Woodland Fish Passage Project

Project Overview

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1. Introduction

This document provides an overview of the Woodland Fish Passage Project and describes the fishway designs and ancillary components. The State of Maine's Department of Marine Resources (Maine DMR) contracted Verdantas (formerly Alden) as the design engineer for the project. The intent of this document is to aid in understanding the proposed project features and to provide a preview in anticipation of the State of Maine's intent to solicit bids for this project. This document should not be used for bidding purposes.

1.1 Description of Project Site and Existing Structures

The Woodland Dam, located within the Woodland Pulp papermill in Baileyville, Maine, spans the St. Croix River, which serves as a 68-mile international boundary between the United States and Canada in eastern Maine. This river has a drainage area of 1,631 square miles at its mouth, where it flows into Passamaquoddy Bay. Constructed in 1906, predating the Federal Power Act, the Woodland Dam is a concrete gravity structure founded on bedrock and authorized through Congressional Authorization rather than Federal Energy Regulatory Commission (FERC) licensing. The dam facility comprises a powerhouse, headworks, principal and emergency spillways, process water intake, and a fishway. Its total length, including spillways, is approximately 1,910 feet, with the dam structure itself measuring 730 feet long and 48 feet high. The main spillway is equipped with five manually operated Tainter gates, each measuring 6 feet by 12.5 feet. The emergency spillway, divided into Canadian and American sections, includes flashboards supported by steel frames, which are manually installed and removed. A 250-foot low concrete training wall below the dam separates flow to either side of an island in the downstream channel.

The right abutment of the dam's American side includes a non-overflow section known as the hydraulic wall, measuring 795 feet in length, with a maximum height of 37 feet and a crest width of 5 feet at an elevation of approximately 145.6 feet (North American Vertical Datum of 1988, NAVD 88). Adjacent to this section are the headworks and powerhouse, which house seven turbine-generator units essential for plant operations. The dam infrastructure directly supports significant operational facilities for Woodland Pulp. The Project site also includes a 730-foot long Denil fishway, which was installed in 1966. This fishway primarily serves to facilitate the upstream of migratory fish. An aerial view of the project is shown on Figure 1.

Figure 1. Aerial Photograph of Woodland Dam

1.2 Description of Proposed Project

The purpose of the proposed project is to provide improved upstream and downstream passage for migratory fish, primarily Alewives, Blueback Herring, American Shad, and American Eel. A new fish lift will be constructed on the island with an entrance near the existing Denil fish ladder entrance. The existing Denil ladder will be demolished and replaced with new fishways. The fish lift will transport fish from the tailrace to an elevated exit flume connected to the head pond. A fish ladder will be installed with an entrance at the downstream end of the island. The fish ladder will extend upstream adjacent to the spillway channel and connect to the fish lift exit channel. Downstream bypasses within the intake will connect to a new steel flume attached to the downstream side of the intake, above the powerhouse and transport fish via an elevated pipe to the tailrace, discharging adjacent to the fish ladder entrance. A second bypass will be located at the downstream end of the fish lift exit flume and discharge adjacent to the fish lift entrance. A new bridge will be installed across the tailrace to accommodate access to the island for construction, operations and maintenance. An overview of the proposed facilities is provided on Figure 2. Descriptions of major project components follow.

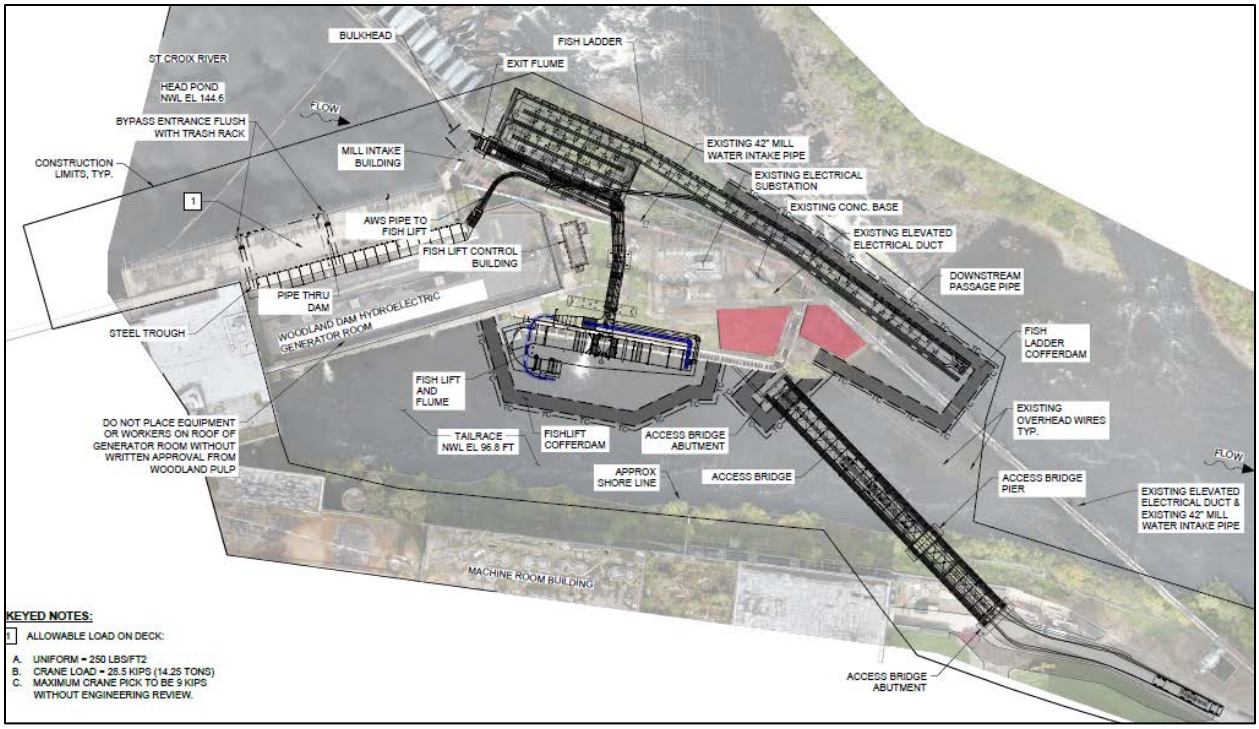

Figure 2. Woodland Fish Passage Project, Overall Site Plan (showing proposed cofferdams)

1.2.1 Fish Lift

The fish lift consists of an 8 ft wide concrete entrance channel, 20 ft long, that turns 180 degrees and increases in width to 14 ft. The entrance channel includes an isolation gate and a hinged flap gate that adjusts with tailwater level to maintain a constant entrance velocity. The 14 ft wide concrete channel is 114 ft long with a top wall elevation of 110 ft and a bottom elevation of 88.5 ft. The channel includes a V-gate, a hopper recessed below the channel, isolation gates, and flow conditioning baffles, sills and weirs upstream of the hopper. Flow enters the channel from three supply pipes at the upstream end of the channel. The hopper is 490 cubic ft in volume and is lifted via a hoist to a discharge elevation of 146 ft. A steel superstructure with a top elevation of 178 ft supports the hopper hoist and lift and includes access stairs and walkways. A three-dimensional view of the fish lift is shown on Figure 3.

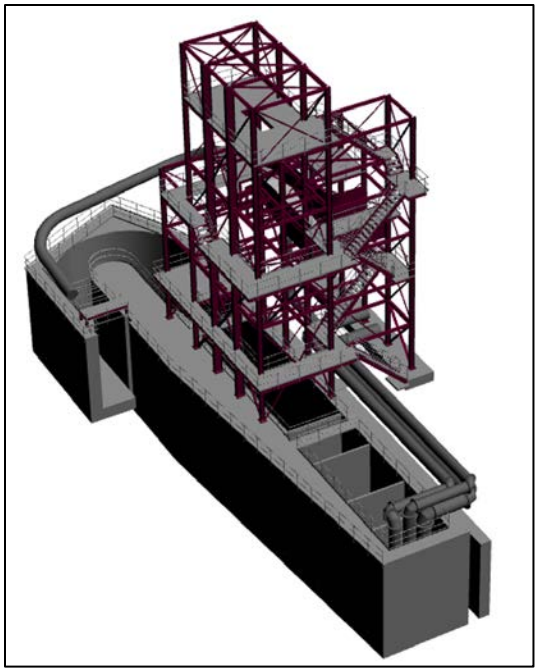

Figure 3. Fish Lift Isometric View

1.2.2 Fish Lift Exit Flume

An exit flume provides egress above the dam for fish lifted from the tailrace by the hopper. The exit flume is 8 ft wide and 10 ft high with a bottom elevation that varies from 137.4 ft at the tower to 135.2 ft at the head pond. The steel portion of the flume extends from the tower approximately 90 ft where it meets the fish ladder and transitions to an elevated concrete flume for approximately 110 ft to the head pond. The concrete portion of the exit flume includes a crowder to guide fish to a viewing window in the concrete wall of the flume. A wedgewire screen auxiliary water intake, 8 ft wide by 20 ft long, is located within the floor at the upstream end of the flume.

1.2.3 Downstream Fish Bypass Systems

Two downstream bypass entrances are included at the hydropower intake within a new 0.75 inch clear spaced trash rack (by others). Each entrance opening is 3 ft wide and 6 ft high, flush within the new rack, and transitions to a 36-inch diameter pipe that is routed through the headwall and dam into a steel trough attached to the dam above the powerhouse. These components are referred to as Fish Bypass 3 in the construction drawings. Additionally, three circular eel bypasses, each 6 inches in diameter, are routed from the intake rack through the headwall and dam into the same steel bypass trough. The three eel bypasses are plumbed so that each can be isolated and backflushed with a submersible backwash pump located within the bypass trough. The steel bypass trough runs along the dam for 160 ft to a flow control weir and then transitions to a pipe routed 380 ft to a discharge point adjacent to the fish ladder entrance. This bypass pipe is referred to as Fish Bypass 1 in the construction drawings. A second downstream fish bypass system is located at the end of the fish lift exit flume on the fish lift tower. The exit flume terminates at a flow control weir and transitions to a 36-inch diameter steel pipe. The bypass pipe is routed

around the tower with a discharge near the fish lift entrance and is referred to as Fish Bypass 2 on the construction drawings.

1.2.4 Auxiliary Water System

Water is supplied to the fish lift entrance channel for attraction flow via the auxiliary water system (AWS). The system is comprised of three separate supply pipes and intakes. The systems are referred to as AWS Pipe 1, 2, and 3 on the construction drawings. AWS Pipe 1 includes an 8 ft wide by 20 ft long intake screen on the floor of the fish lift exit flume at the upstream end near the head pond. The intake transitions to a 30-inch steel pipe and runs below the fish lift exit flume for approximately 260 ft to the upstream end of the fish lift entrance channel. AWS Pipe 2 intake is 5.5 ft wide by 14.5 ft long, starts at an intake screen on the floor of the steel bypass trough and runs under the fish lift exit flume for approximately 267 ft to the upstream end of the fish lift entrance channel. This pipe is a 24-inch diameter steel pipe. AWS Pipe 3 intake is 8 ft wide by 10 ft long, starts at an intake screen near the Fish Bypass 2 flow control weir at the end of the fish lift exit flume. This 24-inch diameter pipe runs along the fish lift tower for 95 ft to the upstream end of the fish lift entrance channel. All three AWS pipes include butterfly valves to modulate flow.

1.2.5 Fish Ladder

A pool and chute fish ladder is located on the north side of the island with an entrance just downstream of where the existing mill water piping crosses the tailrace. The fish ladder is comprised of pools that are 8 ft wide by 8 ft long with a normal water depth of 4.75 ft and a drop of 9 inches from pool to pool. A sloping weir, 2 ft wide by 2.5 ft long, separates each pool with a normal depth through the weir of 21 inches. The fish ladder includes an entrance gate overflow weir that adjusts with the tailwater level to maintain a constant velocity. The fish ladder extends upstream along the north side of the island for approximately 650 ft at a 9.375% slope and connects with the fish lift exit flume, with a total of 65 pools. An adjustable overflow weir gate is located at the top of the ladder where it connects to the fish lift exit flume to control flow. The fish ladder is reinforced concrete construction, and the top half of its length is elevated and supported by concrete columns.

1.2.6 Bridge

The Project includes a new access road and a 13.5 ft wide prefabricated bridge to provide access to the island. The bridge crosses the tailrace with two spans: 160 ft and 67 ft, with a pier at the edge of water on the shoreside bank.

1.2.7 Equipment and Control Building

The Project includes a 12 ft by 30 ft prefabricated equipment building to house electrical and control systems and the air backwash cleaning system for the wedgewire intake screens. The building will also include a workspace for fishway monitoring and controls.

1.3 Anticipated Construction Schedule

Construction of the proposed facilities is scheduled to begin in 2025 with an estimated duration of approximately 24 to 30 months.

The existing Denil fish ladder must remain in operation through June 15, 2025. Installation of the new fish ladder should be prioritized to minimize potential lapse in fish passage or a need for temporary fish passage facilities. The new fish ladder must be operational no later than May 15, 2027.

The Woodland Mill has an annual maintenance outage (AMO) for the paper mill each year. During the AMO construction may need to be reduced and/or suspended and will be coordinated with Woodland Pulp to minimize impacts to Woodland's AMO activities. The AMO for 2025 is scheduled for May 10 through May 25th.

1.4 Permitting

The permits for the Project are summarized in the table below. Several other international, federal, state, and local environmental regulations have reviewed, and those requirements either do not apply or are being fulfilled by the permits listed below.

Permit	Description	Current Status	Anticipated Timeline
USACE Pre-construction Notification	Federal requirement for work in navigable waterways over certain thresholds.	Submitted 10/4/24, under USACE review, awaiting verification	1/31/25
Maine Historic Preservation Commission Notice	Notification as part of USACE PCN.	Complete – No effect correspondence received 11/4/24	NA
Maine Tribal Historic Preservation Office Notice	Notification as part of USACE PCN.	Complete	NA
IJC St. Croix R Bd of Control review	Not required.	NA	NA
National Environmental Policy Act (NEPA)	NOAA will prepare. Sturgeon BA prepared & submitted to NOAA.	In preparation	Jan. 2025
Maine Waterways Development & Conservation Act permit	State requirement for and Water Quality Certification for construction, reconstruction or structural alteration of a hydropower generating project.	Submitted 10/28/24, under MEDEP review, awaiting permit	Feb. 2025
Baileyville Building Permit	Town building permit	Application submitted, awaiting scheduling for town bd mtg.	Feb. 2025