DEER ISLAND HYDROELECTRIC PROJECT, LIHI #43

REVIEW OF APPLICATION FOR RE-CERTIFICATION BY THE LOW IMPACT HYDROPOWER INSTITUTE

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I. BACKGROUND

This report reviews the application submitted by the Massachusetts Water Resources Authority (Applicant) to the Low Impact Hydropower Institute (LIHI) for Low Impact Hydropower recertification for the Deer Island Hydroelectric Project (Project), LIHI #43. The Federal Energy Regulatory Commission (FERC) licensed the Project with an Exemption (Conduit) (FERC No. 11412) on November 9, 1993, permitting the construction, operation and maintenance of two bevel-gear-bulb full-Kaplan turbines rated at 1,100 kilowatt (kW) each. Due to significant construction delays, the two generators were started and placed on-line in July 2001. The energy generated by the facility is used exclusively to provide electrical power to the co-located wastewater treatment facility.

The Project is located in the vicinity of the pumping station at the Deer Island Wastewater Treatment Facility on Deer Island, in Boston Harbor, Boston, Massachusetts (**Figure 1**). As a conduit project, hydropower is generated as treated wastewater from the treatment plant is discharged into an effluent channel. The flow is then split between two separate concrete conduits going to two corresponding hydro turbines. The two intake openings are approximately 20 feet by 18 feet and decrease to 11 feet by 11 feet immediately upstream of the two Kaplan turbines, with a total installed capacity of 2,200 kW. The powerhouse is approximately 100 feet by 100 feet. Maximum unit flow that the turbines can accommodate is equivalent to the maximum flow (640 million gallons per day) through the secondary treatment plant. The mode of operation of the Project is to harness the energy contained in the treated wastewater effluent as it drops from the treatment plant's disinfection basin through the conduits to the turbines. After exiting the turbines, the effluent conduit joins the outfall chute which discharges into a 400-foot-deep outfall shaft, which drops the effluent into a 9.5-mile rock outfall tunnel leading to Massachusetts Bay.

Figure 1: View of Deer Island Treatment Plant and Location of Deer Island Hydroelectric Project

The Project's instrumentation and control system are part of the overall wastewater treatment control system and can be operated unattended. If wastewater flow is in excess of the 640 million gallons per day capacity, the disinfected wastewater is discharged through a separate effluent channel directly to the outfall tunnel.

The Project was originally certified as Low Impact on August 6, 2009 with an expiration date of August 6, 2014. The Project was recertified on August 6, 2014, expiring August 6, 2019. The current certification term was extended to November 30, 2019 and again to January 15, 2020 to accommodate the current recertification process. The original and recertification reviewer's reports can be found at: https://lowimpacthydro.org/lihi-certificate-43-deer-island-hydropower-project-massachusetts-ferc-11412/.

The current certification contains no LIHI conditions.

II. RECERTIFICATION PROCESS AND STANDARDS

Under the current LIHI Handbook, 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, if the only issue is that there is some missing information, a Stage II review may not be required. These standards also state that "material changes" mean non-compliance and/or new or renewed issues of concern that are relevant to LIHI's criteria. If the answer to either question (2) or (3) is "Yes," a more thorough review of the application using the LIHI criteria in effect at the time of the recertification application, and development of a complete Stage II Report, is required. As a result, all Projects currently applying for renewal must go through a full review unless their most recent certification was completed using the current Handbook.

III. ADEQUACY OF APPLICATION

The 2019 recertification application stated that there were no material changes in the Project design or operation since operation began in 2001. In accordance with the Recertification Standards, "material changes" mean changes in operations, non-compliance and/or new or renewed issues of concern, or delays or lack of implementation of commitments that are relevant to LIHI's criteria. A review of the initial application, dated July 31, 2019, resulted in a Stage I or Intake Report, dated August 29, 2019. The Stage I assessment found there were no "material changes" at the Project. The initial application was complete enough to be posted for public comment since only a limited amount of data was missing.
This Stage II assessment included review of the application package and review of annual compliance statements received by LIHI during the past term of Certification. In my opinion, the materials provided and referenced above are sufficient to make a recertification recommendation.

The application was publicly announced on October 8, 2019 and the deadline for submission of comments was December 7, 2019. LIHI received no public or agency comments on the Project. Additional outreach to local resource agencies was deemed not necessary based on a review of agency comments from the original and first recertification periods.

IV. ZONES OF EFFECT AND SUMMARY OF COMPLINACE WITH LIHI CRITERIA

Only one Zone of Effect (ZOE) is applicable. The Project intake and discharge are located on two levels of a manmade conduit system. Figure 2 shows the Deer Island Treatment Plant process flow diagram with the Project included.

The following matrix summarizes the standards selected by the Applicant for the Project. I found that these standards are appropriate, sufficient supporting data was provided, and this data demonstrated compliance with the criteria and standard selected. Details of compliance with the criteria are presented below.

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

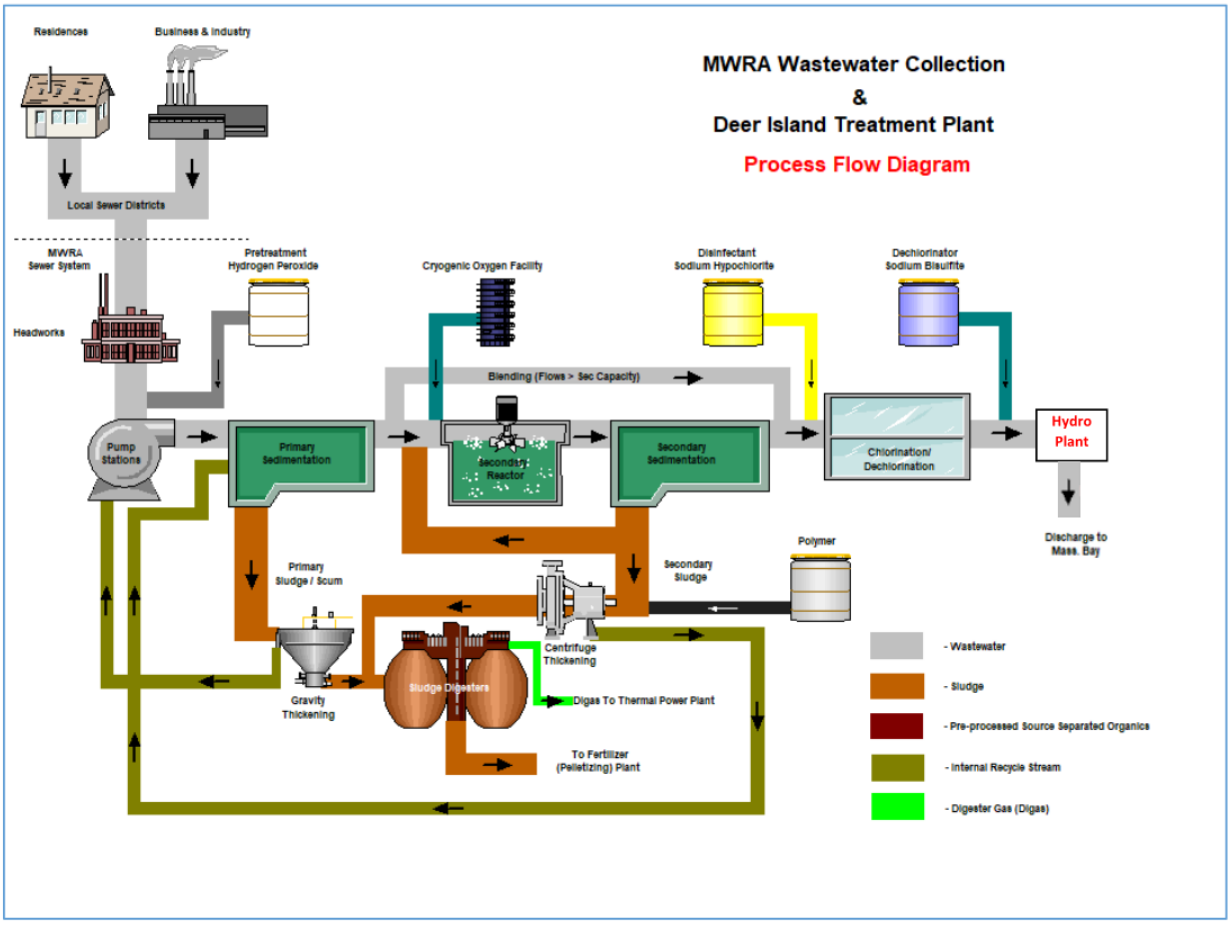

Figure 2. Deer Island Treatment Plant Process Flow Diagram

V. REGULATORY AND COMPLIANCE STATUS

FERC Exemption

On November 9, 1993, FERC issued an order granting exemption from licensing (Conduit Exemption) for the Project. The Applicant is required to adhere to Article 2 of the exemption which requires compliance with the terms and conditions prepared by federal or state fish and wildlife agencies to protect fish and wildlife resources. At the time the exemption was issued, fish and wildlife agencies commented on the Project but did not file terms and conditions for the Project.

Water Quality Certification

Water quality certification was not required for the Project since it is a conduit hydropower facility within a wastewater treatment system. The Project is subject to the National Pollution Discharge

Elimination System (NPDES) permit for the Deer Island Treatment Plant. Information regarding the NPDES permit is discussed in the ***Water Quality*** section below.

Regulatory Compliance

A review of the FERC database eLibrary from August 6, 2014 through September 9, 2019 found no records of Project non-compliance.

VI. DETAILED CRITERIA REVIEW

A. *Ecological Flows*

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.

The Applicant has appropriately selected **Standard A-1, Not Applicable/De Minimis Effect**. In the initial application for the Project, the Applicant indicates a Standard A-2 in Table B-1. However, the associated text and Table B-1.2 both indicate a Standard A-1. I believe the Applicant's indication of Standard A-2 in Table B-1 is a typo. The Project is a conduit hydropower facility within the Deer Island Waste Water Treatment Plant. It receives wastewater from the disinfection basin and discharges it into a shaft which further conveys the wastewater to the 9.5-mile long outfall tunnel 120 feet below the treatment plant surface, which ultimately discharges into the deeper waters of Boston Harbor. The nature of the conduit Project, being installed in existing conduit channels to capture the flow and fall of treated wastewater before the effluent enters the outfall tunnel, eliminates any potential impact of the Project on the surrounding environment.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Ecological Flow Regimes 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.

The Applicant has appropriately selected **Standard B-1, Not Applicable/De Minimis Effect**. Based on my review of the application and Project operation, I have determined that the Project does not alter the physical, chemical, or biotic water characteristics necessary to support fish and wildlife resources or human water uses (e.g., water supply or recreation). According to the U.S. Environmental Protection Agency (EPA), the Deer Island Wastewater Treatment Plant NPDES permit "imposes rigorous conditions to ensure the protection of Massachusetts and Cape Cod Bays. In fact, the permit is the most comprehensive of its type ever issued for a municipal discharger. The permit includes unprecedented ambient monitoring requirements, stringent pollution prevention, and best management practice requirements; and a first-of-its-kind requirement to implement a

"contingency plan", to help ensure that any unexpected problems are dealt with swiftly.

More information regarding the NPDES permit can be found at links below:
http://www.mwra.state.ma.us/harbor/html/bhrecov.htm and
https://www.epa.gov/npdes-permits/epas-permit-massachusetts-water-resources-authority-mwra-outfall.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Water Quality criterion.

The Project Passes Criterion B – Water Quality

C. ***Upstream Fish Passage***

Goal: The Project 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, sustainable fish and wildlife resources in areas affected by the facility.

The Applicant has appropriately selected **Standard C-1, Not Applicable/De Minimis Effect**. There is no requirement for upstream passage at the Project and the Project does not impede or impact fish movement in Boston Harbor since it is located entirely within the treatment plant effluent discharge and fish cannot enter the Project conduit or turbines.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Upstream Fish Passage criterion.

The Project Passes Criterion C – Upstream Fish Passage

D. ***Downstream Fish Passage and Protection***

Goal: The Project 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. All migratory species are able to successfully complete their life cycles and to maintain healthy, sustainable fish and wildlife resources in the areas affected by the Facility.

The Applicant has appropriately selected **Standard D-1, Not Applicable/De Minimis Effect**. There is no requirement for downstream passage at the Project. Fish species are unable to enter the Project conduit or turbines.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Downstream Fish Passage criterion.

The Project Passes Criterion D – Downstream Fish Passage

E. Watershed and Shoreline Protection

Goal: The Project 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.

The Applicant has appropriately selected **Standard E-1, Not Applicable/De Minimis Effect**. The Project is located on Deer Island, which has longstanding use for the sewage disposal facility. The first treatment plant was constructed on Deer Island in the late 1800s. Construction of the current Deer Island Wastewater Treatment Plant began in 1995. The existing plant consists of a grit facility, primary/secondary clarifiers, digesters, centrifuges, gravity thickeners, disinfection basins, a thermal power plant, storage tanks, and cryogenic plant. The land surrounding the plant is highly developed and resistant to erosion. The Project is located inside of the treatment plant and has no direct access to land or shorelines.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Shoreline and Watershed Protection criterion.

The Project Passes Criterion E – Shoreline and Watershed Protection

F. Threatened and Endangered Species Protection

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

The Applicant has appropriately selected **Standard F-1, Not Applicable/De Minimis Effect**. Regarding the discharge to the Massachusetts Bay, the Deer Island Wastewater Treatment Plant's NPDES permit prohibits any adverse effect on critical habitat for endangered species. Because some chemicals may have synergistic effects, the permit also requires the Applicant to periodically test the toxicity of the effluent as a whole on sensitive marine organisms, and establishes strict limits based on those tests. In addition to requiring the Applicant to monitor the discharge itself, the permit also requires the Applicant to implement one of the most extensive ambient monitoring programs (i.e. monitoring of conditions in Massachusetts and Cape Cod Bays) for any treatment plant of its kind in the United States. This multimillion-dollar program includes 43 monitoring stations which collect data on everything from nutrients to heavy metals to algae blooms. Monitoring results are compared with an extensive set of pre-discharge baseline data, to help assess any impact of the discharge.

The Massachusetts Natural Heritage Program[1] lists six rare species known to exist within the park, including two species listed as threatened (T) and four of special concern (SC). They are the birds barn owl (SC), common tern (SC), least tern (SC), and Northern harrier (T), and the plants seabeach dock (T) and American sea blite (SC).

The U.S. Fish and Wildlife Service (FWS) reports several federally listed endangered and threatened species of fish, turtles, birds, and mammals near or in coastal waters of Massachusetts, but not known to be found among the Boston Harbor Islands. There are no island species on the federal list. An

[1] https://www.nps.gov/boha/learn/nature/animals.htm

August 29, 2019 check of FWS's IPac online mapping tool[2] for Deer Island lists these federally threatened species but indicates there are no critical habitats for these species in the Project area.

- Northern long-eared bat
- Piping Plover (bird)
- Red Knot (bird)

The Project does not affect any of the species listed above. The Project is located inside of the treatment plant and these species do not have access to the Project features.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Threatened and Endangered Species Protection criterion.

The Project Passes Criterion F – Threatened and Endangered Species Protection

G. ***Cultural and Historic Resources Protection***

Goal: The Project does not unnecessarily 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.

The Applicant has appropriately selected **Standard G-1, Not Applicable/De Minimis Effect**. The Project is located in the vicinity of the original Deer Island treatment facility. Deer Island has been used as a sewage disposal facility since the 1800s, the original steam pump station was built from 1894 to 1899 and is eligible for the listing on National Register of Historic Places. The steam pump station was restored by the Applicant and is displayed at the treatment facility's administration building and training center.

In addition, the Project is located in the vicinity of the New Resthaven Cemetery and Piggery Point, both historic burial grounds. As a result, the FERC exemption included Article 401 which required the Applicant to provide FERC with revised Project design drawings and specifications depicting the location of the historic burial grounds and describing the measures that the Applicant would implement to avoid any project-related construction activities at the historic burial grounds. In an order approving revised project design drawings issued on May 3, 1994, FERC notes the Applicant provided the necessary design drawings and mitigation measures and noted that all construction-related activities were not in the vicinities of the two burial grounds. No further communication between FERC and the Applicant on this topic was found.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Cultural and Historic Resources criterion.

The Project Passes Criterion G – Cultural and Historic Resources

[2] https://ecos.fws.gov/ipac/

H. ***Recreational Resources***

Goal: The Project 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.

The Applicant has appropriately selected **Standard H-1, Not Applicable/De Minimis Effect**. There are no regulatory requirements to develop recreational features at the Project. Surrounding the treatment facility, Deer Island features five miles of public walkways for walking, jogging, sightseeing, picnicking, fishing, and bicycling. While the Applicant does provide limited tours of the treatment facility, the area of the facility where the Project is located is not accessible to the general public. Deer Island is also part of the Boston Harbor Islands National and State Park[3] and provides recreational access to the public.

Based on my review of the application, supporting documentation, and publicly available information, the Project satisfies the Recreational Resources criterion.

The Project Passes Criterion H – Recreational Resources

VII. GENERAL CONCLUSIONS AND REVIEWER RECOMMENDATION

In conclusion, I believe the Deer Island Project has satisfied the requirements of the **Not Applicable or De Minimis Effect** standard for all criterion, and therefore should be considered a Very Low Impact facility with a ten-year term. I recommend recertification with no conditions.

[3] https://www.bostonharborislands.org/deer-island/