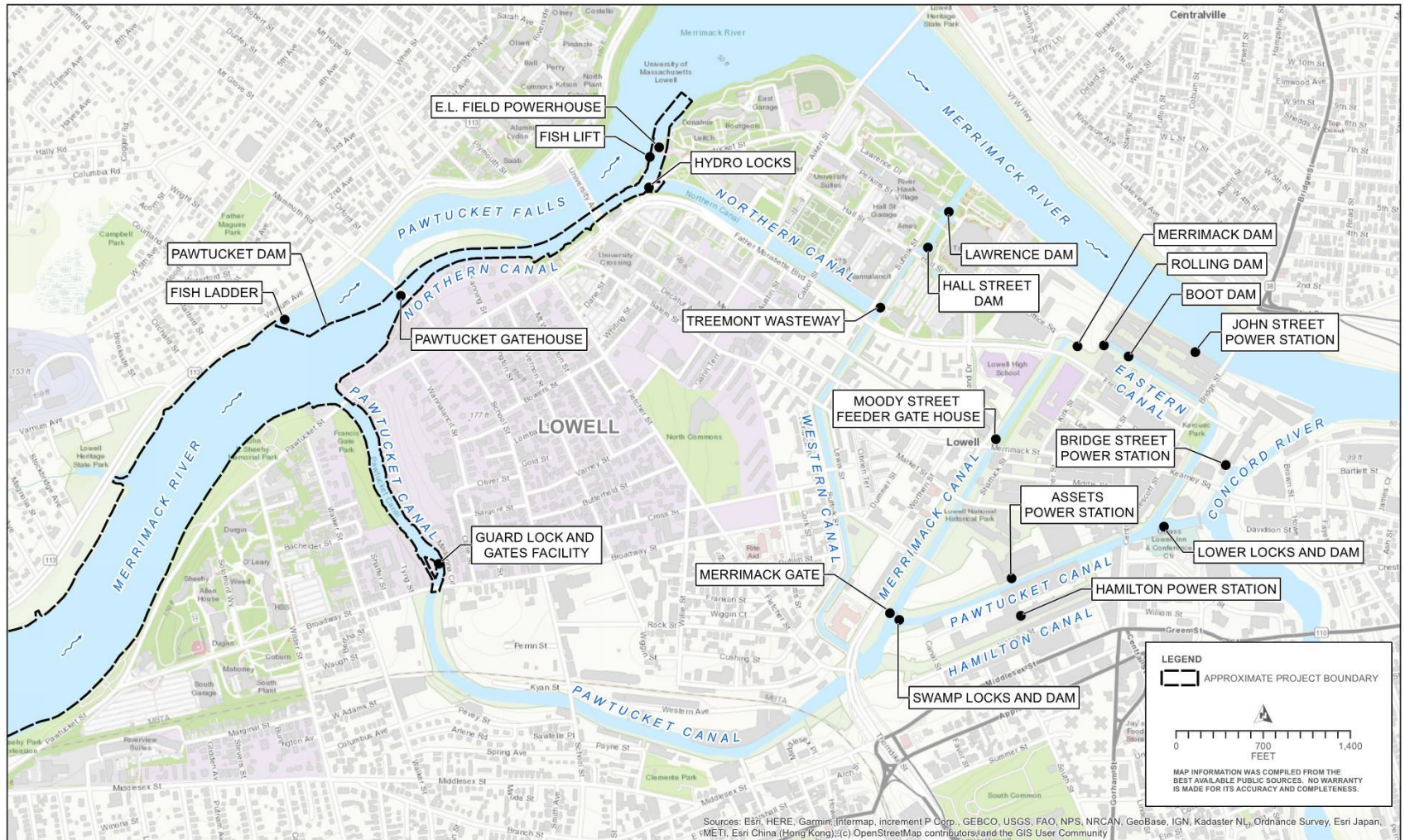


Exhibit A Project Description
Lowell Hydroelectric Project

Figure A.1-2. Lowell Hydroelectric Project Canal System Map



A.2 Physical Composition, Dimensions, and General Configuration (18 C.F.R. §4.51 (b)(1))

The site of the Lowell Project was historically used for hydromechanical and hydroelectric power for various mill operations. Much of the Project's civil works were constructed during the 19th and early 20th centuries, and existed prior to Project licensing and redevelopment in the 1980's. These structures are described below.

A.2.1 The Pawtucket Dam

The Pawtucket Dam is of dressed masonry gravity construction with a length of 1,093 feet, a spillway crest length of 982.5 feet, a spillway crest elevation of 87.2 feet NGVD 29, and an average height of 15 feet. Original drawings show the masonry was ashlar, laid dry with a mortared masonry upstream face at a 1:1 slope, a two-foot-thick capstone, and the bed course laid in mortar. It was built in two sections in 1847 and 1875, the latter being grouted during construction. The dam foundation rests on bedrock, except for a short section on hardpan. A fishway is located at the left dam abutment, and the Pawtucket Gatehouse to the Northern Canal is at the right abutment.

A pneumatically operated crest gate system is mounted on the spillway crest to maintain the headpond at its normal level of 92.2 feet NGVD 29. The pneumatic crest gate system consists of 20 ft long hinged steel panels supported on their downstream side by tubular rubber air bladders. The crest gate system is installed in five independently controllable zones. Air compressors, which supply system inflation and deflation pressure, and the crest gate control system are housed in a building located near the fish ladder and the left (northerly) abutment of the dam.

A.2.2 The Northern Canal

The portion of the Northern Canal contained within the project boundary is about 2,200 feet in length, with masonry or bedrock lining its complete length. The width of the Northern Canal varies along its length. At the head of the canal it is approximately 95-feet-wide, at the location of the University Bridge overpass it is its most narrow at approximately 78-feet-wide. The canal widens to approximately 80 feet as it discharges into the E.L. Field Powerhouse forebay. The Great River Wall is the left retaining wall of the Northern Canal. It runs from the Pawtucket Gatehouse to a natural rock outcrop upstream of the E.L. Field Powerhouse. The wall is a masonry structure that is 2,485 feet long and 32 feet in height. The first 1,000 feet combines masonry walls and an earth dike (with masonry core) as the river wall. The second length is a dressed masonry gravity structure to the site of the E.L. Field powerhouse. The crest of the Great River Wall is approximately 103.0 feet NGVD 29 adjacent to the Pawtucket Gatehouse and varies in elevation along its length. The lowest point of the wall is approximately 93.3 feet at the University Bridge overpass. The width of the wall varies from 8 feet upstream at the Pawtucket Gatehouse to 10 feet at the downstream end.

A.2.3 Pawtucket Gatehouse

The Pawtucket Gatehouse (also known as the “Northern Canal Gatehouse”) is located at the southern abutment of the Pawtucket Dam and controls flow into the Northern Canal. It is principally constructed of dressed masonry with concrete over lintels and contains ten 8-foot-wide by 15-foot-high, motor-operated, timber sliding gates which feed the Northern Canal. Another small intake opening feeds a historic Francis-designed turbine, which formerly powered the gate mechanisms through a line shaft. The structure's water passages are nearly 80 feet in length. A small navigation lock is located on the located at the southerly end of the Pawtucket Gatehouse (Boott 2017).

A.2.4 Eldred L. Field Powerhouse

The E.L. Field powerhouse is a reinforced concrete structure. The powerhouse is approximately 109-feet-long by 96-feet-wide and houses two generating units with a total authorized generation of 15.0 MW. The powerhouse incorporates a separate conventional intake structure for each of the station's two identical units. Each intake is equipped with trashracks; intake and draft tube gate slots with permanent or bulkhead style gates for emergency shutdown and dewatering purposes are also provided. The powerhouse is equipped with a traversing trash rake to remove debris at the intake. Both mobile and on-site cranes are used for heavy equipment movement at the facility.

A.2.5 Tailrace Channel

A 440-foot-long tailrace channel was excavated out of bedrock in the river. The channel excavation is approximately 60 feet wide by an average of 20 feet deep. The tailrace is protected from high river flows by a 10- to 16-foot-high concrete training wall, which directs bypassed river flows away from the tailrace.

A.2.6 Control Structures

A concrete control structure known as “Hydro Locks” was constructed during project redevelopment in the 1980s, at the bend in the Northern Canal upstream of the E.L. Field intake and immediately underneath the Pawtucket Street Bridge. The control structure includes a navigation lock and was constructed to maintain the effective net head at the E.L. Field Powerhouse by isolating the powerhouse forebay from the remainder of the Lowell canal system.

Located just downstream the Great River Wall is the canal surge gate, constructed in the bedrock in the left forebay wall just upstream of the E.L. Field Powerhouse. The steel gate is pneumatically operated and is 15-feet-high by 78-feet-wide set on a masonry weir with a crest elevation of 77.0 feet. This system is designed to attenuate the surge wave in the canal that occurs when there is a sudden plant shutdown. When flow is less than 3,500 cubic feet per second (cfs), the surge suppressor gate is manually disabled. Should the flow increase to over 3,500 cfs, the gate is returned to the automatic operating condition. A safety boom has been installed in the canal above the gate.

A.2.7 Fish Passage Facilities

Upstream and downstream fish passage facilities at the Project include a fish elevator and downstream fish bypass at the E.L. Field powerhouse, and a vertical-slot fish ladder at the Pawtucket Dam. All fish passage facilities were designed in consultation with the U.S. Fish and Wildlife Service. Passage operations are supervised by the state and federal fishery agencies.

The reinforced concrete fish ladder at the Pawtucket Dam is designed to allow for controlled fish passage at river flows up to 25,000 cubic feet per second (cfs). The fishway operates at 200 cfs, including attraction flow, with an additional 300 cfs of supplemental attraction flow released from a slide gate adjacent to the passage facility. The fish ladder is a vertical slot design with 13-foot-wide by 10-foot-long pools. A counting station and fish trap area is provided. The Pawtucket Dam has been modified by removing ashlar masonry to allow the exit channel to penetrate the dam.

The upstream fishway at the powerhouse is a fish elevator. The design discharge capacity is 200 cfs. A fish collection gallery with two openings spans the downstream wall of the powerhouse to collect fish migrating through the tailrace channel, however only the westerly “river side” entrance has been used since the 1990’s, by agreement with the fishery agencies. The fish are attracted into the 30-foot crowding pool, trapped, and crowded. From the crowding pool, they enter the elevator and are lifted in a hopper to the exit channel. From the elevator area, the fish enter a holding pool 10 feet wide by 50 feet long. Fish next enter the fish trap area where they can be counted. A 10-foot by 12-foot fish counting station is provided. Passage of fish through the trap area allows fish to enter the exit channel, passing into the Northern Canal and then upriver.

The downstream fishway at the powerhouse consists of an adjustable-flow sluiceway and bypass adjacent to the intake headwall. Downstream migrants entering the bypass are quickly sluiced into an enlarged and deepened plunge pool located in the bypassed river reach next to the powerhouse. Natural channel braids in the riverbed allow emigrants to move downstream to the mainstem river, at the confluence of the river reach and tailrace.

A.2.8 The Pawtucket Canal

The Pawtucket Canal branches off the Merrimack River about 950 feet upstream of the Pawtucket Gatehouse and feeds water into the downtown canal system. From its starting point, the 9,000-foot canal curves south and then east to meet the Concord River near its junction with the Merrimack River. Only the first 1,600-foot-long section of the Pawtucket Canal between the impoundment and the Guard Lock and Gates Facility is contained within the project boundary. Within this section, the Pawtucket Canal is an excavated channel through soil and ledge which varies from 80 to 100 feet in width.

A.2.9 Guard Lock and Gates Facility

The historic Guard Lock and Gates facility consists of a five-bay gate house located on the left descending side the Pawtucket Canal and a series of three gate structures located within a boat lock on the right descending side of the canal. The substructure of the gate house on the

Pawtucket Canal is of dressed masonry, and the superstructure is of brick masonry and wood frame. Adjacent to this structure is a boat lock consisting of the upper locking gate, Great Guard Gate or Francis Gate, and lower locking gate. The boat lock chamber is 24 feet wide with masonry walls. The upper locking gate and Great Guard Gate are housed in frame buildings.

The Great Guard Gate is a large portcullis gate located within the lock chamber between the upstream and downstream lock gates. This 25' wide by 25' high wooden gate is designed to be lowered into the lock chamber during extreme flood conditions on the Merrimack River, to prevent flooding of downtown Lowell via the Pawtucket Canal. A wood frame structure, the Francis Gatehouse, houses the Great Gate. When needed, the Great Gate can be dropped under its own weight to the bottom of the lock chamber, thereby closing off any flow through the boat lock channel at the Guard Locks, preventing flooding in downtown Lowell via the Pawtucket Canal. The original Great Gate has been used only twice during its history, the year following its construction in 1852 and again in 1936.

Due to the historic nature, public safety concerns and questionable functionality of the historic Great Guard Gate, in 2005 Boott designed and implemented a replacement gate in consultation with the FERC and National Park Service. The replacement gate is a segmented structural steel stoplog gate and frame which is stored on-site. The steel stoplog gate was designed and implemented to functionally replace the historic Great Guard Gate, which remains in place within the Francis Gate House. The steel stoplog gate fits immediately upstream of the Francis Gate House within existing stoplog slots in the granite masonry. When required, installation of the steel stoplog gate can be accomplished within a few hours by a local crane operator. The Project's Emergency Action Plan (EAP) provides that the stoplogs should be installed when the water level at the Pawtucket Dam rises above 98.0 ft NGVD 29. To date, the steel stoplogs have been installed twice, during flooding events in May 2006 and April 2007.

A.3 Impoundment Characteristics (18 C.F.R. §4.51 (b)(2))

The Project operates in a run of river mode and has no usable storage capacity. The pond formed by the Pawtucket Dam extends approximately 23 miles upstream to Moore's Falls in Litchfield and Merrimack, New Hampshire. At the normal pond elevation of elevation 92.2 feet NGVD 29 (crest of pneumatic crest gate), the surface area of the pond is reported to encompass an area of about 720 acres. The gross storage capacity between the normal surface elevation of 92.2 feet NGVD 29 and the minimum pond level of 87.2 feet NGVD 29 is approximately 3,960 acre-feet.

A.4 Generating Equipment (18 C.F.R. §4.51 (b)(3))

Turbine and generator data for the E.L. Powerhouse are provided below in Table A.4-1 and Table A.4-2.

Table A.4-1. Lowell Hydroelectric Project Turbine and Unit Capacity Data

TURBINES									
Powerhouse	Unit #	Type	Diameter Inches	Speed RPM	Head Feet	Flow cfs	Power HP	Power kW	Unit Capacity
E. L. Field	1	Fuji Horizontal Full Kaplan	152.4	120	39	3,300	11,540	8,655	7,506
E. L. Field	2	Fuji Horizontal Full Kaplan	152.4	120	39	3,300	11,540	8,655	7,506

Table A.4-2. Lowell Hydroelectric Project Generator Data

GENERATORS					
Type	kVA	Power Factor	Power kW	Voltage Volts	Speed RPM
Fuji Electric	8,340	0.9	7,506	4,160	120
Fuji Electric	8,340	0.9	7,506	4,160	120

A.5 Transmission Facilities (18 C.F.R. §4.51 (b)(4))

13.8-kilovolt (kV) submarine cable in canal beds carries energy from the E.L. Field powerhouse substation, then travels on another 0.5-mile long submarine cable up the Concord River to National Grid’s Perry Street substation. From the Perry Street substation project output is delivered to the regional utility grid at 115 kV.

A.6 Ancillary Equipment (18 C.F.R. §4.51 (b)(5))

A.6.1 Electrical and Transmission

The design of the electrical equipment and station protection equipment provides completely automatic E.L. Field station operation with load control on a float to measure water level at the dam.

This equipment controls the two synchronous generators connected via 4.16-kV circuit breakers to a common bus. One station transformer is connected directly to this bus and delivers power to the system. Protective relaying comprises one overall differential relaying scheme (with harmonic and percent bias) enclosing within its protected zone the generators, 4.16-kV switchgear, and the transformer.

With the exception of the station transformer and the line circuit breaker, all electrical equipment is housed inside the powerhouse structure. The transformer is located within a fenced enclosure adjacent to the powerhouse. The station transformer has the normal protective devices, such as lightning surge, gas and winding temperature detectors.

Power for station metering is derived from 4.16-kV potential transformers connected to the station bus and current transformers installed in the low-voltage connections to the main transformer.

A.6.2 Mechanical

On-site cranes and hoists can be used to operate the E. L. Field powerhouse head gate and draft tube gates for dewatering. Smaller hoists can be utilized for most other site needs. When required, mobile cranes sited in the facility driveway can be used to reach and operate within most locations of the powerhouse.

A shop and garage located next to the E. L. Field powerhouse provides the station with on-site equipment storage and maintenance capabilities.

A.7 United States Lands within Project Boundary ((18 C.F.R. §4.51 (b)(6))

No lands of the United States are enclosed within the Project boundary. However, portions of the Project do fall within the boundaries of the Lowell National Historical Park. Certain historical structures are owned by the Commonwealth of Massachusetts, administered by Massachusetts Department of Conservation and Recreation.

A.8 References

Boott Hydropower, LLC (Boott). 2017. Application for Amendment of License. Andover, MA.

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Exhibit B. Project Operation and Resource Utilization

B.1 Description of Plant Operations (18 C.F.R. §4.51(c)(1))

B.1.1 General Project Description and Overview

B.1.1.1 Drainage Basin Description

The Lowell Hydroelectric Project is located on the Merrimack River in Lowell, Massachusetts. The Merrimack River watershed has a total drainage area of approximately 5,010 square miles within the states of New Hampshire and Massachusetts (MEOEEA 2002). The drainage area of the Lowell Project is approximately 3,979 square miles.

There is a total of five hydroelectric developments on the Merrimack River, comprising three separate Projects licensed by the Federal Energy Regulatory Commission (FERC or Commission). In New Hampshire, there are four U.S. Army Corps of Engineers (USACE) flood storage dams within the Merrimack River basin. Table B.1-1 presents information on the five hydroelectric developments on the Merrimack River.

Table B.1-1. FERC-regulated Developments on the Merrimack River

Facility	FERC Project #	Licensee	River Mile	Generation Capacity (MW)
Garvins Falls (Merrimack River Project)	1893	CRP NH Amoskeag, LLC	87	12.3
Hooksett (Merrimack River Project)	1893	CRP NH Amoskeag, LLC	81	1.6
Amoskeag (Merrimack River Project)	1893	CRP NH Amoskeag, LLC	73	16
Lowell	2790	Boott	40	20.2
Lawrence	2800	Essex Company, LLC	29	16.8

All the hydroelectric facilities on the Merrimack River operate in ROR mode. The existing license for the Lowell Project was issued by the FERC on April 13, 1983. In accordance with the existing license, the Lowell Project operates in a ROR mode using automatic pond level control of the E.L. Field generating units, with no useable storage capacity, thereby meeting or exceeding the project minimum flow requirement of 1,990 cubic feet per second (cfs).

B.1.2 Current License Requirements and Compliance History

The articles of the 1983 license (as modified by the 2013 Commission order amending the license) represent the applicable license terms under which Boott now operates the Project. A summary of the most applicable of these articles related to Project operations and environmental measures is provided below.

Article 34 (approved September 24, 1984): Requires the Licensee to design and construct upstream and downstream fish passage facilities at the Project, in consultation with the fishery agencies. Accordingly, in the late 1980s the Licensee constructed a fish lift and downstream fish passage facility at the E.L. Field powerhouse and a fish ladder at the Pawtucket Dam. These facilities are operated and managed under a Comprehensive Fish Passage Plan (CFPP) discussed below in Section B.1.3.6.

Article 35 (approved November 28, 2000): Requires the Licensee to conduct an operational study to determine the effectiveness of the fish passage facilities required under Article 34, in consultation with the fishery agencies. During the term of the license The Licensee has conducted numerous fish passage studies and has implemented operational and facility improvements based on the results of those studies. These studies and improvements have been carried out pursuant to the CFPP as discussed below in Section B.1.3.6.

Article 36 (approved November 27, 1984; November 28, 2000; July 11, 2001): Requires the Licensee to develop (1) an instream flow study plan to determine the relationship between Project discharges and downstream aquatic habitat, and (2) a fishery study plan to determine Project discharges necessary to provide for the migration of anadromous fish.

Article 37 (ordered November 27, 1984): Requires the Licensee to discharge an interim continuous minimum flow of 1,990 cfs or inflow, whichever is less, for the purpose of protection of fish and wildlife resources, as measured immediately downstream from the Project.

Article 38 (ordered September 12, 1984): Requires the Licensee to file a revised Report on Recreational Resources to include (1) functional plans for certain repairs and improvements to the Northern Canal and a visitor facility at the Eldred. L. Field (E.L. Field) Powerhouse, and (2) a canal system water level agreement with the National Park Service (NPS).

Boott is also required to adhere to the following operations-related plan:

Crest Gate Operation Plan (approved March 30, 2015): Requires the Licensee to adhere to the detailed plan for operation of the pneumatic crest gate system filed on July 16, 2013 and revised on July 30, 2014. The details of this plan are discussed further in Section B.1.2.1.

B.1.2.1 Operations Compliance History

Boott has continued to operate the Project in compliance with the Project license except for one violation relating to the operation of the Project's only FERC-approved

recreational facility (E. L. Field Powerhouse Visitor Center). FERC issued a letter on December 2, 1994, stating a violation of Article 38 had occurred. In accordance with the license, the Project visitor center was to open to the public by May 30, 1993; however, the opening was delayed by design changes to the powerhouse and development of display signage. The visitor center was opened to the public on July 21, 1994. FERC did not issue any penalties related to this violation.

Following record flooding events on the Merrimack River in May 2006 and April 2007, FERC initiated an investigation of the performance of the Project's wooden flashboards during these events. The investigation was initiated in response to complaints from residents in low-lying areas upstream of the Pawtucket Dam. While it did not designate the issue as a violation or non-compliance, FERC staff concluded that the flashboards had not performed as designed, and on May 28, 2008, ordered the Licensee to remove the flashboards, and to submit a new design for the flashboards that would fail as originally designed. FERC approved Boott's updated flashboard design on June 4, 2008, and the flashboards were fully reinstalled per the approved design on June 20, 2008. On September 25, 2008, FERC issued a letter ordering Boott to work with the NPS and other stakeholders to determine options for a flashboard system that "can be ensured to be completely down during high flows in the Merrimack River." Accordingly, Boott held several meetings with the stakeholders and on March 26, 2010, submitted a letter to FERC indicating that a pneumatic crest gate system had been selected as the best option. On July 6, 2010, Boott submitted an application to amend the Project license to replace the existing five-foot wooden flashboards with a pneumatic crest gate system of equal height. FERC issued an amendment order authorizing the crest gate system on April 18, 2013.

B.1.3 Project Operation

The Project is operated in a ROR mode using the automatic pond level control capability of the E.L. Field Powerhouse. Boott is proposing to continue to operate the Project in the same manner as it is currently operated.

B.1.3.1 General Operations

In accordance with the existing license, the Lowell Project operates in a ROR mode using automatic pond level control of the E.L. Field generating units, with no useable storage capacity, thereby meeting or exceeding the project minimum flow requirement of 1,990 cubic feet per second (cfs) (Boott 2017).

B.1.3.2 Pneumatic Crest Gate Operations

On April 18, 2013, FERC authorized Boott to replace the existing wooden flashboard system on the Project's Pawtucket Dam with a pneumatic crest gate system. FERC approved the amended crest gate system operation plan on March 30, 2015, as discussed in Section B.1.2.1. The plan describes the operation of the pneumatic crest gate system under normal and high-water operations.

The pneumatic crest gate system works in conjunction with the automatic pond level control system at the E.L. Field Powerhouse to maintain consistent headpond level conditions.

Below (Table B.1-2) is a tabular description of the operating curve used for existing crest gate operations.

Table B.1-2. Pneumatic Crest Gate System Operational Scheme

Approximate Spillway Flow (cfs) †	Crest Gate Status	Target Pond Level (ft NGVD 1929)	Unit Operation
0	Full elevation	92.2 ft (Normal pond)	Pond level control maintained at E.L. Field Powerhouse; additional flow passed through downtown canal system as necessary.
0 – 3,250	Full elevation	Rising to ± 93.2 ft	Full available output
3,250 - ± 23,000 (est.)	Automatic pond level control	± 93.2 ft	Full available output
± 23,000 (est.) – 35,000 ^{††}	Automatic pond level control if High Water Operations Protocol is not triggered.	± 93.2 ft	Full available output
	Fully lowered if High Water Operations Protocol is triggered	Pond level follows spillway rating curve based on spillway flow.	Full available output
>35,000	Fully lowered	Rises above 93.2 ft as spillway discharge increases.	Full available output

Source: FERC 2015.

† Flow over the spillway is the inflow to the headpond minus any flow through the turbines at the E.L. Field Powerhouse, through the downtown canal system or through the fish ladder. The maximum combined hydraulic capacity of E.L. Field Powerhouse is approximately 6,600 cfs, but may be restricted by unit availability, debris accumulation at the Northern Canal Gatehouse, high tailwater conditions, and other factors.

†† The potential range of spillway flows over which the crest gate may be fully lowered per the High-Water Operations Protocol. The estimated flow over the spillway is the flow at the Merrimack River (U.S. Geological Survey [USGS] gage No. 01100000) minus the flow at the Concord River (USGS gage No. 01099500) and minus any flow released through Boott's turbines.

B.1.3.2.1 Normal Operation

Under normal operations, the crest gate is maintained at full elevation, and the E.L. Field Powerhouse control system adjusts the main units' output to match inflow and maintain the impoundment water level at the normal, authorized pond elevation of 92.2 feet NGVD 29.

B.1.3.3 Operations During Low Water and Adverse Conditions

During low inflow conditions, Boott operates the Project to maintain the impoundment level of 92.2 feet NGVD 29, and provides the required minimum downstream releases and flows necessary for operation of the fish passage structures in accordance with Articles 36 and 37 of the Project's license. Boott is proposing to continue this operational strategy through a new FERC license for the Project.

B.1.3.4 Operations During High Water and Adverse Conditions

When river flows exceed the hydraulic capacity of the E.L. Field Powerhouse units (approximately 3,300 cfs per unit or 6,600 cfs for both units), excess flows are passed over the Pawtucket Dam spillway.

During these high-water conditions, the crest gate control system automatically adjusts the gates to maintain the impoundment elevation no higher than 93.2 feet NGVD 29, or one foot above the normal pond elevation. When under automatic control, the crest gates would all be fully lowered at spillway flows of approximately 35,000 cfs. In addition, the approved crest gate operations plan requires Boott to fully lower the crest gate panels in anticipation of potential flood events. This minimizes the upstream backwater effect of the Pawtucket Dam to the extent possible. (FERC 2015).

B.1.3.5 Canal System Operations

The Lowell Hydroelectric Project includes a two-tiered network of man-made canals, totaling 5.5 miles in length. Flow enters the canal system upstream of the Pawtucket Dam via the Pawtucket Canal and is controlled by the Guard Lock and Gates Facility.

The Lowell Hydroelectric Project includes four power stations located within mill buildings along the downtown canal system. The Hamilton Power Station contains five units and draws water from the Hamilton Canal in the upper canal system and discharges into the Lower Pawtucket Canal in the lower canal system at a head of approximately 13 feet. The Assets Power Station contains three units and draws water from the Merrimack Canal in the upper canal system and discharges into the Lower Pawtucket Canal in the lower canal system at a head of approximately 13 feet. In the lower canal system, the Bridge Street and John Street Power Stations each draw from the Eastern Canal and discharge to the Merrimack River or the Concord River, at a head of approximately 21 feet. The John Street Power Station contains four units and discharges into the Merrimack River. The Bridge Street Power Station has three units known as "Section 8" discharging into the Concord River.

As stated elsewhere in this application for license, Boott proposes to remove the four mill power stations and associated canal infrastructure from the new FERC license. Nevertheless, Boott will continue to manage the canal structures, water levels and flows using best practices and consistent with current agreements with the National Park Service and other stakeholders.

B.1.3.5.1 Minimum Flow Management

Although there is no formal flow requirement for the canal system, Boott maintains an operating agreement with the NPS to allow tour boat operations to navigate the canal system. Boott maintains canal water levels within appropriate limits during the May 15 to October 15 tour boat operating season. Operations are maintained through a series of locks and gatehouses along the Canal System (Cleantech Analytics 2017).

B.1.3.5.2 Normal Operation

The nominal flow capacity of the downtown canal system via the Pawtucket Canal and the Guard Lock and Gates Facility is approximately 2,000 cfs.

B.1.3.5.3 Operation During High Water

As discussed in Section B.1.3.1, when river flows exceed the hydraulic capacity of the E.L. Field Powerhouse units (6,600 cfs for both units), excess flows up to approximately 2,000 cfs are routed through the downtown canal system and to the canal units. Any flows in excess of these capacities are passed over the Pawtucket Dam spillway.

The Guard Lock and Gates facility includes the Great Guard Gate, a large portcullis gate constructed in 1851 to prevent flooding in downtown Lowell via the Pawtucket Canal. In 2005 Boott designed and implemented a replacement for the historic Great Guard Gate. The replacement gate is a segmented structural steel stoplog gate and frame which is stored on-site and was designed and implemented in consultation with the FERC and National Park Service. It is intended to functionally replace the historic Great Guard Gate, which remains in place within the Francis Gate House. The steel stoplog gate fits immediately upstream of the Francis Gate House within existing stoplog slots in the granite masonry. When required, installation of the steel stoplog gate can be accomplished within a few hours by a local crane operator. The Project's Emergency Action Plan (EAP) provides that the stoplogs should be installed when the water level at the Pawtucket Dam rises above 98.0 ft NGVD 29.

B.1.3.6 Fish Passage Operations

The Comprehensive Fish Passage Plan, approved by FERC on November 28, 2000, required operation of a fish ladder at the Pawtucket Dam. The fish ladder has a total operating flow of 500 cfs including attraction flow. The 500 cfs is the primary source of flow in the bypass reach, other than spillage over the Pawtucket Dam spillway. The fish lift system at E.L. Field Powerhouse has a total flow capacity of 200 cfs, designed to be released through two entrance weirs on either side of the E.L. Field powerhouse. However, since the 1990's only the northern "riverside" entrance operated as 100-120 cfs has been used, by agreement with the fishery agencies. Presently, Boott operates both the fish ladder and the fish lift daily during spring of each year when a cumulative total of 50 American shad (*Alosa sapidissima*) or 200 river herring (alewives, *A. pseudoharengus*, and blueback herring, *A. aestivalis*) are passed at the downstream Lawrence Hydroelectric Project (FERC No. 2800). Additionally, Boott is required to operate the downstream bypass facility from April 1 through July 15 and from September

1 through November 15 (Cleantech Analytics 2017). Since 2013, Boott has worked cooperatively with the U.S. Fish and Wildlife Service (USFWS) and other fishery agencies as part of the Merrimack River Technical Committee to assess and provide passage for eels moving upstream in the mainstem Merrimack. The efforts have occurred primarily at the fish ladder at the Pawtucket Dam, from mid-July through September, annually. Fish passage operations are coordinated with the Merrimack River Technical Committee. All fish passage facilities were designed in consultation with the USFWS.

B.1.4 Plant Factor

Based on the average annual gross energy produced during calendar years 2008 through 2017 and the rated plant capacity of 15.0 megawatt (MW), the estimated annual plant factor for the Lowell Hydroelectric Project is 0.643.

B.2 Estimated Energy Production and Dependable Capacity (18 C.F.R. §4.51(c)(2))

B.2.1 Estimated Average Annual Energy Production

The average annual energy generation of the Lowell Hydroelectric Project for the period of 2008 through 2017 was 84,501 megawatt-hours (MWh). The Project operates in a ROR mode and, therefore, experiences seasonal and annual variations in generation based on natural hydrologic conditions in the Merrimack River Watershed. Table B.2-1 provides a summary of monthly Project generation for a 10-year period from 2008 through 2017 in MWh.

Table B.2-1. Lowell Hydroelectric Project Monthly and Annual Generation (MWh)

Month	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
January	10,610	2,574	6,403	7,163	10,272	8,064	10,422	6,624	9,258	9,325
February	10,955	3,851	6,672	5,228	8,928	8,304	5,232	3,216	9,312	6,335
March	11,727	5,088	8,555	10,176	12,432	12,784	10,536	5,820	10,042	9,395
April	10,876	7,341	8,061	11,088	7,872	13,392	10,959	10,128	8,427	8,387
May	7,690	10,147	8,094	11,472	11,712	9,600	9,264	5,219	7,244	8,181
June	4,512	10,464	4,752	8,304	9,792	11,551	3,075	6,563	2,577	9,716
July	5,615	11,252	2,963	3,552	3,216	11,520	4,608	6,432	1,010	6,635
August	4,810	8,026	2,072	4,416	4,560	6,144	5,472	2,412	1,044	2,959
September	4,962	4,012	1,677	10,128	3,696	6,214	4,428	1,898	498	3,462
October	5,287	5,703	8,457	11,136	7,344	3,894	4,314	5,297	1,059	3,332
November	4,726	4,404	10,216	10,272	6,384	5,376	6,880	6,367	3,649	7,380
December	4,656	4,747	9,687	10,272	8,880	7,772	10,700	8,395	9,025	7,946
Annual	86,425	77,609	77,608	103,207	95,088	104,614	85,890	68,371	63,146	83,053

B.2.2 Estimated Dependable Capacity

Dependable capacity is generally defined as the amount of load a hydroelectric plant can carry under adverse hydrologic conditions during a period of peak demand; for example, during the hot, dry conditions typical of August in the Project area. The estimated dependable capacity is also determined by the minimum flow requirements included in the existing license. Under the current license, the Project’s estimated dependable capacity is approximately 4.9 MW, based on the August median flow of 1,940 cfs at the Project site.

B.2.3 Hydraulic Capacity of Powerhouse

The maximum hydraulic capacity of E.L. Field Powerhouse is approximately 6,600 cfs, but may be restricted by unit availability, debris accumulation at the Northern Canal Gatehouse, high tailwater conditions, and other factors.

Table B.2-2. Lowell Hydroelectric Project Hydraulic Capacity

TURBINES				
			Runner Diameter	Hydraulic Capacity
Powerhouse	Unit #	Type	Inches	cfs
E. L. Field	1	Fuji Horizontal Full Kaplan	152.4	3,300
E. L. Field	2	Fuji Horizontal Full Kaplan	152.4	3,300

B.2.4 Project Flows

The Pawtucket Dam is the main impounding structure that provides head and flow for all the Lowell Hydroelectric Project’s generating stations and the canal system. The normal operating pool level behind the dam is 92.2 ft NGVD 29. Flow passes from the Pawtucket Dam reservoir into the Pawtucket Canal and the Northern Canal. The Northern Canal Gatehouse controls flow into the Northern Canal, which leads to the E.L. Field Powerhouse; normally all flow in the Northern Canal pass through the turbines at E.L. Field and is discharged back to the Merrimack River. A lock control structure controls flow into the lower portion of the Northern Canal downstream of the E.L. Field Powerhouse. The Guard Lock and Gates Facility controls flow into the Pawtucket Canal.

Flow over the spillway is the inflow to the headpond less any flow through the turbines at the E.L. Field Powerhouse, through the downtown canal system, or through the fish ladder.

The majority of flows through the Lowell Project are a direct result of the annual hydrologic cycle. The river receives higher inflows during the annual spring runoff and in the wetter fall and winter months. There are several U.S. Army Corps of Engineers flood control reservoirs in the Merrimack River basin upstream of the Lowell Project. Boott

and other licensees in the Merrimack River basin pay Headwater Benefits annual charges to offset the costs of operation and maintenance of these flood control facilities.

Two USGS Gages were reviewed to establish Project hydrology:

- USGS Gage No. 01100000 *Merrimack River Below Concord River at Lowell, MA; and,*
- USGS Gage No. 01099500 *Concord River Below River Meadow Brook, at Lowell, MA.*

Flows from USGS Gage No. 01099500 *Concord River Below River Meadow Brook, at Lowell, MA* were subtracted from flows at USGS Gage No. 01100000 *Merrimack River Below Concord River at Lowell, MA, MA* to calculate the hydrologic data tabulated in Table B.2-3, presenting data at the Project from the past 30 years (water years 1987-2016).

Table B.2-3. Lowell Hydroelectric Project Hydrologic Data (1987-2016)

Month	Minimum (cfs)	90% Exceedance (cfs)	Average (cfs)	10% Exceedance (cfs)	Maximum (cfs)
January	916	3,462	7,651	12,834	39,710
February	1,478	3,272	6,813	11,415	39,180
March	1,914	4,508	11,484	21,355	50,220
April	2,765	6,558	17,901	31,178	78,890
May	2,034	4,112	10,749	18,657	88,410
June	874	2,279	6,768	13,286	44,660
July	670	1,325	4,207	9,270	29,820
August	569	1,121	3,526	6,852	30,030
September	460	1,008	3,162	6,025	32,264
October	787	1,676	5,938	12,706	50,150
November	1,345	2,888	7,978	14,747	30,990
December	1,839	3,472	9,141	17,243	34,810
Annual	460	1,723	7,941	17,059	88,410

Source: USGS 2018.

Monthly flow duration curves have been developed for the Lowell Project using water years 1987-2016 are shown below in Figure B.2-1 through Figure B.2-4

B.2.5 Area-Capacity and Rule Curves

The Project operates in ROR mode and has no useable storage capacity. The gross storage capacity between the normal surface elevation of 92.2 feet NGVD 29 and the minimum pond level of 87.2 feet is approximately 3,600 acre-feet. Given the Project's current and proposed ROR operations, the minimal fluctuations in the reservoir level cause very little change in the surface area of the impoundment. Consequently, a site-

Exhibit B Project Operation and Resource Utilization
Lowell Hydroelectric Project

specific area-capacity curve and impoundment rule curve for the E.L. Field Powerhouse have not been developed, nor are they necessary to the current and future operation of the Project.

Figure B.2-1. Monthly Flow Duration Curves at Pawtucket Dam (January – March)

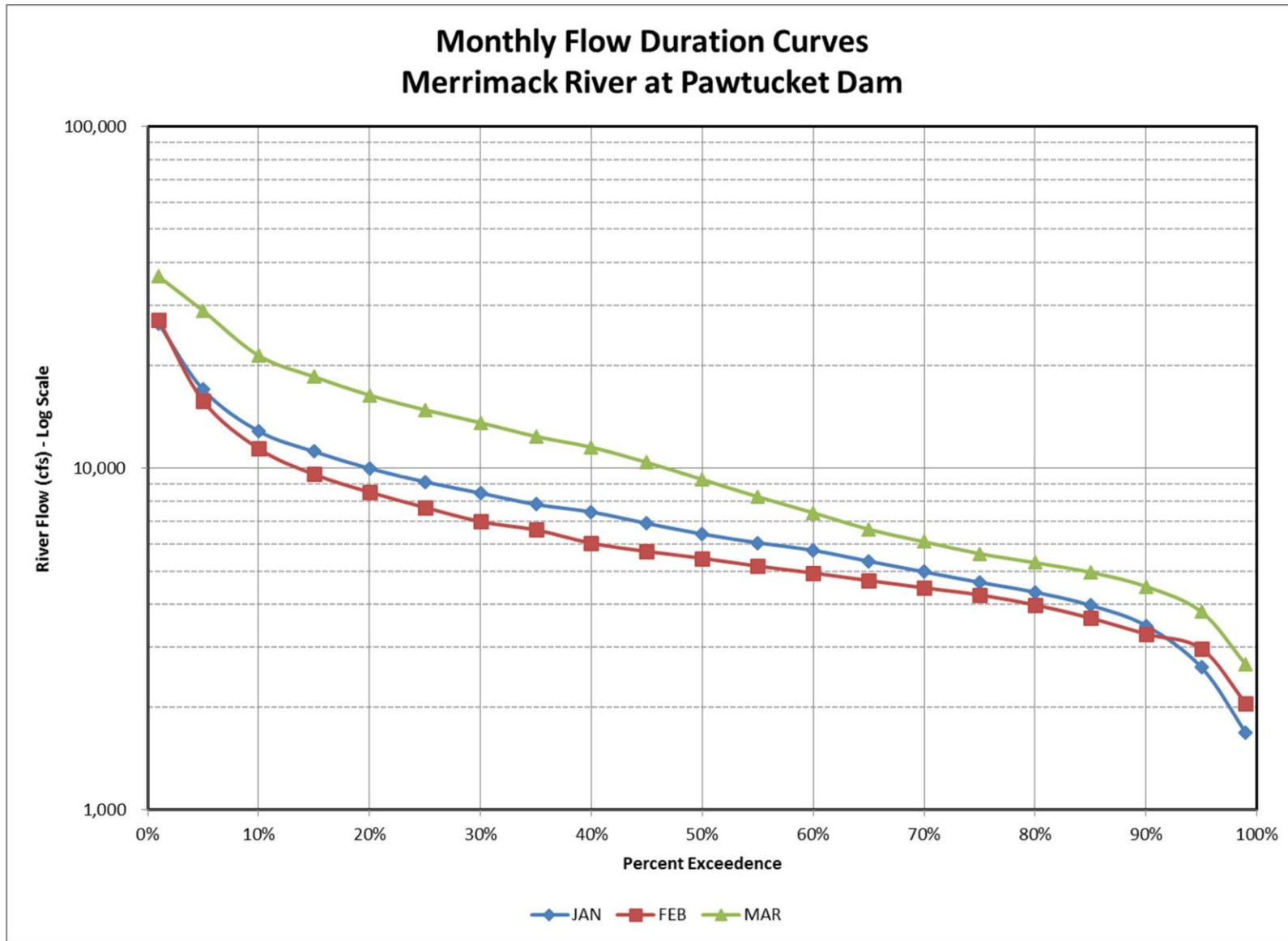


Figure B.2-2. Monthly Flow Duration Curves at Pawtucket Dam (April – June)

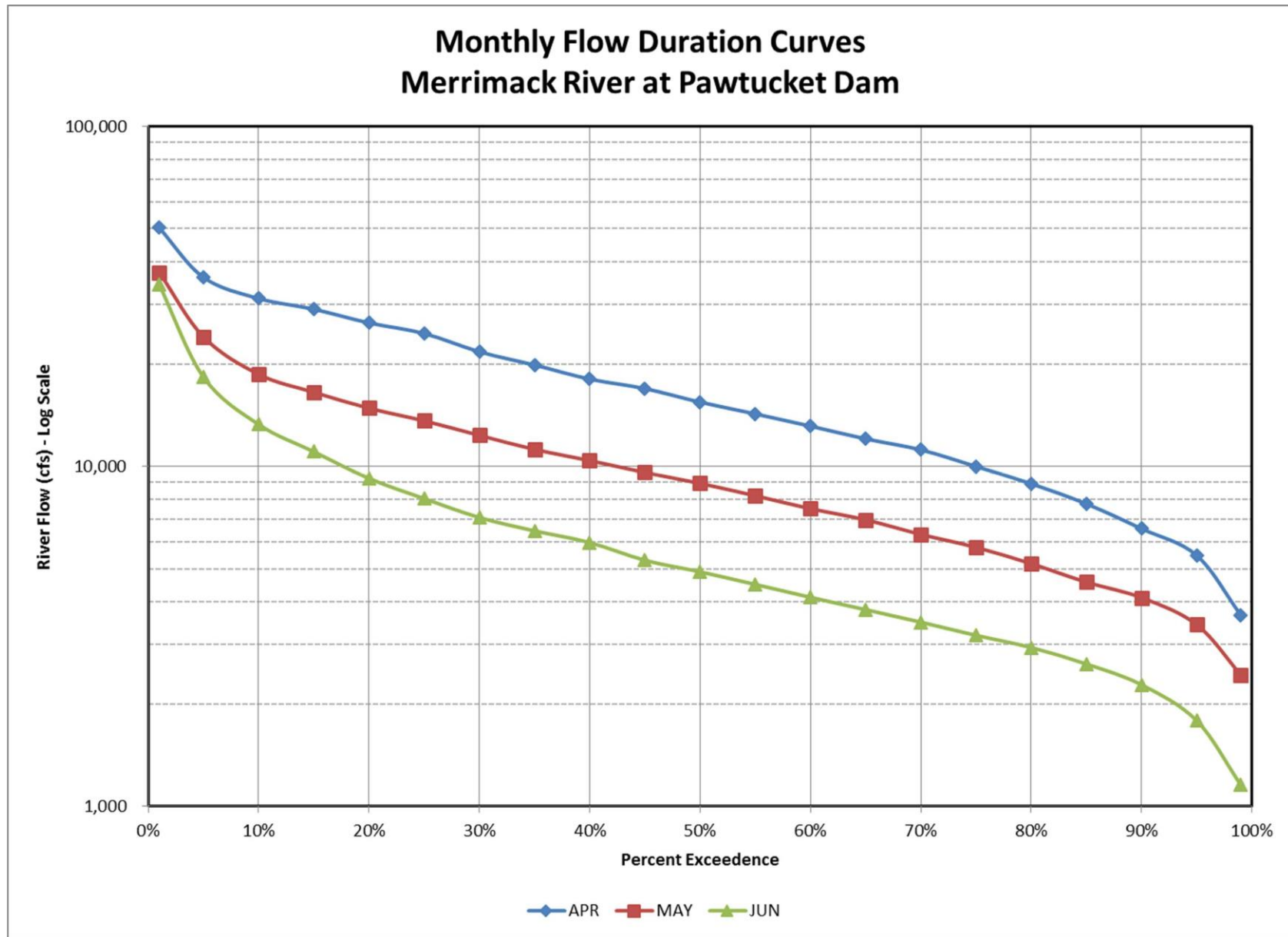


Figure B.2-3. Monthly Flow Duration Curves at Pawtucket Dam (July – September)

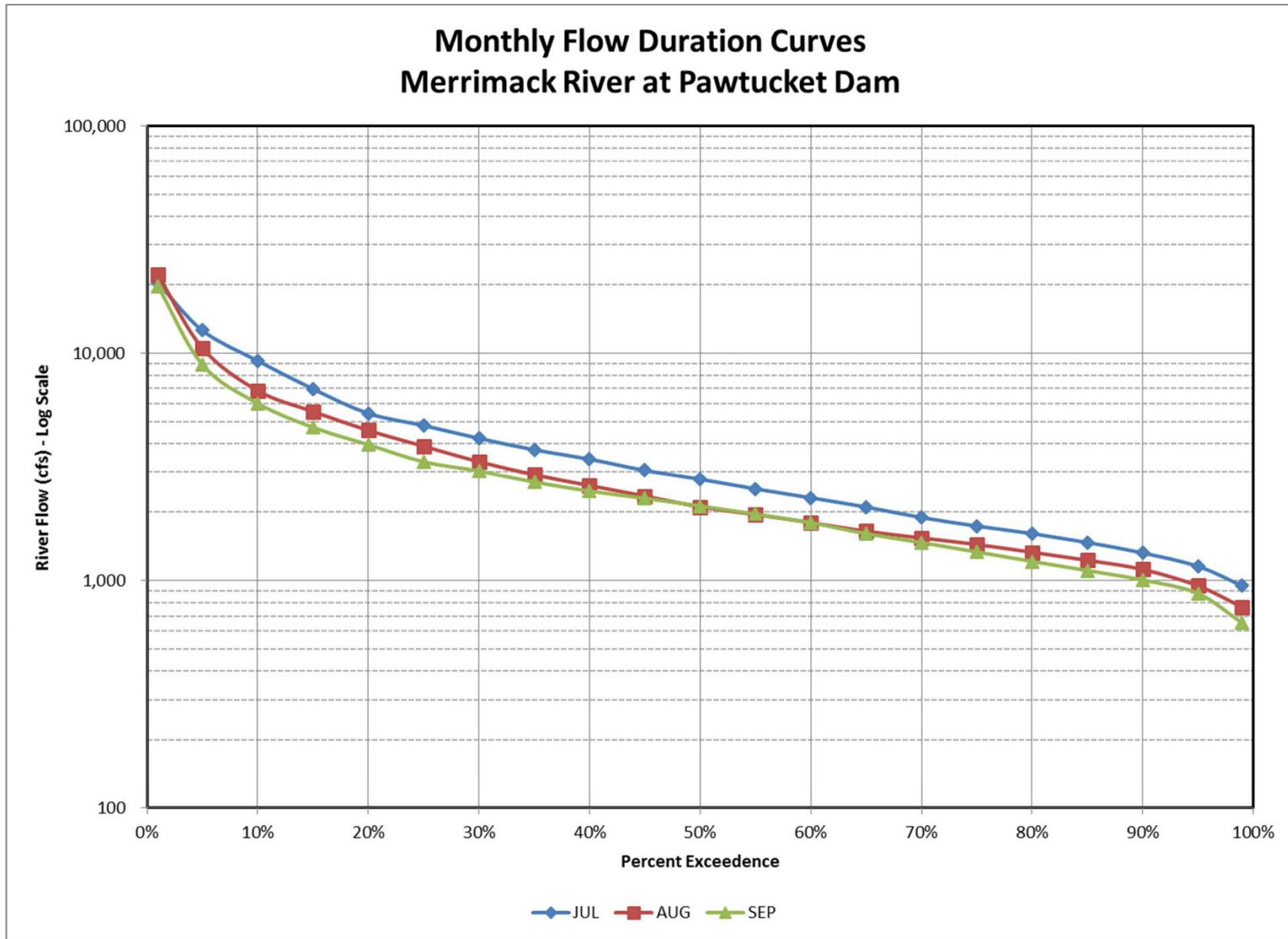
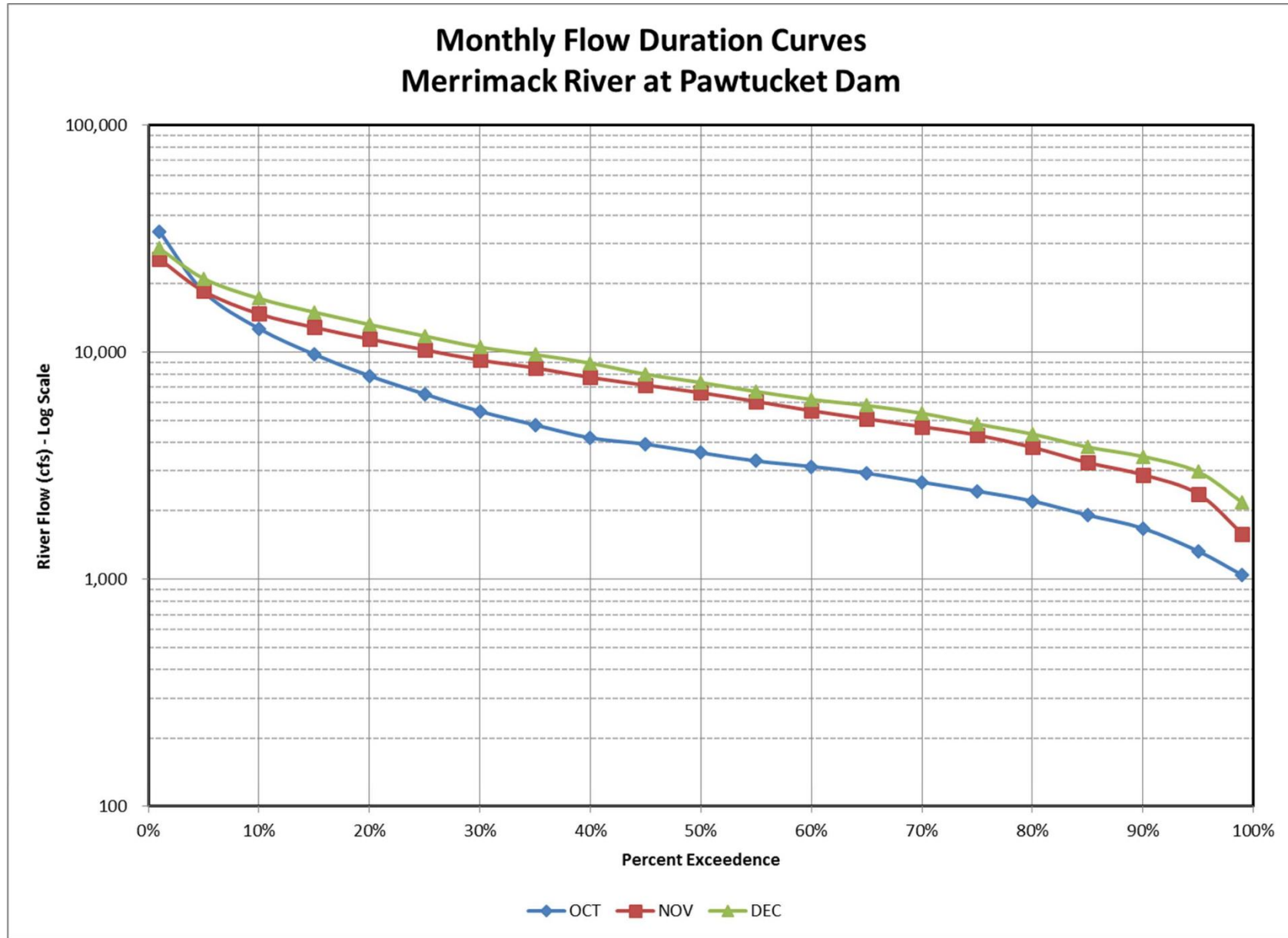


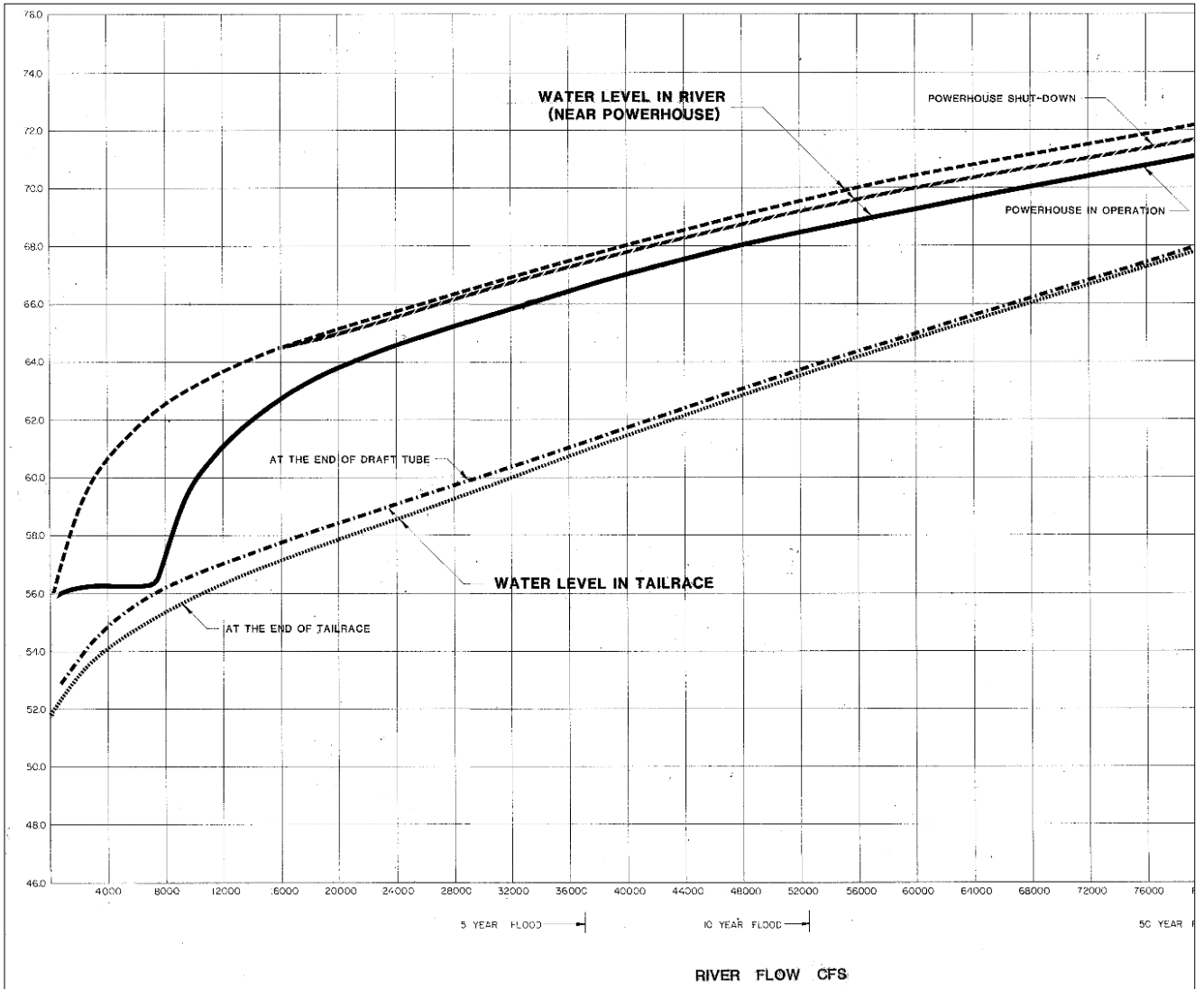
Figure B.2-4. Monthly Flow Duration Curves at Pawtucket Dam (October – December)



B.2.6 Tailwater Rating Curve

The tailwater rating curve for the E. L. Field Powerhouse is presented in Figure B.2-5.

Figure B.2-5. Tailwater Rating Curve



B.2.7 Powerplant Capacity versus Head

Curves indicating powerplant capability versus head for the E.L. Field Powerhouse are not presently available. This information will be provided in the Final License Application.

B.3 Statement of Power Utilization (18 C.F.R. §4.51(c)(3))

Boott proposes to continue to operate the Project in a ROR mode while maintaining minimum flow requirements and reservoir elevations pursuant to the new license. Power generated at the Project is sold to meet the demands of the regional grid.

As noted above, a 13.8-kilovolt (kV) submarine cable within the canal carries energy from the E.L. Field powerhouse to National Grid's Bridge Street substation in Lowell. The output from the E.L. Field Powerhouse is metered at Bridge Street, where a utility disconnect is also located. Metered energy then travels on another 1.5-mile-long submarine cable up the Concord River to National Grid's Perry Street substation. From the Perry Street substation, project output is delivered to the regional utility grid at 115 kV. A single-line diagram for the Project and its interconnection to the grid will be provided in Volume IV of the FLA, and will be filed as Critical Energy Infrastructure Information (CEII).

B.4 Future Development (18 C.F.R. §4.51(c)(4))

Boott is not proposing any new Project facilities or modifications to Project operations currently. However, as economic conditions continue to change, Boott periodically performs evaluations of Project facilities for potential upgrades and will continue to do so in the future.

B.5 References

Boott Hydropower, LLC (Boott). 2017. Application for Amendment of License. Andover, MA.

Cleantech Analytics, LLC. 2017. Certification Application to the Low Impact Hydro Institute, Lowell Hydroelectric Facility. July 26, 2017.

Federal Energy Regulatory Commission (FERC). 2015. Order Approving Amended Crest Gate System Operation Plan. Issued March 30, 2015.

Massachusetts Executive Office of Energy and Environmental Affairs (MEOEEA). 2002. Merrimack River A Comprehensive Watershed Assessment Report 2001. [Online] URL: <http://www.mass.gov/eea/docs/eea/water/assess-rpt-merrimack-2000.pdf> (October 1, 2020).

U.S. Geological Survey (USGS). 2018. National Water Information System: Web Interface. [Online] URL:

Exhibit B Project Operation and Resource Utilization
Lowell Hydroelectric Project

https://waterdata.usgs.gov/ma/nwis/uv/?site_no=01100000&PARAMeter_cd=00065,00060 (Accessed March 23, 2018).

Exhibit C. Construction History (18 C.F.R. § 4.51 (d))

C.1 Introduction

The site of the Lowell Project was historically used for hydromechanical and hydroelectric power for various mill operations. Much of the Project's civil works were constructed during the 19th and early 20th centuries and existed prior to initial Project licensing. In 1796, construction of the Pawtucket Canal was complete. The Pawtucket Canal had to be deepened and its locks rebuilt or repaired several times during its first decade of operation. By 1821, three single locks were constructed along the canal, the Guard Locks, Swamp Locks, and a flight of three locks in a row known as the Lower Locks. By 1836 the canal system comprised of a two-level system, with the Western, Merrimack, and Hamilton canals, all of which took their water from above Swamp Lock Dam, comprising the upper portion of the system, and the Lower Pawtucket and Eastern Canals, fed from below Swamp Locks Dam, comprising the lower portions. The second great phase of construction was completed by 1848 with construction of the Northern Canal and the Pawtucket Gatehouse.

The four additional power stations included under the original Project license were in operation prior to being licensed by the Federal Energy Regulatory Commission (FERC) in 1983. The Assets Power Station was constructed in 1911. The Bridge Street Power Station was constructed in 1910. The Hamilton Power Station was constructed in 1918. The John Street Power Station was constructed in 1919. Boott proposes to remove these power stations and associated canal infrastructure from the new license. On April 13, 1983, FERC issued an original license for the Lowell Hydroelectric Project in accordance with the FERC's delegated authority under the Federal Power Act. Construction of new Project features, including the E.L. Field Powerhouse, Hydro Locks and fishway facilities, was initiated in 1983 and the Project was commissioned and placed into service on November 21, 1985.

Since the license was transferred to Boott in 1983⁷, Boott has engaged in a series of operations and maintenance and life extension activities to maintain the reliability of the Project.

C.2 Project Schedule of New Development

Boott is not proposing any increase in capacity as part of this relicensing, and instead proposes to reduce the currently authorized capacity by removing the four mill powerhouses and associated canal infrastructure from the license. Boott has examined the potential for Project life extension, unit upgrade, and capacity addition (outside of, or beyond current authorizations), and has determined that life extension of the existing canal facilities is not economically feasible. Therefore, Boott is only considering life extension of

⁷ Order Approving Transfer of License, 23 FERC ¶ 62,043 (1983).

the remaining Project facilities, namely the Pawtucket Dam and fish ladder, the E.L. Field powerhouse, the Northern Canal and associated structures leading up to E.L. Field, and the Guard Lock and Gates facility. There is no fixed schedule for Boott's life-extension program, and no proposed new development at this time. This program consists of an ongoing program to maintain, repair, modify, or replace the civil, mechanical, or electrical components of the Project on an as-needed basis. Boott reserves the right to reevaluate the potential for unit upgrades or capacity additions in the future.

Boott is proposing certain protection, mitigation and enhancement (PM&E) measures consistent with the PM&E measures required by the existing license and, therefore, no new construction is necessary for the continuation of the PM&E measures required by the existing license.

Exhibit D. Costs and Financing (18 C.F.R. §4.51(e))

D.1 Original Cost of Existing Unlicensed Facilities

This section is only applicable to initial license applications and not applicable to this current relicensing application of Lowell Hydroelectric Project.

D.2 Project Takeover Cost Pursuant to Section 14 of the FPA

Under Section 14(a) of the Federal Power Act (FPA), the Federal government may take over any project licensed by the Commission upon the expiration of the original 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, the Licensee 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 Federal Power Act.

D.2.1 Fair Market Value

Fair market value is not defined in the FPA or its implementing regulations. The fair value of the Project depends on prevailing power values and license conditions, both of which are currently subject to change. The best approximation of fair value is likely to 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 operating 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, the Licensee would calculate fair value based on then-current conditions.

Boott will provide the fair market value of the Project in the Final License Application to be filed with the Commission by April 30, 2021.

D.2.2 Net Investment

The FPA defines “net investment” as the original cost, plus additions, minus the sum of the following items (to the extent that such items have been accumulated during the period of the license from earnings in excess of a fair return on such investment): (a) unappropriated surplus; (b) aggregate credit balances of current depreciated accounts; and (c) aggregate appropriations of surplus or income held in amortization, sinking fund, or similar reserves.

Boott will provide the net investment of the Project in the Final License Application to be filed with the Commission by April 30, 2021.

D.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, FPA), 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.

D.3 Estimated Cost of New Development

D.3.1 Land and Water Rights

The Licensee currently holds all land and water rights necessary to construct, operate and maintain the Project, and is not proposing expansion of its land or water rights as a consequence of this license application.

D.3.2 Cost of New Facilities

The Licensee is not proposing any capacity-related developments at the Project. Boott is proposing a continuation of certain Protection, Mitigation, and Enhancement (PM&E) measures required by the existing license.

D.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 is approximately (*to be provided in the final application for new license*). This estimate includes costs associated with existing and projected project operations and maintenance⁸, as well as local property and real estate taxes, but excludes income taxes, depreciation, and costs of financing.

D.4.1 Capital Costs

The Licensee uses a (*to be provided in the final application for new license*) 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, revolving credit lines, and cash from operations.

⁸ Including major maintenance costs. Costs for individual protection, mitigation, and enhancement measures are provided in Exhibit E, Section E.8 of the final license application.

D.4.2 Taxes

Property taxes for the 2019 fiscal year were approximately (*to be provided in the FLA*). Income taxes for the Project are incorporated into costs of the Licensee's consolidated business and are not separated out for the Project.

D.4.3 Depreciation and Amortization

The annualized composite rate of depreciation for the Project is approximately (*to be provided in the FLA*) percent.

D.4.4 Operation and Maintenance Expenses

The estimated annual operation and maintenance expense at the Project was approximately (*to be provided in the FLA*), including corporate support costs, but excludes property and real estate taxes.

D.5 Estimated Annual Value of Project Power

The Licensee sells all the electricity generated at the Project into the regional grid under a power purchase agreement. The average annual gross energy projection for the Project, and an approximation of the value of project power, will be provided in the final application for new license.

D.6 Sources and Extent of Financing

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

D.7 Cost to Develop the License Application

The approximate cost through 2019 to prepare the application for new license for the Project was approximately (*to be provided in the FLA*).

D.8 On-Peak and Off-Peak Values of Project Power

The Lowell Hydroelectric Project operates in run of river mode. As per 18 C.F.R. § 4.51(e)(8), this section is not applicable to hydroelectric projects operating in run of river mode.

D.9 Estimated Average Annual Increase or Decrease in Generation

Boott proposes to remove the four mill power stations from the new license. The resulting decrease in generation or value in the will be provided in the final license application.

Exhibit F. Project Description (18 C.F.R. §4.51(g))

F.1 Design Drawings

The general design drawings showing overall plan views, elevations, and sections of the principal works for the Project will be provided in the FLA to be filed with FERC by April 30, 2021. In accordance with FERC's regulations and guidelines,⁹ Boott is requesting that the General Design Drawings for the Lowell Hydroelectric Project be treated as containing Critical Energy Infrastructure Information (CEII). This request for privileged treatment is being made to the Commission in accordance with the Final Rule (Order No. 630-A) issued by the Commission on July 23, 2003 (revised August 8, 2003). Therefore, in conjunction with filing the FLA, Exhibit F general design drawings, amended or replaced as necessary, will be filed with the Commission in Volume II of the application under separate cover in accordance with Order 630-A.

F.2 Supporting Design Report

Pursuant to 18 C.F.R. §4.41(g)(3), an applicant for a new license is required to file with the Commission two copies of a Supporting Design Report (SDR) when the applicant files a license application. An SDR summarizes the studies that have been performed to date and the assumptions that have been made related to the development of the existing Project. The information contained within the SDR demonstrates that the existing structures are safe and adequate to fulfill their stated functions. The SDR will be provided with the FLA.

⁹ "Designation of Incoming Dam Safety Documents" <https://www.ferc.gov/enforcement-legal/ceii/designation-incoming-dam-safety-documents>

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Exhibit G. Project Maps (18 C.F.R. §4.51(h))

G.1 Project Boundary Maps

The current Project Boundary Maps for the Lowell Hydroelectric Project were prepared in accordance with the requirements of 18 C.F.R. §4.39 and 4.51(h) and show the Project vicinity, location, and boundary to provide an understanding of the Project's location. The current, FERC-approved Exhibit G drawings for the Project are listed below in Table G.1-1.

Table G.1-1. Lowell Hydroelectric Project Exhibit G Project Boundary Drawings

Exhibit No.	FERC Drawing No.	FERC Approval Date
G-1	2790-38	April 13, 1983
G-2	2790-39	
G-3	2790-40	
G-4	2790-41	
G-5	2790-42	
G-6	2790-43	
G-7	2790-44	

As stated elsewhere in this application for license, Boott proposes to remove the four mill power stations and associated canal infrastructure from the new FERC license. This will also modify the Project Boundary. Boott is in the process of updating the Exhibit G drawings for the Lowell Hydroelectric Project to meet the Commission's current requirements. The updated Exhibit G drawings for the Project will be provided in the FLA to be filed with the Commission by April 30, 2021.

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Exhibit H. Ability to Operate (18 C.F.R. §5.18(c))

This exhibit is still under development and will be included in its entirety in the Final License Application (FLA).

H.1 Licensee's Ability to Provide Efficient and Reliable Electric Service (18 C.F.R. §5.18(c)(1)(i)(A))

H.1.1 Increase in Capacity or Generation

Boott currently has no plans to increase the capacity or generation of the Project as part of this relicensing.

H.1.2 Coordination of Operation with Upstream and Downstream Projects

As described in Exhibit B of this application, Boott does not coordinate the operation of the Project with other Projects located either upstream or downstream. However, all hydroelectric projects on the Merrimack River are under the common ownership of Central Rivers Power, LLC, which enhances and ensures any necessary coordination of operations on the Merrimack River.

H.1.3 Coordination of Operation with Electrical Systems to Minimize Cost of Production

As described in Exhibit B of this application, Boott does not coordinate the operation of the Project with other Projects or electric systems.

H.2 Need for Project Power (18 C.F.R. §5.18(c)(1)(i)(B))

H.2.1 Cost and Availability of Alternative Sources of Power

To be provided in the FLA.

H.2.2 Increase in Fuel, Capital, and Other Costs to Purchase or Generate Replacement Power

To be provided in the FLA.

H.2.3 Effect of Alternative Power Sources on Licensee’s Customers, Operating and Load Characteristics, and Communities Served

To be provided in the FLA.

H.3 Need, Reasonable Cost, and Availability of Alternative Sources of Power (18 C.F.R. §5.18(c)(1)(i)(C))

H.3.1 Average Annual Cost of Power

The estimated annual costs for the Lowell Project are presented in Table H.3-1.

Table H.3-1. Lowell Project Current Average Annual Cost

Description	Cost
Cost of capital (equity and debt)	To be provided in the Final License Application
Local, state, and federal taxes	
Depreciation and amortization	
Operation and maintenance expenses, including interim replacements, insurance, administrative and general expenses, and contingencies	
Total	

H.3.2 Projected Resources to Meet Licensee’s Capacity and Energy Requirements over the Short and Long Term

To be provided in the FLA.

H.4 Use of Power for Applicant-owned Industrial Facility (18 C.F.R. §5.18(c)(1)(i)(D))

Boott does not own any industrial facilities; therefore, this section is not applicable.

H.5 Native American Tribe as Applicant (C.F.R. §5.18(c)(1)(i)(E))

Boott is not a Native American tribe; therefore, this section is not applicable.

H.6 Impacts of Receiving or not Receiving a License on Licensee's Operations of the Transmission Facility (18§5.18(c)(1)(i)(F))

To be provided in the FLA.

H.7 Modifications to Project Facilities and Consistency with Comprehensive Plans (18 C.F.R. §5.18(c)(1)(i)(G) and (H))

Section 10(a)(1) and (2) of the Federal Power Act (FPA) requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by a project. The Commission's Scoping Document 2 (SD2) identified twenty-eight comprehensive plans that are potentially relevant to the Project. On December 19, 2018, the National Park Service filed five additional comprehensive plans, and by letter dated March 20, 2019, the Commission accepted four of the five plans. The Licensee has reviewed the Commission's list of comprehensive plans, which are listed below. Boott will further consider the Project's consistency with these plans during the development of the Final License Application and will describe them in greater detail in the Final License Application.

1. Atlantic States Marine Fisheries Commission. 1998. Amendment 1 to the Interstate Fishery Management Plan for Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). (Report No. 31). July 1998.
2. Atlantic States Marine Fisheries Commission. 1999. Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.
3. Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). (Report No. 36). April 2000.
4. Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000.
5. Atlantic States Marine Fisheries Commission. 2008. Amendment 2 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2008.
6. Atlantic States Marine Fisheries Commission. 2009. Amendment 2 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. May 2009.
7. Atlantic States Marine Fisheries Commission. 2010. Amendment 3 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. February 2010.
8. Atlantic States Marine Fisheries Commission. 2013. Amendment 3 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. August 2013.

9. Atlantic States Marine Fisheries Commission. 2014. Amendment 4 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2014.
10. Massachusetts Department of Environmental Management. Commonwealth connections: A greenway vision for Massachusetts. Boston, Massachusetts.
11. Massachusetts Department of Fish and Game. 2006. Comprehensive wildlife conservation strategy. West Boylston, Massachusetts. September 2006.
12. Massachusetts Executive Office of Energy and Environmental Affairs. Statewide Comprehensive Outdoor Recreation Plan (SCORP): Massachusetts Outdoor 2006. Boston, Massachusetts.
13. Merrimack River Policy and Technical Committees. 1990. Strategic plan for the restoration of Atlantic salmon to the Merrimack River, 1990 through 2004. Concord, New Hampshire. April 1990.
14. National Marine Fisheries Service. 1998. Final Amendment #11 to the Northeast Multispecies Fishery Management Plan; Amendment #9 to the Atlantic sea scallop Fishery Management Plan; Amendment #1 to the monkfish Fishery Management Plan; Amendment #1 to the Atlantic salmon Fishery Management Plan; and Components of the Proposed Atlantic herring Fishery Management Plan for Essential Fish Habitat. Volume 1. October 7, 1998.
15. National Marine Fisheries Service. 1998. Final Recovery Plan for the shortnose sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. December 1998.
16. National Park Service. 1981. Lowell National Historical Park General Management Plan. Lowell, Massachusetts.
17. National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.
18. National Park Service. 2002. General Management Plan Addendum for Lowell National Historical Park. Lowell, Massachusetts.
19. National Park Service. 1980. Details of the Preservation Plan. Lowell National Historical Park. Lowell, Massachusetts.
20. National Park Service. 1990. Preservation Plan Amendment. Lowell National Historical Park. Lowell, Massachusetts.
21. New Hampshire Office of State Planning. 1977. Wild, scenic, & recreational rivers for New Hampshire. Concord, New Hampshire. June 1977.
22. New Hampshire Office of State Planning. 1989. New Hampshire wetlands priority conservation plan. Concord, New Hampshire.
23. New Hampshire Office of Energy and Planning. New Hampshire SCORP: 2008-2013. Concord, New Hampshire. December 2007.
24. New Hampshire Office of State Planning. 1991. Public access plan for New Hampshire's lakes, ponds, and rivers. Concord, New Hampshire. November 1991.

25. New Hampshire Office of State Planning. 1991. Upper Merrimack River corridor plan-volume 2: management plan. Concord, New Hampshire. March 1991.
26. Policy Committee for Anadromous Fishery Management of the Merrimack River Basin. 1985. A strategic plan for the restoration of Atlantic salmon to the Merrimack River Basin, 1985 through 1999. Laconia, New Hampshire. May 1985.
27. State of New Hampshire. 1991. New Hampshire rivers management and protection program [as compiled from NH RSA Ch. 483, HB 1432-FN (1990) and HB 674-FN (1991)]. Concord, New Hampshire.
28. State of New Hampshire. 1991. New Hampshire rivers management and protection program, including rivers in the Merrimack River basin:
 - (1) 1994 Contoocook and North Branch Rivers, river corridor management plan;
 - (3) 1999 Piscataquog River management plan;
 - (6) 2008 Lower Merrimack River corridor management plan;
 - (7) 2009 Cold River watershed management plan;
 - (10) 2001 Pemigewasset River corridor management plan;
 - (11) 2006 Souhegan River watershed management plan; and
 - (12) 2007 Upper Merrimack River management and implementation plan
29. U.S. Fish and Wildlife Service (USFWS). n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.
30. USFWS. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.
31. USFWS. 1989. Atlantic salmon restoration in New England: Final environmental impact statement 1989-2021. Department of the Interior, Newton Corner, Massachusetts. May 1989.
32. USFWS. 2010. A Plan for the Restoration of American Shad: Merrimack River Watershed. Concord, New Hampshire. 2010.

H.8 Financial and Personnel Resources (18 C.F.R. §5.18(c)(1)(i)(I))

H.8.1 Financial Resources

Boott is dedicated to operating the Project in a safe and reliable manner to provide clean renewable electric energy to the electricity grid. As demonstrated under the existing license, Boott has the financial resources to meet the operation, maintenance, and capital requirements of the Project.

H.8.2 Personnel Resources

Operations, maintenance, environmental and license compliance, modification, technical and administrative activities required for the Project are performed and supported by employees and contractors of Boott. Boott will provide additional details related to personnel resources in the FLA to be filed with the Commission by April 30, 2021.

H.9 Expansion of Project Lands (18 C.F.R. §5.18(c)(1)(i)(J))

At this time, Boott does not anticipate a proposed expansion of Project boundaries at the Project.

H.10 Electricity Consumption Efficiency Improvement Program (18 C.F.R. §5.18(c)(1)(i)(K))

To be provided in the FLA.

H.11 Names and Addresses of Native American Tribes with land on Which the Project is located or Tribes that May Be Affected by the Project as Proposed (18 C.F.R. §5.18(c)(1)(i)(L))

The Project is not located on Native American lands. Boott and the Commission consulted with the following federally recognized Native American tribes that may be affected by the Project throughout the relicensing process and in support of cultural resource studies. Points of contact (names) associated with each of these Native American Tribes is presented in the Initial Statement of this application and the associated distribution list.

Mashpee Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

Narragansett Indian Tribe
PO Box 268
Charlestown, RI 02813

Wampanoag Tribe of Gay Head
(Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

Stockbridge Munsee Tribe of
Mohican Indians
N8467 Moh He Con Nuck Road
Bowler, WI 54416

Penobscot Nation
23 Wabanaki Way
Indian Island, Maine 04468

H.12 Safe Management, Operation, and Maintenance of the Project (18 C.F.R. §5.18(c)(1)(ii)(B))

H.12.1 Operating During Flood Conditions

To be provided in the FLA.

H.12.2 Proposed Project Operation and Emergency Action Plan

To be provided in the FLA.

H.12.3 Warning Devices for Downstream Public Safety

Boott maintains public safety measures at the Project for public safety upstream, in the vicinity of, and downstream of the Project pursuant to the Commission-approved Public Safety Plan.

H.12.4 Monitoring Devices

The Project is maintained by Boott in accordance with manufacturers' instructions and industry best practices and monitored as described in the Dam Safety Surveillance and Monitoring Plan (DSSMPs) that are maintained for the Project and is on file with the Commission's Division of Dam Safety and Inspections – New York Regional Office.

As further described in the DSSMP for the Project, instrumentation at the Project includes one stream flow gauge located in the Merrimack River: Gage Name Merrimack River below Concord River, Lowell, MA (Gage No. 1100000). Transducers are also located throughout the canal system.

H.12.5 Employee Safety and Public Safety Record

Boott manages the Project consistent with its long-standing commitment to employee safety. This commitment begins with compliance with applicable local, state, and federal regulations regarding the safe operation of industrial and electrical facilities.

To be provided in the FLA.

H.13 Current Operation of the Project (18 C.F.R. §5.18(c)(1)(ii)(C))

The Project has been operated in a manner consistent with the requirements of the current license. Details regarding operation and constraints of the Project are discussed in Exhibit B of this application. The Project will continue to operate in a manner consistent with the requirements of the current license until the new license is issued,

after which time the Project will be operated in accordance with the requirements and conditions of the new license.

H.14 Project History (18 C.F.R. §5.18(c)(1)(ii)(D))

A summary of the history of the Project, including recent operation and maintenance upgrades, are provided in Exhibit C of this application.

H.15 Summary of Generation Lost at the Project Due to Unscheduled Outages (18 C.F.R. §5.18(c)(1)(ii)(E))

A summary of unscheduled outages for the Project over the past five years will be provided in the FLA.

H.16 Record of Compliance (18 C.F.R. §5.18(c)(1)(ii)(F))

To be provided in the FLA.

H.17 Actions that Affect the Public (18 C.F.R. §5.18(c)(1)(ii)(G))

Boott holds that past actions and future actions related to the Project will not adversely affect the public. To the contrary, Boott believes that actions by the Licensee are favorable to the public in that the Project provides clean, renewable electric energy as well as other non-power benefits associated with the Project.

H.18 Ownership and Operating Expenses Affected by Transfer of License (18 C.F.R. §5.18(c)(1)(ii)(H))

There is presently no proposal or application to transfer the Project license from the existing Licensee; therefore, this section is not applicable.

H.19 Annual Fees Under Part I of the Federal Power Act (FPA) (18 C.F.R. §5.18(c)(1)(ii)(I))

Given that there are no federal or Native American lands associated with the Project, Boott does not pay annual fees under Part 1 of the FPA.