



Updated Study Report

Lawrence Hydroelectric Project (FERC P-2800)

April 27, 2026

Prepared by:



Prepared for:

Essex Company, LLC
A subsidiary of Patriot Hydro, LLC



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List of Acronyms

2D	Two-dimensional
3D CFD	Three-dimensional Computational Fluid Dynamics
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
DLA	Draft License Application
EA	Environmental Assessment
Essex	Essex Company, LLC
FERC	Federal Energy Regulatory Commission (or Commission)
FLA	Final License Application
ILP	Integrated Licensing Process
ISR	Initial Study Report
MA DMF	Massachusetts Division of Marine Fisheries
MassDEP	Massachusetts Department of Environmental Protection
MassWildlife	Massachusetts Division of Fisheries and Wildlife
MRWC	Merrimack River Watershed Council
NGOs	non-governmental organizations
NHFG	New Hampshire Fish and Game
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
PAD	Pre-Application Document
Project	Lawrence Hydroelectric Project
PSP	Proposed Study Plan
RSP	Revised Study Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
SPD	Study Plan Determination
USFWS	U.S. Fish and Wildlife Service
USR	Updated Study Report

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1 Introduction and Background

1.1 Introduction

Essex Company, LLC (Essex), a subsidiary of Patriot Hydro, LLC, is the Licensee, owner, and operator of the Lawrence Hydroelectric Project (FERC No. 2800) (Project or Lawrence Project). The Lawrence Project is located on the Merrimack River in the City of Lawrence in Essex County, Massachusetts. Essex operates and maintains the Project under a license (P-2800) from the Federal Energy Regulatory Commission (FERC or Commission), under the authority granted to FERC by Congress through the Federal Power Act, 16 United States Code §791(a), et seq., to license and oversee the operation of non-federal hydroelectric projects on jurisdictional waters and/or federal land. The license for the Lawrence Project was issued on December 4, 1978 with an effective date of December 1, 1978, and the license expires on November 30, 2028.

The Commission issued its Study Plan Determination (SPD) with modifications to the Revised Study Plan (RSP) on May 10, 2024. In accordance with 18 Code of Federal Regulations (CFR) §5.15, Essex initiated studies in 2024 and 2025 as provided in the study plan and schedule approved by the Commission. On April 28, 2025, Essex filed the Initial Study Report (ISR). The ISR contained study reports for five studies, updated study plans for three studies, information for consultation for one study, and status reports for the remaining studies. In addition, Essex filed a study report for the Condition Assessment of Historic Properties and Associated Canal System on May 6, 2025. Essex held an ISR meeting on May 7 and May 8, 2025, to discuss the status of studies and results for completed studies, and on May 27, 2025, filed the ISR Meeting Summary. Stakeholders were provided a 30-day period to provide comments on the ISR Meeting Summary, recommend study modifications, and/or to propose new studies.

Pursuant to 18 CFR §5.15(f), Essex is filing this Updated Study Report (USR), which includes updates to the aforementioned information and provides additional updates since the submittal of the ISR. The Commission's regulations at 18 CFR §5.15(c) require Essex to hold a meeting with participants and FERC staff within 15 days of filing the USR. Accordingly, Essex will hold a USR Meeting as outlined below and an agenda is provided in Appendix A.

Date, Time, Address
USR Meeting for all stakeholders
Wednesday May 6, 2026 9:00 AM – 4:00 PM
Thursday May 7, 2026 9:00 AM – 11:30 AM
Elks Lodge 652 Andover St, Lawrence, MA 01843

1.2 Background

On June 16, 2023, Essex initiated the Integrated Licensing Process (ILP) by filing a Pre-Application Document (PAD) and Notice of Intent (NOI) with the Commission. Major ILP milestones to-date are presented in Table 1-1, based on the Commission’s Process Plan and Schedule.

Essex has consulted with stakeholders regarding the approved studies as required by the Commission’s SPD. In accordance with the schedule presented in the RSP, Essex has also provided stakeholders with Quarterly ILP Study Progress Reports that include a description of study activities conducted during the previous quarter, activities expected to occur in the next quarter, and identified variances from the approved study plans.

Table 1-1. Major ILP Milestones Completed

Estimated Date	Milestone
June 16, 2023	File NOI and PAD (18 CFR §5.5(d))
August 15, 2023	Issue Notice of PAD/NOI and Scoping Document 1 (SD1) (18 CFR §5.8(a))
September 13 and 14, 2023	Conduct Scoping Meetings and Site Visit (18 CFR §5.8(b) (viii))
October 16, 2023	Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))
November 28, 2023	Issuance of Scoping Document 2 (SD2) (18 CFR §5.10)
November 28, 2023	File Proposed Study Plan (PSP) (18 CFR §5.11)
January 11, 2024	Study Plan Meeting(s) (18 CFR §5.11(e))
April 10, 2024	File Revised Study Plan (RSP) (18 CFR §5.13(a))
May 10, 2024	Issuance of Study Plan Determination (SPD) (18 CFR §5.13(c))
May 30, 2024	Formal Study Dispute Resolution Process (18 CFR §5.14(a))
June 14, 2024	Third Panel Member Selection Due (18 CFR §5.14(d)(3))
June 19, 2024	Dispute Resolution Panel Convenes (18 CFR §5.14(d))
June 24, 2024	Comments on Study Plan Disputes (18 CFR §5.14(i))
June 29, 2024	Dispute Resolution Panel Technical Conference (18 CFR §5.14(j))
July 19, 2024	Dispute Resolution Panel Findings and Recommendations (18 CFR §5.14(k))
August 8, 2024	Study Dispute Determination (18 CFR §5.14(1))

Estimated Date	Milestone
Spring Summer Fall 2024	Conduct First Season of Studies (18 CFR §5.15)
Quarterly	Study Progress Report (18 CFR §5.15(b))
April 26, 2025	Initial Study Report (ISR) (18 CFR §5.15(c))
May 11, 2025	Initial Study Report Meeting (18 CFR §5.15(c)(2))
May 26, 2025	File Initial Study Report Meeting Summary (18 CFR §5.15(c)(3))
June 25, 2025	File Disputes/Requests to Amend Study Plan (18 CFR §5.15(c)(4))
July 25, 2025	File Responses to Meeting Summary Disagreements (18 CFR §5.15(c)(5))
August 24, 2025	Resolution of Disagreements (18 CFR §5.15(c)(6))
April 27, 2026	File Updated Study Report (USR) (18 CFR §5.15(f))

2 Study Plan Development and Implementation

On June 16, 2023, Essex, as the Licensee, filed a PAD and 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 (NGOs), and other interested parties (collectively, “stakeholders”) in identifying issues, determining information needs, and preparing study requests

The National Environmental Policy Act of 1969, the Commission’s regulations, and other applicable statutes require the Commission to independently evaluate the environmental effects of issuing a new license for the Project and to consider reasonable alternatives to relicensing. At this time, the Commission has expressed its intent to prepare an Environmental Assessment (EA) that describes and evaluates the site-specific and cumulative potential effects (if any) of issuing the new license, as well as potential alternatives to relicensing. The EA is being supported by a scoping process to identify issues, concerns, and opportunities for resource enhancement associated with the proposed action. Accordingly, the Commission issued SD1 for the Project on August 15, 2023. SD1 advises resource agencies, Indian tribes, NGOs, and other stakeholders as to the proposed scope of the EA and to seek additional information pertinent to the Commission’s analysis. As provided in 18 CFR §5.8(a) and §5.18(b), the Commission issued a notice of commencement of the relicensing proceeding concomitant with SD1.

On September 13 and 14, 2023, the Commission held public scoping meetings in Lawrence, Massachusetts. During these meetings, FERC staff presented information

regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and analyses for the EA. Pursuant to 18 CFR §5.8(d), a public site visit of the Project was conducted on September 13, 2023. Resource agencies, Indian tribes, and other interested parties were afforded a 60-day period to request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's August 15, 2023, notice and concluded on October 14, 2023. FERC received nineteen comment letters on SD1, including comments from resource agencies.

FERC issued SD2 on November 28, 2023, to provide information on the proposed action and alternatives, the environmental analysis process FERC staff will follow to prepare the EA based on stakeholder comments, and study requests filed in response to SD1.

In accordance with 18 CFR §5.11, Essex developed a PSP that was filed with the Commission and made available to stakeholders on November 28, 2023. The PSP described Essex's proposed approaches for conducting studies and to address agency and stakeholder study requests. A PSP meeting was held on January 4 and 5, 2024, to describe the intent and contents of the PSP, initial information gathering needs, and address outstanding issues associated with the proposed studies. Resource agencies and stakeholders were afforded 90 days from the date of the PSP filing (i.e., until March 11, 2024) to provide comments on the PSP or to request additional studies. In response to comments from stakeholders, Essex filed the RSP on April 10, 2025. The Commission issued its SPD with modifications to the RSP on May 10, 2024. In the SPD, FERC directed Essex to conduct seventeen studies:

1. Upstream Anadromous Fish Passage Assessment
2. Upstream American Eel Passage Assessment
3. American Eel Upstream Passage Siting Study
4. Desktop Entrainment, Impingement, and Turbine Passage Survival Study
5. Sturgeon Distribution and Project Interaction Study
6. Diadromous Fish Behavior, Movement, and Project Interaction Study
7. Project Operations and Fish Stranding Study
8. Freshwater Mussel Habitat Assessment and Survey
9. Water Quality Study
10. Three-Dimensional Computational Fluid Dynamics (CFD) Modeling
11. Recreation Facilities Use and Aesthetics Study
12. Historically Significant Waterpower Equipment Study
13. Condition Assessment of Historic Properties and Associated Canal System
14. Downstream Juvenile Alosine Passage Assessment
15. Sturgeon Habitat Mapping and Assessment Study
16. Fish Assemblage Assessment
17. Invasive Plants Survey

On May 28, 2024, the National Marine Fisheries Service (NMFS) filed a Notice of Formal Study Dispute to initiate FERC's formal study dispute resolution process. The dispute involved two study requests that were not adopted by FERC in the SPD, which consisted of a sturgeon habitat mapping assessment in the Project's impoundment and Climate-

Related Impacts on Shortnose Sturgeon Habitat Study. A technical conference was held on June 28, 2024, with FERC, Essex, NMFS, the U.S. Fish and Wildlife Service (USFWS), the Massachusetts Division of Fisheries and Wildlife (MassWildlife), the Massachusetts Department of Environmental Protection (MassDEP), the State of New Hampshire Fish and Game (NHFG), and the Merrimack River Watershed Council (MRWC). The technical conference focused primarily on determining whether the study requests would inform a license condition or guide fishery management decisions. The Study Dispute Panel issued its findings on July 19, 2024, affirming the SPD. Subsequently, FERC issued its Study Dispute Determination on August 6, 2024, requiring no modifications to the SPD.

In accordance with 18 CFR §5.15, Essex initiated studies in 2024 and 2025 as provided in the study plan and schedule approved by the Commission. On April 28, 2025, Essex filed the ISR for the studies noted above. The ISR contained study reports for five studies, updated study plans for three studies, information for consultation for one study, and status reports for the remaining studies. In addition, Essex filed a study report for the Condition Assessment of Historic Properties and Associated Canal System on May 6, 2025. Essex held an ISR meeting on May 7 and May 8, 2025, to discuss the status of studies and results for completed studies, and on May 27, 2025, filed the ISR Meeting Summary. Stakeholders were provided a 30-day period to provide comments on the ISR Meeting Summary, recommend study modifications, and/or to propose new studies. Data collection and analysis for the remaining studies occurred during the 2025 and 2026 study season. Comments on the ISR were filed by FERC and the MassDEP on June 24, 2025. The NMFS, MassWildlife, NHFG, and Massachusetts Division of Marine Fisheries (MA DMF) filed comments on June 25, 2025, and Groundwork Lawrence filed comments on June 26, 2025. Essex filed a response to comments on July 25, 2025. FERC issued its Determination on Requests for Study Modifications on August 25, 2025, in which it approved modifications to three studies, denied the requested modifications to six studies, and denied the request for a new study.

3 Study Reporting

Essex's intent has been to provide study reports within the framework of the ISR and USR, and upon completion of each study report. The anticipated study report schedule is provided in Table 3-1. With this USR, the following eleven new study reports are being filed as appendices (Appendix B-L): 1) Upstream Anadromous Fish Passage Assessment, 2) Desktop Entrainment, Impingement, and Turbine Passage Survival Study, 3) Sturgeon Distribution and Project Interaction Study, 4) Diadromous Fish Behavior, Movement, and Project Interaction Study (Phase II), 5) Water Quality Study, 6) Three-Dimensional Computational Fluid Dynamics Modeling (3D CFD), 7) Recreation Facilities, Use, and Aesthetics Study, 8) Sturgeon Habitat Mapping and Assessment Study, 9) Fish Assemblage Assessment, and 10) Invasive Plants Survey, and 11) Downstream Juvenile Alosine Passage Assessment. Additionally, the Phase I Project Operations and Fish Stranding Study will be filed with the Commission by May 1, 2026, or earlier if possible.

As noted in Table 3-1, the Project Operations and Fish Stranding Study (No 7) Phase II and the 3D CFD Study (No 10) are anticipated to be filed with the Commission with the Final License Application (FLA), on or before November 30, 2026. As envisioned in the RSP and SPD, these studies are framed as a phased approach or are contingent on the completion of another study. Phase II of the Project Operations and Fish Stranding Study is contingent on completion of the 3D CFD Model Study as well as the various upstream fish passage/behavior study reports, notably the Phase II Diadromous Fish Behavior, Movement, and Project Interaction Study. While the 3D CFD Model study report is being filed with the USR, the two-dimensional (2D) component of the study (i.e. modeling of the reach below the dam) is ongoing. The bathymetry data collected in late 2025 as part of the Sturgeon Distribution and Project Interaction Study, as well as the bathymetry data collected by the upstream assessments, will be incorporated into the 2D model. Essex anticipates that while both of these studies are in progress, they can be provided with the Draft License Application (DLA) or the FLA.

Table 3-1. Anticipated Study Report Schedule

FERC SPD Study No.	Technical Study	FERC Target Schedule for Report Filing
1	Upstream Anadromous Fish Passage Assessment	April 2026 - USR
2	Upstream American Eel Passage Assessment	April 2025 - ISR
3	American Eel Upstream Passage Siting Study	April 2025 - ISR
4	Desktop Entrainment, Impingement, and Turbine Passage Survival Study	April 2026 - USR
5	Sturgeon Distribution and Project Interaction Study	April 2026 - USR
6	Diadromous Fish Behavior, Movement, and Project Interaction Study	April 2025 – ISR (Phase I) April 2026 – USR (Phase II)
7	Project Operations and Fish Stranding Study	April 2026 – USR (Phase I) November 2026 – FLA (Phase II)
8	Freshwater Mussel Habitat Assessment Study	April 2025 - ISR
9	Water Quality Study	April 2026 - USR
10	Three-Dimensional Computational Fluid Dynamics Modeling (3D CFD)	April 2026 – USR November 2026 – FLA (2D Component)
11	Recreation Facilities, Use, and Aesthetics Study	April 2026 - USR

FERC SPD Study No.	Technical Study	FERC Target Schedule for Report Filing
12	Historically Significant Waterpower Equipment Study	April 2025 - ISR
13	Condition Assessment of Historic Properties and Associated Canal System	April 2025 - ISR
14	Downstream Juvenile Alosine Passage Assessment	April 2025 – ISR April 2026 – USR
15	Sturgeon Habit Mapping and Assessment Study	April 2026 - USR
16	Fish Assemblage Assessment	April 2026 - USR
17	Invasive Plants Survey	April 2026 - USR

4 Upcoming ILP Milestones

As noted, Essex will hold a USR Meeting with interested parties and Commission staff on May 6 and 7, 2026, at the Elks Lodge, 652 Andover Street, Lawrence, Massachusetts. The purpose of the meeting is to discuss the available study results, as well as to discuss Essex’s or the other relicensing participants’ proposals, if any, to modify the study plans in light of the progress of the studies and data collected. Essex is on schedule to complete the remaining milestones in the ILP process as detailed in Table 4-1.

Table 4-1. Upcoming Major ILP Milestones

Date	Milestone
May 6-7, 2026	USR Report Meeting
May 26, 2026	File USR Meeting Summary
June 25, 2026	File Disagreements/Requests to Amend Study Plan
July 3, 2026	File Draft License Application
August 24, 2026	FERC Issue Director’s Determination on Disagreements/Amendments
November 30, 2026	File Final License Application