TECHNICAL MEMORANDUM

To: Randy Dorman, Brookfield

From: Kleinschmidt

Date: May 17, 2022

Re: **Cost Assessment of NLF Conceptual Design Filed with FERC by MDMR for the Shawmut Project Relicensing**

In July 2021 the Federal Energy Regulatory Commission (FERC) issued a draft Environmental Assessment (DEA) for the relicensing process for the Shawmut Project (Project), located on the Kennebec River, Maine. In August 2021 Maine Department of Marine Resources filed comments on the DEA, including a conceptual design for a nature-like fishway (NLF) for the Project. In December 2021 MDMR filed additional comments with FERC updating their recommendations for fish passage at Shawmut. In that letter, MDMR reiterated their recommendation for an NLF at the Shawmut Project, noting that the NLF should "follow the USFWS Fish Passage Engineering Design Criteria (2019)".

At the request of Brookfield White Pine Hydro (BWPH) Kleinschmidt conducted a technical review of the August 2021 MDMR conceptual design, including a review of Kleinschmidt's prior evaluation of fish passage options at three of BWPH's lower Kennebec River hydropower project, and site-specific design considerations. As presented in a technical memorandum dated September 15, 2021, the technical review included review of MDMR's two conceptual NLF designs (submitted in August 2021) against USFWS design criteria for NLFs (e.g., dimensions, flow control, and velocities), site conditions (layout constraints and existing/prior land uses), fish passage considerations (passage capacity, resting pools), and costs. At BWPH's request, this supplement to the September 15, 2021 memorandum is being provided to summarize the cost component of that design review. Costs estimates developed as part of the 2021 review were specific to the MDMR alternatives as presented and did not account for or include costs for any design considerations that would be necessary to address USFWS design criteria (2019).

COST ASSESSMENT

MDMR's filing of design concepts for a NLF at Shawmut provides no assessment of cost and maintenance requirements, which are fundamental to understanding the feasibility of a proposed design.

Kleinschmidt estimated the cost for the two design alternatives based on the drawings filed with FERC by calculating a square foot cost for the channel construction portion of the NLF using the detailed breakdown of the Howland bypass construction costs. In addition to the channel construction cost we included allowances for the access bridge, the hydraulic control structure, additional flood protection, and relocation of the exiting utilities. Kleinschmidt did not assess the feasibility of relocating the canoe portage to the east bank of the river, but assumed that given

Brookfield ownership of property, associated costs would be nominal in comparison to the much more significant components of constructing a NLF at the project.

We assumed that the bridge and hydraulic control structure would be 110 feet long for the maximized width option and 90 feet long for the reduced width option. We assumed a 14-foot wide two span single lane steel girder bridge would be required. Cost for the access bridge were based on comparative bridge costs published by the California Department of Transportation. We used the high range of cost and increased it by 100 percent to account for uncertainties in the design.

Due to the uncertainties around the design and function of the hydraulic control structure Kleinschmidt assumed it would be a large concrete structure with multiple Obermeyer style gates to control flow into the fishway. For the maximized width NLF we assumed six gates would be installed across the full width of the channel with two additional gates in series with the low flow channel. For the reduced width NLF we assumed five gates would be installed across the full width of the channel with two additional gates in series with the low flow channel. For both alternatives we assumed a new control building would be located on top of the northern bank of the bypass channel upstream of the dam. Costs for the hydraulic control structure were estimated using recent quotes from another project.

To account for the potential need to provide increased flood protection we assumed the area upstream of the existing cutoff wall would be raised to elevation 122 to match the existing earthen dike. We also assumed a sheet pile cutoff wall would be driven along the length of the new earthen dike to prevent seepage. Cost for the flood protection measures were calculated using estimated quantities and unit prices from RS Means.

All costs were escalated to present day (2021) value using RS Means Historic Cost Index and include an additional 50 percent contingency which is standard practice for Class 5 (AACE - Concept Screening level) estimates.

Based on the above assumptions, the total cost estimated in our 2021 review was $16.2M for the maximized width option and $14.0M for the reduced width option. These estimates do not include any additional costs associated with design, permitting, owners administration, contaminated site remediation, infrastructure modification, effectiveness testing, or lost generation. Costs also do not include any design considerations that would be necessary to address USFWS design criteria (2019).