

OCCUM HYDROELECTRIC PROJECT

Norwich, CT

RECERTIFICATION APPLICATION TO THE LOW IMPACT HYDROPOWER INSTITUTE

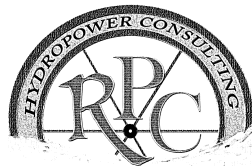
FERC NO. 11574 and LIHI CERTIFICATE 105

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1.0 ***INTRODUCTION***

The Occum Hydroelectric Project (Project) is located in New London County, Norwich, CT on the Shetucket River and is owned and operated by Norwich Public Utilities (NPU). The Project was certified by the Lower Impact Hydropower Institute (LIHI) as a low impact hydropower facility in March 2013. LHI Certificate No. 000105 became effective on March 6, 2013 and expires on March 6, 2018. NPU is submitting this re-certification application to the LIHI as the Project continues to be a low impact hydropower facility.

There have been no material changes in the facility design, operations or regulatory requirements since the original certificate was issued. The Project remains in compliance with all FERC License order and Water Quality Certificate conditions and terms. Appendix D provides a letter from NPU confirming compliance with the WQC conditions since issuance of the original certificate. The information and conclusions contained in the original reviewer's report (2013 report) of May 16, 2013

(<https://lowimpacthydro.org/assets/files/Occum%20files/OccumCertificationFinalReport23May2013.pdf>) remain valid. NPU has also continued to cooperate and complied with all agency requests to support effective fish passage and protection for both anadromous and catadromous fish species

2.0 ***FACILITY DESCRIPTION***

2.1 General Description

The Occum Hydroelectric Project (Project) is located on the Shetucket River, a tributary to the Thames River, in the Village of Occum, City of Norwich and Village of Versailles, Town of Sprague, New London County, Connecticut. The Occum Project is composed of a concrete and masonry dam, impoundment, intake structure, forebay, powerhouse, fish passage facilities and appurtenant facilities. The dam is comprised of two contiguous spillway sections with a total length of 450 ft, bordered on either side by an earth embankment. The east spillway section is a concrete ogee spillway, 170 ft in length, with a crest elevation of 66.1'. The west section is a stone masonry spillway 280 ft in length with a permanent crest elevation of 64.35' and 1.75 ft high wooden flashboards. The west section is equipped with a 4 ft wide fish ladder and a downward opening 6 ft wide trash gate with a sill elevation of 60.32'. The upstream fish ladder parallels the forebay and extends from the dam to the powerhouse tailrace. The intake structure is approximately 85 ft in length and extends from the earth embankment that abuts the western side of the spillway to the west headgate wall. The intake gate structure controls the river flow into the forebay with 6 manually operated motorized rack and pinion gates. The forebay measures approximately 225 ft long by 160 ft wide. A forebay spillway with a crest elevation of 64.4' is topped with 1.7 ft flashboards that raise the pool elevation to the normal water surface elevation (66.1'). This spillway, bordered by the earth embankment to the north and the powerhouse to the south, is approximately 30 ft wide and extends 50 ft along the east side of the forebay. The powerhouse is a 32 ft wide by 40 ft long structure that contains one vertical Kaplan turbine-generator unit.

Fish passage facilities were installed at the project in 2005. The upstream fish passage facility consists of a 4 ft wide concrete Denil ladder with a 1:10 floor slope extending from the Occum Dam to the station's tailrace. The ladder alignment is along the western shore of the bypassed river reach, immediately adjacent to the masonry wall structures. The ladder consists of a rectangular flume with a series of baffles placed on an angle to the water flow to allow the fish to swim through the flume. Water into the ladder is controlled through use of baffles set at appropriate heights to limit the amount of water entering the fishway. Walkways, stairs and platforms are provided to allow access to the viewing window chamber, entrance gate and exit

gate. A 6 ft wide trash sluice gate abuts the eastern wall of the fish ladder to promote the passage of river debris and maintain spillway hydraulic discharge capacity. The system has been operational since 2006.

The downstream fish passage facility is located immediately adjacent to the project's powerhouse and intake structure. The facilities generally consist of a 5 ft wide by 20 ft long concrete collection chamber, a 5 ft wide by 7 ft high dual leaf downward opening flow control gate and a 26-inch diameter high density polyethylene buried pipe exiting the existing tailrace wall. Water into the passage is controlled through the use of the electric operated steel control gate set at appropriate heights to limit the amount of water entering the fish way. The system has been operational since 2006.

An upstream eel ladder is located between the upstream fish ladder and the western dam abutment. The eel ladder consists of an elevated 20-inch wide aluminum trough with strip drain interior surface and aluminum cover plate. Water for the eel ladder is supplied by a submersible electric pump located within a vertical standpipe near the fish ladder exit flume. The eel ladder is equipped with two entrances, one near the forebay spillway toe and the second at the dam toe area. The system has been operational since 2006.

2.2 Project Data

The key features and data for the Project is provided in the following Table B-1.

Table B-1. Facility Description Information for Occum Hydroelectric Project (LIHI #105)

Information Type	Variable Description	Response (and reference to further details)
Name of the Facility	Facility name (use FERC project name if possible)	Occum Hydroelectric Project (FERC No. 11574)
Location	River name (USGS proper name)	Shetucket River
	River basin name	Thames
	Nearest town, county, and state	Norwich, New London County, CT
	River mile of dam above next major river	6.4
	Geographic latitude	41.5967
	Geographic longitude	-72.0500
Facility Owner	Application contact names (IMPORTANT: you must also complete the Facilities Contact Form):	Chris LaRose (860) 823-7300
	- Facility owner (individual and company names)	Norwich Public Utilities
	- Operating affiliate (if different from owner)	N/A
	- Representative in LIHI certification	Alfred Nash (207) 992-3926 Renewable Power Consulting, PA
Regulatory Status	FERC Project Number (e.g., P-xxxxx), issuance and expiration dates	P-11574 Issued: September 29, 1999 Expires: March 1, 2039
	FERC license type or special classification (e.g., "qualified conduit")	Minor
	Water Quality Certificate identifier and issuance date, plus source agency name	WQC 11574 Issued: February 11, 1997 by the State of Connecticut Department of Environmental Protection
	Hyperlinks to key electronic records on FERC e-library website (e.g., most recent Commission Orders, WQC, ESA documents, etc.)	License Order: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19991001-0111 Order Correction https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19991101-0293 WQC Modification Discussion https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20011109-0164

		License Application https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19960229-0025
Power Plant Characteristics	Date of initial operation (past or future for operational applications)	1937
	Total name-plate capacity (MW)	0.8
	Average annual generation (MWh)	2,513 (average from 1993 to 2017)
	Number, type, and size of turbines, including maximum and minimum hydraulic capacity of each unit	Single 800 Kw vertical Kaplan turbine with a maximum hydraulic capacity of 900 cfs and a minimum hydraulic capacity to of 250 cfs
	Modes of operation (run-of-river, peaking, pulsing, seasonal storage, etc.)	Cycling due to impacts from upstream Scotland Project cycling operation. The Scotland Project's new license requires run-of-river operations to be implemented beginning in the summer of 2018. The revised operation of the upstream project is anticipated to permit the Occum project to mimic run-of-river operations with limited pond level fluctuations.
	Dates and types of major equipment upgrades	Unit upgrades have not occurred though the unit was rehabilitated to original condition
	Dates, purpose, and type of any recent operational changes	No significant operational changes have occurred since license order issuance and the completion of fish passage facilities.
	Plans, authorization, and regulatory activities for any facility upgrades	No facility upgrades have been or are proposed since initial license order issuance.
Characteristics of Dam, Diversion, or Conduit	Date of construction	The dam was constructed in 1865 to supply water power to former mills. The project was adapted for hydropower generation between 1934 and 1937.
	Dam height	16 ft
	Spillway elevation and hydraulic capacity	Ogee Section Crest elevation 66.1' Masonry Section Crest elevation 64.35' Top of Board elevation 66.1'. The dam can pass around 64,000 cfs before overtopping of the abutments.
	Tailwater elevation	51.2 ft

	Length and type of all penstocks and water conveyance structures between reservoir and powerhouse	Forebay is approximately 225 ft long by 160 feet wide with an average depth of 11 ft.
	Dates and types of major, generation-related infrastructure improvements	1937 initial operation began. Since then the unit has been rehabilitated but not changed in its hydraulic capacities.
	Designated facility purposes (e.g., power, navigation, flood control, water supply, etc.)	Power Generation
	Water source	Shetucket River
	Water discharge location or facility	Water discharge from the station is into the Shetucket River approximately 220 ft downstream of the dam.
Characteristics of Reservoir and Watershed	Gross volume and surface area at full pool	Gross storage capacity at normal pond level is 600-acre feet with a surface impoundment area of about 90 acres.
	Maximum water surface elevation (ft. MSL)	66.1 ft (normal pond) (79.25 ft a maximum flood stage)
	Maximum and minimum volume and water surface elevations for designated power pool, if available	600 acre-feet to 445 acre-feet
	Upstream dam(s) by name, ownership, FERC number (if applicable), and river mile	The next dam upstream of the Occum dam is the Scotland dam, FERC No. 2662, at river mile 14.5 which owned by FirstLight Hydro Generating Company.
	Downstream dam(s) by name, ownership, FERC number (if applicable), and river mile	Taftville dam at river mile 4.3 which is non-FERC jurisdictional and owned by FirstLight Hydro Generating Company.
	Operating agreements with upstream or downstream reservoirs that affect water availability, if any, and facility operation	<p>None with the upstream Scotland hydroelectric project which supplies water flow for the Occum Project. Historic operation of Scotland was in cycling mode which resulted in a cycling mode of operation at Occum. The new license for the Scotland project requires run-of-river operations which will be implemented in the summer of 2018. The new operational parameters of the Scotland project are expected to permit Occum to operate in a run-of-river mode with limited pond level fluctuation.</p> <p>Informal agreement with downstream Taftville owner to limit pond drawdowns which impact the Occum Project's</p>

		tailwater and minimum flow releases. Taftville's fish passage requires a higher pond level which limits the tailwater level fluctuation at the Occum Project.
	Area inside FERC project boundary, where appropriate	91 acres (including 90-acre impoundment)
Hydrologic Setting	Average annual flow at the dam	720 cfs
	Average monthly flows	January 735 cfs February 810 cfs March 1, 290 cfs April 1, 260 cfs May 794 cfs June 411 cfs July 176 cfs August 132 cfs September 147 cfs October 264 cfs November 560 cfs December 764 cfs
	Location and name of relevant stream gauging stations above and below the facility	Gage No. 011230695 Shetucket River at Taftville, CT with a 512-square mile drainage is located approximately 2 miles downstream of the project.
	Watershed area at the dam	The site has a 465-square mile drainage area
Designated Zones of Effect	Number of zones of effect	3
	Upstream and downstream locations by river miles	ZOE 1: Impoundment RM 6.4 ZOE 2: Bypass RM 6.3 ZOE 4: Downstream of Project RM 6.3
	Type of waterbody (river, impoundment, by-passed reach, etc.)	ZOE 1: 90 acre Impoundment ZOE 2: 0.9 acre Bypass ZOE 3: River Downstream of Project
	Delimiting structures	ZOE 1: Occum Dam ZOE 2: Occum dam and Powerhouse ZOE 3: Occum Powerhouse Tailrace
	Designated uses by state water quality agency	Class B: suitable for recreational uses, fish and wildlife habitat, agricultural and industrial supply and other uses including navigation.
Additional Contact Information	Names, addresses, phone numbers, and e-mail for local state and federal resource agencies	Refer to Appendix B
	Names, addresses, phone numbers, and e-mail for local non-governmental stakeholders	Refer to Appendix B

<i>Photographs and Maps</i>	Photographs of key features of the facility and each of the designated zones of effect	Refer to Appendix A
	Maps, aerial photos, and/or plan view diagrams of facility area and river basin	Refer to Appendix A

3.0 *STANDARDS MATRICES*

3.1 Zone of Effect: Zone 1-Impoundment

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

3.2 Zone of Effect: Zone 2-Bypass

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

3.3 Zone of Effect: Zone 3-Tailwater

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

4.0 ***SUPPORTING DOCUMENTATION FOR STANDARDS***

4.1 Ecological Flow Standards

All ZOE's Criteria A-2 (Agency Recommendation)

Article 401 of the license and Condition 4 of the Water Quality Certificate (WQC) requires that pond level fluctuation be limited to 2-feet below the top of flashboards (or below the crest when boards are not present). Article 402 of the license and Condition 3 of the WQC require the release of 100 cfs or inflow, whichever is less, during non-operational periods and the downstream's dam (Taftville) impoundment level is below elevation 48.9. Article 403 requires the development, in consultation with and approved by resource agencies, of a monitoring plan to confirm compliance.

The Project has historically operated in a cycling mode due to the operation of the upstream Scotland Hydroelectric Project's operation (FERC No. 2662). The store and release operation of this upstream dam results in pulses of water flow (approximately 1,200 cfs) into the Occum impoundment which exceeds the Project's unit hydraulic capacity (900 cfs). The Project is operated during these pulses of inflow and remains off-line during other periods. New license conditions for the Scotland project requires run-of-river operations which are scheduled to begin in the summer of 2018. Upon implementation of the Scotland operational change, the Occum project is expected to also operate in a run-of-river mode with limited pond level fluctuations.

The downstream Taftville Hydroelectric Project's (Taftville) full pond (elevation 51.8) backwaters the Occum tailrace. The non-FERC jurisdictional Taftville cycles its headpond several feet (*i.e.* six feet typically), which impacts both the Project's tailwater level and the river segment between the two projects. Fish passage installation at Taftville resulted in the Taftville impoundment and Occum Project's tailwater fluctuation amounts being reduced. Since this change in pond level management at Taftville the Occum Project's trigger elevation, with the increased minimum Project flow requirement, has not been required, and is not expected.

NPU conducted an assessment of the minimum instream flow needs in 1995 during preparation of the original license application. The study was conducted in consultation with

resource agencies and investigated the instream flow and habitat conditions for the bypass reach immediately below the Occum dam and the free-flowing river reach between the Occum tailrace and the Taftville headpond. The principle objectives of the study were to document the Taftville level when minimum flows are required to protect or enhance aquatic habitat and to identify a possible minimum flow release required to protect aquatic habitat when the Taftville pond was fully drawn down. The concerns associated with the Taftville pond fluctuations are mainly a concern with fish stranding and dewatering of the river reach changes between lacustrine and riverine habitat. The instream flow needs were partially based upon the judgement of a group of professional biologists from the CDEP and NPU's consultant Kleinschmidt Associates. The study team observed that the bypass is fully watered whenever the Occum Project was generating, regardless of the Taftville pond level. The bypass substrate is comprised almost exclusively of cobble (4 to 10-inch diameter) and 10 to 18-inch diameter small boulders that are imbedded with fine sand and mud. The study results suggested that flows of 53 and 155 cfs provide approximately the same quality of habitat. The team agreed that the typical 0.5 cfs per square mile of drainage area (Aquatic Base Flow) of 232 cfs was unnecessary and that flows between 100 and 155 cfs sufficiently wet the riverbed. The USFWS recommended that the Project release 155 cfs when off-line during periods when the downstream Taftville impoundment level was below elevation 48.9 feet. FERC staff completed a wetted area analysis during the licensing proceeding, comparing the recommended 155 cfs release with NPU's proposed 100 cfs and determined that the larger flow amount resulted in minor increase in habitat. The USFWS subsequently concurred with the FERC staff's analysis and proposed the use of the 48.9 foot trigger elevation, rather than NPU's proposed elevation of 48.3 feet. The license order included these recommended terms.

Appendix D provides a signed confirmation that NPU has remained in compliance with the WQC conditions. The approved monitoring plan and correspondence regarding the minimum flow release determination can be seen in the documents contained in the FERC ELibrary system at the links indicated below:

Minimum Flow Compliance Report

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20050906-0129

Environmental Compliance Report

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20050902-0151

(NOTE: FERC has confirmed that the 2005 report is the most recent report and that there are no compliance inspections scheduled in the near future)

Monitoring Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20010305-3049

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20001220-0119

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20000330-0020

FERC Response to USFWS Comments regarding Minimum Flow Recommendations

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19990421-0337

CTDEP Support of EA

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19990414-0214

NPU Comments on EA

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19990409-0236

USFWS Comment on EA

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19980630-0443

Draft Environmental Assessment

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19990224-3055

4.2 Water Quality Standards

All ZOE's Criteria B-2 (Agency Recommendation)

Article 401 of the license and Condition 4 of the Water Quality Certificate (WQC) requires that pond level fluctuation be limited to 2-feet below the top of flashboards (or below the crest when boards are not present). Article 402 of the license and Condition 3 of the WQC require the release of 100 cfs or inflow, whichever is less, during non-operational periods and the downstream's dam (Taftville) impoundment level is below elevation 48.9. Article 403 requires the development, in consultation with and approved by resource agencies, of a monitoring plan to confirm compliance.

The waters within the Project are classified by the State of Connecticut as Class B. suitable for recreational uses, fish and wildlife habitat, agricultural and industrial supply and other uses including navigation. There are no known consumptive uses or direct point source discharges into the Project waters. Table 1 of the 2012 Shetucket River Watershed Summary (2012 report, www.ct.gov/deep/lib/deep/water/tmdl/statewidebacteria/shetucketriver3800.pdf) indicates that the Occum project is included in river Segment CT3800-00_02. Table 2-3 (page 64) and Table 3-4 (page 216) of the 2016 State of Connecticut Integrated Water Quality Report (2016 report,

www.ct.gov/deep/lib/deep/water/water_quality_management/305b/2016_iwqr_final.pdf) does not report this river segment (not included in the 2014 report also). The 2012 report indicates that the upper sections have not been assessed for use support for Aquatic Life and for Recreation.

Daily inflow at the Project is primarily controlled by the operation of the upstream Scotland Hydroelectric Project (FERC No. 2662). The Scotland Project historically operated in a cycling mode with a normal discharge of 1,200 cfs at full generation and a minimum flow of 84 cfs when the Scotland Project is not operating. The Project operates when the Scotland's Project generation discharge arrives at the Project (around 2 hours) and operates until the impoundment is drawn down to its license limits, effectively creating a small pond to capture the future Scotland Project's discharge, which exceeds the Project's unit hydraulic capacity. New license conditions for the Scotland project requires run-of-river operations which are scheduled to begin in the summer of 2018. Upon implementation of the Scotland operational change, the Occum project is expected to also operate in a run-of-river mode with limited pond level fluctuations.

The Project tailwaters are influenced by the backwater effects of the downstream (approximately 2 miles) Taftville Hydroelectric Project (non-FERC jurisdictional). Reduction of the Taftville impoundment below elevation 48.3 results in the exposure of approximately 1,000-foot-long river reach.

CDEP collected water samples in the project area during the 1991 and 1992 summer season as part of a eutrophication control plan. The study results indicated that water quality standards for algae concentrations were not met. Pg 16 of the Environmental Assessment (EA) stated that the CDEP identified point and nonpoint sources of pollution as major contributors to water quality problems in the Shetucket River. The EA concluded that "none of these sources are associated with operation of the Occum Project." The FERC staff's analysis concluded (pg 19 of EA) that "compliance with the WQC minimum flow requirements would enhance water quality within the project area and enhance downstream aquatic habitat. The proposed minimum flows would be adequate to provide circulation through the channel and avoid stagnant water conditions, and would increase DO concentrations in the project's tailwater." Refer to Section 4.1 for a discussion on how the minimum flow amount was established.

4.3 Upstream Fish Passage Standards

ZOE-1 (Impoundment) Criteria C-1 (Not Applicable/De Minimis Effect)

Once passed through the project's fish passage system there are no additional impediments to fish passage through the impoundment.

ZOE -2 and ZOE-3 Criteria C-2 (Agency Recommendation)

Fish species known to be present at the project include: American shad, Blueback Herring, Alewife, Eel, Gizzard shad, hickory shad, striped bass, sea-run brown trout, sea lamprey, white perch, yellow perch, sunfish species, rock bass, pickerel, smallmouth and largemouth bass, bluegills, rainbow smelt. Atlantic salmon was a target species for the fish passage restoration program but have not been observed at the site and the updated 2009 Plan to Restore Diadromous Fishes to the Shetucket River Watershed (2009 Plan) eliminated this species. The 2009 Plan details can be found at www.thamesriverbasinpartnership.org/acrobat_files/Shetucket%20River%20Plan%20-%20Connecticut%20DEP%20December%202009.pdf

Article 405 of the license and Condition 1 of the WQC required the installation of an upstream fish passage system. The upstream passage was designed in consultation and approved by the resource agencies and sized to pass the required population estimates for the target species. The upstream fish passage system sizing was based upon the CTDEP's 1985 Preliminary Plan for the Restoration of Anadromous Fish to the Thames River Basin (1985 Plan). The 2009 Plan maintained the required population amounts. The population estimates were based on a 60 shad per acre of nursery habitat for American shad with river herring estimates (alewife and blueback herring) determined by multiplying the shad estimate by 1.5 (90 fish per acre of nursery habitat). Lamprey estimates are based on around 94 lampreys per river mile.

The CTDEEP's May 8, 2013 letter (CTDEEP letter) in support of NPU's original LIHI application (copy included in LIHI reviewer's report <https://lowimpacthydro.org/assets/files/Occum%20files/OccumCertificationFinalReport23May2>

[013.pdf](#)) indicated that the ladder appears to work well. Testing of the ladder has been suspended due to deficiencies in the fish passage facilities at the downstream Taftville project. The CTDEEP continues to work with downstream Taftville operators for improved passage through their upstream fish passage system. Currently insufficient numbers of migrants (16 shad in 2017) are unable to pass through this site to require a resumption of testing at the Occum site. The 2013 CTDEEP letter did indicate that all of the shad passed through the Taftville project successfully passed through the Occum Project. Video recording of passed fish is being maintained in the interim. NPU continues to assist the CTDEEP and Taftville owners with assessment and fish passage modifications to promote successful passage at both projects.

Though not documented, NPU meets annually with representatives from the CTDEEP (typically Steve Gephard and Tim Wildman) to review expectations and potential concerns with the fish passage facilities. This included NPU suggestion and CTDEEP concurrence that, due to frequent ice damage, the upstream eel ladder be replaced in 2017 with an eel lift system similar to the downstream Greenville Project (FERC No. 2441). The updated eel passage system, per the CTDEEP, has worked well. The last meeting with the CTDEEP occurred on February 9, 2018 with no changes in operation or other specific request being made. In addition to the annual meetings, NPU maintains frequent interaction with the resource agencies during the migration season to promote successful fish passage and protection.

NPU has voluntarily trucked live shad from the downstream Greenville Project's fish elevator to upstream spawning habitat, which is described in the DEP 2013 letter as "a significant contribution and will accelerate the pace of restoration of shad to the river". The CTDEEP provides weekly web-based updates and commentary on passage counts throughout the State, including Occum, during the passage season. This information is summarized in an annual report prepared by the CTDEEP (www.ct.gov/deep/lib/deep/fishing/performance_reports/f50d37.pdf), which documents NPU's assistance during the passage season.

The upstream passage system's approval, effectiveness and O&M plan were approved and can be reviewed on the FERC ELibrary system using the links listed below:

Effectiveness Test Report

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20120110-5078

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20110505-0045

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20110425-5068

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20110411-5020

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20110301-0307

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20110222-0038

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20100301-0050

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20090421-0014

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20090327-0120

Order Modifying and Approving Fish Passage Plan Under Articles 405 and 406

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040803-3004

USFWS Approval of Fish Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040712-0060

Submittal of Fish Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040608-0777

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040608-0778

Order Modifying and Approving Downstream Fish Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20010327-0107

4.4 Downstream Fish Passage and Protection Standards

ZOE-3 (Tailwater) Criteria D-1 (Not Applicable/De Minimis Effect)

Once passed through the project's fish passage systems there are no additional impediments to fish passage downstream of the project.

ZOE-1 and ZOE-2 Criteria D-2 (Agency Recommendation)

Article 406 of the license and Condition 2 of the WQC required the installation of a downstream fish passage system. The article required that the facility be designed in consultation with and approved by the resource agencies. The installed bypass system was installed and is operational. The EA concluded that the intake system for the Project is not adversely affecting existing fish populations and that mitigation was not required. However,

protection for migratory species was required. Testing confirmed that the use of the perforated plate intake rack overlays area not required. The CTDEEP's May 8, 2013 letter (CTDEEP letter) in support of NPU's original LIHI application (copy included in LIHI reviewer's report (<https://lowimpacthydro.org/assets/files/Occum%20files/OccumCertificationFinalReport23May2013.pdf>)) indicated that the passage successfully passed many young-of-the-year shad. The CTDEEP letter also noted that NPU has voluntarily supported the resource agency efforts to research migratory eels migratory path and behavior past three hydroelectric projects. Details of the fish passage system effectiveness and agency comments may be found of the FERC Elibrary system using the links listed below:

Effectiveness Test Report

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20120110-5078

Order Modifying and Approving Fish Passage Plan Under Articles 405 and 406

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040803-3004

USFWS Approval of Fish Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040712-0060

Submittal of Fish Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040608-0777

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20040608-0778

Order Modifying and Approving Downstream Fish Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20010327-0107

USFWS Comments on Downstream Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20001106-0412

Submittal of Downstream Passage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20001003-0331

The CTDEEP letter of March 8, 2013 (DEP 2013, copy in the reviewer's report) in support of NPU's original certification states that "The license for the Greenville project required effective upstream fish passage, effective downstream fish passage, an evaluation study, the provision of minimum flows down the bypass reach, and other procedural requirements relative to our agency. All have been achieved on an ongoing basis." Though not documented, NPU meets annually with representatives from the CTDEEP (typically Steve Gephard and Tim Wildman) to review expectations and potential concerns with the fish passage facilities. The last meeting with the CTDEEP occurred on February 9, 2018 with no changes in operation or other specific request being made. In addition to the annual meetings, NPU maintains frequent interaction with the resource agencies during the migration season to promote successful fish

passage and protection. As also noted in the DEP 2013 letter, NPU has voluntarily supported the resource agency efforts to research migratory eels migratory path and behavior past three hydroelectric projects.

4.5 Shoreline and Watershed Protection Standards

All ZOE's Criteria E-1 (Not Applicable/De Minimis Effect)

The Project topography is generally composed of low rolling hills with steeper topography downstream of the Project. Hardwood forest is the predominant vegetative cover along the steep banks and upland areas of both impoundment shorelines. The impoundment shoreline is relatively undeveloped with no known areas of erosion within the impoundment area or downstream of the Project. The Project has been constructed for numerous years with the current operational parameters and shoreline development has been established with no known plans for changes to the shoreline. Local groups (*i.e.* Shetucket.org and thamesriverbasinpartnership.org) are involved with the Shetucket River valley protection and have not identified a need in the Project area.

4.6 Threatened and Endangered Species Standards

All ZOE's Criteria F-1 (Not Applicable/De Minimis Effect)

There are no federally listed Threatened and Endangered Species (T&E) specific to the Project area as confirmed in the federal listing available at <https://www.fws.gov/newengland/pdfs/CT%20species%20by%20town.pdf> The USFWS further clarified the non-listing in their comments on the EA (https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19980630-0443). The northern long-eared bat range map <https://www.fws.gov/midwest/endangered/mammals/nleb/nlebRangeMap.html> indicates the northern long-eared bat range is statewide, as indicated in the listing. However, the mapping for Connecticut www.ct.gov/deep/lib/deep/endangered_species/images/nleb_approved2_16.pdf indicates that the project area does not have known northern long-eared bat hibernacula.

Stated listed T&E species for New London County can be obtained at www.ct.gov/deep/lib/deep/endangered_species/species_listings/newlondonctspecies.pdf with area maps available for download via www.depdata.ct.gov/naturalresources/endangeredspecies/nddbpdfs.asp?nddsel=104

The Project and Project operations have been established for a number of years with no proposed changes to established habitats. In addition, there is no proposed land disturbing or clearing activities planned for the Project which could impact any of the state listed species. The established fish passage facilities provide mitigation for aquatic species that may enter the Project area.

4.7 Cultural and Historic Resource Standards

All ZOE's Criteria G-2 (Approved Plan)

Article 408 of the license required the implementation of the “Programmatic Agreement Among the Federal Energy Regulatory Commission, the Advisory Council on Historic Preservation, and the State of Connecticut, State Historic Preservation Officer, for Managing Historic Properties That May Be Affected By A License Issuing to the City of Norwich Connecticut For the Continued Operation and Maintenance of the Occum Hydroelectric Project in Connecticut”, and the development and implementation of a Cultural Resource Management Plan (CRMP). NPU maintains consultation with the SHPO during periods of construction that may impact cultural resources in accordance with the CRMP. The approved CRMP, executed Programmatic Agreement and latest annual report may be seen on the FERC Elibrary system using the following links:

NPU Annual CRMP report

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170911-0020

Programmatic Agreement

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20000113-0243

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=19990929-0143

Comments on CRMP

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20011231-0443

Order Approving CRMP

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20010831-0334

CRMP

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20010626-0166

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20010301-0211

Compliance Report

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20050902-0151

(NOTE: FERC has confirmed that the 2005 report is the most recent report and that there are no compliance inspections scheduled in the near future)

4.8 Recreational Resources Standards

All ZOE's Criteria H-2 (Agency Recommendation)

The Project is located within the boundaries of the Quinebaug and Shetucket Rivers Valley National Heritage Corridor which offers several recreational opportunities. Recreation activity at the Project is light. Article 409 of the license required the installation a canoe portage system at the dam as recommended by the resource agencies. The portage was developed and installed in consultation with resource agencies. The site's recreational facilities are free to the public. Access to the western impoundment shoreline is not available through lands owned or controlled by NPU. Access to the powerhouse facility and dam areas are prohibited for public safety. Public access is provided on the eastern shore with a parking area provided. An Americans with Disabilities Act compliant portage ramp has been installed and maintained by NPU.

The current recreational use information and compliance confirmation can be found on the FERC elibrary website with the link provided below.

FORM 80

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20150306-5128

Completion of Canoe Portage

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20020524-0385

Order Approving Canoe Portage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20020412-0107

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20001109-0300

Submittal of Canoe Portage Plan

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20001003-0332

Compliance Report

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20050902-0151

(NOTE: FERC has confirmed that the 2005 report is the most recent report and that there are no compliance inspections scheduled in the near future)

The last FERC environmental compliance report was completed in 2005. FERC has indicated that additional compliance inspections have not occurred and are not currently scheduled to occur in the near term. NPU's downstream Greenville Project (FERC No. 2441) requires annual reporting of recreational use. NPU also collected recreational use data at the Occum Project though NPU is not required to collect this data. Appendix C provides copies of the most recent annual report prepared for the Greenville Project but is not available on the FERC elibrary system. NPU has not received any comments regarding the recreational use reports. The reports indicate that current recreational facilities are satisfying the historic and current needs at the project.

SWORN STATEMENT

As an Authorized Representative of Norwich Public Utilities, the Undersigned attests that the material presented in the application is true and complete.

The Undersigned acknowledges that the primary goal of the Low Impact Hydropower Institute's Certification Program is public benefit, and that the LIHI Governing Board and its agents are not responsible for financial or other private consequences of its certification decisions.

The undersigned further acknowledges that if certification of the applying facility is issued, the LIHI Certification Mark License Agreement must be executed prior to marketing the electricity product as LIHI Certified.

The undersigned Applicant further agrees to hold the Low Impact Hydropower Institute, the Governing Board and its agents harmless for any decision rendered on this or other applications, from any consequences of disclosing or publishing any submitted certification application materials to the public, or on any other action pursuant to the Low Impact Hydropower Institute's Certification Program.

State of Connecticut,

County of New London

The undersigned, being first duly sworn, states that he/she has read the above document and knows the contents of it, and that all of the statements contained in that document are true and correct, to the best of his/her knowledge and belief.


(Signature of appropriate company official)

John F. Bilda
(Printed name of appropriate company official)

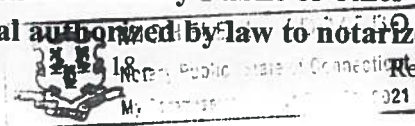
Sworn to me and subscribed before me this 16th of January, 20 18
Day Month

[SEAL]

Occum Project (Cert #105)


(Signature of Notary Public or other state or local
Official authorized by law to notarize documents)


Official authorized by law to notarize documents



OCCUM HYDROELECTRIC PROJECT
(FERC NO. 11574)

LIHI CERTIFICATE 105

LIHI RECERTIFIATION APPLICATION

APPENDIX A

BASIN MAP AND FACILITY PHOTOS

OCCUM BASIN MAP

OCCUM HYDROELECTRIC PROJECT
FERC NO. 11574

SHETUCKET RIVER

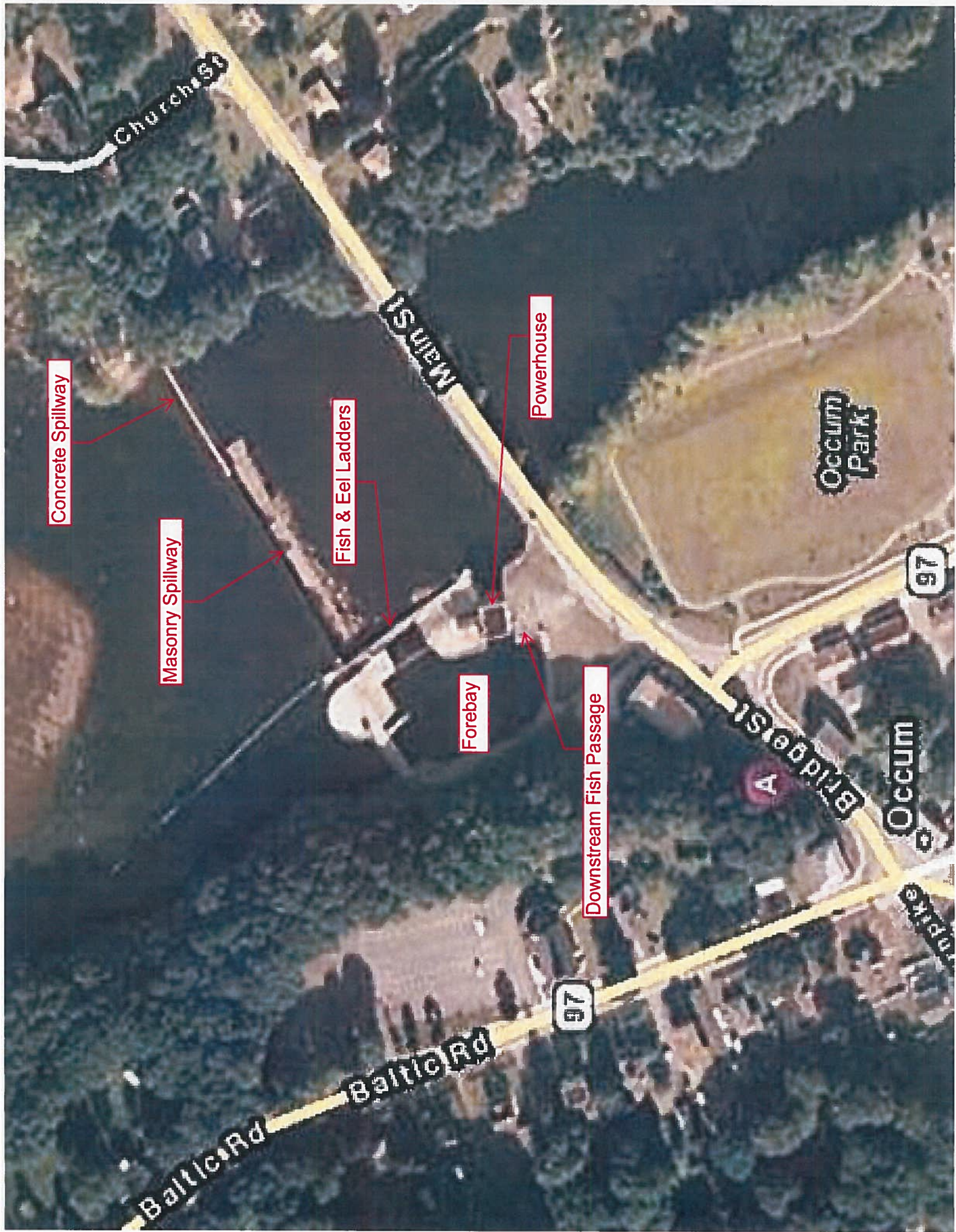
TATTSVILLE HYDROELECTRIC PROJECT
(UNLICENCED)

QUINEBAUG RIVER

SHETUCKET RIVER

TUNNEL HYDROELECTRIC
PROJECT (UNLICENCED)





Concrete Spillway

Masonry Spillway

Fish & Eel Ladders

Powerhouse

Forebay

Downstream Fish Passage

Church St

Main St

Baltic Rd

97

Bridge St

Occum

Occum Park

97



Photo 1: Project Overview



Photo 2: Occum Dam



Photo 3: Occum Concrete Spillway



Photo 4: Occum Masonry Dam

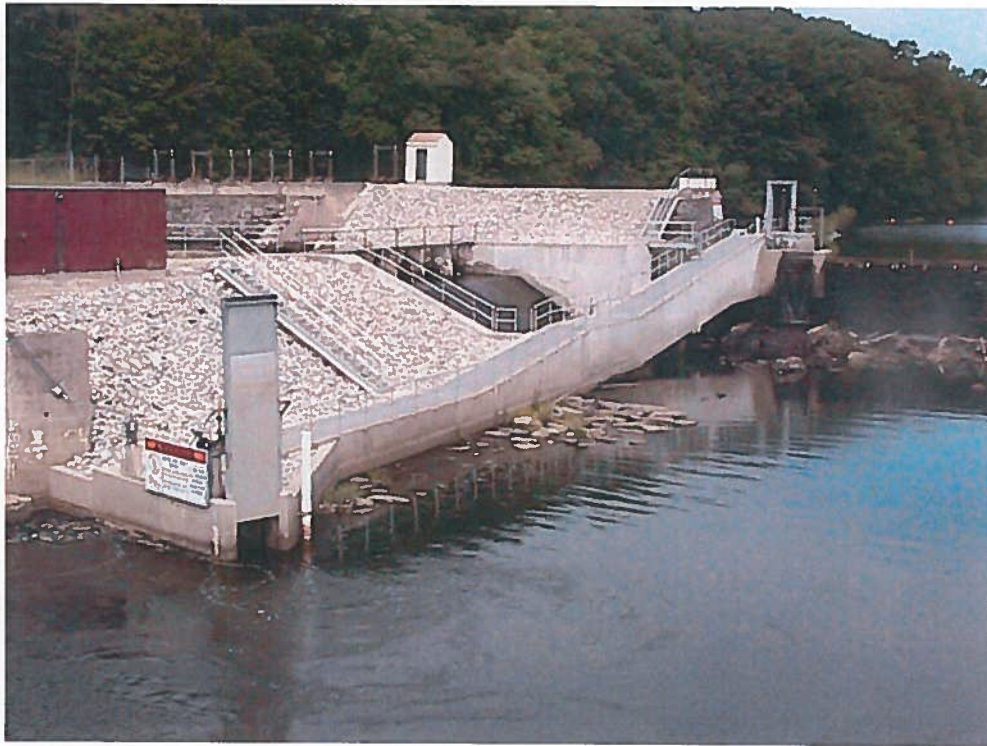


Photo 5: Occum Upstream Fish Passage



Photo 6: Occum Eel Ladder and Denil Fish Ladder



Photo 7: Upstream Eel Passage



Photo 8: Occum Forebay Intake Gate Structure

Photo



Photo 9: Occum Intake and Downstream Fish Passage Entrance

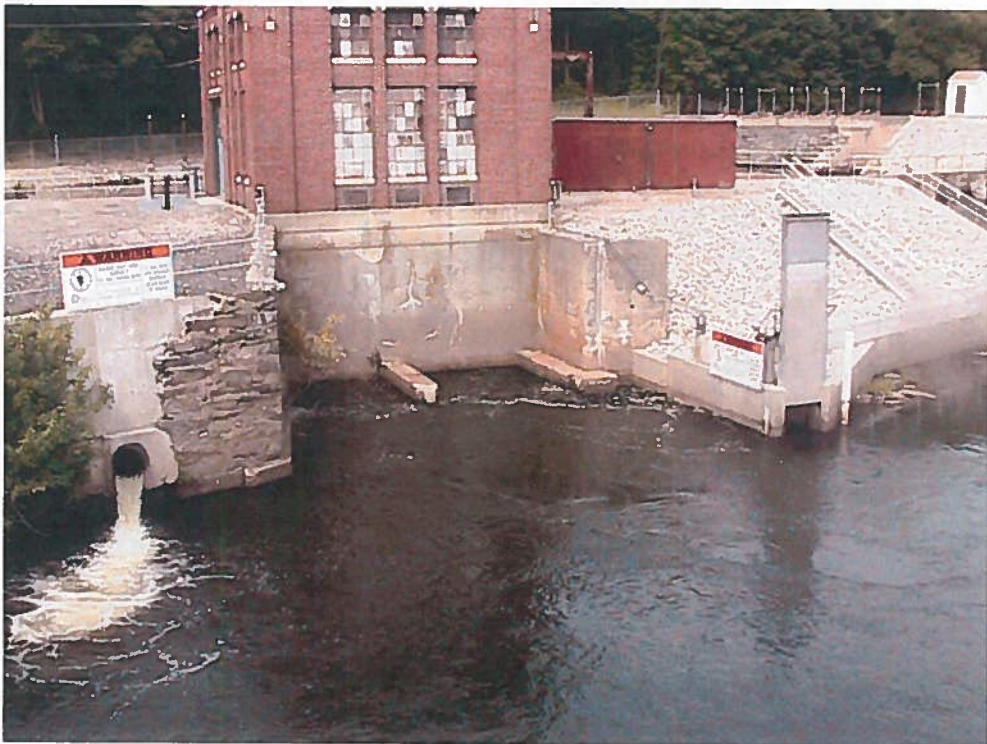


Photo 10: Occum Tailrace, Downstream Passage/Minimum Flow Discharge and Upstream Ladder Entrance



Photo 11: Occum Unit



Photo 12: Recreation Area with Canoe Portage takeout on right.



Photo 13: Upstream Portage Ramp

OCCUM HYDROELECTRIC PROJECT
(FERC NO. 11574)

LIHI CERTIFICATE 105

LIHI RECERTIFIATION APPLICATION

APPENDIX B

FACILITY CONTACTS FORM

FACILITY CONTACTS FORM

Project Owner:	
Name and Title	Chris LaRose, Assistance General Manager
Company	Norwich Public Utilities
Phone	(860) 823-7300
Email Address	Chrislarose@npumail.com
Mailing Address	16 South Golden St., Norwich CT 06360
Project Operator (if different from Owner):	
Name and Title	
Company	
Phone	
Email Address	
Mailing Address	
Consulting Firm / Agent for LIHI Program (if different from above):	
Name and Title	Alfred Nash, President
Company	Renewable Power Consulting, PA
Phone	(207) 992-3926
Email Address	Al.nash@renewablepowerconsulting.com
Mailing Address	P.O. Box 195 Palmyra, ME 04965
Compliance Contact (responsible for LIHI Program requirements):	
Name and Title	Chris LaRose, Assistance General Manager
Company	Norwich Public Utilities
Phone	(860) 823-7300
Email Address	Chrislarose@npumail.com
Mailing Address	16 South Golden St., Norwich CT 06360
Party responsible for accounts payable:	
Name and Title	Chris LaRose, Assistance General Manager
Company	Norwich Public Utilities
Phone	(860) 823-7300
Email Address	Chrislarose@npumail.com
Mailing Address	16 South Golden St., Norwich CT 06360

Current and relevant state, federal, provincial, and tribal resource agency contacts

Agency Contact (Check area of responsibility: Flows___, Water Quality __, Fish/Wildlife Resources <u>X</u> , Watersheds __, T/E Spp. __, Cultural/Historic Resources __, Recreation __):	
Agency Name	CT Department of Energy and Environmental Protection, Inland Fisheries Division
Name and Title	Stephen Gephard, Supervising Fisheries Biologist
Phone	(860) 447-4316
Email address	Steve.gephard@ct.gov
Mailing Address	P.O. Box 719, 333 Ferry Road, Old Lime, CT 06371

Agency Contact (Check area of responsibility: Flows___, Water Quality __, Fish/Wildlife Resources <u>X</u> , Watersheds __, T/E Spp. __, Cultural/Historic Resources __, Recreation __):	
Agency Name	U.S. Fish and Wildlife Service
Name and Title	Melissa Grader, Fish and Wildlife Biologist
Phone	(413) 548-8002 x8124
Email address	Melissa_grader@fws.gov
Mailing Address	New England Field Office, 103 East Plumtree Road, Sunderland, MA 01375

Agency Contact (Check area of responsibility: Flows___, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources <u>X</u> , Recreation __):	
Agency Name	CT State Historic Preservation Office
Name and Title	Danial Forrest, Archaeologist/Environmental Review Coordination
Phone	(860) 256-2761
Email address	Daniel.Forrest@ct.gov
Mailing Address	One Constitution Plaza, 2 nd Floor, Hartford, CT 06103

Agency Contact (Check area of responsibility: Flows___, Water Quality __, Fish/Wildlife Resources __, Watersheds <u>X</u> , T/E Spp. __, Cultural/Historic Resources __, Recreation __):	
Agency Name	River Alliance of CT
Name and Title	Margaret Minor, Executive Director
Phone	(860) 361-9349
Email address	rivers@riversalliance.org
Mailing Address	P.O. Box 1797, West Street 3 rd Floor, Litchfield, CT 06759

Agency Contact (Check area of responsibility: Flows___, Water Quality __, Fish/Wildlife Resources __, Watersheds <u>X</u> , T/E Spp. __, Cultural/Historic Resources __, Recreation __):	
Agency Name	CT Department of Energy and Environmental Protection, Bureau of Water Protection and Land Reuse
Name and Title	Brian Golembiewski, Supervisor
Phone	(860) 424-3867
Email address	Brian.golembiewski@ct.gov
Mailing Address	79 Elm St, Hartford, CT 06106-5127

Agency Contact (Check area of responsibility: Flows __, Water Quality <u>X</u> , Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources __, Recreation __):	
Agency Name	NOAA
Name and Title	Sean McDermott, Hydropower Coordinator
Phone	(978) 281-9113
Email address	Sean.mcdermott@noaa.gov
Mailing Address	55 Great Republic Drive, F/GARFO, Gloucester, MA 01930-2298