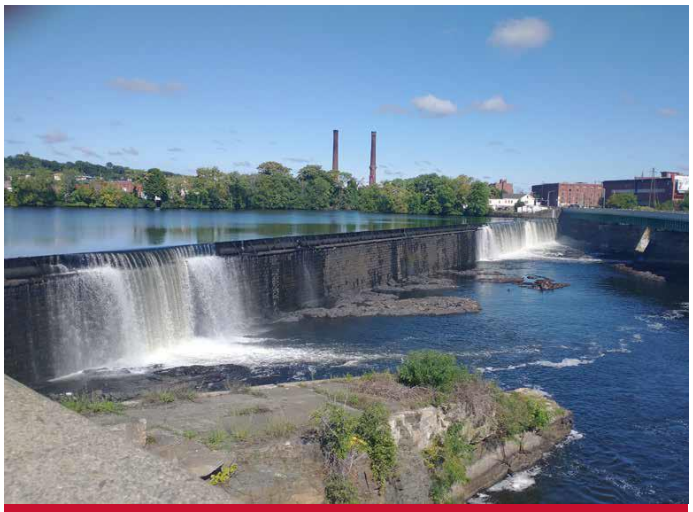

Initial Study Report

Lawrence Hydroelectric Project (FERC No. 2800)

April 28, 2025

Prepared by:

HDR and NORMANDEAU ASSOCIATES ENVIRONMENTAL CONSULTANTS

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Prepared for:

Essex Company, LLC,
a subsidiary of Patriot Hydro, LLC

PATRIOT HYDRO

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Appendices

List of Acronyms

2D	Two-dimensional
3D	Three-dimensional
APE	Area of Potential Effects
CAD	Computer aided drawing
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
DO	Dissolved Oxygen
EA	Environmental Assessment
Essex	Essex Company, LLC
FERC	Federal Energy Regulatory Commission (or Commission)
GLSD	Greater Lawrence Sanitary District
GWL	Groundwork Lawrence
ILP	Integrated Licensing Process
ISR	Initial Study Report
LCW	Lawrence Community Works
MADCR	Massachusetts Department of Conservation and Recreation
MADEP	Massachusetts Department of Environmental Protection
MADMF	Massachusetts Division of Marine Fisheries
MassWildlife	Massachusetts Division of Fisheries and Wildlife
MRTC	Merrimack River Technical Committee
MRWC	Merrimack River Watershed Council
NEPA	National Environmental Policy Act of 1969
NGOs	non-governmental organizations
NHFG	New Hampshire Fish and Game Department
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPS	National Park Service
NRWA	Nashua River Watershed Association
PAD	Pre-Application Document
Project	Lawrence Hydroelectric Project (or Lawrence Project)
PSP	Proposed Study Plan

RSP	Revised Study Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
SHPO	State Historic Preservation Office
SPD	Study Plan Determination
SRHP	State Register of Historic Places
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service
USR	Updated Study Report

1 Introduction and Background

Essex Company, LLC (Essex), a subsidiary of Patriot Hydro, LLC, is the Licensee, owner, and operator of the Lawrence Hydroelectric Project (P-2800) (Project or Lawrence Project). The Project was licensed by the Federal Energy Regulatory Commission (FERC or Commission) on December 4, 1978 (with an effective date of December 1, 1978), and the license expires on November 30, 2028. The Lawrence Project is located on the Merrimack River in the City of Lawrence in Essex County, Massachusetts. Essex is pursuing a new license for the Project using the Commission's Integrated Licensing Process (ILP) as defined in 18 Code of Federal Regulations (CFR) Part 5.

Essex has initiated and completed several studies and information gathering activities as detailed in the Study Plan Determination (SPD) issued by the Commission on May 10, 2024. In accordance with 18 CFR § 5.15, Essex is filing this Initial Study Report (ISR), which describes the Licensee's overall progress in implementing the study plan and schedule, the types of data collected to date, and any variances from the study plan. With this filing, Essex is providing five study reports for review and comment, including the following:

- The Upstream American Eel Passage Assessment Study Report
- American Eel Upstream Passage Siting Study Report
- The Phase 1 of the Diadromous Fish Behavior, Movement, and Project Interaction Study Report
- The Freshwater Mussel Habitat Assessment and Survey Study Report
- Historically Significant Waterpower Equipment Study Report

Essex is also providing a Study Plan for review and comment for the Sturgeon Distribution and Project Interaction Study, the Downstream Juvenile Alosine Passage Assessment Study, and the Sturgeon Habitat Mapping and Assessment Study. Additionally, Essex is providing information for consultation on the Project Operations and Fish Stranding Study that details the location of the cameras below the dam and provides representative photographs taken to date.

The Commission's regulations at 18 CFR § 5.15(c) require Essex to hold meetings with participants and FERC staff within 15 days of filing the ISR. Accordingly, Essex will hold ISR Meetings from 9 AM to 4 PM on May 7-8, 2025. The ISR Meetings will be held at the Elks Lodge at 652 Andover St, Lawrence, Massachusetts 01843. The meetings will be in person. An agenda for the ISR Meeting is presented in Appendix A[1] to this ISR.

To allow for adequate planning, Essex respectfully requests that those planning on attending the ISR Meeting RSVP by emailing Kelsey Iffert with HDR at Kelsey.Iffert@hdrinc.com on or before May 2, 2025.

[1] Due to file size limitations, appendices to this ISR were filed concurrently as individual files.

Date and Time of ISR Meetings
Date: May 7-8, 2025 Time: 9 AM – 4 PM Address: Elks Lodge at 652 Andover St, Lawrence, Massachusetts 01843 Type: In-person, non-virtual

1.1 Background

The Project is located along the Merrimack River in Essex County, Massachusetts. On June 16, 2023, Essex initiated the ILP by filing a Pre-Application Document (PAD) and Notice of Intent (NOI) with the Commission. Major ILP milestones completed to-date are presented in Table 1-1.

Table 1-1. Major ILP Milestones Completed[2]

Date	Milestone
June 16, 2023	PAD and NOI Filed
August 15, 2023	Scoping Document 1 Issued by FERC
September 13 and 14, 2023	FERC Agency and Public Scoping Meetings Conducted
November 28, 2023	Scoping Document 2 Issued by FERC
November 28, 2023	Proposed Study Plan Filed
January 11, 2024	PSP Meeting Conducted
Spring 2024	First Season of Studies
April 10, 2024	Revised Study Plan Filed
April 25, 2024	Comments on RSP
May 10, 2024	Issuance of Study Plan Determination
May 30, 2024	Any Study Disputes Due
June 28, 2024	Dispute Resolution Panel Technical Conference
July 19, 2024	Dispute Resolution Panel Findings and Recommendations
August 6, 2024	Study Dispute Determination
November 1, 2024	First Study Progress Report Filed
April 28, 2025[3]	Initial Study Report

[2] Based on the most recent Process Plan and Schedule issued in the Commission's Scoping Document 2.

[3] As per the schedule provided in the Commission's Scoping Document 2, the ISR is due on April 26, 2025, a Saturday. As per the Commission's schedule, if the due date falls on a weekend or holiday, the due date is the following business day.

Essex has continued consultation 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 a Quarterly ILP Study Progress Report that included 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 plan.

1.2 Study Plan Development and Implementation

Essex filed the PAD and NOI with the Commission on June 16, 2023, to initiate the ILP. The PAD provides a description of the Project and summarizes the existing, relevant, and reasonably available information to assist the Commission, resource agencies, Indian tribes, non-governmental organizations (NGOs), and other stakeholders to identify issues, determine information needs, and prepare study requests.

The National Environmental Policy Act of 1969 (NEPA), the Commission's regulations, and other applicable statutes require the Commission to independently evaluate the environmental effects of issuing new licenses 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 Scoping Document 1 (SD1) for the Project on August 15, 2023. SD1 was intended to advise 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.

During the comment period, a total of nineteen stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or study requests. Thirteen stakeholders filed timely study requests during the comment period including FERC, U.S. Fish and Wildlife Service (USFWS), New Hampshire Fish and Game Department (NHFG), Massachusetts Division of Marine Fisheries (MADMF), National Oceanic and Atmospheric Administration – National Marine Fisheries Service (NMFS), Massachusetts Division of Fisheries and Wildlife (MassWildlife), Groundwork Lawrence (GWL), The Nature Conservancy (TNC), National Park Service (NPS), Greater Lawrence Sanitary District (GLSD), Lawrence Community Works (LCW), Massachusetts Department of Environmental Protection (MADEP), and Merrimack River Watershed Council (MRWC).

In addition, the Nashua River Watershed Association (NRWA), OARS (Alison Field-Juma), the Lawrence History Center (Susan Grabski), Massachusetts State Senator Pavel Payano, Lawrence

City Council (Marc Laplante), and one individual filed general information, statements, and/or informal study requests related to the Project and/or relicensing process.

On November 28, 2023, FERC issued Scoping Document 2 (SD2). Essex also filed the Proposed Study Plan (PSP) on November 28, 2023. Essex held in-person PSP meetings, with a virtual option, on January 4-5, 2024 which provided stakeholders the opportunity to review, comment, and ask questions on the PSP.

Subsequent to the PSP meeting and pursuant to 18 CFR §5.12, stakeholder comments on the PSP were due by March 11, 2024. Between November 28, 2023 and March 20, 2024, a total of thirteen stakeholders filed written correspondence with FERC providing general comments, comments regarding SD2, and/or study requests. Essex filed their Revised Study Plan (RSP) on April 10, 2025.

On May 10, 2024, the Commission issued an SPD for the Project. The SPD directed Essex to conduct 17 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 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 included a sturgeon habitat mapping and assessment in the Project's impoundment and a Climate-Related Impacts on Shortnose Sturgeon Habitat Study. A technical conference was held on June 28, 2024 with FERC, Essex, NMFS, USFWS, MassWildlife, MADEP, the NHFG, and the MRWC. The primary focus of the technical conference focused on if the study requests would inform a license condition or fishery management decisions. The Study Dispute Panel filed its findings on July 19, 2024, which agreed with the SPD in terms of the required studies. FERC issued its Study Dispute Determination on August 6, 2024 that required no modifications to the SPD.

Essex initiated the approved studies in accordance with the schedule and methods described in the RSP and SPD. Section 2 of this ISR describes Essex's overall progress in implementing the study plan and schedule, the types of data collected to-date, and any variances from the approved study plan.

As described in Section 2, data collection and/or analyses are scheduled or in progress for all studies, several of which include data collection into the 2025 study year. Accordingly, this ISR presents the status of ongoing studies and summarizes the types of data that Essex has collected to-date. The results of ongoing studies and the data collected and analyzed by Essex will be documented in completed technical reports which will be made available to stakeholders and participants. Essex will also document the study status and the available results in the Updated Study Report (USR) for the Project. The Commission's regulations require Essex to file the USR on or before April 26, 2026.

1.3 Proposals to Modify Ongoing Studies or for New Studies

Essex will file an ISR Meeting Summary with the Commission within 15 days of the ISR Meeting (on or before May 23, 2025). After review of the ISR Meeting Summary, stakeholders may file disagreements with the meeting summary, request modifications to ongoing studies, or request new studies. Disagreements with the ISR Meeting Summary and any requests to amend the study plan to include new or modified studies must be filed with the Commission no later than 30 days after the filing of the ISR Meeting Summary (on or before June 25, 2025). In requesting modifications to ongoing studies or new studies, stakeholders must take into account the following criteria:

- Criteria for Modification of Approved Study (18 C.F.R. 5.15(d)). Any proposal to modify an ongoing study must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a demonstration that:
  (1) Approved studies were not conducted as provided for in the approved study plan;
  (2) The study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way
- Criteria for New Study (18 C.F.R. 5.15(e)). Any proposal for new information gathering or studies must be accompanied by a showing of good cause why the proposal should be approved, and must include as appropriate to the facts of the case, a statement explaining:
  (1) Any material changes in the law or regulations applicable to the information request
  (2) Why the goals and objectives of any approved study could not be met with the approved study methodology;
  (3) Why the request was not made earlier;
  (4) Significant changes in the project proposal or that significant new information material to the study objectives has become available; and
  (5) Why the new study request satisfies the study criteria in 18 C.F.R. § 5.9(b).

Essex will have 30 days to respond to any disagreements or requests to amend the study plan (by July 25, 2025). The Commission's Director of the Office of Energy Projects will resolve any disagreement and amend the approved study plan, as appropriate, within 30 days of the due date for Essex's response (no later than August 24, 2025).

2 Status and Summaries of Studies

This section describes Essex's overall progress in implementing the study plan and schedule, the types of data collected to-date, and any variances from the study plan and schedule. Study methods and available study results are summarized for each of the 17 studies approved in the Commission's SPD.

2.1 Upstream Anadromous Fish Passage Assessment

2.1.1 Study Status

Essex will conduct the field component of the Upstream Anadromous Fish Passage Assessment during the 2025 spring migratory season for American shad. Findings will be presented in the USR, due to be filed with FERC during April 2026.

2.1.2 Study Summary

As described in the RSP, the goal of the Upstream Anadromous Fish Passage Assessment is to determine the impact of the Lawrence Project on the upstream migration of anadromous adult alosines. The objectives of the Upstream Anadromous Fish Passage Assessment are to:

(1) determine approach of upstream migrating American shad from the downstream release location towards the project fishway under a range of operational/river conditions;

(2) determine tailrace residence duration of upstream migrating American shad following arrival downstream of the project;

(3) estimate the nearfield attraction efficiency, entrance efficiency, internal efficiency, and overall efficiency of the existing upstream fish lift under a range of operational/river conditions and with both entrances in the open position; and

(4) inform on fish lift entry (i.e., frequency, timing and location of entry events).

Essex will initiate the field component of the Upstream Anadromous Fish Passage Assessment during spring of 2025. Essex will conduct monitoring at 14 radio-telemetry monitoring stations throughout the study area. Locations for the monitoring stations include: Haverhill Riverside Park (station 1), an area perpendicular to the river channel near the Essex County Correction Facility (station 2), the section of the Merrimack River just downstream of Essex dam (station 3), the lower portion of the downstream tailrace (station 4), the upper portion of the downstream tailrace (station 5), multiple locations within the fish passage facility (stations 6-10), the forebay (stations 11 and 12), 10 miles upstream of the Project (station 13), at the upstream extent of the impoundment (station 14), and immediately downstream of the Lowell Hydroelectric Project (station 15).

In accordance with the SPD, Essex will also:

- tag 50 sea lamprey as target species.
- tag 430 American shad in the first study season and present the results of the upstream passage assessment at the conclusion of the first year of study.

Essex will continue to consult with the MRTC[4] to determine an appropriate number of tags for study season two.

2.1.3 Variances from the Approved Study Plan

Essex anticipates the Upstream Anadromous Fish Passage Assessment will be performed in accordance with the SPD.

2.2 Upstream American Eel Passage Assessment

2.2.1 Study Status

Essex performed the Upstream American Eel Passage Assessment during 2024. The Upstream American Eel Passage Assessment Study Report is provided in Appendix B.

2.2.2 Study Summary

Essex conducted the field component of the Upstream American Eel Passage Assessment to evaluate the effectiveness of the existing upstream American eel (*Anguilla rostrata*) passage facilities at the Project. As described in the RSP, the study objectives were to:

- Assess attraction to the south side eel trap and north side eel lift.
- Determine the proportion of marked eels entering the south side eel trap or north side eel lift which then successfully ascend upstream (i.e., internal efficiency).
- Review the length frequency distribution of marked eels released downstream of the south side eel trap or north side eel lift with that of the subset which successfully pass upstream via each structure.
- Estimate the retention effectiveness of the collection trap associated with the existing eel passage facility at the south side eel trap.

2.2.3 Variances from the Approved Study Plan

The Upstream American Eel Passage Assessment was conducted following the methodology described in the April 10, 2024, RSP and approved by FERC in their May 10, 2024, SPD with several exceptions:

- The use of red light during the visual surveys was identified in the RSP as a measure to minimize disturbance to eels. Surveys conducted during 2024 utilized standard white lights to ensure crew safety while transiting across wet ledge habitat and accessing the length of the south side eel trap.
- The RSP indicated that a collection tank efficiency test would be conducted for the north side eel lift. Upon review with Essex operations, it was determined that eels are not maintained in

[4] The Merrimack River Technical Committee (MRTC) consists of representatives from the U.S. Fish & Wildlife Service (USFWS); the National Marine Fisheries Service (NMFS); the New Hampshire Fish and Game Department (NHFG); the Massachusetts Division of Marine Fisheries (MADMF); and the Massachusetts Division of Fisheries and Wildlife (MassWildlife).

the upper catchment tank for any period of time following the dump of a hopper lift (instead they are sluiced directly to the project impoundment). For the purposes of evaluating the internal effectiveness of the lift hopper, a temporary blocking screen was installed to allow project staff to recover eels following hopper dump for enumeration. Since normal operation of the north side eel lift facility does not include extended hold times for juvenile eels in the upstream catchment basin, that aspect of the study was not evaluated. Collection tank effectiveness was assessed for the south side eel trap where eels are held for a duration of time prior to being manually collected by project staff and transported to the impoundment.

2.3 American Eel Upstream Passage Siting Study

2.3.1 Study Status

Essex completed fieldwork associated with the American Eel Upstream Passage Siting Study in summer of 2024. Essex developed a technical study report based on the information collected and analyses conducted in support of this study. The study report is provided in Appendix C.

2.3.2 Study Summary

The goal of this study is to evaluate the potential need for additional permanent upstream American eel (*Anguilla rostrata*) passage facilities at the Project. Specifically, this study was intended to inform on the spatial distribution and relative abundance of juvenile eels downstream of the Project and to identify the potential need for any new locations appropriate for a future upstream eel passage structure(s).

Activities conducted during 2024 represented the initial year of study described in the RSP for the Eel Siting Study and consisted of three components: visual nighttime surveys, electrofish sample collection, and deployment of eel pots. Sampling during 2024 took place over a period of ten weeks starting in early June and ending in early August.

2.3.3 Variances from the Approved Study Plan

The Upstream American Eel Upstream Passage Siting Study was conducted following the methodology described in the April 10, 2024, RSP and approved by FERC with modifications in their May 10, 2024, SPD with several exceptions:

- The RSP identified the installation of temporary ramp-style eel traps at locations in the vicinity of the downstream side of the North and South Canal gatehouses and the downstream side of the North Canal outlet gate. These sites were visited with representatives from the MRTC on June 6, 2024 and based on limited safe and feasibly accessible locations to place ramp-style traps, the decision was made to rely on fine-screen eel pots to evaluate eels at these locations. (see report for correspondence following the June 6, 2024 site visit).
- Essex and the MRTC discussed the potential for electrofish sampling targeting juvenile eels within the South Canal during the June 6, 2024 site visit. Due to safety concerns with the ability for staff to access and exit the South Canal in the event of loss of control at the upstream gatehouse, no electrofish sampling was conducted in that reach.

2.4 Desktop Entrainment, Impingement, and Turbine Passage Survival Study

2.4.1 Study Status

Essex anticipates the Desktop Entrainment, Impingement, and Turbine Passage Survival Study will be completed during 2025 and provided as part of the USR to be filed with FERC in April 2026.

2.4.2 Study Summary

Essex will perform the Desktop Entrainment, Impingement, and Turbine Passage Survival Study using the populations of out-migrating diadromous fish species which include adult and juvenile alosines (i.e., alewife, blueback herring, and American shad) and adult American eels at the Project. Specific study goals were to:

- Describe the physical and operational characteristics of the Project, including the location, dimensions, specifications, and hydraulics of the intake, trashrack, powerhouse, turbines, bypass, and spillway
- Calculate approach velocities at the intake over a probabilistic range of inflow values representative of the expected out-migration window of target fish species and life stages for comparison to swim speeds.
- Compile and summarize available passage survival data from entrainment and mortality field studies performed for target fish species and life stages at other hydroelectric projects and compare those facility characteristics to Lawrence.
- Generate estimates of project survival by simulating downstream passage for a theoretical number of target fish species and life stages through the Project under a series of inflow values representative of a high, median, and low flow downstream passage condition.

2.4.3 Variances from the Approved Study Plan

Essex anticipates the Desktop Entrainment, Impingement, and Turbine Passage Survival Study will be conducted in conformance with the Commission's SPD.

2.5 Sturgeon Distribution and Project Interaction Study

2.5.1 Study Status

For the Sturgeon Distribution and Project Interaction Study, Essex collaborated with the MRTC on a variance from the Commission's SPD to develop a more effective approach for fixed-location side scan sonar survey (SSS) component of the study. On November 26, 2024, Essex held a call with the MRTC to discuss alternatives to this component of the study. Essex is requesting this variance from the SPD regarding the fixed-location SSS survey of the tailrace because of an inconsistency with generally accepted scientific practice. A fixed-location SSS array may not provide the desired imagery of the tailrace to detect and identify sturgeon to achieve the study's objectives. Additionally, the eight-month deployment recommended by FERC requires adequate planning and additional

resources at a cost higher than estimated in the SPD. Essex has provided the modified study plan for review by FERC and the MRTC in Appendix D.

Essex has also teamed up with the United States Geological Survey (USGS) and NMFS on a collaborative effort to complete the acoustic tagging component of the Sturgeon Distribution and Project Interaction Study. Essex purchased all the necessary acoustic transmitters, receivers, and USGS-required surgical tools, and is responsible for the deployment and maintenance of the receivers. The USGS is responsible for all permitting and labor associated with the tagging of shortnose and Atlantic sturgeon.

It is expected that the Sturgeon Distribution and Project Interaction Study Report will be provided as part of the USR to be filed with FERC in April 2026.

2.5.2 Study Summary

The goal of this study is to determine if Atlantic or shortnose sturgeon are interacting with the Lawrence Project. Specifically, this study is intended to inform on the presence of Atlantic and shortnose sturgeon within the Project boundary and in the reach downstream. See Appendix D for more information.

2.5.3 Variances from the Approved Study Plan

For the Sturgeon Distribution and Project Interaction Study, Essex is collaborating with the MRTC on a variance from the Commission's SPD to develop a more effective approach for fixed-location SSS component of the study. See Appendix D for more information.

FERC recommended that Essex install a fixed SSS array in the tailrace to monitor, to the extent possible, the entire tailrace for sturgeon from spring through fall. This request was in part based on NMFS comments on the Proposed Study Plan which claimed that a fixed SSS array is a tested methodology suitable for the tailrace to quantify abundance and movement of sturgeon, citing a study by Izzo et al. 2021. However, the study by Izzo et al. 2021 and 2022 used a Dual-frequency Identification Sonar (DIDSON), along with telemetry, to continuously monitor for sturgeon for 30 to 40 days per season from early May to early June (as opposed to 8 months). In addition, the DIDSON was deployed in that study near the riverbank on the main stem of the river and not within a turbulent tailrace of a hydroelectric dam. FERC and the other agencies cited no other FERC relicensing studies that used or required a fixed-SSS array to monitor sturgeon in a tailrace. Based on literature searches and discussion with a SSS vendor, there were no examples to justify recommending the untested application of a fixed-SSS array to study sturgeon from spring through fall in the tailrace at the Project.

A fixed-location SSS array may not provide the desired imagery of the tailrace to detect and identify sturgeon to achieve the study's objectives. In a standard mobile survey application, SSS imagery used to identify the characteristic sturgeon body shapes and acoustic shadows are from compositing images from a narrow fan-like field of view and are taken every second or faster as the SSS array travels over the space being surveyed. The SSS imagery of sturgeon seen further downriver in Stantec (2023) was taken from a moving vessel and was constructed by stitching sequential georeferenced single transmissions that are each effectively 1 pixel high by many pixels wide in resolution. If the SSS array is in a fixed position, SSS imagery would need to be constructed from ping-based or time-based indices (not georeferenced) and would rely on sturgeon moving through the ensonified swath at a reasonable speed to make visualization of the body and shadow

representative for sturgeon identification. In other words, a fixed-location SSS would repeatedly sample the same physical space defined by the swath angle and the narrow receiving beam angles. A characteristic body shape or shadow of a sturgeon may only be recognizable if the fish swims through the field of view at a certain speed. Too slow, it would appear elongated and exaggerated log-like object. Too fast, it would be a shorter reflection (a “blip”).

An eight-month deployment from March through November would require adequate planning and additional resources at a cost higher than estimated in the SPD. The equipment would be exposed to a meaningful risk of damage and loss due to ice, debris, and high flows. Such conditions necessitate a custom designed and fabricated metal mounting or rail system affixed to the concrete structure of the dam, which requires additional time and expense. The lack of detailed bathymetry, varying surface water elevation, and unknown effects from mechanical/electrical noise from powerhouse operations also introduce uncertainties that should be examined and tested prior to an investment in a potential long-term deployment of sonars.

Given that using a fixed-SSS array to monitor sturgeon distribution and behavior in a tailrace is inconsistent with generally accepted scientific practice, an alternative is proposed that would include a pilot study in 2025 to assess the site conditions and test performance of two sonar technologies more suitable for this task. Based on the information from the pilot study, the long-term deployment would take place in 2026 assuming its feasibility had been demonstrated by the pilot study. The anticipated outcome is to determine which sonar has better resolution, capabilities, and target detection, but another potential outcome may be discovering that minimal useful data can be collected from within the tailrace environment due to flow, entrained bubbles, or turbulence over an eight-month period.

2.6 Diadromous Fish Behavior, Movement, and Project Interaction Study

2.6.1 Study Status

Essex initiated field studies associated with Phase 1 of the Diadromous Fish Behavior, Movement, and Project Interaction Study using the methodologies outlined in the RSP and SPD. The Diadromous Fish Behavior, Movement, and Project Interaction Study Report (Phase 1) is located in Appendix E.

Essex is preparing for collection of the remaining field data during 2025. Following collection of the remaining field information, Essex will prepare the technical report on the results of the Phase 2.

2.6.2 Study Summary

The goal of this study was to assess Project-related effects on the behavior of diadromous fish species in and around the Lawrence Project. As described in the RSP, the Project Interaction Study design is a two-phase approach whereby Phase 1 sought to:

(1) determine the appropriate acoustic telemetry tool to address the study goal when considering the hydromorphological conditions of the Merrimack River and the downstream study area as influenced by the Project facilities and its operations, and

(2) validate the detection ranges obtained using acoustic telemetry receivers with the aim of being able to inform the technical and cost aspects of an adequate study design to address the overall goal and objectives to inform on fish behavior downstream of the Project.

Data collection during 2024 focused on information required to meet the objectives for Phase 1 of the Project Interaction Study.

The RSP provides a basic framework for Phase 2 of the Project Interaction Study, and Essex indicated that the information collected during the 2024 Phase 1 assessment will be used to inform the overall study design for the latter phase. As a result, the Phase 2 methodology has been updated based on findings from the 2024 observations and the revised Phase 2 study plan is provided in Appendix E.

2.6.3 Variances from the Approved Study Plan

Phase 1 of the Project Interaction Study was conducted following the methodologies identified in the RSP. A few discrepancies between the proposed and final study approach are noted here:

- The RSP indicated that adult alewife and blueback herring for the tank evaluation of transmitter retention would be collected at the Lawrence upstream fishway and would total 50 test fish of each species. Since herring passage at the Lawrence fish lift at the time of collection was insufficient to provide an adequate number of test fish, Essex coordinated with the state fisheries agencies (Massachusetts and New Hampshire) to obtain samples via boat electrofishing downstream of Essex Dam and at the fish ladder trap and truck facility at Amoskeag Dam in Manchester, NH. Alewife collections met the minimum sample sizes identified in the RSP. Although blueback herring collections did not meet the minimum sample sizes identified in the RSP, enough individuals were obtained to evaluate both tagging methods and maintain some control fish to understand potential collection and handling effects.
- The methodology identified in the RSP to assess the detection range and rate relied on the deployment of transmitters at fixed locations for a duration of time. In lieu of that, geo-referenced transmitter locations were recorded as tags were actively moved around the receiver area to better simulate the active swimming of live fish. The same methodology (i.e., the percentage of detected transmissions relative to the total number of known transmissions for a set period of time) was used to estimate the detection efficiency of the two transmitter models during the Phase 1 analysis. Transmitters used for this testing were affixed to a weighted fishing line to facilitate moving them through the test areas.
- The RSP identified a total of six pilot deployment locations for the collection of Phase 1 receiver performance data. One of the six locations (i.e., pilot deployment location 3) was inaccessible by boat and also had inadequate water depth for the installation and testing of acoustic receivers. Data was collected at the other five locations and is reported here.

2.7 Project Operations and Fish Stranding Study

2.7.1 Study Status

Essex initiated fieldwork associated with Phase 1 of the Project Operations and Fish Stranding Study. The Project Operations and Fish Stranding Study was proposed to evaluate the potential

effects of Project operation on aquatic resources. One of the goals of the Project Operations and Fish Stranding Study is to evaluate the influence of Project operations and maintenance on potential fish stranding areas downstream of the dam and in the Project tailrace area. Essex proposed to perform this study in two phases. Phase 1 is designed as a desktop analysis of Project operations and Merrimack River flows and Phase 2 is a desktop evaluation of the combined results of Phase 1 and the results from the CFD Modeling study. Phase 1 includes the installation of two cameras to capture hourly photographs of the downstream and tailrace water levels in relation to potential fish stranding areas.

On June 27, 2024, field technicians visited the site to perform a reconnaissance and found two potential locations to install the cameras that captured areas of interest below the dam. Based on conversations with the MRTC, Essex understands that the primary areas of concern for potential stranding sites are located below the dam at rock outcrops on either side of the dam (left and right abutments). Essex also used existing aerial imagery, in combination with collected imagery, to identify potential fish stranding sites immediately downstream of the Essex dam. Other locations for camera installation were observed during the June 27, 2024 site visit, but were eliminated from consideration due to the lack of accessibility, safety, concerns for theft and/or vandalism, and poor vantage points to capture potential stranding areas.

On August 13, 2024, two cameras were installed at the Lawrence Hydroelectric Project as part of the Phase 1 portion of the Project Operations and Fish Stranding Study. Essex installed one camera at a location on each side of the dam to capture hourly photographs of the areas of potential stranding. The cameras required downloads and maintenance events every 4 to 6 weeks. During the first download event in September 2024, it was discovered that the cameras malfunctioned and ceased to take photos after approximately 5 days. Essex worked on troubleshooting the issue, checking all settings, replacing battery power, and resetting the cameras. During the second download event in early November, the cameras continued to experience the same malfunction. Essex contacted the manufacturer but was unable to correct the issue.

Following the November 2024 site visit, Essex researched and purchased alternative cameras with cellular capabilities to monitor the function and power status of each camera continuously and remotely. The replacement cellular-enabled cameras with solar panel back-up power were installed during the week of December 9, 2024 and to date appear to be functioning correctly. Essex continues to monitor these cameras remotely and will visit the site as necessary for battery replacement and needed adjustments. See Appendix F – Figure 1 for a map of the camera locations and their approximate viewsheds. As shown in See Appendix F – Figure 1, the angles of both cameras were set to provide a good indication of potential stranding areas at either abutment with cameras directed at rock outcrops and pools downstream of the dam and spillway.

Representative photos from each camera are provided in Appendix F. Camera 1 was placed on the north side of the river adjacent to the water supply protection cover for the upstream eel ramp (Appendix F – Photographs 1 - 32). Camera 2 is mounted on the handrail adjacent to the upstream eel ladder on the south side of the river near the powerhouse (See Appendix F – Photographs 33 – 64).

As per the SPD, with this filing, Essex is consulting with the MRTC on the location of the installed cameras. Appendix F provides a map and representative photographs collected from the two cameras.

Essex is preparing for collection of the remaining field data during 2025. Following collection of the remaining field information, Essex will begin an analysis of Phase 1 data and initiate the Phase 2

desktop evaluation. The technical report for the Project Operations and Fish Stranding Study will be filed with the USR and will incorporate both Phase 1 and Phase 2 findings.

2.7.2 Study Summary

The goals of the study are (1) to provide information on how the Project is operated in a ROR mode, including a review and evaluation of existing operational generation records, minimum flows, Merrimack River flows, and impoundment elevations; and (2) to evaluate influence of Project operations and maintenance on potential fish stranding areas downstream of the dam and Project tailrace. Essex proposed to perform this study in two phases. Phase 1 is designed as a desktop analysis of Project operations and Merrimack River flows and Phase 2 is a desktop evaluation of the combined results of Phase 1 and the results from the CFD Modeling study. Phase 1 includes the installation of two cameras to capture hourly photographs of the downstream and tailrace water levels in relation to potential fish stranding areas.

2.7.3 Variances from the Approved Study Plan

FERC recommended in the SPD that the Project Operations data be filed with the ISR. Essex is still reviewing and analyzing the Phase 1 Project data for the full five-year period of record. Essex intends to file the results on or before the USR. However, included with this ISR are data from April 2024 through April 2025.

2.8 Freshwater Mussel Habitat Assessment and Survey

2.8.1 Study Status

Essex completed field surveys for freshwater mussels and their habitat in August 2024 and supplemental “spot dives” during early September 2024 to further assess mussel communities in areas of interest noted during the transect sampling. The Freshwater Mussel Habitat Assessment and Survey Study Report is located in Appendix G.

2.8.2 Study Summary

The goal of the Mussel Study was to determine the presence, location, and species of freshwater mussels that inhabit Project-affected aquatic habitats within Merrimack River. The study consisted of both field and desktop-based tasks. Field efforts focused on surveys to characterize the distribution, composition, and relative abundance of freshwater mussels and non-native bivalves in the Lawrence Project area. The desktop analysis focused on a review of potential host-fish for documented mussel species through review of relevant publications and concurrent fish data collected in the Project area. The specific field-based objectives of this study were to:

- Determine the species composition, relative distribution, and abundance of freshwater mussel species in the Project area,
- Assess the available habitat within the nearshore areas; and
- Document the presence/absence of *Corbicula* (a non-native, invasive species) in the designated survey areas.

2.8.3 Variances from the Approved Study Plan

The Freshwater Mussel Habitat Assessment and Survey was conducted following the methodology described in the April 10, 2024, RSP and approved by FERC in their May 10, 2024, SPD with several exceptions:

- In their May 10, 2024 SPD, FERC recommended that the licensee survey the North and South Canals for potential suitable mussel habitat and characterization of the distribution, composition, and relative abundance of mussels and non-native bivalves. Habitat and mussel information was collected from the North Canal. Due to safety concerns with the ability for staff to access and exit the South Canal in the event of loss of control at the intake structure, no habitat or mussel data was collected from that project section.
- Measurements were recorded for all rare mussel species and limited to 50 measurements of the most common species, due to their high abundance and wide range in size. Over 12,000 individuals were observed and the time diverted to measure all individuals would detract from supplementing survey coverage and additional species detection through spot dives and yield little additional value to the stated goals of this study.
- In their May 10, 2024 SPD, FERC requested that Essex report the occurrence of all invasive plant species while conducting field sampling conducted as part of the Recreation Facilities, Use, and Aesthetics Study and the Freshwater Mussel Habitat Assessment and Survey. Although invasive plant data was not collected during the 2024 Mussel Study, Essex is collecting observational information on invasive plant species during the Recreation Facilities, Use, and Aesthetics Study and will supplement that with observational data collected during the 2025 Water Quality Study field effort.

2.9 Water Quality Study

2.9.1 Study Status

Essex will conduct the Water Quality Study during the 2025 field season (June through September). The study will be conducted according to the RSP and the modifications in the SPD. Findings will be presented in the USR, due to be filed with FERC during April 2026.

2.9.2 Study Summary

The goal of the Water Quality Study is to collect baseline water quality data upstream and downstream of the project and to assess the effects of project operation on water quality on the Merrick River during late spring and summer (i.e., June 1 to September 30) Essex will conduct the field component of the Water Quality Study from approximately June 1 to September 30, 2025. As described in the RSP, Essex will:

(1) collect weekly vertical profiles of dissolved oxygen (DO) and temperature and Secchi disk depth at the deepest spot in the impoundment;

(2) determine the spatial and temporal effects of project operation on water quality by continuously monitoring DO, temperature, and pH at five locations upstream of the project dam, the tailrace, three locations downstream of the project to the Lawrence I-495 Bridge, two locations each in the North and South Canal (gatehouse and canal mid-point), and two locations in the Spicket River upstream and downstream of the North Canal discharge;

(3) monitor total phosphorus, total nitrogen, and chlorophyll-a at two locations within the impoundment and in the Merrimack River upstream of the impoundment;

(4) monitor turbidity, total suspended solids, and true color in the Merrimack River upstream of the impoundment, one location within the impoundment that is downstream of the project dam, and downstream of the North and South Canal discharges;

(5) sample benthic macroinvertebrates in the Merrimack River at one location upstream of the impoundment and one location downstream of the project dam in consultation with Massachusetts DEP.

In accordance with the Commission's SPD, Essex will also continuously monitor:

(6) water quality in the bypassed reach during the study at the georeferenced coordinates below the Project dam.

(7) DO, water temperature, and pH in the North and South Canal at the entrances to each canal (i.e., the gatehouse) and just upstream of discharge points

2.9.3 Variances from the Approved Study Plan

Essex anticipates that the Water Quality Monitoring Study will be conducted in conformance with the Commission's SPD.

2.10 Three-Dimensional Computational Fluid Dynamics (CFD) Modeling

2.10.1 Study Status

Essex identified the location of the transects for velocity points, coordinated study logistics and identified access locations for fieldwork. Essex performed field data collection for preliminary baseline data (xyz depth information and cross-sectional depth and velocity information). Essex anticipates providing the Three-Dimensional CFD Modeling Study Report as it becomes available in Quarter 2 of 2025.

2.10.2 Study Summary

The goal of this study is to determine the flow field conditions that exist in and around the Lawrence Project's upstream and downstream migratory fish passage routes. This is anticipated to aid in the interpretation of conditions for the guidance of migrating fish to and through the fish passage facilities. The objectives of this study are to:

- Develop and calibrate 3D models of areas pertinent to fish passage structures including the Essex Powerhouse forebay and downstream bypass, tailrace, and fish lift;
- Simulate various operational conditions using each model; and
- Produce a series of color contour maps depicting flow fields relating to attraction and hydraulics.

Project drawings were used to develop 3D representation of the fish passage structures and other pertinent Project facilities and compiled into a full computer aided drawing (CAD) representation for each of the model areas. CAD filed were then used to build 3D hydraulic models. The upstream and

downstream bathymetry data collected from side scan sonars during the Sturgeon Distribution and Project Interaction Study were used to run calibration/validations scenarios. Model simulation runs of the study areas are described in the RSP.

2.10.3 Variances from the Approved Study Plan

Essex anticipates that Three-Dimensional CFD Modeling Study will be performed in full conformance with the Commission's SPD.

2.11 Recreation Facilities, Use, and Aesthetics Study

2.11.1 Study Status

Essex initiated the Recreation Facilities, Use and Aesthetics Study consistent with the methodologies and details provided in the RSP and modifications approved in the SPD. During the 2024 study season, Essex initiated a review of existing literature and archival research to identify formal recreation facilities and recreational resources located within the Project vicinity. Essex established a focus group of representatives from community organizations and governmental agencies to assist in the selection of recreation facilities to be included in the study. In October 2024, Essex performed a field inventory of the sixteen recreation sites (seven formal and nine informal) selected in consultation with the Focus Group. During the 2024 study season, Essex also conducted vegetation and waterborne trash surveys along the canals.

Essex anticipates completing field work associated with the waterborne trash and vegetation in the canals in the spring of 2025. The Field Reconnaissance and Visitor-Intercept Surveys are scheduled to be conducted between May 1, 2025, and October 1, 2025. Essex will continue to review and compile data and develop a technical study report based on the information collected and analyses conducted in support of this study. Essex anticipates filing the Recreation Facilities, Use, and Aesthetics Study Report with the USR in April 2026.

2.11.2 Study Summary

As described in the RSP, Essex is conducting the Recreation Facilities, Use, and Aesthetics Study to: (a) document existing recreation facilities and recreational activities that occur at the project, (b) determine the adequacy and capacity of existing recreational facilities to accommodate current and future recreational needs, and (c) identify areas within the canal system where vegetation growth on historic canal walls and waterborne trash occur.

In 2024, Essex conducted a literature review to identify and describe recreational uses in the Project area. On July 15, 2024, Essex sent a data request letter to interested stakeholders for documentation (visitor use records, guidance documents, maintenance records, engineering plans, etc.) of recreational facilities and uses within the Project area. Stakeholders contacted as part of this data request included: GWL, NPS, Lawrence Redevelopment Authority, City of Lawrence, MADCR, Lawrence Community Works, Greater Lawrence Community Boating, Andover Village Improvement Society (AVIS), Lawrence Conservation Commission, City of Lawrence Recreation Department, Abe Bashara Boathouse, the Town of Andover, Andover Trails Committee, Inc., and the Town of Methuen (See Appendix H for consultation).

Essex established a focus group of representatives from community organizations and governmental agencies to assist in the selection of recreation facilities to be included in the study. The focus group

participants included members from the following organizations: GWL, NPS, Lawrence Redevelopment Authority, City of Lawrence, MADCR, Lawrence Community Works, Greater Lawrence Community Boating, Andover Village Improvement Society, Lawrence Conservation Commission, City of Lawrence Recreation Department, the Town of Andover, and the City of Methuen.

By a letter dated September 3, 2024, and subsequent meeting held on September 19, 2024, Essex invited the Focus Group to participate in the selection of formal and informal facilities to be included and attend the field inventory assessment. (Focus Group consultation is provided in Appendix H).

Essex conducted the field inventory of formal and informal recreation facilities in the Project vicinity on October 10 and 11, 2024. A total of sixteen recreation sites were selected for the field inventory assessment in consultation with the Focus Group. Prior to conducting the field assessment, Essex distributed a schedule along with a map providing the general location of selected sites to the Focus Group on October 7, 2024 A total of seven participants from the Focus Group attended portions of the field inventory assessment. Two focus group participants from GCLB attended portions of the field assessment on October 10, 2024, and five Focus Group participants, four from AVIS and one from Andover Trails attended portions of the field inventory on October 11, 2024.

During the field inventory assessment Essex recorded and mapped the location of the recreational facilities and amenities at each site. Additional information recorded included:

- A description of the type and location of existing recreation facilities;
- Property Ownership;
- The type of recreation provided (boat access, angler access, picnicking, etc.);
- Existing amenities and sanitation;
- The type of vehicular access and parking capacity (if any);
- Any recreational use observed at the time of the field inventory;
- Suitability of facilities to provide recreational opportunities and access for persons with disabilities (i.e., compliance with current ADA standards for accessible design);
- Georeferenced photographic documentation of recreation facilities; and
- On-site comments provided by Focus Group Participants.

During the assessment Essex also identified, photographed and mapped invasive plant species to be included in the Invasive Plant Survey as described in the SPD. Comments, recommendations, and requests from focus group participants that attended portions of the field inventory were also recorded.

By a letter and email dated April 3, 2025, Essex invited the Focus Group to comment on the selection of ten sites to perform the visitor-intercept and site reconnaissance surveys through the 2025 recreation season.

2.11.3 Variances from the Approved Study Plan

There have been no variances from the approved study plan, and Essex anticipates that the Recreation Facilities, Use, and Aesthetics Study will be conducted in conformance with the Commission’s SPD.

2.12 Historically Significant Waterpower Equipment Study

2.12.1 Study Status

Essex initiated consultation with the Lawrence Historical Commission (LHC) and the Massachusetts State Historic Preservation Officer (SHPO) and requested concurrence on the proposed Areas of Potential Effect (APE) for the Historically Significant Waterpower Equipment Study. Essex requested input from LHC and SHPO on July 23, 2023, August 12, 2024, and September 24, 2024, and received concurrence from SHPO on October 10, 2024. Essex conducted a site visit and visual inspection of historical Project facilities, including the canal gatehouses and canal civil works in October 2024.

The Historically Significant Waterpower Equipment Study is located in Appendix I.

2.12.2 Study Summary

Essex conducted the Historically Significant Waterpower Equipment Study to identify and document historically significant waterpower equipment located within the canals and canal gatehouses, and identify the potential for future interpretation, exhibition, and preservation methods of identified resources.

- Consult with the Massachusetts SHPO, the Lawrence Historical Commission, and other interested parties and conduct a site visit to identify historically significant waterpower equipment of interest to stakeholders for potential future interpretation, exhibition, or as a source of spare parts to maintain and operate other historical machinery;
- Photo-document historically significant waterpower equipment identified in consultation with the Massachusetts SHPO, the Lawrence Historical Commission, and other interested parties;
- Conduct background research on the history of identified waterpower equipment, including designer/engineer, dates of manufacture and use, and an explanation of how the equipment was or is used; and
- Document current ownership of historically significant waterpower equipment

2.12.3 Variances from the Approved Study Plan

There have been no variances from the approved study plan. Essex conducted the Historically Significant Waterpower Equipment Study in full conformance with the Commission’s SPD.

2.13 Condition Assessment of Historic Properties and Associated Canal System

2.13.1 Study Status

Essex initiated consultation with the LHC and the Massachusetts SHPO and requested concurrence on the proposed APE for the Condition Assessment of Historic Properties and Associated Canal System on July 23, 2023, August 12, 2024, and September 24, 2024. Essex received concurrence on the APE from SHPO on October 10, 2024. Essex conducted the fieldwork associated with the Condition Assessment of Historic Properties and Associated Canal System in October 2024.

Essex anticipates filing the Condition Assessment of Historic Properties and Associated Canal System Study Report prior to the ISR Meeting on May 7, 2024.

2.13.2 Study Summary

The goal of this study is to evaluate the potential effects of project operation on historic resources within the Project's APE in consultation with the Massachusetts SHPO, LHC, and other interested parties. The specific objectives of this study are as follows:

- Determine the extent to which project operations, including water flow in the North and South Canals, have an effect on historic properties;
- Conduct a condition and structural assessment of the North and South Canals; and
- Identify potential impacts of current and proposed project operations on historic resources.

2.13.3 Variances from the Approved Study Plan

There have been no variances from the approved study plan. Essex conducted the Condition Assessment of Historic Properties and Associated Canal System Study in full conformance with the Commission's SPD.

2.14 Downstream Juvenile Alosine Passage Assessment

2.14.1 Study Status

Essex will complete the Downstream Juvenile Alosine Passage Assessment during 2025, and findings will be presented in the USR, due to be filed with FERC during April 2026.

2.14.2 Study Summary

Essex filed an RSP on April 10, 2024 that did not include a juvenile alosine downstream passage study but instead proposed a desktop assessment of downstream passage through the project turbines. The SPD included an assessment of downstream passage of juvenile alosines through the Project spillway and downstream fish bypass using balloon tags. Essex is proposing this study in response to the SPD. The study plan is provided as Appendix J.

The goal of this study is to determine if the Project operations negatively affect juvenile alosine survival. Specifically, direct survival of juvenile alosines passed downstream through the spillway and fish bypass will be estimated using a HI-Z Tag (i.e., balloon tag) mark-recapture method.

2.14.3 Variances from the Approved Study Plan

There have been no variances from the approved study plan.

2.15 Sturgeon Habitat Mapping and Assessment Study

2.15.1 Study Status

Essex will perform fieldwork associated with the Sturgeon Habitat Mapping and Assessment Study in 2025. Essex will analyze and compile data collected during the field study in a technical study

report scheduled to be filed with the USR. Essex has provided a study plan for review by FERC and the MRTC in Appendix K.

2.15.2 Study Summary

The Study Plan (Appendix K) is designed to address the recommendations by FERC in the SPD to conduct a Sturgeon Habibat Mapping and Assessment Study based on data collected from a side-scan sonar (SSS) survey separate from Sturgeon Distribution and Project Interaction Study (Study 5). The objectives are to (1) map the benthic habitat features of the Merrimack River downstream of the project, from the project dam (Essex Dam) to RM 19 (Basilere Bridge on Route 125); and (2) quantify *the area of juvenile rearing habitat, spawning habitat, and foraging habitat for Atlantic (Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*A. brevirostrum*) are in this reach based on substrate type and water depth.

2.15.3 Variances from the Approved Study Plan

Essex does not anticipate any variances from the Commission's SPD.

2.16 Fish Assemblage Assessment

2.16.1 Study Status

Essex will review and compile data from the fishery studies being conducted in support of this relicensing. A technical study report based on the information collected and analyses conducted in support of this study will be developed and findings will be presented in the USR.

2.16.2 Study Summary

In accordance with the SPD, Essex will conduct the Fish Assemblage Assessment using the following methods: (1) compile information from existing fish assembly study data; (2) summarize the fishery data from all required fishery studies in this determination, and (3) assess the information for any data gaps in the fisheries information.

Fishery study data will be collected during the 2024 and 2025 study seasons. Essex anticipates obtaining relevant study data for the Fish Assemblage Assessment in winter of 2025 and providing the full data set as part of the USR in April 2026.

2.16.3 Variances from the Approved Study Plan

Essex anticipates that the Fish Assemblage Assessment will be conducted in conformance with the Commission's SPD.

2.17 Invasive Plants Survey

2.17.1 Study Status

An invasive plants survey was performed during the field inventory for the Recreation Study in October 2024. Invasive plant surveys are being performed in conjunction with the vegetation and trash surveys of the Canal System (Recreation Study). Essex anticipates completing fieldwork associated with the Invasive Plant Survey in summer of 2025.

2.17.2 Study Summary

In accordance with the Commission's SPD, Essex documented the occurrence of all invasive plants observed during the fieldwork conducted in 2024, which included: two of the three vegetation surveys of the North and South Canals and the field inventory assessment conducted as part of the Recreation Facilities, Use, and Aesthetics Study, as well as during field sampling during the Freshwater Muscle Habitat Assessment and Survey. At each survey site, Essex documented the abundance and distribution of each identified invasive species within the study area, captured photographs, and georeferenced points.

In the 2025 study season, Essex will conduct invasive plant surveys during the third and final vegetation survey on the North and South Canal in spring, and during the field reconnaissance and visitor-intercept recreation surveys in summer. Upon completion of field activities, Essex will compile survey data and develop the Invasive Plant Survey study report. Study findings will be presented in the USR to be filed in April 2026.

2.17.3 Variances from the Approved Study Plan

In their May 10, 2024 SPD, FERC requested that Essex report the occurrence of all invasive plant species while conducting field sampling conducted as part of the Recreation Facilities, Use, and Aesthetics Study and the Freshwater Mussel Habitat Assessment and Survey. Although invasive plant data was not collected during the 2024 Mussel Study, Essex is collecting observational information on invasive plant species during the Recreation Facilities, Use, and Aesthetics Study and will supplement that with observational data collected during the 2025 Water Quality Study field effort.

3 Upcoming ILP Milestones

Upcoming ILP milestones are shown below in Table 3-1. The Commission's regulations at 18 CFR § 5.15(c) require Essex to hold meetings with participants and FERC staff within 15 days of filing the ISR. Accordingly, Essex will hold ISR Meetings from 9 AM to 4 PM on May 7-8, 2025. The ISR Meetings will be held at the Elks Lodge at 652 Andover St, Lawrence, Massachusetts 01843. The meetings will be in person. An agenda for the ISR Meeting is presented in Appendix A to this ISR.

To allow for adequate planning, Essex respectfully requests that those planning on attending the ISR Meeting RSVP by emailing Kelsey Iffert with HDR at Kelsey.Iffert@hdrinc.com on or before May 2, 2025.

Essex will file an ISR Meeting Summary with the Commission within 15 days of the ISR Meeting (on or before May 23, 2025). After review of the ISR Meeting Summary, stakeholders may file disagreements with the meeting summary, request modifications to ongoing studies, or request new studies. Disagreements with the ISR Meeting Summary and any requests to amend the study plan to include new or modified studies must be filed with the Commission no later than 30 days after the filing of the ISR Meeting Summary (on or before June 25, 2025).

Table 3-1. Upcoming Major ILP Milestones

Date	Milestone
May 7-8, 2025	ISR Meeting
May 23, 2025	File ISR Meeting Summary
June 25, 2025	Stakeholders file disagreements with ISR Meeting Summary and/or requests for modified/new studies
July 25, 2025	Essex files response to disagreements with ISR Meeting Summary and/or requests for modified/new studies
August 24, 2025	FERC Director of the Office of Energy Projects makes a determination on disputes/amendments to the approved study plan
Fall 2025	Complete ongoing studies
April 26, 2026	File USR
May 11, 2026	USR Report Meeting
May 26, 2026	File USR Meeting Summary
July 3, 2026	Draft License Application (DLA)
October 1, 2026	Comments on DLA Due
November 30, 2026	File Final License Application

4 Intent to File Draft License Application

As required by 18 CFR §5.16(c), Essex hereby advises the Commission of the intent to file a Draft License Application (DLA), which will include the contents of a license application, rather than a Preliminary License Proposal. The DLA will be filed with the Commission on or before July 3, 2026.