MEETING SUMMARY

BRUNSWICK HYDROELETRIC PROJECT

FERC NO. 2284

UPSTREAM FISH PASSAGE ALTERNATIVES MEETING

March 5, 2026

ATTENDEES:

Mike Scarzello	Brookfield Renewable
Adam Brown	Brookfield Renewable
Matthew Leblanc Sr	Brookfield Renewable
Lucas Stiles	Kleinschmidt Associates
Ralph Nelson	Kleinschmidt Associates
Kirk Smith	Gomez and Sullivan
Kali Shores	Gomez and Sullivan
Lars Hammer	Maine Department of Marine Resources (MDMR)
Casey Clark	MDMR
Don Dow	National Marine Fisheries Service (NMFS)
Kimberly Spiller	United States Fish and Wildlife Service (USFWS)
Ed Friedman	Friends of Merrymeeting Bay (FOMB)
Chip Spies	Free the Andro Coalition (FTA)
Vladamir Douhovnikoff	FTA
John Lichter	FTA

Kirk Smith opened the meeting and outlined the objectives and agenda. The purpose of this meeting was to present and screen potential upstream fish passage alternatives at the Brunswick Project, building upon the January 27, 2026 session that focused on downstream alternatives. Prior to the meeting, participants received an alternatives matrix and conceptual sketches to support the discussion (Attachment 1). The upstream fish passage alternatives matrix was developed by Brookfield based on a literature review of potential applicable technologies that have been implemented at other

hydroelectric projects, as well as any applicable new technologies. The literature review resulted in the identification of approximately 12 alternatives for upstream passage, which have been preliminarily narrowed down by Brookfield to 4 alternatives to be analyzed in a more detailed feasibility assessment to be conducted over the course of 2026.

The objective of this meeting is to consult with resource agencies, review the upstream fish passage alternatives matrix, and obtain concurrence on the alternatives to be carried forward for further detailed evaluation in the feasibility assessment.

Lucas Stiles led a discussion of the alternatives contained in the upstream fish passage matrix. Lucas began by providing a brief overview of the Project features and layout (i.e., powerhouse, spillway, impoundment, etc.).

Alternative U1: Modification of Existing Vertical Slot Ladder

Lucas Stiles began by describing the existing ladder which is located between the powerhouse and Frank J. Wood Bridge on river right (looking downstream). The entrance is located next to Unit 1. The fishway has a 180-degree bend just after the entrance, before extending downstream, where it contains another 180-degree bend before continuing back upstream to a sorting facility. The fishway can also pass fish volitionally into the impoundment through an exit flume that exits immediately adjacent to the intake for Unit 1. There are 42 pools (each 8.5 ft wide × 10 ft long) with 11-inch vertical slots that are designed with a 12-inch drop. There is a 30 cfs conveyance flow through the fishway plus 70 cfs of supplemental attraction flow that is discharged near the entrance via a floor diffuser for 100 cfs of total flow through the system. Lucas stated that one of the primary issues with the existing fishway is the low attraction flow relative to the 5% of maximum turbine capacity (approximately 375 cfs) guidance contained in the USFWS engineering guidelines; modifications to the existing fishway should focus on this variable.

For the first alternative (see Attachment 1), there are not many ways to significantly increase attraction flow through the existing floor diffuser; however, an angled ramp could be installed just downstream of the fishway entrance gate to diffuse additional attraction water. This additional attraction flow would be supplied via a new intake structure located adjacent to the existing exit flume. The feasibility of this needs to be

validated using bathymetry data and analyzing the space/area available to determine how much additional flow could be achievable. Lucas went on to say that the Energy Dissipation Factor (EDF) for the existing fishway ranges from 2.8 to 4.9 depending on the tailwater elevation. Under typical operations the EDF is around 4.0. Current guidelines specify that the EDF should be approximately 3.15 for American Shad. The conveyance flow would need to be reduced to drop EDF levels in the existing fishway. Lucas stated that the existing vertical slot width is 11 inches, which is narrow for American Shad. However, the existing fishway could be modified to a pool-and-chute configuration which would eliminate the narrow slot width and improve the passage route. Modifying the fishway type would also allow shortening the pools to 8 feet in length, which would allow an additional 10 pools to be added to the fishway, reducing the drop between pools to 9 inches. Other modifications that could be considered include enlarging the downstream turning pool near the 180-degree bend to further reduce the EDF in the turning pool, replacing the wooden corner baffles with curved steel plates or concrete to improve bend hydraulics, extending the entrance and fitting it with an overshot-style entrance gate (similar to Milford Hydroelectric Project), adding flow induction pumps to increase attraction flow near the entrance, and updating the sorting facility to enhance usability.

John Lichter stated that an effort in the early 2010s to install flow induction pumps/impellers at the ladder entrance to increase attraction flows did not appear to improve fishway efficiency. John also noted that he worked with Bowdoin students who installed cameras near the entrance which showed a "curtain" of bubbles/turbulence produced from Unit 1 in front of the fishway entrance and this appeared to confuse American Shad and prevent them from entering the fishway. In addition, John stated that previous underwater camera observations showed American Shad congregating about 100 to 150 feet downstream of the current fishway entrance. John said in 2016 when Unit 1 was shut down for maintenance approximately 1,000 American Shad passed the fishway, which is one of the highest passage counts in recent times.

Lucas Stiles acknowledged that they were aware of the anecdotal information about the fish "milling" areas and stated that Kleinschmidt planned to review pump specifications to determine if any advancements in technology might yield a different result for any

effort to increase attraction flow near the entrance. Additionally, Lucas said that Brookfield will be analyzing the results of the Project Interactions Telemetry study to be completed in 2026 and CFD hydraulic modeling results to assess tailrace hydraulics to determine if extending the fishway entrance to another location (e.g., further downstream) made sense.

Casey Clark said that MDMR considers the public viewing window in the fishway a community priority that should be maintained in any future design modifications; however, it should be considered secondary to increasing the performance of the fishway. Casey also noted that the planned overshot gate would be affected by channel and tidal variability.

Don Dow asked if the vertical slots in the fishway were 9 inches instead of 11 inches but added either way they are too small especially for American Shad. Don also said that an understanding of the biomass and design capacities of the fishway as well as updated population targets need to be developed.

Lucas Stiles stated that the existing drawings show 11 inches for the vertical slot size, but he will attempt to verify this via another source. Lucas said that prior population numbers for the fishway design capacity came from a draft management plan for the Androscoggin River developed by MDMR. Don suggested reviewing the NMFS management plan for the Androscoggin River for that information as well.

Ed Friedman asked if the new license would contain conditions to allow for flexibility and adaptive management so that modifications can be made if performance standards are not met. Kirk Smith explained that most modern FERC licenses typically include effectiveness testing, performance standards, and modifications measures if targets are not met.

Alternative U2: New Vertical Slot Fishway (South side of Powerhouse)

Lucas Stiles stated that this concept uses 18-inch vertical slots per USFWS engineering guidance with 12 foot wide by 15 foot long pools, for a total of 52 pools, with a 9 inch drop per pool (see Attachment 1). This alternative would also include a new attraction flow intake near the exit flume and a wall diffuser located near the fishway entrance that discharges at a low velocity. This alternative would also include an overshot-style

entrance gate and a new trap-and-sort facility. Lucas stated there are challenges associated with the alternative including multiple 180 degree bends and switchbacks along the fishway, full demolition of the existing fishway will be required before construction begins, large cofferdams will be needed during construction, and support of excavation structure will be required to maintain access to the mill building and powerhouse. Construction likely will span multiple seasons which will affect the ability to provide uninterupted upstream passage at the Project.

Lars Hammer asked whether there was flexibility to extend the fishway entrance downstream for all alternatives. Lucas stated that shifting the entrance downstream is possible but doing so must avoid restricting powerhouse flows, this is likely more feasible with any new-build alternative rather than modifying the existing structure.

Don Dow stated that he does not prefer this option, as he would consider 24-inch vertical slots more ideal at a first-dam on the river site, but the available footprint makes that impractical and results in too many switchbacks for reliable passage.

Alternative U3: New Fish Lift on South Side of Powerhouse

Lucas stated that this alternative includes the construction of a new fish lift, which would include a lower entrance channel with a wall diffuser (see Attachment 1). The hopper would lift fish to an exit flume for volitional entry to the impoundment. This alternative also includes a crowder and a small trap along with a new sorting facility. Lucas said that the entrance location could be shifted downstream, if necessary, following analysis of the Project Interactions Telemetry Study and CFD Modeling Study results.

Don Dow stated that he preferred the fish lift option. Don recommended delivering the attraction flow upstream of the hopper. He suggested moving the entrance to the previously discussed congregation area downstream and, if feasible, discharging the hopper contents into the existing exit flume. Don also suggested using a dedicated attraction flow source rather than the existing fishways.

Lucas Stiles stated that he is open to assessing the discharge-to-existing flume geometry, but notes that it will be challenging. He agreed that attraction flow source should not rely on the current fishway intake.

Casey Clark stated that the final entrance siting should await the results of the Project Interactions Telemetry Study and noted that some evidence suggests American Shad often approach all the way upstream to the mid-powerhouse area, then travel in a counterclockwise direction downstream past the current entrance without stopping. Casey also suggests considering over-unit entrances, like the Safe Harbor Project, if this is supported by the Project Interactions Telemetry Study results.

Don Dow commented that although he places a lot of weight on behavioral studies, he still wants to include observation and judgment and the CFD Modeling Study to guide the selection.

Casey also asked why portions of the existing ladder might be abandoned in place. Lucas Stiles explained that leaving sections in place to act as cofferdams, reduce cost and schedule as well as shorten the fishway outage window.

Alternative U4: New FishHeart System with Guidance Nets

Lucas said Alternative 4 consists of the FishHeart technology, which includes a floating barge and capture system that is anchored in the tailrace and includes guidance nets (see Attachment 1). This alternative can discharge to the existing exit flume or to a sorting facility but must be removed annually and for extreme high-water events. The deployment and removal would require crane access under the existing overhead transmission lines. A major operation and maintenance concern for this alternative is debris loading on the fish guidance nets. Lucas Stiles also said that there is limited attraction flow associated with this alternative compared to the 5% of maximum turbine capacity (approximately 375 cfs) guidance contained in the USFWS engineering guidelines.

Don Dow states that he is skeptical that the system can provide the capacity to accommodate a river herring run of several million fish. He is supportive of evaluating it, but not as a stand-alone solution.

Casey Clark added concerns about the interactions of the system's guidance nets with downstream migratory fish movements and sturgeon spawning and requested an analysis of flow-duration to quantify percentage of time the system would be out of service due to high flow and/or floods.

Other Alternatives: Nature-Like Fishway (Right-Bank Bypass Around Dam)

Lucas Stiles stated that Brookfield also conducted a preliminary analysis of two Nature-Like Fishway alternatives (see Attachment 1). The initial concept creates a 100-foot-wide channel extending from below the Frank J. Wood bridge upstream around the spillway infrastructure to the impoundment. The total length would be about 1,800 feet with a 2.2% slope to pass 375 cfs (5% of station capacity). This alternative would require isolation walls and partial left dam abutment demolition, and a new bridge across the NLF to access the spillway gates. There are dam safety considerations with this NLF alternative, regarding access, spillway capacity, and stability of structures. Placement of the fishway would be on private parcels. The NLF entrance is located across the river and approximately 1,100 feet downstream of the powerhouse attraction flow. Competing attraction flows may lessen effectiveness of the NLF entrance.

Don Dow requested that the report document why this option is eliminated if screened out, with drawings and constraints included. He noted recent Frank J. Wood bridge replacement as well as concerns about construction under and around the bridge and cutting into roadway embankments as challenges.

Other Alternatives: In-Channel Nature-Like Fishway (River-Left Split-Channel via Shad/Goat Islands)

Lucas Stiles explained that this concept includes demolishing and modifying the spillway from Shad Island to the left-bank and building a new spillway wall up to Goat Island (see Attachment 1). This would also include constructing a 2,500 foot long (1.6% slope) Nature-Like Fishway along the river left portion of the river. The major technical challenges of this alternative include large cofferdams, spill capacity/ice/debris passage, substantial rock excavation (at downstream end), substantial in river fill (at upstream end), and shoreline grade adjustments. Downstream passage protection measures at the powerhouse would still be required since the Nature-Like Fishway entrance cannot exclude potential entrainment from the turbines.

Vladimir Douhovnikoff suggested carrying this option forward through costed feasibility given stakeholder interest. Don Dow stated his support for advancing this alternative to feasibility assessment level development despite also acknowledging that Nature-Like

Fishways are not proven universally superior to technical fishways. Don would like to better understand the earthwork and spill modifications that would be required from an engineering and cost perspective.

Lucas Stiles stated that one concern with the Nature-Like Fishway alternatives is the location of the entrance is far downstream of the powerhouse, and fish may not be attracted to it. Lars Hammer reports seeing many river herring and some American Shad congregated below Shad Falls during a stranding survey with no spill across the Tainter gates. Ed Friedman suggested deliberate Tainter gate flow pulses coupled with acoustic monitoring to test whether attraction shifts toward the left channel from other areas (e.g., just downstream of the powerhouse). Kirk Smith suggested that the Project Interactions Telemetry Study might be a better method to determine fish attraction in this area, as well as other areas below the Project.

Vladimir Douhovnikoff addressed the fact that dam removal was not on the matrix or a topic of discussion in this meeting whereas it did come up at the previous January meeting. Mike Scarzello responded by saying that Brookfield is not going to be removing the dam and is committed to relicensing. In addition, Mike stated that FERC stated in the NEPA Scoping Document as well as the Study Plan Determination that analysis of the dam removal alternative was not necessary. Mike said that FERC's policy is that dam removal is not considered, if reasonable protection and mitigation measures can be implemented as part of any new license. Vladimir responded that understanding the result from the no dam alternative would be beneficial to be able to evaluate the other alternatives in the matrix. Mike suggested that Vladimir submit his comments in writing.

Next Steps and Requests

Kirk Smith said the meeting summary will be circulated with attachments of the matrix and conceptual sketches and any written comments should be submitted to Brookfield by April 6, 2026.

Attachment 1-Upstream Fish Passage Alternatives Matrix and Conceptual Sketches

Draft Alternatives Review – Upstream Fish Passage at the Brunswick Project

ID	Alternative	Description	Effectiveness	Safety	Equipment Longevity	Risk/Uncertainty	Constructability	Construction Costs	Operation and Maintenance Costs	Impacts to Generation
U1	**Modification of Existing Vertical Slot Ladder**	-This alternative would include modifying the existing vertical slot fishway to improve overall effectiveness. -The existing fishway has (42) 8.5-foot-wide by 10-foot-long pools with 11-inch slots. -The fishway was designed for a maximum drop per pool of 12 inches. -The ladder has a conveyance flow of 30 cfs and a supplemental attraction flow of 70 cfs for a total attraction flow of 100 cfs. The supplemental attraction flow is provided via a floor diffuser near the entrance. -The extent and feasibility of the modifications will be determined based on additional analysis and CFD modeling. Some potential modifications include: • Decreasing conveyance flow. The EDF (Energy Dissipation Factor) for the existing pools ranges from ~2.8 to 4.9 and is 4.0 at normal conditions. This is above USFWS's recommendation of 3.15 for American Shad. Reducing conveyance flow to ~ 20 cfs would bring the EDF down to acceptable levels. • Increasing supplemental attraction flow. Due to the geometry of the existing facility, it's not feasible to increase the supplemental attraction flow through the existing fishway. To supplement the attraction flow, a ramped entrance diffuser similar to the one at the Scotland fishway may be able to be installed in front of the entrance. Review of the bathymetry in this area is required to assess the feasibility and determine amount of flow that could be provided. Total attraction flow will still likely be less than 5% of station discharge which is what's recommended by USFWS. • Modifying the fishway type. USFWS recommends a minimum slot width of 18 inches for American Shad. Increasing the slot width also requires that the pool size increases to maintain the hydraulic performance of the fishway. Increasing the pool sizes is not feasible due to the	<u>Low/Moderate</u> -A telemetry study of river herring conducted by NAI in 2022 showed an entrance efficiency of 37.5% and an overall internal effectiveness of 33.3%. A similar study for American shad in 2022 showed that only 2.4% of the tagged fish entered the attraction flow field and no fish entered the fishway. -Reducing conveyance flow would improve internal fishway hydraulics and improve internal efficiencies. -Increased supplemental attraction flow would improve entrance efficiency. -Smaller pool sizes mean a lower theoretical capacity than a new vertical slot fishway. -Overshot entrance gate should improve entrance efficacy. -Provides volitional passage (not currently operated due to invasive species).	<u>Low Risk</u> -Minimal changes to operating conditions.	<u>Low</u> -The bulk of the existing facility which was built in 1983 would remain in place.	<u>High</u> -Use of ramped entrance diffuser is limited. -The existing upstream fishway may need to be shut down for a portion of the season to facilitate construction. -Its unlikely that these modifications would improve effectiveness enough to meet the standards that the agencies will likely require. -Extension of the turning pool may be limited by property boundary or bridge easements.	<u>Moderate</u> -A small cofferdam near the fishway entrance would be required to facilitate potential modifications. -A cofferdam in the headpond would be required to facilitate construction of the attraction water intake structure. -Routing of new attraction water pipe may be difficult.	<u>Moderate</u> - Construction of ramped entrance diffuser. -Construction of entrance channel extension. -Installation of overshot entrance gate. -Installation of new dewatering gate. -Installation of flow induction pumps. -Modifications to internal fishway baffles. -Modifications to existing floor diffuser. -Replacement of wooden chamfers. -Installation of new attraction water pipe. -Construction of new attraction water intake. -Modifications to trap, sort, and truck facility.	<u>Low/Moderate</u> -Additional raking/cleaning of new attraction water intake. -No impact on parking, powerhouse access, or commercial traffic. -Vertical slot fishways are typically less complicated to maintain and operate. Pool and weir systems require more frequent operational adjustments for varying headwater and tailwater levels	<u>Moderate</u> -Additional losses due to increased attraction flow (likely to be less than a new vertical slot or fish lift).

Draft Alternatives Review – Upstream Fish Passage at the Brunswick Project

ID	Alternative	Description	Effectiveness	Safety	Equipment Longevity	Risk/Uncertainty	Constructability	Construction Costs	Operation and Maintenance Costs	Impacts to Generation
		site constraints. Modifying the fishway to a pool and chute style fishway may improve passage for shad. Additionally reducing the length of the pool from 10 feet to 8 feet would allow you to add 10 additional pools, reducing the drop per pool to 9 inches. • Increasing the size of the turning pool. It's unclear from the effectiveness testing that has been completed if the 180-degree turning pool at the downstream end of the fishway is problematic, but these have been an issue at other projects. Increasing the size of the tuning pool to further reduce the EDF and providing additional room for fish to rest could improve internal efficiencies. • Modifying the existing floor diffuser. Some recent studies have indicated that floor diffusers can be an area of concern in fishways. Due to the geometry of the existing facility, it is not feasible to replace the existing floor diffuser with a wall diffuser, but it may be possible to improve the hydraulics at the floor diffuser by adding baffles, porosity plates, or turning vanes. • Replacing the existing chamfered wooden corners with radiused steel plate or concrete. • Extending the existing entrance downstream to allow for an overshot style entrance gate to be installed. • Installation of flow induction pumps near the fishway entrance. • Modify/Improve the existing trap, sort, and truck facility (Discuss with Brookfield).								
U2	**New Vertical Slot Ladder on South Side of the Powerhouse**	-This alternative would include constructing a new larger vertical slot fishway with a 9-inch drop per pool. Based on the maximum fishway operating head at the site (~ 40-feet), a vertical slot fishway with a 9-inch drop per pool would require approximately 52 pools. -The required pool size is based on the slot width. The minimum required slot width for American shad is 18 inches which results in a 12-foot-wide by 15-foot-long pool.	Moderate/High -Increased attraction flow would improve entrance efficiency. -Elimination of floor diffusers would improve internal fishway efficiency.	Low Risk -Similar operating procedures as the existing facility.	High -New fishway. -New trap, sort, and truck facility.	Moderate -Would likely require the existing upstream fishway to be shut down for multiple passage seasons to facilitate construction. -Footprint may be limited by property	Difficult -A large cofferdam in the tailrace would be required to facilitate construction of the fishway. -Complete demolition of the existing fishway would be required.	High -Construction of new vertical slot fishway. -Installation of new attraction water pipe. -Construction of new attraction water intake.	Moderate -Similar operating conditions to existing facility. -More pools to maintain. -Additional raking/cleaning of	High -Additional losses due to increased attraction flow.

Draft Alternatives Review – Upstream Fish Passage at the Brunswick Project

ID	Alternative	Description	Effectiveness	Safety	Equipment Longevity	Risk/Uncertainty	Constructability	Construction Costs	Operation and Maintenance Costs	Impacts to Generation
		-This alternative would require the construction of a new trap, sort, and truck facility.	-Reduced drop per pool would improve internal fishway efficiency. -Larger pool sizes would increase the capacity of the fishway. -Length of the fishway may result in some fallback which would impact internal fishway efficiency. -Multiple switchbacks required could reduce effectiveness particularly for shad. -Would provide volitional passage.			boundary or bridge easements.	-Large impact area. -An SOE (support of excavation) structure to support the existing access road while the new facility is built would be required. -A cofferdam in the headpond would be required to facilitate construction of the attraction water intake structure and fishway exit. -Construction could impact access to the powerhouse.	-Construction of new trap, sort, and truck facility.	new attraction water intake. -Impacts parking, powerhouse access, and commercial traffic.	
U3	**New Fish Lift on South Side of Powerhouse**	-This alternative would include constructing a new fish lift to the south of the existing vertical slot fishway. -The hopper would be sized to accommodate the anticipated design population size (130,000 American shad, 600 Atlantic salmon, and 4.6M river herring). -This alternative would require the construction of a new trap, sort, and truck facility.	High -Increased attraction flow would improve entrance efficiency. -Elimination of floor diffusers would improve internal fishway efficiency. -Length of fishway is reduced which should improve internal efficiency. -Would not provide volitional passage.	Moderate Risk -Additional safety requirements associated with hopper lifting and fish lift operation.	High -New fish lift. -New trap, sort, and truck facility. -Remaining portion of existing fishway to be abandoned in place.	Low -Would likely require the existing upstream fishway be shut down for one passage season to facilitate construction. -Mechanical failures can result in the fishway being down for portions of the passage season.	Moderate -A cofferdam in the tailrace would be required to facilitate construction of the fishway. The cofferdam would be smaller than the one needed for the vertical slot fishway since most of the new fish lift would be on the land side of the existing fishway. -Portions of the existing fishway need to be demolished to facilitate construction. The remaining portion of the structure would be abandoned in place. -An SOE (support of excavation) structure to support the existing access road while the new facility is built would be required.	High -Construction of new fish lift. -Installation of new attraction water pipe. -Construction of new attraction water intake. -Construction of new trap, sort, and truck facility.	High -Fish lifts are more complex and have more mechanical components that need to be maintained. -Additional raking/cleaning of new attraction water intake. -Impacts parking, powerhouse access, and commercial traffic. -A secondary lift for trapping could be provided to allow some level of pre-sorting of species (similar to Milford).	High -Additional losses due to increased attraction flow.

Draft Alternatives Review – Upstream Fish Passage at the Brunswick Project

ID	Alternative	Description	Effectiveness	Safety	Equipment Longevity	Risk/Uncertainty	Constructability	Construction Costs	Operation and Maintenance Costs	Impacts to Generation
							-A cofferdam in the headpond would be required to facilitate construction of the attraction water intake structure and fishway exit. -Construction could impact access to the powerhouse.			
U4	**New FishHeart System**	-This alternative would include installation of a FishHeart collection system in the tailrace downstream of the powerhouse. The Fishheart system consists of a floating, in-water fish passage solution that uses a barge-mounted pump system to guide and transport fish over the dam. It uses pumped flow to attract fish into one of two 18-inch diameter pipes that are suspended below the barge where fish are captured and moved through the enclosed piping system and above the dam. Guide nets downstream of the structure help to guide fish into the system. -Fish could be pumped from the FishHeart system directly upstream or to the existing trap, sort, and truck facility. -Modify/Improve the existing trap, sort, and truck facility (Discuss with Brookfield).	Experimental -This is still an experimental technology with some support from the agencies, though effectiveness for collecting the target species is still being studied. -The floating nature of the FishHeart system allows it to be repositioned as needed to optimize effectiveness. -Additional satellite entrances can be added as needed. -Could be used to supplement existing fishway.	High Risk -A crane and boat access is needed to lift the Fishheart system into position. -Potential crane operation near overhead powerlines. -A boat and/or drivers may be required to maintain guidance nets. -Safety risk at high flows.	Moderate/High -The Fishheart system is removed after each season and overhauled so that it is in optimal condition before each season. -The existing trap, sort, and truck facility would be reused. -Existing fishway could be abandoned in place or maintained for supplemental passage.	Experimental -Additional testing of this system is needed. -The system uses two submerged pipes for entrances. Some species such as American shad may be hesitant to enter the pipes. -The system uses very little attraction flow which could impact overall effectiveness.	Easy -The Fishheart system would minimize in-water construction. -This option would allow the existing upstream fish passage to operate if needed during construction.	Low -Purchase of Fishheart System. -Installation of anchor points. -Modifications to trap, sort, and truck facility.	Moderate -Integrated cameras with artificial intelligence allow for real time data collection and sorting. Sorting effectiveness is unknown. -Guidance nets could be a maintenance challenge during portions of the upstream passage season. -Requires annual installation and removal. -The Fishheart system is typically removed during high flow events. -No impact on parking, powerhouse access, or commercial traffic.	Low -No attraction water from upstream of the dam is required.
ALTERNATIVES RULED OUT										
-	**No Action (Maintain Existing Conditions)**	This was eliminated due to the low effectiveness of the existing fishway.	–	–	–	–	–	–	–	–
-	**New Vertical Slot Fishway on North Side of Powerhouse**	This was eliminated due to the limited real estate available between the powerhouse and Shad Island.	–	–	–	–	–	–	–	–
	New Fish Lift on North Side of Powerhouse	This was eliminated due to the limited real estate available between the powerhouse and Shad Island and the operations and maintenance challenges.	–	–	–	–	–	–	–	–
-	**New Traditional Pool and Weir Ladder**	This was ruled out due to the agency's preference for vertical slot fishways in recent years.	–	–	–	–	–	–	–	–
-	**New Denil Ladder**	This was eliminated due to the anticipated design population at Brunswick (130,000 American shad, 600 Atlantic salmon, and 4.6M river herring).	–	–	–	–	–	–	–	–

Draft Alternatives Review – Upstream Fish Passage at the Brunswick Project

ID	Alternative	Description	Effectiveness	Safety	Equipment Longevity	Risk/Uncertainty	Constructability	Construction Costs	Operation and Maintenance Costs	Impacts to Generation
-	**New Alaskan Steeppass**	This was eliminated due to the anticipated design population at Brunswick (130,000 American shad, 600 Atlantic salmon, and 4.6M river herring).	–	–	–	–	–	–	–	–
-	**New Whoosh System**	This was eliminated due to the experimental nature of the technology and the limited success for American shad at prior on-site demonstrations.	–	–	–	–	–	–	–	–
-	**New Nature-Like-Fishway**	This was eliminated due to the required footprint and the limited amount of real estate available at Brunswick. The fishway entrance would also need to be located several hundred feet downstream of the powerhouse, which could adversely affect overall effectiveness.	–	–	–	–	–	–	–	–
-	**New Fishway on Topsham Side of the Dam**	This was eliminated as it would likely be less effective under non-spill conditions, the presence of the fish barrier dam, and the rock ledges that prevent fish from easily passing upstream to the spillway area.	–	–	–	–	–	–	–	–

MN
14°47'W ± 0°6'
AS OF 08/2024
CHANGING BY
0°6'E PER YEAR

MILL RD
SUMMER ST
MAIN ST
WATER ST
ANDROSCOGGIN RIVER
SHAD ISLAND
COMMERCIAL BUILDING

57'–0" NON–OVERFLOW DAM
48'–0" EMERGENCY SPILLWAY
80'–0" TAINTER GATE
322'–0" CONC. UNCONTROLLED SPILLWAY
170'–0" CONC. LONG FISH BARRIER WALL
188'–0" CONC. SPILLWAY WITH FLASHBOARDS
APPROX. EDGE OF WATER (TYP.)
OVERHEAD ELECTRIC
OE
BOAT BARRIER
FISHWAY
PROJECT POWERHOUSE (SEE F–2)
PROJECT UNDERGROUND ELECTRIC LINE
18,000/24,000 KVA, 12.47–34.5 KV, 3 PHASE, 60 HERTZ PROJECT TRANSFORMER
INTERCONNECTION POINT (NON–PROJECT)

7 F–3
6 F–3
5 F–3
4 F–3
3 F–3
2 F–3
1 F–3

New Dewatering Gate
New Ramped Entrance Diffuser
Existing Floor Diffuser
Existing Sorting Facility
Entrance Extension
Overshot Entrance Gate
Existing Attraction Intake
Existing Exit Flume
New AWS Intake Screen
New AWS Intake Structure
New Attraction Water Pipe
Existing Vertical Slot Fishway to be Modified to a Pool and Chute Fishway
Existing Attraction Water Pipe
New Bridge
Existing Turning Pool Size to be Increased.

PROJECT PLAN
SCALE: 1"=80'

Alternative U1 - Modifications to Existing Fishway

Potential Modifications
-Extend the Fishway Entrance Downstream and Install an Overshot Style Entrance Gate
-Modify Fishway to a Pool and Chute Style Fishway and add 10 Additional Pools
-Increase the Size of the Downstream Turning Pool
-Modify Existing Floor Diffuser to Reduce Upwelling and Improve Internal Fishway Hydraulics (CFD Modeling Needed to Determine Extents of Modifications)
-Replace Chamfered Plywood Corners with Radiused Concrete or Steel
-Provide Additional Supplemental Attraction Flow Near Entrance Using a Ramped Entrance Diffuser (Need to Review Bathymetry DS of Entrance to Determine Feasibility)
-Provide Flow Induction Pumps Near Fishway Entrance.
-Modify/Improve Existing Trapping Facility

BRUNSWICK HYDROELECTRIC PROJECT
BROOKFIELD WHITE PINE HYDRO LLC
FERC NO. 2284

F-1
PROJECT PLAN

80' 0 80' 160'
SCALE: 1" = 80'

MN
14°47'W ± 0°6'
AS OF 08/2024
CHANGING BY
0°6'E PER YEAR

MILL RD
SUMMER ST
MAIN ST
WATER ST
ANDROSCOGGIN RIVER
SHAD ISLAND
COMMERCIAL BUILDING

57'–0" NON–OVERFLOW DAM
48'–0" EMERGENCY SPILLWAY
80'–0" TAINTER GATE
322'–0" CONC. UNCONTROLLED SPILLWAY
170'–0" CONC. LONG FISH BARRIER WALL
188'–0" CONC. SPILLWAY WITH FLASHBOARDS
APPROX. EDGE OF WATER (TYP.)
PROJECT POWERHOUSE (SEE F–2)
PROJECT UNDERGROUND ELECTRIC LINE
18,000/24,000 KVA, 12.47–34.5 KV, 3 PHASE, 60 HERTZ PROJECT TRANSFORMER
INTERCONNECTION POINT (NON–PROJECT)
OVERHEAD ELECTRIC
BOAT BARRIER
FISHWAY

7 F–3
6 F–3
5 F–3
4 F–3
3 F–3
2 F–3
F–3

Overshot Entrance Gate
Entrance Dewatering Gage
Existing Fishway to be Demolished
Vertical Slot Fishway
Grizzly Rack
Dewatering Gate
AWS Intake Screen
AWS Intake Structure
Attraction Water Pipe
Wall Diffuser
Crowder (Below)
Viewing Room (Below)
Trap and Transport Hopper
New Sorting Facility
Pool Size (12'wx15'Long)
Slot Width = 18"
New Bridge

PROJECT PLAN
SCALE: 1"=80'

Alternative U2 - New Vertical Slot Fishway

BRUNSWICK HYDROELECTRIC PROJECT
BROOKFIELD WHITE PINE HYDRO LLC
FERC NO. 2284

F-1
PROJECT PLAN

80' 0 80' 160'
SCALE: 1" = 80'

MN
14°47'W ± 0°6'
AS OF 08/2024
CHANGING BY
0°6'E PER YEAR

MILL RD

SUMMER ST

MAIN ST

57'–0" NON–OVERFLOW DAM

48'–0" EMERGENCY SPILLWAY

80'–0" TAINTER GATE

7 F–3

6 F–3

5 F–3

OVERHEAD ELECTRIC

322'–0" CONC. UNCONTROLLED SPILLWAY

4 F–3

170'–0" CONC. LONG FISH BARRIER WALL

SHAD ISLAND

3 F–3

188'–0" CONC. SPILLWAY WITH FLASHBOARDS

APPROX. EDGE OF WATER (TYP.)

2 F–3

ANDROSCOGGIN RIVER

Overshot Entrance Gate

Entrance Dewatering Gage

Portion of Existing Fishway to be Demolished

BOAT BARRIER

New Training Wall

Portion of Existing Fishway to be Abandoned in Place

Trap and Transport Hopper

PROJECT POWERHOUSE (SEE F–2)

Wall Diffuser

DS Migrant Pipe

Exit Flume

V-Trap

Grizzly Rack

Main Hopper

New Bridge

Exit Flume Dewatering Gate

Blocking Screen

PROJECT UNDERGROUND ELECTRIC LINE

Attraction Water Pipe

Exit Flume Conveyance Flow Screen

AWS Intake Screen

F–3

Crowder

18,000/24,000 KVA, 12.47–34.5 KV, 3 PHASE, 60 HERTZ PROJECT TRANSFORMER

Viewing Room (Below)

New Sorting Facility

AWS Intake Structure

INTERCONNECTION POINT (NON–PROJECT)

COMMERCIAL BUILDING

MAIN ST

ANDROSCOGGIN RIVER

WATER ST

PROJECT PLAN
SCALE: 1"=80'

Alternative U3 - New Fish Lift

BRUNSWICK HYDROELECTRIC PROJECT
BROOKFIELD WHITE PINE HYDRO LLC
FERC NO. 2284

F-1
PROJECT PLAN

80' 0 80' 160'
SCALE: 1" = 80'

MN
14°47'W ± 0°6'
AS OF 08/2024
CHANGING BY
0°6'E PER YEAR

MILL RD

SUMMER ST

MAIN ST

57'–0" NON–OVERFLOW DAM

48'–0" EMERGENCY SPILLWAY

80'–0" TAINTER GATE

7 F–3

6 F–3

5 F–3

OVERHEAD ELECTRIC

322'–0" CONC. UNCONTROLLED SPILLWAY

4 F–3

170'–0" CONC. LONG FISH BARRIER WALL

SHAD ISLAND

3 F–3

188'–0" CONC. SPILLWAY WITH FLASHBOARDS

APPROX. EDGE OF WATER (TYP.)

2 F–3

Gap in Net for DS Migrants

BOAT BARRIER

Anchor Cables

Guidance Nets

New Fishheart System

Existing Fishway to Remain

ANDROSCOGGIN RIVER

PROJECT POWERHOUSE (SEE F–2)

Transport Pipe To Sorting Facility

Transport Pipe To Exit Flume

New Bridge

PROJECT UNDERGROUND ELECTRIC LINE

Fishheart Control Building

1 F–3

Existing Sorting Facility

18,000/24,000 KVA, 12.47–34.5 KV, 3 PHASE, 60 HERTZ PROJECT TRANSFORMER

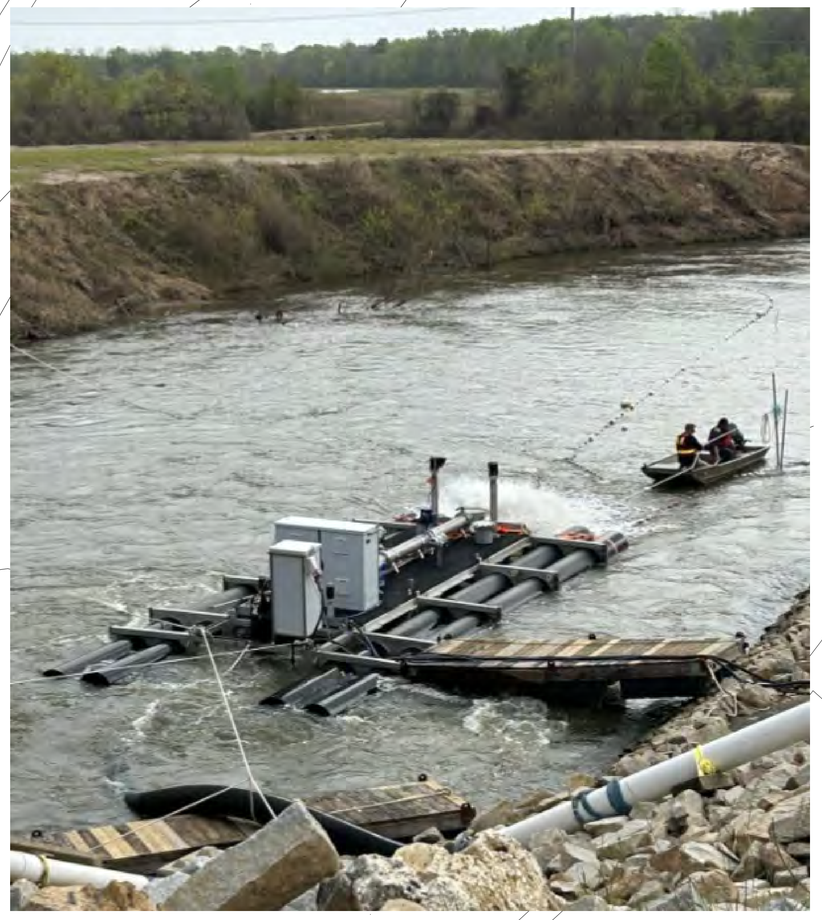
Existing Exit Flume

INTERCONNECTION POINT (NON–PROJECT)

COMMERCIAL BUILDING

MAIN ST

WATER ST



PROJECT PLAN
SCALE: 1"=80'

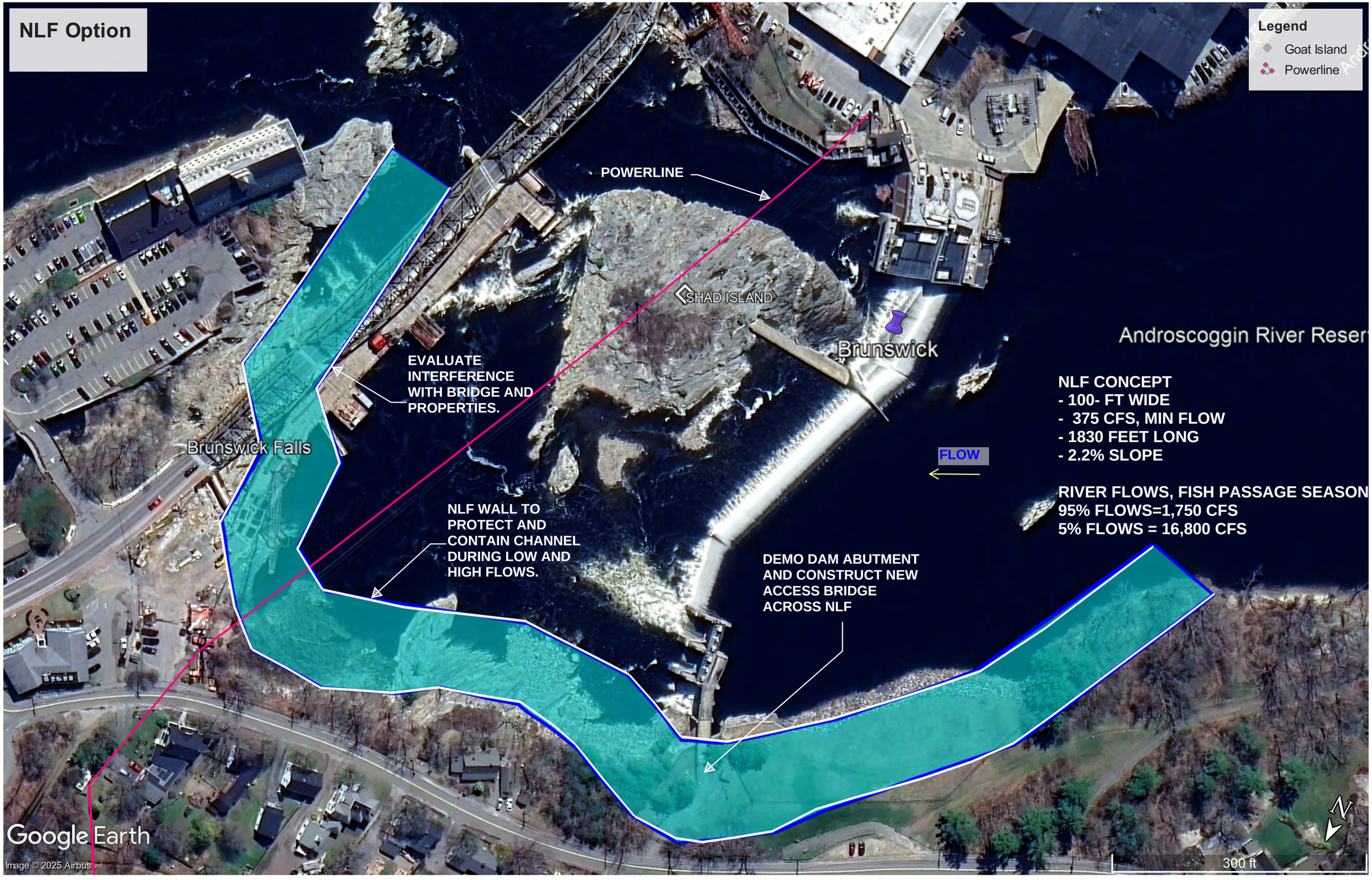
Alternative U4 - New Fishheart System

BRUNSWICK HYDROELECTRIC PROJECT
BROOKFIELD WHITE PINE HYDRO LLC
FERC NO. 2284

F-1
PROJECT PLAN

80' 0 80' 160'
SCALE: 1" = 80'

NLF Option


Legend
Goat Island
Powerline
POWERLINE
SHAD ISLAND
Brunswick
Androscoggin River Reser
EVALUATE INTERFERENCE WITH BRIDGE AND PROPERTIES.
Brunswick Falls
NLF CONCEPT
- 100- FT WIDE
- 375 CFS, MIN FLOW
- 1830 FEET LONG
- 2.2% SLOPE
FLOW
RIVER FLOWS, FISH PASSAGE SEASON
95% FLOWS=1,750 CFS
5% FLOWS = 16,800 CFS
NLF WALL TO PROTECT AND CONTAIN CHANNEL DURING LOW AND HIGH FLOWS.
DEMO DAM ABUTMENT AND CONSTRUCT NEW ACCESS BRIDGE ACROSS NLF
Google Earth
Image © 2025 Airbus
300 ft

"Free the Andro" NLF Option

BEDROCK EXCAVATION

DEBRIS BOOM

NLF CHANNEL MODIFICATION FOR SLOPE AND LOW FLOW CHANNEL

NEW SPILLWAY GATES

BEDROCK EXCAVATION

Androscoggin River

NEW 20-FT TALL SPILLWAY WALL 685 ft

Goat Island

NEW 5FT TO 20-FT TALL SPILLWAY WALL, 580 ft

131 ft

OVERHEAD POWERLINE

Brunswick

Androscoggin River Reservoir

1,789 ft

45 ft

nswick Falls

316 ft

286 ft

NLF CONTROL WEIRS OR ROCK ARCH RAMPS TO PROVIDE HEADPOND ELEVATION

NLF CHANNEL IN RIVER BOTTOM. FILL AND EXCAVATION GRADING AS REQUIRED FOR SLOPE. ADDITIONAL WEIRS NOT SHOWN

DEMO EXISTING ABUTMENT, GATES, SPILLWAY

Legend

- Goat Island
- Powerline

FTA NLF CONCEPT
- WIDTH VARIES
- 375 CFS, MIN FLOW
- 2560 FEET LONG
- 1.6% SLOPE

RIVER FLOWS, FISH PASSAGE SEASON
95% FLOWS=1,750 CFS
5% FLOWS = 16,800 CFS

N

500 ft

Google Earth