REVIEW OF APPLICATION FOR RE-CERTIFICATION BY THE LOW IMPACT HYDROPOWER INSTITUTE OF THE ORONO HYDROELECTRIC FACILITY, LIHI #66

Prepared by Patricia McIlvaine
March 5, 2021

I. INTRODUCTION

This report summarizes the review findings of the recertification application submitted by Black Bear Hydro Partners, LLC (BBHP), a subsidiary of BBHP Renewable Energy Group, and affiliate of Brookfield Renewable (Brookfield) for the Orono Project (FERC No. 2710). Brookfield Renewable purchased BBHP in November 2013. The Orono Project, LIHI #66, is a run-of-river, 6.548 MW hydroelectric generating facility located on the Stillwater Branch of the Penobscot River in Orono, Maine. The Orono Project was one of several hydropower facilities incorporated into the Lower Penobscot River Basin Comprehensive Settlement Accord ("Agreement"), a settlement agreement which represented a collaboration of the licensee, numerous state and federal agencies, the Penobscot Indian Nation (PIN) and several non-governmental organizations, to restore 11 species of sea-run fish, while rebalancing hydropower generated on the Penobscot River and several tributaries. A detailed discussion of this Settlement Agreement can be found in the original Reviewer's Report dated January 17, 2011, available on the LIHI website.[1]

The Orono Project was first certified by the Low Impact Hydropower Institute (LIHI) in January 2011 and recertified for the period between June 1, 2015 - June 1, 2020. The Certification period was extended to April 30, 2021. The Orono project has been owned and operated by the same entity, BBHP, since initial certification by LIHI, although the parent company of BBHP has changed. The two past review reports can be found on the LIHI website.[2]

The Project's 2015 certification had five conditions:

- Condition 1. The Owner shall notify LIHI within 30 days of receipt of USFWS certification of the upstream and downstream anadromous fish and eel passage facilities as required by the Lower Penobscot River Multiparty Settlement Agreement. This certification requires affirmation that: a) the facilities were designed and installed as prescribed, b) the facilities are ready for routine operation as evidenced by approved Operating Manuals and electronic data collection systems, and c) one year of testing and any required "fine tuning" has been completed. It is assumed that certification of the fish lift indicates that the capacity concerns have been resolved. If such USFWS certification is not received by the end of 2017, the Owner shall provide LIHI documentation as to why the certification has not been received and the plan and schedule to remedy deficiencies identified by USFWS preventing such certification.

  Condition was satisfied with the submission of the US Fish and Wildlife Service (USF&WS)

[1] https://lowimpacthydro.org/wp-content/uploads/2020/08/Orono-Reviewer-Report.pdf
[2] https://lowimpacthydro.org/lihi-certificate-66-orono-hydroelectric-project-maine /

certification letter on September 11, 2018.

- Condition 2**.** If the requirement for re-initiation of quantitative studies of downstream passage of juvenile and adult alosine species occurs within this LIHI certification period, the Owner shall notify LIHI within 60 days of receipt of such study re-initiation. This notification shall include the study schedule including the expected report issuance date. A copy of the final report, along with agency statement as to whether the testing results prove that safe downstream passage has been demonstrated, shall be provided to LIHI within 60 days of issuance of the final report.

  Condition remains open as studies conducted in 2018 and 2019, provided to LIHI in 2019 and 2020, have not yet received agency concurrence that downstream passage is effective. Results of studies planned for 2020 have not yet been provided.

- Condition 3**.** The Owner shall notify LIHI within 60 days of receipt of USFWS, NMFS and MDMR acknowledgement that the standards specified in the Biological Opinion for safe downstream passage of Atlantic salmon have been met. Currently, effectiveness testing could be completed by 2018 based on the three-year testing requirement, unless advancement to a higher enhancement sequence is found to be necessary. Should this occur, the Owner shall notify LIHI in the annual compliance report as to the new date by which such continuing testing to meet passage standards is expected to be completed.

  Condition remains open as the most recent study conducted in 2018 and provided to LIHI in 2019, reports the required downstream passage performance standard was met in 2018. However, agency agreement with this finding that downstream passage is effective has not been provided because three consecutive years of meeting the standard has not yet been satisfied.

- Condition 4. The Owner shall provide LIHI with a summary of the results of the 2016 quantitative downstream effectiveness study for American eel, along with any comments received from USFWS, NMFS and MDMR as to whether the testing results prove that safe downstream passage for American eel has been demonstrated. Also, the Owner shall provide a summary of the annual American eel upstream passage results, along with confirmation that any changes to the passage facilities recommended by the resource agencies have been, or are scheduled for implementation. The noted upstream and downstream passage results shall be provided within 60 days of report finalization.

  The results of the 2016 downstream effectiveness study for American eel was submitted on April 13, 2017, satisfying that portion of the Condition. On April 12, 2018, BBHP provided the final report summarizing the 2017 studies of upstream eel passage, which reported 98% successful passage. BBHP did not propose, and the agencies did not request additional years of study, nor were any ladder modifications requested. Based on agency response to the Reviewer's outreach, since numerical standards have not yet been developed, they have not yet confirmed passage is "safe and effective".

- Condition 5. The Owner shall provide LIHI a summary of the results the 2017 survey for

Hyssop-leaved fleabane, a state-listed species of Special Concern, as required by the Sensitive Species Protection Plan. This summary shall be provided within 60 days of its finalization, following review and comment by the Maine Natural Areas Program and New England Wild Flower Society.

Condition was satisfied with submission of the report on June 1, 2018.

Conditions 2, 3 and 4 remain open. More detail on the status of these Conditions is discussed under the applicable criteria.

II. RECERTIFICATION PROCESS AND MATERIAL CHANGE REVIEW

Under the current LIHI Handbook (Revision 2.04: April 1, 2020), recertification reviews are a two-phase process starting with a limited review of a completed LIHI application, focused on three questions:

(1) Is there any missing information from the application?
(2) Has there been a material change in the operation of the certified facility since the previous certificate term?
(3) Has there been a change in LIHI criteria since the Certificate was issued?

In accordance with the Recertification Standards, all Projects currently applying for renewal must go through a full review unless their most recent certification was completed using the 2016 version of the Handbook. Thus, this Stage II report was required for the Orono Project.

A review of the initial application, dated July 6, 2020, resulted in a Stage I or Intake Report, dated August 5, 2020. The Stage I report noted that data was missing for a number of criteria that was required to complete a full review. As a result, a revised application was submitted to LIHI on November 12, 2020.

This Stage II assessment included review of the application package, public records in FERC's eLibrary since the last LIHI certification in 2015 through February 11, 2021, and annual compliance statements received by LIHI during the past term of Certification. Also, follow-up communication with the Applicant, and outreach to several stakeholders was conducted for this review. Copies of these communications can be found in Appendix A.

III. PROJECT'S GEOGRAPHIC LOCATION

The Orono Project is located on the Stillwater Branch of the Penobscot River, less than 1,000 feet upstream of where the Branch enters the Penobscot River, and downstream of the Stillwater Project (LIHI #67) in the town of Orono in Penobscot County, Maine. The Stillwater Branch is 10.5 miles (mi) long and serves as a channel of the Penobscot River as it flows around the western side of Orson and Marsh Islands. The Penobscot River Basin ("Basin") is New England's second largest river system with a drainage area of 8,570 square miles extending from its West Branch near Penobscot Lake, upstream of Seboomook Lake, near the Maine/Quebec border and its East Branch at East Branch Pond near the headwaters of the Allagash River with the mainstem emptying into Penobscot Bay near the Town of Bucksport. Figure 1 shows the location of the Orono Project and

other dams in the river basin. Upstream storage dams on both the West and East Branches control a large portion of flows within the drainage area.

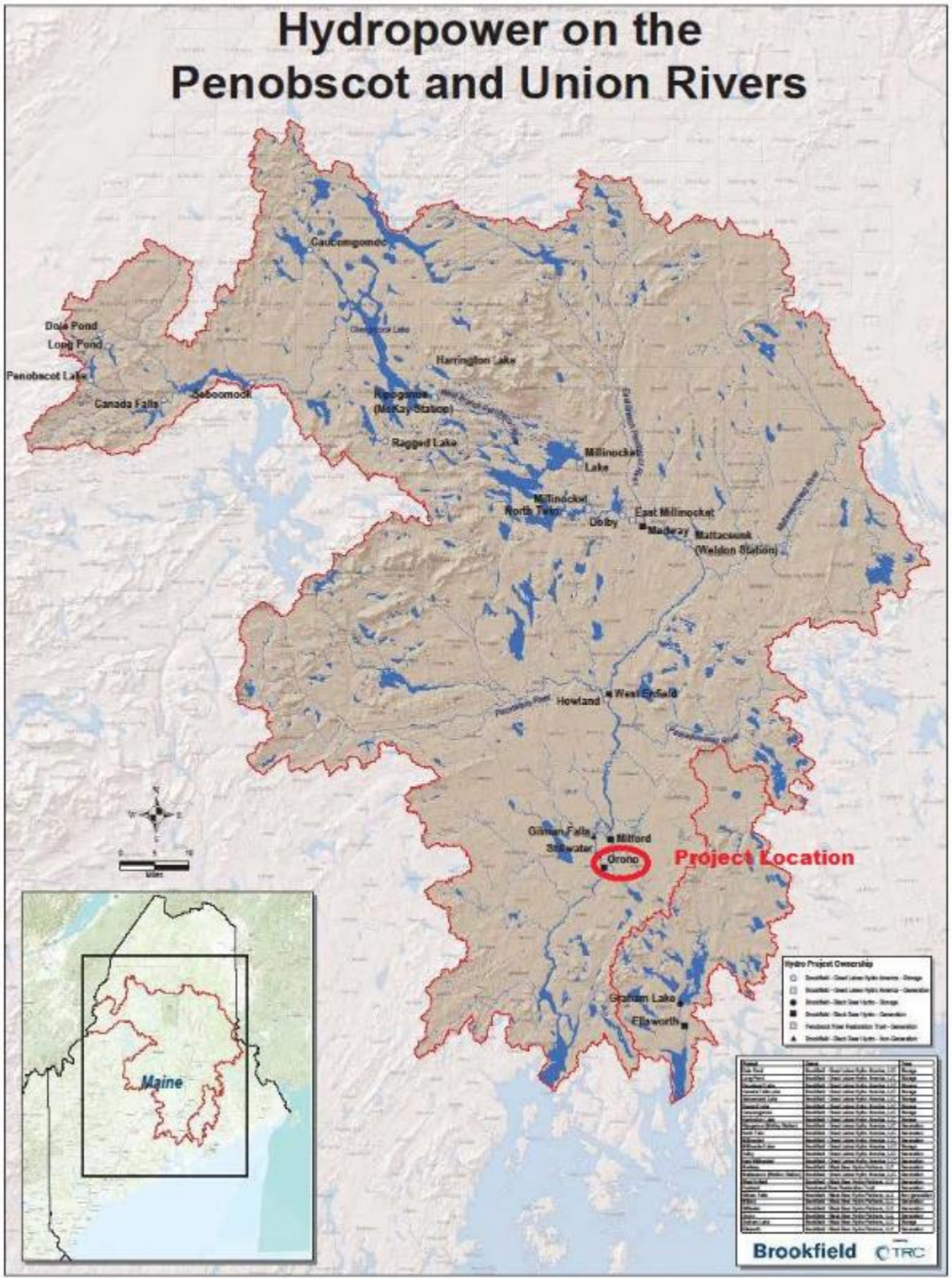

Figure 1 – Location of the Orono Project and Upstream and Downstream Dams

Brookfield operates the following five hydropower facilities on the Stillwater Branch, West Branch and mainstem of the Penobscot River:

Project	River Branch	FERC License	LIHI Certified?
Medway	West Branch	P-2666	# 65 on 6/1/15. In review now.
West Enfield	Mainstem	P-2600	No
Milford	Mainstem	P-2534	# 113 on November 13, 2018.
Orono	Stillwater Branch	P-2710	# 66 on 6/1/15. In review now.
Stillwater	Stillwater Branch	P-2712	# 67 on 6/1/15. In review now.

The Stillwater Project and Gilman Falls dam (which is part of the Milford Project) are upstream of the Orono Project on the Stillwater Branch. Orono is the most downstream dam on the Stillwater Branch, and now the most downstream dam on the entire Penobscot River with the removal of the Great Falls and Veazie Dams, formally located on the mainstem of the Penobscot River, as a result of the Settlement Agreement.

The Orono Project has a lift for upstream anadromous fish passage, but collected fish are trucked for release in the Penobscot River above the Stillwater Branch. The Project also has an upstream American eel passage channel with access to the Orono impoundment. Orono has a downstream fish/eel passage facility associated with both Powerhouses A and B. The upstream Stillwater Project has downstream passage for all species and only upstream eel passage.

IV. PROJECT AND IMMEDIATE SITE CHARACTERISTICS

The Orono Project currently consists of an existing 1,230-foot-long by 15-foot-high dam, including a 320-foot-long spillway topped with 3-foot-high flashboards; an existing 2.0-mile-long reservoir, which has a surface area of 180 acres at the normal full pond elevation of 73 feet National Geodetic Vertical Datum (NGVD); a 866-foot-long, 20-foot-wide, 12-foot-high concrete penstock supplying water to Powerhouse A; a 292-foot-long, 25-foot-wide, 12-foot-high concrete penstock supplying water to Powerhouse B; Powerhouse A containing four generating units with a total installed generating capacity of 2,798 kW; Powerhouse B containing three generating units with a total installed capacity of 3,750 kW; transmission lines; upstream and downstream fish passage facilities; and appurtenant facilities. The Project has a 1-inch clear space angled trashrack over a single intake structure that serves both Powerhouse A and Powerhouse B.

Although the Project operates as run-of-river, the application states that the impoundment has an estimated gross storage capacity of 1,405 acre-feet and allows for a one-foot variation from full pond for operational flexibility. An increase of the headpond full elevation by 0.6 inches was part of the Settlement Agreement, amended FERC license, and Water Quality Certification (WQC). The Project boundary encloses the dam, the reservoir up to the 73.0-foot msl elevation, the powerhouse, and the penstocks except for a short section that traverses beneath the Maine Central railroad bridge. The Project civil works are also surrounded by 8-foot-tall, chain-link perimeter fencing. Land area within the Project boundary is noted as 12.6 acres. The watershed area at the Orono dam is approximately 7,602 sq. miles.

The Orono site was first developed for hydromechanical power to the mill in 1898, and in the

ensuing decades went in and out of operation. In 1949-1950, Bangor Hydro Electric Company acquired the Orono Project and added three generators to three existing, unused turbines. The entire concrete dam structure was replaced in 1960. One of the three penstocks collapsed in 1994. The Project stopped operating in 1996, when the remaining two penstocks collapsed during a maintenance dewatering operation. In 2008, the Project's four turbines in the original powerhouse (Powerhouse A) were re-powered, and the collapsed penstocks were replaced with a single concrete penstock and intake. In 2013, construction was completed on both a new powerhouse (Powerhouse B) and a singular intake and trashrack structure serving both Powerhouse A and B. An upstream fish lift and associated trap and truck facility, downstream fish passage, and upstream eel passage were also constructed and began operations in 2014 (fish lift; downstream fishway) and 2016 (upstream eel ladder).

The Orono Project has a gross nameplate generating capacity of 6.548 MW. Follow-up communication with K. Maloney of Brookfield noted an average annual generation of 34,729 MWh (Period of Record: 2014 to 2019).[3] Key features are shown on Figures 2 through 11.

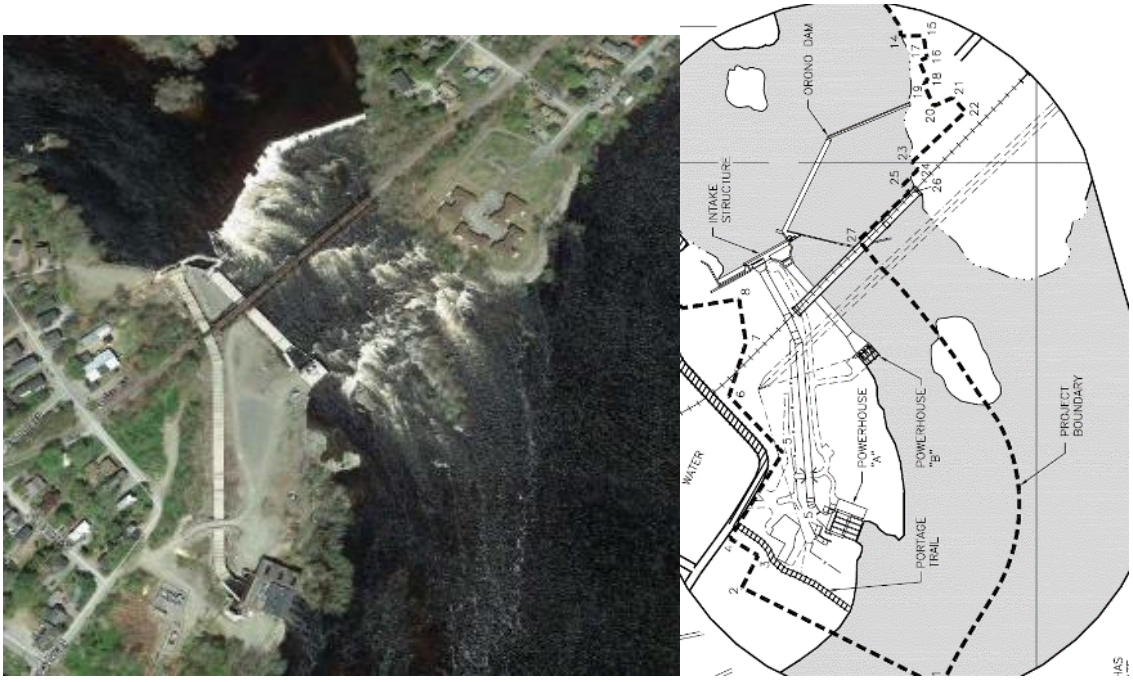

Figure 2 – Aerial and Schematic of the Orono Project

[3] See Appendix A.

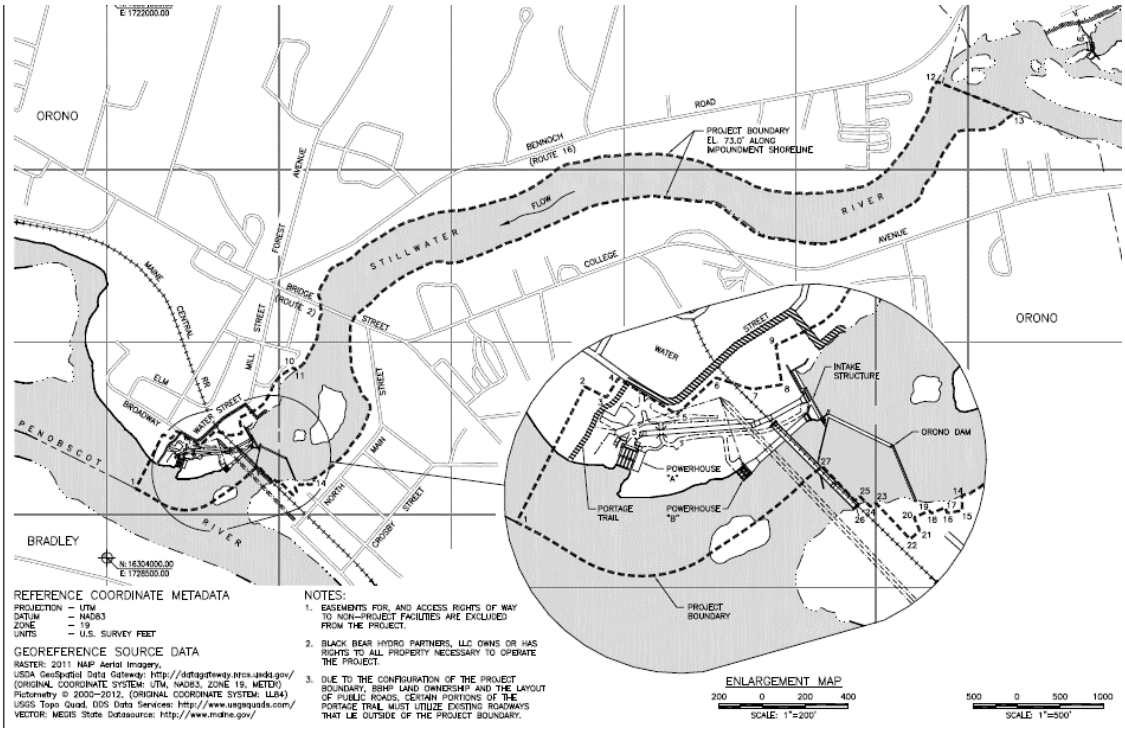

Figure 3 – Orono Project Boundary

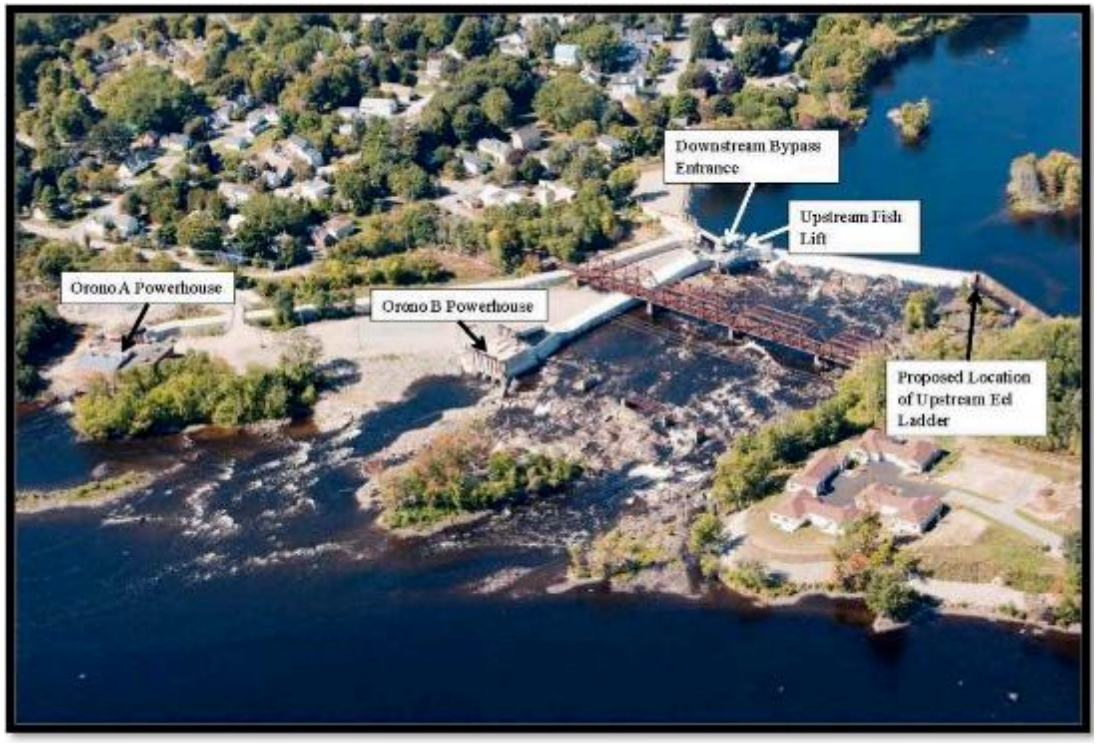

Figure 4 – Key Features of the Orono Project

Figure 5 – Powerhouse A

Figure 6 – Powerhouse B

Figure 7 – Orono Spillway

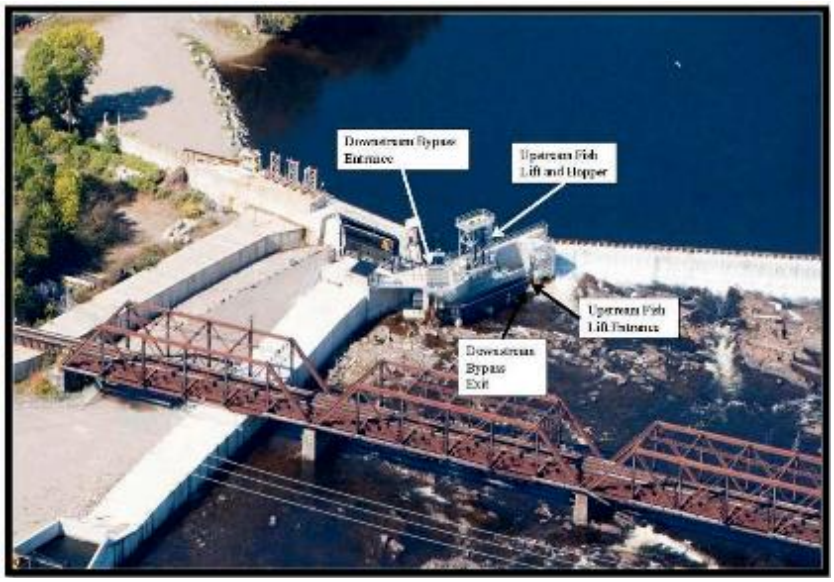

Figure 8 – Location of Orono Fish Passage Features

Figure 9 – Fish Lift

Figure 10 – Upstream Eel Ladder

Figure 11 – Downstream Fish Passage

V. ZONES OF EFFECT AND STANDARDS SELECTED

Three Zones of Effect (ZOE) were appropriately designated by the Applicant. They are illustrated on Figures 12 and 13.

- ZOE #1 – Impoundment - RM 2.41 to 0.15
- ZOE #2 – Bypass Reach - RM 0.15 to 0.05
- ZOE #3 – Tailrace/ Downstream Reach - RM 0.05 to 0

Figure 12 – Project Zone of Effect #1 - Impoundment

Figure 13 – ZOE #2 – Bypass Reach (Yellow) and ZOE #3 Downstream Reach (Red)

The Standards identified in the final application for each ZOE are shown on the tables below. Shown in red are what I believe are better selections for two criteria. I also recommend that Standard F-2 be eliminated as noted for Criterion F. The rationale for these suggestions and details of compliance with the criteria are presented in Section VIII.

Standards for the Impoundment (ZOE #1)

Criterion		Alternative Standards				
		1	2	3	4	Plus
A.	Ecological Flow Regimes		X			
B.	Water Quality		X			
C.	Upstream Fish Passage	X	~~X~~			
D.	Downstream Fish Passage		X			
E.	Watershed and Shoreline Protection	X				
F.	Threatened and Endangered Species Protection		~~X~~	X		X
G.	Cultural and Historic Resource Protection		X			
H.	Recreational Resources		X			

Standards for the Bypass Reach (ZOE #2)

Criterion		Alternative Standards				
		1	2	3	4	Plus
A.	Ecological Flow Regimes		X			X
B.	Water Quality		X			
C.	Upstream Fish Passage		X			
D.	Downstream Fish Passage		X			X
E.	Watershed and Shoreline Protection	X				
F.	Threatened and Endangered Species Protection		~~X~~	X		X
G.	Cultural and Historic Resource Protection		X			
H.	Recreational Resources	X				

Standards for the Tailrace/Downstream Reach (ZOE #3)

Criterion		Alternative Standards				
		1	2	3	4	Plus
A.	Ecological Flow Regimes		X			
B.	Water Quality		X			
C.	Upstream Fish Passage		X			
D.	Downstream Fish Passage	X	~~X~~			
E.	Watershed and Shoreline Protection	X				
F.	Threatened and Endangered Species Protection		~~X~~	X		X
G.	Cultural and Historic Resource Protection		X			
H.	Recreational Resources		X			

VI. REGULATORY AND COMPLIANCE STATUS

Copies of the Federal Energy Regulatory Commission (FERC) license, amendments and Water Quality Certifications (WQC) and amendments referenced below are contained in the LIHI application.

The Orono Project was operated under a FERC license issued to Bangor Hydro-Electric Company (Bangor Hydro) in 1977, with a retroactive effective date of 1950. This license was set to expire in 1993. By an order issued on September 25, 1985, the license expiration date was accelerated, effective the date of the Order. From 1985 to 2005, when the new license was issued, the Project operated under annual licenses.

The Orono license was transferred to Penobscot Hydro LLC, which later became PPL Maine, LLC, (PPL Maine) in October 2000. The Orono Project was purchased by BBHP and the license transferred on September 17, 2009.

The Orono Project received the new 40-year license from the FERC on December 8, 2005

(expiring in 2045) for the rehabilitation (replacing the three failed penstocks) and operation of Powerhouse A. This license incorporated those provisions of the 2004 Settlement Agreement that were not contingent upon the removal of the Great Falls and Veazie dams. As such, fish passage provisions, as mandated by the Departments of Commerce and Interior, were reserved at that time. The license was amended on September 14, 2012 to accommodate the construction of Powerhouse B and to incorporate the provisions for fish passage pursuant to the Settlement Agreement, and to extend the license term to extended to March 31, 2048. A WQC was issued for the Orono Project on December 14, 2004 adopting the applicable provisions of the Settlement Agreement and incorporated into the new 2005 FERC license. The WQC was amended to incorporate construction of Powerhouse B on August 23, 2011, which was incorporated into the September 14, 2012 amended license.

The Orono Project is part of the Lower Penobscot River Multiparty Settlement Agreement (Settlement Agreement), signed on June 25, 2004[4], the goal of which is to restore self-sustaining populations of 11 native species of sea-run fish along the Penobscot River in Maine. The Settlement Agreement involved the purchase and removal of the lower-most dams on the Penobscot River, Veazie (FERC No. 2403) and Great Works (FERC No. 2312), and installation of a fish bypass at and decommissioning of the Howland dam (FERC No. 2721) on the Piscataquis River, a tributary of the Penobscot River. As part of the Settlement Agreement, the signatories agreed to amend the license for the Orono Project to increase the authorized maximum elevation of the Project reservoir by one foot. In June 2004, an application was filed with FERC for the amendment, which was approved as a new license in 2005. The Settlement Agreement was jointly entered into by:

- PPL Maine, PPL Great Works, PPL Generation (the owners of Orono at this time)
- the Penobscot River Restoration Trust (PRRT)
- Penobscot Indian Nation (PIN)
- United States Department of Interior, acting through the Fish and Wildlife Service (USF&WS), Bureau of Indian Affairs (BIA) and the National Park Service (NPS)
- Maine State Planning Office
- Maine Atlantic Salmon Commission (MASC)
- Maine Department of Inland Fish and Wildlife (MIF&W)
- Maine Department of Marine Resources (MDMR)
- American Rivers, Inc
- Atlantic Salmon Federation
- Maine Audubon Society
- Natural Resources Council of Maine (NRCM), and
- Trout Unlimited (TU).

Notably, NMFS was not a signatory and has issued mandatory fish passage requirements for the Project, which were incorporated into the FERC license.

FERC incorporated the provisions of the Contingent Mitigation Fund of Attachment B of the Settlement Agreement into the license via incorporation of the 2004 WQC. Under the Contingent Mitigation Fund, the contributions due to the effects of the headpond increases would be $1,000

[4] https://lowimpacthydro.org/wp-content/uploads/2020/08/Penobscot-Agreement-6-04.pdf

per year (adjusted annually in accordance with the Consumer Price Index) for the term of the license. The disposition of the monies would be determined upon mutual agreement among the many of the signatories to the Settlement Agreement for replacing the fish and wildlife habitat lost or degraded by habitat effects, compensating for loss or degradation of fish and wildlife habitat due to habitat effects by means other than replacement, and supporting efforts directed at restoring to the Penobscot River fisheries and the habitat on which these fisheries rely. However, as the Veazie and Great Works dams were removed and the Howland bypass constructed, the funding requirement was not implemented.

In response to a 2018 FERC site inspection where discrepancies were discovered in nameplate data and FERC records, a license amendment was issued on February 11, 2019 correcting the Authorized Installed Capacity information.

No deviations from FERC license requirements were found during the review of the FERC eLibrary from June 1, 2015 through November 30, 2020.

VII. PUBLIC COMMENT RECEIVED OR SOLICITED BY LIHI

The deadline for submission of comments on the LIHI recertification application was January 30, 2021. Agency outreach via email (See Appendix A) was made to the following agencies. Direct responses were received from MDIF&W. MDMR and USF&WS responses were incorporated in their comments submitted to LIHI.

- Maine Department of Inland Fisheries and Wildlife (MDIF&W), Kevin Dunham, Regional Fisheries Biologist
- Maine Department of Marine Resources (MDMR), Gail Wippelhauser, Marine Resources Scientist
- National Marine Fisheries Service (NMFS), Jeff Murphy, Penobscot SHRU
- US Fish and Wildlife Service (USF&WS), Julianne Rosset, Migratory Fish/Hydropower Biologist
- Penobscot Indian Nation (PIN) - Dan McCaw, Fisheries Program Manager

The MDMR submitted combined comments on the Medway, Orono, and Stillwater applications, addressing my inquiries, with which the USF&WS concurred. Kevin Durham of MDIF&W also submitted limited comments, saying he has had limited interaction with the Applicant. MDMR stated that Jeff Murphy of NMFS would not be responding as he did not believe it would be appropriate to comment on projects with which he would be involved in regulatory proceedings in the near future. However, the Orono license will not expire until 2045. BBHP also submitted a response to the agency comments, which refuted the statements in the MDMR comments, and should be reviewed for the details which are not completed renumerated in my discussion. All comments are incorporated into the two fish passage criteria discussions and are available on the LIHI website.

VIII. DETAILED CRITERIA REVIEW

A. ECOLOGICAL FLOW REGIMES

Goal: The flow regimes in riverine reaches that are affected by the facility support habitat and other conditions suitable for healthy fish and wildlife resources.

Assessment of Criterion Passage

The applicant selected **A-2 – Agency Recommendation** for all ZOEs as there are headpond limits, bypass minimum flows and run-of-river operational requirements. **Standard A-1 - Not Applicable/De Minimis Effect** may also be suitable for the Impoundment (ZOE #1) per the LIHI Handbook. There have been no changes in requirements or in the mode of operation of the Facility since it was last re-certified by LIHI.

The Orono Project is operated as a run-of-river facility with the headpond managed pursuant to the FERC-approved Project's Operations and Flow Monitoring Plan to maintain compliance with requirements for run-of-river operations, headpond elevation, and minimum flow. The WQC specifies that "the Orono Project shall be operated in a run-of-river mode, with outflow approximately equal to inflow on an instantaneous basis except for flashboard failure or replacement, and impoundment levels maintained within one foot of full pond (elevation 73.0 feet msl). During times of flashboard failure, the applicant will maintain water levels at or above the spillway crest. During those times when flashboards are being replaced, the applicant will maintain water levels within one foot of the spillway crest."

The Orono dam backwaters the Stillwater Branch of the Penobscot River (i.e. the impoundment) to the Stillwater Powerhouse A tailrace. Inflow to the Orono impoundment typically passes through Orono's Powerhouse A and B. Inflow in excess of the hydraulic capacity of the Project or in times of unit outage are spilled to the bypass reach (ZOE#2). The Orono Project has a required bypass reach minimum flow of 200 cubic feet per second (cfs), which is provided as 150 cfs through the existing fish passage facility and 50 cfs via the spillway (both of which discharge into the bypass reach. In addition, approximately 1.5 cfs is also seasonally provided (from June 1 to August 31) into this bypass via the upstream eel passage facility conveyance flow. This minimum flow was established in the 2005 FERC license and WQC. Bypass reach flows were established to maintain both the aquatic life designated use plus water quality numeric standards. The license and WQC also incorporated the terms of the Settlement Agreement.

An Instream Flow Incremental Methodology (IFIM) analysis was conducted as part of relicensing the Orono Project. The analysis showed that over the range of flows evaluated, weighted usable area (WUA) was highest at a flow of 346 cfs for all but two species life stages--smallmouth bass young of the year (YOY) and juveniles. However, for this species and these life stages, the WUA versus discharge curves were relatively flat over a range of flows from 86 to 258 cfs for YOY and 189 to 346 cfs for juveniles suggesting that similar habitat is provided by the 200-cfs flow. Although WUA is shown to continue to increase with increasing flow for smallmouth bass adults and Atlantic salmon juveniles over the range of flows evaluated, the rate of habitat improvement declined at flows above 189 cfs. Habitat improvement for American shad spawning/incubation and larvae/juvenile life stages continued to increase as flows increased throughout the entire range

of flows evaluated.

In accordance with the 2012 amended license, the 200 cfs minimum flow is provided by conveying 153 cfs through the fish passage facility and 47 cfs through the flashboards. An additional flow of 1-2 cfs is provided to the bypass reach via the upstream eel passage facility. As discussed in more detail under *Criterion D – Downstream Fish Passage*, additional flows are temporarily released to the bypass since 2016 during the Atlantic salmon smolt outmigration period, as part of the assessments being conducted to enhance downstream passage with the goal of achieving the passage performance standard established for this federally endangered species.

BBHP has not experienced a flow or water level excursion, nor received any notice of a violation of the license from FERC in the last 5 years, through February 11, 2021. Two headpond deviations in 2015 (during the earlier certification period) were considered license violations. However, the lack of issues since May 2015 indicates improvements to the Project's compliance protocols.

No stakeholders contacted during my review provided comments about flow concerns at the Project. Based on review of the Application and FERC eLibrary, I believe that the Project continues to satisfy this criterion.

The Project Passes Criterion A – Ecological Flow Regimes

B. WATER QUALITY

Goal: Water Quality is protected in waterbodies directly affected by the facility, including downstream reaches, bypassed reaches, and impoundments above dams and diversions.

Assessment of Criterion Passage

The Applicant appropriately selected **Standard B-2 Agency Recommendation** for all ZOEs as Project operations are governed by a WQC.

The Orono Project operates under the terms of the WQC as issued in 2004 and amended in 2011. Bypass reach flows were established to maintain both the aquatic life designated use plus water quality numeric standards.

The application noted that the entirety of the Stillwater Branch of the Penobscot River is Class B. The Maine Department of Environmental Protection (MDEP) historically conducted ambient water quality sampling in the Stillwater Branch with all dissolved oxygen (DO) readings in attainment. Water quality monitoring conducted by BBHP as part of the FERC required Dissolved Oxygen Monitoring Plan, following construction of the Powerhouse B facilities was completed in 2014, and reported in April 2015, demonstrating that DO standards for Class B waters are met under the current operating scheme. No agencies had comments regarding the results of these studies.

The LIHI application noted that according to MDEP's 2016 Integrated Water Quality and Assessment Report (305(b) report) to the U.S. Environmental Protection Agency, the Stillwater Branch is not impaired. However, the mainstem of the Penobscot River at Orono into which the

Stillwater Branch discharges, is classified by MDEP as a Category 4B water— Rivers and Streams with Impaired Use Other than Mercury, TMDL Completed. This classification is a result of excursions of Class B bacteria (E. coli) standards, which are not influenced or caused by Project operations as reported by the Applicant.

Attached to the LIHI application is a letter dated November 3, 2020, from MDEP, responding to BBHP's request for comment. In the letter, the MDEP detailed activities conducted by BBHP that satisfied various WQC requirements. The MDEP also stated that they believe that provided BBHP continues to consult with the fisheries resource agencies on passage issues, as the Applicant has made provisions to mitigate the impacts of the Orono Project on fisheries resources in the Stillwater Branch of the Penobscot River, they "find that BBHP continues to abide by the Terms and Conditions of the WQC."

No stakeholders contacted during my review provided comments about water quality concerns at the Project. Based on my review of the application and eLibrary information, I believe the Project continues to satisfy the requirements for this criterion.

The Project Passes Criterion B – Water Quality

C. UPSTREAM FISH PASSAGE

Goal: The facility allows for the safe, timely, and effective upstream passage of migratory fish. This criterion is intended to ensure that migratory species can successfully complete their life cycles and maintain healthy populations in areas affected by the facility.

Assessment of Criterion Passage

The Applicant selected **C-2 – Agency Recommendation** for all ZOEs although I believe that **C-1 - Not Applicable/De Minimis Effect** is appropriate for the impoundment (ZOE #1) as upstream passage is unimpeded once fish reach this area.

An Environmental Assessment was issued on July 9, 2012, to support the application for the 2012 FERC license amendment. It reported that the Stillwater Branch of the Penobscot River supports a variety of resident fish species and serves as a secondary downstream migration corridor for several anadromous fishes and American eel. Resident warmwater species include smallmouth bass, chain pickerel, brown bullhead, white perch, yellow perch, white sucker, redbreast sunfish, pumpkinseed sunfish, burbot, banded killifish, fallfish, and several other minnow species. The two most important gamefish in the lower Penobscot River are smallmouth bass and chain pickerel. Smallmouth bass is the most abundant gamefish species present, inhabiting both riverine reaches and impoundments. Chain pickerel occupy backwater areas where stream velocities are low and submerged aquatic vegetation is available. Chain pickerel and smallmouth bass are not native species but were introduced in 1819 and 1869, respectively. Coldwater species, such as burbot, landlocked salmon, brook trout, and lake trout, may occur seasonally or immigrate from upstream reaches. Diadromous species present in the Penobscot River include alewife, Atlantic salmon, American shad, sea lamprey and American eel. Historically, the Penobscot River supported larger runs of American shad, blueback herring, Atlantic sturgeon, shortnose sturgeon, rainbow smelt, tomcod, and striped bass.

American shad, blueback herring, alewife, American eel and Atlantic salmon, are the species addressed in the licensing. These waters are also now mapped critical habitat for Atlantic salmon, which is now a federally endangered species, as discussed further under *Criterion F – Threatened and Endangered Species*.

As previously noted, the 2004 License incorporated fish passage via reservation of authority to require the Project to implement the mandatory Section 18 prescriptions issued by both the Department of Commerce and Department of Interior. The 2012 license amendment expanded on these requirements via:

- Article 409, which specified the need to construct upstream and downstream passage facilities for targeted anadromous species;
- Article 410 which required updating of plans specific to Atlantic salmon;
- Article 411 which required passage effectiveness testing for the passage facilities required by Article 409, with target species to include American shad, alewife, blueback herring, and American eel; and
- Article 412 which included requirements for siting, construction and testing of the new upstream eel passage.

The upstream anadromous fish lift and trapping facility is adjacent to, and integral with the new downstream fish passage facility. Of the 150 cfs downstream attraction flow entering the screen chamber, approximately 130 cfs is passed through the floor screen and used for upstream attraction flow for the trapping facility, controlled by two submerged gates. The upstream fish lift and trapping facility consists of a fixed brail system, a blocking screen, and an elevating hopper to retrieve the trapped fish. BBHP provides short distance trucking of trapped fish to a location upstream of the dam on the Penobscot River, not in the Stillwater Branch. This is done because it was determined that it was more beneficial for overall fish restoration of the river basin, to concentrate the upstream passage in the Penobscot River mainstem. The upstream fishway is operated April 15 to November 15.

Anadromous Species other than Atlantic Salmon

Only one upstream passage study, in 2015 for adult alewife, has been attempted by BBHP at the Project, and it was unsuccessful due to fallback (i.e. all alewife traversed downstream and did not continue their upstream migration following tagging). Based on LIHI staff discussions with BBHP, another such study is planned for 2021. The University of Maine, Orono (UMO) has also conducted various studies at the project including adult shad radio-tag studies in 2014, 2015, 2016, and 2018 and the majority of fish also fell back in all years of those studies.

Counts of river herring and American shad are made annually before the fish are transported to the Penobscot River mainstream. The annual numbers of river herring counted from 2015 – 2020 ranged from a low of 19,016 (2015) to a high of 163,126 (2019), with increases each year except in 2020 when a small drop in number occurred. American shad counts have never exceeded six in any year. Based on these counts and consultation with fisheries agencies and PIN, modifications have been made to enhance passage. Based on data provided by Brookfield in their response to stakeholder comments, these have all been associated with increases in staff or transport tanks to

accommodate the growing number of fish arriving at the lift.

On March 6, 2020, FERC issued a letter regarding fish passage conditions on the lower Penobscot River, including the Orono Project, identifying "frequent issues that arise in the stakeholder comments which may require further explanation, additional review or data analysis, or future study." These concerns primarily address downstream passage with the exception of FERC noting the lack of numerical performance standards, thus the letter is discussed under that criterion.

As migratory use of the Stillwater Branch by anadromous species is not a goal of the river basin fisheries restoration, BBHP stated that it is unclear if numerical performance standards for upstream passage will be established or required. BBHP however did commit that "*we will restart upstream fish passage effectiveness testing when determined to be the priority in consultation with the agencies*."[5]

MDMR, with concurrence from the USF&WS, commented with regard to all species, not just alosines, that BBHP has generally made requested changes to enhance effectiveness of the Orono fish lift, however, they believe the iterative and slow-paced approach being used by BBHP for studies at their various Penobscot River Projects has made it difficult for the agencies to fully assess the safety and effectiveness of the upstream passage at each of the projects, and for making informed recommendations for modification to passage facilities or project operations for many species. MDMR reports that this approach involves "monitoring for one aspect (e.g. passage route or survival) often for only one species, life stage, and direction of migration in a given year". As noted, while upstream effectiveness studies conducted by BBHP have been limited to one 2015 adult alewife study, other study results are available from UMO and annual counts are performed of fish captured by the trap and truck facilities. Finally, MDMR also stated that numerical performance standards for Penobscot River basin projects for upstream (and downstream) diadromous species passage may be developed within the next five years and as a result, MDMR may request additional studies to be performed at the BBHP Projects for American Shad and river herring.

The response to comment letter issued by BBHP on February 16, 2021, again stated they have been conducting the studies prioritized by the agencies in the annual meetings. A significant point made by BBHP in their letter is that the Settlement Agreement, and hence the FERC license and WQC, and even the Biological Opinion, all note that the purpose of the fish lift is only to capture and relocate fish (with a focus on salmon) away from the Stillwater Branch, as the mainstem of the Penobscot River is the prioritized migratory path. It appears from some of the MDMR comments that this limited function is not acknowledged or is misunderstood (discussed below).

Specific to Orono, in their comments, MDMR recommended the following changes be implemented to enhance the current use of the Orono fish lift:

- Dedicated BBHP staff (3-4 persons) specific to the Orono Facility utilized for trap and transport of river herring and salmon during the river herring season.
- BBHP staff time optimized to match river herring daily run timing during the season.
- Repairs and/or modifications to the trap/V-gates to eliminate fish entering the hopper area

[5] See Appendix A Brookfield email

while the V-gates are closed.
- Investigate varying entrance gate settings in attempts to optimize hopper lifts and to limit overcrowding the hopper.
- Run attraction water 24 hours per day as prescribed by designs.
- Provide weekly reports for the site that document the following metrics: fish passage numbers, fish passage operations and changes in fish passage operations at the facility, project operations and changes in operations at the facility, number of staff and number of hours per staff dedicated to fish passage operations, and flow conditions.

In their February 23, 2021 response letter, BBHP provided detailed discussion why these recommendations are not all necessarily productive. They also contend that they have sufficient staffing and revised protocols to handle the increasing population of alewife using the lift. BBHP reported they already provide the suggested information in the weekly reports to MDMR with the exception of staff hours. Perhaps a more important point made by BBHP in their letter and in follow-up communications is found on page A-4 and A-5 of the Agreement:

> "The purpose of the trap would be to gain access to any fish that are attracted to spill or minimum flow releases at the dam. The licensee will have no obligation to install additional upstream fish passage facilities for anadromous species on the Stillwater Branch during the term of the licenses for the Orono and Stillwater projects."

This stated purpose is mirrored in the Biological Opinion for the Project (NMFS is not a signatory to the Settlement Agreement). The Agreement goes on to say:

> "If information collected by the licensee demonstrates that more fish are arriving at the Orono Project than might be accommodated by the fish trapping measures in place, the licensee will convene a special meeting with the Restoration Interests to discuss the scope of the problem, if any, and discuss reasonable solutions. To the extent that the Parties are in general agreement that resolution requires minor operational adjustments, the licensee agrees to implement those measures or modifications in cooperation with the Restoration Interests, subject to any necessary regulatory approvals. To the extent that the Parties are in general agreement that resolution of identified problems can only be addressed by construction of new or additional facilities or by major modifications in operations, the licensee agrees to cooperate and petition the FERC for the appropriate license amendments, provided that the licensee receives the funding for such modifications."

According to BBHP, funding for major modifications is to be provided by the Restoration Interests (Agreement page 4). The Agreement also contains a "safe harbor" provision on pages A-10 and A-11 applicable to all Projects covered under the Agreement that limits costs to BBHP, and states:

> "…the Restoration Interests will not request that FERC require the licensee to make any "major changes" in the fish passage facilities constructed by the licensee at the Milford, Stillwater, and Orono Projects for a period of 10 years after installation and "certification" of the facilities. Certification will consist of affirmation by DOI that the licensee has designed and installed the facilities as prescribed, completed a year of testing and fine tuning, and that the facilities are ready for routine operations. For purposes of this

> provision, "major changes" shall mean changes in facilities or operations requiring an expenditure by the licensee(s) of more than an aggregate of $50,000 in any one calendar year, for modifications at all the projects covered by the safe harbor. Routine operations and maintenance expenditures shall not be counted against this $50,000, which will be measured in 2004 dollars. Turbine shutdowns for downstream passage of eels will not be required, if at all, until after the expiration of the 10-yr. safe harbor."

USF&WS formally certified the fish lift on September 11, 2018. In discussions with LIHI staff, BBHP acknowledged that more fish have been arriving at the lift than its design capacity allows. BBHP also noted that in accordance with the Agreement, BBHP convened a meeting of SA signatories in 2019 at the request of PIN at which BBHP laid out all improvements that had been done to maximize trapping capabilities. BBHP reported in follow-up communication with LIHI staff that they made three additional attempts to meet since 2019 but received no responses to meeting invitations.

BBHP's position is that they have already exceeded the obligation for making "minor operational adjustments" even beyond the safe harbor funding limits having already completed the agency-recommended enhancements, and that major modifications would only be triggered in 2028 or later under the safe harbor provision. Based on available information, neither the agencies nor BBHP have identified further need for significant modifications, or new or additional facilities, which would trigger a license amendment.

MDMR also suggested that LIHI certification should be contingent upon BBHP's development of "a prudent timeline to complete the additional studies" identified in their comments. Their comments however do not detail what those studies are, except for reference to potential future studies once numerical performance standards are developed, and their general concern about limitations caused by limited numbers of studies performed each year. From materials provided by BBHP, and recent discussions, it appears BBHP is continuing to address study priorities with the fishery agencies and PIN.

Atlantic Salmon

Atlantic salmon use the same lift as described above. The upstream fish passage effectiveness for Atlantic salmon has not been tested and there is no performance standard for this species established in the Biological Opinion which assumed that the majority of Atlantic salmon would use the mainstem of the Penobscot and would only be incidentally attracted to the Stillwater Branch under high flow/spill conditions.[6] This is why any salmon caught in the lift are transported to the mainstem of the river.

BBHP reported that their studies conducted in 2014 and 2015 confirmed that there is no delay experienced by upstream migrating adult Atlantic salmon that are incidentally attracted to the Stillwater Branch during high flow conditions. As noted in BBHP and LIHI staff discussions, additional upstream radio-tag studies of adult salmon were conducted by UMO in 2014, 2015,

[6] The preference for restoration of salmon migration via the mainstem of the river is also noted in FERC's letter dated December 13, 2016 (https://elibrary.ferc.gov/eLibrary/filelist?document_id=14520690&accessionnumber=20161213-3041)

2017, 2018, and 2019. In their comments, MDMR expressed concern about these two studies as they used fish that were captured at the top of the Milford fishway and placed downstream in order to assess their re-use of the Milford fishway. MDMR stated: "Due to the study design the results of the study are biased towards fish that had already approached Milford and therefore are a biased assessment of the Orono Project as fish were unlikely to be motivated to pass the project". As a result, MDMR recommended further studies will be needed to determine if passage is safe, timely, and effective for Atlantic salmon at Orono.

BBHP's response again pointed out the purpose of the lift, as documented in the Biological Opinion, is "not to serve as a traditional fishway, but rather as an evacuation device that will remove fish that are attracted to the spillage in the Orono bypass reach", and BBHP also states "there is no upstream performance standard at the Orono Project" under the expectation that "no more than 33% of the migrating adult Atlantic salmon attracted to the discharge from either of the two (Orono) powerhouses will be harassed due to significant delay (more than 48 hours)". FERC's March 27, 2014 "Order Modifying and Approving Revised Species Protection Plan and Revised Atlantic Salmon Passage Study Plan" also acknowledges this, stating "(t)here is no performance standard for upstream passage effectiveness at the Orono Project, as the management goal is for Atlantic salmon to avoid the Stillwater Branch and pass upstream at the Milford Project."

BBHP also reported to LIHI staff in follow-up communications that agencies including MDMR approved the prior study plans and results, which showed no evidence of bias; and noted that all other studies at Penobscot River projects have used fish trapped from Milford except for studies of juvenile alosines.

American Eel

A permanent, flow-through concrete upstream eel passage channel was installed in 2016 which is located to the right and downstream side of the non-overflow spillway section of the dam. It is approximately 4 feet wide and 49 feet long, has a bristle-brush floor, and ends approximately 20 feet from the pier between the spillway and the overflow dam. A 1.5-cfs conveyance flow is provided at the upstream eel passage seasonally. The eel passage ramp exits directly into the head pond. Flow through the eel passage is controlled by a stop log weir at its exit. The upstream eel passage facility is operated at a minimum from June 1 to August 31 annually.

Video monitoring and night-time surveys of upstream eel migration using the eel ladder were only conducted in 2016, with results reported to FERC on April 13, 2017.[7] Agency comments on the results of this study appeared to only come from USF&WS. Regarding their overall assessment of the results, which included Orono and Stillwater studies, they stated:

> *"While Orono's results are very encouraging, Stillwater's are not. Further testing at Stillwater is needed. Replication of the Orono's results would be valuable."*

In response to my request to BBHP for details on whether or not the resource agencies have concluded that upstream eel passage has been proven safe and effective, their position was "*the*

[7] On page 40 of the LIHI application, BBHP stated that upstream eel passage was also conducted in 2017. However, review of the referenced report showed such monitoring was only done at the Stillwater Project.

agency comments on the 2016 upstream eel passage study at Orono should provide the concurrence that you seek"[8]. BBHP also reported their intent to conduct an upstream eel study in 2021. Based on LIHI's review requirements, I do not believe that the USF&WS comment, or the lack of any comments from the other agencies, demonstrates agency concurrence of safe and effective passage. BBHP has not conducted any additional analysis of upstream eel passage at Orono as stakeholders appear to have set other study priorities. The only eel-related comment made by MDMR was that they intend to develop numerical performance standards for up and downstream passage within the next five years at which time additional studies would likely be required to confirm effective upstream eel passage.

Summary Conclusion

Based on my review of the application, FERC eLibrary files, stakeholder comments and follow-up data from BBHP, I believe that efforts being conducted during the past five years indicate that BBHP is making appropriate efforts to provide safe upstream passage for migratory species. This assumes that there are no plans to promote use of the Stillwater Branch for anadromous species migration, which appears to be the case today, based on my understanding of the license, WQC and Settlement Agreement. I recommend conditions to confirm continued compliance with this criterion. My recommendations are detailed in Section IX.

The Project Conditionally Passes Criterion C – Upstream Fish Passage

D. DOWNSTREAM FISH PASSAGE AND PROTECTION

Goal: The facility allows for the safe, timely, and effective downstream passage of migratory fish. For riverine (resident) fish, the facility minimizes loss of fish from reservoirs and upstream river reaches affected by Facility operations. Migratory species are able to successfully complete their life cycles and maintain healthy populations in the areas affected by the Facility.

Assessment of Criterion Passage

The Applicant has selected **D-2 – Agency Recommendation** for all ZOEs although I believe that **D-1 - Not Applicable/De Minimis Effect** for the tailrace (ZOE #3) as downstream passage is unimpeded once fish reach this area. BBHP also applied for PLUS credit for the bypass reach.

The Project has a 1-inch clear space angled trashrack over a single intake structure to minimize fish entrainment that serves both Powerhouse A and Powerhouse B. The downstream fish passage facility consists of a combination of an opening in the flashboards on the spillway (for 2 weeks during the downstream Atlantic salmon smolt migration) and an 8-foot-wide entrance into a 20-foot-long by 12-foot-wide floor screen chamber with a 3-foot wide exit at the downstream end that is operated throughout the fish migration season. A lower level entrance for American eel, consisting of a 4-ft square opening at the base of the trashrack, which outlets to the downstream end of the screen chamber, is also part of the downstream fish passage facility. An attraction flow of up to 150 cfs is provided to the downstream surface bypass through an 8-foot-wide, adjustable entrance, controlled by a 3-foot-wide adjustable weir that discharges into a plunge pool below the

[8] See Appendix A, Brookfield email.

dam. The surface bypass is opened for the duration of the juvenile alosine outmigration period. Downstream facilities have been operational since 2014.

As discussed above, the goals for restoration of anadromous species have been designed on a regional basis, with focus on the mainstem of the River, pursuant to the Settlement Agreement. Studies of American shad, alewife, blueback herring and American eel follow "traditional" approaches, as defined in the Settlement Agreement and incorporated in the FERC license. The testing for Atlantic salmon is governed by the Biological Opinion issued on August 31, 2012.

Studies evaluating the effectiveness of the downstream passage facilities have been ongoing since 2005 conducted by BBHP or UMO. Studies conducted by BBHP are shown in the table below . Studies in 2020 included juvenile river herring passage route studies and desktop turbine blade strike analyses, and the final 2020 study reports were issued February 15, 2021, pursuant to a request BBHP received from the resource agencies for extra time to review the reports, and which FERC approved. BBHP is required to consult with the stakeholders if the results of the current monitoring indicate that changes in Project structures or operations, including alternative flow releases, are necessary to protect fish resources. The following changes were made in response to downstream testing conducted between 2015 and 2018 based on email communication from Brookfield.[9]

- Operation of Powerhouse A is now prioritized over Powerhouse B to increase Atlantic salmon smolt survival,
- Following the fish mortality incident in 2018 (see discussion below), BBHP revised its flashboard maintenance procedure such that water is passed over the spillway throughout the work (to ensure that the bypass area is not dewatered), and
- Sequential increases in bypass flows, as established in the Biological Opinion, are being implemented in an effort to enhance Atlantic salmon downstream passage effectiveness.

In May 24, 2018, a mortality event involving about 50,000 alewife and one Atlantic salmon occurred during a routine drawdown for boat barrier installation. Normal procedures, including typical reduction of outflows, were used, however, such reduced outflows from the fish passage facility into the bypass reach resulted in fish stranding, as a large number of upstream migrating alewife and the salmon were present in the bypass reach as the flows dropped. Agencies consulted during the event did not indicate any concern or recommend corrective actions. The incident was reported to FERC on June 19, 2018, including all agency consultation, and the FERC determined the event was not a violation of the license on October 30, 2018. The corrective actions implemented by BBHP included updating of the internal environmental risk assessment for the Orono Project, incorporating environmental risks into job planning, updating the drawdown procedure to accommodate the consideration of fish passage season risks, and additional staff training. One of MDMR's comments on this Project is they believed that the fish kill was due the inability of the lift and BBHP transport procedures to handle the large number of alewife attempting to move up the Stillwater Branch.

[9] See Appendix A Brookfield email

SUMMARY OF BBHP DOWNSTREAM PASSAGE STUDIES AT ORONO

Study Year	Study Dates	Species	Life Stage	Analysis Type	Median Residence Time	Passage Survival/Success		Key Agency Comments Related to Study Findings
						Estimate	Confidence Interval	
2017	June 13-Aug 15	American Shad	Adult	Quantitative	1.6 d	87.0%	75% CI = 82.4-91.2%	
2018	June-July	American Shad	Adult	Quantitative	8.1 hr	94.4% *	**estimated from 17 of 18 tagged shad which approached dam*	
2018	June-July	Alewife	Adult	Quantitative	2.1 hr	97.8%	75% CI = 96.0-98.8%	
2016	September-October	American Eel	Adult	Quantitative	0.1 hr	98.0%	-	Possible mortality issue associated with ledges downstream of spillway; passage delay a concern
2014	May	Atlantic Salmon	Smolt	Quantitative	>24 hrs	92.3%	75% CI = 85.5-99.4%	
2015	May	Atlantic Salmon	Smolt	Quantitative	>24 hrs	82.8%	75% CI = 79.3-86.2%	
2016	May	Atlantic Salmon	Smolt	Quantitative	>24 hrs	85.8%	75% CI = 81.9-89.4%	Implementation of 20 to 50% spill
2017	May	Atlantic Salmon	Smolt	Quantitative	>24 hrs	99.1%	75% CI = 98.3-100%	Implementation of 20 to 50% spill
2018	May	Atlantic Salmon	Smolt	Quantitative	>24 hrs	99.2%	75% CI = 99.2-97.9%	Implementation of 20 to 50% spill

Anadromous Species other than Atlantic Salmon

Downstream passage studies were conducted at Orono by BBHP between 2014 and 2018. Five studies were done for Atlantic salmon, two for American shad and one each for alewife and American eel at Orono. According to BBHP, UMO also conducted acoustic tag studies of adult shad in 2018 and 2020, as well as salmon smolt downstream studies in most years from 2005 – 2019.

In addition, two studies were conducted in the fall of 2020, including "Downstream Juvenile Alosine Passage Route Utilization", a radio telemetry evaluation having the goals of evaluating the residence time from arrival until downstream passage and the proportional downstream passage route utilization for juvenile alosines at the Milford, Stillwater, and Orono Projects, and "Desktop Assessment of Juvenile Alosine Project Passage Survival" having the goal of understanding out-migration survival using estimated blade strike probabilities for juvenile alosines and estimates of total station survival for juvenile alosines using the Turbine Blade Strike Analysis (TBSA), Final reports were filed February 15, 2021, pursuant to a request BBHP received from the resource agencies for extra time to review the reports, and which FERC approved.

No agency has confirmed that effective downstream passage for any species has been demonstrated to date, likely in large part because numerical performance standards do not exist, except for Atlantic salmon. In their comments, MDMR stated their intentions to develop such standards within the next five years. Also as previously discussed under Criterion C - *Upstream Fish Passage*, they have concerns about the limited number of studies performed each year, although BBHP's position is that studies recommended at each annual fisheries meeting are being conducted and are supplemented by the UMO studies. A benefit of this collaborative and prioritized approach to the studies is that it allows the studies to focus on current fish passage needs, fish availability, and agency priorities. BBHP also noted that they are subject to specific testing and schedule requirements in the 2012 Species Protection Plan and Biological Opinion. Some studies have been deliberately delayed or are determined by proxy, as in the case of using river herring in lieu of adult shad given inconclusive results in other similar studies due to handling effects and indeterminate passage motivations by shad. It is unclear how LIHI can help resolve these apparent conflicting viewpoints, although I am recommending that this topic be openly discussed between BBHP and the stakeholders, when they meet annually. From the information provided, it appears that BBHP has generally been responsive to agency requests.

As previously noted, FERC issued a letter on March 6, 2020[10] identifying that the following issues must be investigated to assess ongoing stakeholder concerns: (1) migratory delay; (2) operational conditions; and (3) development of passage performance standards (effectiveness criteria) for up and downstream passage for alosines and eel. The LIHI application notes the following:

> *"Two meetings have been held with the agencies, on June 3, 2020 and September 9, 2020, to discuss the March 6, 2020 letter. For migratory delay, the above referenced studies were disseminated for residence times, compared to other eel and alosine studies conducted in New England, and found to be comparable or better. Study factors, such as the use of pre-spawn shad contributing to increased residence time, were also discussed. For operational*

[10] This letter is contained in Appendix B as it is referenced several times in this report.

conditions, the various improvements implemented to date, such as spill, were discussed with acknowledgement that any future improvements would be contingent upon passage performance standards. Regarding passage performance standards, a review of a model of shad restoration was conducted and for which restoration goals will need to be considered. At the September 9, 2020 meeting, it was agreed that another meeting should be convened after the fall passage studies (juvenile river herring passage route studies and turbine blade strike analyses at Orono/Stillwater/Milford) are completed and results compiled."

Based on this, it appears that BBHP has been diligently working to comply with FERC's request to address these concerns.

Atlantic Salmon

The numerical performance standards for salmon, contained in the Biological Opinion and noted below, are to be measured during a three-year testing period. Specific action plans, also included in the BO, have also been established if these standards are not met each consecutive year, which are noted below.

"The performance standard for downstream migrating smolts and kelts at the Orono Project is a minimum of 96% survival, based on a 75% confidence interval. That is, no fewer than 96% of downstream migrating smolts and kelts approaching the dam structure will survive passing the dam structure, which would include from 200 meters upstream of the trashracks and continuing downstream to a point where delayed effects of passage can be quantified. Fish that stop moving prior to reaching the most downstream telemetry array or take longer than 24 hours to pass the project will be considered to have failed in their passage attempt."

In the event that the performance standard is not met, the following sequence of enhancements will be implemented sequentially each year:

1. Increase bypass flow up to the limit of the facility;
2. Increase spill to between 20% and 50% of river flow at station at night during the two week smolt out migration period; and
3. Two weeks of 100% spill of river flow at night (except for one unit, which will be operated at its lowest possible setting as required for powerhouse startup), followed by two weeks of spill of 25% of river flow during day and night.

Per follow-up communications with Brookfield, step #1 of this sequence of enhancements was skipped and step #3 not yet employed. Step #2 targeted flows were released 24 hours per day throughout the month of May in 2016, 2017 and 2018. Such flows were implemented by dropping enough flashboards prior to the two-week smolt migration period to ensure that 20 – 50% of the river flow is spilled at the target headpond elevation[11]. That headpond elevation is then maintained at the Project using both powerhouses (although Orono A is prioritized over Orono B to increase smolt survival, along with unit #1 at Stillwater B).

[11] See Appendix A for Brookfield email

To date, as shown in the preceding table, the Atlantic salmon standards have not yet been met for three consecutive years. However, BBHP noted in their application that recent discussions with NMFS indicate concerns with the statistical validity of the standard as currently written (i.e. consecutive years of study increase the likelihood of non-attainment) so they are working with the NMFS on the potential to reinitiate consultation on this issue ahead of the 2023 deadline for take associated with performance standard achievement. MDMR did not comment on downstream Atlantic salmon passage.

American Eel Studies

BBHP reported that using out-of-basin eels (from the St. Croix River), a radio telemetry study of downstream migrating adult silver eels was conducted at the Orono and other basin projects in 2016. Study results showed that 44 of 45 eels (98% survival) successfully passed the Orono Project, with the lone mortality being the one eel that passed though the turbines (at Powerhouse B). The low incidence of turbine passage is likely due to the one-inch trashracks installed at the Project when the site was redeveloped in 2013 – 2014. This study also demonstrated that silver eels use low level entrance bypasses, as well as surface bypasses at Orono. Combined passage rates of the low level and surface bypasses was 62.3%. Spillways also were found important for downstream passage, even in a year with lower-than-normal river flow.

Only the USF&WS provided comments on the draft 2016 study report, with their only Orono-related comment being that passage delays are a concern at all Brookfield lower Penobscot River Projects. In response, BBHP pointed out that silver eel migration is triggered by flows and moon phases, and that eels tended to move downstream past the dams when flows increased, and as the moon was waning toward the new moon phase. This suggests that the observed delay may primarily have been a function of the presence or absence of environmental cues to trigger downstream movement. BBHP reported to LIHI that no additional downstream eel passage studies have since been requested by the resource agencies or FERC at the Orono Project.

The MDMR, however, did question these studies in their comments, identifying that it was unusual for the Orono Project to be spilling on all but ten days of the study even though river flows were below station capacity. Their position is that spillage at Orono is not normal given the low river flows and thus the study results are not relevant for normal operations. In their response, BBHP noted they have agreed to re-examine the raw data and operational information to better clarify the hydrologic and passage conditions at the time of the study. They also noted that flows in excess of station capacity, which would result in spill conditions such as in the 2016 study, occurs approximately 20% in September and 40% in October. Thus, while spillage during flow conditions less than station capacity may be uncommon, spillage during these months is not and can occur based on typical environmental conditions.

Based on my review of the materials provided and comments received, I believe that the Orono Project continues to conditionally satisfy this criterion, provided the recommended conditions are satisfied. These conditions incorporate requirements of Conditions #2 and #3 from the previous LIHI certification that remain open.

However, I do not believe that the Project is entitled at this time to receive extra years of certification as requested by BBHP. The LIHI requirement is:

> *"In addition to satisfying one or more of the standards above, the facility has deployed an advanced technology, the primary purpose of which is to increase downstream fish passage; or is part of a basin-scale redevelopment strategy; or is operating an adaptive management program to regularly evaluate the performance of new technology. The adaptive management program should include monitoring of the overall fish passage effectiveness and correction of deficiencies in effectiveness."*

The downstream measures used at Orono are not an advanced or new technology. While the passage efforts at the Project, along with those at many of the other Penobscot River basin BBHP Projects are enhancing the basin fisheries, the requirements built into the license and WQC are the result of focused negotiations, resulting in the Settlement Agreement. That Agreement included a goal to restore self-sustaining populations of 11 native species of sea-run fish in the basin. However, another key piece of the negotiations was maintenance of approximately 90% of the current power production owned by BHHP in the river basin through changes such as the headpond level increase and construction of Powerhouse B at Orono, and similar power generation increases at other BBHP basin projects. It was also agreed that development of these new facilities would not be challenged by the signatories to the Agreement. Thus, I believe the downstream passage efforts at Orono are a license requirement (via the Settlement Agreement) rather than voluntary adoption of a basin-scale redevelopment strategy having only fisheries restoration as its focus.

The Project Conditionally Passes Criterion D – Downstream Fish Passage and Protection

E. SHORELINE AND WATERSHED PROTECTION

Goal: The Facility has demonstrated that sufficient action has been taken to protect, mitigate and enhance the condition of soils, vegetation and ecosystem functions on shoreline and watershed lands associated with the facility.

Assessment of Criterion Passage

The Applicant has appropriately selected **Standard E-1, Not Applicable/De Minimis Effect** to pass the Shoreline and Watershed Protection criterion for all Project ZOEs.

There has been no change in the shoreline and watershed protection requirements for the Project since it was last certified by LIHI. No conservation buffer zone, watershed enhancement fund, or Shoreland Management Plan is required by the FERC license.

The current FERC Project boundary encloses the dam; the reservoir up to the full pond 73.0 feet NGVD elevation; the two powerhouses; and the penstocks (see Figure 3). There are no shoreline lands within the Project boundary save for a small parcel upstream of the Project intake (that includes the egress and a very short section of the canoe portage trail). Immediately adjacent to Powerhouse A, the canoe portage ingress and a short section of trail are located on Project lands. BBHP's land ownership is limited to those within the Project boundary, estimated at 12.6 acres.

The discussion under the *Criterion F -Threatened and Endangered Species* denotes that one species of plant classified as a State "Species of Special Concern" is noted at the dam area and several state-listed animal species (eight bats and wood turtle) are possibly in the area. This includes the Northern long-eared bat which is also a federal endangered species. No critical habitats for these terrestrial species are identified at the Project. There is limited land available within the Project boundary, and much of it developed with Project facilities. As noted under the *Threatened and Endangered Species* criterion, as no changes in Project facilities or operation are planned, no impacts to any terrestrial species are expected.

Based on my review, I believe the Project continues to pass this criterion.

The Project Passes Criterion E – Shoreline and Watershed Protection

F. THREATENED AND ENDANGERED SPECIES PROTECTION

Goal: The Facility does not negatively impact federal or state-listed species.

Assessment of Criterion Passage

The applicant selected **Standard F-2 – Agency Recommendation**, **F-3 - Recovery Planning and Action** and the **PLUS** standard for all three ZOEs. Standard F-3 was selected as there is a Biological Opinion with specific requirements, as the Stillwater Branch, as well as the Penobscot River, are mapped as critical habitat for the federally and state endangered Distinct Population Segments of Atlantic Salmon. A Recovery Plan exists for this species. This designation occurred in 2009. The Biological Opinion was issued August 31, 2012. While there are other protected species also potentially in these ZOEs that do not have Recovery Plans, selection of only one standard per ZOE is recommended by the LIH Handbook, so only F-3 was recommended. The following discussion has been developed per category of species type and status as all potential effects would be relatively similar between ZOEs.

Federal Aquatic Species

The primary federally protected aquatic species of interest at the Orono Project is the endangered Atlantic salmon, Gulf of Maine – Distinct Population Segment (GOM-DPS) which has mapped Critical Habitat in the Stillwater Branch and which has a federal Recovery Plan. The FERC Order dated September 14, 2012, incorporated the previously required Atlantic Salmon Species Protection Plan (SPP), Biological Opinion, and Atlantic Salmon Passage Study Plan.

The shortnose and Atlantic sturgeon, both also federally endangered, could potentially migrate to the Orono dam since the 2014 removal of the Great Works and Veazie dams located downstream of the Orono Project on the mainstem of the Penobscot River. The Orono license required development of a Sturgeon Handling Plan which describes the protocol to handle and return any sturgeon that may arrive downstream of the dam, as the dam's location was historically the upstream limit for these species. The Plan was updated and approved by FERC on February 3, 2017, to update the approved release location in the Penobscot River. To date, neither of these species have been caught at the Orono Project, although several have arrived at the Milford dam on the Penobscot River.

The Orono fish passage facilities are operated pursuant to the Biological Opinion, which includes a plan identifying iterative measures that BBHP is required to undertake should downstream passage effectiveness studies indicate that the required performance standard for Atlantic salmon is not being met (96% survival within a 75% confidence interval with passage within 24 hours for downstream migrants). The Biological Opinion developed by NMFS found that the construction of new powerhouses and increases in headpond levels at the Stillwater and Orono may adversely affect but are not likely to jeopardize the continued existence of Atlantic salmon. This opinion is based on the assumption that the downstream passage facilities at Orono will provide safe passage for the species, which are defined by the numerical standard, as previously discussed under *Criterion D - Downstream Passage*. Proof of safe passage has not yet been confirmed as the noted numerical standards have not been met for three consecutive years. As previously noted, consultation between NMFS and BBHP about possible changes to the current effectiveness standards may be initiated prior to the 2023 deadline for take.

As previously noted, there are no performance standards for upstream passage of Atlantic salmon in the Biological Opinion, because it assumed that the majority of Atlantic salmon would use the mainstem of the Penobscot and would only be incidentally attracted to the Stillwater Branch under high flow/spill conditions. This was also agreed to during Settlement Agreement negotiations.

For Orono, the Biological Opinion includes an Incidental Take Statement (ITS), which exempts the incidental taking of Atlantic salmon adults, smolts, and kelts from activities associated with the construction of Powerhouse B, ongoing Project operations, and downstream passage and survival studies. BBHP has submitted the required reporting for incidental takes of GOM-DPS Atlantic salmon for 2016 through 2020. At Orono, there were two smolts lost in 2015, none in 2016 or 2017, one adult in 2018, one adult and one kelt in 2019 and no species in 2020. These are all within the expected limits.

Federal Terrestrial Species – Northern Long-Eared Bat

USF&WS records indicate that Northern long-eared bat may use the site and nearby areas. BBHP noted that routine Project operations are not anticipated to affect this species, and committed that any periodic vegetation clearing activities would be conducted in accordance with the Section 4(d) rule for Northern long-eared bats using the USF&WS streamlined consultation process.

State Aquatic Species

Review done by MDIF&W and provided in the application, indicated that one state threatened mussel species, the yellow lampmussel, has been documented in the vicinity of the Orono Project. BBHP reported that none were found in the impoundment during mussel relocation efforts undertaken as part of the construction of Powerhouse B. Normal Project operations would not likely impact this species. However, it is theoretically possible that significant lowering of the headpond could expose some mussels. The Atlantic salmon, also listed by the state as endangered, was discussed above.

State Terrestrial Fauna and Plant Species

The application noted the following state-listed animal species that likely occur in the Project area during migratory or breeding season:

- Little brown bat (State Endangered)
- Northern long-eared bat (State Endangered)
- Eastern small-footed bat (State Threatened)
- Big brown bat (Special Concern)
- Red bat (Special Concern)
- Hoary bat (Special Concern)
- Silver-haired bat (Special Concern)
- Tri-colored bat (Special Concern)
- Wood Turtle (Special Concern)

Given run-of-river operations and limited shoreline management activities at the Project, normal Project operation is not expected to impact these species. It is assumed that BBHP would consult with MDIF&W if any significant construction activities are conducted at the site in the future. None are currently planned.

In a letter dated October 19, 2020 and presented in the application, the Maine Natural Areas Program (MNAP) identified the presence of hyssop-leaved fleabane, a state Species of Special Concern, at the Project dam area. The species was also previously identified in 2010, and a requirement for the construction of Powerhouse B was the development and implementation of a Sensitive Plant Protection Plan. A follow-up survey for this plant was conducted in 2017. The April 2018 Kleinschmidt report noted that not all areas inspected in 2010 were re-inspected in 2017 due to safety concerns (Project ownership changed during this period) and some areas were just not accessible. The report states that the majority of the habitat remains intact and is of good quality. Some loss of species was identified due to habitat loss within the Powerhouse B footprint. The 2020 MNAP letter stated that provided there are no changes to current impoundment levels or river flows, MNAP has no concerns with the recertification for the Orono Project related to impacts to this species.

Based on this review, I believe that the Project continues to conditionally satisfy the requirements of this criterion. This is based on the ongoing efforts of BBHP to try to provide safe and effective downstream passage for Atlantic salmon and the unlikelihood of negative effects to other species, as no changes to the Project are planned.

BBHP applied for PLUS certification for this criterion, using their activities associated with the activities required by the Biological Opinion and Species Protection Plan (SPP). The Biological Opinion, and subsequent SPP, were requirements pursuant to the Federal Endangered Species Act, and incorporated into the Project license. BBHP's position is that the Biological Opinion and SPP are an "enforceable agreement with resource agencies" and as a result, is "a significant participant in a species recovery effort". It is true that the Settlement Agreement in its entirety has had a major role in restoration of the endangered Atlantic salmon, and other migratory species, in the Penobscot River basin. However, the Project has yet to fully comply with the passage standards established by the Biological Opinion. Thus, I do not believe the Project has yet satisfied the PLUS

requirements. A condition is recommended associated with this issue as noted in Section IX.

The Project Passes Criterion F – Threatened and Endangered Species Protection

G. CULTURAL AND HISTORIC RESOURCE PROTECTION

Goal: The Facility does not inappropriately impact cultural or historic resources that are associated with the Facility's lands and waters, including resources important to local indigenous populations, such as Native Americans.

Assessment of Criterion Passage

The Applicant has selected **Standard G-1 – Not Applicable/De Minimis Effect** for all ZOEs as past studies during Project construction activities did not find any significant cultural resources.

The Maine Historic Preservation Commission (MHPC), by letter dated March 14, 2004, reported that there are no properties in the Orono Project area of prehistoric, historic, architectural or archaeological significance that would be adversely affected by the Project. There is no requirement in the Orono Project license for a Programmatic Agreement or Cultural Resource Management Plan, as no culturally significant properties have been identified. Article 405 of the license required the licensee to consult with the State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer (THPO) if any archaeological or cultural sites are discovered during ground-disturbing or land clearing activities.

Based on my review of the application materials, and assuming that BBHP would conduct the required SHPO and THPO consultation during future ground-disturbing or land clearing activities, I believe the Project continues to satisfy this criterion.

The Project Passes Criterion G – Cultural and Historic Resource Protection

H. RECREATIONAL RESOURCES

Goal: The facility accommodates recreation activities on lands and waters controlled by the facility and provides recreational access to its associated lands and waters without fee or charge.

Assessment of Criterion Passage

The Applicant has selected **Standard H-2, Agency Recommendation** for all Project ZOEs, although Standard H-1 may be more appropriate for the bypass reach as there are no recreational features in this ZOE due to safety reasons.

In ZOE#1, BBHP maintains a portage trail around the dam via Water Street to a downstream put-in location on the mainstem of the Penobscot River immediately below Powerhouse A. Public parking is available at the downstream end of the portage trail off Water Street. The downstream reach (ZOE #3) can be reached via the ingress of the canoe portage trail. Whitewater canoeing and kayaking opportunities are located below the dam at the confluence of the Stillwater Branch and the mainstem of the Penobscot River at a site known to local boaters as the "Trestle".

In addition, three recreation facilities, owned and managed by others, provide access to the Orono Project impoundment. Webster Park owned and maintained by the Town of Orono; the University of Maine's Stillwater Branch Riverside Recreation Area; and the Fay Hyland Botanical Garden and Walking Trail, encompassing approximately 10 acres along the impoundment shoreline.

An inspection conducted by FERC on July 9, 2018 noted that Project-related recreational facilities (the portage trail and parking area) appear to be in compliance with no deficiencies noted.

Based on my review, I believe that the Project continues to satisfy this criterion.

The Project Passes Criterion H – Recreational Resources

IX. GENERAL CONCLUSIONS AND REVIEWER RECOMMENDATION

Based on my review, I believe that this Project conditionally continues to meet the requirements of a Low Impact facility and recommend it be re-certified for a five-year period with the following conditions. Although PLUS standards were being sought under *Criterion A – Ecological Flow Regimes*, *Criterion D – Downstream Passage* and *Criterion F - Endangered and Threatened Species*, as described under those sections, I do not believe the requirements for extra years of certification have been met at this time.

Condition 1 – The facility Owner shall provide LIHI a copy of agency correspondence documenting numerical performance standards that the agencies may establish for upstream and/or downstream passage for the Penobscot River basin that affect the Orono Project within 60 days of publication of the standards.

Condition 2 – In annual compliance statements, the facility Owner shall notify LIHI of actions implemented, as agreed to by agencies and PIN, that address upstream passage concerns:

a) If additional upstream fish passage studies are required at this Project, the plan and schedule for implementation, study results, and agency and PIN comments on them shall be provided to LIHI in applicable compliance statements. Should studies occur, LIHI reserves the right to modify this condition based on study results and assessment of the effectiveness of upstream passage.

b) If additional meetings with agencies and PIN are convened to discuss fish lift modifications or provision of upstream passage measures at the Project, the facility Owner shall provide a summary of the meetings, agency and PIN recommendations, areas of disagreement if any, and plans and schedules for implementing facility upstream passage modifications. Should modifications occur, LIHI reserves the right to modify this condition in light of future Project changes.

Condition 3 – In annual compliance statements, the facility Owner shall notify LIHI of actions implemented, as agreed to by agencies and PIN, that address downstream passage concerns for alosines and American eel:

a) At the conclusion of meetings held to address the three concerns identified in FERC's March 6, 2020 letter, the facility Owner shall provide a summary of the final agreements. This shall include a copy of filing(s) made to FERC addressing these concerns, plans and schedules for implementation, results of studies, and agency and PIN comments on them. Should the Owner not agree to make all requested modifications, the rationale for these decisions shall be provided.

b) Should studies or modifications occur, LIHI reserves the right to modify this condition based on study results and assessment of the effectiveness of downstream passage.

Condition 4 – In annual compliance statements, the facility Owner shall notify LIHI of actions implemented, as agreed to by agencies and PIN, that address Atlantic salmon downstream passage concerns, including:

a) Any changes made in the current Atlantic salmon downstream passage performance standards established by the Biological Opinion or if formal consultation under the Endangered Species Act ahead of the 2023 deadline is needed. The status of actions undertaken as part of any formal consultation shall also be provided.

b) If during the term of LIHI certification, the current or new performance standards cannot be met within the existing or any new timeframes established by NMFS, LIHI reserves the right to modify, suspend, or revoke the Certificate.

c) If, prior to expiration of the LIHI Certificate, the facility Owner receives NMFS concurrence that current or revised numerical performance standards for downstream Atlantic salmon have been met, thus confirming safe and effective downstream passage, the facility Owner may request that LIHI consider possible certification extension pursuant to satisfying the PLUS requirements under the *Threatened and Endangered Species Criterion*.

Appendix A

Responses to Reviewer Inquiries

From: PBMwork@maine.rr.com
To: "julianne_rosset@fws.gov" <julianne_rosset@fws.gov>, "Dan.McCaw@penobscotnation.org" <Dan.McCaw@penobscotnation.org>, "Kevin.Dunham@maine.gov" <Kevin.Dunham@maine.gov>, "Jeff.Murphy@noaa.gov" <Jeff.Murphy@noaa.gov>, "Gail.Wippelhauser@maine.gov" <Gail.Wippelhauser@maine.gov>
Cc:
Bcc:
Priority: Normal
Date: Monday December 14 2020 11:41:06AM
Seeking your your thoughts on Brookfield's Stillwater, Orono and Medway Projects

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Hi

I am the reviewer for the Low Impact Hydropower Institute (LIHI) for the recertification applications submitted by Brookfield Renewable / Black Bear Hydro Partners (BBHP) for the Stillwater, Orono and Medway Projects located on the Stillwater Branch or mainstem of the Penobscot River, Maine.

You should have received an invitation directly from LIHI to comment on these applications. That comment deadline is January 30, 2021.

I would be interested in hearing your opinion on whether or not you believe these projects should be re-certified again as low-impact. Would you characterize your working relationship as positive with BBHP? If you believe any of the projects should not be re-certified, I would like to know what issues raise concern to you' As noted below, in addition to these general questions, I also have some specific ones, for Orono and Stillwater, I would like your feedback on.

<u>Finding a passage facility is safe and effective</u>
BBHP stated in their application that the approach being used at this time to evaluate passage success is to conduct requested monitoring and then, based on stakeholder consultation, make the improvements recommended by you to enhance either up or downstream migratory passage. In your opinion, has BBHP been accommodating in making modifications to the various passage facilities or project operations that you have been suggesting?

I also understand that to date, specific numerical standards for determining "safe and effective" passage have not been developed, except for downstream passage of Atlantic salmon (and these standards have not yet been met.) From your perspective, will these be required for all other designated species? Can you tell me if there is a target date for establishment of these standards for the other target species?

<u>Upstream passage at Orono</u>
1) BBHP informed us that that no further upstream passage studies for Atlantic salmon beyond that conducted in 2014 and 2015 will be needed at Orono as "We were only required to conduct an upstream passage study to determine whether salmon that were attracted to the Orono bypass reach during times of spill or generation flows were delayed in making their way to the Milford facility and the 2015 study showed they were not." Do you agree that no further studies are needed as a result of the 2015 study findings?

2) At this time, can you comment on whether or not upstream passage performance standards for river herring and American shad will be likely be developed and testing required, or given the fact that fisheries restoration is focused on the Penobscot River mainstem rather than the Stillwater Branch, is it more likely that such standards will never be established?

3)Would you also agree that based on the 2016 upstream American eel passage studies, that no further studies for eels will be required, as reported to us by BBHP? (BBHP has noted to LIHI that additional upstream passage studies for eel however will like be required at Stillwater.) Or will possible future studies be requested if numerical standards for passage effectiveness are established?

<u>Downstream Eel Passage at Stillwater and Orono</u>

From your perspective, have sufficient studies been conducted to determine that downstream eel passage has been shown to be safe and effective at these sites or will numerical standards still be developed in the future and new studies required to make this determination?

All information and perspectives are important to my review and I sincerely appreciate any input you are willing to share with me. You can respond directly to me or incorporate the information in your formal response to LIHI. Alternatively, if you prefer to discuss your thoughts over the phone, I'd be happy to call if you provide me a date and time I should call you.

Thank you very much

Pat McIlvaine

From: "Dunham, Kevin" <Kevin.Dunham@maine.gov>
To: "PBMwork@maine.rr.com" <PBMwork@maine.rr.com>
Cc:
Bcc:
Priority: Normal
Date: Friday December 18 2020 3:32:39PM
RE: Seeking your your thoughts on Brookfield's Stillwater, Orono and Medway Projects

---

Hi Pat,

As a fisheries biologist for Maine Inland Fisheries and Wildlife I have very little interaction with BBHP as Atlantic salmon, river herring, and other anadromous/catadromous species are managed by Maine Department of Marine Resources and various Federal agencies. What little interaction I have had with BBHP has been cordial and positive.

Kevin

Kevin Dunham
Fisheries Biologist
Maine Department of Inland Fisheries & Wildlife
Fisheries Division – Penobscot Region
16 Cobb Road
Enfield, ME 04493
Office: (207) 732-4131 Ext. 4003

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From: PBMwork@maine.rr.com <PBMwork@maine.rr.com>
Sent: Monday, December 14, 2020 11:41 AM
To: Rosset, Julianne <julianne_rosset@fws.gov>; Dan McCaw <dan.mccaw@penobscotnation.org>; Dunham, Kevin <Kevin.Dunham@maine.gov>; jeff.murphy <jeff.murphy@noaa.gov>; Wippelhauser, Gail <Gail.Wippelhauser@maine.gov>
Subject: Seeking your your thoughts on Brookfield's Stillwater, Orono and Medway Projects

Hi

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I would be interested in hearing your opinion on whether or not you believe these projects should be re-certified again as low-impact. Would you characterize your working relationship as positive with BBHP? If you believe any of the projects should not be re-certified, I would like to know what issues raise concern to you' As noted below, in addition to these general questions, I also have some specific ones, for Orono and Stillwater, I would like your feedback on.

Finding a passage facility is safe and effective

BBHP stated in their application that the approach being used at this time to evaluate passage success is to conduct requested monitoring and then, based on stakeholder consultation, make the improvements recommended by you to enhance either up or downstream migratory passage. In your opinion, has BBHP been accommodating in making modifications to the various passage facilities or project operations that you have been suggesting?

I also understand that to date, specific numerical standards for determining "safe and effective" passage have not been developed, except for downstream passage of Atlantic salmon (and these standards have not yet been met.) From your perspective, will these be required for all other designated species? Can you tell me if there is a target date for establishment of these standards for the other target species?

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3)Would you also agree that based on the 2016 upstream American eel passage studies, that no further studies for eels will be required, as reported to us by BBHP? (BBHP has noted to LIHI that additional upstream passage studies for eel however will like be required at Stillwater.) Or will possible future studies be requested if numerical standards for passage effectiveness are established?

Downstream Eel Passage at Stillwater and Orono

From your perspective, have sufficient studies been conducted to determine that downstream eel passage has been shown to be safe and effective at these sites or will numerical standards still be developed in the future and new studies required to make this determination?

All information and perspectives are important to my review and I sincerely appreciate any input you are willing to share with me. You can respond directly to me or incorporate the information in your formal response to LIHI. Alternatively, if you prefer to discuss your thoughts over the phone, I'd be happy to call if you provide me a date and time I should call you.

Thank you very much

Pat McIlvaine

From: "Maloney, Kelly" <Kelly.Maloney@brookfieldrenewable.com>
To: "PBMwork@maine.rr.com" <PBMwork@maine.rr.com>
Cc:
Bcc:
Priority: Normal
Date: Tuesday December 8 2020 12:15:35PM
RE: Fish Passage questions

Hi, Pat,

See responses below.

Thanks!

Kelly

From: PBMwork@maine.rr.com <PBMwork@maine.rr.com>
Sent: Tuesday, December 08, 2020 12:06 PM
To: Maloney, Kelly <Kelly.Maloney@brookfieldrenewable.com>
Subject: RE: Fish Passage questions

Hi Kelly

Thanks for the responses. As I don't like to "read" anything into a response that kind of remains silent on a specific question, can you respond to my follow-up questions noted in red below? I highlighted in blue your statements that raised my questions.

Thanks. These should be the last questions for Orono and Stillwater.

Pat

From: "Maloney, Kelly"
To: "PBMwork@maine.rr.com", "mfischer@lowimpacthydro.org", Kevin"
Cc:
Sent: Monday December 7 2020 8:01:42AM
Subject: RE: Fish Passage questions

Pat,

The short answer to all of this is that the agencies feel that testing of the downstream performance is more of a priority than upstream for the Penobscot River, and the Orono facility is not a true fish passage facility. I conferred internally with my team, including Kevin Bernier, cc'd who provided much of the information below.

Last fall and winter, we had consulted with the agencies regarding re-doing the upstream adult alewife study in 2020 at the Orono and Milford Projects due to the successful 2019 "proof of concept" evaluation, whereby a set of improved methodologies was developed that can be used for the assessment of adult river herring upstream passage effectiveness. As you indicate, these upstream river herring studies had been attempted at Orono and Milford in 2015, but they provided no meaningful results due to fallback of the study fish. However, we changed direction earlier this year as the result of the consultation meetings held last fall and winter, as the agencies indicated a preference for downstream juvenile alosine studies, so that is what we are doing this season. FERC has supported our approach to prioritized studies, in consultation with the agencies, so we are fully compliant with Article 411.

Below is a table explaining all of the incremental improvements made at the Orono fishway for alewife and the annual passage numbers.

Orono Trap and Truck - Measures implemented to increasing the number of river herring trucked upriver.

	2015	2016 - 2018	2019	2020
Staffing and Equipment	2015 - 4 seasonal staff and one transport transport trailer with 700 gallon tank; max 600 fish per load	2016- 4 Season Staff and one transport trailer with 700 gallon tank; max 1,000 fish per load. 2 Seasonal leased vehicles to support Penobscot and Union River fish passage efforts.	Two seasonal fish passage technicians hold CDL license, therefore in addition to the trailer with the 700 gallon tank, we can also utelize the larger trailer with 1,000 gallon tank; max 1,500 fish per load. Will have ability to haul with two trucks 7 days per week rather than 5.	Obtained additional tank truck from the Saco dedicated to Orono during the peak of the ale run.
		2017 & 2018- 1 additional seasonal staff, 1 additional leased truck and part time use of additional trailer (Ellsworth)		
Strategy		1. Improve efficiency (trap/count/sort/load) to maximize # fish trucked per day	Staff on site earlier in the morning and will stay later into the evening to increase number of loads	Same

			daily	
	Max 4 truckloads per day at 600 fish per truckload	2. Increase load capacity by 66% to 1,000 alewife per load (700ga x 1.5=1,000 per truck load)	Same	Same
		3. Utilize 2 trailer/tank from Ellsworth Monday - Friday	Haul 7 days per week	Add 1 tank truck from Saco
		4. Utilize 3 staff at Orono whenever possible.	2 CDL licensed drivers allowing for use of trailer with 1,000 gallon tank. 3 staff per day during peak of river herring run.	Same
		4. Utilize underwater camera and monitor to reduce frequency of too many fish in hopper	Same	Same
		5. Adjust attraction water to improve trap/sort/truck efficiency.	Same	Same
# herring trucked	19,016	2016 - 90,306; 2017 - 100,976; 2018 - 93,446	171,029	121,787

Yes, we will restart upstream fish passage effectiveness testing when determined to be the priority in consultation with the agencies. To be clear, there are no performance standards yet established for alewife and shad and our instruction from FERC is just to continue to consult with the agencies on such, which we continue to do. It's not clear what, if any, standards will be established. And it's unclear whether those standards would be applied to Orono anyway. The Orono facility was not constructed as a true fish passage facility. As stated in NMFS 2012 Biological Opinion, "The purpose of the fish trap is not to serve as a traditional fishway, but rather as an evacuation device that will remove fish that are attracted to the spillage in the Orono bypass reach."

As such, there is not a requirement to test the effectiveness of upstream passage for Atlantic salmon for Orono, technically and there is no upstream Atlantic salmon performance standard for Orono. We were only required to conduct an upstream fish passage study to determine whether salmon that were attracted to the Orono bypass reach during times of spill or generation flows were delayed in making their way to the Milford facility and the 2015 study showed that they are not. Therefore, there will be no further upstream Atlantic salmon studies conducted for Orono. Please provide documentation from the fisheries agencies and PIN that they agree no further testing is required for salmon. If they have not issued any such specific statements, please say so. Honestly, there is nothing to send you. There is no further testing because testing was never required in the first place at Orono.

Orono upstream eel passage – construction of a new upstream eel ladder was completed at the Orono Project in June 2016. Eels were then observed entering and exiting the eel ladder at high rates (nearly 100,000 estimated overall) during video monitoring and nighttime surveys conducted at the Project in 2016; in addition, lower numbers of eels were observed downstream of the dam during the nighttime surveys than in previous years. Due to the documented successful use of the new Orono eel ladder in 2016, and the fact that the FERC-approved, "*Revised American Eel Assessment and Monitoring Plan*" (dated February 17, 2015) called for a one year study in 2016 (with consultation regarding "whether additional monitoring in 2017 is necessary"), Black Bear proposed to operate and maintain the Orono eel ladder in 2017 and in future years as designed and tested; however, Black Bear did not propose additional upstream eel studies or monitoring at the Orono Project. Although the USFWS commented that "replication of the Orono results would be valuable", there were no objections to discontinuing upstream eel monitoring at the Orono Project. Please provide documentation from the fisheries agencies and PIN that they agree that no further testing is required. LIHI's focus is on resource agency concurrence, not FERC's. Can you provide any insight as to why the agencies believe more testing is needed at Stillwater and not Orono? (see blue highlighted sentence below). Also, since you did not identify additional eel ladder modifications, can I assume that none were made since it was installed in 2016? The agency comments on the upstream eel passage study at Orono should provide the concurrence that you seek and you are correct, the Orono study showed that the ladder was successful as designed so no modifications were made and we are simply operating it now. The agencies will likely want a future eel passage study at Stillwater because of the relocated minimum flow.

Stillwater upstream eel passage – construction of a new upstream eel ladder was completed at the Stillwater Project in December 2015. Video monitoring and nighttime surveys in 2016 showed that eels were successfully passing upstream over Stillwater Dam, but they were not utilizing the new upstream eel ladder. As a result of the 2016 monitoring, modifications (extension of bristle-brush climbing substrate; water flow adjustment to remove a velocity barrier; reduction of competing flows through the flashboards) were made for the 2017 passage season, and the video monitoring and nighttime surveys were repeated. The 2017 video monitoring showed that the modifications improved eel passage (as an estimated 11,500 eels passed through the new upstream eel ladder in 2017, compared to none in 2016); in addition, many other eels were observed during the nighttime surveys ascending the ledges and spillway and successfully passing into the headpond at multiple locations across the dam. Due to the upstream eel passage success observed under the conditions tested in 2017, Black Bear (after consultation with the resource agencies) submitted applications to the Maine DEP and to FERC in 2019 to respectively modify the Stillwater Project's Water Quality Certification and amend the Project's FERC license in order to permanently implement these 2017 test conditions (which include releasing the Project's 70 cfs minimum flow to the east bypass channel in order to eliminate false attraction of eels to the west bypass channel). The Maine DEP approved this WQC modification on October 28, 2020, and FERC amended the license on June 8, 2020.

As indicated in the 2018 upstream eel passage report (submitted to FERC on March 22, 2019), USFWS and MDMR (with concurrence from MDEP and PIN) have noted that effectiveness testing should ideally be performed to close the loop on upstream eel passage at the Stillwater Project. However, due to unresolved difficulties at the site with performing a "standard" effectiveness test (e.g., by confining test groups of eels in a tank at the fishway entrance near dusk, and then capturing the migrant eels that pass upstream), this testing has not been conducted. The issue has been discussed annually with the resource agencies (most recently during a March 3, 2020 consultation meeting), but the site complications remain an obstacle, and other studies have been prioritized (especially with the agency focus on downstream passage). Black Bear will continue annual consultation with the agencies to determine if a satisfactory and feasible means exists for accomplishing this effectiveness testing of the Stillwater upstream eel passage.

Orono downstream eel passage – using out of basin eels (from the St. Croix River), a radio telemetry study of downstream-migrating adult silver eels was conducted at the Orono Project in 2016. The study results showed that 44 of 45 eels (98% survival) successfully passed the Project, with the lone mortality being the one eel that passed though the turbines (at Station B). The low incidence of turbine passage is likely due to the one-inch trashracks installed at the Project when the site was redeveloped in 2013 – 2014; these trashracks were designed to physically exclude larger fish from entering the turbines, including adult eels. The USFWS provided the only comments on the 2016 study report, with their only Orono-related comment being that passage delays are a concern at all stations. In response, Black Bear pointed out that silver eel migration is triggered by flows and moon phases, and that eels tended to move downstream past the dams when flows increased, and as the moon was waning toward the new moon phase. This suggests that the observed delay may primarily have been a function of the presence of environmental cues to trigger downstream movement. No additional downstream eel passage studies have been requested by the resource agencies or FERC at the Orono Project. Is it safe for me to conclude that they have not yet gone "on record" saying that such downstream passage is "safe and effective"? As you did not provide any summary of passage facility improvements, can I assume none were made because none were recommended by the agencies? Again, I would refer to agency comments on the study reports but if 98% isn't "safe and effective" I don't know what is. You are correct, with 98% effectiveness, no additional modifications or operational adjustments have been made.

Stillwater downstream eel passage - using out of basin eels (from the St. Croix River), a radio telemetry study of downstream-migrating adult silver eels was conducted at the Stillwater Project in 2016. The study results showed that 47 of 51 eels (92% survival) successfully passed the Project, with three of four mortalities being eels that passed though the Station A turbines and one from an eel that never passed the Project. The USFWS provided the only comments on the 2016 study report, and recommended that Black Bear inspect the Stillwater Plant A intake racks for gaps or bent trashracks that may have allowed large eels to gain entrance to the turbines; the USFWS also commented that passage delays are a concern at all stations. A dive inspection by Black Bear in late July 2017 confirmed that several small gaps existed in the Stillwater A trashracks, and these gaps were then repaired by divers in September 2017. Black Bear pointed out that silver eel migration is triggered by flows and moon phases, and that eels tended to move downstream past the dams when flows increased, and as the moon was waning toward the new moon phase. This suggests that the observed delay may primarily have been a function of the presence of environmental cues to trigger downstream movement. No additional downstream eel passage studies have been requested by the resource agencies or FERC at the Stillwater Project. As above, have they gone on record saying the passage is "safe and effective" yet? So improvements were only made in 2017, is that correct? Again, 92% is highly effective but I don't know that the agencies have gone on record and would only refer to comments on the reports. Correct on improvements though it is important to note that we do inspect the fishways annually and made modifications/improvements as necessary to ensure they are working properly.

Please let me know if you have additional questions.

Thank you,

Kelly Maloney

Manager, Compliance – Northeast

150 Main Street, Lewiston, Maine 04240

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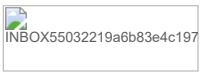

From: PBMwork@maine.rr.com <PBMwork@maine.rr.com>
Sent: Thursday, December 03, 2020 11:33 AM
To: Maloney, Kelly <Kelly.Maloney@brookfieldrenewable.com>; 'mfischer@lowimpacthydro.org' <mfischer@lowimpacthydro.org>
Subject: Fish Passage questions

Hi Kelly

I need some additional information on fish passage, mostly but not all associated with upstream passage issues.

The biggest gap I am finding is documentation of compliance with the requirements of effectiveness testing at the Orono fish lift as required by Article 411 of the 2012 license amendment. Article 411 appears to require "passage effectiveness testing for the passage facilities required by Article 409, with target species to include American shad, alewife, blueback herring, and American eel. at the project". My Stage I report for Orono requested that you include a "discussion which includes a list of studies conducted, a brief summary of the results and documentation of agency support of any agreements that monitoring or effectiveness testing can be stopped". This request was also made for downstream passage, and that information was provided, but was not for upstream passage.

Upstream passage of alewife, herring and shad - Orono

The only discussion the updated application includes about alewife, herring and shad upstream passage testing is the sentence that reads: "Only one upstream passage study, for adult alewife, has been attempted at the Orono Project, and it was unsuccessful due to fallback...." (The application does not say when this testing was done.) Additional discussion of why such testing was not again conducted must be provided. With respect to all anadromous species, it appears that lift fish counts, followed by implementation of modifications suggested by the stakeholders following each year's count, has been substituted for traditional effectiveness testing methods. Thus, please provide a discussion that shows the results of each year's count and the yearly improvements made to enhance passage. It appears this approach has been acceptable do far to the fishery agencies and PIN but it seems that is changing given your recent discussions on developing numerical standards for all species. Will radio-telemetry testing be restarted at some point in the future, perhaps once the upstream performance standards are established? What will be the trigger that re-initiates its implementation?

Upstream passage of Atlantic salmon - Orono

Please describe what upstream passage studies have been done for Atlantic salmon....nothing is mentioned in the application yet a letter from FERC dated Dec 13, 2016 states that "the 2015 was the second year of adult salmon passage studies, and that BBHP proposed to reinitiate such studies at Orono in 2017." So your list is needed. If changes were made to the lift in response to testing...please describe them. This data for salmon can be incorporated into the discussions noted above provided it is clear what species is being discussed.

Upstream passage of eel - Orono and Stillwater

The application states upstream eel passage studies were only done in 2017 and 2019 but its not clear from your write-up on page 99 whether these studies were done at Orono, Stillwater or both,,,,so please clarify. Also, please provide the agency (fishery and PIN) agreement that no further studies are needed (and at which sites) ....unless more studies are just on the back burner? What do you understand will be needed by the fishery agencies and PIN to declare that upstream eel passage is safe and effective? Also, please identify for each year, what improvements were made based on the most recent previous passage studies. For example, provide statements such as "based on he 2015 studies the following improvements (list them) were made in _____ Noting these enhancements is important to demonstrate the value of the adaptive program you are implementing at this time.

Downstream Passage - Orono and Stillwater

Please summarize the changes (by year) implemented in response to downstream eel testing conducted between 2015 and 2019 in the same fashion as noted above for upstream eel passage at both sites.

Thanks again

Pat

From: "Bernier, Kevin" <Kevin.Bernier@brookfieldrenewable.com>
To: "Maloney, Kelly" <Kelly.Maloney@brookfieldrenewable.com>, "PBMwork@maine.rr.com" <PBMwork@maine.rr.com>
Cc:
Bcc:
Priority: Normal
Date: Tuesday December 15 2020 4:38:03AM
RE: A few more Orono questions

Pat – just to clarify #2 regarding the tallies of river herring at the Orono fish lift, 163,126 would be the "official" number reported to MDMR at season's end and after the data are checked and verified. The tallies in the weekly reports are "unofficial" and are not yet double-checked by the fish passage staff (i.e., they go through the daily data sheets at season's end and corroborate the tallies before they are provided to MDMR).

Kevin Bernier

Senior Compliance Specialist

Brookfield Renewable

C 207 951 5006

From: Maloney, Kelly
Sent: Monday, December 14, 2020 3:46 PM
To: PBMwork@maine.rr.com
Cc: Bernier, Kevin <Kevin.Bernier@brookfieldrenewable.com>
Subject: RE: A few more Orono questions

Pat,

Good afternoon. Please find the responses to your questions below.

Much obliged!

Kelly Maloney

Manager, Compliance – Northeast

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Brookfield
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From: PBMwork@maine.rr.com <PBMwork@maine.rr.com>
Sent: Monday, December 14, 2020 11:39 AM
To: Maloney, Kelly <Kelly.Maloney@brookfieldrenewable.com>
Subject: A few more Orono questions

Hi Kelly

1) Just to make sure I'm not missing something.,.. am I correct in saying there were no downstream passage studies for Orono in 2019 for any species? (None were mentioned in the application or annual compliance filings.) Was there any particular reason for this? That is correct. As discussed elsewhere, Brookfield has taken a prioritized approach to fish passage studies wherein we annually consult with the agencies to determine which species, lifestages and direction they would like Brookfield to prioritize for the upcoming fish passage season. In 2019, upstream passage studies for adult river herring were conducted for the Milford Project following agency consultation. In 2020, downstream passage studies at the Milford, Stillwater and Orono projects were conducted for juvenile alosine, including a desktop analysis of entrainment, in consultation with the agencies.

2) When I looked at the 2019 study (which seems to address only Milford upstream work) I noticed that the # river herring reported in 2019 at the Orono lift as 163,126 yet your email to me stated 171,029. So which is the correct number? (I just like my report to be as accurate as possible.) According to the weekly fish passage reports provided to the agencies, 171,029 alewife were caught at the trap and 165,078 were transported upstream while 5,951 were released downstream.

3) Could you summarize any changes (operational, passage changes, etc.) made at Orono to enhance downstream passage of anadromous species between 2015 and 2020 if there were any other than the flow increases in 2016, 2017 and 2018 to address the requirements of the Biological Opinion for salmon? As indicated in the March 27, 2017 SPP report to FERC (included in Section 6.0 of the application), operation of Station A is now prioritized over Station B to increase Atlantic salmon smolt survival. In addition, following the fish mortality incident in 2018, Brookfield revised its flashboard maintenance procedure such that water is passed over the spillway throughout the work (to ensure that the bypass area is not dewatered).

Thanks

Pat

Appendix B

FERC Letter of March 6, 2020

FEDERAL ENERGY REGULATORY COMMISSION
Washington, D. C. 20426

OFFICE OF ENERGY PROJECTS

Project No. 2712-086--Maine
Stillwater Hydroelectric Project

Project No. 2710-070--Maine
Orono Hydroelectric Project
Black Bear Hydro Partners, LLC; Black Bear SO, LLC; and Black Bear Development Holdings, LLC

Project No. 2534-100--Maine
Milford Hydroelectric Project
Black Bear Hydro Partners, LLC

March 6, 2020

VIA FERC Service

Kelly Maloney
License Compliance Manager
Black Bear Hydro Partners, LLC
150 Main Street
Lewiston, ME 04240

Subject: Discussion of ongoing Quantitative Diadromous Fish Passage Studies

Dear Ms. Maloney:

This letter is in regard to your February 12, 2019 and January 13, 2020 filings describing your completed and continuing quantitative evaluations of the fish passage facilities at your Penobscot River Projects, conducted pursuant to Article 409 for the Milford Project (No. 2534),[1] Article 408 for the Stillwater Project (No. 2712),[2] and

[1] Order Approving Fish Passage Design Drawings Under Articles 407 and 408 (141 FERC ¶62,025), issued October 9, 2012.

[2] Order Amending License and Revising Annual Charges (140 FERC ¶62,195), issued September 14, 2012.

Article 411 for the Orono Project (No. 2710)[3] (collectively, 2012 Orders). This letter acknowledges your recent efforts to comply with the requirements of the 2012 Orders by summarizing some of the findings of your diadromous fish studies conducted since 2014 and actions you have taken at your projects to improve passage. We also take this opportunity to highlight issues frequently raised by the project stakeholders.[4] To ensure your continued compliance with the 2012 Orders, we propose future topics of investigation or discussion in response to the frequently noted stakeholder concerns which must be addressed in future plans and reports, as outlined below.

Background and Requirements

Pursuant to the above-referenced 2012 Orders and subsequent Federal Energy Regulatory Commission (Commission) orders approving your diadromous fish passage study plans,[5,6,7] you have planned and conducted qualitative and quantitative fish passage studies to monitor and evaluate the effectiveness of the fish passage facilities for three alosine species (alewife and blueback herring, collectively referred to as river herring, and American shad) and American eel. The three projects provide upstream eel passage via eel ladders, and provide downstream alosine and eel passage via surface and low-level bypasses. Upstream alosine passage is provided at the Orono (fish lift with trap and transport) and Milford (fish lift and Denil ladder) projects. The results of these monitoring studies would provide a basis for recommending modifications to project structures or operations, including alternative flow releases, to protect fish resources.

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[3] Order Amending License and Revising Annual Charges (140 FERC ¶ 62,194), issued September 14, 2012.

[4] Stakeholders include representatives from the U.S. Fish and Wildlife Service, National Marine Fisheries Service, the Penobscot Indian Nation, Maine Department of Inland Fisheries and Wildlife, and Maine Department of Marine Resources.

[5] Order Modifying and Approving, in Part, Diadromous Fish Passage Study Plan (146 FERC ¶ 62,118), issued February 11, 2014.

[6] Order Approving and Modifying Quantitative Diadromous Fish Passage Study Plan (150 FERC ¶ 62,111), issued February 25, 2015.

[7] Order Modifying and Approving Quantitative American Eel Downstream Passage Study Plan (156 FERC ¶ 62,089), issued July 29, 2016.

Completed Diadromous Fish Passage Studies, 2014-2019

You have completed qualitative and quantitative studies at the Milford, Stillwater, and Orono projects, as summarized in the table below. You also collaborate with the Maine Department of Marine Resources (Maine DMR) to collect annual upstream fish passage counts at the Milford and Orono fish lifts.

Year	Study & Species	Site/Project
2014	Upstream eel passage siting survey	Stillwater & Orono
	Upstream eel counts	Milford
	Adult eel presence	Stillwater Branch & Penobscot River
	Downstream fish passage video	Orono & Milford
		Milford, Orono, & Stillwater
2015	Upstream and downstream adult river herring telemetry	Milford, Orono, & Stillwater
	Downstream adult eel video	Stillwater
	Upstream fish lift video	Milford & Orono
	Pilot juvenile alosine tagging study	
2016	Downstream adult eel telemetry	Milford, Orono, & Stillwater
2017	Downstream adult shad telemetry	Milford, Orono, Stillwater
2018	Downstream adult shad telemetry	Milford
	Downstream adult river herring telemetry	Milford, Orono, Stillwater
2019	Upstream adult river herring	Milford

Since the start of studies, you have consulted with the stakeholders in development of the study plans and preparation of the reports. As summarized here and in previous letters, you have enacted modifications at the fish passage facilities, repeated studies in order to determine the effectiveness of modifications (e.g., the shad study at Milford in 2018), refined study techniques, and collected information about environmental and operational data during fish passage.

As a result of your studies and stakeholder consultations, you have enacted changes at the passage facilities, including: increasing the truck and transfer effort at the Orono fishlift to reduce overcrowding; installing backwatering bulkheads at the Milford fishlift to alleviate the entrained air issue that was contributing to passage delays; repairing gaps in the trashracks at the Stillwater A plant to prevent eel entrainment; inspecting the Bay 7 downstream passage at Milford to determine if there is an issue that may be affecting survival; and installing entrance weirs in the outer trashracks at the Milford Dam to improve downstream fish passage.

Your results have also contributed to discussions with the stakeholders about project operation and maintenance during the passage season. For example, you clarified the prioritization of passing inflows at the Milford Project during periods of ISO New England generation curtailment, stating that you prioritize use of the sluice gate (for passage of spill flows up to 2,000 cfs), as it provides a relatively safe downstream passage compared to the other spill routes (i.e., the Obermeyer gate and flashboard gates), and does not contribute to false attraction flows or lead to potential stranding.[8] In your 2019 report, the stakeholders noted that fish were present at the fish lift in the early morning and you state that you consider initiating lift sequences earlier in the morning if there is interest from the resource agencies to do so.

You have also used stakeholder comments in the development of studies by identifying data gaps and determining study methods. For example, in consultation for the 2019 study year, you and the stakeholders identified evaluation of upstream passage of adult alosines and downstream passage of juvenile alosines as two existing data gaps, and you worked with the stakeholders to identify the study design modifications being proposed for 2019, as well as to identify a source for fish to use in the juvenile study.

Discussion

As described above, we recognize the efforts you have made to improve passage or correct issues at the facilities based on the results of the monitoring studies. Based on our review of data collected at the projects, we have identified some frequent issues that arise in the stakeholder comments which may require further explanation, additional review or data analysis, or future study. These are: (1) migratory delay; (2) operational conditions; and (3) development of passage performance standards (effectiveness criteria). Due to the common themes in these comments and because they frequently arise, we conclude that they require further action to maintain compliance with your project license and to benefit fishery resources at the project.

Migratory delay

Based on your studies of downstream eel passage (as contained in your 2016 report, filed April 13, 2017), the U.S. Fish and Wildlife Service (FWS) expressed concern for migratory delay occurring at the three projects, as some eels took too long to find a successful downstream route. You responded that eels tended to move downstream

[8] The 2017 report did not describe route-specific survival estimates at Milford, but good survival is inferred from the results, which reported that all tagged adult shad passing via spill were detected at each of the 3 downstream stations; the 2018 report describes 90 percent survival for tagged adult shad passing through spill routes.

following increased river flow and precipitation, and that the delay may be a function of the absence of environmental cues to move downstream.

In your studies of downstream migrating shad (your 2017 report, filed April 12, 2018 and 2018 report, filed February 12, 2019), you noted the complexity of shad movements and the difficulty in being able to differentiate active searching for downstream passage routes at the dams from the intervening periods of time shad might spend upstream (which may be related to spawning or may be searching for a downstream route). The National Marine Fisheries Service (NMFS) questioned what an appropriate residence time for shad might be, and suggested that the timeliness of passage needed improvement. FWS and Penobscot Indian Nation (PIN) noted that at Milford, many shad were milling around in the forebay, unable or unwilling to use the downstream bypass, and were delayed until the waste gate was fully open. Though survival was better at Stillwater and Orono than at Milford, shad still experienced delay at those projects. Based on the results of the 2017 study and the comments received from the stakeholders, you made changes to the Milford bypass and repeated the downstream shad study at Milford in 2018. The 2018 studies again demonstrated that the downstream migration of shad was not always continuous and may include forays upstream following their initial arrival at the dams. The median upstream residence time for adult shad was overall lower in 2018 than in 2017, particularly at the Stillwater Project, which was attributed to the study method differences (location of release) and potential differences in the spawning condition of the shad (still spawning or completed spawning).

In your 2019 study of upstream migrating adult river herring at the Milford Project (filed January 13, 2020) you concluded that the internal lift efficiency was low compared to the near field attraction effectiveness of the lift and the lift entrance efficiency, despite the majority of fish passing upstream within 48 hours or less from arrival at the project. PIN noted that the 2019 study has similar findings to your previously completed Atlantic salmon studies conducted under separate license requirements. The salmon studies indicated high attraction efficiency at the Milford fish lift but low internal lift efficiency, with upstream passage delayed by fish making multiple forays in and out of the lift before completing successful passage. PIN recommended, and NMFS agreed, that you should employ an array of cameras or sonar devices at multiple points in the Milford fish lift to identify potential bottlenecks to passage and areas where the fish are prone to reject the fishway.

We recognize that you have taken steps to minimize delay by making structural changes when your results indicate problems with the timeliness of passage, however there may be the potential to enact other operational changes to minimize any delay. Maine Department of Marine Resources (Maine DMR) suggested that you decide a maximum residence time (i.e., 1 hour, 6 hours, 12 hours, 24 hours) before you implement additional measures to provide passage. Your 2017 and 2018 daily fishway observations

describe schools of alosines milling in the impoundments, and PIN's comments on the 2019 report indicate river herring were observed swimming in and out of the Milford fishlift. However, decisions are made to enact a corrective action in response to these observations are not always clear; for example, at Stillwater station A, operators removed a grizzly bar at the downstream fishway on July 10, 2017 to see whether it would encourage shad to pass, but you don't report whether there was a threshold for numbers of fish or other triggers informing that action.

Based on your completed telemetry studies, recorded observations of fish behavior, and project-specific information, you may already have the data available to inform reasonable operational and/or structural modifications to ensure timely up- and downstream passage at the projects. Therefore, you should continue to consult with the stakeholders to determine whether there are potential project or environmental factors that may be contributing to migratory delay, and what additional structural or operational modifications must be enacted to minimize delay.

Operational conditions

Pursuant to the requirements for each project, the results of your diadromous monitoring studies provide a basis for recommending structural or operational changes at the project. As we noted above, you have used the results of the fish studies to make structural changes to the facilities (such as installing widows at Milford bypass or repairing gaps in the racks at Stillwater). However, it is unclear whether you plan to make intentional operational changes to facilitate passage. This may include, but isn't limited to: turbine prioritization, lift frequency, flow augmentation, changes to how flow is released, and/or cessation of generation.

Based on the stakeholder comments over the years of studies, there is interest in understanding how project operations may affect passage. In its review of your 2017 study plan, Maine DMR suggested that you document operational changes (e.g. timing and duration of opening gates, lowering the Obermeyer dam, spill conditions and locations of spill, etc.) in order to evaluate its effect on passage. You provide this information as tables in your reports, and describe the project conditions during the studies as "baseline" (units operating and bypass open). We note that some of the operational conditions described in your reports appear to be related to precipitation and flow conditions or ISO curtailments beyond your control. You report the environmental and operational conditions during each passage study; therefore you have documented passage under different conditions. Specifically, your 2017 report indicates peaks of passage coinciding with sluice gate operation at Milford, and your 2018 and 2019 reports provide information about passage when flashboards are down (Milford in 2019) and when they are installed and intact (Orono in 2018).

Your recent reports under the Atlantic Salmon Species Protection Plan[9] describe how you manipulate specific spill conditions, prioritize stations, or pass inflows in order to improve passage conditions for Atlantic salmon smolts, indicating that you should be able to develop similar conditions or evaluations for alosines and eels. As the diadromous fish passage study results are expected to inform recommendations for structural or operational changes at the projects, you should review your years of passage data and operations information and consult with the stakeholders to determine whether you have sufficient evidence to refine operational conditions to improve passage. Alternatively, it may be necessary to develop additional studies to specifically evaluate passage under different operational conditions.

Performance standards

The 2012 orders stated that monitoring and evaluation of the passage facilities over time would help ensure that the facilities are effective and would minimize fisheries-related impacts caused by the project. The orders also required you to determine, in consultation with the stakeholders, what actions are necessary to remedy the fisheries impacts if the studies identify that these facilities are not effective. PIN commented on your 2017 Plan (filed May 15, 2017) that it needed a description of how effectiveness would be quantified, and whether evaluation criteria for determining if passage is adequate in accordance with the 2012 Orders and respective fish passage articles. In our letter responding to the 2017 Plan (issued October 4, 2017), we concluded that your current approach to the effectiveness studies has been accepted by the stakeholders and approved by the Commission, and in the absence of specific performance criteria, this process over the life of the licenses is expected to ensure that the facilities provide safe and effective passage for diadromous species at the projects.

Subsequently, in their comments on your 2018 Plan (filed March 16, 2018), PIN and NMFS expressed an interest in development of up- and downstream passage performance standards for alosines, which would help identify the levels of passage necessary to achieve restoration, management, and cultural goals in the watershed, and referred to a recently developed passage performance model for the Penobscot River[10] which warranted further discussion. You stated you would continue to consult with the stakeholders on the parameters that are needed to satisfactorily demonstrate safe, timely,

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[9] Order Modifying and Approving Revised Species Protection Plan and Revised Atlantic Salmon Passage Study Plan (146 FERC ¶ 62,224), issued March 27, 2014.

[10] Stich, D.S., T.F. Sheehan, and J.D. Zydlewski. 2019. A dam performance standard model for American shad. Canadian Journal of Fisheries and Aquatic Sciences 76: 762-779.

and effective passage at the facilities, but that alosines and eels are not listed under the Endangered Species Act the way Atlantic salmon are, and therefore passage criteria should not be strictly established or enforced. To date, neither you nor the stakeholders have proposed effectiveness criteria.

In your 2019 report, you referenced the dam passage performance standard model for the Penobscot River in describing your river herring passage results, where approximately 58 percent of the river herring passed upstream within 24 hours and 79 percent within 48 hours of arrival at the Milford Project. Specifically, you noted that the model estimates the effects of dam passage and migratory delay on management goals for shad (i.e., abundance, spatial distribution of spawning adults, and proportion of repeat spawners in space and time), and highlighted a finding in the model that upstream passage efficiencies of 0.60 or greater with passage occurring within 48 hours are needed in order to meet interim recovery targets for shad.

Though the model provides a tool to relate proposed performance standards directly to management objectives, your 2019 report does not indicate whether you will pursue use of this model to establish effectiveness criteria, and the stakeholders don't provide specific comments. You should therefore reconvene with the stakeholders on the matter now that the model is published to discuss the potential for passage criteria. You should also consider a re-examination of your completed radio telemetry studies with adult alosines (conducted 2017-2019) as the model may inform the understanding of those results with regard to management objectives, and/or determining what additional information is needed.

Conclusion

In conducting diadromous fish studies between 2015 to 2019, you have collected information about downstream migrating adult shad, river herring, and eels, and upstream migrating river herring at the projects. Pursuant to the fish passage articles for each project, you are required to consult with the stakeholders if the results of the monitoring indicate that changes in project structures or operations, including alternative flow releases, are necessary to protect fish resources. Based on review of your completed quantitative studies at the projects, we acknowledge that you have made modifications to facility structures based on the results of the studies to improve passage conditions as required by the respective fish passage effectiveness articles for each project. However, as detailed above, we have identified three recurring requests in the stakeholder comments which require additional analysis or consultation: (1) migratory delay, (2) operational conditions, and (3) performance standards.

Your 2019 report indicates that you intend to continue qualitative alosine evaluations at the projects in fall of 2020. Your 2020 Diadromous Fish Passage Study

Plans are due for Commission review by April 15, 2020. Given this timeframe, we understand that you may not be able to fully address the above issues in the 2020 study proposal. However, to the extent you can modify your study plans at this late time, to incorporate a stakeholder proposal, that would be advisable. Further, because you hold regularly scheduled monthly fish passage meetings with the stakeholders, and based on the history of completed studies at the projects and the proposed 2020 study, you are in a position to adaptively manage or change the plans to improve overall effectiveness. Any changes would be made after discussion with the stakeholders concerning migratory delay, operational conditions, and performance standards.

In order to provide us sufficient time next year to review the results of this year's study results and make any necessary changes in your 2021 Study Plans, please file your Diadromous Fish Passage Study report for our review by January 15, 2021. Please file your report along with any consultation letters or email regarding these issues, and describe your next steps toward a resolution of the three concerns identified by the stakeholders.

Thank you for providing your diadromous fish reports and study plans. We look forward to receiving your 2020 diadromous fish study plans by April 15, 2020. If you have any questions pertaining to this letter, please contact me at holly.frank@ferc.gov or (202) 502-6833.

Sincerely,

Thomas J. LoVullo
Chief, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance

cc: VIA Electronic Mail

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