Renewable Power Consulting, PA

Low Impact Hydropower Institute
c/o Mr. Fred Ayer
Executive Director
34 Providence Street
Portland, Maine 04103

April 9, 2012

LIHI Application for the
Occum Hydroelectric Project

Dear Mr. Ayer:

On behalf of our client, Norwich Public Utilities, we are submitting an application for certification by the Low Impact Hydropower Institute (LIHI) for the Occum Hydroelectric Project. The application fee has been sent under separate cover.

For purposes of responding to inquiries regarding this application, please contact the following:

Primary Contact

Mark Greene
Operations Integrity Manager
Norwich Public Utilities
16 South Golden Street
Norwich, CT 06360
(860) 823-4119
MarkGreene@npumail.com

Secondary Contact

Alfred Nash, P.E.
Consultant
Renewable Power Consulting, PA
P.O. Box 195
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(207) 992-3926
al.nash@renewablepowerconsulting.com

Thank you for consideration of these applications.

Sincerely,
RENEWABLE POWER CONSULTING, PA

Alfred Nash, P.E.
President

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LOW IMPACT HYDROPOWER QUESTIONNAIRE

[Excerpted from Part VI, Section E of the Low Impact Hydropower Certification Program. Words in italics are defined in Part VI, Section C, and line-by-line instructions are available in Section D of the program, available on-line in PDF format at http://www.lowimpacthydro.org.

E. LOW IMPACT HYDROPOWER QUESTIONNAIRE

Background Information	
1) Name of the *Facility*.	Occum Project
2) Applicant's name, contact information and relationship to the Facility. If the Applicant is not the Facility owner/operator, also provide the name and contact information for the Facility owner and operator.	Norwich Public Utilities 16 South Golden St Norwich, Connecticut 06360 Attn: Chris LaRose (860) 823-7300 Email: Chrislarose@npumail.com Norwich Public Utilities is the owner and operator of the Facility
3) Location of Facility by river and state.	The Occum Project is located on the Shetucket River (mile 6.4) in the village of Occum, City of Norwich, Connecticut

4) Installed capacity.	800 KW
5) Average annual generation.	3,750 MWH
6) Regulatory status.	A 40 year operating license issued September 29, 1999. Refer to Attachment #1
7) Reservoir volume and surface area measured at the high water mark in an average water year.	The Occum Project impoundment has a surface area of approximately 90 acres and extends approximately 10,000 ft upstream of the dam. Gross storage capacity at the normal pond level is 600-acre feet; usable storage capacity is an estimated 155-acre feet.
8) Area occupied by non-reservoir facilities (*e.g.*, dam, penstocks, powerhouse).	1.4 acres
9) Number of acres inundated by the Facility.	0.8 acre
10) Number of acres contained in a 200-foot zone extending around entire impoundment.	92 acres
11) Please attach a list of contacts in the relevant Resource Agencies and in non-governmental organizations that have been involved in Recommending conditions for your Facility.	See Attachment #2
12) Please attach a description of the Facility, its mode of operation (*i.e.*, peaking/run of river) and a map of the Facility.	See Attachment #3
Questions For "New" Facilities Only: If the Facility you are applying for is "new" i.e., an existing dam that added or increased power generation capacity after August of 1998 please answer the following questions to determine eligibility for the program	**Not Applicable**
13) When was the dam associated with the Facility completed?	**Not Applicable**
14) When did the added or increased generation first generate electricity? If the added or increased generation is not yet operational, please answer question 18 as well.	**Not Applicable**

15) Did the added or increased power generation capacity require or include any new dam or other diversion structure?	**Not Applicable**	
16) Did the added or increased capacity include or require a change in water flow through the facility that worsened conditions for fish, wildlife, or water quality, (for example, did operations change from run-of-river to peaking)?	**Not Applicable**	
17 (a) Was the existing dam recommended for removal or decommissioning by resource agencies, or recommended for removal or decommissioning by a broad representation of interested persons and organizations in the local and/or regional community prior to the added or increased capacity? (b) If you answered "yes" to question 17(a), the Facility is not eligible for certification, unless you can show that the added or increased capacity resulted in specific measures to improve fish, wildlife, or water quality protection at the existing dam. If such measures were a result, please explain.	**Not Applicable**	
18 (a) If the increased or added generation is not yet operational, has the increased or added generation received regulatory authorization (e.g., approval by the Federal Energy Regulatory Commission)? If not, the facility is not eligible for consideration; and (b) Are there any pending appeals or litigation regarding that authorization? If so, the facility is not eligible for consideration.	**Not Applicable**	
A. Flows	**PASS**	**FAIL**
1) Is the Facility in *Compliance* with *Resource Agency Recommendations* issued after December 31, 1986 regarding flow conditions for fish and wildlife protection, mitigation and enhancement (including in-stream flows, ramping and peaking rate conditions, and seasonal and episodic instream flow variations) for both the reach below the tailrace and all bypassed reaches?	Yes, see attachment #4	
2) If there is no flow condition recommended by any Resource. Agency for the Facility, or if the recommendation was issued prior to January 1, 1987, is the Facility in Compliance with a flow release schedule, both below the tailrace and in all bypassed reaches, that at a minimum meets Aquatic Base Flow standards or "good" habitat flow standards calculated using the Montana-Tennant method?		

3) If the Facility is unable to meet the flow standards in A.2., has the Applicant demonstrated, and obtained a letter from the relevant Resource Agency confirming that demonstration, that the flow conditions at the Facility are appropriately protective of fish, wildlife, and water quality?		
B. Water Quality	**PASS**	**FAIL**
1) Is the Facility either: a) In Compliance with all conditions issued pursuant to a Clean Water Act Section 401 water quality certification issued for the Facility after December 31, 1986? Or b) In Compliance with the quantitative water quality standards established by the state that support designated uses pursuant to the federal Clean Water Act in the Facility area and in the downstream reach?	YES – see Attachment #5	
2) Is the Facility area or the downstream reach currently identified by the state as not meeting water quality standards (including narrative and numeric criteria and designated uses) pursuant to Section 303(d) of the Clean Water Act?	NO	
3) If the answer to question B.2 is yes, has there been a determination that the Facility is not a cause of that violation?	NOT APPLICABLE	
C. Fish Passage and Protection	**PASS**	FAIL
1) Is the Facility in Compliance with *Mandatory Fish Passage Prescriptions* for upstream and downstream passage of anadromous and catadromous fish issued by Resource Agencies after December 31, 1986?	YES – Refer to Attachment #6	
2) Are there historic records of anadromous and/or catadromous fish movement through the Facility area, but anadromous and/or catadromous fish do not presently move through the Facility area (*e.g.*, because passage is blocked at a downstream dam or the fish run is extinct)? a) If the fish are extinct or extirpated from the Facility area or downstream reach, has the Applicant demonstrated that the extinction or extirpation was not due in whole or part to the Facility?		

b) If a Resource Agency Recommended adoption of upstream and/or downstream fish passage measures at a specific future date, or when a triggering event occurs (such as completion of passage through a downstream obstruction or the completion of a specified process), has the Facility owner/operator made a legally enforceable commitment to provide such passage?		
3) If, since December 31, 1986: a) Resource Agencies have had the opportunity to issue, and considered issuing, a Mandatory Fish Passage Prescription for upstream and/or downstream passage of anadromous or catadromous fish (including delayed installation as described in C2a above), and b) The Resource Agencies declined to issue a Mandatory Fish Passage Prescription, c) Was a reason for the Resource Agencies' declining to issue a Mandatory Fish Passage Prescription one of the following: (1) the technological infeasibility of passage, (2) the absence of habitat upstream of the Facility due at least in part to inundation by the Facility impoundment, or (3) the anadromous or catadromous fish are no longer present in the Facility area and/or downstream reach due in whole or part to the presence of the Facility?		
4) If C3 was not applicable: a) Are upstream and downstream fish passage survival rates for anadromous and catadromous fish at the dam each documented at greater than 95% over 80% of the run using a generally accepted monitoring methodology? Or b) If the Facility is unable to meet the fish passage standards in 4.a., has the Applicant demonstrated, and obtained a letter from the US Fish and Wildlife Service or National Marine Fisheries Service confirming that demonstration, that the upstream and downstream fish passage measures (if any) at the Facility are appropriately protective of the fishery resource?		
5) Is the Facility in Compliance with Mandatory Fish Passage Prescriptions for upstream and/or downstream passage of *Riverine* fish?	YES	

6) Is the Facility in Compliance with Resource Agency Recommendations for Riverine, anadromous and catadromous fish entrainment protection, such as tailrace barriers?	YES	
D. Watershed Protection	PASS	FAIL
1) Is there a buffer zone dedicated for conservation purposes (to protect fish and wildlife habitat, water quality, aesthetics and/or low-impact recreation) extending 200 feet from the high water mark in an average water year around 50 - 100% of the impoundment, and for all of the undeveloped shoreline		NO
2) Has the facility owner/operator established an approved watershed enhancement fund that: 1) could achieve within the project's watershed the ecological and recreational equivalent of land protection in D.1.,and 2) has the agreement of appropriate stakeholders and state and federal resource agencies?		NO
3) Has the facility owner/operator established through a settlement agreement with appropriate stakeholders and that has state and federal resource agencies agreement an appropriate shoreland buffer or equivalent watershed land protection plan for conservation purposes (to protect fish and wildlife habitat, water quality, aesthetics and/or low impact recreation)		NO
4) Is the facility in compliance with both state and federal resource agencies recommendations in a license approved shoreland management plan regarding protection, mitigation or enhancement of shorelands surrounding the project?	YES	
E. Threatened and Endangered Species Protection	**PASS**	FAIL
1) Are threatened or endangered species listed under state or federal Endangered Species Acts present in the Facility area and/or downstream reach?	NO	
2) If a recovery plan has been adopted for the threatened or endangered species pursuant to Section 4(f) of the Endangered Species Act or similar state provision, is the Facility in Compliance with all recommendations in the plan relevant to the Facility?		
3) If the Facility has received authority to incidentally *Take* a listed species through: (i) Having a relevant agency complete consultation pursuant to ESA Section 7 resulting in a biological opinion, a habitat recovery plan, and/or (if needed) an incidental Take		

statement; (ii) Obtaining an incidental Take permit pursuant to ESA Section 10; or (iii) For species listed by a state and not by the federal government, obtaining authority pursuant to similar state procedures; is the Facility in Compliance with conditions pursuant to that authority?		
4) If a biological opinion applicable to the Facility for the threatened or endangered species has been issued, can the Applicant demonstrate that? a) The biological opinion was accompanied by a FERC license or exemption or a habitat conservation plan? Or b) The biological opinion was issued pursuant to or consistent with a recovery plan for the endangered or threatened species? Or c) There is no recovery plan for the threatened or endangered species under active development by the relevant Resource Agency? Or d) The recovery plan under active development will have no material effect on the Facility's operations?		
5) If E.2. and E.3. are not applicable, has the Applicant demonstrated that the Facility and Facility operations do not negatively affect listed species?		
F. Cultural Resource Protection	**PASS**	FAIL
1) If FERC-regulated, is the Facility in Compliance with all requirements regarding Cultural Resource protection, mitigation or enhancement included in the FERC license or exemption?	YES – Refer to Attachment #7	
2) If not FERC-regulated, does the Facility owner/operator have in place (and is in Compliance with) a plan for the protection, mitigation or enhancement of impacts to Cultural Resources approved by the relevant state or federal agency or *Native American Tribe*, or a letter from a senior officer of the relevant agency or Tribe that no plan is needed because Cultural Resources are not negatively affected by the Facility?		

G. Recreation	**PASS**	FAIL
1) If FERC-regulated, is the Facility in Compliance with the recreational access, accommodation (including recreational flow releases) and facilities conditions in its FERC license or exemption?	YES – Refer to Attachment #8	
2) If not FERC-regulated, does the Facility provide recreational access, accommodation (including recreational flow releases) and facilities, as Recommended by Resource Agencies or other agencies responsible for recreation?		
3) Does the Facility allow access to the reservoir and downstream reaches without fees or charges?	YES	
H. Facilities Recommended for Removal	**PASS**	FAIL
1) Is there a Resource Agency Recommendation for removal of the dam associated with the Facility?	NO	

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #1

FERC LICENSE

88 FERC ¶ 62,299

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

City of Norwich, Department of Public Utilities)	Project No. 11574-000 Connecticut

ORDER ISSUING ORIGINAL LICENSE
(Minor Project)

(Issued September 29, 1999)

INTRODUCTION

On February 23, 1996, the City of Norwich, Department of Public Utilities (Norwich), filed an application for an original minor license under Part I of the Federal Power Act (FPA)[1] to continue to operate and maintain the existing, unlicensed, 800-kilowatt (kW) Occum Hydroelectric Project No. 11574, located on the Shetucket River in New London County, Connecticut. The project would affect the interests of interstate or foreign commerce.[2]

BACKGROUND

Notice of the application was published on May 8, 1996. The United States Department of the Interior (Interior) filed a motion to intervene in this proceeding on June 25, 1996. No agency objected to issuance of this license. Comments received from interested agencies and individuals have been fully considered in determining whether and under what conditions to issue this license.

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[1] 16 U.S.C. § 791(a) - 825(r).

[2] Installation of the 800-kW turbine in 1937 constitutes post-1935 construction, as defined under Section 23(b) of the FPA. The Shetucket River, below the project site, was found to be a navigable water of the United States (See 33 FPC 804). On February 24, 1993, the Director, Office of Hydropower Licensing, issued an Order Finding Hydroelectric Project Jurisdiction for the Occum Project under Section 23(b) of the FPA (see 62 FERC ¶62,131). The Commission determined that because the project is located on a stream over which Congress has jurisdiction under the Commerce Clause, affects interstate commerce through its connection to an interstate power grid, and was constructed after 1935, the project requires a license to continue to operate.

A draft environmental assessment (EA) was issued for this project on February 24, 1999. Comments on the draft EA were addressed in the final EA, which was issued on August 13, 1999.

PROJECT DESCRIPTION

Norwich purchased the Occum Project's facilities in 1932, redeveloped the site for hydroelectric production between 1934 and 1937, and began commercial operation in 1937. Norwich proposes to continue to operate the project as a cycling plant based on pulsing water releases from the upstream Scotland Project No. 2662.

The existing constructed project consists of: (1) an existing dam; (2) a 90-acre impoundment; (3) a forebay; (4) an intake structure; (5) an existing powerhouse housing a hydropower unit with a capacity of 800 kW; (6) an existing 4.8-kilovolt (kV) transmission line; and (7) appurtenant facilities. Norwich proposes to install an upstream fish ladder and a downstream fish bypass. A more detailed project description is contained in ordering paragraph (B)(2).

COASTAL ZONE MANAGEMENT

The Occum Project is not located in a state-designated coastal zone management area. Our assessment is that no coastal zone consistency certification is needed for this project.

WATER QUALITY CERTIFICATION

Under Section 401(a)(1) of the Clean Water Act (CWA),[3] the Commission may not issue a license for a hydroelectric project unless either the licensee obtains water quality certification (WQC) from the certifying agency of the state in which the project discharge will originate, or the certifying agency waives certification. Section 401(a)(1) states that certification is deemed waived if the certifying agency fails to act on a WQC request within a reasonable period of time, not to exceed one year.[4] Section 401(d) of the

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[3] 33 U.S.C. § 1341(a)(1).

[4] Section 401(a)(1) requires an applicant for a federal license or permit to conduct any activity that may result in any discharge into navigable waters to obtain from the state in which the discharge originates certification that any such discharge will

(continued...)

CWA[5] provides that state certification shall set forth conditions necessary to ensure that licensees comply with specific portions of the CWA and with appropriate requirements of state law.

On February 22, 1996, Norwich requested Section 401 WQC for the Occum Project from the Connecticut Department of Environmental Protection (Connecticut DEP). The Connecticut DEP issued a Section 401 WQC with four conditions on February 11, 1997. Section 401(d) of the CWA provides that any state certification shall become a condition of any federal license or permit that is issued. The state certification conditions are included as part of the license, and are attached as Appendix A.

SECTION 18 OF THE FEDERAL POWER ACT

Section 18 of the FPA[6] authorizes the Secretary of the Interior or the Secretary of Commerce to prescribe fishways at Commission-licensed projects.[7] In its letter dated June 24, 1998, Interior requested that the Commission reserve its authority to prescribe the construction, operation, and maintenance of fishways at the Occum Project under Section 18 of the FPA.

The Commission recognizes that future fish passage needs cannot always be determined at the time of project licensing. The Commission's practice has been to include a license article that reserves the Secretary of the Interior's authority to prescribe facilities for fish passage when so requested. Therefore, consistent with Commission practice, Article 407 of this license reserves the Commission's authority to require the licensee to construct, operate, and maintain such fishways as may be prescribed by the Secretary of the Interior under Section 18 of the FPA.

(...continued)
comply with applicable water quality standards.

[5] 33 U.S.C. § 1341(d). Pursuant to American Rivers v. FERC, 129 F.3d 99 (2nd Cir. 1997), the Commission must accept as license conditions all conditions attached to a valid water quality certification.

[6] 16 U.S.C. § 811.

[7] Section 18 of the FPA states: "The Commission shall require the construction, maintenance, and operation by a licensee at its own expense of... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior as appropriate."

RECOMMENDATIONS OF FEDERAL AND STATE FISH AND WILDLIFE AGENCIES

Section 10(j) of the FPA[8] requires the Commission, when issuing a license, to include license conditions based on recommendations of federal and state fish and wildlife agencies submitted pursuant to the Fish and Wildlife Coordination Act, to "adequately and equitably protect, mitigate damages to, and enhance, fish and wildlife (including related spawning grounds and habitat)" affected by the project. In the draft EA, we addressed the fish and wildlife agency recommendations, and this license provides conditions consistent with those recommendations, with one exception.

In determining whether to accept or reject recommendations of fish and wildlife agencies under Section 10(j), the Commission first determines whether each recommendation is supported by substantial evidence in the record; if not, the recommendation is inconsistent with the requirements of Section 313(b) of the FPA that Commission orders be supported by substantial evidence.

Second, the Commission determines whether a substantiated recommendation is inconsistent with the FPA or other applicable law. Any such inconsistency is usually with the Commission's determination under the equal consideration/comprehensive development standards of FPA Sections 4(e) and 10(a)(1), in that the recommendation conflicts unduly with another project purpose or value.

Third, the Commission must show how the fish and wildlife conditions that are adopted will "adequately and equitably protect, mitigate damages to, and enhance, fish and wildlife (including related spawning grounds and habitat)" affected by the project.

In the draft EA, staff concluded that Interior's recommendation for a minimum flow of 155 cfs whenever the project is not operating and the Taftville headpond elevation falls below elevation 48.9 feet may be inconsistent with the comprehensive planning standard of Section 10(a) of the FPA, including the equal consideration provision of Section 4(e) of the FPA. We based our conclusion on the relatively minor amount of additional fisheries habitat (wetted area) provided with a minimum flow release of 155 cfs at a tailwater elevation of 48.9 feet over the amount of habitat provided at the staff-recommended minimum flow of 100 cfs at the same tailwater elevation.

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[8] 16 U.S.C. § 803(j)(1).

By letter dated February 24, 1999, we requested that Interior consider other options that would be agreeable to Interior and that would adequately protect fisheries resources consistent with other project purposes. Interior responded by letter dated March 23, 1999, that it could accept that a release of 100 cfs would adequately protect instream resources when tailwater elevations fall below 48.9 feet, based on Commission staff analysis and our acceptance of Interior's recommended trigger elevation of 48.9 feet for the release of minimum flows when the project is not operating. Therefore the inconsistency between Interior's recommendation and the FPA is resolved.

This license contains conditions consistent with Interior's and Connecticut DEP's recommendations for: (1) impoundment drawdown limitations (Article 401); (2) tailwater trigger elevations for the release of minimum flows (Article 402); (3) operations monitoring (Article 403); and (4) fish passage facilities (Articles 405 and 406).

Pursuant to Section 10(j) of the FPA, staff evaluated each recommendation of the federal and state wildlife agencies for consistency with the purpose and requirements of Part I of the FPA or other applicable law. In light of the above, staff concluded that the fish and wildlife measures required in this license comply with the requirements of Section 10(j) of the FPA. I concur with staff's findings.

Interior and Connecticut DEP made several other recommendations that are not specific measures to protect, mitigate damages to, or enhance fish and wildlife; consequently, they are not recommendations pursuant to Section 10(j) of the FPA. Staff considered these recommendations pursuant to Section 10(a), as discussed below.

Section 10(a)(1) requires that any project for which the Commission issues a license shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of waterpower development, for the adequate protection, mitigation, and enhancement of fish and wildlife, and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes.[9]

Interior recommended that Norwich file the operations monitoring plan within three months of license issuance. Given the need for Norwich to consult with agencies during the development of the monitoring plan and to provide agency comments on the completed plan, staff concluded that three months would be insufficient time. Article 403

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[9] 16 U.S.C. § 803(a)(1).

requires Norwich to file the operations monitoring plan within six months of the date of license issuance.

Interior recommended that Norwich file functional design drawings for the upstream fish ladder and downstream fish bypass within six months of license issuance. Article 405 requires Norwich to file final plans for the upstream fish ladder within two years of license issuance. Article 406 requires Norwich to file final plans for the downstream fish bypass within one year of license issuance. The time frame in Article 405 would allow sufficient time for agency review and Commission action to enable Norwich to complete installation of the upstream fish ladder within four years of the effective upstream passage of target species at the downstream Taftville project. Likewise, the time frame in Article 406 would provide sufficient time for agency review and Commission action on the final plan for the downstream fish bypass to enable Norwich to complete installation within three years of license issuance.

Connecticut DEP recommended installation of a boat barrier and canoe portage facilities within four years of license issuance. During the staff site visit, we confirmed that a boat barrier has been installed. We agree with Connecticut DEP's recommendation for installation of canoe portage facilities, and will require Norwich to file a final plan for the canoe portage facilities in Article 409.

CULTURAL RESOURCES

The Occum Project facilities were placed on the National Register of Historic Places on February 7, 1996, as the Occum Hydroelectric Plant and Dam.[10] To ensure that continued operation and installation of fish passage facilities and recreational enhancements would not have an adverse effect on the archeological and historic sites of the Occum Project, the Connecticut State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (Advisory Council), and the Director, Office of Hydropower Licensing, as the Commission's delegated representative, entered into a Programmatic Agreement (PA) on cultural resources for the project pursuant to the Advisory Council's regulations 36 CFR 800. The PA was signed and executed by the Advisory Council on September 16, 1999.

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[10] Occum Hydroelectric Plant and Dam historic properties consist of the dam, headgate, forebay, and powerhouse.

Implementation of the PA, which requires preparation of a cultural resources management plan (CRMP), would provide a process to protect the historic integrity of the properties (Article 408).

STATE AND FEDERAL COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA[11] requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving waterways affected by the project. Under Section 10(a)(2), federal and state agencies filed ten plans with the Commission that address various resources in Connecticut, seven of which are relevant to this project.[12] No conflicts were found.

COMPREHENSIVE DEVELOPMENT

Sections 4(e) and 10(a)(1) of the FPA, §§ 16 U.S.C. 797(e) and 803(a)(1), require the Commission, in acting on applications for license, to give equal consideration to the power development purposes and to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife, the protection of recreational opportunities, and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to

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[11] 16 U.S.C. § 803(a)(2).

[12] (1) Connecticut Department of Environmental Protection. 1983. Statewide comprehensive outdoor recreation plan. Hartford, Connecticut. December 1983. 112 pp. and appendices. (2) Connecticut Department of Environmental Protection. 1987. Statewide comprehensive outdoor recreation plan, 1987-1992. Hartford, Connecticut. 202 pp. (3) Policy Committee for Fisheries Management of the Connecticut River. 1982. A strategic plan for the restoration of Atlantic salmon to the Connecticut River Basin. Laconia, New Hampshire. September 1982. 49 pp. plus appendices. (4) Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. May 1986. 19 pp. (5) Fish and Wildlife Service. Undated. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C. 11 pp. (6) Fish and Wildlife Service. 1989. Final environmental impact statement - restoration of Atlantic Salmon to New England Rivers. Department of the Interior, Newton Corner, Massachusetts. May 1989. 88 pp. (7) National Park Service. 1982. The nationwide rivers inventory. Department of the Interior, Washington, D.C. January 1982. 432 pp.

a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. The decision to license this project, and the terms and conditions included herein, reflect such consideration.

In determining whether a proposed project will be best adapted to a comprehensive plan for developing a waterway for beneficial public purposes, pursuant to Section 10(a)(1) of the FPA, the Commission considers a number of public interest factors, including the economic benefits of project power.

Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division,[13] the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power, with no forecasts concerning potential future inflation, escalation, or deflation beyond the license issuance date. The basic purpose of the Commission's economic analysis is to provide a general estimate of the potential power benefits and the costs of a project, and reasonable alternatives to project power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

Based on current economic conditions, without future escalation or inflation, the Occum Project, if licensed as proposed by Norwich with the additional enhancement measures that are being required in this license, would produce an average of 3,494,000 kilowatt-hours (kWh) of energy annually at an annual cost of about $354,791, or 101.5 mills per kWh (mills/kWh). The project would have a total annual value of about $192,176, or 55.0 mills/kWh in 1998 dollars, based on the average cost of alternative capacity and energy in the region.[14] Therefore, we estimate the project power would cost about $162,616, or 46.5 mills/kWh, more than the current cost of alternative power in the

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[13] 72 FERC ¶61,027 (1995).

[14] We would typically base our estimate of the value of project-related energy on the 1998 cost of natural gas to electric generators in the New England division of the United States. In this case, however, the project is treated as having no dependable capacity because there are significant periods during low flow when no generation occurs, due in part to the dependence on releases from the upstream Scotland project. Furthermore, the regional energy value of 29.81 mill/kWh is too low to represent the replacement cost for a small municipal utility such as Norwich. Therefore, in this analysis, we use the current energy replacement cost of 55 mill/kWh as stated by Norwich.

regional market. Almost all of the negative net benefits presented herein are associated with our estimated costs of upstream fish passage facilities. However, the intention is to require such facilities only at such time as effective upstream fish passage is achieved at the downstream Taftsville generating facilities and fish have adequate access to the tailrace of the Occum Project.

However, as explained in Mead, project economics is only one of the many public interest factors that is considered in determining whether or not to issue a license. The continued operation of a project may be desirable for other reasons. Norwich would need to decide whether continued operation of the existing project, including the conditions herein, is a reasonable decision in these circumstances.

The final EA analyzes the effects associated with the issuance of a license for the Occum Project. The final EA also recommends a variety of measures to protect and enhance the environmental resources, which are adopted, as discussed herein. Staff's recommended environmental measures were developed after consideration of the license terms and conditions submitted by federal and state agencies.

Based on review and evaluation of the project as proposed by the licensee, and with the additional required environmental measures, we conclude that continued operation and maintenance of the project in the manner required by the license will protect and enhance fish and wildlife resources, water quality, recreational, and cultural resources. The electricity generated from renewable water power resources will be beneficial because it will continue to offset the use of fossil-fueled, steam-electric generating plants, thereby conserving nonrenewable resources and reducing atmospheric pollution. Therefore, I find that the Occum Project, with the required environmental enhancement measures, is best adapted to a comprehensive plan for the use, conservation, and development of the waterway for beneficial public purposes.

I am requiring the licensee to implement at the Occum Project, the environmental measures summarized below:

(1) operate the project with impoundment drawdowns not to exceed 2 feet;

(2) develop and implement soil and erosion control measures, including temporary cofferdams, as part of the final plans for construction of the upstream and downstream fish passage and the canoe portage;

(3) release minimum flows of 30 cfs through a combination of leakage and spillage when the project is not operating, and, following installation of the

downstream fish bypass, a total of 100 cfs or inflow, whichever is less, through a combination of leakage, spillage, and the downstream sluiceway when the project is not operating and the impoundment elevation at the Taftville Project is below 48.9 feet;

(4) develop and implement an operations monitoring plan to monitor impoundment and tailwater elevations and minimum flows;

(5) develop and implement a final plan for the construction, operation, maintenance, and effectiveness monitoring of the upstream Denil fish ladder within four years of effective upstream passage at Taftville;

(6) develop and implement a final plan for the construction, operation, maintenance, and effectiveness monitoring of downstream fish bypass within three years of license issuance;

(7) implement the PA among the Commission, the SHPO, and the Advisory Council, that provides for the development and implementation of a CRMP;

(8) develop and implement a final plan for the installation of canoe portage around the dam, including signs and erosion control measures; and

(9) reserve the Commission's authority to require fishways as may be prescribed by Interior under Section 18 of the FPA for the Occum Project.

LICENSE TERM

Section 6 of the FPA[15] provides that original licenses for hydropower projects shall be issued for a term not to exceed 50 years. The Commission's license term policy when issuing original licenses for existing projects that should have been licensed earlier is set forth in City of Danville.[16] The Commission issues a 30-year license for projects with little or no redevelopment, new construction, or new environmental mitigation and enhancement requirements; a 40-year license for projects with a moderate amount of new construction or new environmental mitigation and enhancement requirements; and a 50-

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15 16 U.S.C. §§ 797(e) and 803(a)(1).

16 16 U.S.C. § 799.

year license for projects with an extensive amount of new construction or new environmental mitigation and enhancement requirements.

This license authorizes moderate new environmental mitigation and enhancement requirements.[17] Accordingly, the license issued for the Occum Project will be for a license term of 40 years.

ANNUAL CHARGES

The Commission collects annual charges from licensees for the administration of the FPA. Commission policy for payments of back annual charges for previously unauthorized, existing post-1935 projects with a determination that the specific project by itself affects interstate commerce (such as is the case with Occum Project) establishes a back annual charge to be paid from May 1, 1965, or date of construction, whichever is later.[18] As of October 1, 1994, the Commission has not assessed annual charges for projects less than or equal to 1,500 kW authorized installed capacity (Article 201). Therefore, the Occum Project with an installed capacity of only 800 kW, will be assessed a back annual charge from May 1, 1965 to September 30, 1994 (Article 202).

SUMMARY OF FINDINGS

The final EA issued for this project includes background information and analysis of impacts, and supports related license articles.

The Occum Project would be safe and adequate for future operation during the license term, and would pose no threat to public safety if operated and maintained according to good engineering practice, and the normal regulations governing our hydroelectric licenses. Analysis of related issues is provided in the Safety and Design Assessment, which is available in the Commission's public files for this project.

Based upon a review of the agency and public comments filed on the project, and staff's independent analysis pursuant to Sections 4(e), 10(a)(1), and 10(a)(2) of the FPA, I conclude that issuing a license for the Occum Project, with the required environmental

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[17] Norwich is proposing to install, operate, and monitor upstream and downstream fish passage facilities, and install canoe portage facilities.

[18] See City of Danville, 58 FERC ¶ 61,318 (1992), at p. 62,020 and 62,021; Indiana Michigan Power Company, 72 FERC ¶ 61,153 (1995), at p. 61,772 and 61,773.

measures and other special license conditions, would not conflict with any planned or authorized development, and would be best adapted to the comprehensive development of the Shetucket River for beneficial public uses.

The Director orders:

(A) This license is issued to the City of Norwich, Department of Public Utilities (licensee), for a period of 40 years, effective the first day of the month in which this order is issued, to continue to operate and maintain the Occum Project. This license is subject to the terms and conditions of the FPA, which is incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the FPA.

(B) The project consists of:

(1) All lands, to the extent of the licensee's interests in those lands, enclosed by the project boundary shown by exhibit G filed February 22, 1996:

Exhibit G Drawing	FERC No.	Description
Sheet G-1	11574-5	Project Map

(2) Project works consisting of: (1) an 895-foot-wide (perpendicular to flow) and 16.1-foot-high concrete and masonry dam and earth embankments consisting of, from left to right looking downstream, (a) a 185-foot-wide earth embankment, (b) a 170-foot-wide concrete ogee overflow spillway section, (c) a 280-foot-wide stone masonry overflow spillway section with flashboards, and (d) three sections of earth embankment totaling 260 feet in width; (2) a 10,000-foot-long, 90-acre impoundment with gross storage of 600 acre-feet at 66.1 feet above msl; (3) a 160-foot-wide by 225-foot-long (parallel to flow) forebay with a 55-foot-long flashboard-equipped spillway, a sluice gate, and trashracks, controlled by an 85-foot wide concrete intake structure with six rack and pinion gates; (4) a 32-foot-wide by 400-foot-long concrete and brick powerhouse containing one turbine-generator unit with an installed capacity of 800 kW; (5) all electrical equipment necessary to carry all of the project power to the interconnected power system; and (6) other appurtenant facilities.

The project works generally described above are more specifically shown and described by those portions of exhibits A and F shown below:

Exhibit A: The following sections of exhibit A filed on February 22, 1996: Pages A-3 to A-6, page A-11 and pages A-25 to A-27, describing the mechanical, electrical, and transmission equipment within the application for license.

Exhibit F: The following sections of exhibit F filed on February 22, 1996:

Exhibit F Drawing	FERC No.	Description
F-1	11574-1	Plan View
F-2	11574-2	Elevation of Dam
F-3	11574-3	Elevation of Forebay Spillway
F-4	11574-4	Plan View and Section of Powerhouse

(3) All of the structures, fixtures, equipment, or facilities used to operate or maintain the project, all portable property that may be employed in connection with the project, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.

(C) The exhibits A, F, and G described above are approved and made part of the license.

(D) The following sections of the FPA are waived and excluded from the license for this minor project:

4(b), except the second sentence; 4(e), insofar as it relates to approval of plans by the Chief of Engineers and the Secretary of the Army; 6, insofar as it relates to public notice and to the acceptance and expression in the license of terms and conditions of the Act that are waived here; 10(c), insofar as it relates to depreciation reserves; 10(d); 10(f); 14, except insofar as the power of condemnation is reserved; 15; 16; 19; 20; and 22.

(E) This license is subject to the articles set forth in Form L-12 (October 1975), entitled "Terms and Conditions of License for Constructed Minor Project Affecting the Interests of Interstate or Foreign Commerce," and the following additional articles:

Article 201. The licensee shall pay the United States the following annual charges, effective as of the first day of the month in which the license is issued:

For the purposes of reimbursing the United States for the costs of administering Part I of the Federal Power Act, a reasonable amount as determined in accordance with the provisions of the Commissioner's regulations in effect from time to time. The authorized installed capacity for that purpose is 800 kW. Under the regulations currently in effect, projects with authorized installed capacity of less than or equal to 1,500 kW are not assessed an annual administrative charge.

Article 202. The licensee shall pay the United States an amount equal to the annual charges that would have been assessed from May 1, 1965, to September 30, 1994, as if the project had been licensed during that period, for the purposes of reimbursing the United States for the costs of administering Part I of the Federal Power Act, as determined by the Commission. The authorized installed capacity for that purpose is 800 kW.

Article 203. Within 90 days from the date of issuance of this license, the licensee shall file with the Commission, in accordance with the provisions of 18 CFR Part 11 of the Commission's regulations, a statement showing the gross amount of power generation for the project in kilowatt-hours for each calender year beginning May 1, 1965, and ending September 30, 1994.

Article 204. Within 45 days of the date of issuance of the license, the licensee shall file an original set and two duplicate sets of aperture cards of the approved drawings. The set of originals must be reproduced on silver or gelatin 35mm microfilm. The duplicate sets are copies of the originals made on diazo-type microfilm. All microfilm must be mounted on type D (3-1/4" x 7-3/8") aperture cards.

Prior to microfilming, the Commission Drawing Number (11574-F1 through F4 and 11574-G1) shall be shown in the margin below the title block of the approved drawing. After mounting, the Commission Drawing Number must be typed on the upper right corner of each aperture card. Additionally, the Project Number, Commission Exhibit (e.g., F-1, G-1, etc.), Drawing Title, and date of this license must be typed on the upper left corner of each aperture card.

The original and one duplicate set of aperture cards must be filed with the Secretary of the Commission, ATTN: DLC/ERB. The remaining duplicate set of aperture cards shall be filed with the Commission's New York Regional Office.

Article 205. If the licensee's project is directly benefited by the construction work of another licensee, a permittee, or of the United States for a storage reservoir or other headwater improvement, the licensee shall reimburse the owner of the headwater

improvement for those benefits, at such time as they are assessed. The benefits will be assessed in accordance with Subpart B of the Commission's regulations.

Article 301. The licensee shall commence construction of the project works within two years from the issuance date of the license and shall complete construction of the project within 5 years from the issuance date of the license.

Article 302. Within 90 days after finishing construction, the licensee shall submit, for Commission approval, eight copies of the revised exhibits A, F, and G describing the project as built. The licensee shall submit six copies to the Commission, one copy to the Commission's Regional Director, and one to the Director, Division of Licensing and Compliance.

Article 302. Before starting construction, the licensee shall review and approve the design of contractor-designed cofferdams and deep excavations and shall make sure construction of cofferdams and deep excavations is consistent with the approved design. At least 30 days before starting construction of the cofferdam, the licensee shall submit one copy to the Commission's Regional Director and two copies to the Commission (one of these copies shall be a courtesy copy to the Commission's Director, Division of Dam Safety and Inspections), of the approved cofferdam construction drawings and specifications and the letters of approval.

Article 303. The licensee shall, at least 60 days prior to the start of construction, submit one copy to the Commission's Regional Director and two copies to the Commission (one of these shall be a courtesy copy to the Director, Division of Dam Safety and Inspections), of the final contract drawings and specifications for pertinent features of the project, such as water retention structures, powerhouse or equivalent, and water conveyance structures. The Commission may require changes in the plans and specifications to assure a safe and adequate project.

If the licensee plans substantial changes to location, size, type, or purpose of the water retention structures, powerhouse or equivalent, or water conveyance structures, the plans and specifications must be accompanied by revised exhibits F and G drawings, as necessary.

Article 401. The licensee shall manage impoundment fluctuation levels for the protection and enhancement of water quality and aquatic resources in the Shetucket River. The licensee shall limit the maximum drawdown of water levels in the impoundment to 2 feet from the top of the flashboards or 2 feet below the masonry dam crest when the flashboards are not in place (no lower than elevation 64.1 feet National

Geodetic Vertical Datum) during normal operations, in accordance with the schedule of pulse flows released from the upstream Scotland Project (FERC No. 2662).

The drawdown limitation may be temporarily modified if required by operating emergencies beyond the control of the licensee and for short periods for project construction, and inspections upon mutual agreement between the licensee, the U.S. Fish and Wildlife Service (FWS), and the Connecticut Department of Environmental Protection (Connecticut DEP). If the drawdown limitations are so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident. This notification shall include the reason for the drawdown and documentation of prior consultation with the FWS and the Connecticut DEP.

Article 402. The licensee shall release from the Occum dam into the Shetucket River minimum flows as measured in the bypassed reach immediately downstream of the dam for the protection and enhancement of water quality and aquatic resources in the Shetucket River according to the regime defined below.

The licensee shall release a minimum flow of 30 cubic feet per second (cfs) or inflow, whichever is less, through a combination of leakage and spillage when the project is not operating, and, following the installation of the downstream fish bypass (Article 406), a total of 100 cfs or inflow, whichever is less, through a combination of leakage, spillage, and the downstream sluiceway when the project is not operating and the impoundment elevation at the downstream Taftville project is below 48.9 feet National Geodetic Vertical Datum.

Releases from the Occum Project may be temporarily modified if required by operating emergencies beyond the control of the licensee, and for short periods upon mutual agreement between the licensee, the U.S. Fish and Wildlife Service (FWS), and the Connecticut Department of Environmental Protection (Connecticut DEP). If the flow is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident, and shall provide the reason for the modified flow.

Article 403. Within six months after the issuance date of the license, the licensee shall file for Commission approval, after consultation with the U.S. Fish and Wildlife Service (FWS), and the Connecticut Department of Environmental Protection (Connecticut DEP), a plan to monitor project operation and maintain the limitations on impoundment fluctuations as required by Article 401, and the minimum flows to the bypassed reach as required by Article 402. The operations monitoring plan, at a minimum, shall include provisions to monitor: (1) impoundment surface elevation; (2) tailwater elevation; and (3) minimum flows to the bypassed reach, including any fish

passage facility. The plan shall detail the mechanisms and structures that would be used, including any periodic maintenance and calibration necessary to ensure that the devices work properly, and shall specify how often impoundment and tailwater levels and flow releases would be recorded.

The licensee shall include with the operations monitoring plan an implementation schedule, documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The operations monitoring plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan according to the approved schedule, including any changes required by the Commission.

Article 404. At least 90 days before the start of any land-disturbing or land-clearing activities, the licensee shall file with the Commission, for approval, a plan to control erosion, to control slope instability, and to minimize the quantity of sediment resulting from project construction activities. The plan may be a component of the broader plans for the installation of the Denil fish ladder required under Article 405, the downstream fish bypass required under Article 406, and the canoe portage required under Article 409.

The plan shall be based on site-specific geological and soil conditions and on project design, and shall include, at a minimum, the following four items: (1) a description of the actual site condition at laydown/mobilization areas and any other areas that the proposed construction would affect; (2) measures proposed to control erosion, to prevent slope instability, and to minimize the quantity of sediment resulting from project construction and operation; (3) detailed descriptions, functional design drawings, and specific topographic locations of all control measures; and (4) a specific implementation schedule and details for monitoring and maintenance programs for stabilization of water-retaining structures, fishways, and recreational facility construction and operation.

The licensee shall prepare the plan after consultation with the Natural Resources Conservation Service (NRCS), the Connecticut Department of Environmental Protection (Connecticut DEP), and the State Historic Preservation Officer (SHPO). The licensee

shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on geological, soil, and groundwater conditions at the site.

The Commission reserves the right to require changes to the erosion control plan. No land-disturbing or land-clearing activities shall begin until the licensee is notified that the erosion control plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 405. Within two years after the issuance date of the license, the licensee shall file for Commission approval, after consultation with the U.S. Fish and Wildlife Service (FWS), the Connecticut Department of Environmental Protection (Connecticut DEP), and the State Historic Preservation Officer (SHPO), a final plan and schedule, (after the effective passage of target species at the downstream Taftville project results in fish having adequate access to the tailrace of the Occum Project), to install, operate, maintain, and monitor the effectiveness of an upstream Denil fish ladder. The purpose of the plan is to provide safe and effective upstream fish passage at the Occum Project.

The licensee shall include with the plan an implementation schedule, documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The upstream fish passage plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission, according to the approved schedule.

Article 406. Within one year after the issuance date of the license, the licensee shall file for Commission approval, after consultation with the U.S. Fish and Wildlife Service (FWS), the Connecticut Department of Environmental Protection (Connecticut DEP), and the State Historic Preservation Officer (SHPO), a final plan and schedule to

install within three years of the date of license issuance, operate, maintain, and monitor the effectiveness of downstream fish passage facilities. The purpose of the plan is to provide safe and effective downstream passage of American shad and river herring at the Occum Project, and to provide a downstream sluiceway for the minimum flow releases required under Article 402. The final downstream fish passage plan shall include provisions for installation of a perforated plate with 1-inch diameter holes over the intake structure during the fall period for the protection of outmigrating juvenile shad and river herring.

The licensee shall include with the plan an implementation schedule, documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The downstream fish passage facilities plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission, according to the approved schedule.

Article 407. Authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of the Interior.

Article 408. The licensee shall implement 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," executed on September 16, 1999, including but not limited to the Cultural Resources Management Plan (CRMP) for the project. In the event that the Programmatic Agreement is terminated, the licensee shall implement the provisions of its approved CRMP. The Commission reserves the authority to require changes to the CRMP at any time during the term of the license. If the Programmatic Agreement is terminated prior to Commission approval of the CRMP, the licensee shall obtain approval before engaging in any ground disturbing activities or taking any other

action that may affect any historic properties within the project's area of potential effect. The CRMP shall at a minimum provide for consultation with the SHPO prior to any change in the mode of operation, expansion of capacity, alteration to project facilities, or initiation of ground-disturbing recreational enhancements or other activities.

Article 409. Within one year from the date of issuance of the license, the licensee shall file with the Commission for approval, a final plan for the installation of canoe portage around the Occum dam. The purpose of the final plan is to ensure passage around the dam and a safe and clearly marked put-in/take-out area downstream of the dam. The final plan shall include erosion control measures as required under Article 404.

The final plan shall also include, at a minimum, the following: (a) schedule for construction and operation of the canoe portage; (b) a description of how the needs of the disabled were considered in designing and developing the facilities; (c) a final site plan for the canoe portage; and (d) a description of directional signage.

The licensee shall prepare the final plan after consultation with the U.S. Fish and Wildlife Service (FWS), the Connecticut Department of Environmental Protection (Connecticut DEP), and the State Historic Preservation Officer (SHPO). The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after is has been prepared and provided to the agencies, and specific description of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The canoe portage plan shall not be implemented until the licensee is notified the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission, according to the approved schedule.

Article 410. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants

permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and water for which the licensee may grant permission without prior Commission approval are:

(1) landscape plantings;

(2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; and

(3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline.

To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements.

Before granting permission for construction of bulkheads or retaining walls, the licensee shall:

(1) inspect the site of the proposed construction;

(2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site; and

(3) determine that the proposed construction is needed and would not change the basic contour of the reservoir shoreline.

To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of, project lands for:

(1) replacement, expansion, realignment, or maintenance of bridges and roads for which all necessary state and Federal approvals have been obtained;

(2) storm drains and water mains;

(3) sewers that do not discharge into project waters;

(4) minor access roads;

(5) telephone, gas, and electric utility distribution lines;

(6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary;

(7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and

(8) water intake or pumping facilities that do not extract more than one million gallons per day from a project reservoir.

No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for:

(1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained;

(2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained;

(3) other pipelines that cross project lands or waters but do not discharge into project waters;

(4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained;

(5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile from any other private or public marina;

(6) recreational development consistent with an approved Exhibit R or approved report on recreational resources of an Exhibit E; and

(7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from the edge of the project reservoir at normal maximum surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year.

At least 45 days before conveying any interest in project lands under this paragraph (d), the licensee must submit a letter to the Director, Office of Hydropower Licensing, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked exhibit G or K map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any Federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with Federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved exhibit R or approved report on recreational resources of an exhibit E; or, if the project does not have an approved exhibit R or approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include covenants running with the land adequate to ensure that: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; and (ii) the grantee shall take all reasonable precautions to insure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised exhibit G or K drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised exhibit G or K drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

(F) The licensee shall serve copies of any Commission filing required by this order on any entity specified in this order to be consulted on matters related to that filing. Proof of service on these entities must accompany the filing with the Commission.

(G) This order is issued under authority delegated to the Director and constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 CFR 385.713. The filing of a request for rehearing does not operate as a stay of the effective date of this order or of any other date specified in this order, except as specifically ordered by the Commission. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

J. Mark Robinson
Director
Division of Licensing and Compliance

Appendix A

Water Quality Certificate Conditions for the Occum Project Issued By the Connecticut Department of Environmental Protection on February 19, 1997.

Pursuant to Section 401 of the Federal Water Pollution Control Act, the Department hereby certifies that operation of the proposed project as described in the City of Norwich, Department of Public Utilities' application to the Federal Energy Regulatory Commission (FERC) dated February 9, 1996, will not violate Connecticut's Water Quality Standards provided that the following conditions are complied with:

(1) The applicant shall, in a manner and on a schedule as approved by the Department of Environmental Protection, construct and maintain facilities for upstream fish passage.

(2) The applicant shall begin construction of a downstream fishway/sluiceway within two years and complete construction within four years of the issuance of a license for the project.

(3) The applicant shall maintain a minimum stream flow of 22 cfs from a combination of leakage and releases from the forebay sluice gate in the bypassed stream segment whenever the project is not generating. Four years after the issuance of the FERC license for the project, a minimum stream flow of 100 cfs will be maintained in the bypassed stream segment whenever the Taftville Pond elevation drops below 48.3 feet.

(4) The applicant shall operate the project in a cycling mode based on flows from the upstream Scotland Project. The drawdown of the impoundment shall be limited to 2 feet from the top of the flashboards or two feet below the masonry dam crest when the flashboards are not in place.

Nothing contained herein shall relieve the applicant of other obligations under applicable federal, state, and local law.

FINAL
ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Occum Hydroelectric Project

FERC Project No. 11574-000

Connecticut

Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Licensing and Compliance
888 First Street, NE
Washington, DC 20426

August 1999

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ac-ft	acre-feet
Advisory Council	Advisory Council on Historic Preservation
APE	area of potential effect
Btu	British thermal units
CDEP	Connecticut Department of Environmental Protection
cfs	cubic feet per second
CL&P	Connecticut Light & Power Company
CRMP	Cultural Resources Management Plan
CWA	Clean Water Act
DO	dissolved oxygen
EA	Environmental Assessment
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
Federal	Federal Paper Board
Commission	Federal Energy Regulatory Commission
FPA	Federal Power Act
fps	feet per second
FWS	U.S. Fish and Wildlife Service
Interior	U.S. Department of the Interior
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
MWh	megawatt-hours
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NEPOOL	New England Power Pool
NERC	North American Electric Reliability Council
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
Norwich	city of Norwich, Department of Public Utilities
NPCC	Northeast Power Coordinating Council
NU	Northeast Utilities
NWI	National Wetland Inventory
PA	Programmatic Agreement
rm	river mile
SCADA	Supervisory Controls and Data Acquisition System
SD1, SD2	Scoping Document 1, Scoping Document 2
SHPO	State Historic Preservation Officer
sq mi	square mile
USGS	U.S. Geological Survey
WQC	Water Quality Certification
YOY	young-of-the-year

SUMMARY

On February 23, 1996, the city of Norwich, Department of Public Utilities (Norwich) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) for an original license under Part I of the Federal Power Act (FPA) to operate the 800-kilowatt (kW) Occum Hydroelectric Project No. 11574, located on the Shetucket River in New London County, Connecticut.

This final environmental assessment (final EA) analyzes the effects of the proposed action and various alternatives, including no-action. Our analysis shows that the best alternative for the Occum Project to reduce or avoid adverse effects on environmental resources is to issue an original license with the following measures: (1) operate the project in a cycling mode, limiting impoundment drawdown to 2 feet; (2) develop and implement soil and erosion control measures, including temporary cofferdams, as part of the final plans for construction of the downstream fish bypass and upstream fish ladder and the canoe portage; (3) release minimum flows of 30 cfs through a combination of leakage and spillage when the project is not operating, and, following installation of the downstream fish bypass, a total of 100 cfs through a combination of leakage, spillage, and the downstream fish bypass when the project is not operating and the impoundment elevation at the Taftville Project is below 48.9 feet; (4) develop and implement a plan to monitor impoundment and tailwater elevations and minimum flows; (5) develop and implement a final plan for the construction, operation, maintenance, and effectiveness monitoring of the upstream Denil fish ladder; (6) develop and implement a final plan for the construction, operation, maintenance, and effectiveness monitoring of downstream fish bypass; (7) implement a Programmatic Agreement among the Commission, the State Historic Preservation Officer, and the Advisory Council for Historic Preservation, that provides for the development and implementation of a Cultural Resources Management Plan; and (8) develop and implement a final plan for the installation of canoe portage around the dam, including signs and erosion control measures. We discuss these measures in section V and summarize them in section VII of this final EA.

Overall, these measures, along with the standard articles provided in any license issued for the project, would protect, mitigate, or enhance geology and soils, water quality, fisheries, terrestrial, cultural, and recreational resources.

Under the provision of Section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations of federal and state fish and wildlife agencies submitted to adequately and equitably protect, mitigate damages to, and enhance fish and wildlife (including spawning grounds and habitat) affected by the project. The Connecticut Department of Environmental Protection (CDEP) and the U.S. Department of Interior (Interior) filed recommendations for the protection, mitigation, and enhancement of such resources in response to the Notice of Application Ready for Environmental Analysis issued on April 28, 1998. All except one of our recommendations are consistent with those of the resource agencies. We did not adopt Interior's recommendation that Norwich should provide a minimum flow of 155 cubic feet per second when the tailwater elevation drops below 48.9 feet. Pursuant to Section 10(j), we contacted Interior by letter dated February 24, 1999, to attempt to resolve the inconsistency with the FPA. By letter dated March 23, 1999, Interior responded saying it could accept our recommended minimum flow of 100 cfs when the tailwater elevation drops below 48.9 feet. Consequently, we consider all inconsistencies between Interior's recommendations and the FPA to be resolved. We discuss these measures and our recommendations in sections V and VIII of this final EA.

The CDEP granted Norwich, pursuant to Section 401 of the Clean Water Act, a water quality certificate with conditions on February 11, 1997. In this final EA, we make recommendations consistent with the terms of the water quality certificate to ensure protection of water quality at the site.

On the basis of our independent analysis, we conclude that issuing an original license for the Occum Project, with our recommended measures, would not be a major federal action significantly affecting the quality of the human environment.

FINAL ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Licensing and Compliance
Washington, DC

OCCUM HYDROELECTRIC PROJECT
FERC NO. 11574--CONNECTICUT
August 1999

INTRODUCTION

The Federal Energy Regulatory Commission (Commission) issued the Occum Hydroelectric Project Draft Environmental Assessment (draft EA) for comment on February 24, 1999. In response, we received three comment letters. The comment letters and staff responses to the comment letters are contained in Appendix A.

I. APPLICATION

On February 23, 1996, the city of Norwich, Department of Public Utilities (Norwich or applicant) filed an application with the Commission for an original minor license under Part I of the Federal Power Act (FPA) to operate the 800-kilowatt (kW) Occum Hydroelectric Project. The Occum Project is located on the Shetucket River in the city of Norwich and the town of Sprague in New London County, Connecticut (figure 1). No new construction or installed capacity is proposed. The project does not occupy any federally owned lands.

II. PURPOSE AND NEED FOR ACTION

A. Purpose of Action

The Commission must decide whether to license Norwich's proposed project, and what, if any, conditions should be placed on any license issued. In this final environmental assessment (final EA), we assess the environmental and economic effects of: (1) operating the project as proposed by Norwich; (2) operating the project as proposed by Norwich with additional staff-recommended measures; and (3) no-action.

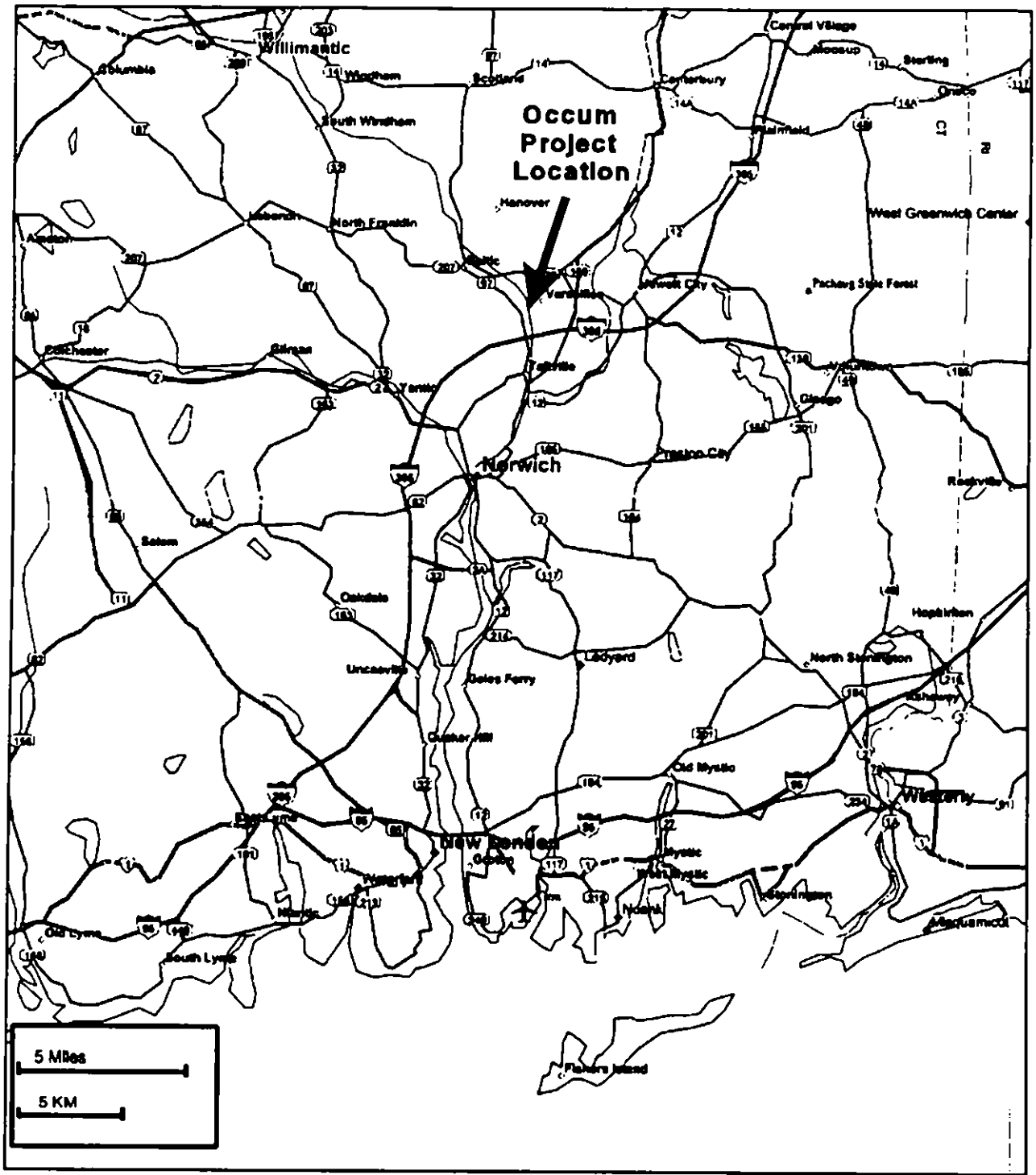

Figure 1. Occum Hydroelectric Project Location
(Source: DeLorme, 1995).

B. Need for Power

To assess the need for power, we reviewed the future use of the project's power, together with that of the operating region in which the project would be located. The Occum Hydroelectric Project would be located in the New England Power Pool (NEPOOL) subregion of the Northeast Power Coordinating Council (NPCC) region of the North American Electric Reliability Council (NERC). NEPOOL annually forecasts electrical supply and demand in the region for a 10 year period. NEPOOL's most recent report on annual supply and demand projections indicates that, for the period 1997-2007, loads in the NEPOOL area will increase slightly, less than 1 percent annually; however, the planned capacity retirements plus additions, will decrease supply slightly resulting in decreased reserve margins. These margins could fall below 15 percent for summer periods by 1998 for each year of the forecast.

The Occum Project would generate an annual average of about 3,750 megawatt-hours (MWh) of power for the region. The project would help meet Connecticut Light & Power Company's (CL&P) power requirements and reserve margin, resource diversity, and NEPOOL's capacity needs. Based on these estimates, current reserve margins will diminish in the long run, and the project would contribute to maintaining an adequate and resource-diverse capacity mix. We conclude that the future use of the project's power, displacement of nonrenewable fossil-fired generation, and contribution to a resource diversified generation mix support a finding that the power from the project would help meet the need for power in the NEPOOL area in the long term.

III. PROPOSED ACTIONS AND ALTERNATIVES

A. Proposed Action

1. Project Description

The Occum Project (figure 2) would consist of: (1) an existing dam consisting of two adjacent spillway sections, earth embankments, and an intake structure, from east to west described as follows: (a) a 185-foot-long east embankment having a stone and concrete core wall with a top elevation of 79.1 feet National Geodetic Vertical Datum (NGVD); (b) the eastern spillway section consisting of a 170-foot-long, 14-foot-high concrete ogee spillway, with a crest elevation of 66.1 NGVD; (c) the western

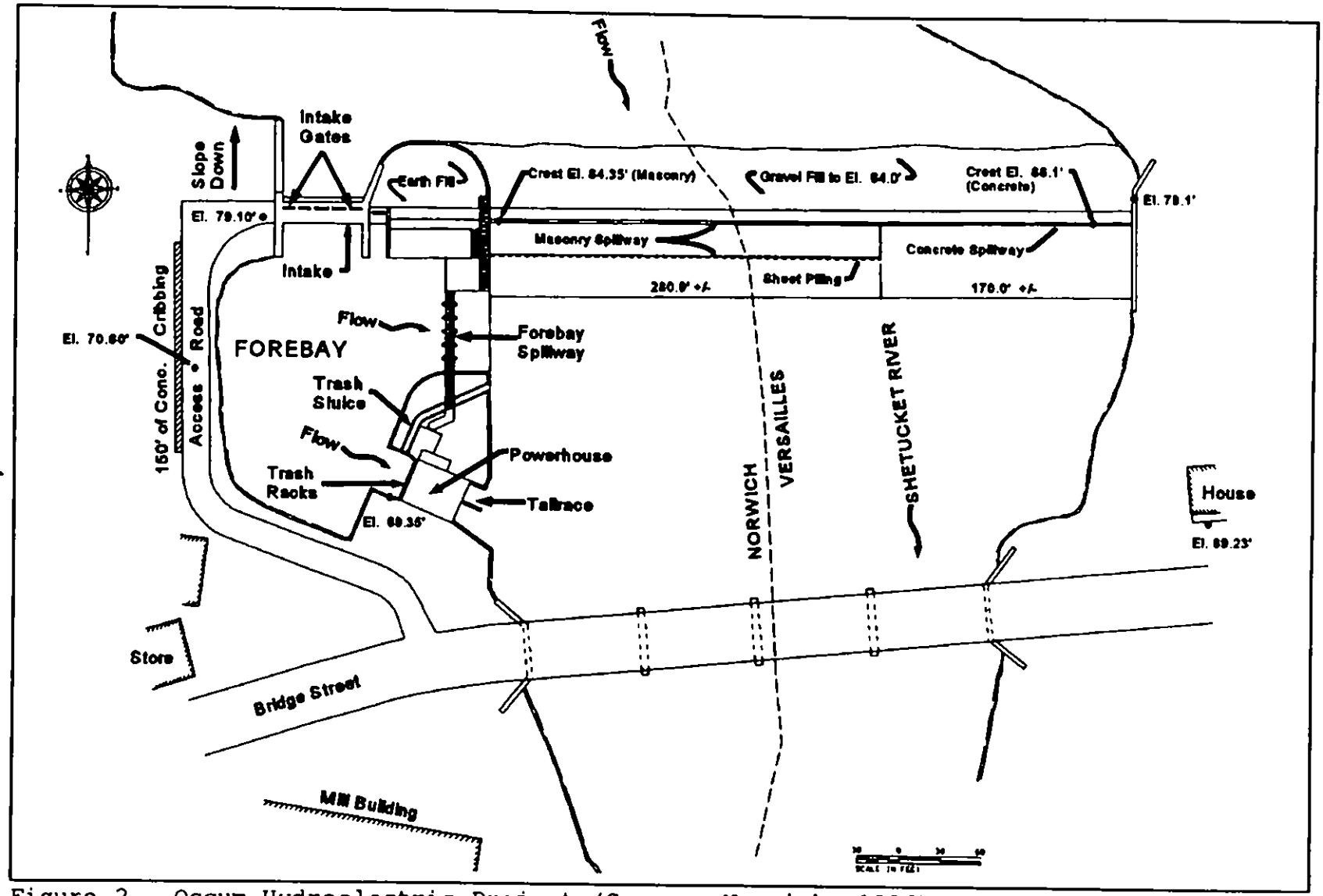

Figure 2. Occum Hydroelectric Project (Source: Norwich, 1996)

usable storage capacity of 155 acre-feet (ac-ft), and a gross storage of 600 ac-ft at normal pool elevation 66.1 feet NGVD; (3) a 225-foot-long, 160-foot-wide forebay area, equipped with a trash sluice gate and a 55-foot-long forebay spillway section with a crest elevation of 64.5 NGVD, topped with 1.60-foot-high flashboards; (4) an existing 40-foot-long, 32-foot-wide brick and masonry powerhouse containing one vertical shaft Kaplan turbine with a hydraulic capacity ranging from 250 to 900 cubic feet per second (cfs), which is directly connected to a generator rated at an installed capacity of 800 kW at 13 feet of head, and discharging at a tailwater elevation of about 51.2 feet NGVD; (5) an existing 4.8 kilovolt (kV) transmission line; and (6) appurtenant facilities.

2. Proposed Operation

Norwich operates the Occum Project as a cycling facility. Inflow to the Occum Project fluctuates considerably as a result of the cycling operation of the upstream Scotland Project (FERC No. 2662). The Scotland Project, owned and operated by the CL&P, a subsidiary of Northeast Utilities (NU), uses one turbine that has a normal discharge of 1,200 cfs. During periods when river flow does not fully support the unit at the Scotland Project, it operates in a peaking mode, and the impoundment is drawn down 2 feet. The Scotland Project releases a minimum flow of 84 cfs at all times. The Occum Project operates during the time period when 1,200 cfs or more is released from the Scotland Project and continues to operate after the Scotland Project ceases operation until the Occum impoundment is drawn down approximately 2 feet. At that time, the project is shut down and does not begin to generate again until the next pulse of water is received from the Scotland Project. Travel time for water between the Scotland Project and the Occum Project is approximately 2 hours at river flows of 1,200 cfs.

Norwich proposes to continue operating the Occum Project as a cycling project but to provide a minimum flow of between 22 and 32 cfs to the bypassed reach whenever the Occum Project is not operating. This minimum flow would consist of 10 to 20 cfs from the forebay sluice gate, added to approximately 12 cfs of leakage flow that originates from the dam.

3. Proposed Environmental Measures

Norwich proposes the following measures:

(1) operate the Occum Project in a daily cycling mode, with up to a 2-foot drawdown, in accordance with the

schedule of pulsed flows released from the upstream Scotland Project;

(2) install temporary cofferdams to isolate construction activities during installation of fish passage facilities;

(3) release minimum flows of between 22 and 32 cfs into the project's bypassed reach when the project is not operating; and a total project minimum flow of 100 cfs or inflow, whichever is less, when the tailwater elevation is below 48.3 feet (referenced to Taftville impoundment gage) after installation of the downstream fish bypass;

(4) monitor project operation, including the minimum flow releases and the tailrace levels;

(5) work with the owner of the downstream Taftville Project to limit drawdowns of Taftville's impoundment to a maximum of 3.5 feet (48.3-foot elevation);

(6) construct a minimum flow/downstream fish bypass on the downstream side of the powerhouse including perforated (1-inch holes) plate overlays on the existing trashracks within 2 to 4 years of licensing;

(7) conduct an economic feasibility study for an upstream fish ladder, based on conceptual designs agreed to by the resource agencies; and

(8) install a boat barrier at the project (completed) and provide a canoe portage around the project dam.

B. Proposed Action with Additional Staff-recommended Measures

In addition to, or in lieu of, Norwich's proposed measures, we recommend the following measures:

(1) provide a minimum flow of 100 cfs or inflow, whichever is less, downstream of the project when the tailwater elevation is below 48.9 feet after installation of the downstream fish bypass;

(2) develop and implement a plan to monitor impoundment and tailwater elevations and minimum flows;

(3) develop and implement a final plan, including soil and erosion control measures for the construction, operation, and maintenance of a downstream fish bypass within 3 years of license issuance.

(4) develop and implement a final plan, including soil and erosion control measures and temporary cofferdams, for the construction, operation, and maintenance of an upstream fish ladder within 4 years of the time that any future fish passage facilities at the downstream Taftville Project begin passing migrants;

(5) develop and implement a plan to monitor the effectiveness of the downstream and upstream fish passage facilities;

(6) execute a Programmatic Agreement (PA) among the Commission, the State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (Advisory Council) that provides for the development and implementation of a Cultural Resources Management Plan (CRMP); and

(7) file a final plan for canoe portage around the project including signs and soil erosion and control measures.

C. No-action

Under the no-action alternative, the project would continue to operate, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

IV. CONSULTATION AND COMPLIANCE

A. Agency Consultation and Interventions

The Commission's regulations require applicants to consult with appropriate state and federal environmental resource agencies and the public before filing a license application. This consultation is required to comply with the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be complete and documented in accordance with the Commission's regulations.

The Commission issued a Public Notice on April 28, 1998, saying that the application for the Occum Project was ready for environmental analysis and that all comments should be filed within 60 days of the notice. The following entities commented:

Commenting Entities	Date of Letter
Connecticut Department of Environmental Protection	June 22, 1998
U.S. Department of the Interior	June 24, 1998

Organizations and individuals also may petition to intervene and become a party to subsequent proceedings. On May 8, 1996, the Commission issued a notice that Norwich had filed an application to license the Occum Project. This notice set July 7, 1996, as the deadline for filing protests and motions to intervene. In response to the public notice, the following entities filed motions to intervene, but not in opposition, in the proceeding:

Intervenors	Date of Motion
U.S. Department of the Interior	June 25, 1996

We address intervenor concerns in the environmental analysis section (section V) of this final EA.

On February 24, 1999, we issued a public notice for the Occum Project stating that the draft EA was available for comment. The following entities provided comments on the Occum Project:

Entities	Date of Letter
U.S. Department of the Interior	March 23, 1999
Norwich Department of Public Utilities	April 7, 1999
Connecticut Department of Environmental Protection	April 12, 1999

B. Scoping

Before preparing this final EA, we conducted scoping to determine what issues and alternatives should be addressed. A Scoping Document (SD1) was distributed to interested agencies and others on May 28, 1996. No comments were received in response to the SD1. We issued a revised Scoping Document (SD2), on January 6, 1997, which reflects the Commission's staff review of comments

included in the U.S. Department of the Interior's (Interior's) Motion to Intervene, dated June 25, 1996, and Interior's letter on upstream fish passage, dated August 7, 1996.

C. Mandatory Requirements

1. Water Quality Certification

Under Section 401(a)(1) of the Clean Water Act (CWA), license applicants must obtain either state certification that any discharge from a project would comply with applicable provisions of the CWA or a waiver of certification by the appropriate state agency.

On February 22, 1996, Norwich applied to the Connecticut Department of Environmental Protection (CDEP) for Water Quality Certification (WQC) for the Occum Project, as required by Section 401 of the CWA. The CDEP issued a WQC for the Occum Project on February 11, 1997.

The WQC includes the following four conditions: (1) the applicant shall, in a manner and on a schedule as approved by the CDEP, construct and maintain facilities for upstream fish passage; (2) Norwich shall begin construction of a downstream fishway/sluiceway within 2 years and complete construction within 4 years of the issuance of a license for the project; (3) Norwich shall maintain a minimum stream flow of 22 cfs from a combination of leakage and releases from the forebay sluice gate in the bypassed stream segment whenever the project is not generating, and 4 years after the issuance of a license for the project, a minimum of 100 cfs will be maintained in the bypassed stream segment whenever the Taftville Pond elevation drops below 48.3 feet; and (4) Norwich shall operate the project in a cycling mode based on flows from the upstream Scotland Project. The drawdown of the impoundment shall be limited to 2 feet from the top of the flashboards or 2 feet below the masonry dam crest when the flashboards are not in place. We discuss our recommendations to ensure protection of water quality at the Occum Project in section V.C.2, Water Resources.

2. Section 18 Fishway Prescription

Section 18 of the FPA states that the Commission shall require the construction, maintenance, and operation by a licensee of such fishways as may be prescribed by the Secretary

of the Interior, or the Secretary of Commerce, as appropriate.1/ The National Marine Fisheries Service (NMFS) indicated that it would not offer any comment on the project because there are currently no anadromous fish species present within the Shetucket River in the Occum Project vicinity (personal communication between Cory Collins, NMFS, and Jeff Murphy, Norwich, January 12, 1996).

Pursuant to Section 18, Interior filed with the Commission, by letter dated June 24, 1998, a request for the reservation of authority to prescribe the construction, operation, and maintenance of upstream and downstream fishways and to modify its Section 18 fishway prescription, as needed, to facilitate fish passage at the project.

3. Coastal Zone Management Act

The Occum Project is not in a state-designated coastal zone management area and therefore is not subject to Connecticut coastal zone program review (personal communication, Chris Orphanides, Recreation Planner, Louis Berger & Associates, Inc., and Brian J. Emerick, Supervising Environmental Analyst, CDEP, on August 12, 1998). Our assessment is that no coastal zone consistency certification is needed for this project.

V. ENVIRONMENTAL ANALYSIS

In this section, we first describe the general environmental setting in the project area, including a discussion of environmental resources in the project area that may be subject to cumulative effects from the Occum Project when considered in combination with other actions affecting the resources. Then, we discuss each affected environmental resource. For each resource, we first describe the affected environment--which is the existing condition and the baseline against which to measure the effects of the proposed project and any alternative actions--and then the environmental effects of the project, including proposed mitigation, protection, and enhancement measures.

We include only resources that would be affected, or about which comments have been made by interested parties, in detail in this final EA.

1/Section 18 of the FPA provides that "the Commission shall require construction, maintenance, and operation by a licensee at its own expense such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior, as appropriate."

Unless mentioned otherwise, the source of our information is the license application (Norwich, 1996) and supplemental filings by the applicant (Norwich, 1998).

A. General Description of the Shetucket River Basin

The Occum Project is on the Shetucket River in southeastern Connecticut. The Shetucket River is a major tributary to the Thames River, which drains a significant part of southeastern Connecticut and a portion of northwestern Rhode Island (see figure 2). The Occum Project is located in the Occum section of the city of Norwich, which has a population of 37,391. The project is 6.4 river miles (rm) north of the confluence of the Shetucket and Yantic Rivers, which combine to form the Thames River. The drainage area above the project is approximately 465 square miles (sq mi).

Table 1 lists the hydroelectric projects on the Shetucket River. The Scotland Project (FERC No. 2662) is located approximately 8.1 miles upstream of the Occum Project. The Taftville Project is an unlicensed project located about 2 miles downstream of the Occum Project and its operations influence the tailwaters of the Occum Project. The Greenville Project (FERC No. 2441) is located at rm 1.3, or about 5.1 miles downstream of the Occum Project and is the first dam on the Shetucket River.

B. Scope of Cumulative Effects Analysis

According to the Council on Environmental Quality's Regulations for implementing the National Environmental Policy Act (NEPA) (§ 1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the

Table 1. Hydropower development on the Shetucket River (Source: Staff)

Project name	Location	Installed capacity (kW)	Approx. river mile	Drainage area (sq mi)	Storage capacity (ac-ft)
Scotland[a] (No.2662)	Scotland CT	2,000	14.5	429	268
Occum (No.11574)	Norwich CT	800	6.4	465	155
Taftville (Unlicensed)	Taftville CT	1,760	4.4	511	1,712

Project name	Location	Installed capacity (kW)	Approx. river mile	Drainage area (sq mi)	Storage capacity (ac-ft)
Greenville[b] (No.2441)	New London CT	2,200	1.3	1,264	453

[a] The Scotland Project license expires on August 31, 2012.
[b] The Greenville Project license expires on December 31, 2043.

action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

We identify fisheries, cultural resources, and recreation as having the potential to be cumulatively affected by this project in combination with the other hydropower developments in the basin.

1. Geographic Scope

The geographic scope of our cumulative effects analysis defines the physical limits or boundaries of the proposed actions' effects on fisheries, cultural, and recreation resources. The geographic scope of analysis for this final EA encompasses the Shetucket River from below the Scotland Project to the Long Island Sound. Included within this scope are the Occum Project, the upstream Scotland Project, and the downstream, unlicensed Taftville Project and the Greenville Project (figure 3).

Because the proposed actions affect the resources differently, the geographic scope for each resource area may

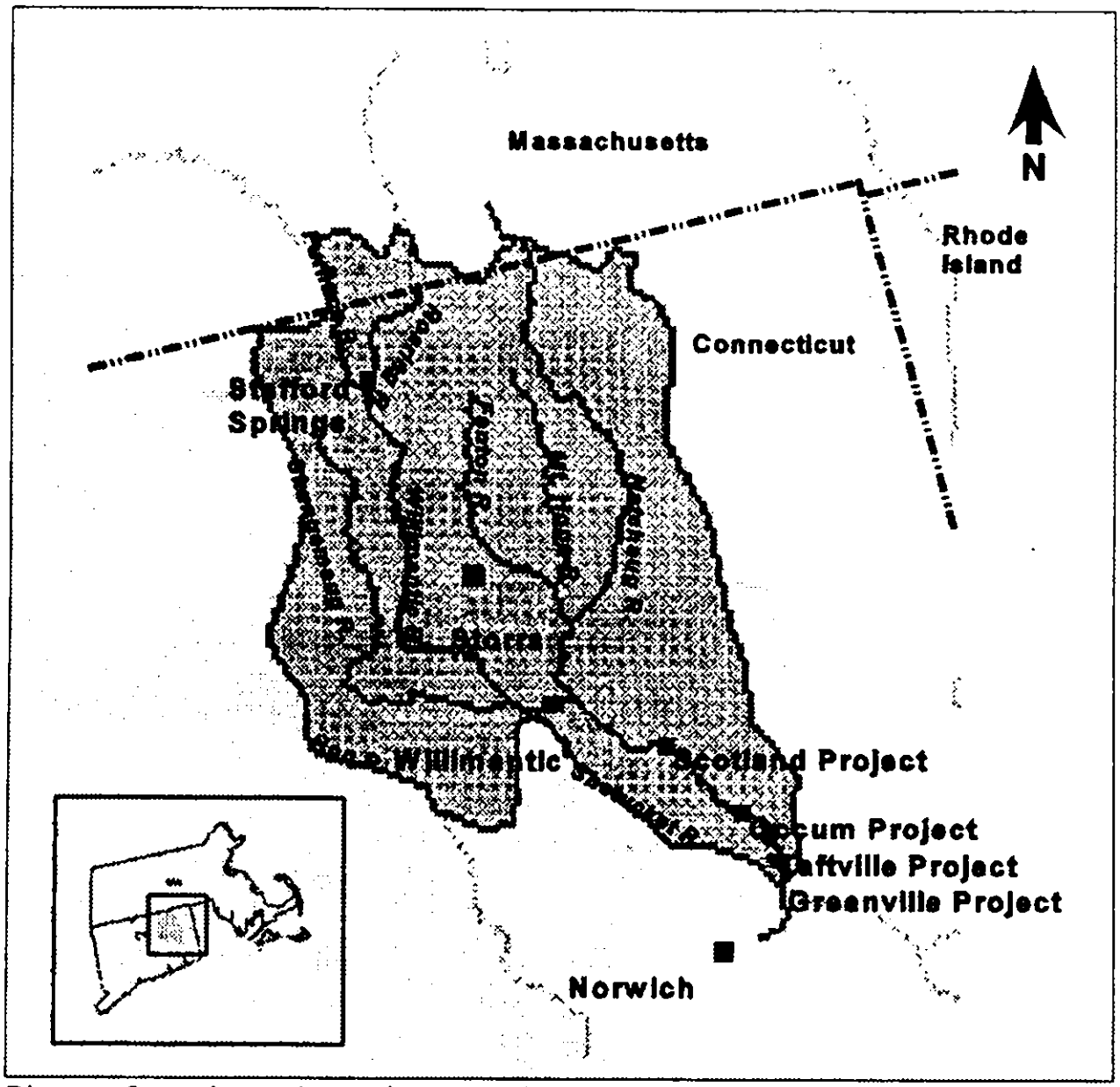

Figure 3. Shetucket River Basin Map (Source: EPA, 1998).

vary. In this case, for the main stem of the Shetucket River below the Scotland Project, we include resident and anadromous fisheries resources.

We choose this geographic scope because of: (1) concerns about the project's effects on anadromous fish restoration efforts in the Shetucket River, particularly American shad and

river herring; and (2) the aquatic habitat issues related to minimum flows in the project's tailrace.

For all other resources, we confine our analysis to the immediate project area.

2. Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and future actions and their effects on fisheries resources, water quality and quantity, wildlife resources, recreation, and cultural resources. Based on the term of the proposed license, we looked 30 to 50 years into the future, concentrating on the effects on fisheries, recreation, and historic resources 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, comprehensive plans, and scoping comments received from agencies.

As we discuss in detail in sections V.C.3, Fisheries Resources; V.C.5, Cultural Resources; and V.C.6, Recreation and Land Use Resources, with our proposed environmental measures, the project would have beneficial cumulative effects on anadromous populations and recreation resources, and would have no adverse cumulative effects on historical resources in the Shetucket River Basin.

C. Proposed Action and Action Alternatives

1. Geology and Soils

a. Affected environment: Topography of the upper basin consists of generally lowland hills surrounding the wide floodplain of the Shetucket River. In the project vicinity, the land is characteristically low with rolling hills. Downstream of the project to the Thames River, the topography is steeper. The broad floodplain upstream is replaced by fairly steep embankments to the east, and by major roadways that have been built up along the industrially developed western bank. The impoundment shoreline is relatively undeveloped. There are no areas of erosion within the impoundment area, upstream or downstream of the project.

b. Environmental effects: Norwich indicates that continued operation of the project, along with the proposed operational changes, would not affect the existing geology or soils of the project area. The proposed release of minimum flows into the

bypassed and downstream reaches would result in increased water levels in the tailrace. Impoundment levels and fluctuation range would remain the same as under current operations.

Our Analysis

The operational changes that Norwich proposes would not increase long-term erosion rates along the project shorelines. The future construction of fish passage facilities (see section V.C.3) and a canoe portage (see section V.C.6) would involve some incidental disturbance of soil during construction. However, this disturbance would be minimized through the use of best practices to control erosion. Therefore, we recommend that Norwich include soil and erosion control measures in the final plans for the upstream and downstream fish passage facilities and the canoe portage.

c. Unavoidable adverse effects: None.

2. Water Resources

a. Affected environment:

Water Quantity

Daily inflow of water at the project is controlled primarily by the upstream Scotland Project (FERC No. 2662), which is owned and operated by the CL&P, a subsidiary of NU. This project operates in a cycling mode using one turbine, which results in a normal discharge of 1,200 cfs at full generation and a minimum flow of 84 cfs when the project is not generating. The Occum Project operates when 1,200 cfs or more is released from the Scotland Project, and it continues to operate after the Scotland Project ceases operation until the Occum impoundment is drawn down approximately 2 feet. Travel time for water between the Scotland Project and the Occum Project is about 2 hours at river flows of 1,200 cfs.

Flows in the Shetucket River above the Occum Project fluctuate considerably because of the cycling operation of the Scotland Project. Average daily inflow to the Occum Project fluctuates from 100 cfs to more than 1,200 cfs. The estimated maximum and minimum mean daily flows at the site were 39,760 cfs (September 21, 1938) and 21 cfs (August 22, 1949), respectively. Occum has an estimated average annual flow of approximately 720 cfs. The annual flow duration data for the site indicate that, on average, flows exceeded 116 cfs 90 percent of the time, 517 cfs 50 percent of the time, and 1,747 cfs 10 percent of the

time.2/ These are measurements of natural inflow; however, the natural inflow to the Occum Project is influenced by the operations of the upstream Scotland Project.

Norwich states that the cycling mode of Occum Project operation is likely to limit the available habitat in the bypassed reach and downstream from the powerhouse during ponding periods. The Occum tailrace is influenced by the operations of the Taftville Project located approximately 2 miles downstream. The Occum tailrace is backwatered when impoundment elevations at Taftville are above 48.3 feet. Below that level, an approximately 1,000-foot-long reach of river is exposed.

Water Quality

The CDEP's Water Management Bureau classifies the Shetucket River within the Occum Project area as Class B. These waters should have a minimum dissolved oxygen (DO) concentration of 5 mg/l, and temperature can deviate above ambient conditions by 4°F, but is not to exceed 85°F. According to Connecticut Water Quality Standards, waters designated as Class B are intended for recreational use, fish and wildlife habitat, agricultural use, industrial supply, and other legitimate uses including navigation. There are no known consumptive uses or direct point source discharges to project waters.

During the summers of 1991 and 1992, the CDEP collected water samples in the project area as part of a eutrophication control plan. The data show that during this sampling period, the waters within the project area violated the established water quality standards for algae concentrations. The CDEP has since identified point and non-point sources of pollution as major contributors to water quality problems in the Shetucket River. However, none of these sources are associated with operation of the Occum Project.

Federal Paper Board (Federal), a paper company located in Versailles, previously discharged treated wastewater directly into the Little River, a tributary that flows into the Shetucket River approximately 1,200 feet downstream of the project dam.

2/Flow regime data are prorated based on relative drainage areas from U.S. Geological Survey (USGS) records for gage #01122500, approximately 10.6 miles upstream near Willimantic, Connecticut, on the Shetucket River. This gage measures a drainage area of 404 square miles, and the Shetucket River drainage area above the project is 465 square miles.

The CDEP suspected that Federal's discharge contributed to algal blooms. During our July 24, 1998, site visit, Norwich staff stated that Federal has recently re-routed its discharge directly into the Norwich wastewater collection system, eliminating Federal discharges into the Little River, and subsequently into the Shetucket River. Norwich does not believe that continued project operations would have any negative effects on existing water quality conditions.

b. Environmental effects:

Water Quantity

Water levels in the Occum Project tailrace are influenced by the downstream Taftville Project. The Taftville project impoundment is typically fluctuated up to 6 feet during normal cycling operations. At full pond (52-foot elevation), it backwaters to the base of the Occum Project dam. However, below that level, a 1,000-foot-long reach of river is exposed.

Minimum Flows in the Bypassed Reach

Appropriate minimum flows to the bypassed reach of the project are needed to protect habitat for fish and other aquatic organisms. Therefore, we provide a discussion and our analysis of the minimum flows proposed by Norwich and recommended by the agencies in section V.C.3, Fisheries Resources.

Monitoring Minimum Flows

Norwich proposes to monitor project operations, including minimum flow releases and water surface levels in the tailrace. Norwich attempted to reach an agreement with NU, the owners of the downstream Taftville Project, to limit drawdowns of the Taftville impoundment to a maximum of 3.5 feet, which would have minimized exposed aquatic habitat below the Occum Project. As part of these negotiations, Norwich explored the feasibility of installing remote controls to allow Norwich to operate the Taftville Project via its Supervisory Controls and Data Acquisition System (SCADA). Norwich has determined that the costs of automation of Taftville would equal or exceed the cost to install a gate at the Occum Project (at least $100,000) (letter from Jon M. Christensen, Project Manager, Kleinschmidt Associates, Pittsfield, ME, dated December 31, 1998).

To document compliance with the 2-foot drawdown limitation of the Occum Project impoundment and the recommended minimum flows, Interior recommends that, within 3 months from the

effective date of the license, Norwich file a plan for monitoring impoundment and tailwater levels and flow releases from the project with the Commission for approval. Interior recommends that this plan: (1) detail the mechanisms and structures that would be used, including any periodic maintenance and calibration necessary to ensure that the devices work properly; (2) specify how often impoundment and tailwater levels and flow releases would be recorded; and (3) be developed in consultation with Interior, the Environmental Protection Agency (EPA), and the CDEP (letter to David Boergers, Acting Secretary, Federal Energy Regulatory Commission, from Andrew Raddant, Regional Environmental Officer, U.S. Department of the Interior, dated June 24, 1998).

Our Analysis

Monitoring of flow, impoundment elevation, and tailwater elevation at the Occum Project would document compliance with recommended drawdown and minimum flow requirements. We agree with Interior that Norwich's monitoring proposal should include these three parameters to ensure the protection of fisheries and aquatic resources.

Water Quality

Norwich states that it does not expect any negative effects on water quality conditions from continued and proposed operation of the Occum Project. Some incidental enhancements to DO levels may occur in the project bypassed reach and tailwater areas under the proposed habitat-based minimum flow of 22 to 100 cfs (depending on the tailwater elevation; see section V.C.3.b). This flow would serve to circulate aerated water throughout the reach. Circulation reduces the potential for localized stagnation to occur during periods of non-spillage, thus reducing the likelihood of seasonal algal blooms. Norwich proposes no further measures to protect water quality resources in the project area.

The WQC for the Occum Project includes a condition allowing Norwich to operate the Occum Project in a cycling mode based on flows from the upstream Scotland Project. A minimum stream flow of 22 cfs, from a combination of leakage and releases from the forebay sluice gate, must be provided in the bypassed stream segment whenever the project is not generating. The WQC further requires, following the installation of the downstream fish bypass (sluiceway) at the Occum Project, a minimum flow of 100 cfs be provided to the bypassed stream segment whenever the Taftville Pond elevation drops below 48.3 feet. These conditions

would protect water resources within the Occum Project area and are consistent with Norwich's proposed flows.

In the letter of response to the Draft License Application, (letter from Michael J. Bartlett, Supervisor, Interior's New England Field Office, Concord, NH, to Jon Christensen, Project Manager, Kleinschmidt Associates, Pittsfield, ME, dated January 26, 1996), Interior expressed concern that the project operation could potentially exacerbate seasonal algal blooms in the project area by interrupting continuous river flow. No recommendations for mitigation were given.

Our Analysis

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. Increased flows promote aeration of project waters, which in turn increases assimilative capacity in downstream river reaches. The recent re-routing of Federal's discharge away from the Little River eliminates sources of nutrient loading to the Shetucket River, further improving river water quality. There is no evidence that the existing flows and continued operation of the project adversely influence the water quality within the project area. Presently, the project waters are suitable for recreational use, fish and wildlife habitat, agricultural uses, industrial supply, and other legitimate uses, as required under CDEP's Class B standards.

c. Unavoidable adverse effects: None.

3. Fisheries Resources

a. Affected environment: The reaches of the Shetucket River upstream and downstream of the Occum Project are bounded by the Scotland Project, about 8.1 miles upstream of Occum, and the Taftville Project, about 2 miles downstream. The upstream reach, including Occum's 1.9-mile-long impoundment, is characterized by slow-water habitat with embedded cobble and boulder substrates. The downstream reach is dominated by cobble and boulder substrates with depths and flows that fluctuate considerably because of Scotland, Taftville, and Occum Projects' operations.

Both the upstream and downstream species assemblages are classified as warmwater fisheries. During a 1993 stream survey conducted about 2.5 miles upstream of Occum, the CDEP found

abundant smallmouth bass, sunfish species, rock bass, several coarse fish species, and the American eel. Other recreational fishes included largemouth bass, chain pickerel, and yellow perch. Norwich also identified common carp and white perch in the project vicinity.

The CDEP annually stocks post-spawned adult Atlantic salmon in the reach between Occum and Scotland. These stockings support a put-and-take fishery, but are not an attempt to restore anadromous runs of Atlantic salmon to the Shetucket River Basin. Adult salmon are released in late November, and most fish are removed by anglers by February of the following year.

Although there are several anadromous fish species in the lower reaches of the Shetucket River below the Taftville Project, none can reach the tailwaters of Occum because Taftville has no upstream passage facilities. As part of its anadromous fish restoration program, the CDEP stocks pre-spawned American shad and river herring between Taftville and Greenville. Greenville is the first project on the Shetucket River and the only project with upstream and downstream passage facilities. The CDEP indicates that it does not plan to stock pre-spawned shad and herring adults above Occum until downstream passage facilities have been installed for juvenile fish, which migrate to the ocean in the fall. Although Atlantic salmon fry and parr have been stocked (1988 through 1992), the CDEP currently has no plans to restore anadromous runs of salmon to the Shetucket River Basin.

b. Environmental effects:

Instream Flows

Flow releases from the Occum Project may affect upstream and downstream fisheries by altering daily headwater and tailwater levels when the project is cycling. The main areas of influence downstream include a 180-foot-long bypassed reach from the dam to the tailrace and a reach of the main stem of the river that extends 1,000 feet downstream to where the Little River enters the Shetucket River. Tailwater levels also are affected by Taftville Project operations, which backs up water into the Occum bypassed reach when impoundment elevation is greater than 48.3 feet. When Occum is not generating and the Taftville impoundment drops below this elevation, the bypassed reach and areas of the river bed downstream to the Little River confluence are exposed.

Under Norwich's proposal, maximum drawdown of the Occum impoundment would be 2 feet from the top of the flashboards, or 2 feet from the crest of the dam if the flashboards are not in place. Norwich states that its proposed cycling mode and maximum

drawdown levels would have little effect on fishery resources in the impoundment.

To reduce environmental effects associated with the de-watering of the Occum tailwater, Norwich proposes to release a minimum flow of 22 to 32 cfs to the bypassed reach during periods when the Taftville impoundment is at elevations greater than 48.3 feet, and to release a minimum flow of 100 cfs or inflow, whichever is less, when the Taftville impoundment drops below this elevation. These minimum flow releases would minimize fish stranding and eliminate stagnant water below Occum. The proposed minimum flow releases are based on extrapolated data from the instream flow study, which evaluated the extent of de-watering in the bypassed reach and the 1,000-foot section downstream. Instream flows were evaluated with the Taftville impoundment set at elevations ranging from 46.4 feet to 48.3 feet and with flow releases from Occum between 0 and 155 cfs.

The CDEP, whose staff participated in the field effort for the instream flow study, concurs with Norwich's proposed minimum flow releases. As part of the project's WQC, the CDEP requires that Norwich release a minimum flow of 22 cfs into the bypassed reach whenever the project is not generating (this may include leakage and releases from the forebay sluice gates), and, beginning 4 years after the issuance of a license, release a minimum flow of 100 cfs below the project whenever the Taftville impoundment elevation drops below 48.3 feet. The CDEP also agrees with the proposed maximum drawdown levels of 2 feet below the flashboards or the dam crest when the flashboards are not present, and includes this as a condition of the WQC.

Interior recommends a minimum flow release of 30 cfs in the bypassed reach during non-generation periods. At Taftville pond elevations below 48.9 feet, Interior recommends increasing the minimum flow to 155 cfs (based on actual data collected during the instream flow study). The Interior does not oppose operation of the project in a cycling mode, which is based on the releases from the upstream Scotland Project, nor does it disagree with the proposed maximum drawdown of the impoundment (i.e., 2 feet below the top of the flashboards or 2 feet below the crest of the dam when the flashboards are not present).

Both Norwich and Interior use data that were collected when the Taftville impoundment was at an elevation of 46.4 feet to support their recommended trigger elevations. Norwich concludes that the wetted area of the study reach was similar for releases of 53 cfs (112,590 square feet) and 155 cfs (132,830 square feet) when the Taftville elevation was 46.4 feet. Conversely, Interior characterizes the difference between releases of 53 cfs and 155

cfs at a Taftville elevation of 46.4 feet to be considerable, noting that there is an additional 20,240 square feet of wetted area at a flow release of 155 cfs than at 53 cfs. Interior states that it cannot support a minimum flow release of 100 cfs because there were no data collected for this flow level.

Our Analysis

The minimum flow releases proposed by Norwich and recommended by Interior are considerably different in two ways:

(1) the Taftville impoundment elevation (48.9 feet versus 48.3 feet) that would trigger an increase in the minimum flow release; and

(2) the minimum flow (155 cfs versus 100 cfs) that would be released when the Taftville impoundment drops below the trigger elevation (the CDEP agrees with the trigger elevation and release flows proposed by Norwich).

Norwich bases its proposed trigger elevation for increasing the minimum flow on observations made by the study team, including Norwich's consultants and the CDEP, that conducted the instream flow evaluation. The study team agreed that the Occum tailwater levels observed at a Taftville impoundment elevation of 48.3 feet were adequate to maintain a reasonable amount of wetted area and prevent stagnation of water in the bypassed reach. Interior selected a Taftville elevation of 48.9 feet based on observations from photographs that show the study reach at this elevation and at an elevation of 48.3 feet. Interior concludes that there was a considerable difference in the amount of exposed substrate in the bypassed reach and on a downstream shoal that warranted the higher trigger elevation for increases in the minimum flow.

To quantify the difference in wetted area, we developed a model to estimate the wetted area of the study reach at an additional elevation of 48.9 feet. We used the data that were collected at five known Taftville impoundment elevations between 46.4 feet and 48.3 feet and with a release of 12 cfs leakage flow (table 2). Wetted area for Taftville headpond levels at 48.9

Table 2. Estimated wetted area and percent bank full below the Occum Project (Source: Staff)[a]

Taftville impoundment elevation	Wetted area in the study reach (sq ft)	Percent bank full in the study reach
46.4	83,857	39.8
47.0	91,627	67.7
47.5	115,065	43.5
47.8	142,660	54.6
48.3 (Norwich)	152,670	72.5
48.9 (Staff)	199,710	94.8

[a] Estimates are based on leakage flow (12 cfs) from Occum. Wetted area for elevation 48.9 feet was derived from channel cross sections provided in the instream flow report.

feet was measured by drawing a horizontal line at 48.9 feet on the channel cross sections provided in the instream flow report. Using this approach, we calculated the wetted area, at a Taftville elevation of 48.9 feet and with leakage flow (12 cfs),to be 199,710 square feet, which is about 30.8 percent more wetted area than was estimated when the Taftville impoundment elevation was 48.3 feet. This difference is most pronounced at Transects 2 and 3 because of a midstream shoal in this river segment. Along these two transects the wetted area increases dramatically when water surface elevation rises from 48.3 feet to 48.9 feet (figure 4). The 30.8 percent difference equates to a considerable difference in percent bank full. A percent bank full of 94.8 percent (see table 2) should be adequate for achieving the goals of minimizing fish stranding downstream, minimum water coverage for aquatic macroinvertebrate communities, and preventing the stagnation of water in the bypassed reach.

Table 2 provides the estimates of wetted area for a 12 cfs flow release at various Taftville impoundment elevations. Actual data for the proposed 22-30 cfs flow release were not available from the instream flow study; therefore, 12 cfs was used as a basis of comparison. At an elevation of 48.3 feet, a 12 cfs release would wet approximately 152,670 square feet resulting in a 72.5 percent bank full condition. At an elevation of 48.9 feet during leakage flow, there is a 94.8 percent bank full condition. We conclude that a release of 22 to 30 cfs, as proposed by Norwich, would minimize fish stranding downstream and prevent water from stagnating below the dam when Taftville elevation is

above 48.9 feet. We agree with Interior that a trigger elevation of 48.9 feet is an appropriate level to provide sufficient protection to aquatic resources, and possibly enhancing local aquatic productivity by improving water quality through higher DO and increased circulation.

Based on our independent review and evaluation of the instream flow data, wetted perimeter and available habitat are similar at releases of 53 cfs and 155 cfs when the Taftville impoundment elevation is 46.4 feet. To calculate the wetted perimeter and available habitat for a flow of 100 cfs at an elevation of 46.4 feet, we estimated a midpoint between 155 cfs and 53 cfs using channel cross sections provided in the instream flow study (figure 5). Using the available flow data at an elevation of 46.4 feet, our calculations show that a release of 100 cfs would produce about 4,265 square feet (3.3 percent) less wetted area in the study reach than would a release of 155 cfs (128,565 versus 132,830 square feet). Wetted area for 30 cfs is also calculated using the same technique.

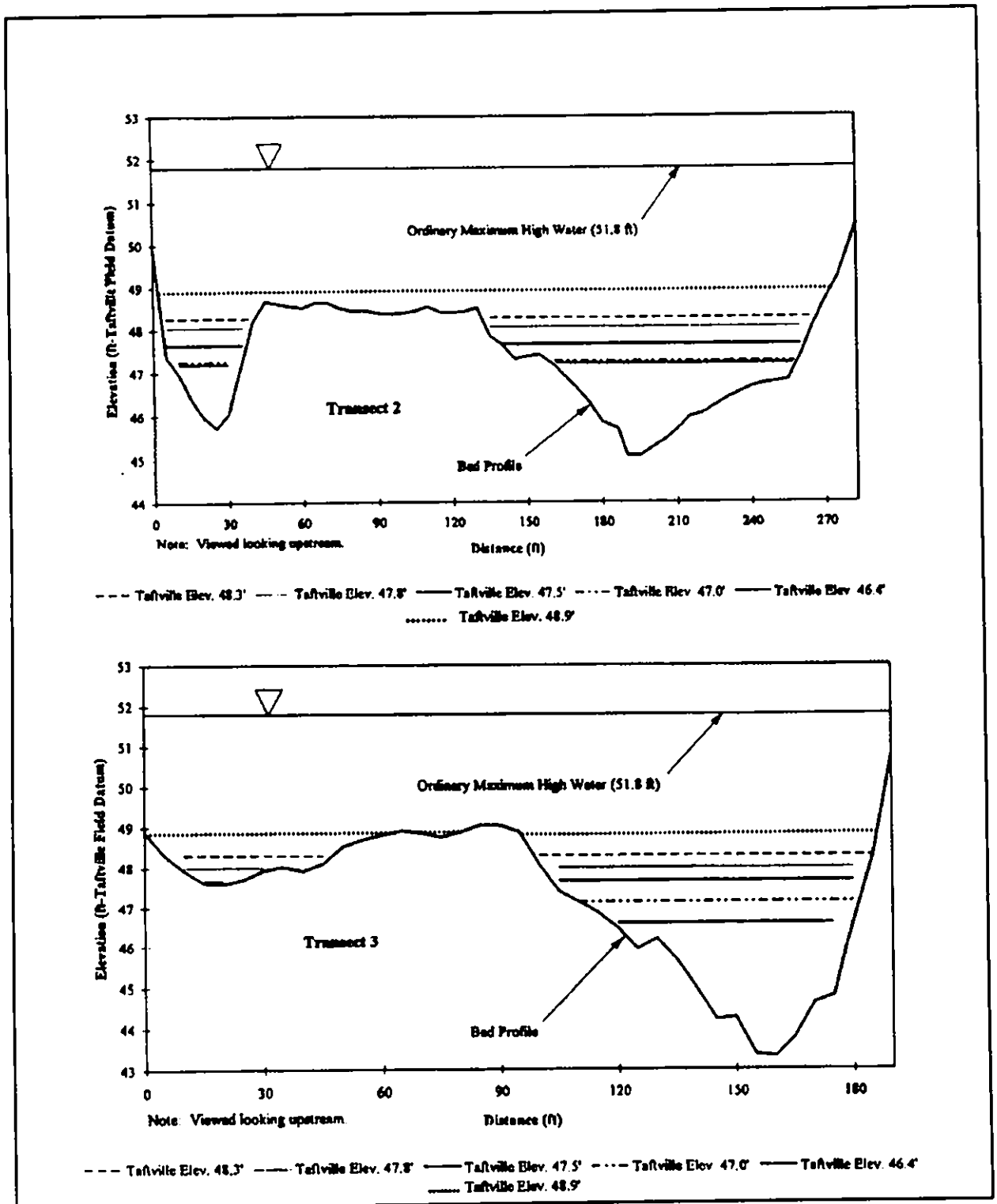

Figure 4. Water surface elevations at Transects 2 and 3 at alternative Taftville impoundment elevations when discharge from the Occum Project is leakage (12 cfs)(Source: Norwich, 1996).

To evaluate appropriate trigger elevations, we extrapolated

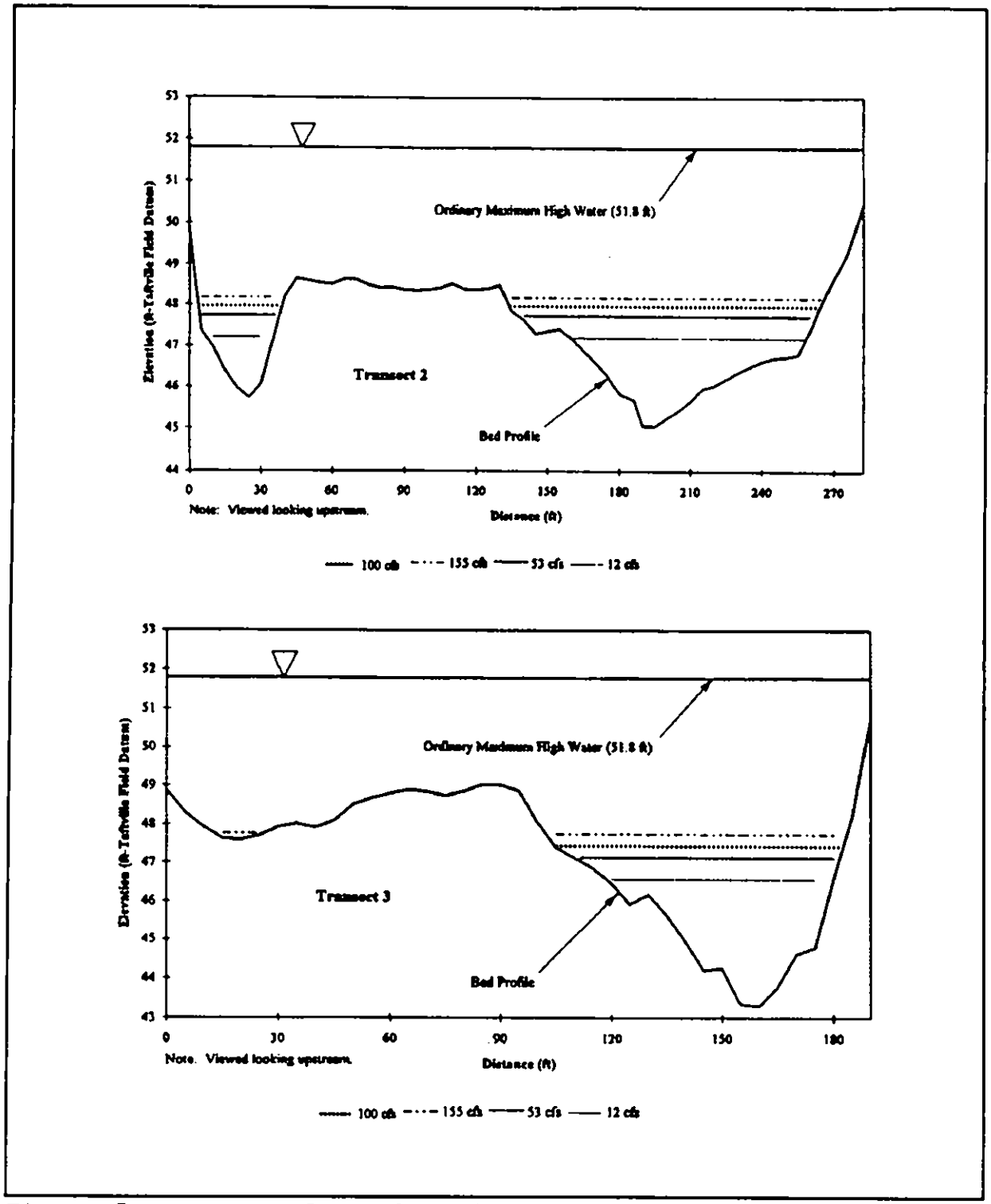

Figure 5. Water surface elevations at Transects 2 and 3 at alternative discharges from the Occum Project when Taftville impoundment elevation is 46.4 feet (Source: Norwich, 1996).

assuming a curvilinear relationship between flow and wetted area. Table 3 shows the estimates of wetted area for a 12, 30, 53, 100, and 155 cfs flow release at a Taftville impoundment elevation of 46.4 feet. Figure 6 shows the curvilinear relationship of our estimates of wetted areas and percent bank full at flows of 100 and 155 cfs.

Table 3. Estimates of wetted area and percent bank full for Occum flow release at Taftville impoundment elevation of 46.4 feet (Source: Staff)

Flow release (cfs)	Wetted area (sq ft)	% Bank full
12	83,857	39.8
30	101,560	48.2
53	112,590	53.5
100	128,565	61.0
155	132,830	63.1

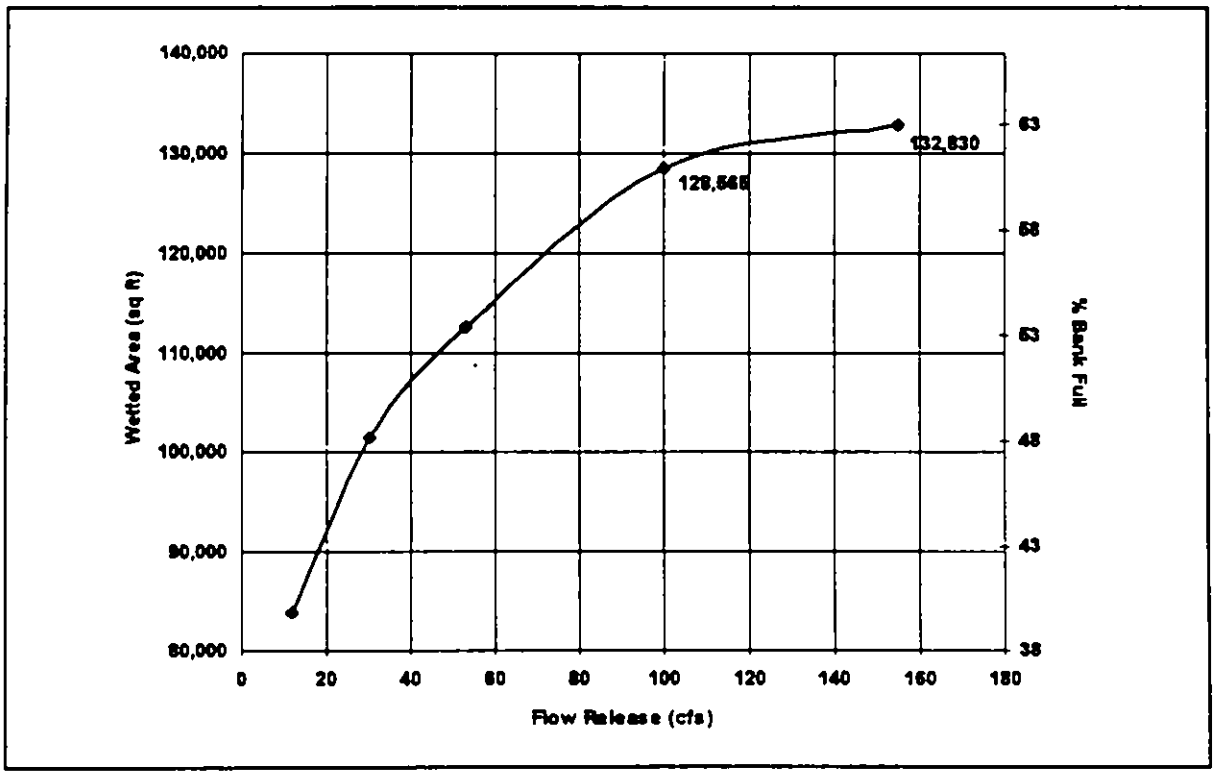

Figure 6. Wetted area and percent bank full as a function of flow release at a Taftville impoundment elevation of 46.4' (Source: Norwich, 1996).

The incremental gain between 100 cfs and 155 cfs does not justify a higher minimum flow requirement. In addition, the minimum flow from the Scotland Project (84 cfs plus inflow from tributaries between the projects) is likely to be closer to 100 cfs. Flow duration data indicate that 116 cfs is exceeded 90 percent of the time. A 100 cfs minimum flow requirement is more reasonable based on historical flows because with a minimum flow release of 155 cfs, the Occum impoundment could not be refilled under certain flow conditions and could frequently force Norwich into a situation of violating its 2-foot drawdown limitation or its minimum flow release at low Taftville impoundment levels (Interior does not specify that minimum flows could be reduced to inflow to the Occum Project, if inflow is less than 155 cfs).

When the Taftville impoundment is above 48.9 feet, a minimum release of 22 to 32 cfs would sufficiently protect aquatic resources in the downstream reach below the Occum powerhouse by providing water circulation through the channel and thereby avoiding stagnation. During periods of prolonged low flows and especially low pond levels at Taftville (below 48.9 feet), the Occum Project would release a minimum flow of 100 cfs or inflow, whichever is less, into the bypassed reach. We provide our recommendation for minimum flows when the tailwater elevation of the Occum Project is below 48.9 feet in section VIII.

Our recommendation for a minimum flow of 100 cfs when the tailwater elevation drops below 48.9 feet would not be implemented until after installation of the downstream fish passage. The downstream fish passage would be installed within 3 years after licensing, for reasons we discuss later in this section under "Fish Passage". Interior has indicated that it would consider lowering the trigger elevation to 48.3 feet if actual data were available to demonstrate that wetted area at 48.9 and 48.3 feet were similar. Interior also indicates that it cannot support 100 cfs because this flow was not assessed in the instream flow study (letter from Michael J. Bartlett, Supervisor, Interior's New England Field Office, Concord, NH, to Jon Christensen, Project Manager, Kleinschmidt Associates, Pittsfield, ME, dated February 6, 1996).

There is sufficient time, prior to implementation of the recommended 100 cfs minimum flow, when the tailwater elevation drops below 48.9 feet for Norwich to complete the instream flow study as it was intended to be conducted. Completion of the study, at least for comparison of the 100 cfs and 155 cfs flows at elevations of 48.3 and 48.9 feet, could provide data that would allow reconsideration of Interior's recommendations (through a post-licensing amendment). Reconsideration based on

real data could result in lowering the trigger elevation to 48.3 feet.

Fish Entrainment

Fish moving downstream can be entrained into project intakes and suffer injury or death when passing through hydroelectric turbines (EPRI, 1987). Entrainment rates usually depend on biological, environmental, and project operation and design parameters (EPRI, 1992; FERC, 1995). Injury and mortality rates are influenced by several factors, including fish species and size, turbine type, and mode of operation (EPRI, 1987).

Norwich states that the entrainment of fish through the Occum turbine is not adversely affecting resident fish populations, based on calculated water velocities through the trashracks at two forebay elevations: 65.8 feet (full pond) and 63.8 feet (minimum level). At a forebay elevation of 65.8 feet, the estimated velocities at the trashracks for maximum and minimum generation flows (900 cfs and 300 cfs) are 1.82 feet per second (fps) and 0.73 fps, respectively. At a forebay elevation of 63.8 feet, the estimated velocities for maximum and minimum generation are 2.07 and 0.83 fps, respectively. Norwich concludes that these estimated intake velocities are within the criteria established by the fisheries agencies for minimizing involuntary impingement and entrainment of fish (i.e., 2 fps or less).

To reduce the potential for entrainment of anadromous species (i.e., juvenile American shad and river herring), once these species become established, Norwich proposes to install a perforated plate with 1-inch diameter holes at the intake as part of its downstream fish bypass plan. The perforated plate would be placed over the trashracks only during the shad and herring outmigration period, which typically occurs from September through November.

The CDEP and Interior agree with Norwich's conclusions on entrainment effects on riverine fish populations. Interior concludes that the maximum intake velocity for a worst case scenario (flashboards out, minimum impoundment, and maximum generation flow) would be 1.8 fps, which is below its design criteria of 2 fps or less (letter from Michael J. Bartlett, Supervisor, Interior's New England Field Office, Concord, NH, to Jon Christensen, Project Manager, Kleinschmidt Associates, Pittsfield, ME, dated January 26, 1996). Neither agency recommends mitigation measures for reducing entrainment or impingement of riverine fish at the project. The agencies request downstream passage for American shad and blueback

herring, but provide no specific comments on the acceptability of the perforated plate for reducing entrainment of juvenile outmigrants.

Our Analysis

We reviewed available literature that discusses entrainment of riverine fish species to determine the potential effects of fish passing through the Occum powerhouse. We also considered the design of the project's intake (e.g., bar spacing), the location relative to river flow, and water velocities at the trashracks as factors that would influence entrainment rates. We used information that is available for the same or similar species as those that occur upstream of the Occum Project.

Entrainment of fish at hydroelectric projects usually occurs sporadically throughout the year. Although catchable-size gamefish and adult coarse fish also may be entrained at Occum because the trashracks at the intake have a clear spacing of 4 inches, peak entrainment events often are associated with seasonal movements of young-of-the-year (YOY) fish (EPRI, 1992; FERC, 1995). Consequently, most riverine fish entrained at hydroelectric projects are small (less than 8 inches long) (EPRI, 1992). In the Shetucket River, YOY riverine fish species (e.g., freshwater basses, sunfish, minnows, shiners, and suckers) most likely move downstream during the spring and summer months and, subsequently, would be subject to entrainment at Occum. Dispersal of these species would occur naturally whether or not the project existed.

Turbine mortality of small fish (less than 8 inches long) usually is low, depending on turbine design and operation, as well as fish species (EPRI, 1992). Occum has a single Kaplan unit, and fish mortality rates associated with passage through Kaplan turbines generally are lower than for other turbine types (e.g., Francis turbines), because of fewer blades and wider spacing between blades. The turbine mortality rate of resident fish at the Occum Project is likely to be low because most entrained fish are probably YOY (EPRI, 1992). Turbine mortality of adult game and coarse fish would be higher, but large resident fish tend to represent a small percentage of the fish entrained (EPRI, 1992). Also, the low intake velocities (less than 2 fps) would limit entrainment of larger fish, which tend to be stronger swimmers. Juvenile American shad and river herring entrained at Occum could suffer 10 to 20 percent mortality rates during their outmigration. Also, the effect of shad and herring mortality would be compounded by passage through the two projects downstream of Occum. There are no state or federally listed

endangered or threatened species upstream of the project that would be subject to entrainment and turbine mortality at the Occum Project.

We conclude that entrainment at Occum is not adversely affecting existing resident fish populations, and concur that protective measures are not needed at this time. However, anadromous populations of American shad and river herring, if these species become established upstream of the Occum Project, may suffer mortality rates that could have negative effects on the populations of these two species in the Shetucket River. Because the agencies plan to restore shad and herring runs upstream of Occum, and the potential for additional mortality of outmigrating fish at the two downstream projects is high, turbine mortality of these species at Occum should be minimized. Therefore, we recommend that the final plan for the downstream fish bypass as proposed by Norwich include a 1-inch diameter perforated plate over the intake during the fall period when juvenile shad and herring migrate to the ocean.

Fish Passage

Norwich proposes to install downstream fish passage facilities for American shad and river herring. The design and installation schedule of these facilities has been developed in consultation with the resource agencies. Norwich proposes to install a fish bypass on the south side of the powerhouse, and place a perforated plate with 1-inch diameter holes over the trashracks to minimize entrainment of outmigrants through the turbine, as previously discussed in the section on fish entrainment. Norwich proposes to begin construction within 2 years of license issuance and complete construction within 4 years. The downstream fish passage facility also would provide the sluiceway for the proposed 100 cfs minimum flow release downstream of the project when tailwater elevations drop below the recommended trigger elevation of 48.9 feet.

Norwich also proposes to consult with the agencies on an appropriate design for an upstream ladder for shad and herring. However, based on cost estimates for the conceptual design of the fish ladder, Norwich indicates that the cost of the upstream fish ladder may render the Occum Project uneconomical. Therefore, Norwich proposes to conduct an economic feasibility study for providing upstream passage at Occum after license issuance. If the study reveals that installation of upstream passage facilities would make the project uneconomical, then Norwich proposes to consult with the Commission on the possibility of selling the project or surrendering the license. If an upstream fish ladder is economically feasible, then Norwich would begin

the design phase within 2 years of licensing, and begin construction after upstream passage facilities are installed at the Taftville Project.

The CDEP concurs with the general design and installation schedule proposed by Norwich for downstream and upstream fish passage facilities. The CDEP recommends, however, no delay in the development of conceptual designs for upstream fish passage facilities, despite the uncertainty of when the facilities would be needed, and requests that the design and schedule of such facilities be approved by its staff. The installation of downstream and upstream passage facilities, including CDEP approval of design and schedule, is a condition of the state's 401 WQC for the Occum Project. The CDEP also recommends effectiveness studies for upstream and downstream fish passage facilities and that the methods and techniques for these studies be developed in consultation with and approved by the CDEP.

Interior requests a reservation of authority to prescribe downstream and upstream fish passage facilities under Section 18 of the FPA. Interior did not prescribe fishways at this time because the downstream Taftville project, which does not have fish passage facilities, is unlicensed and negotiations for fish passage may take some time. However, Interior recommends that Norwich provide functional drawings for a downstream fish bypass and an upstream fish ladder within 6 months of license issuance (including an operations and maintenance schedule), and requests that it and the CDEP be consulted during the design phase for these facilities. Interior recommends that construction of the downstream fish bypass begin no later than 2 years from licensing and be completed within 3 years. Interior also recommends that construction of the upstream fish ladder at Occum begin within 2 years of when upstream migrants first pass over the downstream Taftville Project, and construction be completed within 4 years.

Our Analysis

Based on the state and federal management plans for the Shetucket River, we concur with Norwich and the agencies that downstream and upstream fish passage facilities for American shad and river herring would be consistent with state and federal management objectives to restore shad and herring to the Shetucket River. The CDEP indicates that it most likely will not stock pre-spawned shad and herring upstream of Occum until downstream facilities have been installed for outmigrating juveniles. Because the timeliness of downstream passage will help restore shad and herring populations, we concur with Interior and recommend that the downstream fish bypass be

completed within 3 years of license issuance. We also agree with Norwich and the agencies on the need for the upstream fish ladder when sufficient numbers of target species pass through any facilities installed at the Taftville Project.3/ We consider the schedule recommended by the agencies (beginning the development of a functional design within 2 years and completing construction within 4 years of fish passing Taftville) to be reasonable. Finally, we recommend including in any license issued for this project an article reserving Interior's authority to prescribe fish passage facilities in the future.

c. Cumulative effects: We considered turbine entrainment mortality and instream flow fluctuations as having potential cumulative effects that may adversely affect Shetucket River fisheries. We selected the Shetucket River from the Scotland Project to Long Island Sound as the geographic scope for assessment of cumulative effects. Hydroelectric projects that are located within the selected geographic boundaries include, in upstream to downstream order, the Scotland, Occum, Taftville, and Greenville Projects.

Although turbine mortality most likely is occurring at each project, we conclude that the cumulative effects are minor because most entrainment probably consists of YOY, which usually suffer low mortality during turbine passage. Instream flow fluctuations produced by the projects within the defined geographic scope may be affecting habitats used by some species. However, the lower portion of the Shetucket River is not considered free-flowing due to the peaking operations of the four projects within this reach. The lower Shetucket River supports a warmwater fishery that does not appear to be adversely affected by Occum or the other projects.

Cumulative effects on anadromous (shad and herring) populations in the Shetucket River are associated with the ability of upstream migrants to reach spawning grounds and for outmigrating juveniles to safely move downstream through each project they encounter on their way to the ocean. A fish lift installed at the lower-most project (Greenville) has successfully passed American shad and river herring. The next upstream project (Taftville) is unlicensed. Consequently, it is uncertain when, or even if, fish passage facilities will be installed at this project. Occum is the next upstream project on the

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3/We assume that the CDEP and Interior intend that the installation of upstream fish passage facilities should occur within 2 years of the effective passage of target species at the Taftville Project.

Shetucket River. The CDEP is planning to stock pre-spawned adult shad and herring upstream of Occum, but has indicated that it will not stock fish until downstream facilities have been constructed or are near completion. There are no upstream or downstream fish passage facilities at the Scotland Project, which is upstream of Occum.

The installation of upstream and downstream fish passage facilities at projects on the Shetucket River would aid restoration efforts and reduce adverse effects of the project on anadromous fish populations.

d. Unavoidable adverse effects: Turbine injury and mortality of upstream YOY riverine fish would continue to occur at Occum, but should be minimal because most fish entrained are small (less than 8 inches long). Anadromous species (i.e., juvenile American shad and river herring) also would be exposed to entrainment after the CDEP initiated stocking of pre-spawned adults upstream of Occum. The proposed provision of a downstream fish bypass with perforated plate overlays on the intake during juvenile shad and herring outmigrations would reduce the environmental impacts of entrainment to anadromous fish.

4. Terrestrial Resources

a. Affected environment:

Upland Vegetation

Successional hardwood forest is the predominant vegetative cover type along the steep banks and upland areas of both shorelines of the project impoundment. These areas contain species that represent the Southeast Hills ecoregion of Connecticut, which is part of the oak, chestnut, and tulip poplar region of New England. These and other deciduous species, such as maple, beech, and sycamore, dominate the forested areas surrounding the project; white pine, eastern hemlock, and pitch pine are also found throughout this ecoregion. Many shrubs typical to this region of New England are also prevalent in the project vicinity.

Wetlands

Norwich reviewed the National Wetland Inventory (NWI) maps for the project area, up to and including the area approximately 1.2 miles upstream of the dam. There are several wetland areas along the portions of the river bank with shallower slopes. NWI mapping shows 39 acres of palustrine forested wetlands, and

another 3.0 acres of two palustrine emergent wetlands. The forested wetlands are deciduous floodplain forests that formed due to naturally occurring high spring river levels. During a site visit on July 24, 1998, Norwich verified that there are no wetland areas within the downstream reach of the project.

Wildlife

Wildlife expected to occur in the project vicinity include species common to central Connecticut. Mammals include white-tailed deer, red and gray squirrel, opossum, beaver, raccoon, porcupine, and skunk. Common passerine bird species likely to occur in the area include warblers, finches, robins, and swallows. A variety of waterfowl and wading birds, such as Canada geese, mallards, black ducks, great blue heron, and egrets, may be attracted to the impoundment area. The project site also is likely to provide suitable habitat for a variety of reptiles and amphibians, such as snapping turtle, eastern painted turtle, northern water snake, green frog, and bullfrog.

Threatened and Endangered Species

The CDEP Natural Resources Center conducted a search of its Natural Diversity Data Base maps and files for the project area. According to the CDEP, there are no terrestrial threatened or endangered species known to occur in the area (letter from Dawn M. McKay, Biologist, Connecticut Department of Environmental Protection, to Tina Jones, Licensing Coordinator, Kleinschmidt Associates, dated September 11, 1995).

Interior, Office of Environmental Policy and Compliance, indicates that no federally listed or proposed threatened or endangered species under the jurisdiction of Interior are known to occur within the project area, except for occasional transient bald eagles (*Haliaeetus leucocephalus*) or peregrine falcons (*Falco peregrinus*) (letter from Andrew L. Raddant, Regional Environmental Officer, U.S. Department of the Interior, to David P. Boergers, Acting Secretary, Federal Energy Regulatory Commission, dated June 24 1998).

b. Environmental impacts:

Vegetation

Norwich's proposed operation would not have an impact on upland vegetation in the project area. The operational changes that Norwich proposes (minimum bypass flow of 22 to 32 cfs during periods of non-generation, and release of 100 cfs downstream when

tailwater elevation falls below 48.3 feet) would not alter existing upland vegetation. The future construction of fish passage facilities and a canoe portage may involve some incidental removal of vegetative cover during construction.

Our Analysis

We concur with Norwich's findings that continued operation of the project, along with the proposed operational changes, would not have a significant impact on upland vegetation in the project area.

Wetlands

Norwich proposes to continue operating the project in a cycling mode, such that the impoundment level is not drawn down more than 2 feet below the dam crest or the top of the flashboards. Additionally, Norwich proposes to implement a minimum bypass flow of 22 to 32 cfs during periods of non-generation to promote water circulation, and to release 100 cfs or inflow, whichever is less, downstream of the project when tailwater elevation falls below 48.3 feet (due to drawdown at the downstream Taftville Project) to prevent fish stranding and to protect aquatic habitat downstream. These activities may result in minimal changes to the current impoundment fluctuation levels in the Occum impoundment. Better coordination with the upstream and downstream hydroelectric facilities, as Norwich proposes, should help reduce the periods during which the project is in drawdown mode and thus limit any adverse impacts on upstream wetlands.

Our Analysis

Most wetlands in the project vicinity are forested floodplain wetlands that formed from naturally occurring high spring river levels and thus are minimally affected by project operation. The potential for desiccation of emergent wetlands around the impoundment area due to drawdown activity would not increase, because impoundment drawdown limitations would remain the same as for current operations. We concur with Interior (letter from Andrew L. Raddant, Regional Environmental Officer, U.S. Department of the Interior, to David P. Boergers, Acting Secretary, Federal Energy Regulatory Commission, dated June 24, 1998) that a final plan for monitoring and recording the impoundment level should be developed to ensure compliance with the drawdown limit of 2 feet set by the WQC. The enhancement of downstream aquatic habitats resulting from improved water flow

may also result in the incidental creation of shoreline emergent wetland habitats in the downstream reach.

Except for possible downstream enhancements, we concur with Norwich that continued operation of the project, along with the proposed operational changes, would not have a significant impact on wetlands in the project vicinity.

Wildlife

Current project operation does not appear to affect resident wildlife or wildlife habitats. Norwich is presently negotiating with the owners of the downstream Taftville Project to better coordinate operations and thus improve riparian habitat availability in the section of river that lies between the two facilities.

Our Analysis

We concur with Norwich that continued operation of the project, along with the proposed operational changes, would not have a significant impact on wildlife resources in the project area. We also agree that some incidental enhancements to wildlife habitat may occur as a result of future flow improvements and operational coordination with surrounding hydroelectric stations. In addition, the future restoration of anadromous fish runs (as discussed in section V.C.3) would benefit piscivorous birds and mammals by increasing the available prey base.

Threatened and Endangered Species

Interior notes that two federally endangered bird species, the bald eagle and peregrine falcon, may occur as occasional transients through the project area. Interior stated that the preparation of a Biological Assessment or further consultation with Interior under Section 7 of the Endangered Species Act is not required (letter from Andrew L. Raddant, Regional Environmental Officer, U.S. Department of the Interior, to David P. Boergers, Acting Secretary, Federal Energy Regulatory Commission, dated June 24, 1998). Breeding habitat for these species is not present in the project vicinity.

Our Analysis

Continued operation of the Occum Project, along with proposed operational changes, would have no effect on federally listed threatened or endangered species.

c. Unavoidable adverse effects: None.

5. Cultural Resources

a. Affected environment:

Historical Resources

The Occum Project's area of potential effect (APE) includes the project facilities and the shorelines to the high water mark of the impoundment, which extends approximately 1.9 miles upstream from the project dam. The project facilities were listed in the National Register of Historic Places (National Register) in 1996 under the name Occum Hydroelectric Plant and Dam, and included the dam, headgate and forebay components, and powerhouse as contributing elements.

In 1865, the Occum Company constructed the stone portion of the dam, and the associated headgates, to provide water power for hydromechanically powered mills downstream. Although the company's plans for two power canals to supply a variety of industries were never realized, its dam did supply water in one canal to two woolen mills, which were later combined into a single manufacturing enterprise to produce cotton textiles. This firm, known as Totoket Mills, operated until the 1930s. In 1932, the Occum Company sold the dam and power privileges to the city of Norwich, which between 1934 and 1937 redeveloped the site for hydroelectric power production. The redevelopment effort included construction of a brick powerhouse, addition of a sixth gate to the intake structure, and burying the old power canal. The hurricane of 1938 damaged the dam, particularly the eastern end. The city of Norwich rebuilt this section of the dam in reinforced concrete, at the same time extending the structure an additional 170 feet. There have not been any major alterations to the project facilities since that time.

The project is located within the boundaries of the Quinebaug and Shetucket Rivers Valley National Heritage Corridor (NPS, 1998). The Heritage Corridor covers 850 square miles and stretches over 25 towns and several villages. Historical sites in the region in addition to the project facilities include numerous museums and historic buildings highlighting the region's small town agrarian history and textile production.

Archeological Resources

Neither Norwich nor the Connecticut SHPO identified any archeological resources within the project's APE.

b. Environmental effects: In letters dated April 6, 1994, and December 4, 1995, the SHPO issued its opinion that continued operation of the project under its current mode would have no effect on the historic and engineering significance of the Occum Hydroelectric Plant and Dam. The SHPO did, however, request that Norwich consult with that office on the design of the proposed fish passage facilities, canoe portage improvements, or other recreational enhancements. In its application, Norwich proposes to consult with the SHPO, prior to any construction, about potential impacts of specific mitigation measures that may ultimately be included in the new license.

Our Analysis

Occum Dam has provided water power since 1865, and it has been used for generation of electric power since completion of the city of Norwich's hydroelectric plant in 1937. The Occum Hydroelectric Plant and Dam are significant in several respects. The dam is significant for its association with the textile industry, the major engine of economic growth in eastern Connecticut throughout the 19th century, and also as an example of dam engineering in that period. The hydroelectric plant is significant as a late example of the standardized hydroelectric engineering that came to dominate the industry in the 1910s and 1920s. Continued operation and maintenance of the Occum Project with staff-recommended measures would maintain its historic facilities for the purpose for which they were designed and built, and would therefore be beneficial to the National Register-listed Occum Hydroelectric Plant and Dam.

Construction of fish passage facilities could require alteration of the dam or powerhouse and the introduction of a new structure or structures within the National Register boundaries of the Occum Hydroelectric Plant and Dam that may constitute a visual intrusion. There could be adverse effects. Consultation with the SHPO on the design of fish passage facilities would ensure that adverse effects on the National Register property would be minimized or appropriately mitigated.

Improvements to canoe portages or other potential recreation enhancements may involve ground-disturbing activities that could affect as yet unknown archeological resources. Consultation with the SHPO on the need for and level of investigations to locate, identify, and evaluate archeological resources within the project's APE would ensure that adverse effects on significant archeological resources would be avoided or minimized.

To protect the historic property and any as yet unknown archeological resources, we recommend that a PA be developed and executed pursuant to Section 106 of the NHPA, and the regulations of the Advisory Council on Historic Preservation at 36 CFR Part 800. The PA would require Norwich to develop a CRMP for historic properties. The CRMP would require consultation with the SHPO prior to any change in mode of project operation, expansion of capacity, alteration to project facilities, or initiation of potentially ground-disturbing recreational enhancements or other activities. Norwich's implementation of the measures contained in the PA would ensure that project operation and maintenance would continue without loss of historical integrity of historic properties.

c. Cumulative effects: The continued operation of the Occum Project, the installation of fish passage facilities, and installation of canoe portage could have potential cumulative effects of the Occum Hydroelectric Plant and Dam, an Historic Property of statewide significance. Norwich's proposal to continue operating and maintaining the Occum Project with our recommended CRMP would maintain the historic character and use of the project facilities and would, therefore, provide beneficial cumulative effects by preserving resources of statewide significance over the next 30 to 50 years.

Norwich's proposal to add a downstream fish bypass and our recommended upstream fish ladder, and the canoe portage, with our recommended CRMP, would ensure that the fish passage and recreational facilities would be designed to be compatible with the historic character of the Occum Hydroelectric Plant and Dam.

We conclude that Norwich's proposed action, along with our recommendation would have no adverse cumulative effect on the physical characteristic of that qualify the Occum Hydroelectric Plant and Dam for listing in the National Register as a resource of statewide significance.

d. Unavoidable adverse effects: None.

6. Recreation and Land Use Resources

a. Affected environment: The Occum Project is located in the transition area between the upper and lower Shetucket River Basins in eastern Connecticut. Land use in this region varies from a rural area containing small towns, light manufacturing, and agricultural land in the upper basin, to more developed urban land in the city of Norwich and the lower basin. Topography upstream of the project is relatively flat, and topography

downstream is gently sloping. Land use bordering the western shoreline of the impoundment is largely residential, and land use bordering the eastern shoreline contains a mix of residential and undeveloped land. Dwellings are set back from the water's edge and trees and other vegetation grow along both shorelines.

The project is situated within the boundaries of the Quinebaug and Shetucket Rivers Valley National Heritage Corridor (see section V.C.6), which offers numerous recreational opportunities. Several parks, forests, and preserves within the corridor offer hiking, biking, canoeing, fishing, picnicking, and equestrian opportunities. Parks include Mashamoquet Brook State Park, Mohegan Park, Pachaug State Forest, and Trail Wood, a Connecticut Audubon Society preserve.

Recreation activity in the project area is light and consists mainly of boating and fishing by local residents. Fishing pressure is light for most of the year. and species commonly caught are mainly warmwater species, although fishing pressure is moderate in the spring when the CDEP stocks the river with post-spawned Atlantic salmon. Boating activity on the impoundment is light, and it is limited by the shallowness of the impoundment. Boaters occasionally launch small motorless boats and canoes from an informal dirt boat launch, but boaters rarely use motor boats on the impoundment. Although no formal portage route exists, people also occasionally portage canoes around the dam at this informal launch. Additional access to the impoundment occurs via informal footpaths.

b. Environmental effects: Norwich recently installed a boat barrier and proposes to provide a canoe portage around the dam. The canoe portage would be located on the eastern shoreline and would use the existing upstream informal launch site as a put-in/take-out area. From this launch site, the portage would extend south over moderately sloped land to a point roughly 20 to 30 feet below the dam. In the area of the proposed downstream put-in/take-out, the trail would cross a river bank roughly 5 feet high and finish on rocks lining the shoreline.

The CDEP expressed interest in Norwich's proposal to provide a canoe portage by letter dated January 19, 1996 (letter from Brian Emerick, Supervisor Environmental Analyst, CDEP, Hartford, Connecticut, Jon Christensen, Kleinschmidt Associates, January 19, 1996)

Our Analysis

The proposed canoe portage would enhance recreation opportunities in the project area. However, the downstream portage put-in/take-out area could prove difficult to use depending on its exact location. A moderately steep bank borders the river, and large rocks line the tailrace shoreline. The final design of the portage route and downstream put-in/take-out area should take advantage of existing flat rocks along the shoreline for easier entrance and exit to and from the river. The route also should follow a path of minimal slope over the bank adjacent to the river.

Currently, a moderately steep trail runs adjacent to the abutment on the east side of the dam. Depending on the exact location of the proposed portage put-in/take-out, directional signs may be beneficial to ensure that the safer proposed portage route is taken rather than the steeper existing trail. We recommend that Norwich consult with the CDEP on the final design of the canoe portage to ensure a safe and clearly marked put-in/take-out area downstream of the dam.

c. Cumulative effects: Norwich's proposed canoe portage would provide beneficial cumulative effects on recreational opportunities in the project area by facilitating canoe passage around one of several dams on the Shetucket River.

d. Unavoidable adverse effects: None.

D. No-action

Under the no-action alternative, Norwich would continue to operate the project and there would be no changes to the existing environment. No measures to protect, mitigate, or enhance existing environmental resources would be implemented.

VI. DEVELOPMENTAL ANALYSIS

In this section, we analyze the project's use of the Shetucket River's available water resources to generate hydropower; estimate the economic benefits of the proposed project; and estimate the cost of various environmental protection, mitigation, and enhancement measures and the effects of these measures on project operations.

A. Power and Economic Benefits of the Project

Our independent economic studies are based on existing electric power conditions, with no considerations for future

inflation, escalation, or deflation beyond the potential license issuance date.4/

We would typically base our estimate of the value of project-related capacity on a cost of alternative capacity of $109/kW-year (at a fixed charge rate of 14 percent), which is based on a combined-cycle combustion turbine plant fueled by natural gas. We would typically base our estimate of the value of project-related energy on the 1998 cost of natural gas to electric generators in the New England Division of the United States. The 1998 cost of fuel would be based on information in Energy Information Administration (1996) and our estimate of the amount of fuel that would be displaced would be based on fuel consumption at a heat rate of 6,200 British thermal units per kilowatt-hour (Btu/kWh).5/

In this case, however, the project is treated as having no dependable capacity because there are significant periods during low flow when it is unable to generate, due in part to its dependence on releases from the upstream Scotland Project. Furthermore, the regional energy value (29.81 mills/kWh) is too low to represent the replacement cost for a small municipal utility such as Norwich. Therefore, in this analysis, we use the current energy replacement cost of 55 mills/kWh stated by Norwich.

For our economic analysis of the alternatives, we use the assumptions, values, and sources shown in table 4. The proposed action consists of the operation of the Occum Project with Norwich's proposed environmental and safety measures as shown in table 5.

Based on the assumptions in table 4 and the costs of enhancements shown in table 5 , we estimate that the annual cost of the Occum Project would be $201,913, or about $8,439 (2.4 mills/kWh) more than the annual power value of $193,474. The estimated average annual output of the project would be 3,518 MWh.

4/See Mead Corporation, Publishing Paper Division, 72 FERC ¶61,027 (July 13, 1995).

5/This fuel consumption rate is for a new plant designed for maximum efficiency.

Table 4. Staff's assumptions for economic analyses of the Occum Project (Source: Staff)

Assumption	Value	Source
Energy value (1998) [a]	55 mills/kWh	Norwich
Capacity value (1998) [b]	$109/kW-yr	Staff
Operation & maintenance costs (1998) [c]	$124,025	Norwich
Period of analysis	30 years	Staff (Mead)
Discount rate	10%	Staff
Net investment [d]	$18,934	Norwich

[a] Energy-only, based on Norwich's 1998 replacement cost (Norwich's #7 response to AIR, Jon M. Christensen, Kleinschmidt Associates, March 16, 1998 [NDPU, 1998]).

[b] Assigned to dependable capacity. The Occum Project has no dependable capacity, so entire value of generation is reflected in 55 mills/kWh energy-only figure.

[c] Based on figure of $121,000 presented by Norwich in its 1997 AIR response. Adjusted by the staff to 1998$ by inflating 2.5% annually for one year.

[d] Based on figure of $20,534 presented by Norwich in 1997 AIR response. Adjusted by the staff to 1998$ by depreciating $1,600 annually for one year, as also presented by Norwich in 1997 AIR response.

Table 5. Summary of annual costs of Norwich's proposed enhancements for the Occum Project (Source: Staff)

Protection, mitigation, or enhancement measure	Capital cost (1998$)	O&M cost (1998$)	Annual cost (1998$)
Downstream fish bypass	$230,000	$3,285	$35,973 [a]
Minimum flow releases of 22-32 cfs and 100 cfs, or inflow [b]	0	0	$5,060
Canoe portage [c]	0	0	0
Review of plans with SHPO [d]	0	0	0

[a] Includes $7,715 in lost energy (140.3 MWh at 55 mills/kWh).

[b] Assume capital and O&M cost accounted for elsewhere because flow would be released through new downstream fish bypass. Annual cost consists of $5,060 in lost energy (92 MWh at 55 mills/kWh).

[c] We assume landowners would bear cost of removing sheds and that maintenance and the filing of final design with erosion control measures would be a minor part of normal O&M.

[d] We assume these costs to be minor and part of normal O&M.

B. Proposed Action with Additional Staff-recommended Measures

In this section, we present the annual costs of the proposed action with the staff's recommended measures. Table 6 shows the annual costs of enhancements for staff-recommended measures.

Based on these assumptions, we estimate that the annual cost of the proposed action with the staff's recommended measures would be about $354,791, or about $162,616 (46.5 mills/kWh) more than the annual power value of $192,176. The estimated average annual output of the project would be 3,494 MWh.

Table 6. Summary of annual costs of enhancements of the staff and agency-recommended measures for Norwich's proposed Occum Project (Source: Staff)

Protection, mitigation, or enhancement measure	Capital cost (1998$)	O&M cost (1998$)	Annual cost (1998$)
Minimum flow of 155 cfs when tailwater drops below 48.9 feet[a]	0	0	$1,815[a]
Operations monitoring plan	$5,000	-	$530
Upstream fish ladder[b,c]	$1,322,000	$8,700	$153,542
Execute PA	$1,000	-	$106

[a] The staff is not recommending this measure and the cost of this measure is not included in the proposed action with additional staff-recommended measures shown in table 7.
[b] The upstream fish ladder would be installed within 4 years of passing migrant fish at the Taftville Project.
[c] Annual cost includes $1,300 in lost energy (23.6 MWh at 55 mills/kWh).

C. No-action

Under the no-action alternative, the project would continue to operate as it does now, with no change in existing environmental conditions.

The annual cost of the existing project, including carrying charges on the net investment, necessary future capital, and licensing costs, is about $173,655 (46.3 mills/kWh) for the existing generation of about 3,750 MWh annually. As stated above, we assume that the cost of alternative power is 55 mills/kWh. Therefore, the existing project would produce power

at a cost of about $32,595 (8.7 mills/kWh) less than the currently available alternative.

D. Economic Comparison of the Alternatives

Table 7 presents a summary of the current net annual power benefits for no action, the proposed action, and the proposed action with additional staff-recommended measures.

Table 7. Summary of the net annual benefits of alternatives for Norwich's proposed Occum Project (Source: Staff)

	Proposed action	Proposed action with additional staff-recommended measures	No action
Annual generation (MWh)	3,518	3,494	3,750
Annual power benefit			
($)	193,474	192,176	206,250
(mills/kWh)	55.0	55.0	55.0
Annual cost [a]			
($)	201,913	354,791	173,655
(mills/kWh)	57.4	101.5	46.3
Annual net benefit			
($)	-8,439	-162,616	32,595
(mills/kWh)	-2.4	-46.5	8.7

[a] Annual cost of no action consists of $12,709 for net investment, $19,105 for future capital (trash booms, SCADA control equipment, and forebay intake gates), $14,946 for licensing, $124,025 for operation and maintenance, $1,230 for Commission fees, and $1,640 for miscellaneous.

Our evaluation of the economics of the proposed action and the proposed action with additional staff-recommended measures shows that the project appears to cost more than alternative power costs.

Project economics is only one of the many public interest factors that is considered in determining whether or not to issue a license. The construction and operation of a project may be desirable for other reasons, such as to diversify the mix of energy sources in the area, to promote local employment, to provide a fixed-cost source of power and reduce contract needs, and to conserve fossil fuels and reduce atmospheric pollution.

E. Pollution Abatement

The Occum Project annually generates about 3,750 MWh of electricity. This amount of hydropower generation, when contrasted with the generation of an equal amount of energy by fossil-fueled facilities, avoids the unnecessary emission of atmospheric pollutants. Assuming that the 3,750 MWh of hydropower generation would be replaced by an equal amount of natural gas-fired generation, generating electrical power equivalent to that produced by the Occum Project would require combustion of about 38.7 million cubic feet of natural gas annually. Removal of pollutants from the emissions to levels presently achievable by state-of-the-art technology would cost about $2,083 (1998 $) annually.

VII. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which the project is located. When we review a hydropower project, we consider the water quality, fish and wildlife, recreational, cultural and other nondevelopmental values of the involved waterway equally with its electric energy and other developmental values. In determining whether, and under what conditions, to license a project, the Commission must weigh the various economic and environmental tradeoffs involved in the decision.

This section contains the basis for, and a summary of, our recommendations to the Commission for the licensing of the Occum Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

A. Recommended Alternative

Based on our independent review and evaluation of the proposed project, the proposed action with the additional staff-recommended measures, and no-action, we select the proposed action with our additional staff-recommended measures as the preferred alternative.

We recommend this alternative because: (1) issuance of a license would allow Norwich to continue to operate the project as a dependable source of electric energy; (2) the 800-kW project would avoid the need for an equivalent amount of fossil-fuel fired electric generation and capacity, continuing to help conserve these nonrenewable energy resources and reduce atmospheric pollution; and (3) the recommended environmental protection, mitigation, and enhancement measures would improve

water quality, protect fish and terrestrial resources, improve public use of recreation facilities and resources, improve multiple use and management of project lands, and maintain and protect historic and archeological resources within the area affected by project operations.

We recommend including the following environmental measures in any license issued by the Commission for the Occum Project:

(1) operate the project in a cycling mode limiting impoundment drawdown to 2 feet;

(2) develop and implement soil and erosion control measures, including temporary cofferdams, as part of the final plans for construction of the upstream and downstream fish passage and the canoe portage;

(3) release minimum flows of 30 cfs through a combination of leakage and spillage when the project is not operating, and, following installation of the downstream fish bypass, a total of 100 cfs or inflow, whichever is less, through a combination of leakage, spillage, and the downstream sluiceway when the project is not operating and the impoundment elevation at the Taftville Project is below 48.9 feet;

(4) develop and implement a plan to monitor impoundment and tailwater elevations and minimum flows;

(5) develop and implement a final plan for the construction, operation, maintenance, and effectiveness monitoring of the upstream Denil fish ladder within 4 years of effective upstream passage at Taftville;

(6) develop and implement a final plan for the construction, operation, maintenance, and effectiveness monitoring of downstream fish bypass within 3 years of license issuance;

(7) execute a PA among the Commission, the SHPO, and the Advisory Council, that provides for the development and implementation of a CRMP; and

(8) develop and implement a final plan for the installation of canoe portage around the dam, including signs and erosion control measures.

Because our recommendations for the operations monitoring plan, upstream fish ladder, and programmatic agreement represent tradeoffs between developmental and non-developmental resources,

we present our justification for these measures and a comparison of the alternatives in the following section.

Implementation of these measures would protect and enhance fisheries, cultural and recreational resources in the project areas and provide for the best use of the waterway.

The costs of some of these measures would reduce the net benefit of the project. As discussed in section VI, we estimate that the project as proposed by Norwich would cost more than currently available alternative power. Specifically, three of our additional recommended measures would further reduce the economic benefits of the project. These include: (1) development of a plan to monitor project operations and minimum flows; (2) development and implementation of a plan for the construction, operation, maintenance, and effectiveness monitoring of an upstream fish ladder; and (3) execution of a PA. We summarize these recommendations briefly in the following section.

1. Project Operations and Minimum Flow Monitoring Plan

Norwich proposes to monitor minimum flows and tailwater elevations. Interior recommends that Norwich develop a plan to monitor project operations including impoundment and tailwater elevations and minimum flows. Because habitat suitability and fish passage could be adversely affected by inconsistent flow releases and water surface elevations, compliance with our recommended flow releases and water surface management regime should be monitored.

We recommend that Norwich develop a monitoring plan that would provide for measuring and reporting impoundment and tailwater elevations and minimum flows released into the bypassed and downstream reaches. The plan also should indicate specific methods that would be used to verify impoundment and tailwater elevations and minimum flows. We estimate that the current net annual cost of this monitoring and documentation of compliance with our recommended flows and water surface elevation regimes would be about $530.

2. Upstream Fish Ladder

Norwich proposes to conduct a feasibility study for the installation, operation, and maintenance of an upstream fish ladder. Norwich states that the costs associated with the upstream fish ladder may render the continued operation of the project infeasible. Interior and CDEP recommend the

installation, operation, maintenance, and effectiveness monitoring of an upstream fish ladder to allow the passage of American shad and river herring. Installation of an upstream fish ladder would be consistent with both state and federal management plans for the Shetucket River.

We recommend that Norwich develop a final plan for the construction, operation, maintenance, and effectiveness monitoring of an upstream fish ladder, to be installed within 4 years of effective passage of fish through facilities at the Taftville Project. We estimate that the current net annual cost of the upstream fish ladder would be $153,542, a major cost relative to the overall project economics. We conclude that the environmental benefits of providing upstream fish passage are worth the cost.

3. Execute a Programmatic Agreement and CRMP

Norwich proposes to review plans for fish passage and canoe portage with the SHPO. The SHPO states that continued use and maintenance of the facilities would have no effect on the historic characteristics of the property, provided that the SHPO is given the opportunity to review and comment on the fish passage and canoe portage designs. A PA and CRMP are necessary to ensure that the historic character of the Occum Project is protected during the license period. We estimate that the current net annual cost of preparation of the CRMP would be $106.

B. Conclusion

Based on our independent analysis of the Occum Project, we conclude that operation of the project with our recommended protection, mitigation, and enhancement measures would improve environmental conditions in the project area and would be a beneficial use of the resources.

VIII. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of Section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or

other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

Section 10(j) Inconsistency

Pursuant to Section 10(j) of the FPA, we are making a preliminary determination that one of the recommendations of the fish and wildlife agencies may be inconsistent with the purposes and requirements of Part I of the FPA or other applicable laws. Recommendations, or parts of recommendations that are inconsistent with Section 10(j) conflict with the comprehensive planning and public interest standards of Section 4(e) and 10(a) of the FPA. This is because the recommendation would cost more to implement than the value of its potential benefits.

For the Occum Project, both CDEP and Interior have had the opportunity to make comments and recommendations. Both agencies have provided recommendations, and all recommendations are evaluated and discussed in the water, fisheries, and recreation resource sections of this final EA.

In table 8 we summarize CDEP's and Interior's recommendations, show if they are within the scope of Section 10(j) and indicate whether we recommend adopting the measures under the proposed action with additional staff-recommended measures.

Table 8. Analysis of fish and wildlife agency recommendations for the Occum Project (Source: Staff).

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost	Recommend adopting?
1. Maintain impoundment to within 2 feet of the top of the flashboards or crest of the dam when flashboards are not in place	CDEP Interior	Yes	$0	Yes
2. Provide minimum flow of 30 cfs to the bypassed reach when the project is not generating	Interior	Yes	$5,060*	Yes

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost	Recommend adopting?
3. Provide minimum flow of 155 cfs when the tailwater elevation drops below 48.9 feet	Interior	Yes	$1,815[b]	No. 155 cfs provides only inconse-quential benefit at more cost
4. Provide minimum flow of 22 cfs to the bypassed reach when the project is not generating and, 4 years after licensing, 100 cfs when the Taftville impoundment elevation drops below 48.3 feet[c]	CDEP	Yes	$5,060[a]	Yes
5. Develop and implement a plan for monitoring impoundment and tailwater levels, and minimum flow releases	Interior	Yes	$530	Yes
6. File monitoring plan with the Commission within 3 months of license issuance	Interior	No. Not a specific measure to protect and wildlife	$0	Yes, considered under Section 10(a)
7. Develop and implement functional design drawings for a downstream fish bypass and commence construction within 2 years and complete construction within 3 years of license issuance	Interior	Yes	$35,973	Yes
8. Develop and implement functional designs for a downstream fishway/sluiceway (bypass) and commence construction within 2 years and complete construction within 4 years of license issuance	CDEP	Yes	$35,973[a]	Yes

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost	Recommend adopting?
9. Develop and implement functional design drawings for an upstream fish ladder and commence construction within 2 years and complete construction within 4 years of the time Taftville facilities begin passing migrants	Interior CDEP	Yes	$153,542[a]	Yes
10. File functional design drawings for downstream and upstream fish bypass and fish ladder with the Commission for approval within 6 months of license issuance	Interior	No. Not a specific measure to protect fish and wildlife	$0	Yes, considered under Section 10(a)
11. Develop and implement a plan for monitoring the effectiveness of upstream and downstream fish passage facilities	CDEP	Yes	$0[c]	Yes
12. Provide boat barrier and canoe portage facilities within 4 years of license issuance	CDEP	No. Not a specific measure to protect fish and wildlife	$0	Yes, considered under Section 10(a)

[a] Norwich provided cost data that combined the costs associated with providing 22 to 32 cfs and 100 cfs minimum flows. We assume the $5,060 cost estimate primarily results from the 22 to 32 cfs because of the anticipated agreement with owners of the downstream Taftville Project to eliminate drawdown below the 48.3 foot elevation thereby eliminating the need for the 100 cfs flow.

[b] This cost represents the incremental difference between providing 100 cfs at trigger elevation 48.3 feet and 155 cfs at the trigger elevation of 48.9 feet.

[c] Although CDEP does not specify 100 cfs "or inflow, whichever is less", there is nothing in the record of this proceeding to indicate that CDEP is in disagreement with Norwich's proposal to release 100 cfs or inflow, whichever is less, when the tailwater elevation is below 48.3 feet.

[d] Conceptual drawings of the fish passage facilities were submitted to the agencies; we assume that costs associated with final design drawings are included in annual O&M costs.

[e] We assume these costs are included in the final plans for upstream and downstream fish passage.

As shown in table 8, we determined that 3 recommendations are not within the scope of Section 10(j) because they are not specific measures for the protection of fish and wildlife. We do not recommend adopting Interior's recommendation to release a minimum flow of 155 cfs when the tailwater elevation drops below 48.9 feet. Based on our analysis, the wetted area increases only 3.3 percent over the amount wetted with Norwich's proposed 100 cfs release when the tailwater elevations drops below our recommended trigger elevation of 48.9 feet. This minor increase would afford inconsequential benefits to fish and aquatic resources.

By letter dated February 24, 1999, we requested that Interior consider other options that would be agreeable to Interior and would adequately protect fish and aquatic resources consistent with other project purposes.

Interior, in its response by letter dated March 23, 1999, indicated that it could accept that a 100 cfs release (or inflow) would adequately protect instream resources when tailwater elevations fall below 48.9 feet, based on our analysis and acceptance of Interior's recommended headpond elevation trigger of 48.9 feet.

IX. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, and conserving waterways affected by the project. Under Section 10(a)(2), federal and state agencies filed 10 plans that address various resources in Connecticut. Eight plans address resources

relevant to the Occum Project.6/ No conflicts were found with the plans.

X. FINDING OF NO SIGNIFICANT IMPACT

With the staff's additional recommended measures, the Occum hydroelectric facilities would continue to operate, fish passage facilities and minimum flows would facilitate passage of anadromous fish (shad and herring), and recreational access would be enhanced and maintained. With our recommended consultation with the SHPO, execution of the PA, and development of a revised CRMP, no significant impacts on cultural resources are expected.

Based on our independent analysis, issuance of a license for the project with additional staff-recommended measures would not constitute a major federal action significantly affecting the quality of the human environment.

XI. LITERATURE CITED

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XII. LIST OF PREPARERS

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Denise Short--Technical Editor (B.A., English)

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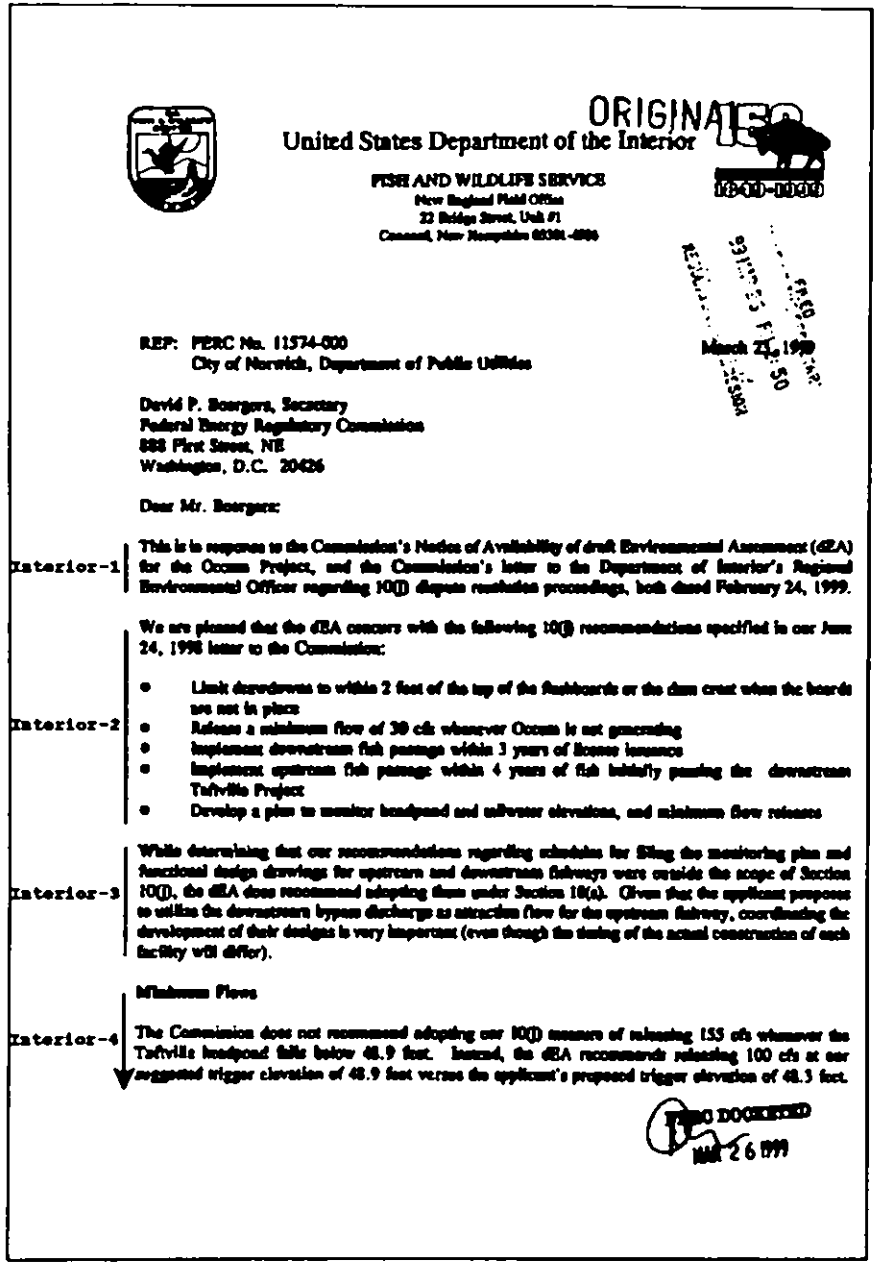
Appendix A: Comments on the Draft Environmental Assessment

Comment letters on the Draft EA issued February 14, 1999, appear in the following order:

Entity	Date of Letter
U.S. Fish and Wildlife Service	March 23, 1999
Norwich Department of Public Utilities	April 7, 1999
Connecticut Department of Environmental Protection	April 12, 1999



ORIGINAL

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
22 Bridge Street, Unit #1
Concord, New Hampshire 03301-4986

1800-0000

REF: FERC No. 11574-000
City of Norwich, Department of Public Utilities

March 23, 1999

David P. Boergers, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Dear Mr. Boergers:

Interior-1 This is in response to the Commission's Notice of Availability of draft Environmental Assessment (dEA) for the Occum Project, and the Commission's letter to the Department of Interior's Regional Environmental Officer regarding 10(j) dispute resolution proceedings, both dated February 24, 1999.

We are pleased that the dEA concurs with the following 10(j) recommendations specified in our June 24, 1998 letter to the Commission:

Interior-2
- Limit drawdowns to within 2 feet of the top of the flashboards or the dam crest when the boards are not in place
- Release a minimum flow of 30 cfs whenever Occum is not generating
- Implement downstream fish passage within 3 years of license issuance
- Implement upstream fish passage within 4 years of fish initially passing the downstream Taftville Project
- Develop a plan to monitor headpond and tailwater elevations, and minimum flow releases

Interior-3 While determining that our recommendations regarding schedules for filing the monitoring plan and functional design drawings for upstream and downstream fishways were outside the scope of Section 10(j), the dEA does recommend adopting them under Section 18(a). Given that the applicant proposes to utilize the downstream bypass discharge as attraction flow for the upstream fishway, coordinating the development of their designs is very important (even though the timing of the actual construction of each facility will differ).

Minimum Flows

Interior-4 The Commission does not recommend adopting our 10(j) measure of releasing 155 cfs whenever the Taftville headpond falls below 48.9 feet. Instead, the dEA recommends releasing 100 cfs at our suggested trigger elevation of 48.9 feet versus the applicant's proposed trigger elevation of 48.3 feet.

FERC DOCKETED
MAR 26 1999

A1

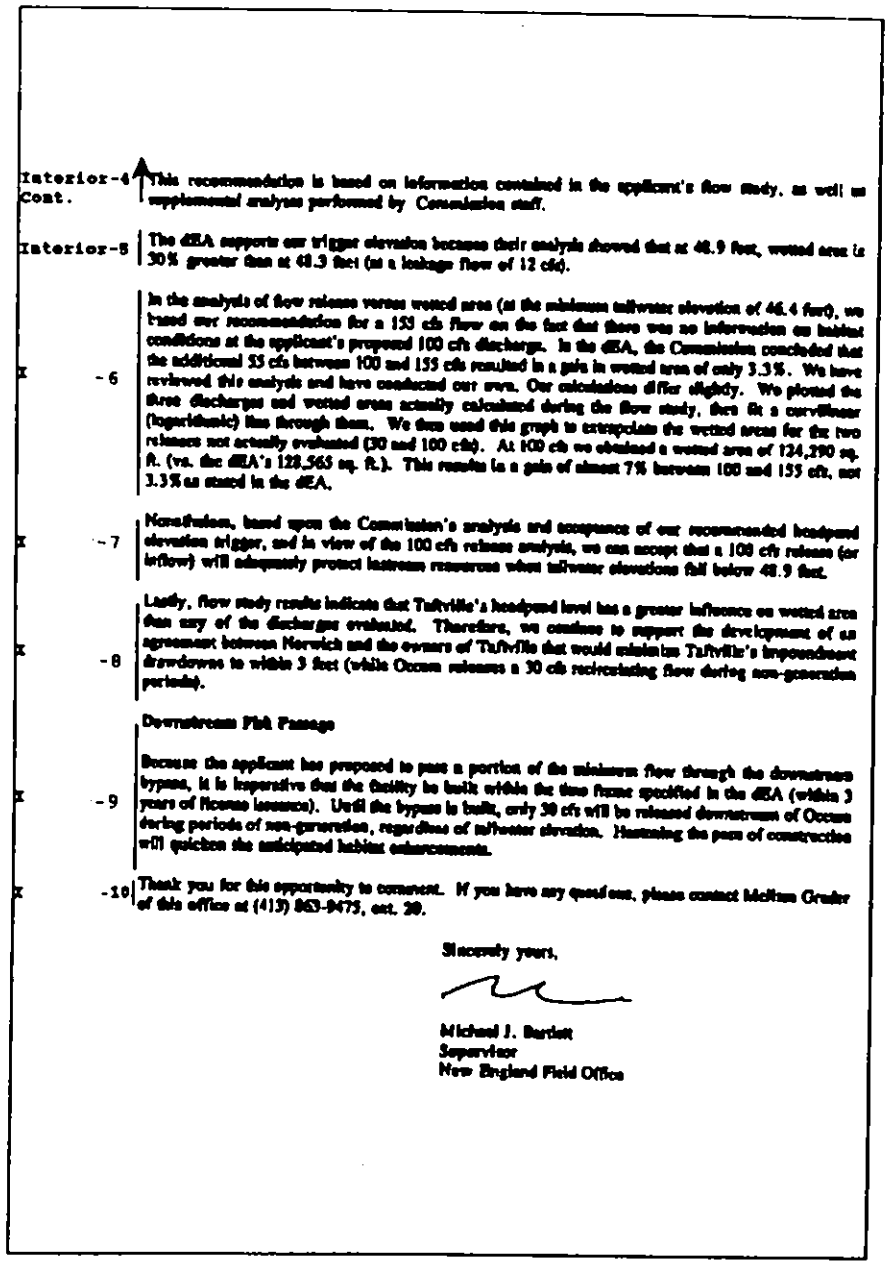
Response to Comments
of the U.S. Department of the
Interior,
Fish and Wildlife Service
on the Draft Environmental Assessment
for the
Occum Project
March 23, 1999

Interior-1 No response required.

Interior-2 No response required.

Interior-3 No response required.

Interior-4 No response required.



Interior-4 Cont. This recommendation is based on information contained in the applicant's flow study, as well as supplemental analyses performed by Commission staff.

Interior-5 The dEA supports our trigger elevation because their analysis showed that at 48.9 feet, wetted area is 30% greater than at 48.3 feet (at a leakage flow of 12 cfs).

M -6 In the analysis of flow release versus wetted area (at the minimum tailwater elevation of 46.4 feet), we based our recommendation for a 155 cfs flow on the fact that there was no information on habitat conditions at the applicant's proposed 100 cfs discharge. In the dEA, the Commission concluded that the additional 55 cfs between 100 and 155 cfs resulted in a gain in wetted area of only 3.3%. We have reviewed this analysis and have conducted our own. Our calculations differ slightly. We plotted the three discharges and wetted areas actually calculated during the flow study, then fit a curvilinear (logarithmic) line through them. We then used this graph to extrapolate the wetted areas for the two releases not actually evaluated (30 and 100 cfs). At 100 cfs we obtained a wetted area of 124,290 sq. ft. (vs. the dEA's 128,565 sq. ft.). This results in a gain of almost 7% between 100 and 155 cfs, not 3.3% as stated in the dEA.

M -7 Nonetheless, based upon the Commission's analysis and acceptance of our recommended headpond elevation trigger, and in view of the 100 cfs release analysis, we can accept that a 100 cfs release (or inflow) will adequately protect instream resources when tailwater elevations fall below 48.9 feet.

M -8 Lastly, flow study results indicate that Taftville's headpond level has a greater influence on wetted area than any of the discharges evaluated. Therefore, we continue to support the development of an agreement between Norwich and the owners of Taftville that would minimize Taftville's impoundment drawdowns to within 3 feet (while Occum releases a 30 cfs recirculating flow during non-generation periods).

Downstream Fish Passage

M -9 Because the applicant has proposed to pass a portion of the minimum flow through the downstream bypass, it is imperative that the facility be built within the time frame specified in the dEA (within 3 years of license issuance). Until the bypass is built, only 30 cfs will be released downstream of Occum during periods of non-generation, regardless of tailwater elevation. Hastening the pace of construction will quicken the anticipated habitat enhancements.

M -10 Thank you for this opportunity to comment. If you have any questions, please contact Melissa Grader of this office at (413) 863-9475, ext. 30.

Sincerely yours,

Michael J. Bartlett
Supervisor
New England Field Office

Interior-5 No response required.

Interior-6 Variations in estimates, on which these calculations are based, could account for this small difference.

Interior-7 No response required.

Interior-8 We agree; however, we note that Norwich indicates that attempts to gain agreement on Taftville headpond elevation are stymied pending sale of the Taftville facility.

Interior-9 We agree and will recommend inclusion of such a condition in any license issued for the Occum Project.

Interior-10 No response required.

KA KLEINSCHMIDT ASSOCIATES
Consulting Engineers & Scientists

ORIGINAL

FILED
OFFICE OF THE SECRETARY
99 APR -8
FEDERAL ENERGY
REGULATORY COMMISSION

75 Main Street PO Box 576 • Pittsfield, Maine 04967 • Phone: 207-487-3328 • Fax: 207-487-3124 • [illegible]

April 7, 1999

VIA Federal Express

Mr. David P. Boergers, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Occum Hydroelectric Project (FERC No. 11574)
Response to Draft Environmental Assessment

Dear Secretary Boergers:

Norwich-1 | On behalf of the City of Norwich, Department of Public Utilities (Norwich), owner and operator of the referenced project, this letter responds to the request for comments on the Draft Environmental Assessment (DEA) dated February 24, 1999.

Norwich-2 | Norwich concurs with the conclusions drawn by the Commission staff in the DEA that the issuance of an original license for the Occum Hydroelectric Project (Occum) "would not be a major federal action significantly affecting the quality of the human environment". The DEA recommends the adoption of measures proposed by Norwich to protect the existing environmental resources of the project, with a modification to the proposed minimum flow plan, the addition of specific upstream fish passage requirements, requirements for upstream and downstream passage effectiveness studies, and measures to provide for the protection of historic and cultural resources. For the most part, Norwich finds these recommended measures to be acceptable, but wishes to make comments on the Staff-recommended minimum flow measures:

Norwich-3 | "Provide a minimum flow of 100 cfs or inflow, whichever is less, downstream of the project when the tailwater elevation is below 48.5' after installation of the downstream fish bypass" (DEA, Pg. 4)

With regard to the Commission's analysis and recommendations concerning minimum flows for the Project, we appreciate the Commission's additional analysis that contrasted potential habitat gains associated with alternative minimum flows of 100 and 155 cfs. The Commission found that, below a certain Taftville headpond elevation, a minimum flow of 100 cfs from Occum provided only 1.3 percent less wetted area than a minimum flow of 155 cfs. Based on that analysis, the DEA recommended that Occum provide a minimum flow of 100 cfs or inflow when the Taftville headpond level was below that trigger elevation. Norwich agrees with this flow recommendation. In its comment letter dated March 23, 1999, the USFWS has also agreed that 100 cfs or inflow provides an adequate minimum flow when the Taftville headpond is below a certain trigger elevation.

[illegible] APR - 8 1999

West Columbia, SC	Strasburg, PA	Fairfax Station, VA	Chester, CT	East Syracuse, NY
[illegible]	717-687-7211	[illegible]	[illegible]	[illegible]

Response to Comments
of the City of Norwich
Department of Public Utilities
on the Draft Environmental Assessment
for the
Occum Project
April 7, 1999

Norwich-1 No response required.

Norwich-2 No response required.

Norwich-3 No response required.

Norwich-4

Although we agree that a minimum flow of 100 cfs or inflow is reasonable when the Taftville headpond is substantially drawn down, the elevation at which the 100 cfs flow is triggered remains a concern to Norwich. As discussed in the Instream Flow Report (KA, 1995) the relatively short, 1,800 ft reach between the Occum tailwater and the Little River is inundated when the Taftville headpond is full, and free flowing when the Taftville headpond is drawn down. This reach provides marginal habitat for most aquatic organisms. Six ft pond fluctuations (between elevation 51.5' and 46.0', approximately) of the downstream Taftville headpond render this area neither lotic nor lacustrine habitat, instead it is an artificial, freshwater "tidal" area. The Instream Flow Study (1995) conclusions indicated that the primary impact to the reach below the Occum tailwater is a result of the ecotone taken at the Taftville Project. Minimum flows from Occum were proposed by Norwich to maintain flows in the bypassed reach, and to provide circulation flows for the downstream reach while the Taftville headpond was drawn down.

Norwich-5

The analysis contained in the DEA recognizes that a large shoal located in the middle of the reach below the Occum tailwater is almost fully submerged when the Taftville headpond elevation is 48.9' or higher. Study data indicates that as the Taftville headpond is drawn down further to elevation 48.3' the Occum tailrace and bypass reach become dewatered, and this downstream shoal is exposed. The shoal becomes dewatered as the Taftville headpond is drawn down to its minimum level, *regardless of whether a minimum flow of 100 or 155 cfs is maintained*, as shown in Figure 5 of the DEA. Indeed, during the fieldwork the study team observed that even at 250 cfs much of that shoal remained dewatered while the Taftville headpond was at elev. 46.4'(0.4 feet higher than the lowest anticipated Taftville headpond level). Thus, the presumed intent of protecting the shoal with a minimum flow is not met by the proposed trigger elevation of 48.9'. When the Taftville pond drops to elevation 48.5' or lower, the minimum flow will largely pass down the right channel (looking upstream) and the shoal area will be dewatered and have substantially reduced biological production. Norwich and CDEP, whose staff participated in the study, chose the 48.3' elevation as the trigger for the higher minimum flows because this would prevent the dewatering of the Occum bypassed reach, while providing circulation flows in the main channel of the downstream reach. Minimum flows from the Occum Project can provide little mitigation to the downstream reach when the impact is due to a six foot pond level fluctuation caused by the downstream project.

Norwich-6

Based on the fact that flows from the Occum Project have no significant influence on the shoal exposed by the Taftville drawdown, Norwich requests the Commission to reconsider the trigger level for Norwich's minimum flow release. Norwich still maintains that a trigger level of 48.3' will protect and enhance aquatic resources that are impacted by the Occum Project.

Norwich-7

Thank you for the opportunity to comment on the EA. If you have any questions about these comments, please feel free to contact me at (207) 487-3328, or Peter Polshin at (860)823-4153.

Sincerely,

KLEINSCHMIDT ASSOCIATES

Joel M. Christiansen
Project Manager

JMC:gls
cc: Peter Polshin
Service List

J:\044-01\P003-344-EA response.doc

Norwich-4 Please note that the instream flow study did not include flows of 100 cfs and 155 cfs at 48.9 or 48.3 feet. Through extrapolation of the available data, we conclude that at trigger elevation of 48.9 feet, with flows of 100 cfs would provide enhanced aquatic habitat throughout the bypassed reach below the dam by increasing wetted habitat.

Norwich-5 Our trigger elevation is not designed to protect the shoal area, but to provide enhanced aquatic habitat throughout the bypassed reach. We note that there are gaps in the available data and that you would have 3 years to install the downstream conduit through which the 100 cfs minimum flow would be provided. You have the opportunity to complete the instream flow study during this time period. If your field data makes a compelling case for adjusting the trigger elevation, the Commission could consider lowering the trigger elevation in a license amendment.

Norwich-6 Please see our response to Norwich-5.

Norwich-7 No response required.

OCCUM PROJECT
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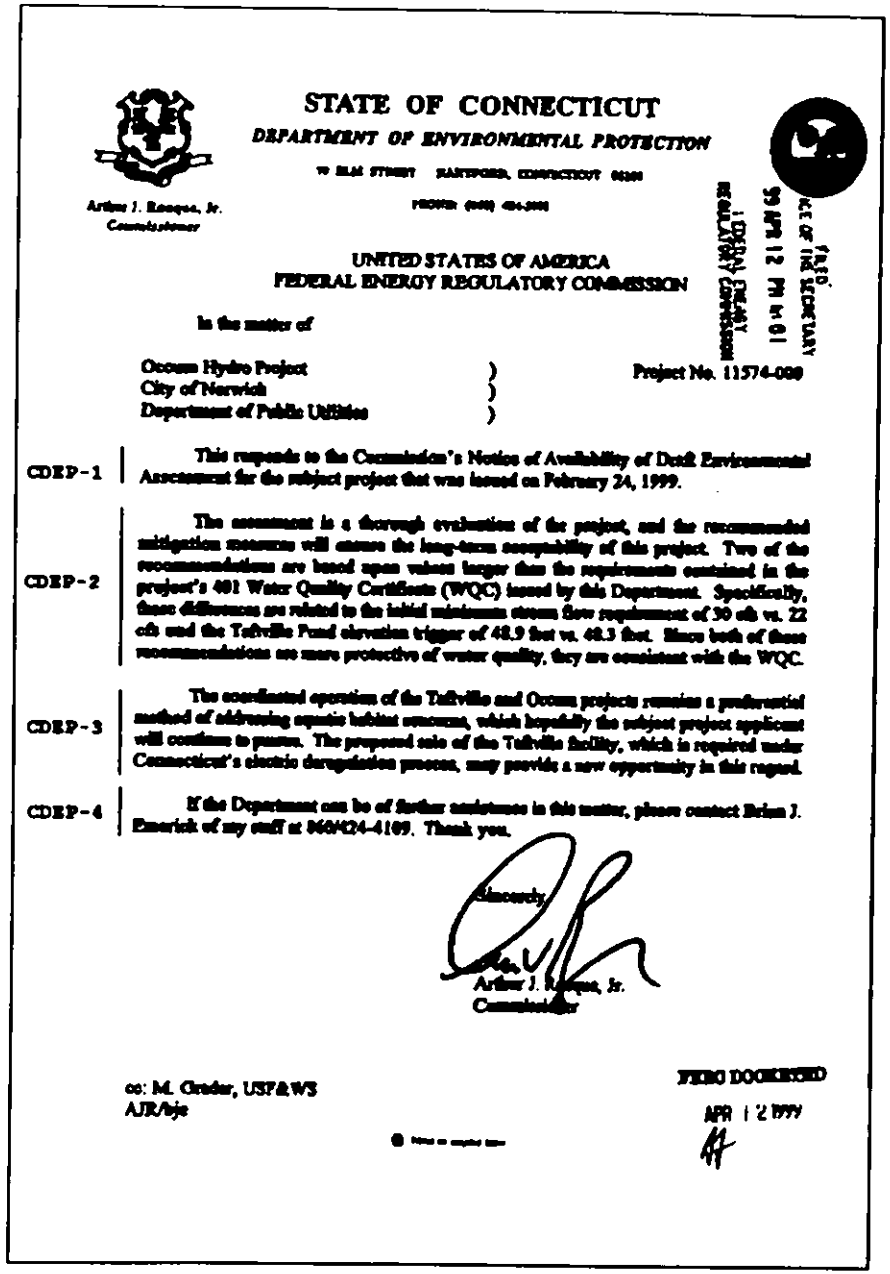
Revised 4/98



STATE OF CONNECTICUT

DEPARTMENT OF ENVIRONMENTAL PROTECTION

79 ELM STREET HARTFORD, CONNECTICUT 06106

PHONE (860) 424-3000

Arthur J. Rocque, Jr.
Commissioner

OFFICE OF THE SECRETARY
'99 APR 12 PM 4:01
FEDERAL ENERGY REGULATORY COMMISSION

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

In the matter of

Occum Hydro Project)
City of Norwich)
Department of Public Utilities)

Project No. 11574-000

CDEP-1 This responds to the Commission's Notice of Availability of Draft Environmental Assessment for the subject project that was issued on February 24, 1999.

CDEP-2 The assessment is a thorough evaluation of the project, and the recommended mitigation measures will ensure the long-term compatibility of this project. Two of the recommendations are based upon values longer than the requirements contained in the project's 401 Water Quality Certificate (WQC) issued by this Department. Specifically, these differences are related to the initial minimum stream flow requirement of 30 cfs vs. 22 cfs and the Taftville Pond elevation trigger of 48.9 feet vs. 48.3 feet. Since both of these recommendations are more protective of water quality, they are consistent with the WQC.

CDEP-3 The coordinated operation of the Taftville and Occum projects remains a preferential method of addressing aquatic habitat concerns, which hopefully the subject project applicant will continue to pursue. The proposed sale of the Taftville facility, which is required under Connecticut's electric deregulation process, may provide a new opportunity in this regard.

CDEP-4 If the Department can be of further assistance in this matter, please contact Brian J. Emerick of my staff at 860/424-4189. Thank you.

Sincerely,

Arthur J. Rocque, Jr.
Commissioner

cc: M. Grader, USF&WS
AJR/bje

FERC DOCKETED
APR 12 1999

Response to Comments
of the State of Connecticut
Department of Environmental Protection
on the Draft Environmental Assessment
for the
Occum Project
April 12, 1999

CDEP-1 No response required.

CDEP-2 We agree.

CDEP-3 Please see our response to Interior-8.

CDEP-4 No response required.

Form L-12
(October, 1975)

FEDERAL ENERGY REGULATORY COMMISSION

TERMS AND CONDITIONS OF LICENSE FOR CONSTRUCTED MINOR PROJECT AFFECTING THE INTERESTS OF INTERSTATE OR FOREIGN COMMERCE

Article 1. The entire project, as described in this order of the Commission, shall be subject to all of the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: Provided, however, That if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval a revised, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. The project area and project works shall be in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, there shall not be made without prior approval of the Commission any substantial alteration or addition not in conformity with the approved plans to any dam or other project works under the license or any substantial use of project lands and waters not authorized herein; and any emergency alteration, addition, or use so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in project works, or in uses of project lands and waters, or divergence from such approved exhibits may be made if such changes will not result in a decrease in efficiency, in a material increase in cost, in an adverse environmental impact, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct.

Article 4. The project, including its operation and maintenance and any work incidental to additions or alterations authorized by the Commission, whether or not conducted upon lands of the United States, shall be subject to the inspection and supervision of the Regional Engineer, Federal Energy Regulatory Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him such information as he may require concerning the operation and maintenance of the project, and any such alterations thereto, and shall notify him of the date upon which work with respect to any alteration will begin, as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall submit to said representative a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of any such alterations to the project. Construction of said alterations or any feature thereof shall not be initiated until the program of inspection for the alterations or any feature thereof has been approved by said representative. The Licensee shall allow said representative and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may prescribe from time to time for the protection of life, health, or property.

Article 5. The Licensee, within five years from the date of issuance of the license, shall acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for the construction maintenance, and operation of the project. The Licensee or its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights or occupancy and use; and none of such properties shall be voluntarily sold, leased, transferred, abandoned, or otherwise disposed of without the prior written approval of the Commission, except that the Licensee may lease or otherwise dispose of interests in project lands or property without specific written approval of the Commission pursuant to the then current regulations of the Commission. The provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear; and mortgage or trust deeds or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article.

Article 6. The Licensee shall install and thereafter maintain gages and stream-gaging stations for the purpose of determining the stage and flow of the stream or streams on which the project is located, the amount of water held in and withdrawn from storage, and the effective head on the turbines; shall provide for the required reading of such gages and for the adequate rating of such stations; and shall install and maintain standard meters adequate for the determination of the amount of electric energy generated by the project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission or its authorized representative. The Commission reserves the right, after notice and opportunity for hearing, to require such alterations in the number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, as are necessary to secure adequate determinations. The installation of gages, the rating of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of the project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision, or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient records of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 7. The Licensee shall, after notice and opportunity for hearing, install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so.

Article 8. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other projects or power systems and in such manner as the Commission may direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 9. The operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Commission may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes, and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Commission may prescribe for the purposes hereinbefore mentioned.

Article 10. On the application of any person, association, corporation, Federal agency, State or municipality, the Licensee shall permit such reasonable use of its reservoir or other project properties, including works, lands and water rights, or parts thereof, as may be ordered by the Commission, after notice and opportunity for hearing, in the interests of comprehensive development of the waterway or waterways involved and the conservation and utilization of the water resources of the region for water supply or for the purposes of steam-electric, irrigation, industrial, municipal or similar uses. The Licensee shall receive reasonable compensation for use of its reservoir or other project properties or parts thereof for such purposes, to include at least full reimbursement for any damages or expenses which the joint use causes the Licensee to incur. Any such compensation shall be fixed by the Commission either by approval of an agreement between the Licensee and the party or parties benefiting or after notice and opportunity for hearing. Applications shall contain information in sufficient detail to afford a full understanding of the proposed use, including satisfactory evidence that the applicant possesses necessary water rights pursuant to applicable State law, or a showing of cause why such evidence cannot concurrently be submitted, and a statement as to the relationship of the proposed use to any State or municipal plans or orders which may have been adopted with respect to the use of such waters.

Article 11. The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.

Article 12. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of the Licensee's lands and interests in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be reasonably prescribed by the Commission in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 13. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and for outdoor recreational purposes, including fishing and hunting: Provided, That the Licensee may reserve from public access such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property.

Article 14. In the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon the request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing.

Article 15. The Licensee shall clear and keep clear to an adequate width lands along open conduits and shall dispose of all temporary structures, unused timber, brush, refuse, or other material unnecessary for the purposes of the project which results from the clearing of lands or from the maintenance or alteration of the project works. In addition, all trees along the periphery of project reservoirs which may die during operations of the project shall be removed. All clearing of the lands and disposal of the unnecessary material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission and in accordance with appropriate Federal, State, and local statutes and regulations.

Article 16. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without adequate replacement, or shall abandon or discontinue good faith operation of the project or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address of the Licensee or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license. The Commission, after notice and opportunity for hearing, may require the Licensee to remove any or all structures, equipment and power lines within the project boundary and to take any such other action necessary to restore the project waters, lands, and facilities remaining within the project boundary to a condition satisfactory to the United States agency having jurisdiction over its lands or the Commission's authorized representative, as appropriate, or to provide for the continued operation and maintenance of nonpower facilities and fulfill such other obligations under the license as the Commission may prescribe. In addition, the Commission in its discretion, after notice and opportunity for hearing, may also agree to the surrender of the license when the Commission, for the reasons recited herein, deems it to be the intent of the Licensee to surrender the license.

Article 17. The right of the Licensee and of its successors and assigns to use or occupy waters over which the United States has jurisdiction, or lands of the United States under the license, for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless the Licensee has obtained a new license pursuant to the then existing laws and regulations, or an annual license under the terms and conditions of this license.

Article 18. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #2

AGENCY CONTACTS

BACKGROUND INFORMATION

Item 11: Please attach a list of contacts in the relevant Resource Agencies and in non-governmental organizations that have been involved in Recommending conditions for your Facility.

Stephen Gephard
Ct Department of Environmental Protection
Bureau of Natural Resources Inland Fisheries Division
P.O. Box 719
Old Lyme, CT 06371
(860) 447-4316
Email: steve.gephard@po.state.ct.us

Melissa Grader
US FWS/New England Field Office
c/o CT River Coordinator's Office
103 East Plumtree Road
Sunderland, MA 01375
413-548-8002, x124
Email: melissa_grader@fws.gov

David Poirier
The Connecticut Historic Commission
59 S. Prospect St
Hartford, CT 06106
(860) 566-3166
Email: Dave.Poirier@po.state.ct.us

Margaret Minor
Rivers Alliance of CT
P.O. Box 1797
West Street, 3rd Floor
Lichfield, CT 06759
860-361-9349
rivers@riversalliance.org

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #3

FACILITY DESCRIPTION

BACKGROUND INFORMATION

Item 12: Please attach a description of the Facility, its mode of operation (*i.e.*, peaking/run of river) and a map of the Facility

Facility Description:

The Occum 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. The unit has an installed capacity of 800 KW, at a flow capacity of 900 cfs and a normal net head of 13 ft.

Construction of the original stone and masonry dam was completed in the late 1860's. The dam was purchased by NPU in 1932 from a local manufacturing company. Construction of the powerhouse began in 1934 and included the installation of the 800 KW generating unit, which was placed on-line in April of 1937. 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 and is continuing to access the system's effectiveness.

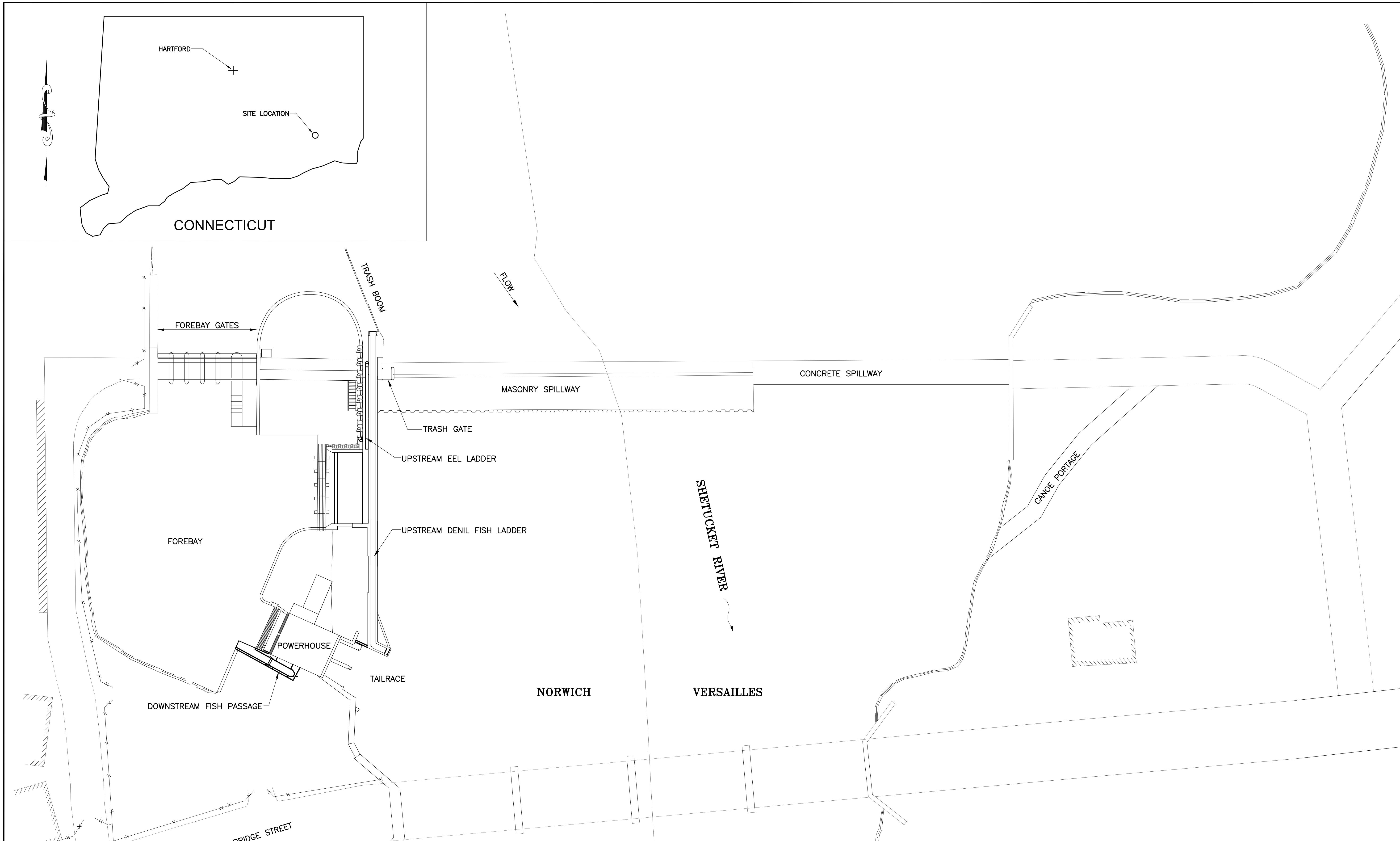
The downstream fish passage facilities is located immediately adjacent to the project's powerhouse and intake structure. The facilities generally consist of a 5 ft wide by 20 ft long concrete collection chamber, a 5 f wide by 7 ft high dual leaf downward opening flow control gate and a 26-inch diameter 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 and is continuing to access the system's effectiveness.

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 and has completed effectiveness testing requirements.

Project Operation

The Occum Project is operated primarily as a cycling facility and is dependent upon flows from the upstream Scotland Project (FERC No. 2662). The Scotland Project, owned and operated by First Light Energy, utilizes one turbine which has a normal discharge of 1200 cfs. During periods when river flow does not fully support the operation of the unit at the Scotland Project, the Scotland Project operates in a peaking mode and the impoundment is drawn down 2 ft via use of the unit. A minimum flow of 84 cfs is released at all times from the Scotland dam. The effect for the downstream Occum Project is an inflow which fluctuates greatly in magnitude. The resulting operation for the Occum Project is essentially pulsing. The Occum Project generates during the time period when 1200 cfs is being received from the Scotland Project and continues to operate after the Scotland Project ceases operation until the Occum headpond is drawn down approximately 2 ft. At that time the project is shut down, and does not begin to generate again until the next pulse of water from the Scotland Project has begun to fill the head pond. Travel time for water between the Scotland Project and the Occum Project is approximately two hours at the higher flow level.

The project is required to provide a minimum 30 cfs ,or inflow if less, bypass flow which may increase to 100 cfs depending upon the impoundment level of the downstream Taftville station. Approximately 10 cfs of leakage flow originates from the dam and unit with the remaining required flow being provided by the downstream fish passage or dam trash gate. During periods when the Taftville Project headpond is above elevation 48.3 ft (referenced to Taftville headpond gage), the Occum tailrace is backwatered. Below that level, an approximately 1000 ft long reach of river is exposed. When the Taftville headpond is drawn down below elevation 48.3', NPU is required to release a flow of 100 cfs, or inflow if less, below the powerhouse. The higher minimum flow release is provided through a combination of unit leakage, dam sluice gate and flows through the downstream fishway.



RenewablePower CONSULTING
P.O. Box 195
Palmyra, ME 04965
Telephone: (207) 992–3926
Email: info@renewablepowerconsulting.com

No.	Revision	Date	
			Project No: 601-007
			Filename: IMPOUNDMENT DWG
			Design By: AJN
0	ISSUED FOR LIHI APPLICATION	08/10/11	Drawn By: AJN
			Date Revised: 08-10-11

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NORWICH PUBLIC UTILITIES
NORWICH, CT

OCCUM DAM PROJECT
FERC NO. 11574-CT

GENERAL SITE PLAN

DRAWING NO.
LIHI

REVISION
0


Concrete Spillway
Masonry Spillway
Fish & Eel Ladders
Forebay
Powerhouse
Downstream Fish Passage
Baltic Rd
Baltic Rd
Church St
Main St
Bridge St
Occum
Occum Park
97
97
A

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #4

ITEM A: FLOW COMPLIANCE

94 FERC ¶ 62, 185
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

City of Norwich

Project No. 11574-001

ORDER MODIFYING AND APPROVING MONITORING PLAN REQUIRED BY ARTICLE 403

(Issued March 02, 2001)

City of Norwich (licensee) filed for Commission approval, on March 29, 2000, and supplemented on December 18, 2000, a monitoring plan required by Article 403 of the license for the Occum Project.[1] Article 403 requires the licensee to consult with the U.S. Fish and Wildlife Service (FWS) and the Connecticut Department of Environmental Protection (CDEP) and develop a plan to monitor project operation and maintain the operating requirements specified in articles 401 and 402. The project is located on the Shetucket River, in New London County, Connecticut.

Article 401 requires the licensee to limit the drawdown in the impoundment to two feet from the top of the flashboards or two feet below the masonry dam crest when the flashboards are not in place (no lower than elevation 64.1 feet NGVD). Article 402 requires the licensee to release a minimum of 30 cfs or inflow, whichever is less, through a combination of leakage and spillage when the project is not operating, and, following installation of the downstream fish bypass, a total of 100 cfs or inflow, whichever is less, through a combination of leakage, spill, and the downstream sluiceway when the project is not operating and the impoundment elevation at the downstream Taftville Project is below 48.9 feet NGVD. The project operates in a peaking mode relying on pulsed releases from the upstream Scotland Project (FERC No. 2662).

LICENSEE'S PLAN

The licensee proposes to monitor impoundment elevations in the project forebay using a pressure transducer on the east masonry forebay wall, upstream of the intake racks. Readings will be recorded hourly by project personnel using the existing SCADA system.

[1] 88 FERC ¶ 62,299 (1999).

The required minimum flow will be released through the forebay sluice and/or over the spillway, prior to installation of the downstream fish passage facility.[2] When the forebay is dewatered, the unit will be off-line and all flow will be passed over the spillway. The licensee states changes in impoundment elevation limit the amount of flow released through the forebay sluice to a greater extent than originally assumed. Therefore, until such time that the downstream fish passage facility is operational, the licensee proposes to restrict impoundment elevations, more so than that required by article 401, in order to provide the required flow. The licensee plans to maintain impoundment elevations to within 0.77 foot from the top of the flashboards when in place (at an approximate impoundment elevation of 65.33 feet NGVD) until such time that the downstream fish passage facility is functional. Following the installation of the downstream fish passage facility, which will provide another means of releasing additional water, the operating range specified in Article 401 will be maintained. Calculations were provided with the plan that indicates an impoundment elevation maintained to within 0.77 feet from the top of the flashboards would provide enough head to release the required minimum flow through the forebay sluice and from leakage. The licensee provided the results of a recent leakage study (leakage flows were estimated to be approximately 8-9 cfs in August 2000).

Flashboards at the project consist of a lower support section, approximately 9 inches high, and an upper 12-inch high board section. The licensee states that loss of the upper board section can occur without loss of the lower section. During periods when the both sections are out, the licensee plans to maintain the impoundment elevation at 64.45 feet NGVD, providing a minimum of 1.2 inches of spill over the spillway. If the lower support section remains in place, the licensee states the impoundment elevation will be maintained at or above 65.15 feet with the minimum flow released through the forebay sluice and over the top of the timber supports. Calculations were provided to verify that at these impoundment elevations, the minimum flow would be maintained.

[2] Article 406 requires the licensee to develop a plan and schedule for the operation, maintenance, and monitoring of a downstream fish passage facility. This plan was filed with the Commission on September 29, 2000, and is currently under review. Article 403 specifies that the facility be installed by September 2002.

Following installation of the downstream fish passage facility, the licensee plans to release the required minimum flow (minus leakage) through the facility in the event the project is not operating and the impoundment of the Taftville Project is 48.9 feet NGVD, as required by Article 402. Monitoring of the downstream impoundment elevation will be through the use of a pressure transducer in the Taftville impoundment connected to the licensee's SCADA system. The licensee plans to determine the settings necessary to release the required flow through the facility during the final design stage of the facility. The licensee states that two settings will be established for the fish passage system and will be based on calculations of the size of the opening necessary to provide the required spill with the impoundment drawn down two feet below the top of the flashboards or two feet below the masonry dam crest. Either setting will provide more than the required spill when the reservoir is above these minimum elevations.

In the event of flashboard failure, the licensee states an interruption in flow may occur during flashboard maintenance or replacement. During this type of maintenance, the licensee plans to draw down the impoundment to approximately one foot below the dam crest. Depending on flow during the maintenance, unit operation will be maintained to prevent dewatering of the downstream reach during the drawdown and refill. If inflow is not sufficient to maintain operation and a minimum flow interruption occurs, during flashboard maintenance or any other time, the licensee plans to notify the Commission within ten days, as required by Article 402.

The licensee plans to provide flow and operating data to the FWS, National Marine Fisheries Service (NMFS), U.S. Geological Survey, or the CDEP within 30 days of any agency request. The licensee plans to install the monitoring equipment in the first full construction season following Commission approval of the plan.

AGENCY COMMENT

By letter dated March 17, 2000, the FWS commented on the proposed plan. The CDEP did not provide written comments on the plan.

At the time of the FWS's March 17 letter, the licensee had not verified the quantity of leakage at the project. In August 2000, the licensee performed the requested study thereby making many of the specific comments regarding FWS's recommended impoundment elevations moot.

When flashboard maintenance is necessary, the FWS recommends that the licensee coordinate their maintenance needs with the downstream project so that maintenance can occur when the downstream impoundment is at full pond in order to maximize

backwatering effects. The licensee states they will attempt to do so, but since it has no control over elevations at the downstream project, the licensee cannot guarantee it.

DISCUSSION

The licensee proposes to further restrict impoundment elevations until such time that a downstream fish passage facility is constructed. The licensee proposes the minimum impoundment elevations necessary to maintain the required flow are the following: (1) 65.33 feet NGVD when the flashboards (both upper and lower sections) are in place with all flow released through the forebay sluice; (2) 65.15 feet NGVD when just the lower flashboard section is in place with flow released through the forebay sluice and over the top of the lower flashboard support section; and (3) 64.45 feet when both sections of flashboards are removed with all flow released via the spillway. At these impoundment elevations, the licensee assumes a leakage rate of 8-9 cfs.

Article 403 specifies the monitoring plan include provisions to monitor impoundment surface elevation, tailwater elevations, and minimum flows released, to include use of the planned fish passage facility. The licensee's plan includes provisions to directly monitor impoundment surface elevations and the elevation of the downstream impoundment. Minimum flows will be documented through impoundment elevations and forebay sluice settings until such time that the downstream fish passage facility is operational. Calculations to determine the actual settings for releases through the downstream fish passage facility are expected to be included in the detailed design drawings that are required by Article 303.

While we recognize the licensee has no control over the operation of the downstream project, flashboard repair should be planned while the downstream impoundment is at full pond to the extent practicable, as recommended by the FWS. So that the Commission can monitor compliance with articles 401 and 402, the licensee should report any deviations from those requirements to the Commission within 30 days of the incident. We conclude the licensee's monitoring plan with this modification, is adequate to ensure compliance with the operating requirements of the project license and should be approved.

The Director orders:

(A) The licensee's operation and monitoring plan, filed with the Commission on March 29, 2000, and supplemented on December 18, 2000, as modified in paragraphs (B) and (C), is approved.

(B) If the minimum flow, as measured by the approved gages, falls below 30 cfs, or inflow (or 100 cfs, or inflow, after installation of the downstream fishway), as required by Article 403, or if the reservoir elevation deviates from the requirements of Article 401 (or the interim operating range described here prior to installation of the downstream fishway), the licensee shall file a report with the Commission within 30 days of the incident. The report shall, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report shall also include: 1) operational data necessary to determine compliance with Articles 401 and 402; 2) a description of any corrective measures implemented at the time of occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and 3) comments or correspondence received from the resource agencies regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission reserves the right to require modifications to project facilities and operations to ensure future compliance.

(C) Unless otherwise directed in this order, the licensee shall file seven copies of any filing required by this order with:

The Secretary
Federal Energy Regulatory Commission
Mail Code: DHAC, PJ-12.3
888 First Street, NE
Washington, DC 20426

In addition, the licensee shall serve copies of these filings on any entity specified in this order to be consulted on matters related to these filings. Proof of service on these entities shall accompany the filings with the Commission.

(D) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to CFR § 385.713.

George H. Taylor
Group Leader
Division of Hydropower Administration
And Compliance

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #5

WATER QUALITY

BACKGROUND INFORMATION

Item B:

1) Is the Facility either:

   a) In Compliance with all conditions issued pursuant to a Clean Water Act Section 401 water quality certification issued for the Facility after December 31, 1986? Or

   b) In Compliance with the quantitative water quality standards established by the state that support designated uses pursuant to the federal Clean Water Act in the Facility area and in the downstream reach?

Water quality in the Shetucket River in the vicinity of the project is identified as Class B by the CDEP Water Management Bureau. According to Connecticut Water Quality Standards, Class B waters have a minimum dissolved oxygen concentration of 5 mg/l and temperature can deviate above ambient conditions by 4 degrees F. Water quality should be suitable for recreational use, fish and wildlife habitat, agricultural, industrial supply and other legitimate uses including navigation.

In general, the CDEP's main water quality concern for the Shetucket River is the occurrence of seasonal algal blooms. The CDEP collected data in the 1991 and 1992 summer months for the purpose of creating an eutrophication control plan. These data show that the Shetucket River in the vicinity of Occum (one sample location approximately 2.5 miles upstream of the dam and one sample location less than 1,200 ft downstream of the dam) exceeds the established water quality standards for algae concentrations.

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #6

FISH PASSAGE

BACKGROUND INFORMATION

Item C: Is the Facility in Compliance with *Mandatory Fish Passage Prescriptions* for upstream and downstream passage of anadromous and catadromous fish issued by Resource Agencies after December 31, 1986?

The project is equipped with upstream and downstream fish passage facilities and an upstream eel ladder system. Refer to the following FERC approval orders for confirmation that the facilities have fulfilled the resource agencies' requirements.

ORIGINAL

FEDERAL ENERGY REGULATORY COMMISSION
DIVISION OF HYDROPOWER ADMINISTRATION AND COMPLIANCE
TELEPHONE CONVERSATION AWARD

Date: June 29, 2004
Time: 4:15 p.m.

Call by: Melissa Grader, U.S. Fish and Wildlife Service
Answer by: Robert Grieve, Commission staff

Project No.: P-11574, Occum Project

Subject Discussed: Status of approval of final fish passage plan

SUMMARY OF TELEPHONE CONVERSATION

Ms. Grader , U.S. Fish and Wildlife Service (FWS), called to inform Commission staff that the FWS concurs with the final Occum fish passage plan, filed on June 7, 2004.

UNITED STATES OF AMERICA 108 FERC ¶ 62,115
FEDERAL ENERGY REGULATORY COMMISSION

City of Norwich Project No. 11574-013

ORDER MODIFYING AND APPROVING FISH PASSAGE PLAN UNDER ARTICLES 405 AND 406

(Issued August 3, 2004)

City of Norwich (licensee) filed on June 7, 2004, a plan for the installation, operation, maintenance, and monitoring of upstream and downstream fish passage facilities at the Occum Project. This plan is required by articles 405 and 406 of the project license.[1] The Occum Project is located on the Shetucket River in Norwich, New London County, Connecticut.

Article 405 requires the licensee to consult with the U.S. Fish and Wildlife Service (FWS), the Connecticut Department of Environmental Protection (CDEP), and the State Historic Preservation Office (SHPO) and develop a final plan to install, operate, maintain, and monitor the effectiveness of a Denil ladder in providing upstream fish passage. Article 406 requires the licensee to consult with the same agencies and develop a final plan to install, operate, maintain, and monitor the effectiveness of downstream fish passage facilities.

BACKGROUND

The licensee originally filed a downstream fish passage plan with the Commission on September 29, 2000. This plan was approved by the Commission on March 23, 2001. As required by article 406, installation of the downstream fish passage facilities was scheduled to be completed by September 2002.

Following approval of the plan, the licensee began to consult with the FWS and CDEP to install and operate both upstream and downstream fish passage facilities at the project by April 2005. The licensee reasoned that the concurrent installation of both upstream and downstream facilities would be more cost-effective than separate installations. The licensee requested an extension of time to install the downstream facilities and an extension of time to file the related fish passage filings. The Commission granted the licensee's request in the unpublished Order Granting Extensions of Time under Articles 303, 405, and 406, issued on December 14, 2001.[2] The licensee

[1] 88 FERC ¶ 62,249 (1999).

[2] This order extended the due dates for filing the upstream and downstream fish passage plans to September 28 and 30, 2003, respectively.

filed another request for extension of time on April 19, 2004. This request was granted by unpublished order dated May 3, 2004.

The original downstream fish passage facility consisted of a 6 foot wide by 25 feet long entrance channel adjacent to the powerhouse, a 15 feet long collection chamber, and a pipe that would bring fish just beyond the project tailrace.

LICENSEE'S PROPOSED PLANS

Proposed facilities

For downstream passage, the licensee proposes a 5-foot wide concrete entrance channel approximately 16 feet in length, leading to a collection chamber and buried pipe (either galvanized steel or high density polyethylene pipe) approximately 60 feet in length. The facility will be located adjacent to the powerhouse. Construction will necessitate the removal of portions of the forebay masonry wall, and tailrace masonry wall.

Flow will be controlled at the entrance by either timber planks or a vertical slide gate. The bypass system invert will be set to allow a minimum of 45 cubic feet per second (cfs) through the facility at the lowest allowable impoundment level (i.e., 62.3 feet m.s.l.). During the migration period (approximately June-mid July and September-mid November), flow through the facility will be 45 cfs. During other times, a portion of the required minimum flow may be released through the facility.[3]

The licensee notes that exclusion devices to deter turbine entrainment, as required by article 406, are not proposed at this time. Based on the results of the effectiveness study for downstream passage, such devices may be installed if deemed warranted. The type of device to be installed will be determined in consultation with the FWS and CDEP and additional testing is planned to determined subsequent effectiveness.

During periods when the impoundment level is below 64.6 feet NGVD, the licensee states that there is an increased risk of impingement during full generation when approach velocities exceed 2 feet per second, the FWS's recommended criteria. Under these conditions, the licensee plans to reduce the wicket gate opening to 82 percent, thereby reducing flow through the unit.

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[3] Following installation of the downstream fish passage facility, article 402 of the license requires the release of 100 cfs or inflow, whichever is less, through a combination of leakage, spillage, and the downstream sluiceway when the project is not operating and the impoundment elevation at the downstream Taftville Project is below 48.9 feet NGVD.

For upstream passage, the licensee plans to install a Denil ladder as required by article 405. The ladder will be installed along the western shore of the bypassed river reach and will extend from the dam to the tailrace, adjacent to existing masonry structures associated with the powerhouse and forebay. A four-foot wide trash sluice will abut the eastern wall of the new fish ladder. A viewing window is planned near the fish ladder exit. The licensee indicates that approximately 4-5 feet of sediment will be removed in the area of the ladder's exit. In addition, the drawings filed with the plan indicate that some modifications to the existing forebay spillway will be necessary.

The licensee also plans to install upstream eel passage at the project. The eel ladder will be located between the proposed Denil ladder and the existing dam abutment. The proposed eel ladder will be constructed of an aluminum rectangular covered flume with a roughened bottom. Two entrances are proposed, one at the dam toe and one at the dam apron. A submersible pump will be used to supply water through the eel ladder. The section of dam flashboards immediately upstream of the eel ladder will be raised to avoid migrants being swept downstream during periods of spill.

Operation and Maintenance

The licensee plans to operate the downstream fish passage facility from June-mid July for passage of spent adult clupeids and from September to mid-November to pass juvenile clupeids and eels. The upstream fish passage facility will be operated from April 1 through mid-July for American shad, alewives, and blueback herring, and from October to mid-November for searun brown trout. The eel ladder will be operated from April to mid-November. Adjustments to this schedule may be made based on experience passing migrants at the project.

The licensee states that an operator visits the project three times a week during unit operation and a minimum of once a week when the project is off-line. During these visits, the operator will check the upstream and downstream fish passage facilities for debris, proper gate adjustment, cleaning of the trashracks, baffles, and pump operation (for the eel ladder).[4] Additional inspections of the facilities are planned following storm events and during the changing of video tapes for passage through the Denil ladder.

Annual maintenance checks will include dewatering of the structures, if necessary, to remove accumulated debris and to check structure integrity. The flow control stop logs or gates (if installed) will also be inspected annually or more frequently if warranted. Gate maintenance, if gates are installed, will include an annual inspection and the

[4] The licensee notes that the project is equipped with a trashrack head differential sensing system. In the event of excessive head differential across the racks, an operator is dispatched to the project to clean the trashracks.

application of lubricants and visual inspection of the stem, drive bushing seals, and gate seals.

Effectiveness Testing

To assess the effectiveness of the downstream fish passage facility, the licensee plans to conduct a mark-recapture study. The licensee plans to release approximately 500 juvenile clupeids upstream of the dam and upstream of the project's intake within the forebay area. The study will be scheduled to coincide with peak downstream movement of juvenile clupeids (mid-September to October). Test fish will be obtained from the downstream Greenville Project (FERC No. 2441) or an alternate location.

Test fish will be transported to the project and held for 24 hours in four 500-gallon holding tanks supplied with a continuous flow of ambient river water. After the holding period, healthy fish will be marked using fin clipping, streamer tags, or dye. The appropriate method of marking the fish will be determined in consultation with the CDEP and FWS. A minimum of 50 control fish will be marked and held in the tanks to assess any mortality associated with marking and handling the fish. The condition of control fish will be assessed daily for 72 hours.

Test fish will be released in two groups. The first group consisting of 300 test fish will be released in the project forebay area immediately downstream of the forebay intake gates. The second group of 200 fish will be released at a point at least 500 feet upstream of the dam during a non-spill period and after recovery of the first group. A collection net will be installed within the downstream fish passage collection chamber. The net will be checked every 1-2 hours during testing to allow for the recapture of the test (during which time flows will be temporarily reduced). Collection of fish will continue until the majority of test fish have emigrated out of the project area. Bypass effectiveness will be determined as:

> Percent Effectiveness= 100 * number of test fish using the downstream bypass/number of test fish released

A report on the results of the study will be prepared and submitted to the resource agencies for comment prior to filing the report with the Commission. If results indicate that effectiveness is low, the licensee plans to consult with the DEP and FWS to determine appropriate devices to minimize entrainment at the project and conduct a second phase of effectiveness testing similar to that described above.

Effectiveness of the Denil ladder in providing upstream passage will be assessed in two phases: the first phase will identify any deficiencies of the ladder and, if necessary, a second phase will involve a mark recapture study to quantify the effectiveness.

Phase 1 is planned for the first spring that the fishway is operational and will include a qualitative assessment of the fishway and attraction flows. The licensee will monitor whether the facility is attracting fish and successfully passing them in appreciable numbers for two years using video and visual observations. Monitoring will be conducted twice a week from April through mid-July and from October through mid-November. Data collected at the project will be compared to other facilities on the Shetucket River, i.e., the downstream Greenville and Taftville Dams.[5] Annual reports will be prepared by the licensee. If after consultation with CDEP and FWS, it is determined the effectiveness of the facility is unacceptable, the licensee plans to conduct a mark-recapture study to further quantify use of the facility. The study, in brief, will use 100 adult American shad released approximately 100 yards downstream of the fishway and will be similar to that conducted to assess the effectiveness of the downstream facility. A report will be prepared and submitted to the resource agencies prior to filing with the Commission.

For eel passage, the licensee plans to follow the recommendations made by the CDEP. Specifically, the licensee plans to install a collection tank at the eel passage exit to capture all eels ascending the ladder. Captured eels will be removed from the tank one-three times per week, depending upon the number of eels collected. Captured eels will be categorized according to size and then released into the impoundment. The licensee plans to evaluate eel passage for three years. Data will be compared to other facilities on the Shetucket River. The licensee plans to provide the results of the evaluation to CDEP for consultation on the rate and effectiveness of passage.

Schedule

The licensee proposes to install the facilities upon Commission approval and have both the upstream and downstream facilities operational by spring 2005. Construction is planned to continue through February 2005. Testing of the downstream facilities will begin in September 2005. Phase 1 of upstream fish passage effectiveness testing is planned for the first spring the ladder is operation, i.e., 2005 and continue through 2007. Eel passage monitoring will continue through 2008.

AGENCY COMMENT

The CDEP and FWS provided comments on the licensee's plan by letters dated May 24 and 25, 2004, respectively. In its filing with the Commission, the licensee stated the majority of the comments have been incorporated into the plan. The two exceptions

[5] The Taftville Project is an unlicensed project located about 2 miles downstream of the Occum Project. The Greenville Project (FERC No. 2441) is located about 5.1 miles downstream of the Occum Project and is the first dam on the Shetucket River.

included the FWS's recommendations to increase the size of the pipe used for the downstream fish passage facility to 30 inches and increase the size of the viewing chamber to 6.0 feet from the window to ensure capture of the entire water column.

In response, the licensee states the 24-inch pipe previously proposed could not supply the 45 cfs attraction flow whenever pond levels were lower than elevation 63.1 feet NGVD. The licensee therefore proposes to increase the diameter of the pipe to 26 inches, as well as reduce the gate sill invert to permit passage of 45 cfs flow when the impoundment level is at the lower end of the allowed operating range. Regarding the viewing chamber size, the licensee states that the proposed 5.5 feet distance from the viewing window should be sufficient to capture the entire water column. Further, the licensee cannot extend the camera chamber due to the additional projection in the waterway. Subsequently, in a phone conversation with Commission staff, the FWS stated that it concurred with the licensee's proposed plan.[6]

The SHPO commented on the proposed plan by letter dated April 2, 2004. In its April 2 letter, the SHPO stated that the proposed undertaking is consistent with the project's approved cultural resource management plan and that it supports the licensee's proposed plan for upstream and downstream fish passage facilities at the project.

DISCUSSION

The downstream fish passage facility will be located adjacent to the powerhouse and consist of a 5-foot wide by 16 foot long concrete entrance channel leading to a collection chamber and buried pipe approximately 60 feet in length. Upstream fish passage will be provided via a Denil ladder that extends along the masonry structures associated with the powerhouse and forebay spillway. The proposed facilities, operation plan, and effectiveness studies have the support of the FWS and CDEP.

Commission staff notes that the licensee's plan did not include a provision to install a perforated plate with 1-inch diameter holes over the intake structure during the fall, as required by article 406.[7] This measure was originally proposed by the licensee in its license application and subsequently incorporated into the license. We agree with the proposed approach to evaluate the effectiveness of the facility without the overlay to ascertain whether it is needed. If effectiveness is low, installation of the overlay may be necessary to improve the facility's efficiency at passing downstream migrants. We also acknowledge FWS's concerns regarding the netting of juvenile clupeids within the collection chamber of the downstream fish passage facility during the effectiveness study.

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[6] Phone conversation between Melissa Grader, FWS staff, and Robert Grieve, Commission staff on June 29, 2004.

[7] A perforated plate overlay was not proposed in the original downstream fish passage plan submitted to and approved by the Commission in its March 23, 2001 order.

The licensee is assuming some risk in placing a net at this location for two reasons. First, there is an increased risk of mortality netting test fish at this location. Secondly, the results of the study may be inconclusive because of this potential mortality. As FWS noted, and Commission staff agrees, inconclusive results may necessitate additional study.

According to the licensee's proposed schedule, initial downstream fish passage effectiveness will be completed in 2005, while studies on initial upstream passage will be completed in 2007. Eel passage effectiveness monitoring will continue through 2008. Annual summary reports to the agencies are proposed for the results of the upstream passage effectiveness study. Since effectiveness studies collectively will not be complete until late fall 2008 at the earliest, we will establish separate due dates for filing the final reports with the Commission. The licensee should file the results of the: (1) downstream fish passage effectiveness study by March 31, 2006; (2) upstream fish passage effectiveness study by March 31, 2008; and (3) eel passage effectiveness study by March 31, 2009. These reports should include recommendations, for Commission approval, on changes to facility structures or operation to improve effectiveness.

Detailed plans and specifications, along with a temporary emergency action plan, soil erosion and sediment control plan, and a quality control inspection plan were filed with the Commission's Division of Dam Safety and Inspections-New York Regional Office on May 10, 2004, as required by articles 303 and 404 of the license, and are currently under review. Commission staff notes here that construction may not commence until authorized by the Regional Engineer.

The licensee's fish passage plan provides for upstream and downstream fish passage facilities as required by articles 405 and 406 of the license. This plan meets the intent of the articles and should be approved.

The Director orders:

(A) The licensee's fish passage plan, filed on June 7, 2004, as modified in paragraphs (B) and (C), is approved.

(B) The licensee shall file reports with the Commission describing the results of the downstream fish passage, upstream fish passage, and upstream eel passage effectiveness studies by March 31, 2006, March 31, 2008, and March 31, 2009, respectively. The reports shall include, but not be limited to, estimates on the effectiveness of the facilities and a description of any problems associated with successful passage. The licensee's reports shall include recommendations, for Commission approval, on changes to facility structures or operation to improve passage effectiveness.

Prior to filing the reports with the Commission, the licensee shall submit the report to the U.S. Fish and Wildlife Service and Connecticut Department of Environmental Protection for comment. Each agency shall be given 30 days to comment. The licensee's filing shall include agency comments and the licensee's response to agency comments. Based on the Commission's review of the report, the Commission shall reserve the right to require modifications to project facilities and operations to ensure successful upstream and downstream passage.

(C) Unless otherwise directed in this order, the licensee shall file an original and eight copies of any filing required by this order with:

The Secretary
Federal Energy Regulatory Commission
Mail Code: DHAC, PJ-12.3
888 First Street, NE
Washington, DC 20426

In addition, the licensee shall serve copies of these filings on any entity specified in this order to be consulted on matters related to these filings. Proof of service on these entities shall accompany the filings with the Commission.

(D) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days from the date of issuance of this order, pursuant to 18 CFR § 385.713.

George H. Taylor
Chief, Biological Resources Branch
Division of Hydropower Administration
and Compliance

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #7

CULTURAL RESOURCE PROTECTION

BACKGROUND INFORMATION

Item F**:** If FERC-regulated, is the Facility in Compliance with all requirements regarding Cultural Resource protection, mitigation or enhancement included in the FERC license or exemption?

The project is subject to the provisions of an approved Cultural Resource Management Plan (CRMP). A copy of the FERC order approving the CRMP is provided below.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

City of Norwich, Connecticut — Project No. 11574-006

ORDER APPROVING CULTURAL RESOURCE MANAGEMENT PLAN (ARTICLE 408)
(Issued August 30, 2001)

On June 20, 2001, the City of Norwich, Connecticut (City or licensee) filed a cultural resource management plan (CRMP or plan) for the Occum Project, FERC No. 11574, located on the Shetucket River in New London County, Connecticut. The plan was filed pursuant to article 408 of the license issued on September 1, 1999.[1] Article 408 requires the licensee to implement the Programmatic Agreement (PA) executed on September 16, 1999.[2]

LICENSEE'S PLAN

The licensee described the historic properties at the project and included copies of the National Register of Historic Places Registration Forms. As a working hydroelectric project, the Occum Project will be operated under the "continuance of use" concept. The licensee will maintain the project with in-kind replacements wherever feasible and reasonable. Any maintenance activities that require new structural features will trigger consultation with the CtSHPO. The licensee will also consult with the CtSHPO during any ground disturbing activities and will avoid historic properties when possible. The licensee included its procedures should any unanticipated discoveries of historic properties or human remains occur during the course of maintenance or operation of the project. It also included its procedures for establishing a public interpretive program in which it will provide access to the site during Archeology Awareness Week.

CONSULTATION

The licensee prepared the CRMP in consultation with the CtSHPO and incorporated its comments into the final CRMP. Pursuant to Stipulation II. B. of the PA, the Commission staff requested concurrence from the Council in a letter dated

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[1] 87 FERC ¶ 62,262

[2] The PA was executed among the Commission, the Advisory Council on Historic Preservation (Council), and the Connecticut State Historic Preservation Officer (CtSHPO).

August 3, 2001. No comments were filed.

DISCUSSION AND CONCLUSION

The CRMP addresses protection of historic properties at the project. The licensee has established guidelines for consultation with the CtSHPO to ensure the historic properties are protected and, if and when changes are necessary, appropriate actions are taken. The CRMP meets the requirements of article 408 and should be approved.

The licensee is reminded that pursuant to Stipulation II. D. of the PA, it must file with the CtSHPO on every anniversary of the license issuance date, a report of activities conducted under the implemented PA. The first report is due September 1, 2002.

The Director orders:

(A) The Cultural Resources Management Plan for the Occum Hydroelectric Project, filed on June 20, 2001, pursuant to article 408, is approved.

(B) This order constitutes final Commission action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 C.F.R. § 385.713.

John E. Estep
Division of Hydropower Administration
and Compliance

OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT #8

RECREATION

BACKGROUND INFORMATION

Item G**:** If FERC-regulated, is the Facility in Compliance with the recreational access, accommodation (including recreational flow releases) and facilities conditions in its FERC license or exemption?

The project is subject to the provisions of an approved recreational plan and has installed a canoe portage at the site. A copy of the FERC order approving the portage and confirmation of completion is provided below.

UNITED STATES OF AMERICA93 FERC ¶ 62,096
FEDERAL ENERGY REGULATORY COMMISSION

City of Norwich, Department of

Project No.
11574-003

Public Utilities

ORDER APPROVING CANOE PORTAGE PLAN UNDER ARTICLE 409

(Issued November 08, 2000)

On September 29, 2000, the City of Norwich, Department of Public Utilities (Norwich or licensee), licensee for the Occum Project (FERC No. 11574), filed a plan for installing a canoe portage pursuant to article 409 of the project license. [1] The project is located on the Shetucket River in New London County, Connecticut.

BACKGROUND

License article 409 requires the licensee, within one year of the date of issuance of the project license, to file with the Commission for approval a final plan for providing a canoe portage around the project dam. According to the article, the plan must include: (1) a schedule for construction and operation of the portage; (2) a description of how the needs of the disabled were considered in designing the portage facilities; (3) a final site plan for the portage; and (4) a description of directional signage to be installed for the portage. Also, article 409 states that the final plan must include erosion control measures as required under license article 404.

Article 409 requires the licensee to prepare the plan after consultation with the U.S. Fish and Wildlife Service (FWS), the Connecticut Department of Environmental Protection (CDEP), and the State Historic Preservation Officer (SHPO). The licensee must include with the plan documentation of consultation, copies of agency comments and recommendations on the completed plan, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must give the consulted agencies a minimum of 30 days to comment and make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project-specific information.

[1] See 88 FERC ¶ 62,299 (issued September 29, 1999).

DESCRIPTION OF PLAN

Norwich proposes to improve the existing informal canoe portage around the project dam along the east shore between a point immediately upstream of the project's boat restraint barrier (about 75 feet upstream of the dam) and a point about 150 feet downstream of the dam (about 100 feet upstream of Bridge Street). From the canoe take-out site, the portage trail would cross an existing graveled and vegetated area to the access drive for the dam. After crossing the access drive, the trail would traverse the downstream side of the access drive embankment, with a portion of the path running in a parallel alignment with the embankment. The canoe put-in site would be protected with riprap to prevent bank erosion during dam discharges to the tailwater.

Existing vegetation would be cleared a minimum width of four feet along the trail route, and the minimum four-foot-wide trail would be surfaced with gravel. Directional signage would be placed at both ends of the pathway and near its intersection with the dam access drive.

Norwich contacted the Connecticut Department of Parks and Recreation regarding the applicability of federal Americans with Disabilities Act (ADA) guidelines for the portage. The licensee also reviewed accessibility guidelines from other sources, including state criteria, guidelines from the National Center on Accessibility, and the Final Report of the Regulatory Negotiation Committee on Accessibility Guidelines for Outdoor Developed Areas. Consistent with these guidelines, the proposed portage path's gradient would be limited to 12 percent where feasible, and would not exceed 18 percent at any point. The licensee states that using a flatter gradient than proposed would result in the portage trail extending onto properties not owned by Norwich.

Appendix A of the filing contains a detailed description of the measures that would be taken to control soil erosion and stream sediment during various phases of portage installation. Construction activities covered in the description include site preparation; excavation and backfill; borrow, stockpile, and disposal of unsuitable materials; landscape planting; sign installation; and inspection and maintenance. Temporary control measures would include silt fences, dikes, hay bale berms, and mulching. Permanent measures would include revegetating, graveling, and riprapping of all disturbed ground areas.

Appendix B of the filing consists of two site plan drawings for the portage. One of the drawings shows the proposed general arrangement of the portage in relation to existing project features; the other contains a detailed layout plan for the portage facilities, a typical cross section of the portage trail, and design specifications for the portage signs.

The licensee states that the portage facilities would be completed no later than the first full construction season following Commission approval of the plan.

CONSULTATION

A draft of the portage plan was submitted to the FWS, the CDEP, and the SHPO on September 7, 2000. In an e-mail dated September 15, 2000, the FWS informed the licensee it had no comments on the proposed portage. By letter dated September 25, 2000, the CDEP states that the proposed portage facility is adequate and will improve the ability of recreational boaters to move through the project area. In a letter dated September 8, 2000, the SHPO states that the proposed portage would have no effect on any properties listed or eligible for listing on the National Register of Historic Places.

DISCUSSION

According to the licensee, the project impoundment and tailwaters currently receive light boating pressure, with some canoe traffic occurring on the river. The licensee's plan for enhancing the project's existing informal canoe portage will achieve the purpose of providing a safe and clearly marked passage around the dam for canoeists.

Based on our review of the filing, we find that all the requirements of license article 409 have been adequately met. We also find the proposed implementation schedule for the plan to be reasonable. The proposed canoe portage plan should be approved.

The Director orders:

(A) The canoe portage plan filed on September 29, 2000 by the City of Norwich, Department of Public Utilities for the Occum Project (FERC No. 11574), as required by license article 409, is approved and made a part of the project license.

(B) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days from the date of this order pursuant to 18 CFR § 385.713.

John E. Estep
Division of Hydropower
Administration and Compliance

Norwich Public Utilities

TRUSTED FOR GENERATIONS

April 10, 2002

Mr. Anton Sidoti
Regional Director
Federal Energy Regulatory Commission
New York Regional Office
19W 34th Street Suite 400
New York, NY 10001

Reference: Occum Dam Canoe Portage
Sprague, CT
FERC No. 11574

Dear Mr. Sidoti,

The purpose of this letter is to provide final notification that the Occum Dam Canoe Portage project has been completed. As discussed in my previous letter, dated December 19, 2001, we have performed an inspection and there was no significant erosion or damage to the portage path or surrounding areas since the installation last year. Upon completion of seeding and silt fence removal later this month, the project will be complete.

If you have any questions or comments, please feel free to contact me at (860) 823-4119.

Mark D. Greene
Utility Engineer

cc: C. Berger - Director, CT DEP Inland Water Resources Division
P. Cipriani - Chairman, Sprague Inland Wetlands & Conservation Commission
C. LaRose - Operations Integrity Manager, Norwich Public Utilities
L. Sullivan - P.E., CLA Engineers

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