UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

New England Hydropower Company, LLC Project No. 14550-001 – CT

# NOTICE OF AVAILABILITY OF ENVIRONMENTAL ASSESSMENT

(May 19, 2016)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's regulations, 18 CFR Part 380 (Order No. 486, 52 FR 47879), the Office of Energy Projects has reviewed the application for exemption from licensing for the Hanover Pond Dam Hydroelectric Project, to be located on the Quinnipiac River, in the city of Meriden, in New Haven County, Connecticut, and has prepared an Environmental Assessment (EA). In the EA, Commission staff analyzes the potential environmental effects of the project and concludes that issuing an exemption for the project, with appropriate environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

A copy of the EA is on file with the Commission and is available for public inspection. The EA may also be viewed on the Commission's website at http://www.ferc.gov using the "eLibrary" link. Enter the docket number, excluding the last three digits in the docket number field, to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll-free at 1-866-208-3676, or for TTY, (202) 502-8659. You may also register online at http://www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, contact FERC Online Support.

For further information, contact Erin Kimsey at (202) 502-8621 or erin.kimsey@ferc.gov.

Kimberly D. Bose,
Secretary.

# ENVIRONMENTAL ASSESSMENT FOR SMALL HYDROELECTRIC PROJECT EXEMPTION

Hanover Pond Dam Hydroelectric Project

FERC Project No. 14550-001

Connecticut

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

May 2016

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On June 26, 2015, New England Hydropower Company, LLC (NEHC) filed an application for a small hydroelectric (10 megawatts [MW] or less) exemption from licensing to construct, operate, and maintain the proposed 220-kilowatt (kW) Hanover Pond Dam Hydroelectric Project (Hanover Pond) on the Quinnipiac River, in the city of Meriden, in New Haven County, Connecticut. The project would not occupy any federal land.

## Proposed Action

The Hanover Pond Project would consist of: (1) an existing 25-foot-high, 397-foot-long concrete and earthen dam (Hanover Pond dam) that includes a 247-foot-long concrete spillway composed of: (i) a 40-foot-long section with an ogee crest elevation of 87.3 feet National Geodetic Vertical Datum 1929 (NGVD 29), (ii) a 147-foot-long section with a broad crest elevation of 87.3 feet NGVD 29, (iii) a 40-foot-long section with an ogee crest elevation of 87.0 feet NGVD 29, (iv) a 6-foot-long low-flow notch with an ogee crest elevation of 86.3 feet NGVD 29, and (v) a 14-foot-long section with an ogee crest elevation of 88.3 feet NGVD 29; (2) an existing 71-acre impoundment (Hanover Pond) with a storage capacity of 1,800-acre-feet at elevation of 87.3 feet NGVD 29; (3) an existing 40-foot-long training wall with four 4-foot-wide, 4.5-foot-high intake sluice gates; (4) an existing 12-foot-wide, 13-foot-high sluice outlet flume; (5) an existing 175-foot-long, 16-foot-wide, 10-foot-high Denil fish ladder; (6) a new 12-foot-wide, 8-foot-high intake structure and trashrack with 9-inch clear bar spacing; (7) a new 78-foot-long, 12-foot-wide, 8-foot-deep buried concrete penstock channel; (8) a new 18-foot-long, 16-foot-wide, 12-foot-high brick and concrete powerhouse; (9) a new 46.5-foot-long, 12-foot-diameter steel and concrete turbine bay containing a 46.5-foot-long, 11.65-foot-diameter 220-kW Archimedes screw turbine-generator unit; (10) a new 15-foot-long concrete tailrace; (11) a new 45-foot-long, 3-foot-wide, 2-foot-deep fish passage channel with a boulder guide-wall;[1] (12) a new automatic controller and water-level sensor; (13) a new 300-kilovolt-amp (kVA) transformer and 500-foot-long, 35-kilovolt (kV) above-ground transmission line connecting the powerhouse electrical panel to Connecticut Light and Power's regional distribution grid; and (13) appurtenant facilities.

New facilities constructed by NEHC would include the intake structure, buried channel, sluice gates, powerhouse, turbine-generator unit, tailrace, fish passage channel, boulder guide wall, above-ground transmission line, and automatic controller and water-

[1] The new fish passage channel would merge with an existing 65-foot-long, 5-foot-wide, 2-foot-deep fish passage channel that is located downstream of the entrance to the Denil fish ladder.

level sensor. The proposed project would annually generate approximately 900 megawatt-hours (MWh).

The proposed project would bypass approximately 65 feet of the Quinnipiac River downstream of Hanover Pond dam.

To protect environmental resources, NEHC proposes to: (1) operate the project in a run-of-river mode; (2) implement best management practices (BMPs) to minimize soil erosion and in-river siltation during project construction; (3) prepare an Invasive Species Monitoring and Control Plan to map existing invasive species, monitor the project area for invasive species periodically, and initiate an early detection and rapid response protocol for infestations of invasive species; (4) release a year-round minimum flow of 30 cubic feet per second (cfs) into the bypassed reach and fish passage channels;[2] (5) develop and implement an Operation, Maintenance, and Monitoring Plan (OMMP) to ensure the project operates in run-of-river mode and provides the required minimum flow; (6) install a trashrack at the intake sluice gate with a 9-inch clear bar spacing that will allow fish to pass through the Archimedes screw turbine; (7) evaluate downstream fish passage through the sluice gate and Archimedes screw turbine; (8) conduct a pre-construction freshwater mussel survey to locate and identify any mussels present in the project area; (9) excavate the new fish passage channel and construct the new boulder guide wall to guide fish away from the proposed tailrace to the existing fish passage channel and ultimately to the Denil fish ladder entrance; (10) conduct a fish ladder use study; (11) install a trap to collect and transport juvenile eels attracted to the project tailrace; (12) conduct a water quality monitoring survey for up to 3 years after the project begins operation; (13) implement an impoundment refill procedure after drawdowns associated with flashboard replacement, dam maintenance, or emergencies where no more than 10 percent of inflow is stored and 90 percent of inflow is released to protect habitat and water quality downstream of the dam; (14) construct signage to identify an existing portage around the western end of the dam; and (15) plant vegetation to minimize the visual impacts of the proposed project facilities.

**Public Involvement and Areas of Concern**

Before filing its application for exemption from licensing, NEHC conducted a pre-filing meeting and site visit on November 19, 2014. NEHC invited federal, state, and local agencies and the general public to participate in the meetings and site visit.

[2] The 30-cfs minimum flow is expected to provide at least 2 feet of depth in the fish passage channels. NEHC indicates that it would increase the minimum flow if it is necessary to provide 2 feet of depth in the fish passage channels.

On June 26, 2015, NEHC filed its application for exemption from licensing. On July 1, 2015, the Commission issued a public notice tendering the final application for exemption from licensing and soliciting additional study requests. There were no requests for additional studies. On September 16, 2015, the Commission issued a public notice accepting the application, soliciting motions to intervene, stating the Commission's intent to waive scoping, stating that the application was ready for environmental analysis and requesting comments, terms and conditions, and recommendations. The U.S. Department of the Interior (Interior) and National Marine Fisheries Service (NMFS) made filings in response to the Commission's September 15, 2015, notice.

The primary issue associated with the construction and operation of the Hanover Pond Hydroelectric Project is maintaining safe and effective upstream and downstream passage for American eel, American shad, alewife, and blueback herring.

**Alternatives Considered**

This Environmental Assessment (EA) analyzes the effects of project operation and recommends conditions for any exemption from licensing that may be issued. In addition to NEHC's proposal, we consider two alternatives: (1) the applicant's proposal including the section 30(c) conditions issued by Interior and NMFS, the water quality certification conditions issued by Connecticut Department of Energy and Environmental Protection (Connecticut DEEP), and additional measures recommended by staff (staff alternative) and (2) a no-action alternative – denial of the exemption application.

In addition to NEHC's proposed measures, the 30(c) conditions, and the water quality certification conditions, the staff alternative would require NEHC to: (1) modify the OMMP to measure and report depth in the fish passage channels; (2) consult with the Connecticut State Historic Preservation Officer (Connecticut SHPO) prior to implementing any project modifications, including maintenance activities, land-clearing or land-disturbing activities, or changes to project operation or facilities, that do not require Commission approval but could affect cultural resources; (3) consult with the Connecticut SHPO if previously unidentified cultural resources are discovered during the course of constructing, maintaining, or developing project works or other facilities; (4) use silt fencing and surveys to exclude and remove Eastern box turtles and wood turtles from construction sites; and (5) implement BMPs to reduce the potential for chemical or fuel spills during construction. Below we briefly discuss the anticipated environmental effects of issuing an exemption from license for the proposed project under the staff alternative.

**Staff Alternative**

Geology and Soil Resources – Implementing the proposed BMPs would reduce the quantity of soil and sediment entering the river during project construction. Implementing BMPs for handling chemicals and fuels in the project area during construction would reduce the potential for spills. These measures would reduce the potential for water quality to be impaired by project construction.

Aquatic Resources – Operating the proposed project in a run-of-river mode, maintaining a 30-cfs minimum flow, and implementing impoundment refill procedures would protect aquatic habitat in the impoundment and in the Quinnipiac River downstream of the project. Implementing an OMMP would establish procedures for documenting compliance with run-of-river and minimum flow requirements and ensuring that adequate flow is released into the fish passage channels. Installing a trashrack with 9-inch clear bar spacing and an evaluating downstream fish passage through the sluice gate and turbine would ensure that the project provides safe and effective downstream fish passage. Conducting water quality monitoring would ensure that any adverse project effects on water quality are identified and can be addressed if needed. Trapping juvenile eels that are attracted to the project tailrace and releasing them upstream would improve upstream eel passage and provide efficient access to upstream eel rearing habitat. Excavating a new fish passage channel and evaluating effectiveness of the Denil fish ladder would ensure safe and effective upstream passage is provided at Hanover Pond dam. Conducting a freshwater mussel survey would identify mussels located in project construction areas that may need to be relocated to other areas.

Terrestrial Resources – Operating the project in the proposed run-of-river mode would maintain stable impoundment levels and minimize effects on wetland and riparian habitat. Constructing the project facilities would disturb some vegetation, but these effects would be short-term and minor. Installing silt fencing around construction sites and conducting surveys to remove Eastern box turtles and wood turtles from these areas would protect these turtle species from harm during project construction.

Threatened and Endangered Species –The federally listed threatened Northern long-eared bat (*Myotis septentrionalis*) could occur in New Haven County; however, the species has not been documented in the immediate project vicinity, and no critical habitat has been identified in the project area.[3] Because this species is not known to inhabit the project area and construction, operation, and maintenance of the proposed project would not substantially alter the existing environment (i.e. no trees would be removed), the proposed project would have no effect on the northern long-eared bat. No other federally listed species are known to occur in the project area; therefore, issuing an exemption order for the proposed project would have no effect on threatened or endangered species.

[3] http://ecos.fws.gov/ipac/

Recreation and Aesthetic Resources – Constructing signage to identify the existing portage around the western end of the dam would improve boater access between the impoundment and areas downstream of the Hanover Pond dam. Planting vegetation to screen and blend project features into the surrounding area would minimize the visual impacts of the proposed project facilities.

Cultural Resources – Construction and operation of the proposed project would not alter the historic character of the existing structures and would not disturb any known cultural resources. Redeveloping hydropower at the project site is consistent with the historic use of the Hanover Pond dam.

Consulting with the Connecticut SHPO prior to implementing any maintenance activities, land-clearing or land-disturbing activities, or changes to project operation or facilities would ensure protection of cultural resources at the project. Consulting with the Connecticut SHPO if previously unidentified cultural resources are discovered during the course of constructing, maintaining, or operating the project works or other facilities would ensure proper treatment of those resources.

**No Action**

Under the no-action alternative (denial of the application), the project would not be constructed, it would not generate an annual average of 900 MWh, and environmental resources in the project area would not be affected.

**Conclusions**

Based on our analysis, we recommend granting an exemption for this project as proposed by NEHC with the section 30(c) conditions provided by Interior, NMFS, the water quality certification conditions provided by Connecticut DEEP, and two additional staff-recommended measures. We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region; (2) the 220 kW of electric capacity would come from a renewable resource that would not contribute to atmospheric pollution; and (3) the recommended environmental measures would adequately protect and enhance environmental resources affected by the project.

We conclude that granting an exemption from licensing for the project, with the staff-recommended environmental measures, would not be a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

HANOVER POND DAM HYDROELECTRIC PROJECT
FERC No. 14550-001, Connecticut

# 1.0 APPLICATION

On June 26, 2015, New England Hydropower Company, LLC (NEHC) filed an application with the Federal Energy Regulatory Commission (Commission) for a small hydroelectric (10 megawatt [MW] or less) exemption from licensing for the proposed 220 kilowatt (kW) Hanover Pond Dam Hydroelectric Project. The project would be located on the Quinnipiac River, in the city of Meriden, New Haven County, Connecticut (Figures 1 and 2). The project would not occupy any federal lands.

# 2.0 PURPOSE OF ACTION AND NEED FOR POWER

## 2.1. Purpose of Action

The Commission must decide whether to grant NEHC an exemption from licensing for the project, and what, if any, conditions should be included in any exemption issued. Issuing an exemption from licensing would allow NEHC to generate electricity, making approximately 900 megawatt-hours (MWh) of electric power from a renewable resource available to the region per year. In this Environmental Assessment (EA), we assess the effects of constructing and operating the project as proposed by NEHC, alternatives to the proposed project, a no-action alternative, and recommend conditions to become a part of any exemption from licensing issued.

## 2.2 Need for Power

Under section 213 of the Public Utility Regulatory Policies Act (PURPA), the authority of the Commission to grant an exemption from licensing is not limited by a determination of the need for power. See Briggs Hydroelectric, 32 FERC ¶ 61,399 (1985). See also David Cereghino, 35 FERC ¶ 61,067 (1986).

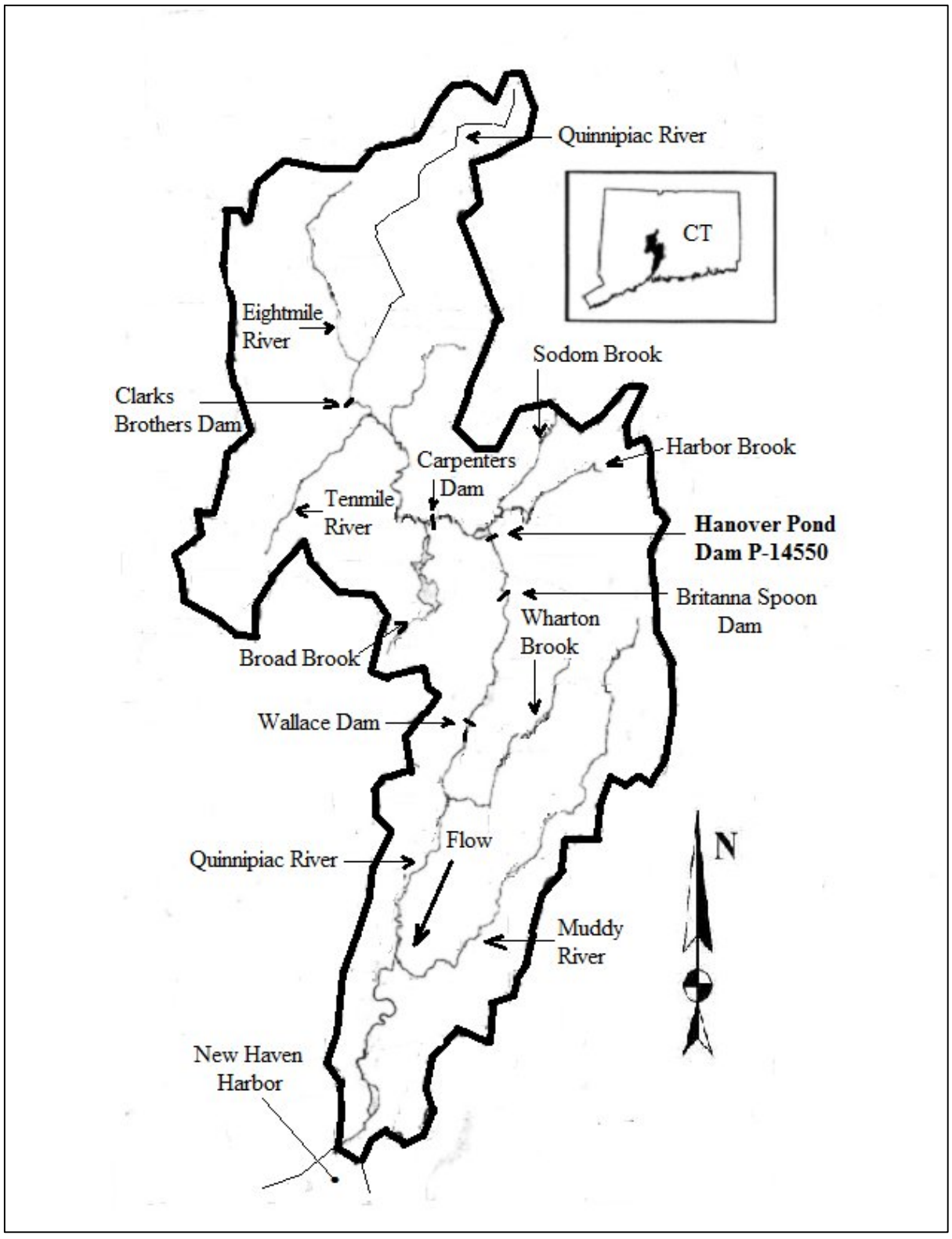


**Figure 1:** Location of the Hanover Pond Dam Hydroelectric Project in the Quinnipiac River Basin (Source: staff).

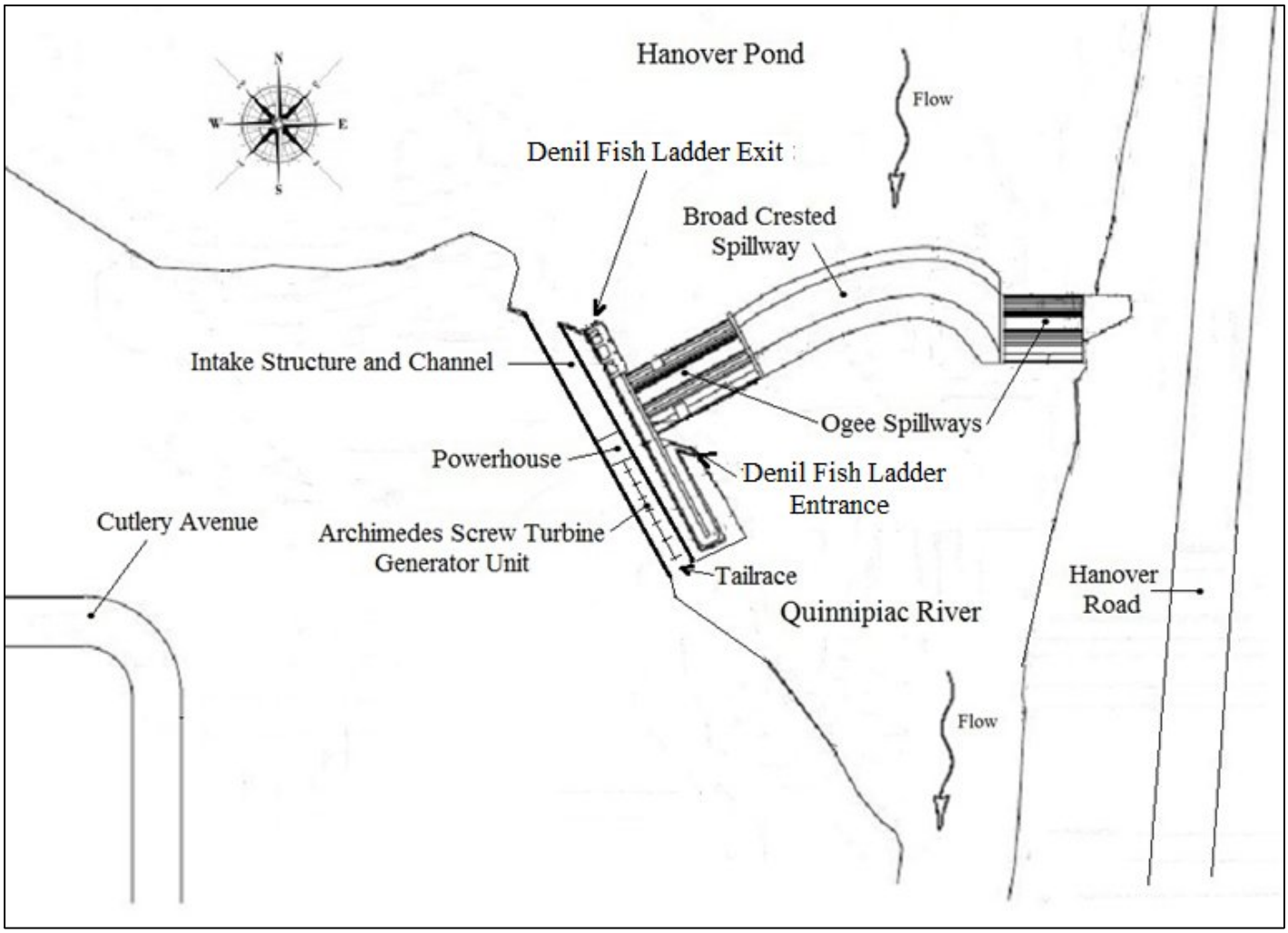


**Figure 2:** Hanover Pond Dam Project site plan (Source: NEHC, as modified by staff).

# 3.0 PROPOSED ACTION AND ALTERNATIVES

## 3.1 Proposed Action

### 3.1.1 Project Description

The Hanover Pond Project would consist of: (1) an existing 25-foot-high, 397-foot-long concrete and earthen dam (Hanover Pond dam) that includes a 247-foot-long concrete spillway composed of: (i) a 40-foot-long section with an ogee crest elevation of 87.3 feet National Geodetic Vertical Datum 1929 (NGVD 29), (ii) a 147-foot-long section with a broad crest elevation of 87.3 feet NGVD 29, (iii) a 40-foot-long section with an ogee crest elevation of 87.0 feet NGVD 29, (iv) a 6-foot-long low-flow notch with an ogee crest elevation of 86.3 feet NGVD 29, and (v) a 14-foot-long section with an ogee crest elevation of 88.3 feet NGVD 29; (2) an existing 71-acre impoundment (Hanover Pond) with a storage capacity of 1,800-acre-feet at elevation of 87.3 feet NGVD 29; (3) an existing 40-foot-long training wall with four 4-foot-wide, 4.5-foot-high intake sluice gates; (4) an existing 12-foot-wide, 13-foot-high sluice outlet flume; (5) an existing 175-foot-long, 16-foot-wide, 10-foot-high Denil fish ladder; (6) a new 12-foot-wide, 8-foot-high intake structure and trashrack with 9-inch clear bar spacing; (7) a new 78-foot-long, 12-foot-wide, 8-foot-deep buried concrete penstock channel; (8) a new 18-foot-long, 16-foot-wide, 12-foot-high brick and concrete powerhouse; (9) a new 46.5-foot-long, 12-foot-diameter steel and concrete turbine bay containing a 46.5-foot-long, 11.65-foot-diameter 220-kW Archimedes screw turbine-generator unit; (10) a new 15-foot-long concrete tailrace; (11) a new 45-foot-long, 3-foot-wide, 2-foot-deep fish passage channel with a boulder guide-wall;[4] (12) a new automatic controller and water-level sensor; (13) a new 300-kilovolt-amp (kVA) transformer and 500-foot-long, 35-kilovolt (kV) above-ground transmission line connecting the powerhouse electrical panel to Connecticut Light and Power's regional distribution grid; and (13) appurtenant facilities.

New facilities constructed by NEHC would include the intake structure, buried channel, sluice gates, powerhouse, turbine-generator unit, tailrace, fish passage channel, boulder guide wall, above-ground transmission line, and automatic controller and water-level sensor. The proposed project would annually generate approximately 900 megawatt-hours (MWh).

[4] The new fish passage channel would merge with an existing 65-foot-long, 5-foot-wide, 2-foot-deep fish passage channel that is located downstream of the entrance to the Denil fish ladder.

### 3.1.2 Project Operation

NEHC proposes to operate the project in a run-of-river mode, where outflow from the project would equal inflow, and water levels in Hanover Pond would not be drawn down for electric generation. In addition, NEHC proposes to release a year-round minimum flow of 30 cubic feet per second (cfs) to the bypassed reach and fish passage channels. During the fish passage seasons (i.e., from April 1 to June 30 and from October 1 to November 15), NEHC would release 23.5 cfs through the low-flow notch and 6.5 cfs through the existing Denil fish ladder.[5] At all other times, NEHC would release 30 cfs through the low-flow notch.

NEHC proposes to remotely monitor and operate the project using the new water-level sensor that will be located in Hanover Pond and a new automatic controller that will be connected to the sluice gate located upstream of the turbine-generator unit. When the sensor detects a change in the elevation of Hanover Pond, the sluice gate would adjust the flow to the turbine-generator unit to maintain the elevation of Hanover Pond and releases of the 30-cfs minimum flow. During floods, the sluice gate would close and the turbine-generator unit would shut down which would protect project facilities from flood damage.[6]

As proposed, the project would use flows between 10 cfs (the minimum hydraulic capacity of the generator unit) and 194 cfs (the maximum hydraulic capacity) to generate electricity.

At flows less than 40 cfs (the minimum hydraulic capacity plus the minimum flow), the project would not operate, and all flow would be released through the low-flow notch or a combination of the low-flow notch and existing Denil fish ladder (6.5 cfs). At flows between 40 cfs and 224 cfs (the maximum hydraulic capacity plus the minimum flow), the project would operate, and 30 cfs would be released through the low-flow notch or a combination of the low-flow notch (23.5 cfs) and the Denil fish ladder (6.5 cfs). At flows greater than 224 cfs, the project would operate at its maximum capacity, and all remaining flow would pass over the spillway or a combination of the spillway and Denil fish ladder (6.5 cfs) until flood flow is reached and the project would be shut down. The proposed project would generate about 900 MWh annually.

[5] Currently, the Connecticut Department of Energy and Environmental Protection (Connecticut DEEP) operates the Denil fish ladder by pulling out and replacing all the boards at the fishway's upstream exit into Hanover Pond.

[6] NEHC's application does not indicate the flood flow that would result in project shutdown.

### 3.1.3 Proposed Measures

In addition to operating the project in a run-of-river mode, NEHC proposes the following environmental measures.

- Implement best management practices (BMPs) to minimize soil erosion and in river siltation during project construction.

- Prepare an Invasive Species Monitoring and Control Plan to map existing invasive species, monitor the project area for invasive species periodically, and initiate an early detection and rapid response protocol for infestations of target species.

- Provide a continuous minimum flow of 30 cfs into the bypassed reach and fish passage channels.

- Develop and implement an Operation, Maintenance, and Monitoring Plan (OMMP) to ensure of the project operates in run-of-river operation and provides the required minimum flow.

- Install a trashrack at the intake sluice gate with a minimum 9-inch clear bar spacing that will allow fish to pass through the turbine.

- Evaluate fish passage through the sluice gate and the turbine.

- Conduct a freshwater mussel survey to identify mussels located in project construction areas that may need to be relocated to other areas.

- Excavate a new fish passage channel and construct a new boulder wall to guide fish from the proposed tailrace to the fish ladder entrance.

- Conduct a fish ladder use study.

- Use a trap to collect juvenile eels from the trailrace for release into Hanover Pond.

- Conduct water quality monitoring for up to 3 years after the start of project operation.

- Implement an impoundment refill procedure after drawdowns associated with flashboard replacement, dam maintenance, or emergencies where no more than

10 percent of inflow is stored and 90 percent of inflow is released to protect habitat and water quality downstream of the dam.

- Install signage to identify an existing portage trail around the western end of the dam and improve access to downstream areas.

- Plant vegetation to minimize the visual impacts of project facilities.

### 3.2 Section 30(c) Conditions

Pursuant to section 30(c) of the FPA, 16 U.S.C. § 823a(c), federal and state fish and wildlife agencies have mandatory conditioning authority on exempted projects. The U.S. Department of the Interior (Interior) and National Marine Fisheries Service (NMFS) filed such conditions on October 15, 2015 and October 16, 2015, respectively (see Appendix A and B). The conditions are summarized below.

- Operate the project in an instantaneous run-of-river mode with inflow equal to outflow (Interior, NMFS).

- Excavate a new fish passage channel and construct a new boulder guide wall between the tailrace and the Denil fish ladder entrance (Interior, NMFS).

- Provide a continuous minimum flow of 30 cfs, sufficient to operate the existing fish ladder and maintain a 2-foot depth in the fish passage channels (Interior, NMFS).

- Develop and implement an OMMP to ensure the project operates in run-of-river mode and provides the required minimum flow (Interior).

- Install a trashrack at the intake sluice gate with a minimum 9-inch clear bar spacing that will allow fish to pass through the turbine (Interior, NMFS).

- Evaluate attraction to (Interior) and upstream passage through (Interior, NMFS) the existing Denil fish ladder.

- Evaluate downstream fish passage through the existing sluice gate (Interior) and the proposed turbine (Interior, NMFS).

- Conduct a pre-construction freshwater mussel survey to locate and identify any mussels present in the project area (Interior).

- Develop a freshwater mussel monitoring and relocation protocol, if needed (Interior).

- Use a trap to collect juvenile eels from the trailrace for release into Hanover Pond (Interior, NMFS).

- Conduct water quality monitoring for up to 3 years after the start of project operation (Interior).

- During impoundment refilling, pass 90 percent of inflow downstream and refill the impoundment with the remaining 10 percent of inflow (Interior).

- Prepare an Invasive Species Monitoring and Control Plan to map existing invasive species, monitor the project area for invasive species periodically, and initiate an early detection and rapid response protocol for infestations of target species (Interior).

- Notify the agencies when the project commences operation and provide a set of as-built drawings (Interior, NMFS).

- Allow the agencies to inspect the project area at any time while the project operates to monitor compliance with agency terms and conditions (Interior, NMFS).

- A reservation to revise and add terms and conditions of the exemption to carry out agency responsibilities with respect to fish and wildlife resources (Interior, NMFS).

- Include the 30(c) conditions in any conveyance (by lease, sale, or otherwise) of the exemptee's interests (Interior, NMFS).

### 3.3 Water Quality Certification Conditions

The Connecticut Department of Energy and Environmental Protection (Connecticut DEEP) issued water quality certification conditions for the Hanover Pond dam project on April 15, 2016 (see Appendix C). [7]

[7] The certification includes 14 special conditions, and 14 general terms and conditions.

### 3.4 Additional Staff-Recommended Measures

In addition to NEHC's proposed measures and the 30(c) conditions filed by Interior and NMFS, and the water quality certification conditions filed by the Connecticut DEEP, the staff alternative would require NEHC to: (1) modify the OMMP to measure and report depth in the fish passage channels; (2) consult with the Connecticut State Historic Preservation Officer (Connecticut SHPO) prior to implementing any project modifications, including maintenance activities, land-clearing or land-disturbing activities, or changes to project operation or facilities, that do not require Commission approval but could affect cultural resources; (3) consult with the Connecticut SHPO if previously unidentified cultural resources are discovered during the course of constructing, maintaining, or operating project works or other facilities; and (4) use silt fencing and surveys to exclude and remove Eastern box turtles and wood turtles from construction sites; and (5) implement BMPs to reduce the potential for chemical or fuel spills during construction. Below we briefly discuss the anticipated environmental effects of issuing an exemption from license for the proposed project under the staff alternative.

### 3.5 No-Action Alternative

Under the no-action alternative (denial of the application), the project would not be constructed and it would not annually generate an estimated average of 900 MWh and environmental resources in the project area would not be affected.

## 4.0. CONSULTATION AND COMPLIANCE

### 4.1 Agency Consultation

The Commission's regulations require that applicants consult with appropriate state and federal agencies, tribes, and the public before filing an exemption application. This consultation is required to comply with the Endangered Species Act, the National Historic Preservation Act, and other federal statutes. Pre-filing consultation must be completed and documented in accordance with Commission regulations.

### 4.2 Public Outreach and Scoping

As part of their pre-filing consultation, NEHC distributed an initial consultation document on October 15, 2014. NEHC also conducted a pre-filing site visit and joint agency/public meeting on November 19, 2014. Following the public meeting, NEHC worked collaboratively with Connecticut DEEP, Interior, and NMFS to develop terms and conditions. On September 14, 2015, NEHC filed a request to waive second stage consultation. On September 14, 2015, NEHC filed documentation indicating agency

concurrence with its request to waive second stage consultation. On June 26, 2015, NEHC filed a final application for exemption from licensing.

On August 13, 2015, Commission staff issued a letter that identified deficiencies in the final application and requested additional information. NEHC addressed these deficiencies and provided the requested information in responses filed on September 4, 2015, and September 14, 2015.

Before preparing this EA, the Commission solicited additional study requests by public notice on June 30, 2015. No comments or study requests were filed. On September 16, 2015, the Commission issued a public notice of its intent to waive scoping. No comments were filed on the intent to waive scoping.

### 4.3 Interventions

On September 16, 2015, the Commission issued a public notice accepting the application and soliciting motions to intervene.[8] A notice of intervention was filed by NMFS on October 16, 2015.

### 4.4 Comments and Recommendations

On September 16, 2015, the Commission issued a public notice stating the application was ready for environmental analysis and requesting final comments, recommendations, and terms and conditions.[9] The following entities filed comments and final terms and conditions:

| Commenting Entity | Date Filed |
|---|---|
| Interior | October 15, 2015 |
| NMFS | October 16, 2015 |

NEHC did not file reply comments.

### 4.5 Compliance

#### 4.5.2 Endangered Species Act

[8] The notice established October 16, 2015, as the deadline to file motions to intervene and comments.

[9] The notice established October 16, 2015, as the deadline to file comments, recommendations, and terms and conditions.

Section 7 of the Endangered Species Act requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. Although one federally listed species, the Northern long-eared bat (threatened), may occur in New Haven County,[10] this species has not been documented in the immediate project area and there is no known habitat for this species in the project area. Because this species is not known to inhabit the project area and construction, operation, and maintenance of the proposed project would not substantially alter the existing environment (i.e. no trees would be removed), the proposed project would have no effect on the northern long-eared bat. No other federally listed species are known to occur in the project area; therefore, issuing an exemption order for the proposed project would have no effect on threatened or endangered species.

### 4.5.3 Section 106 of the National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that federal agencies "take into account" how the agency's undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

In a project letter review cover form, dated September 25, 2015, the Connecticut SHPO determined that there is no potential to cause effects on historic properties within the proposed project's area of potential effects (APE). We have determined that there are no historic properties within the project's APE and that the project would not affect historic properties. Therefore, the Commission's regulatory requirements pertaining to section 106 of the NHPA have been satisfied.

[10] http://ecos.fws.gov/ipac/

# 5.0 ENVIRONMENTAL ANALYSIS

In this section, the general environmental setting in the project area and cumulative effects are described. An analysis of the environmental effects of the proposed action and action alternatives is also included. Sections are organized by resource area (aquatic resources, cultural resources, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures. Staff conclusions and recommended measures are discussed in section VI of the EA.

Unless noted otherwise, the sources of our information are NEHC's exemption application (NEHC, 2015) and additional information filed by NEHC (NEHC, 2015a, 2015b).

## 5.1 General Description of the Area

The proposed project would be located on the Quinnipiac River in the city of Meriden, in New Haven County, Connecticut at the site of the existing Hanover Pond dam. The 46-mile-long Quinnipiac River is located in south central Connecticut. The Quinnipiac River's headwaters are in the Dead Wood Swamp, which lies on the border between the city of New Britain and the town Farmington, which is approximately 12 miles north of Hanover Pond dam. From Hanover Pond, the river continues in a southerly direction for approximately 21 miles, where it reaches New Haven Harbor, which is an inlet of Long Island Sound and the Atlantic Ocean. Major tributaries of the Quinnipiac River include Ten Mile River and Eight Mile River. Land use in the watershed is highly developed, with the majority of developed land consisting of residential, commercial, and industrial areas. The watershed encompasses 15 municipalities with a total population of about 240,000.

There are five existing dams along the main stem of the Quinnipiac River, but there are no existing licensed or pending hydropower projects in the Quinnipiac River watershed (FERC, July 2014). From downstream to upstream the existing dams are the Wallace dam, Britannia Spoon dam, Hanover Pond dam, Carpenter's dam, and Clarks Brothers dam (Figure 1).

## 5.2. Scope of Cumulative Effects Analysis

According to the Council on Environmental Quality's regulations for implementing NEPA (40 C.F.R., section 1508.7), an action may cause cumulative impacts on the environment if its impacts overlap in time and/or space with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of NEHC's application for an exemption from licensing; agency and public comments; and our independent analysis; we have identified diadromous fish[11] (i.e., sea lamprey, American eels, American shad, alewife, and blueback herring) as resources that could be cumulatively affected by constructing and operating the Hanover Pond dam project.

### 5.2.1 Geographic Scope

The geographic scope of the cumulative analysis defines the physical limits or boundaries of the proposed action's effect on the resource. We have identified the geographic scope for diadromous fish to include the Quinnipiac River Basin from New Haven Harbor to the headwaters of the Quinnipiac River located upstream of Clarks Brothers Dam (see figure 1). We chose this geographic area because the effects of the proposed project operation on diadromous fish in combination with other dams in the basin would be limited to this area.

### 5.2.3 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on alewife, American eel, American shad, blueback herring, and sea lamprey. Based on the term of the proposed license, we will look 30 to 50 years into the future, concentrating on the effects on these species from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information. We identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

[11] Diadromous fish migrate between fresh and saltwater.

## 5.3 Proposed Action and Action Alternatives

Only resources that would be affected, or about which comments have been received, are addressed in detail in this EA and discussed in this section. Commission staff has not identified any land use or socioeconomic issues associated with the proposed action; therefore, we do not assess effects on these resources in this EA.

### 5.3.1 Geology and Soils

#### Affected Environment

The overlying soils in the project area are classified as Udorthents that have been disturbed from prior excavation or fill due to past dam construction and repairs. Udorthent series soils consist of glaciofluvial or glaciolacustrine deposits that are moderately- to well-drained rounded sand and gravel.[12]

#### Environmental Effects

To minimize erosion and re-suspension of river sediments, NEHC proposes to use BMPs including: (1) placing erosion control barriers around upland work areas prior to the start of ground disturbing activities; (2) grading slopes to facilitate water run-off and drainage; (3) placing riprap to protect and stabilize ground slopes; and (4) installing temporary sandbag cofferdams in Hanover Pond and the Quinnipiac River downstream of Hanover Pond dam. The areas within the cofferdams would be dewatered by pumping water through on-site filter bags. Details of the proposed BMPs and construction sequence are shown and labeled on the Exhibit F drawings.

In addition to the above, NEHC proposes to construct a new 500-foot-long, 35-kV above-ground transmission line from the powerhouse to an existing utility pole located near Cutlery Avenue.

Connecticut DEEP's certification (special condition 3 and general condition 10) would require NEHC to implement BMPs to reduce erosion, sedimentation, and petroleum and chemical spills during project construction.

*Staff Analysis*

During project construction, NEHC proposes to draw down Hanover Pond for about 3 months, from July through September. NEHC estimates that the project

[12] See http://cteco.uconn.edu/docs/usda/connecticut.pdf.

construction area would be limited to about 1.3 acres, primarily on the west side of the river. NEHC estimates that total in-water dredging volumes would be about 200 cubic yards of material. Because the drawdown would be gradual, temporary, and would occur during the low-flow period, we would not expect any significant erosion or disturbance of sediments to result from the draw down.

Installing and dewatering temporary sandbag cofferdams in Hanover Pond and in the Quinnipiac River, downstream of Hanover Pond dam, would minimize sedimentation, disturbance of riverbed material, and re-suspension of sediments in the Quinnipiac River during project construction.

Constructing the proposed transmission line would disturb a minimal amount of vegetation on project lands because the line would be installed above ground and require drilling and placement of approximately six new power poles along an existing gravel road. Installation of the project transmission line would result in little or no erosion along the length of the proposed transmission line route.

Implementing the proposed BMPs would limit erosion and re-suspension of sediments in the project area and river during project construction.

During project construction, NEHC will occasionally need to use chemicals and fuels in the project area. Poor handling or management of chemicals and fuels could result in spills in the project area that could pollute soils and the Quinnipiac River. Implementing BMPs to reduce the potential for chemical and fuel spills would reduce the potential for pollution of soils and waters in the project area during construction.

### 5.3.2 Aquatic Resources

#### Affected Environment

The impoundment created by the Hanover Pond dam has a surface area of about 71 acres at an elevation of 87.9 feet NGVD 29, a maximum depth of 7.0 feet and a mean depth of 2.5 feet. Hydrologic data measured at a United States Geological Survey (USGS) gage (USGS gage no. 01196500) that is approximately 10 miles downstream of the proposed project indicates that the Quinnipiac River exhibits higher flows during the spring (March through May) and lower flows during the summer (July through September).[13] The 50 percent exceedance flow at the gage is 130 cfs with a flow of 58 cfs exceeded 90 percent of the time and a flow of 380 cfs exceeded 10 percent of the time

[13] Flow estimates for the project site were derived by multiplying flows at the gage site by the ratio (i.e., 0.82747) of the drainage areas at the project site (i.e., 95 square miles) and at the gage (i.e., 115 square miles).

at the gage. Flows in the Quinnipiac River at the project location meet or exceed the maximum operating capacity of the project (224 cfs) approximately 25 percent of the time (see Appendix E, ICD flow duration curve) and meet or exceed the minimum operating capacity of the project (40 cfs) approximately 99 percent of the time.

Water Quality

The Quinnipiac River is designated as Class B under Connecticut DEEP surface water quality standards. Class B waters are suitable for recreation purposes, including water contact recreation, for water supply, and for fish habitat. Class B waters have a minimum dissolved oxygen (DO) standard of 5 milligrams per liter (mg/l) (Connecticut DEEP, 2013). Connecticut DEEP specifies that there shall be no changes to the natural temperature of Class B waters and in no case shall the water temperature exceed 85 degrees (°) Fahrenheit (F) or the temperature of surface water increase more than 4° F. (Connecticut DEEP, 2013).

Water quality sampling conducted in the summer and fall of 2014 (NEHC, 2013) indicates that water quality standards in the project area are currently being met for DO. DO samples collected upstream of Hanover Pond dam between July 25 and October 2, 2014 ranged from 7.5 to 13.9 mg/l or about 80 to 160 percent saturation. DO samples taken downstream of the dam during the same period ranged from 8.2 to 10.0 mg/l or about 94 to 106 percent saturation. DO concentrations collected upstream of the dam were generally higher upstream than samples collected downstream of the dam.

Fishery Resources

The Quinnipiac River provides habitat for smallmouth bass, various sunfish species, brown bullhead, common sucker, yellow perch, white perch, common shiner, chain pickerel, common carp, white sucker, blacknose dace brook trout, brown trout, and rainbow trout. Each spring, the Connecticut DEEP stocks the river with as many as 800 brook trout, 2,500 brown trout, and 3,200 rainbow trout to support a put-and-take fishery.

Several diadromous fish species are found in the Quinnipiac River and in the vicinity of the proposed project, including American eel, sea lamprey, alewife, American shad, and blueback herring. Restoration for diadromous fish to portions of Quinnipiac River is a high priority for the Connecticut DEEP.

**Environmental Impacts and Recommendations**

Mode of Operation

NEHC proposes to operate the project in a run-of-river mode, with inflow equal to

outflow.

Interior and NMFS's 30(c) condition 1 and Connecticut DEEP's certification (special condition 1) would require NEHC to operate the project in an instantaneous run-of-river mode to maintain existing aquatic habitat and water quality downstream of the project.

*Staff Analysis*

Operating the proposed hydroelectric project in a run-of-river mode would result in no change in the amount, schedule, or duration of flow released to the Quinnipiac River downstream of the project. Run-of-river mode would also minimize the length of time water is retained in the impoundment and help avoid increasing water temperatures in the upper levels of the impoundment from solar heating. This measure would also limit fluctuating water levels which influence the reproductive success of fishes that spawn in near-shore areas (Sammons and Bettoli, 2000). By operating the project in a run-of-river mode, habitat in the project impoundment and habitat in the Quinnipiac River downstream of the project would essentially be unchanged from current conditions, and aquatic organisms, including fish and benthic macroinvertebrates, would be unaffected.

Drawdown Management

NEHC states the proposed project impoundment would have to be drawn down temporarily for construction of the project. After commencing operation, the proposed project may need to be drawn down occasionally for emergencies; however, NEHC indicates it would not need to be drawn down for routine operation or maintenance. To refill the impoundment after any drawdowns, NEHC proposes to pass 90 percent of project inflow downstream, and use the remaining 10 percent to refill the impoundment.

Interior's 30(c) condition 9 and Connecticut DEEP's certification (special condition 11) would require the implementation of NEHC's proposed impoundment refill procedure.

*Staff Analysis*

Releasing 90 percent of the project impoundment's inflow during impoundment refilling would ensure that downstream flows are kept at near natural flow levels and the impoundment is refilled in a timely manner. Minimizing the length of time that the impoundment is drawn down and that flows are reduced downstream would help maintain the existing aquatic habitat for fish and other aquatic species. Further, the impoundment refill procedures would ensure that aquatic habitat downstream would

quickly be returned to normal conditions with minimal impacts to aquatic resources.

Downstream Fish Passage

To allow migratory fish to use the Archimedes screw turbine for downstream passage when the project is operating, NEHC proposes to install a trashrack with a 9-inch clear bar spacing.

Interior and NMFS's 30(c) condition 4 and Connecticut DEEP's certification (special condition 5) would require the installation of a trashrack that has clear spacing of no less than 9 inches. Interior and NMFS also specify that NEHC would need to keep the trashrack free of debris and maintained.

*Staff Analysis*

During project operation, much of the Quinnipiac River flow (40 to 224 cfs of the total streamflow) would pass through the Archimedes screw turbine. However, rather than screening the intake to prevent fish from passing through the turbine, NEHC is proposing to use the Archimedes screw turbine as a primary means of downstream passage for migratory fish. NEHC provided results of several studies (Kibel and Coe, 2011; Spah, 2001; Lucas and Bracken, 2010) that suggest that the design and operation of the proposed turbine results in very high fish passage survival rates (i.e., 100% of eels, bream, sea lamprey, salmon, and brown trout observed in these studies survived passage through the Archimedes screw turbine). These studies also reported some minor damage to about 1.3% of juvenile sea lampreys; 1.4% of salmonids; and about 0.64% of eels passing through Archimedes screw turbines and any damage reported was minor and recoverable.

Because studies have shown that passage through the Archimedes screw turbine would be safe and effective, NEHC is proposing to use flow through the turbine as the primary route for downstream movement of fish from Hanover Pond. A trashrack is needed to prevent large debris from entering and damaging the Archimedes screw turbine-generator unit; however, a trashrack with a small bar spacing could discourage downstream fish passage through the turbine or even injure fish as they enter the turbine. Therefore, NEHC has proposed a trashrack with a 9-inch clear bar spacing. This spacing should be small enough to prevent debris from entering the turbine, but would also allow downstream fish migrants, such as post-spawned shad, alewife, and blueback herring, to safely enter and pass through the turbine during downstream passage.

If debris accumulates on the trashrack, velocities at the turbine entrance could be uneven and disrupt fish movements or the debris could create narrower passages where the fish could be entangled in or impinged on the debris. Ensuring that the trashrack is

free of trash and other debris, as specified by Interior, NMFS, and Connecticut DEEP, would reduce the potential for an uneven flow field in front of the intake structure that could discourage fish passage or result in fish impingement on the intake structure.

Downstream Passage Studies

NEHC proposes to evaluate fish passing downstream through the turbine for injuries and mortalities. NEHC also proposes to assess the effects of the sluice gate that will control flow entering the turbine on downstream passage.

Interior's 30(c) condition 8b, NMFS's 30(c) condition 5b, and Connecticut DEEP's certification (special condition 10d) would require NEHC to assess fish injuries and mortality associated with downstream passage through the turbine. Interior's 30(c) condition 8c and Connecticut DEEP's certification (special condition 10c) would require NEHC to study the effects of its proposed sluice gate on downstream fish passage.

*Staff Analysis*

Alewife, blueback herring, and American shad could be injured or killed during passage through the turbine from contact with physical structures or extreme pressure changes. As explained above, previous studies on the mortality and injury to fish passing through an Archimedes screw turbine have indicated high fish passage survival; however, these studies did not include alewife, blueback herring, and American shad. NEHC's proposed study to determine the occurrence of injuries and mortalities during downstream passage of these migratory species will either confirm that the proposed turbine can provide safe and effective downstream passage for alewife, blueback herring, and American shad or provide information that can be used to improve downstream passage.

To control the flow entering the turbine, NEHC proposes to install a downward-closing sluice gate at the proposed project's intake. During periods of low-flow, the downward closing gate may be opened as little as 4 inches and the opening would be submerged about 4 to 5 feet below the surface. Large migratory fish (e.g. adult American shad) and fish that migrate at or near the surface (e.g. shad, alewife, and blueback herring) may not be able to locate or pass through a 4-inch sluice gate opening that is submerged 4 to 5 feet below the surface, which could delay or prevent migratory fish from moving downstream. NEHC's proposed study of the effects of the downward closing sluicegate on downstream fish passage will either confirm that fish can locate and enter the turbine without delay or provide information that can be used to improve downstream fish passage.

Water Quality Monitoring

NEHC proposes to monitor water quality during project operation and determine if there are any adverse project effects on DO.

Interior's 30(c) condition 5 and Connecticut DEEP's certification (special condition 6) would require NEHC to conduct water quality monitoring for a minimum of 3 years after the first low-flow season after the project commences operation. In addition, Connecticut DEEP's certification (special condition 7) would require NEHC to submit a water quality monitoring plan for approval that includes the protocol for monitoring DO concentrations and water temperature upstream of Hanover dam and downstream of the project's tailrace. The plan would also include and implementation schedule and protocol for reporting water quality monitoring data. If water quality monitoring indicates a violation of water quality standards for DO, NEHC may be directed by Interior or Connecticut DEEP to implement mitigation measures.

*Staff Analysis*

During project operation, much of the flow passing downstream from the project impoundment would be diverted into the project intake and released into the tailrace; therefore, flow spilling over the Hanover Pond dam would be reduced by project operation. Reducing the flow that spills over the dam by diverting flow through the project works could result in less aeration of the Quinnipiac River downstream of the dam and result in lower DO concentrations. Reduced DO would likely be most significant during the warmer months (July through September) when water temperatures are higher and the assimilative capacity of water is lower.

Class B waters have a minimum DO standard of 5 mg/L (CT DEEP, 2013). Based on a water quality sampling at the project site in 2014 (NEHC, 2013), water quality standards are currently being met for DO during the low flow season. However, diverting flow to the proposed project's intake and spilling less flow over the dam could lower the DO in the river immediately downstream of the dam and in the bypassed reach and consequently, cause the DO concentration in the river downstream of the dam to fall below the state water quality standard and affect the quality of the aquatic habitat for fish and other aquatic organisms in the Quinnipiac River.

Conducting post-operation water quality monitoring would determine if the project is affecting water quality, in particular DO, in the river downstream of the dam. If monitoring identified significant adverse changes to water quality, then other measures could be developed and implemented, such as reducing flows to the powerhouse and increasing flows over the dam. Monitoring and consideration of additional measures in consultation with Interior would ensure that any significant adverse project effects on water quality would be addressed. Developing a plan for scheduling, monitoring, and

reporting water quality data would ensure that a protocol for collecting water quality data meets acceptable standards.

New Fish Passage Channel

NEHC proposes to excavate a new fish passage channel in the bypassed reach and construct a new boulder wall to guide migratory fish from the project's tailrace to the entrance of the existing Denil fish ladder upstream (Figure 3).

Interior and NMFS's 30(c) condition 3 and Connecticut DEEP's certification (special condition 4) would require NEHC to excavate its proposed new fish passage channel in the bypassed reach.

*Staff Analysis*

The existing fish passage facilities at Hanover Pond dam include a Denil fish ladder and a 65-foot-long fish passage channel. The existing fish passage channel was excavated and the Denil fish ladder was constructed by the city of Meriden in 2005-2006. The existing fish passage channel provides access to the fish ladder entrance through a section of the river that would otherwise be too shallow for fish passage during low flow periods.

The proposed project would discharge flow into the tailrace at the downstream end of the existing low-flow channel. Because the discharge from the project's tailrace would generally be greater in velocity and flow (up to 194 cfs) than the flow and velocity that would generally be found in the low-flow channel (typically ≤30 cfs), fish may be attracted to the tailrace rather than the entrance of the Denil fish ladder. Fish attracted to the tailrace could become disoriented and fatigued which may delay or prevent them from locating the entrance to the fish ladder. Attraction of migratory fish to the tailrace could reduce upstream passage efficiency at Hanover Pond dam and potentially reduce the reproductive success of these migratory fish.

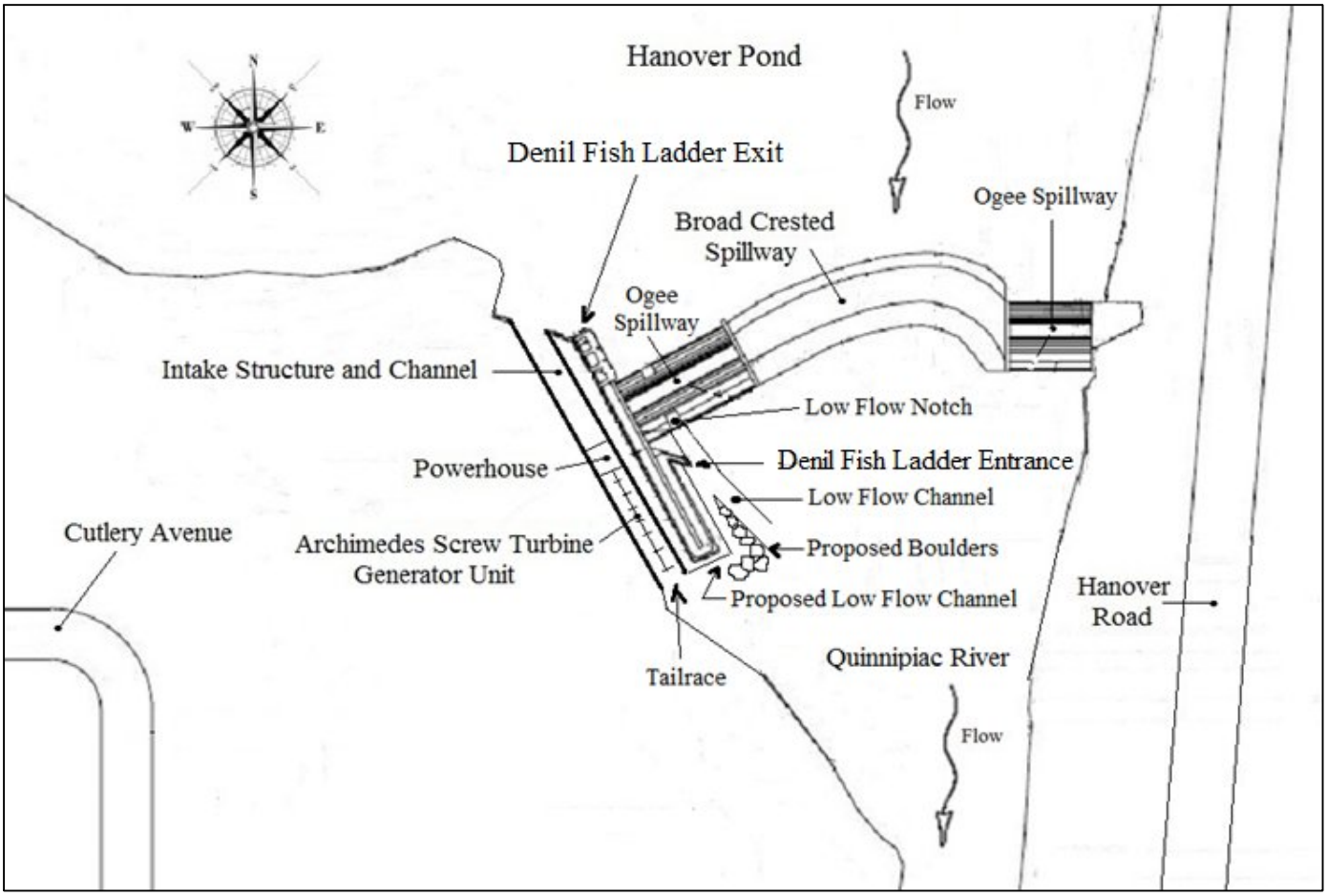


**Figure 3:** Hanover Pond Dam Project fish passage channel site plan (Source: NEHC, as modified by staff).

Excavating a new fish passage channel leading from the proposed project's tailrace entrance to the existing fish passage channel and entrance to the Denil fish ladder will create a route for guiding fish upstream of the project tailrace (figure 3). Constructing a new boulder wall along the new fish passage channel will confine flow and fish in the new fish passage channel. NEHC would also provide a jet of water in the tailrace to attract migratory fish into the new fish passage channel. The new fish passage channel with boulder wall and attraction jet would provide a zone of passage between the tailrace and fish ladder entrance and would reduce potential migration delays that could occur if fish are attracted to project discharge in the tailrace.

Minimum Flow

NEHC proposes to release a minimum flow of 30 cfs or inflow, whichever is less, into the project's bypassed reach. The objective of the 30 cfs minimum flow is to ensure that flow in the fish passage channels is maintained at a depth of 2 feet. The 30-cfs

minimum flow is also intended to provide flow in the existing fish ladder for upstream passage and through the low-flow notch for downstream fish passage. NEHC has indicated that if the 30-cfs minimum flow does not provide a least 2 feet of water in the two fish passage channels, allow for operation of the existing fish ladder, and provide adequate flow through the low-flow notch, it will increase the minimum flow.

Interior's 30(c) condition 3, NMFS's 30(c) condition 2, and Connecticut DEEP's certification (special condition 2) would require NEHC to provide a continuous minimum flow of 30 cfs, sufficient to operate the existing fish ladder and maintain a 2-foot depth in the fish passage channels.

*Staff Analysis*

When operating, the proposed project would divert flow for generation and bypass approximately 65 linear feet of the Quinnipiac River between the Hanover Pond dam and the proposed tailrace. During generation, flow in the fish ladder and the fish passage channels and flow through the low-flow notch could be reduced or eliminated which could inhibit or eliminate upstream and downstream fish passage. To provide adequate conditions for upstream and downstream passage, NEHC and the agencies indicate that a depth of 2 feet needs to be maintained in the two fish passage channels. Modeling conducted by NEHC indicates that a 30 cfs flow would maintain a depth of 2 feet in the fish passage channels, and also provide 12-15 cfs flow through the low-flow notch sufficient to allow fish to pass downstream (i.e., provide about 8 inches deep flow through the notch), and allow for 6-9 cfs through the existing fish ladder. Thus, a 30-cfs minimum flow should be adequate to maintain zones of passage for migratory fish in the bypassed reach and allow effective operation of the existing low-flow notch and fish ladder. This flow should be adequate to provide safe and efficient passage of fish migrating upstream and downstream of Hanover Pond dam. Monitoring water depth in the fish passage channels would ensure that the minimum flows could be increased if 30 cfs does not maintain a 2-foot depth in the fish passage channels.

Upstream Passage Delay Studies

NEHC proposes to conduct studies to determine if project operation affects upstream passage of migratory fish through the existing Denil fish ladder.

Interior's 30(c) condition 8a, NMFS's 30(c) condition 5a, and Connecticut DEEP's certification (special condition 10a) would require NEHC to compare use of the existing Denil fish ladder before and after the project begins operation. Interior's 30(c) condition 8b and Connecticut DEEP's certification (special condition 10b) would require NEHC to determine passage delay associated with turbine discharge and the effectiveness of the new fish passage channel if the fish ladder use study identifies decreased use after

the project begins operation.

*Staff Analysis*

During non-flood periods, the majority of streamflow would be released to the project tailrace which could attract migratory fish away from the entrance to the existing fish ladder. As indicated above, NEHC proposes to excavate a new fish passage channel in the bypassed reach that would guide fish from the project tailrace to the fish ladder entrance. To ensure that the new fish passage channel is effective and fish ladder use is unaffected by project operation, NEHC will compare fish ladder use before and after project operation. If the study determines that fish ladder use decreases during project operation, NEHC will conduct a second study to determine passage delay associated with the turbine discharge and the effectiveness of the new fish passage channel. Conducting these studies will provide information about the effect of the project on upstream fish passage and provide information that can be used to modify project facilities or operation to improve upstream passage.

Operation, Maintenance, and Monitoring Plan (OMMP)

NEHC proposes to develop and implement an OMMP.

Interior's 30(c) condition 6 and Connecticut DEEP's certification (special condition 8) would require that NEHC develop an OMMP for maintaining and monitoring run-of-river operation and minimum flows at the proposed project site.

*Staff Analysis*

An OMMP would help the agencies and Commission staff verify that appropriate methods and equipment would be used to ensure the project is operating in a run-of-river mode and the minimum flow of 30 cfs would be maintained. Modifying the OMMP to require depth measurements in the fish passage channels would ensure that the 30-cfs minimum flow provides 2 feet of depth in the fish passage channels.

Freshwater Mussels

NEHC proposes to conduct a pre-construction freshwater mussel survey, and if mussels are identified in proposed construction areas, develop a plan to relocate freshwater mussels to areas that would not be affected by project construction.

Interior's 30(c) conditions 7a and 7b and Connecticut DEEP's certification (special conditions 9a and 9b) would require NEHC to conduct a pre-construction freshwater mussel survey and develop plan to relocate freshwater mussels that occur in

project construction areas.

*Staff Analysis*

No current surveys are available to document the existence and range of freshwater mussels in the Quinnipiac River watershed; however, it is possible freshwater mussels are present in the project area. If freshwater mussels are present in the project area, they could be injured or killed during project construction or their habitat could be altered or destroyed. Therefore, NEHC proposes to conduct a survey to identify any freshwater mussels living in the proposed project area. If freshwater mussels are located in the proposed project area and could be adversely affected by project construction or operation, then NEHC would relocate the mussels to ensure they are not harmed by project construction. Implementing these measures would limit potential project effects on any freshwater mussels that may occur in the project area.

Eel Trap

NEHC proposes to trap juvenile eels attracted to the project tailrace during their upstream migration, record the number and size classes caught, and release them upstream of the dam.

Interior's 30(c) condition 8e, NMFS's 30(c) condition 5c, and Connecticut DEEP's certification (special condition 10e) would require that NEHC trap juvenile eels that are attracted to the project tailrace.

*Staff Analysis*

Currently, juvenile American eels use an eel ramp that is seasonally installed in the existing fish ladder to pass upstream of Hanover Pond dam. However, proposed project operation could attract juvenile eels to the project tailrace and prevent them from finding the entrance to the existing ramp. Installing and operating an eel trap in the tailrace would allow NEHC to collect eels that are attracted to the tailrace and transport and release these fish upstream of the dam.

**Cumulative Effects**

Diadromous fish, including sea lamprey, American eel, American shad, alewife, and blueback herring, use the Quinnipiac River Basin for spawning and rearing. Within the river basin, these fish species could be cumulatively affected by the proposed project along with other non-hydropower dams. Dams throughout the basin can inhibit and block migratory fish passage which can limit access to suitable spawning, feeding, and rearing habitat.

At the proposed Hanover Pond Project, migratory fish could be delayed in their upstream migration by project operation. Flow releases to project's tailrace and low flows downstream of the dam could reduce the ability of migratory fish to locate the Denil fish ladder entrance or to move through the bypassed reach. NEHC's proposed measures, including release of the 30-cfs minimum flow, construction of the new fish passage channel, operation of the eel trap, and studies of upstream fish passage, should ensure migratory fish are able to safely move upstream of Hanover Pond dam and access spawning, feeding, and rearing habitat. Operation of the proposed Hanover Pond Project and implementation of these measures would reduce or eliminate any adverse project effects on diadromous fish, thereby reducing or eliminating any project contribution to ongoing cumulative effects on diadromous fish in the Quinnipiac River Basin.

### 5.3.3 Terrestrial Resources

#### Affected Environment

The proposed project would be located in the Connecticut Valley section of the Northeastern Coastal Zone ecoregion (Griffith et al., 2009). This region is primarily flat with some rolling hills, and is dominated by the Connecticut River and its tributaries. The Connecticut Valley section has more fertile soils and a milder climate than surrounding areas. Trees in this region are common to transition hardwood forests with some floodplain forests of silver maple and cottonwood.

The project is located in a suburban area, and the land immediately within the project vicinity has residential areas, schools, small businesses, and natural and park areas. The area around the dam consists of mowed lawn, some shrubs, and a few trees such as Silver maple (*Acer saccharinum*) and willows (*Salix* sp.). Invasive species such as Asiatic bittersweet (*Celastrus orbiculatus*), Common Reed (*Phragmites australis*), Japanese knotweed (*Fallopia japonica*), Jimson weed (*Datura stramonium*), multiflora rose (*Rosa multiflora*), Norway maple (*Acer platanoides*), Russian olive (*Elaeagnus angustifolia*) and non-native grass species are abundant.

Wetlands

According to the National Wetlands Inventory (USFWS, 2015), four wetlands exist in or near the project boundary, and all of these are located along the impoundment (see Figure 4). A 0.66-acre freshwater emergent wetland exists on the narrow peninsula located along the Quinnipiac River at the upstream end of the impoundment. A 4.65-acre freshwater forested/shrub wetland is located on a peninsula between Sodom Brook and Harbor Brook, which are tributaries to the impoundment. A 3.5-acre freshwater emergent wetland exists just north of the forested/shrub wetland on the peninsula, and a

smaller 0.72-acre forested/shrub wetland is located on the other side of Sodom Brook from the 4.65-acre forested/shrub wetland. Additionally, there are two very small wetland areas at the dam. The first is an area of forested shoreline just north of the dam, and the second is an area of floodplain soils along the toe of the fill slope on the west side of the river. These wetlands have been altered by filling and grading associated with dam construction and operation, and are likely not natural.

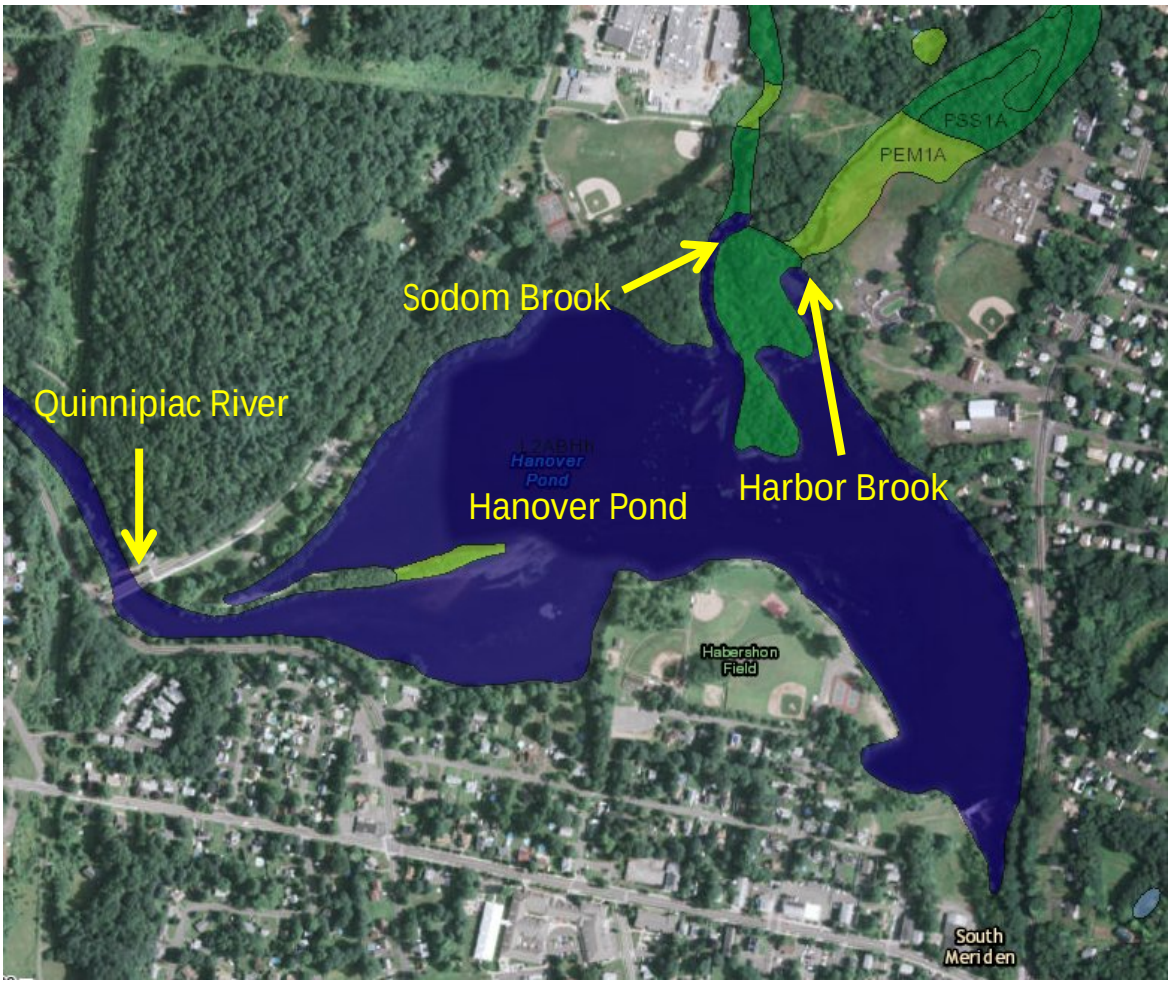


**Figure 4:** Location of wetlands in the vicinity of Hanover Pond (Source: USFWS, 2015, as modified by staff).

Wildlife Resources

Amphibians in the proposed project vicinity include the American toad (*Bufo americanus*), and several frog species. Reptiles include the Northern redbelly snake (*Storeria occipitomaculata*), common garter snake (*Thamnophis sirtalis*), and Northern ringneck snake (*Diadophis punctatus*). Common birds found nearby include woodpeckers (*Picoides* spp.), blue jay (*Cyanocitta cristata*), mallards (*Anas*

*platyrhynchos*), and Canada geese (*Branta canadensis*). The Connecticut Basin forms part of the Northern Flyway for waterfowl and many waterfowl fly through the area, but few stay to nest in the project vicinity. Mammals commonly found near the project include various shrew and bat species, Eastern chipmunk (*Tamias striatus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphus virginiana*), whitetail deer (*Odocoileus virginianus*), and muskrat (*Ondatra zibethicus*).

**Environmental Effects**

NEHC proposes to operate the project in a run-of-river mode. Proposed construction would include a new small powerhouse, a new penstock, a new tailrace, an approximate 500-foot long single overhead powerline, and a pad-mounted transformer. NEHC also proposes, as part of its proposed terms and conditions developed in collaboration with Interior and NMFS, to prepare an Invasive Species Monitoring and Control Plan (Invasive Species Plan) to map existing invasive species, monitor the species in the area periodically, and initiate early detection and rapid response protocols for infestations of target species.

Connecticut DEEP's certification (special condition 12) would require NEHC to protect Eastern box turtles (*Terrapene carolina carolina*) and wood turtles (*Glyptemys insculpta*) during project construction by: (1) installing silt fencing around the work area prior to construction; (2) investigating the work area after the silt fencing has been installed, but before construction begins, to search for turtles; (3) informing workers of the possible presence of turtles and providing them with descriptions of the species; (4) moving any turtle found in the construction area to an area immediately outside of the silt fence; (5) avoiding parking any vehicles or machinery in turtle habitat; (6) taking special care not to harm turtles during early morning and evening hour construction; and (7) removing all silt fencing after work is completed and soils are stable so as not to restrict turtle movement between uplands and wetlands.

*Staff Analysis*

Operating the project in the proposed run-of-river mode would maintain stable impoundment levels and minimize effects on wetland habitat along the project impoundment. Constructing the project facilities would disturb some vegetation, which could cause the spread of the invasive species that have infested the project area. NEHC's implementation of an Invasive Species Plan would help to prevent the establishment and spread of invasive species that could be caused by project construction and operation.

Implementing to exclude and remove Eastern box turtles and wood turtles from the construction area would help to prevent injuries to or deaths of turtles during project construction.

### 5.3.4 Threatened and Endangered Species

#### Affected Environment

The United States Fish and Wildlife Service website indicates that Northern long-eared bat (threatened) could potentially be found in the project vicinity.[14] There is no critical habitat designated for this species within the vicinity of the proposed project.

#### Environmental Effects

Northern Long-Eared Bats

NEHC does not propose any measures that would affect the Northern long-eared bat (*Myotis septentrionalis*). No comments regarding this species were received.

*Staff Analysis*

Northern long-eared bats hibernate colonially in caves, mines, and other underground areas through the winter. Summer habitat requirements include: (1) dead or live trees and snags with peeling or exfoliating bark, split tree trunks or branches, or cavities that may be used as maternity roost areas; (2) live trees such as shagbark hickory and oaks which have exfoliating bark; and (3) barns or sheds. These bats are susceptible to the fungal white-nose syndrome, disturbance during hibernation by human activity in or near the entrances of their caves, loss or fragmentation of summer forest habitat, and pesticide usage that reduces the number of flying insects or causes accumulation of toxins in the bats (USFWS, 2015b).

Northern long-eared bats are not known to hibernate near the project. They may be present in the project vicinity in the summer, but if these bats were present, it is doubtful that the operation of the project would negatively affect them because project operations would not have any expected effect on their habitat or food availability. There are very few trees with adequate habitat for the bats within the project boundary, and project construction would not remove any trees. The few trees that are suitable are greater than 1,000 feet apart, and therefore the bats would be extremely unlikely to use them as roosts (USFWS, 2014). Additionally, the area around the project does not have man-made structures that would be suitable for bat habitat. Because Northern long-eared

[14] http://ecos.fws.gov/ipac/

bats are not known to inhabit the project area and project construction does not involve tree removal or disturbance of potential Northern long-eared bat habitat, issuing an exemption from licensing for the Hanover Pond Project would have no effect on Northern long-eared bats.

### 5.3.5 Recreation and Aesthetic Resources

#### Affected Environment

#### Recreation

The Hanover Pond dam impoundment is used for boating and fishing, with two boat access points along the impoundment. An existing, unmarked path around the western part of the dam is used by canoeists to portage from the impoundment to downstream areas. There is a network of pedestrian and biking trail systems in the proposed project vicinity.

#### Environmental Impacts and Recommendations

#### Recreation

NEHC proposes to improve the existing portage route by installing signage.

*Staff Analysis*

Installing signage would improve the existing portage route by marking and identifying the existing path for boaters moving from Hanover Pond dam to the Quinnipiac River downstream of the dam.

#### Aesthetics

NEHC proposes to plant vegetation to reduce the visual impacts of the proposed project facilities.

*Staff Analysis*

Construction of the proposed powerhouse, penstock, tailrace, overhead electrical connection, and pad-mounted transformer will change the appearance of the project area. Existing vegetation and topography will provide a natural screen from some view points; however, additional plantings proposed by NEHC would help to reduce the effect of the proposed project on the appearance of the project area by hiding or blending in project features.

### 5.3.6 Cultural Resources

#### Affected Environment

Area of Potential Effect

The Advisory Council on Historic Preservation defines an area of potential effect (APE) as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE for the Hanover Pond Dam Hydroelectric Project includes: (a) lands that would be enclosed by the project boundary; and (b) lands or properties outside the project boundary in which project operations or project-related actions may cause changes in the character or use of historic properties, if any exist.

Historical background

Meriden, Connecticut was established in May 1806 and became recognized as a city in June 1867. Meriden's population and infrastructure increased through the end of 19th Century. The first major industry in Meriden was an ivory comb factory, which opened in 1822 and supplied 75 percent of domestic ivory combs and also exported globally. With the introduction of steam power, industrial growth spiked from the early 19th century through the early 20th century, with 120 factories established in Meriden by 1910. Meriden became known as a notable manufacturing center earning the nickname "Silver City," as a large quantity of cutlery, pewter buttons, and related products were manufactured in mills and factories in the area. Historically, over 100 Industrial Revolution-era dams existed on the Quinnipiac River; however, only five dams remain today.

The Hanover Pond dam was originally built in 1855 to provide power to the Meriden Cutlery Company. In the winter, tons of pond ice was harvested to support local stores and homes as a means of early refrigeration and food preservation. The seasonally harvested ice was also shipped throughout the region on trains, until the advent of the refrigerator in the 1930's. The manufacturing industry persevered through the Great Depression of the 1930's, and World War II reinvigorated growth and provided a huge boost to the local economy with all manufacturing plants converted to nearly 100 percent wartime uses (Karmazinas et all, 2015). Reduction of domestic manufacturing began in the 1950's and continued to decline until the manufacture of silverware in Meriden ceased in 1984.

Several parks were developed around the pond over time. Hanover Park, once a major regional attraction, was home to a large amusement park with theater productions,

rides, games, and semi-professional baseball.[15]

Historic Properties

Immediately upstream of the Hanover Pond impoundment is Red Bridge. Red Bridge was constructed in 1891 and is the oldest bridge spanning the Quinnipiac River. It is one of the 600 out of more than 2,000 remaining wrought iron lenticular truss bridges in the United States, and one of only twenty-five remaining in Connecticut. Red Bridge is listed on the National Register of Historic Places.

**Environmental Effects and Recommendations**

NEHC is not proposing any measures to address cultural resources.

*Staff Analysis*

In an email to NEHC dated October 4, 2014, and included in the exemption application, the Mashantucket Pequot Nation's Tribal Historic Preservation Officer (THPO) indicated that the project does not appear to have any impact to potentially significant religious or cultural resources for the Mashantucket Pequot Indian Nation.

In a letter dated September 25, 2014, the Connecticut SHPO determined that no historic properties will be affected by the proposed project. The Connecticut SHPO recommended that the Commission conclude that no historic properties will be affected by the project and indicated that no further review is required.

Staff has reviewed the information provided by NEHC and concluded that while the construction and operation of the proposed project would alter the character of the existing Hanover Pond dam, it would have no adverse effect on historic, archaeological, or traditional cultural properties.

During the term of any exemption, NEHC would occasionally need to implement project modifications that would not require Commission approval but could affect cultural resources at the project. These modifications could include activities such as painting or repairing facilities on the dam or general landscaping. Including a condition in any exemption that would require NEHC to consult with the Connecticut SHPO prior to conducting any maintenance activities, land-clearing or land-disturbing activities, or changes to project operation or facilities would ensure that cultural resources are not adversely affected.

[15] http://www.meridenlandtrust.com/Hanover_tri.pdf

It is possible that unknown cultural resources could be discovered during the course of constructing or operating the project. Including a condition in any exemption that would require NEHC to consult with the Connecticut SHPO if previously unidentified cultural resources are encountered would ensure the proper treatment of these resources. In the event of any such discovery, NEHC would discontinue all exploratory or construction-related activities until the proper treatment of any potential cultural resources is established.

### 5.4 No-Action Alternative

Under the no-action alternative, the project would not be issued an exemption, the project would not generate electricity, and there would be no effects on environmental resources.

## 6.0 RECOMMENDED ALTERNATIVE

Based on our independent review and evaluation of the environmental effects of the proposed action, section 30(c) conditions filed by Interior and NMFS, water quality certification conditions issued by the Connecticut DEEP, and a no-action alternative, we recommend the proposed action, including all of NEHC's proposed measures, the 30(c) conditions, the water quality certifications, and additional staff-recommended measures as the preferred alternative. Additional measures recommended by staff include: (1) modifying the OMMP to measure and report depth in the fish passage channels, (2) consulting with the Connecticut SHPO prior to implementing any project modifications, including maintenance activities, land-clearing, or land-disturbing activities, or changes to project operation or facilities, that do not require Commission approval but could affect cultural resources; and (3) consulting with the Connecticut SHPO if previously unidentified cultural resources are discovered during the course of constructing, maintaining, or developing project works or other facilities.

We recommend this alternative because: (1) issuing an exemption from licensing would allow NEHC to construct and operate the project as a beneficial and dependable source of electric energy; (2) the 220 kW of electric capacity would come from a renewable resource that would not contribute to atmospheric pollution; and (3) the recommended environmental measures would protect water quality, aquatic resources, terrestrial resources, and any previously unidentified cultural resources.

We recommend the following environmental measures proposed by NEHC for any exemption that would be issued for the proposed project (measures specified in Interior's and NMFS's 30(c) conditions are noted in parentheses):

- Operate the project in a run-of-river mode.

- Implement BMPs to minimize soil erosion and in river siltation during project construction.

- Develop and implement an Invasive Species Monitoring and Control Plan to map existing invasive species, monitor the project area for invasive species periodically, and initiate an early detection and rapid response protocol for infestations of target species.

- Provide a continuous minimum flow of 30 cfs into the bypassed reach and fish passage channels.

- Develop and implement an OMMP to ensure the project operates in run-of-river mode and provides the required minimum flows (i.e., operation compliance monitoring plan).

- Install a trashrack at the intake sluice gate with a minimum 9-inch clear bar spacing that will allow fish to pass through the Archimedes screw turbine.

- Evaluate fish passage through the sluice gate and the Archimedes screw turbine.

- Conduct a freshwater mussel survey to identify mussels to identify mussels located in project construction areas that may need to be relocated to other areas.

- Excavate a new fish passage channel and construct a new boulder wall to guide fish from the proposed tailrace to the fish ladder entrance.

- Conduct a fish ladder use study.

- Use a trap to collect juvenile eels from the tailrace for release into Hanover Pond.

- Conduct water quality monitoring for up to 3 years after the start of project operation.

- Implement an impoundment refill procedure after drawdowns associated with flashboard replacement, dam maintenance, or emergencies where no more than 10 percent of inflow is stored and 90 percent of inflow is released to protect habitat and water quality downstream of the dam.

- Install signage to identify an existing portage trail around western end of the dam and improve access to downstream areas.

- Plant vegetation to minimize the visual impacts of project facilities.

We also recommend the additional measures discussed below for the protection of environmental resources.

Modifying the OMMP

NEHC indicates that the 30-cfs minimum flow is intended to provide 2 feet of depth in the fish passage channels and it performed modeling to demonstrate that its proposed 30-cfs minimum flow will achieve this goal. NEHC also proposed to increase the minimum flow if it does not provide 2 feet of depth in the fish passage channels. However, there is no requirement or proposal for monitoring depth in the fish passage channels. Therefore, to ensure that the 30-cfs minimum flow achieves the goal of providing 2 feet of depth in the fish passage channels, we recommend modifying the OMMP to require NEHC to measure and report the depth in the fish passage channels within 30 days of commencing project operation and releasing the 30-cfs minimum flow.

Reducing the Potential for Fuel and Chemical Spills

Connecticut DEEP's certification (general condition 10) would require NEHC to implement BMPs to reduce the likelihood of fuel and chemical spills. During project construction, NEHC will occasionally need to use fuels and chemicals in the project area. Poor handling or management of fuels and chemicals could result in spills that contaminate soils and pollute the Quinnipiac River. Therefore, to reduce the potential for soil contamination and pollution of the Quinnipiac River from fuel and chemical spills, we recommend that NEHC implement the BMPs specified in Connecticut DEEP's certification.

Turtle Protection Measures

Connecticut DEEP's certification (special condition 12) would require NEHC to install silt fencing and conduct surveys to exclude and remove Eastern box turtles (*Terrapene carolina carolina*) and wood turtles (*Glyptemys insculpta*) from project construction areas. During project construction, turtles could be injured or killed from movement of heavy equipment and ground-disturbing activities. Implementing measures to exclude and remove Eastern box turtles and wood turtles from the construction area would help to prevent injuries to or deaths of turtles from construction activities. Therefore, we recommend that NEHC implement the measures specified by Connecticut

DEEP to protect Eastern box turtles and wood turtles.

Cultural Resources

During the term of any license, NEHC would occasionally need to implement project modifications that would not require Commission approval but could affect cultural resources at the project. These modifications could include activities such as roof or siding repairs, general landscaping, and yard maintenance within the project boundary. To ensure that cultural resources are not adversely affected from project modifications, we recommend that NEHC consult with the Connecticut SHPO prior to conducting any maintenance activities, land-clearing or land-disturbing activities, or changes to project operation or facilities that could affect cultural resources.

While the project would have no adverse effect on known on historic properties, it is possible that unknown cultural resources could be discovered during the course of constructing or operating the project. Therefore, we recommend that NEHC consult with the Connecticut SHPO if previously unidentified cultural resources are encountered to ensure the proper treatment of these resources. In the event of any such discovery, NEHC would discontinue all exploratory or construction-related activities until the proper treatment of any potential cultural resources is established.

Unavoidable Adverse Effects

During project operation some upstream fish passage delay and some downstream fish passage mortalities or injuries may occur; however, we would not expect any long-term effects on the aquatic community from these unavoidable project effects.

## 7.0 FINDING OF NO SIGNIFICANT IMPACT

If the Hanover Pond Dam Hydroelectric Project is exempted from licensing as proposed with the additional staff-recommended measures, the project would be constructed and operated while protecting water quality, aquatic resources, terrestrial resources, aesthetic resources, existing historic resources, and any previously unidentified cultural resources in the project area.

Based on our independent analysis, issuance of an exemption from licensing for the Hanover Pond Dam Hydroelectric Project, as proposed with the additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

## 8.0 LITERATURE CITED

Connecticut Department of Energy and Environmental Protection (Connecticut DEEP). 2013. State of Connecticut Integrated Water Quality Report Standards for Classification of Surface Waters of the State. http://des.nh.gov/organization/divisions/water/wmb/section401/index.htm

Federal Energy Regulatory Commission. (July 2014). Retrieved from: https://www.ferc.gov/industries.hydropower.asp

Griffith, G., Omernik, J., Bryce, S., Royte, J., Hoar, W., Homer, J., Keirstead, D., Metzler, K., and Hellyer, G. 2009. Ecoregions of New England. U.S. Geological Survey: Reston, Virginia.

Karmazinas, Lucas, and Tod Bryant. "Historic and Architectural Resources Inventory for the City of Meriden, Connecticut, Phase I Study." City of Meriden, 1 Nov. 2013. Web. 12 Nov. 2015. (https://www.cityofmeriden.org/FormRepository/processDownload.asp?ID=390)

Kibel, P. and Coe, T. (2011). Archimedes screw risk assessment: strike and delay probabilities. FISHTEK Consulting.

Lucas, M. and Bracken, F. (2010). Potential impacts of hydroelectric power generation on downstream moving lampreys at Howsham, Yorkshire Derwent. University of Durham, R&D Report.

NEHC LLC. 2015. Application for Exemption from Licensing of a Small Hydroelectric Facility: Hanover Pond Dam Hydroelectric Project. Filed June 25, 2015.

NEHC LLC. 2015a. Response to August 13, 2015 Deficiencies in Application for Exemption from Licensing: Hanover Pond Dam Hydroelectric Project. Filed September 4, 2015.

NEHC LLC. 2015b. Supplemental Exhibit G Information of New England Hydropower Company LLC.: Hanover Pond Hydroelectric Project. Filed September 29, 2015.

Sammons, S.M and Bettoli, P. W. 2000. Population dynamics of a reservoir sport fish community in response to hydrology. North American Journal of Fisheries Management 20:791-800.

Spah, H. (2001). Fishery biological opinion of the compatibility of the patented Hydraulic screw from Ritz Atro. Bielfield, Germany.

United States Fish and Wildlife Service (USFWS). 2015. Letter filed July 13, 2015

United States Fish and Wildlife Service (USFWS). 2015. National Wetlands Inventory. U.S. Department of the Interior: Washington, D.C. Available online at http://www.fws.gov/wetlands/index.html.

United States Fish and Wildlife Service (USFWS). 2015b. Northern long-eared bat (*Myotis septentrionalis*). U.S. Department of the Interior: Washington, D.C. Available online at http://www.fws.gov/Midwest/endangered/mammals/nleb/index.html.

United States Fish and Wildlife Service (USFWS). 2014. Northern long-eared bat interim conference and planning guidance. U.S. Department of the Interior: Washington, D.C. Available online at file:///C:/Users/ntppj141/Downloads/NLEBinterimGuidance6Jan2014.pdf.

## 9.0 LIST OF PREPARERS

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**APPENDIX A**
U.S. DEPARTMENT OF THE INTERIOR
SECTION 30(c) CONDITIONS OF THE FEDERAL POWER ACT
FILED ON OCTOBER 15, 2015

1. The Exemptee shall operate the Project in an instantaneous run-of-river mode, whereby inflow to the Project will equal outflow from the Project at all times, and water levels above the Dam are not drawn down for the purpose of generating power. Run-of-river operation may be temporarily modified if required by operating emergencies beyond the control of the Exemptee, or for short periods upon mutual agreement between the Exemptee, the U.S. Fish and Wildlife Service, the Connecticut Department of Energy and Environmental Protection, and the National Marine Fisheries Service.

2. The Exemptee shall install a fishway attraction channel within the bypass reach. The purpose of the channel is to attract fish away from the tailrace discharge and up to the entrance of the fish ladder. The channel shall be designed in consultation with, and require approval by, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection. The effectiveness of the channel shall be evaluated pursuant to condition 8b below. The Exemptee shall be responsible for maintaining the channel to its design specifications. The channel shall be constructed and operational upon commencement of Project generation.

3. The Exemptee shall provide a continuous flow to the bypass reach of 30 cfs. During periods when the fish ladder is operating, the Exemptee shall provide a continuous bypass reach flow of 30 cfs or flows sufficient to operate the fish ladder and wet the two low-flow channels to a depth of at least 2 feet (whichever is greater). Bypass flow requirements are subject to available inflow to Hanover Pond.

4. The Exemptee shall install a coarse trashrack in front of the Project intake with clear spacing of no less than 9-inches. The trashrack shall be installed and operational concurrent with Project start-up. The rack shall be required to be kept free of debris and maintained to design specifications.

5. The Exemptee shall conduct a post-operation water quality monitoring survey. The survey protocol shall be developed in consultation with, and require approval by, the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection. Data shall be collected for up to three (3) years, and shall be initiated the first low-flow season after the turbine becomes operational. If results indicate that the Project is not meeting water quality standards, the Exemptee shall implement mitigation measures sufficient to achieve applicable standards.

6. The Exemptee shall, within six (6) months of the date of issuance of an exemption from licensing, prepare in consultation with, and require approval by, the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection, a plan for maintaining and monitoring bypass flows and run-of-river operation at the Project. The plan shall include a description of the mechanisms and structures that will be used, the level of manual and automatic operation, the methods to be used for recording data on bypass flows and run-of-river operation, an implementation schedule, and a plan for maintaining the data for inspection by the U.S. Fish and Wildlife Service, the Federal Energy Regulatory Commission, and the Connecticut Department of Energy and Environmental Protection.

7. The Exemptee shall undertake the following measures and studies related to freshwater mussels:

a. The Exemptee shall undertake a Pre-Construction Freshwater Mussel Survey. The study plan for the survey shall be developed in consultation with, and require approval by, the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection. The objectives of the study will be to: (1) document the identity of any mussels living in the Project area prior to Project construction; (2) document the location of identified mussels; and (3) determine if any mussel beds would be affected by construction activities (including drawing down the headpond). The study shall be completed prior to the initiation of construction activities. If results of the survey indicate that construction-related activities will impact mussel beds, the Exemptee shall implement protective measures as directed by the U.S. Fish and Wildlife Service and/or the Connecticut Department of Energy and Environmental Protection.

b. If the survey conducted pursuant to condition 7.a documents that mussels residing in Hanover Pond would be impacted by future headpond drawdowns, the Exemptee shall be required to develop a Freshwater Mussel Monitoring and Relocation Protocol. The protocol shall be developed in consultation with, and require the approval of, the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection. The objectives of the protocol will be to: (1) monitor specific locations within Hanover Pond during headpond drawdowns; and (2) relocate exposed mussels from those locations to areas that will remain wetted during the drawdown. If required, the protocol shall be submitted for approval within 9 months after the turbine becomes operational.

8. In order to ensure that the Project does not inhibit the safe, timely and effective movement of fish, the Exemptee shall undertake the following fish passage measures and studies:

a. Upstream Fish Ladder Utilization Study

The Exemptee shall undertake a Fish Ladder Utilization Study (FLUS). The study plan shall be developed in consultation with, and require approval by, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection. The goal of the study will be to compare pre-operation use of the fishway with post-operation use of the fishway to determine if Project operations impact utilization of the fishway. Study objectives include: (1) documenting the species and numbers of fish that use the existing Denil fishway; (2) documenting the periodicity of such passage; and (3) determining relative passage efficiency through both the zone of passage (i.e., bypass reach) and existing fish ladder, under both existing and post-operation conditions. Study methodology shall be developed under the guidance of the Connecticut Department of Energy and Environmental Protection, but broadly shall consist of using video monitoring to document passage of both wild fish and tagged test fish. The study shall be conducted for 1 year pre-operation and 3 years post-operation. The study shall be conducted between April 1 and June 15 annually for all four years. In order for a year's study to be considered complete, the video system and all components of the study must be effective and operational for 65 days during the study time period for each year of study. If the study for that year is not deemed complete, it will not count as one of the required four years and the study must be repeated for another year.

A report summarizing the methods and results of the FLUS shall be submitted to the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection by October 1, annually. In reviewing the annual reports, if the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and/or the Connecticut Department of Energy and Environmental Protection determine that a study methodology is not performing adequately to meet the study's objectives, the Exemptee shall modify the methodology prior to the next year's study, as directed by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and/or the Connecticut Department of Energy and Environmental Protection.

At the end of the FLUS, the Exemptee shall turn over the operation of the video system to the Connecticut Department of Energy and Environmental Protection for its use in monitoring fish runs in the River and the Connecticut Department of Energy and Environmental Protection shall operate the system without further obligation on the part of the Exemptee.

If study results indicate that Project operation is affecting utilization of the fish ladder, the Exemptee shall implement mitigation measures as directed by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and/or the Connecticut Department of Energy and Environmental Protection.

b. Upstream Fish Ladder Attraction Study

If the U.S. Fish and Wildlife Service and/or the Connecticut Department of Energy and Environmental Protection determine that the results of the study conducted under Condition 8a do not address the issue of false attraction sufficiently, the Exemptee shall undertake a stand-alone False Attraction Study. The study plan shall be developed in consultation with, and require approval by, the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection. The objectives of the study will be to determine if the turbine discharge falsely attracts upstream migrants and/or verify that the new secondary low-flow channel is successfully attracting and passing migrants up to the ladder entrance. The study will be initiated the first upstream passage season after receiving notification from the U.S. Fish and Wildlife Service and/or the Connecticut Department of Energy and Environmental Protection that the study is needed. This study will be repeated annually, for up to three (3) years. If study results document false attraction or problems with the secondary low-flow channel, the Exemptee shall implement mitigation measures as directed by the U.S. Fish and Wildlife Service and/or the Connecticut Department of Energy and Environmental Protection.

c. Downstream Passage: Sluice Gate Evaluation

The Exemptee shall undertake a Sluice Gate Evaluation. The evaluation plan shall be developed in consultation with, and require approval by, the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection. The objective of the evaluation will be to determine if the downward-closing sluice gate affects downstream movement of migratory fish. The study will use one or more underwater cameras, or other similar methodology deemed acceptable by the agencies,

to monitor fish behavior at the sluice gate during the downstream migration period. The study will be initiated the first upstream passage season after the turbine becomes operational, and will be repeated annually, for up to three (3) years. The turbine shall not begin operating until the study plan has been approved by the U.S. Fish and Wildlife Service. If results of the evaluation indicate that operation of the sluice gate inhibits movement down through the ASG, the Exemptee shall implement mitigation measures protective of public safety, as directed by the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection.

d. Downstream Passage: ASG Injury/Mortality Assessment

The Exemptee shall undertake an ASG Injury/Mortality Assessment. The assessment methodology shall be developed in consultation with, and require approval by, the U.S. Fish and Wildlife Service, the Connecticut Department of Energy and Environmental Protection, and the National Marine Fisheries Service. The objective of the assessment will be to determine if passage through the ASG turbine causes injury or mortality to fish. The assessment will be initiated the first passage season after the turbine becomes operational, and will be repeated annually, for up to three (3) years. The turbine shall not begin operating until the assessment methodology has been approved by the U.S. Fish and Wildlife Service, the Connecticut Department of Energy and Environmental Protection, and the National Marine Fisheries Service. If results of the assessment indicate that the ASG turbine imposes injury or mortality to greater than 5 percent of transiting fish, the Exemptee shall implement mitigation measures as directed by the U.S. Fish and Wildlife Service, the Connecticut Department of Energy and Environmental Protection, and/or the National Marine Fisheries Service.

e. Upstream Passage for American Eels

The Exemptee shall install and operate an eel ramp trap at the Project tailrace. The purpose of the eel ramp is to intercept juvenile eels attempting to migrate upstream that are attracted to the ASG tailrace discharge. The location and design of the ramp shall be determined in consultation with, and require approval by, the U.S. Fish and Wildlife Service, the Connecticut Department of Energy and Environmental Protection, and the National Marine Fisheries Service. The Exemptee shall be responsible for installing and operating the ramp annually from May 1 through October 31. Operation of the ramp shall include periodically (at least weekly) collecting

trapped eels, recording numbers and size classes caught, and releasing the eels into the Hanover Pond headpond. The ramp shall be constructed and operational the first passage season after the turbine becomes operational. A report detailing the biological data of eels collected and moved shall be provided to the U.S. Fish and Wildlife Service, the Connecticut Department of Energy and Environmental Protection, and the National Marine Fisheries Service by December 1 of each operation year.

9. During refilling of the Project reservoir after Dam maintenance or emergency drawdown, the Exemptee shall operate the Project such that 90 percent of inflow to the Project is released below the Project and the impoundment is refilled on the remaining 10 percent of inflow until the headpond is restored to normal levels and run-of-river operation is restored. This refill procedure may be modified on a case-by-case basis with the prior approval of both the U.S. Fish and Wildlife Service and the Connecticut Department of Energy and Environmental Protection.

10. The Exemptee shall, within nine (9) months of the date of issuance of an exemption from licensing, prepare and file for approval by the U.S. Fish and Wildlife Service, an Invasive Species Monitoring and Control Plan. The objectives of the plan will be to map existing invasive species, monitor the area periodically, and initiate an early detection, rapid response protocol for infestations of target species. The plan shall be developed in consultation with, and require approval of, the U.S. Fish and Wildlife Service.

11. The Exemptee shall notify the U.S. Fish and Wildlife Service in writing when the Project commences operation. Such notice shall be sent within 30 days of Project start-up to: Supervisor, New England Field Office, 70 Commercial Street, Suite 300, Concord, New Hampshire 03301. The Exemptee shall provide the U.S. Fish and Wildlife Service with a set of as-built drawings concurrent with filing said plans with the Federal Energy Regulatory Commission.

12. The Exemptee shall allow the U.S. Fish and Wildlife Service to inspect the Project area at any time while the Project operates under this exemption from licensing, to monitor compliance with its terms and conditions.

13. The U.S. Fish and Wildlife Service reserves the right to add to and alter terms and conditions for this exemption as appropriate to carry out its responsibilities with respect to fish and wildlife resources. The Exemptee shall, within thirty (30) days of receipt, file with the Federal Energy Regulatory Commission any additional terms and conditions imposed by the U.S. Fish and Wildlife Service.

14. The Exemptee shall incorporate the aforementioned terms and conditions in any

conveyance—by lease, sale or otherwise—of its interests so as to assure compliance with said conditions for as long as the Project operates under an exemption from licensing. These conditions are required with the understanding that the Federal Energy Regulatory Commission will likely want to retain concurrent approval authority over some or all of the plans and actions described above, and the above conditions should not be read as preventing this.

**APPENDIX B**
NATIONAL MARINE FISHERIES SERVICE
SECTION 30(c) CONDITIONS OF THE FEDERAL POWER ACT
FILED ON OCTOBER 16, 2015

The Terms and Conditions are being proposed pursuant to the Public Utilities Regulatory Policy Act, which incorporates Section 30 (c) of the Federal Power Act.

1. The Exemptee shall operate the Project in an instantaneous run-of-river mode, whereby inflow to the Project will equal outflow from the project at all times and water levels above the Dam are not drawn down for the purpose of generating power. Run-of-river operation may be temporarily modified if required by operating emergencies beyond the control of the Exemptee, or for short periods upon mutual agreement between the Exemptee, the U.S. Fish and Wildlife Service, the Connecticut Department of Energy and Environmental Protection, and the National Marine Fisheries Service.

2. The Exemptee shall provide a continuous flow to the bypass reach of 30 cfs, or flows sufficient to operate the fish ladder (seasonally) and wet the two low-flow channels to a depth of at least 2 feet (whichever is greater), subject to available inflow to Hanover Pond.

3. The Exemptee shall install a fishway attraction channel within the bypass reach. The purpose of the channel is to attract fish away from the tailrace discharge and up to the entrance of the fish ladder. The channel shall be designed in consultation with and require approval by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection. The Exemptee shall be responsible for maintaining the channel to its design specifications. The channel shall be constructed and operational upon commencement of Project generation.

4. The Exemptee shall install a trashrack with clear spacing of no less than 9-inches. The trashrack shall be installed and operational concurrent with Project start-up. The racks shall be required to be kept free of debris and maintained to design specifications.

5. To ensure the Project does not inhibit the safe, timely and effective movement of fish, the Exemptee shall undertake the following fish passage measures and studies:

a. Upstream Fish Ladder Utilization Study

The Exemptee shall undertake a Fish Ladder Utilization Study. The study plan shall be developed in consultation with, and require approval by, the

U.S. Fish & Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection. The goal of the study will be to compare pre-operation use of the fishway with post-operation use of the fishway to determine if project operations impact utilization of the fishway. Study objectives include: (1) documenting the species and numbers of fish that use the existing Denil fishway, (2) documenting the periodicity of such passage, and (3) determining relative passage efficiency through both the zone of passage (i.e., bypass reach) and existing fish ladder.

Study methodology shall be developed under the guidance of the Connecticut Department of Energy and Environmental Protection, but broadly consist of using video monitoring to document passage of both wild fish and tagged test fish. The study shall be conducted for 1 year pre-operation and 3 years post-operation. The study shall be conducted between April I and June 15 annually for all four years. In order for a year's study to be considered complete, the video system and all components of the study must be effective and operational for 65 days during the study time period. If a study year is not deemed complete it will not count as one of the required four years and the study must be repeated.

A report summarizing the methods and results of the Fish Ladder Utilization Study shall be submitted to the U.S. Fish & Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection by October l, annually. In reviewing the annual reports, if the U.S. Fish & Wildlife Service, the National Marine Fisheries Service, and/or the Connecticut Department of Energy and Environmental Protection determines that a study methodology is not performing adequately to meet the study's objectives, the Exemptee shall modify the methodology prior to the next year's study, as directed by the U.S. Fish & Wildlife Service, the National Marine Fisheries Service, and/or the Connecticut Department of Energy and Environmental Protection.

Upon completion of the Fish Ladder Utilization Study, the Exemptee shall turn over the operation of the video system to the Connecticut Department of Energy and Environmental Protection for its use in monitoring fish runs in the river and the Connecticut Department of Energy and Environmental Protection shall operate the system without further obligation on the part of the Exemptee.

If study results indicate that Project operation is affecting utilization of the fish ladder, the Exemptee shall implement mitigation measures as directed

by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and/or the Connecticut Department of Energy and Environmental Protection.

b. Downstream Passage: ASG Injury/Mortality Assessment

The Exemptee shall undertake an ASG Injury/Mortality Assessment. The assessment methodology shall be developed in consultation with, and require approval by, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection. The objective of the assessment will be to determine if passage through the ASG unit causes injury or mortality to fish. The assessment will be initiated the first passage season after the turbine becomes operational, and will be repeated annually, for up to 3 years. The turbine shall not begin operating until the assessment methodology has been approved by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection. If results of the assessment indicate that the ASG imposes injury or mortality to greater than 5 percent of transiting fish, then the Exemptee shall implement mitigation measures as directed by the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and/or the Connecticut Department of Energy and Environmental Protection.

c. Upstream Passage for American Eels

The Exemptee shall install and operate a blind eel ramp at the Project. The purpose of the eel ramp is to intercept juvenile eels attempting to migrate upstream that are attracted to the ASG tailrace discharge. The location and design of the ramp shall be determined in consultation with, and require approval by, the U.S. Fish & Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection. The Exemptee shall be responsible for installing and operating the ramp annually from May 1 through October 31. Operation of the ramp shall include periodically (at least weekly) collecting trapped eels, recording numbers and size classes caught, and releasing the eels into the Hanover Pond headpond. The ramp shall be constructed and operational the first passage season after the turbine becomes operational. A report detailing the biological data of eels collected and moved shall be provided to the U.S. Fish & Wildlife Service, the National Marine Fisheries Service, and the Connecticut Department of Energy and Environmental Protection by December 1 of each operation year.

6. The Exemptee shall notify the National Marine Fisheries Service in writing when the Project commences operation. Such notice shall be sent within 30 days of start-up to Regional Administrator, National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office, 55 Great Republic Drive, Gloucester, Massachusetts, 01930. The Exemptee shall furnish us with a set of as-built drawings concurrent with filing said plans with the Commission.

7. The Exemptee shall allow the National Marine Fisheries Service to inspect the Project area at any time while the Project operates under an exemption from licensing to monitor compliance with its terms and conditions.

8. The National Marine Fisheries Service reserves the right to add to and alter terms and conditions for this exemption as appropriate to carry out its responsibilities with respect to fish and wildlife resources. The Exemptee shall, within thirty (30) days of receipt, file with the Federal Energy Regulatory Commission any additional terms and conditions imposed by the National Marine Fisheries Service.

9. The Exemptee shall incorporate the aforementioned terms and conditions in any conveyance-by lease, sale or otherwise---of its interests so as to legally assure compliance with said conditions for as long as the Project operates under an exemption from licensing.

These conditions are required with the understanding that the Federal Energy Regulatory Commission likely will want to retain concurrent approval authority over some or all of the plans and actions described above, and the above conditions should not be read as preventing this.

# APPENDIX C

## CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION
## SECTION 401 WATER QUALITY CERTIFICATION CONDITIONS OF THE CLEAN WATER ACT
## ISSUED ON APRIL 15, 2016

This authorization is subject to the following conditions:

### SPECIAL CONDITIONS

1. The Permittee shall operate the Project in an instantaneous run-of-river mode, whereby inflow to the Project will equal outflow from the Project at all times and water levels above the Dam are not drawn down for the purpose of generating power. Run-of-river operation may be temporarily modified if required by operating emergencies beyond the control of the Permittee, or for short periods upon mutual agreement between the Permittee, the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

2. The Permittee shall provide a continuous flow to the bypass reach of 30 cfs, or flows sufficient to operate the fish ladder (seasonally) and wet the two low flow channels to a depth of at least 2 feet (whichever is greater), subject to available inflow to Hanover Pond.

3. The Permittee shall, prior to commencing construction, file for Connecticut Department of Energy and Environmental Protection approval of an erosion and sediment control plan, which structures shall be in place before dewatering and construction. Erosion and sediment control structures shall be removed within one year after construction is complete and site is stabilized.

4. The Permittee shall construct a fishway attraction channel within the bypass reach of the natural stream channel. The purpose of the channel is to collect and direct flow to attract fish away from the tailrace discharge and up to the entrance of the existing fish ladder. The channel shall be designed in consultation with and require approval by the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. The effectiveness of the channel shall be evaluated pursuant to Condition number ten (10) b., below. The Pe1mittee shall be responsible for maintaining the channel to its design specifications. The channel shall be constructed and operational upon commencement of Project generation.

5. The Permittee shall install at the water intake for the Archimedes Screw Generator (ASG) Turbine, a trashrack with clear spacing of no less than nine (9) inches. The trashracks shall be installed and operational concurrent with Project start-up. The racks shall be required to be kept free of debris and maintained to design specifications.

6. The Permittee shall conduct a post-operation water quality monitoring survey. The survey protocol shall be developed in consultation with, and require approval by, the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service.

   Data shall be collected for up to three (3) years, and shall be initiated the first low-flow season after the ASG turbine becomes operational. If results indicate that the Project is not meeting water quality standards, the Permittee shall implement mitigation measures as sufficient to achieve said standards.

7. The Permittee shall, within six (6) months from the effective date of the exemption from the Federal Energy Regulatory Commission license concerning "Hanover Pond Darn Hydroelectric Project No. 14550-000/001-CT", or by March 30, 2017, whichever is sooner, file for Connecticut Department of Energy and Environmental Protection approval of a water quality monitoring plan, consistent with the requirement stated in Condition number six (6) above. The plan shall include, but not necessarily be limited to:

   a. A description of locations, time period, methods, equipment, maintenance, and calibration procedures to monitor dissolved oxygen concentrations and water temperature at a location in the Quinnipiac River immediately upstream of the darn and in the Quinnipiac River downstream of the tail race;

   b. Description of the protocol for annually reporting water quality monitoring data to the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service including any recommendations for modifications to Project operations or facilities, and any other enhancement measures that are proposed by the licensee if the water quality constituents monitored in Project-affected waters fall below state water quality standards; and

   c. An implementation schedule.

8. The Permittee shall, within 30 days of commencement of project generation, prepare in consultation with, and require approval by, the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service, a plan for maintaining and monitoring bypass flows and run-of-river operation at the Project. The plan shall include a description of the mechanisms and structures that will be used, the level of manual and automatic operation, the methods to be used for recording data on bypass flows and run-of- river operation, an implementation schedule, and a plan for maintaining the data for inspection by the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and the Federal Energy Regulatory Commission.

9. The Permittee shall undertake the following measures and studies related to freshwater mussels:

    a. The Permittee shall undertake a Pre-Construction Freshwater Mussel Survey. The study plan shall be developed in consultation with, and require approval by, the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service. The objectives of the study will be to (1) document the identity of any mussels living in the Project area prior to Project construction, (2) document the location of identified mussels, and (3) determine if any mussel beds would be affected by construction activities (including drawing down the headpond). The study shall be completed prior to the initiation of construction activities. If results of the survey indicate that construction-related activities will impact mussel beds, the Permittee shall implement protective measures as directed by the Connecticut Department of Energy and Environmental Protection and/or the U.S. Fish and Wildlife Service.

    b. If the survey conducted pursuant to Condition number nine (9) a. above, documents mussels residing in Hanover Pond that would be impacted by future headpond drawdowns, the Permittee shall be required to develop a Freshwater Mussel Monitoring and Relocation Protocol. The protocol shall be developed in consultation with, and require the approval of, the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service. The objectives of the protocol will be to (1) monitor specific locations within Hanover Pond during headpond drawdowns and (2) relocate exposed mussels from those locations to areas that will remain wetted during the drawdown. If required, the protocol shall be submitted for approval prior to the first drawdown required for construction.

10. In order to ensure that the Project does not inhibit the safe, timely and effective movement of fish, the Permittee shall undertake the following fish passage measures and studies:

    a. Upstream Fish Ladder Utilization Study

    The Permittee shall undertake a Fish Ladder Utilization Study (FLUS). The study plan shall be developed in consultation with, and require approval by, the Connecticut Department of Energy and Environmental Protection, the U.S. Fish & Wildlife Service and the National Marine Fisheries Service. The goal of the study will be to compare pre-operation use of the fishway with post-operation use of the fishway to determine if Project operations impact utilization of the fishway. Study objectives include: (1) documenting the species and numbers of fish that use the existing Denil fishway, (2) documenting the periodicity of such passage, and (3) determining relative passage efficiency through both the zone of passage (i.e., bypass reach) and existing fish ladder.

    Study methodology shall be developed under the guidance of the Connecticut Department of Energy and Environmental Protection, but broadly shall consist of using video monitoring to document passage of both wild fish and tagged test fish. The study shall be conducted for 1 year pre-operation and 3 years post-operation. The study shall be conducted between April 1 and June 15 annually for all four years. In order for a year's study to be considered complete, the video system and all components of the study must be effective and operational for 65 days during the study time period. If the study for that year is not deemed complete it will not count as one of the required four years and the study must be repeated for another year.

    A report summarizing the methods and results of the FLUS shall be submitted to the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service by October 1, annually. In reviewing the annual reports, if the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service determines that a study methodology is not performing adequately to meet the study's objectives, the Permittee shall modify the methodology prior to the next year's study, as directed by the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service.

At the end of the FLUS, the Permittee shall turn over the operation of the video system to the Connecticut Department of Energy and Environmental Protection for its use in monitoring fish runs in the river and the Connecticut Department of Energy and Environmental Protection shall operate the system without further obligation on the part of the Permittee.

If the Connecticut Department of Energy and Environmental Protection determines that the study results indicate that Project operation is negatively affecting utilization of the fish ladder, the Permittee shall implement mitigation measures as directed by the Connecticut Department of Energy and Environmental Protection in consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to be in compliance with this permit. Once those changes are implemented, the Permittee shall undertake studies to demonstrate their effectiveness. The Permittee shall submit a Plan for the Connecticut Department of Energy and Environmental Protection's approval for such additional study and the study must be conducted for a minimum of three years, consistent with requirements provided in Condition number ten (10) unless otherwise determined by the Connecticut Department of Energy and Environmental Protection.

b. Upstream Fish Ladder Attraction Study

If the Connecticut Department of Energy and Environmental Protection and/or the U.S. Fish and Wildlife Service determine that the results of the study conducted under Condition number ten (10) a. above, do not address the issue of false attraction sufficiently, the Permittee shall undertake a stand-alone False Attraction Study. The study plan shall be developed in consultation with, and require approval by, the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service. The objectives of the study will be to determine if the ASG turbine discharge attracts upstream migrants away from the fishway entrance and/or verify that the new secondary low flow channel is successfully attracting and passing migrants up to the fishway entrance. The study will be initiated the first upstream passage season after receiving notification from the Connecticut Department of Energy and Environmental Protection and/or the U.S. Fish and Wildlife Service that the study is needed and will be repeated annually, for up to three (3) years. If study results document false attraction or problems with the secondary low flow channel, the Permittee shall implement mitigation measures as directed by the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service. Once those changes are implemented, the Permittee shall undertake studies to demonstrate

their effectiveness. The Permittee shall submit a Plan for the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service's approval for such additional study and the study must be conducted for a minimum of three years, consistent with requirements provided in Condition number ten (10) unless otherwise determined by the Connecticut Department of Energy and Environmental Protection and/or the U.S. Fish and Wildlife Service.

c. Downstream Passage: Sluice Gate Evaluation

The Permittee shall undertake a Sluice Gate Evaluation. The evaluation plan shall be developed in consultation with, and require approval by the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service. The objective of the evaluation will be to determine if the downward-closing sluice gate affects downstream passage of migratory fish. The study will use one or more underwater cameras to remotely monitor fish behavior at the sluice gate during the downstream migration period, or other similar methodology deemed acceptable by the agencies. The study will be initiated the first upstream passage season after the ASG turbine becomes operational, and will be repeated annually, for up to three (3) years. The ASG turbine shall not begin operating until the study plan has been approved by the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service. If results of the evaluation indicate that operation of the sluice gate inhibits movement down through the ASG turbine, the Permittee shall implement mitigation measures protective of public safety, as directed by the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service. Once those changes are implemented, the Permittee shall undertake studies to demonstrate their effectiveness. The Permittee shall submit a Plan for the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service's approval for such additional study and the study must be conducted for a minimum of three years, consistent with requirements provided in Condition number ten (10) unless otherwise determined by the Connecticut Department of Energy and Environmental Protection and/or the U.S. Fish and Wildlife Service.

d. Downstream Passage: ASG Turbine Injury/Mortality Assessment

The Permittee shall undertake an ASG Turbine Injury/Mortality Assessment. The assessment methodology shall be developed in consultation with, and require approval by, the Connecticut Department of Energy and

Environmental Protection, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. The objective of the assessment will be to determine if passage through the ASG turbine causes injury or mortality to fish. The assessment will be initiated the first passage season after the ASG turbine becomes operational, and may be repeated annually, for up to three (3) years, upon the determination of the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service, and/or the National Marine Fisheries Service. The ASG turbine shall not begin operating until the assessment methodology has been approved by the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. If results of the assessment indicate that the ASG turbine imposes injury or mortality to greater than 5 percent of transiting fish, then the Permittee shall implement mitigation measures as directed by the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service, and/or the National Marine Fisheries Service. Once those changes are implemented, the Pe1mittee shall undertake studies to demonstrate their effectiveness. The Permittee shall submit a Plan for the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service's approval for such additional study and the study may be conducted for a minimum of three years, as determined by the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service, and/or the National Marine Fisheries Service.

e. Upstream Passage for American Eels

The Permittee shall install and operate a blind eel ramp at the Project. The purpose of the eel ramp is to intercept juvenile eels attempting to migrate upstream that are attracted to the ASG tailrace discharge. The location and design of the ramp shall be determined in consultation with, and require approval by, the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. The Permittee shall be responsible for installing and operating the ramp annually from May 1 through October 31. Operation of the ramp shall include periodically (at least weekly) collecting trapped eels, recording numbers and size classes caught, and releasing the eels into the Hanover Pond headpond. The ramp shall be constructed and operational the first passage season after the ASG turbine becomes operational. A report detailing the biological data of eels collected and moved shall be provided to the Connecticut Department of Energy and Environmental Protection, the U.S.

Fish and Wildlife Service and the National Marine Fisheries Service by December 1 of each operation year.

11. During refilling of the Project reservoir after Darn maintenance or emergency drawdown, the Permittee shall operate the Project such that 90 percent of inflow to the Project is released below the Project and the impoundment is refilled on the remaining 10 percent of inflow. This refill procedure may be modified on a case-by-case basis with the prior approval of both the Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service.

12. Species of Special Concern -The Connecticut Department of Energy and Environmental Protection records indicate the following extant populations of species of special concern: the Eastern box turtle (Terrapene Carolina Carolina) and wood turtle (Glyptemys insculpta). The following precautions should be taken to protect these species of special concern:

    - Silt fencing should be installed around the work area prior to construction;
    - After silt fencing is installed and prior to construction, a sweep of the work area should be conducted to look for turtles;
    - Workers should be apprised of the possible presence of turtles, and provided a description of the species (www.ct.gov/deep/cwp/view.asp?a=2723&g=473472&deepNav GID=I655);
    - Any turtles that are discovered should be moved, unharmed, to an area immediately outside of the fenced area, and position in the same direction that it was walking; No vehicles or heavy machinery should be parked in any turtle habitat;
    - Work conducted during early morning and evening hours should occur with special care not to harm basking or foraging individuals; and
    - All silt fencing should be removed after work is completed and soils are stable so that reptile and amphibian movement between uplands and wetlands is not restricted.

Please re-submit an NDDB Request for Review if the scope of work changes or if work has not begun on this Project by December 31, 2017. Silt fencing should be installed around the work area prior to activity.

13. The Permittee shall notify the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in writing when the Project commences operation. Such notice shall be sent within 30 days of start-up. The Permittee shall furnish the Connecticut Department of Energy and Environmental Protection with a set of as-built drawings concurrent with filing said plans with the Federal Energy Regulatory Commission.

14. The Permittee shall allow the Connecticut Department of Energy and Environmental Protection, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to inspect the Project area at any time while the Project operates under an exemption from licensing to monitor compliance with its terms and conditions.

## GENERAL TERMS AND CONDITIONS

1 . Rights. This certificate is subject to and does not derogate any present or future property rights or other rights or powers of the State of Connecticut, and conveys no prope1ty rights in real estate or material nor any exclusive privileges, and is further Subject to any and all public and private rights and to any federal, state, or local laws or regulations pertinent to the property or activity affected hereby. This certification does not comprise the permits or approvals as may be required by Chapters 440, 446i, 446j and 446k of the Connecticut General Statutes.

**2.** Expiration of Certificate. This certificate shall expire upon the expiration of the Federal Energy Regulatory Commission permit no. P-14550-000/001-CT for the same activity.

**3.** Compliance with Certificate. All work and all activities authorized herein conducted by the Permittee at the site shall be consistent with the terms and conditions of this certificate. Any regulated activities carried out at the site, including but not limited to, construction of any structure, excavation, fill, obstruction, or encroachment, that are not specifically identified and authorized herein shall constitute a violation of this certificate and may result in its modification, suspension, or revocation. In carrying out the ce1tified discharge(s) authorized herein, the Permittee shall not store equipment or construction material, or discharge any material including without limitation, fill, construction materials or debris in any wetland or watercourse on or off site unless specifically authorized by this certificate. Upon initiation of the activities authorized herein, the Permittee thereby accepts and agrees to comply with the terms and conditions of this certificate.

**4.** Transfer of Certificate. This authorization is transferable with the written consent of the Connecticut Department of Energy and Environmental Protection. The Permittee shall incorporate the aforementioned terms and conditions in any conveyance---by lease, sale or otherwise---of its interests so as to legally assure compliance with said conditions for as long as the Project operates under an exemption from licensing.

**5.** Reliance on Application. In evaluating the Permittee's application, the Connecticut Department of Energy and Environmental Protection has relied on information provided by the Permittee. If such information subsequently proves to be false, deceptive, incomplete or inaccurate, this certificate may be modified, suspended or revoked.

**6.** Approval of Project Changes. Any change to the project that would have a significant or material effect on the findings, conclusions or conditions of this certification, including project operation, must be submitted to the Connecticut Department of Energy and Environmental Protection for prior review and written approval where appropriate and authorized by law and only as related to the change proposed.

**7.** Continuing Jurisdiction. The Connecticut Department of Energy and Environmental Protection, in consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, reserve the right to add and alter the terms and conditions of this certification, when authorized by law and as appropriate to carry out its responsibilities with respect to water quality, fish and wildlife resources during the life of the project.

**8.** Reopening of Certification. The Connecticut Department of Energy and Environmental Protection may reopen and alter or amend the conditions of this Certification over the life of the Project when such action is necessary to assure compliance with the Connecticut Water Quality Standards and to respond to any changes in the classification or management objectives for the affected waters.

**9.** Enforcement. Certification conditions are subject to enforcement mechanisms available to the federal agency issuing the license and to the state of Connecticut. Other mechanisms under Connecticut state law may also be used to correct or prevent adverse water quality impacts from construction or operation of activities for which certification has been issued.

**10.** Best Management Practices. In constructing or maintaining the activities authorized herein, the Permittee shall employ best management practices,

consistent with the terms and conditions of this certificate, to control storm water discharges and erosion and sedimentation and to prevent pollution. Such practices to be implemented by the Permittee at the site include, but are not necessarily limited to:

a. Prohibiting dumping of any quantity of oil, chemicals or other deleterious material on the ground;

b. Immediately informing the Connecticut Department of Energy and Environmental Protection's Oil and Chemical Spill Response Division at (860) 424-3338 (24 hours) of any adverse impact or hazard to the environment, including any discharges, spillage, or loss of oil or petroleum or chemical liquids or solids, which occurs or is likely to occur as the direct or indirect result of the activities authorized herein;

c. Separating staging areas at the site from the regulated areas by silt fences or straw/hay bales at all times;

d. Prohibiting storage of any fuel and refueling of equipment within twenty-five (25) feet from any wetland or watercourse;

e. Preventing pollution of wetlands and watercourses in accordance with the document "Connecticut Guidelines for Soil Erosion and Sediment Control" as revised. Said controls shall be inspected by the Permittee for deficiencies at least once per week and immediately after each rainfall and at least daily during prolonged rainfall. The Permittee shall correct any such deficiencies within 48 hours of said deficiencies being found;

f. Stabilizing disturbed soils in a timely fashion to minimize erosion. If a grading operation at the site will be suspended for a period of thirty (30) or more consecutive days, the Permittee shall, within the first seven (7) days of that suspension period, accomplish seeding and mulching or take such other appropriate measures to stabilize the soil involved in such grading operation. Within seven (7) days after establishing final grade in any grading operation at the site the Permittee shall seed and mulch the soil involved in such grading operation or take such other appropriate measures to stabilize such soil until seeding and mulching can be accomplished.

g. Prohibiting the storage of any materials at the site which are buoyant, hazardous, flammable, explosive, soluble, expansive, radioactive, or which could in the event of a flood be injurious to human, animal or plant life, below the elevation of the five hundred (500) year flood. Any other material or equipment stored at the site below said elevation by the

Permittee or the Permittee's contractor must be firmly anchored, restrained or enclosed to prevent flotation. The quantity of fuel stored below such elevation for equipment used at the site shall not exceed the quantity of fuel that is expected to be used by such equipment in one day.

h. Immediately informing the Connecticut Department of Energy and Environmental Protection's Planning and Program Development Office at (860) 424-3003 of the occurrence of pollution or other environmental damage resulting from construction or maintenance of the authorized activity or any construction associated therewith in violation of this certificate. The Permittee shall, no later than 48 hours after the Permittee learns of a violation of this certificate, report same in writing to the Connecticut Department of Energy and Environmental Protection. Such report shall contain the following information:

   i. The provision(s) of this certificate that has been violated;

   ii. The date and time the violation(s) was first observed and by whom;

   iii. The cause of the violation(s), if known;

   iv. If the violation(s) has ceased, the duration of the violation(s) and the exact date(s) and time(s) it was corrected;

   v. If the violation(s) has not ceased, the anticipated date when it will be corrected;

   vi. Steps taken and steps planned to prevent a reoccurrence of the violation(s) and the date(s) such steps were implemented or will be implemented; and

   vii. The signatures of the Permittee and of the individual(s) responsible for actually preparing such report, each of whom shall certify said report in accordance with General Condition number 13 of this certificate.

For information and technical assistance, contact the Connecticut Department of Energy and Environmental Protection's Planning and Program Development Office at (860) 424-3003.

**11.** Other Regulated Activities. Should the Permittee wish to conduct any regulated activity in the future which requires the issuance of a permit from the Connecticut Department of Energy and Environmental Protection, the Permittee

must obtain the appropriate permit(s) prior to conducting such activity. Please be aware that performing an activity without a pe1mit required by Title 22a of the General Statutes may subject the Permittee to an injunction and penalties.

**12.** Public Use. The Connecticut Department of Energy and Environmental Protection and the U.S. Fish and Wildlife Service recommend that the Permittee permit access to the Project area wherever possible to allow for public utilization of fish and wildlife resources, taking into consideration any necessary restrictions to maintain public safety and protect Project civil works.

**13.** Certification of Documents. Any document, including but not limited to any notice, which is required to be submitted to the Connecticut Department of Energy and Environmental Protection under this certificate shall be signed by the Permittee, a responsible corporate officer of the Permittee, a general partner of the Permittee, or a duly authorized representative of the Permittee and by the individual or individuals responsible for actually preparing such document, each of whom shall certify in writing as follows:

> "I have personally examined and am familiar with the information submitted in this document and all attachments and certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief, and I understand that any false statement made in this document or its attachments may be punishable as a criminal offense in accordance with section 22a-6 under section 53a-157b of the Connecticut General Statutes."

**14.** Submission of Documents. The date of submission to the Connecticut Department of Energy and Environmental Protection of any document required by this certificate shall be the date such document is received by the Connecticut Department of Energy and Environmental Protection. Except as otherwise specified in this certificate, the word "day" as used in this certificate means the calendar day. Any document or action which falls on a Saturday, Sunday, or legal holiday shall be submitted or performed by the next business day thereafter. Any document or notice required to be submitted to the Connecticut Department of Energy and Environmental Protection under this certificate shall, unless otherwise specified in writing by the Connecticut Department of Energy and Environmental Protection, be directed to:

Office of Planning & Program Development
Department of Energy and Environmental Protection

79 Elm Street, Third Floor
Hartford, Connecticut 06106-5127

15.

Document Content(s)