FINAL
ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Oswego River Project
FERC No. 2474-004
New York

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Environmental and Engineering Review
888 First Street, N.E.
Washington, DC 20426

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ACRONYMS AND ABBREVIATIONS

ac	acre
Advisory Council	Advisory Council on Historic Preservation
ADK	Adirondack Mountain Club
ac-ft	acre-feet
BMP	best management practices
Btu	British thermal units
CBC	Christmas bird count
cfs	cubic feet per second
cm	centimeters
cms	cubic meters per second
Corps	Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
CRMP	Cultural Resources Management Plan
CSO	combined sewer overflow
DO	dissolved oxygen
EPRI	Electric Power Research Institute
EA	Environmental Assessment
Erie	Erie Boulevard Hydropower (Orion Power New York)
FAS	Fisherman Alert System
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
fps	feet per second
FWS	U.S. Fish and Wildlife Service
GPM	gallons per minute
GWh	gigawatt-hours
IFIM	Instream Flow Incremental Methodology
Interior	U.S. Department of Interior
kW	kilowatt
kWh	kilowatt-hour
LO-SLR	Lake Ontario-St. Lawrence River
m	meter

mg/l	milligrams per liter
ml	milliliter
MW	megawatt
NERC	North American Electric Reliability Council
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMPC	Niagara Mohawk Power Corporation
NPCC	Northeast Power Coordination Council
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NYISO	New York Independent System Operator
NYRU	New York Rivers United
NYS	New York State
NYSBC	New York State Barge Canal
NYSCRP	New York State Canal Recreationway Plan
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
NYSOPRHP	New York State Office of Parks, Recreation and Historic Preservation
NYSTA	New York State Thruway Authority
O&M	operation and maintenance
OCDPCD	Oswego County Department of Planning and Community Development
PA	Programmatic Agreement
PCB	polychlorinated biphenyl
RAP	Remedial Action Plan
RIBS	Rotating intensive basin studies
RM	river mile
SD	Scoping Document
SHPO	State Historic Preservation Officer
SPDES	State Pollution Discharge Elimination System
STP	sewage treatment plant
USGS	U.S. Geological Survey
WQC	water quality certification
WUA	Weighted Usable Area

SUMMARY

On December 9, 1991, Niagara Mohawk Power Corporation[1] (NMPC) filed an application with the Federal Energy Regulatory Commission (Commission) for a major new license (relicense) for the 18.05-megawatt (MW) Oswego River Project (FERC No. 2474-004). The project includes three developments, Fulton, Minetto, and Varick, located on the Oswego River between 1.4 and 11.6 miles upstream of the confluence with Lake Ontario in Oswego County, in the cities of Fulton and Oswego, and the towns of Minetto, Granby, and Volney, New York. The current license for the project expired at the end of 1993. Under NMPC's current revised proposal, no new capacity is proposed for the project.

NMPC proposed new capacity and a series of environmental enhancements in its original application for relicense. By letter dated August 9, 1993, NMPC proposed to modify existing project operations and operate in run-of-river mode, in conjunction with run-of-river operation at other dams on the Oswego River. NMPC also performed updated financial analyses and found that proposed capacity enhancements (unit upgrades and pneumatic crest gates at Varick and Minetto) were no longer cost-effective. In the Final Report on Entrainment Study, dated November 13, 1995, NMPC withdrew the proposed pneumatic crest gates and capacity upgrades at the Varick and Minetto developments. In this final Environmental Assessment (EA), we evaluate the revised proposal, which consists of the existing project operating run-of-river without pneumatic crest gates at Varick and Minetto, as well as the environmental measures originally proposed in the application for relicense.

In this final EA we analyze and evaluate the effects associated with the issuance of a new license for the existing project and recommend terms and conditions to become a part of any license issued. For any license issued, the Commission must determine that the project licensed will be best adapted to a comprehensive plan for improving or developing the waterway. In addition to the power and development purposes for which licenses are issued, the Commission must give equal consideration to the following purposes: energy conservation, the protection and enhancement of fish and wildlife, aesthetics, cultural resources, and recreation. This final EA reflects our consideration of these factors.

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[1]On July 26, 1999, the Commission issued an order approving the transfer of this project, along with others, from NMPC to Erie Boulevard Hydropower L.P. (Erie), 88 FERC ¶ 62,082.

Based on our consideration of all developmental and nondevelopmental resource interests related to the project, we recommend that the following measures to protect and enhance environmental resource values should be included in any license issued for the Oswego River Project.

The licensee should: (1) finalize erosion and sediment control plans; (2) operate run-of-river while maintaining the water surface level at or near the top of the flashboard or crest of the dam; (3) provide specified seasonal minimum flows in the bypassed reaches at the Fulton and Varick developments; (4) provide minimum flows during flashboard replacement at Fulton and Varick, as appropriate; (5) develop and implement a flow monitoring plan for the project; (6) finalize the design of downstream fish protection and passage facilities at all three developments and operate them from March 1 through December 31; (7) finalize the design of upstream American eel passage facilities at all three developments and operate them from April 1 through September 1; (8) study the effectiveness of installed fish passage facilities at all three developments; (9) develop a plan for future selective upstream passage when agency plans for migratory fish are finalized; (10) develop a plan to minimize downstream loss of flashboards at Fulton and Minetto; (11) develop a plan to replace the existing breakaway flashboard system at Varick with a system that minimizes impoundment fluctuations and downstream debris deposition due to flashboard failures; (12) reinstall flashboards before May 1 or after June 30; (13) make aesthetic improvements at all three developments; (14) implement a Programmatic Agreement; (15) add recreation facilities at Fulton and Varick developments, provide a canoe portage at the Minetto development, and add portage signage at the Fulton and Minetto developments; (16) monitor recreational use; and (17) update the existing Comprehensive Recreation Plan to reflect current conditions and the recreational enhancements specified in any new license issued for this project.

We recommend these environmental measures to protect or enhance fishery resources, water quality, recreational, and aesthetic resources. In addition, the electricity generated from the project would be beneficial because it would: (1) continue to reduce the use of fossil-fueled, electric generating plants; (2) conserve nonrenewable energy resources; and (3) continue to reduce atmospheric pollution.

In addition to the licensee's proposed action with additional staff-recommended measures, we also considered the no action alternative. Decommissioning alternatives also were considered and are addressed in the environmental analysis and the comprehensive development section of this EA. Denial of the license would mean that about 74.2 gigawatt-hours (GWh) of electrical energy generation per year would be lost, and no measures would be implemented to protect and enhance existing environmental resources.

NMPC filed an application for water quality certification (WQC) from the New York State Department of Environmental Conservation (NYSDEC) for the Oswego River Project. The application was denied without prejudice on November 19, 1992. Subsequent activities included legal challenges, settlement talks, and issuance of draft WQC's on January 3, 1994, and on May 31, 1996. The first draft was appealed. The second draft is still pending. Final action on the WQC will be discussed in the license order for this project.

Of the 25 recommendations by federal and state fish and wildlife agencies, we found 19 to be within the scope of Section 10(j) of the Federal Power Act (FPA). Seventeen of these recommendations have been adopted. During a September 12, 2000, meeting, Interior agreed to modify one recommendation to be consistent with NYSDEC's recommendation, and NYSDEC agreed to withdraw its recommendation to modify the Varick bypassed reach, as long as we continued to recommend its minimum flows. Section 10(j) of the FPA requires the Commission to include license conditions, based on recommendations of federal and state fish and wildlife agencies, for the protection and enhancement of fish and wildlife resources. For the Oswego River Project, these recommendations have been incorporated into the staff's recommendations. Thus, we have addressed the concerns of the federal and state fish and wildlife agencies.

Under Section 18 of the FPA, the U.S. Department of the Interior (Interior) has provided modified prescriptions for upstream passage facilities for American eel and downstream passage facilities for seven resident target species at all three developments. In addition, Interior requested that the Commission reserve its authority to prescribe construction, operation, and maintenance of such fishways as deemed necessary during the term of any new license issued for this project.

Based on our independent analysis of the project, including our consideration of all relevant economic and environmental concerns, we conclude in this final EA that: (1) the Oswego River Project, as proposed and revised with our recommended environmental measures, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the Oswego River and other project-related resources; and (2) issuance of a new license for the project would not constitute a major federal action significantly affecting the quality of the human environment.

FINAL
ENVIRONMENTAL ASSESSMENT

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ENERGY PROJECTS
DIVISION OF ENVIRONMENTAL AND ENGINEERING REVIEW

Oswego River Project
FERC Project No. 2474-004
New York

I. APPLICATION

On December 9, 1991, Niagara Mohawk Power Corporation[1] (NMPC) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) for a major new license (relicense) for the Oswego River Project (FERC No. 2474-004). The project consists of three developments on the Oswego River in the towns of Granby, Volney, and Minetto, and the cities of Fulton and Oswego, Oswego County, New York (figure 1). The project is located on the Oswego River between 1.4 and 11.6 miles upstream of the confluence with Lake Ontario and has a total installed capacity of 18.05 megawatts (MW). The project does not occupy any United States lands.

On August 9, 1993, NMPC revised its proposal for the Oswego River Project in a letter to the Commission. In its original application, it proposed to continue store-and-release operation; however, in its subsequent letter, NMPC proposed run-of-river (ROR) operation. The original application also included proposed unit upgrades and new generating equipment. These changes have subsequently been subject to further economic analyses, with the results reported in the Final Report on Entrainment Studies, dated November 13, 1995. NMPC proposed to withdraw its original proposal to increase generation. We reviewed the economic analyses and agree that additional expenditures for increased capacity by the proposed unit upgrades and new generating equipment would not be cost-effective at this time.

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[1]On July 26, 1999, the Commission issued an order approving the transfer of this project, along with others, from NMPC to Erie Boulevard Hydropower L.P.(Erie), 88 FERC ¶ 62,082. Our convention in the text of this final EA is to use "NMPC" if the reference pertains to past events up to the license transfer, and "Erie" if the reference pertains to events after the license transfer (i.e., current and future operations).

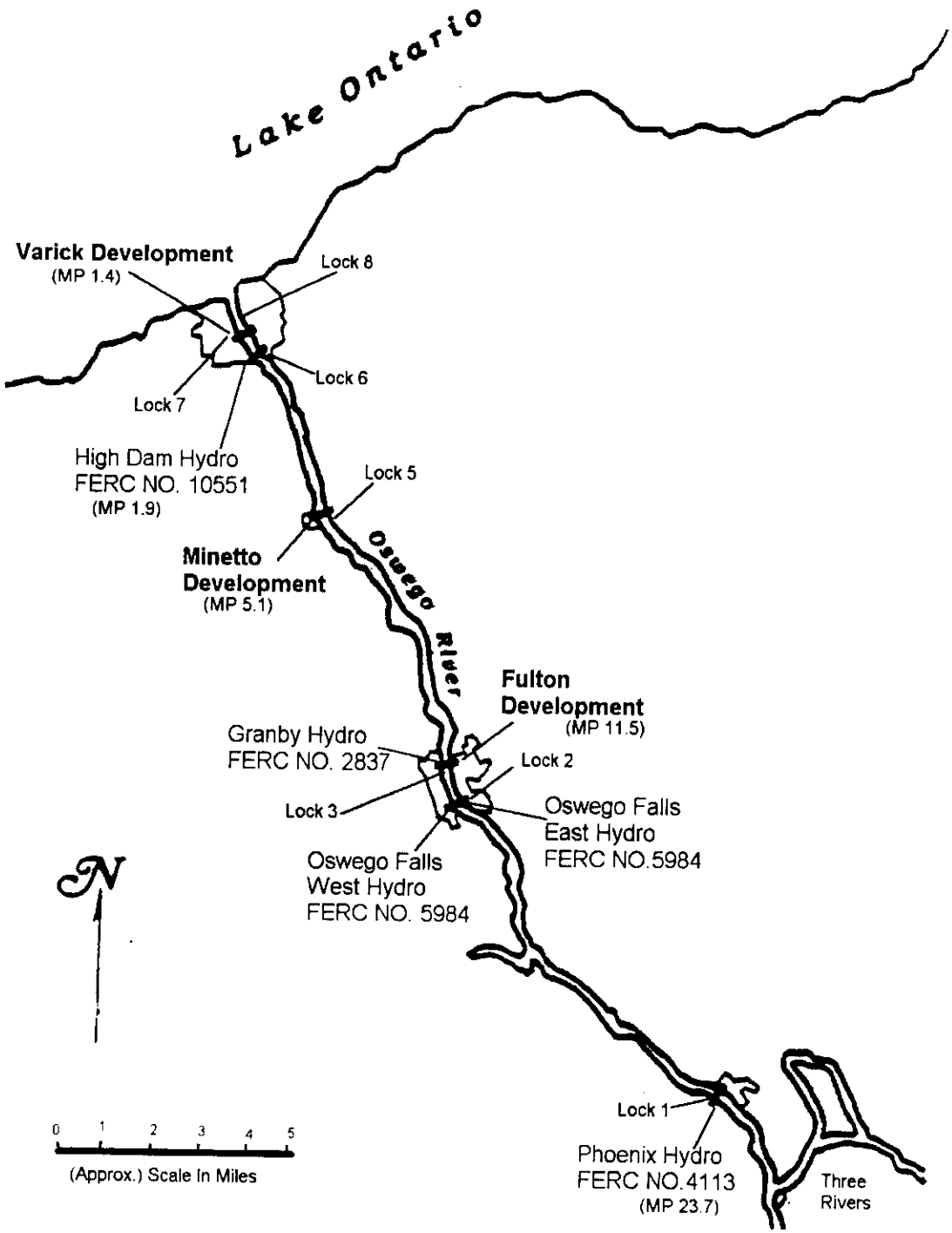

Figure 1. Oswego River Project location map (Source: NMPC 1991).

II. PURPOSE OF ACTION AND NEED FOR POWER

A. Purpose of Action

In this final Environmental Assessment (EA), we analyze the impacts of continued operation of the constructed project, evaluate alternatives to the proposed project, and make recommendations to the Commission on whether to issue a license, and if so, recommend terms and conditions to become part of any license issued. The Federal Power Act (FPA) provides the Commission with the exclusive authority to license nonfederal water power projects on navigable waterways. The Oswego River is a navigable waterway.

In deciding whether to issue any license, the Commission must determine that the project adopted will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the purposes of energy conservation; the protection of, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreation opportunities; and the preservation of other aspects of environmental quality.

B. Need for Power

To assess the need for power, we reviewed NMPC's use of the project power for more than 70 years to date and in the future, together with that of the operating region in which the project is located.

The Oswego River Project is in the central region of the New York Independent System Operator (NYISO) market. According to Patton (2001):

> New York loads continued to grow in the face of limited expansions in generating capability, which has led to shrinking reserve margins and increasingly tight market conditions during peak load periods. Although more than 30,000 MW of new proposed generating capability is currently in queue in New York, a very difficult siting process for new generation has prevented substantial new resources from entering the market in the near-term. These conditions will lead to substantially higher prices as periods of supply scarcity that are generally accompanied by very high prices occur more (frequently).

NYISO indicates that continued load growth in New York has caused the reserve margins to drop from more than 25 percent to about 16 percent. Additional reductions in reserve margins are projected in the absence of new generation (Patton, 2001).

The Oswego River Project has historically generated an annual average of 74.2 gigawatt-hours (GWh) of power. Power has historically been sold to NMPC's customers and would continue to be sold to customers in the NYISO market area regardless of the change in ownership to Erie. In addition, the project displaces nonrenewable fossil-fired generation and contributes to diversification of the generation mix in the NYISO market area. We conclude that present and future use of the project's power, its displacement of nonrenewable fossil-fired generation, the contribution to a diversified generation mix, and the likelihood of shrinking reserve margins support a finding that the power from the Oswego River Project would help meet a need for power in the NYISO market area in the short and long terms.

III. PROPOSED ACTION AND ALTERNATIVES

A. Proposed Action

1. Project Description

The Oswego River Project is composed of three developments extending from the Fulton development at river mile (RM) 11.6 to the Varick development at RM 1.4. The developments are operated as store-and-release pulsing facilities.

The Fulton development (figure 2) consists of: (1) a reservoir with a surface area of 33 acres (ac) and a gross storage of 620 acre-feet (ac-ft) and usable storage capacity of 35 ac-ft; (2) a 509-foot-long concrete buttress dam with a maximum height of 15 feet, topped with 6-inch-high flashboards, and consisting of (a) a gated concrete intake section, 35 feet high by 41 feet long by 14 feet wide, with three steel gates, (b) a 10-foot-long by 40-foot-wide forebay which averages 11 feet of water depth, (c) trashracks, and (d) a bypassed reach about 1,850 feet long; (3) a 43-foot-long by 35-foot-wide by 55-foot-high concrete and brick powerhouse, housing two vertical fixed propeller turbines rated at 825 and 450 kilowatts (kW) with hydraulic capacities of 750 and 415 cubic feet per second (cfs) connected directly to generator units with generating capacities of 800 and 450 kW; (4) a switchgear building, 24 feet by 32 feet; and (5) appurtenant facilities.

The Minetto development (figure 3) consists of: (1) a reservoir with a surface area of 350 ac, gross storage of 4,730 ac-ft, and usable storage of 290 ac-ft; (2) a 500-foot-long concrete gravity dam with a maximum height of 22.5 feet, topped with

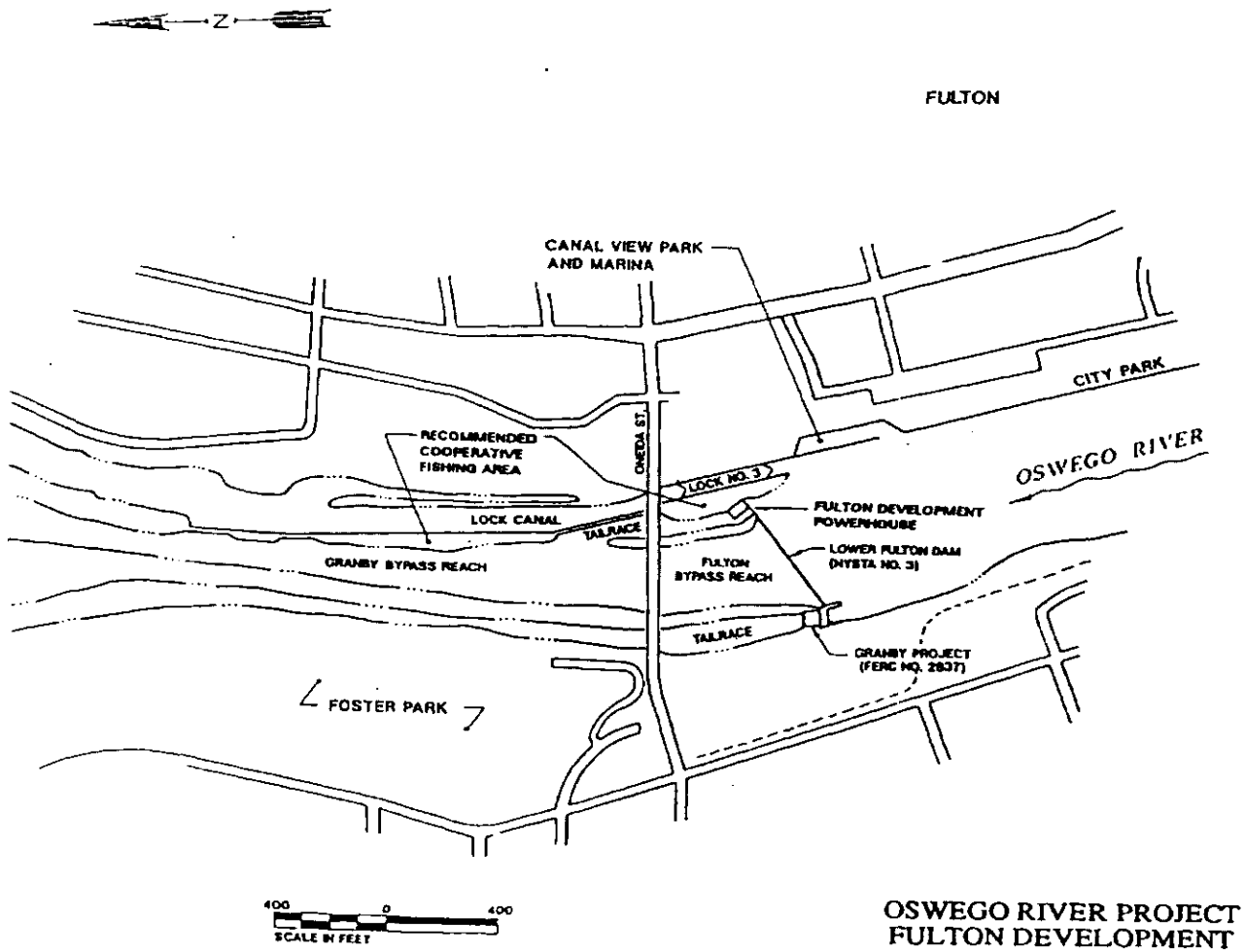

Figure 2. Oswego River Project, Fulton development (Source: NMPC 1991).

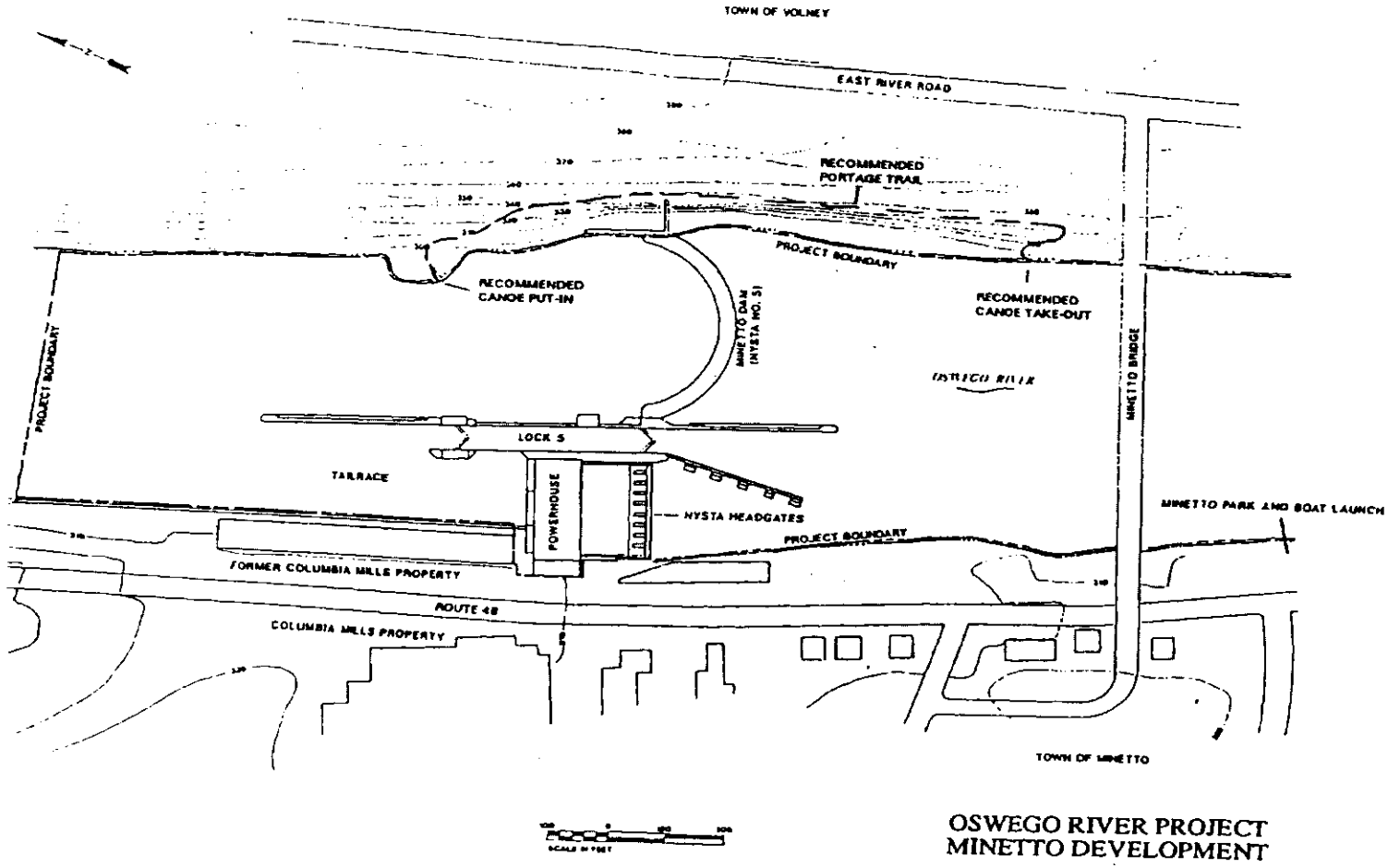

Figure 3. Oswego River Project, Minetto development (Source: NMPC 1991).

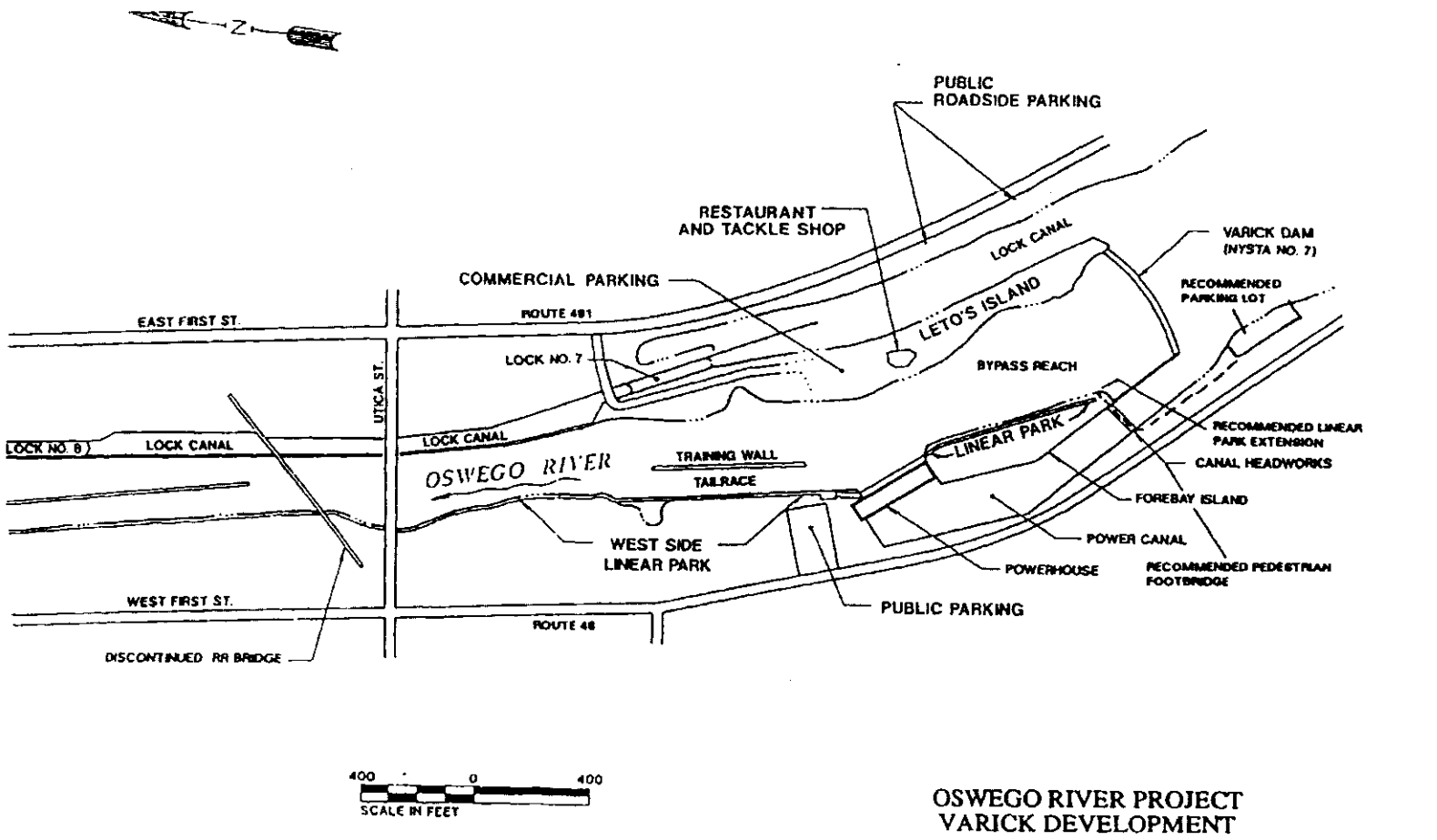

Figure 4. Oswego River Project, Varick development (Source: NMPC 1991).

10-inch-high flashboards, and consisting of (a) a gated concrete intake section, about 40 feet high by 190 feet long by 40 feet wide with nine steel gates, (b) a 100-foot-long by 200-foot-wide forebay which averages 25 feet of water depth, and (c) trashracks; (3) a 230-foot-long by 88-foot-wide by 77-foot-high concrete, brick and steel powerhouse, housing five vertical Francis turbines rated at 8,250 kW with a total hydraulic capacity of 7,500 cfs connected directly to generator units with a total generating capacity of 8,000 kW; and (4) appurtenant facilities.

The Varick development (figure 4) consists of: (1) a reservoir with a surface area of 32 ac, a gross storage of 435 ac-ft, and usable storage of 80 ac-ft; (2) a 730-foot-long masonry gravity dam with a maximum height of 13 feet and consisting of (a) a 480-foot-long curved section, (b) a straight 250-foot-long section, (c) a system of stepped flashboards varying in height from 10 inches along the straight section of the dam and from 30 to 36 inches along the curved section, (d) a gated section, 189 feet long by 26 feet high by 28 feet wide with 24 steel gates and an unused minimum flow gate, (e) a 950-foot-long by 150-foot-wide forebay that averages 18 feet of water depth, (f) trashracks, and (g) a bypassed reach about 1,940 feet long; (3) a 271-foot-long by 66-foot-wide by 78-foot-high concrete brick and steel powerhouse, housing four fixed-blade propeller turbines, 3 rated at 1,950 kW and one at 2,175 kW with a total hydraulic capacity of 5,600 cfs connected to generator units with a total generating capacity of 8,800 kW; and (4) appurtenant facilities.

2. Proposed Project Operation

a. Current operation: Erie operates the Oswego River Project's developments as store-and-release facilities. The regulation of the water is controlled by the New York State Thruway Authority (NYSTA), operator of the State Barge Canal System and owner of the locks and dams, including the intake structures, along the Oswego River. NYSTA generally regulates the river to control flooding and to provide adequate water levels during the navigation season (generally May 1 to December 1) to operate the Barge Canal lock system. The Oswego River is traversed by a series of seven locks between the cities of Phoenix and Oswego, New York (see figure 1). NYSTA controls the flow of water into the Oswego River by manipulating gates at Phoenix and Oswego Falls. The other dams have no such control structures that are owned and operated by NYSTA. Erie owns the powerhouses and all associated power generation equipment at the three developments. During the navigation season, the Barge Canal System uses an average flow of 40 cfs to perform locking operations. The number of lockages varies by season, but typically there are about 10 per day. Erie must maintain water levels at or above dam crest elevations at all of the developments during this period to facilitate navigation. NYSTA mandates that a depth of at least 14 feet be maintained in the canal and

impoundments and 13 feet on the lock sills. NYSTA conducts coordination meetings with Erie and other hydro licensees every three or four months to discuss plant operations and coordination of flows.

The Fulton development operates in conjunction with the Granby Project, using flows provided from the upstream Oswego Falls Project. NYSTA permits Erie to place 6-inch flashboards on the dam. (NYSTA owns the dams at all three developments, which are not part of the original license, and controls the use of flashboards; the Commission would consider the dams to be part of the project works in any new license issued for this project.) Because the usable storage at the Fulton development is relatively small, no reservoir rule curve is employed under currently licensed operation. Instead, the reservoir is allowed to fluctuate between specified upper and lower elevation limits. If washed away by late fall or early spring floods, the flashboards are installed as soon as inflow conditions permit. The normal usable power storage is restricted from top of boards (334.50 feet National Geodetic Vertical Datum [NGVD]) to top of permanent spillway crest (334.00 feet NGVD), resulting in a usable storage capacity of 35 ac-ft. If no flashboards are present, the usable power storage is restricted from top of crest (334.00 feet NGVD) to 0.5 foot below top of permanent spillway crest (333.50 feet NGVD).

Typically, the Granby powerhouse is shut down whenever available river flow is less than 2,500 cfs (minimum turbine setting of one Granby unit). Under this situation, the Fulton powerhouse uses the river flow up to the maximum hydraulic capacity of the development (750 cfs through Unit 1 and 415 cfs through Unit 2). For available river flows less than 1,165 cfs, the Fulton development operates by float control utilizing impoundment storage and fluctuating the pond over 0.5 foot. When generating, the units remain set at maximum gate (1,165 cfs). When replenishing the pond to top of boards, the units are motored.

Whenever the available river flow exceeds 2,500 cfs, the Granby powerhouse is manually activated and all available water is diverted through its turbines up to the development's maximum hydraulic capacity of 6,000 cfs. Not all of the water can be used within this range due to the narrow operating limits of the Granby units (2,500 to 3,000 cfs each). For example, a river flow of 3,500 cfs would require Granby to operate two units at 5,000 cfs. At this setting the usable storage within the pond would be depleted within minutes. Therefore, the existing operation would pass 3,000 cfs through one unit at Granby and divert the remaining 500 cfs to the Fulton development.

For flows between 2,500 and 6,000 cfs, the Fulton powerhouse is typically motored with sporadic pulsing of the units. Once river flows exceed 6,000 cfs or fall below 2,500 cfs, the Fulton powerhouse is operated once again using float control.

Overall, about 11.5 percent of the available water at the site is used for energy production at the Fulton development. The remaining water is either used at the Granby Project or not utilized for power production.

The Minetto development consists of five vertical Francis turbines installed in bays 2 through 6. Bay 1 currently contains a turbine, but not a generator.

Because the usable storage at the Minetto development is relatively small, no reservoir rule curve is employed. Instead, the reservoir is allowed to fluctuate between specified upper and lower elevation limits. The existing license allows for 10 inches of flashboards, which are normally installed about June 1 of each year, remaining on the dam until washed away by late fall or early spring floods. When the flashboards are present, drawdown is restricted from top of flashboards (307.83 feet NGVD) to the spillway crest (307.00 feet NGVD). At all other times, drawdown is restricted to 10 inches below permanent crest, resulting in a usable storage capacity of 290 ac-ft.

Each day, based on a projected daily river flow, the station operator manually sets the number of units to generate and/or motor. The available units are operated by float control.

As flow conditions dictate, from adversely low to high availability of water, the normal operating procedure is to set one unit at efficient gate (1,400 cfs), two units at efficient gate (2,800 cfs), three units at efficient gate (4,200 cfs), four units at efficient gate (5,600 cfs), five units at efficient gate (7,000 cfs), or five units at maximum gate (7,500 cfs).

On average, about 65.0 percent of the available water at the site is used for energy production.

The Varick development, which uses stepped height (2.5-foot to 3.0-foot) flashboards, passes an interim flow to minimize stranding of fish in the bypassed reach. Erie maintains flows in the bypassed reach for up to 72 hours, especially during the salmonid spawning season, after a significant increase or decrease in flow.

Because the usable storage at the Varick development is relatively small, no reservoir rule curve is employed. Instead, the reservoir is allowed to fluctuate between

specified upper and lower elevation limits. The existing flashboards are normally installed about June 1 of each year, remaining on the dam until washed away by late fall or early spring floods. When the flashboards are present, drawdown is restricted from top of flashboards (270.00 feet NGVD) to the spillway crest (267.50 feet NGVD), resulting in a usable storage capacity of 80 ac-ft. At all other times, drawdown is restricted to 1 foot below permanent crest, resulting in a usable storage capacity of 32 ac-ft.

Each day, based on a projected daily river flow, the station operator manually sets the number of units to generate or motor. The available units are operated by float control.

As flow conditions dictate, from adversely low to high availability of water, the normal operating procedure is to set one unit at 75 percent gate (1,400 cfs), two units at 75 percent gate (2,800 cfs), three units at 75 percent gate (4,200 cfs), or four units at 75 percent gate (5,600 cfs).

On average, about 57.6 percent of the available water at the site is used for energy production.

b. Proposed operation: On August 9, 1993, NMPC sent a letter to the Commission containing responses to items requested in the Commission's letter dated August 7, 1992. One item requested was an estimate of the cost of converting the proposed store-and-release mode of Oswego River Project operation to ROR operation (outflow instantaneously equaling inflow). The letter not only provides the estimate but also contains NMPC's proposal to operate the Oswego River Project, as well as the Granby and Oswego Falls Projects, in ROR mode.[2] We considered the contents of the submittal in preparing this final EA and incorporated the ROR operation as NMPC's revised proposal.

Operating the developments ROR would eliminate daily fluctuation in pond water levels. Flashboards still would be present at each of the developments, but water level in the ponds would be maintained at either the top of the flashboards, when installed, or at the dam crest. Conversion of the Oswego River Project to ROR would not result in lost generation, but the shift of generation from peak to off-peak periods would reduce the annual power value.

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[2]The Commission issued a new license for the Oswego Falls Project No. 5984 in 1996 that requires ROR operation. Granby is currently operated in ROR mode voluntarily.

3. Proposed Environmental Measures

NMPC modified certain elements of its project as proposed in its license application during subsequent consultations and reassessment of economic factors involved in implementing originally proposed capacity-related enhancements (i.e., upgrade of units at the Minetto and Varick developments and installation of pneumatic crest gates at the Minetto and Varick developments). We consider the most recent environmental measures to be Erie's proposed environmental measures, which in some cases differ from those presented in the license application. The environmental measures proposed are currently as follows:

- operate all three developments in ROR mode with the impoundment water level at or near the top of the flashboards or dam crest;

- release a minimum flow of 75 cfs to the upper Fulton development bypassed reach year round;

- release a minimum flow of 875 cfs to the lower Fulton development bypassed reach during the walleye spawning season (which typically occurs from about March 15 through about May 31) and 375 cfs for the remainder of the year;

- release a minimum flow of 475 cfs to the upper Varick development bypassed reach during the walleye spawning season, 300 cfs during the fall upstream salmonid migration period (which typically occurs from about September 15 through about March 15), and 200 cfs for the remainder of the year;

- release a minimum flow of 200 cfs to the lower Varick development bypassed reach during the walleye spawning season, 150 cfs during the fall upstream migration period, and 75 cfs for the remainder of the year;

- implement a flow monitoring plan at all three developments;

- install low-cost, 1-inch, clear-spaced trashrack fish protection systems with downstream passage at all three developments by 2010 (contingent on finalizing Atlantic salmon restoration goals);

- conduct downstream fish passage effectiveness studies for installed passage facilities at all three developments;

- provide upstream passage for Atlantic salmon by constructing an interim trap and truck facility at the Varick development upon completion of NYSDEC and U.S. Fish and Wildlife Service (FWS) environmental impact statements pertaining to the restoration of Atlantic salmon to the Oswego River Basin and development of public support (assumed implementation during 2010);

- implement aesthetic improvements at all three developments;

- provide pedestrian and angler access to the Canal Lock No. 3 island downstream of the Fulton development by establishing a woodchip trail and installing fences and signs;

- assist NYSTA in improving shoreline fishing at the Canal Lock No. 2 island, upstream of the Fulton development;

- assist with the city of Fulton's Granby Trail from the Granby Project to the Oswego Falls Project;

- assist with the West Side Linear Park improvements at the Varick development (completed);

- install an audio angler alarm system at the Varick development (completed);

- install angler warning signs at the Varick development (completed); and

- assist with the development of the city of Oswego's planned Varick Impoundment Trail.

B. Alternatives to the Proposed Project

1. Proposed Action with Additional Staff-recommended Measures

After evaluating Erie's proposal and reviewing recommendations and prescriptions from the resource agencies, we considered what, if any, additional measures would be necessary and appropriate to include in any new license for the

project. Our alternative consists of Erie's current proposal with the additions or modifications presented below.

The applicant should:

- finalize the existing conceptual sediment and erosion control plans to reflect site-specific conditions associated with ground-disturbing activities that we recommend and the Commission approves;

- provide seasonal minimum flows to the upper Varick bypassed reach of 800 cfs during the walleye spawning season, 500 cfs during the fall salmonid upstream migration period, and 400 cfs for the remainder of the year, instead of Erie's proposed flows;

- finalize the design of downstream fish protection and passage facilities at all three developments and operate them from March 1 through December 31, rather than the low-cost facilities proposed by NMPC (we conclude that these measures are not needed, but must recommend them because they are mandatory prescriptions);

- finalize the design of upstream American eel passage facilities at all three developments and operate them from April 1 through September 1 (we conclude that these measures are not yet needed, but must recommend them because they are mandatory prescriptions);

- develop a plan for future selective upstream passage when resource agency restoration goals for Atlantic salmon and lake sturgeon are finalized (an issue-specific reopener condition);

- develop a plan to minimize downstream loss of flashboards at Fulton and Minetto;

- develop a plan to replace the existing breakaway flashboard system at Varick with a system that minimizes impoundment fluctuations and downstream debris deposition due to flashboard failures;

- reinstall flashboards before May 1 or after June 30, if flashboards should need replacement for any reason;

- provide minimum flows during flashboard replacement at Fulton and Varick, as appropriate;

- implement a Programmatic Agreement (PA);

- provide canoe portage at the Minetto development and signage for the portage routes at Fulton and Minetto;

- extend the existing Westside Linear Park Trail an additional 250 feet to connect with the city of Oswego's planned pedestrian bridge across the development's headworks (if this bridge is constructed) and provide a scenic overlook with parking and access trail to the Varick Impoundment Trail;

- develop a plan to monitor recreational use; and

- update the Comprehensive Recreation Plan submitted to the Commission on December 14, 1993, to reflect current conditions and the recreational enhancements specified in any new license issued for this project.

2. No-action

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, with no change in existing environmental conditions.[3] We use this alternative to establish baseline environmental conditions for comparison with other alternatives. We discuss the alternative of license denial and project retirement in section III.B.3.

3. Alternatives Considered but Eliminated from Detailed Study

We considered two retirement alternatives to Erie's relicensing proposal but eliminated them from detailed study because they are not reasonable in the circumstances of this case. Project retirement could be accomplished with or without dam removal.

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[3]Pursuant to Section 15 of the FPA, if the Commission does not act on an applicant's relicense application before the original license expires, the Commission is legally required to issue an annual license with the same terms and conditions as the existing license, until such time as the Commission takes final action on the relicense application.

Either alternative would involve denial of the license application and surrender or termination of the existing license with appropriate conditions.

No participant has suggested that dam removal would be appropriate in this case, and we have found no adequate basis for recommending it. The current project and impoundments provide recreational opportunities, wildlife habitat, and important wetland areas. Thus, dam removal is not a reasonable alternative to relicensing the project with appropriate environmental measures. In addition, Erie does not own the project dams. They are owned by NYSTA and are integral to the State Barge Canal System.

The second retirement alternative would involve retaining the dams and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency willing and able to assume regulatory control and supervision of the remaining facilities. No federal or state agency has stepped forward, no participant has advocated this alternative, nor have we found any adequate basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

In its letter dated March 28, 1996, New York Rivers United (NYRU) suggests creation of a decommissioning fund to cover the cost of retiring the Oswego River Project, when and if necessary. The need could arise from several factors including the physical integrity of the developments and the financial status of Erie. NYRU does not provide any specific recommendations as to when the fund should be developed, how much money is necessary, or how the fund would be used in the event the project is decommissioned.

On December 14, 1994, the Commission issued a policy statement that addresses issues concerning relicensing and decommissioning of hydropower projects. Under its decommissioning policy,[4] the Commission will address project decommissioning and the proposed decommissioning fund in its order for the Oswego River Project. The order will address the need for license requirements that would require the licensee to conduct studies, make financial provisions, or otherwise make reasonable provisions for retirement of the project.

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[4]60 FR 339-56 (1995).

IV. CONSULTATION AND COMPLIANCE

A. Agency Consultation

The Commission issued a Notice of Application Ready for Environmental Assessment on January 30, 1996, requesting comments, recommendations, and terms and conditions from state and federal resource agencies as well as the public. The following entities commented on the application:

Commenting Entity	Date of Letter
U.S. Department of the Interior	March 26, 1996
New York Rivers United	March 28, 1996
Adirondack Mountain Club	March 29, 1996
New York State Department of Environmental Conservation	April 1, 1996

NMPC responded to these comments by letter dated May 13, 1996.

B. Interventions

In addition to providing comments, organizations and individuals may petition to intervene and become a party to the proceeding. The following entities intervened in the relicensing proceeding:

Intervenor	Date of Motion
John Leto Associates	February 4, 1992
U.S. Department of the Interior	August 20, 1992
New York State Department of Environmental Conservation	March 12, 1993
Adirondack Mountain Club	April 12, 1993
Trout Unlimited, New York Council of Trout Unlimited	April 12, 1993
City of Oswego, New York	April 12, 1993

Intervenor (cont'd)	Date of Motion (cont'd)
American Whitewater Affiliation, American Rivers, New York Rivers United, Natural Heritage Institute, Trout Unlimited, National Audubon Society, Onondaga Audubon Society	April 12, 1993
Town of Minetto, New York	November 10, 1993
City of Fulton, New York	February 5, 1996

Trout Unlimited, along with the New York Council of Trout Unlimited, and Interior filed in opposition to the project. We address intervenor concerns in the environmental analysis section (section V) of this EA.

C. Water Quality Certificate Conditions

On December 4, 1991, NMPC submitted a request for 401 water quality certification (WQC) to NYSDEC. In June 1992, the application was determined to be complete. On November 19, 1992, NYSDEC denied (without prejudice) NMPC's request for WQC. NMPC requested that NYSDEC review the legality of the denial. After various legal proceedings, a draft WQC was issued at the request of the presiding judge on January 3, 1994. NMPC commented on the draft on January 20, 1994, and appealed the draft WQC on May 6, 1994. Subsequent legal proceedings led to settlement talks. The talks to date have failed to reach a settlement; however, NYSDEC's comments on the license application, dated April 1, 1996, recommended terms and conditions for the new license. These recommendations are evaluated in this final EA pursuant to Section 10(j) or 10(a) of the FPA.

D. Section 18 Fishway Prescription

Section 18 of the FPA provides the Secretary of the Interior authority to prescribe fishways at Commission-licensed projects.[5] By letter dated March 26, 1996, Interior made an initial prescription for downstream fish passage facilities at all three developments, which we assessed in the draft EA that was issued on November 24, 1999.

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[5]Section 18 of the FPA provides: "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 the Interior or the Secretary of Commerce, as appropriate." See 16 U.S.C. § 811.

On October 23, 2000, Interior issued a Schedule for Filing a Section 18 Fishway Prescription and Administrative Record which provided an opportunity for interested parties to comment on the preliminary fishway prescription. Erie and NYSDEC provided comments on the preliminary prescription on November 29, 2000, and November 30, 2000, respectively. On February 27, 2001, Interior filed a Modified Prescription and Administrative Record including responses to comments received on the preliminary prescription (Interior, 2001). The modified prescription includes the following:

(1) Downstream fishways should be operated from March 1 through December 31, encompassing migration periods specified for rainbow smelt, white perch, yellow perch, smallmouth bass, walleye, channel catfish, largemouth bass, and American eel. Upstream fishways designed to pass American eel should be operated from April 1 through September 1.

(2) Fishways at all developments should be fully operational no later than 2 years after license issuance.

(3) The licensee shall develop a fish passage evaluation plan and conduct effectiveness evaluations in consultation with FWS.

(4) Downstream passage facilities prescribed at all three developments involve applying seasonal overlay racks or punch plates or modifying the clear spacing between the bars of the existing racks. [At Minetto, Interior also provides an option of installing the overlays at the pier fronts upstream of the existing racks to reduce approach velocities.] A maximum clear spacing of 1 inch between bars (or 1 inch maximum diameter punch plate holes) is specified, but Interior indicates that this spacing is subject to change prior to construction based on sampling of American eels below Varick dam and in the Oswego River.

(5) Downstream passage facilities at all sites include bypasses and attraction flows that amount to 5 percent of plant capacity at Fulton and Minetto and 3 percent of the plant capacity at Varick.[6] At Fulton, surface and deep

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[6]Interior's characterization of attraction flows in section 8.13 of its prescription differs from that presented in its conceptual design figures 2, 3, and 4. Specifically, figure 2 indicates that the attraction flow should be 3 percent of the total hydraulic capacity at Fulton, which is 55 cfs, figure 3 indicates that the attraction flow should be 5

(continued...)

bypass entrances would be provided by modifying the existing log/ice sluice spillway on the left side of the forebay. At Minetto, surface and deep bypasses would be provided at two locations on the left and right sides of the powerhouse. At Varick, surface and deep bypasses would be provided via a sluice or channel through the unused turbine bay at the left side of the powerhouse.

(6) At each of the four bypasses (one at Fulton, two at Minetto, and one at Varick), Interior provides an option of using a screened pump-back facility to recycle all but a 20 cfs conveyance flow to the forebay. At Fulton, a plunge pool would be required at the bypass discharge, which must have a depth of approximately 5 feet to meet FWS design criteria of 1/4 of the differential head (17 feet).

(7) To provide safe, timely, and effective upstream passage of yellow-phase American eels, the licensee shall construct, operate, and maintain separate eel passage facilities at all three developments. The upstream passage facilities would consist of an 18-inch wide open channel with 1.5-inch diameter by 5-inch long PVC tubes anchored to the channel floor in a diagonal pattern with a minimum clear opening between tubes of 1-5/16 inches. At each development, the fishway would be attached directly to the spillway or powerhouse training wall at an angle not to exceed 30 degrees, with 80 gallons per minute (GPM)(0.2 cfs) of flow supplied at the top of the fishway and an additional 120 GPM (0.3 cfs) of attraction flow supplied at the fishway entrance.

We analyze the modified prescription in section V.C.3.b, Fisheries Resources. Interior requests a reservation of authority to prescribe additional fishways, measures to evaluate the need for fishways, and effectiveness studies at all three developments of the Oswego Project.

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[6](...continued)
percent of the total hydraulic capacity at Minetto, which is 375 cfs, not the 450 cfs shown on the figure, and although figure 4 indicates that the attraction flow at Varick should be 3 percent of the total hydraulic capacity, which is 168 cfs, Interior's figure lists this value as 190 cfs and its text lists it as 222 cfs. Our analysis assumes that Interior's intended attraction flows are 55 cfs, 375 cfs, and 168 cfs for Fulton, Minetto, and Varick, respectively.

E. Dredge and Fill Permit Conditions

Pursuant to Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (Corps) issues dredge and fill permits for specified types of construction in wetlands. These permits generally include conditions applicable to project construction activities. If wetlands cannot be avoided by the final design of any measure included in a new license that may be issued for this project, Erie would need to obtain a dredge and fill permit from the Corps.

F. Coastal Zone Management Program

The Oswego River Project is in a New York State (NYS)-designated coastal zone management area. The coastal zone program in New York is administered by the New York Department of State, Division of Coastal Resources and Waterfront Revitalization. NMPC filed with the Commission a Federal Consistency Assessment Form by letter dated November 1, 1996, and supplemental additional requested information on November 4, 1996. By letter dated December 23, 1996, the state concurred with NMPC's consistency determination.[7]

G. Scoping

On January 26, 1995, we issued a Scoping Document (SD) describing the environmental issues that we would and would not subject to detailed analysis in this EA. We based our preliminary conclusions on information provided in the application for relicense and in comment letters.

On March 6 and 7, 1995, we held two public meetings in Oswego, New York, to discuss the SD and other pertinent information concerning the project. Representatives of NMPC, FWS, NYSDEC, Trout Unlimited, NYRU, the city of Oswego, Adirondack Mountain Club (ADK), New York State Canal Corporation, John Leto Associates, Oswego County Federation of Sportsmans' Clubs, town of Minetto, and members of the public attended the meetings. We established a 30-day comment period to receive additional comments after the meeting.

A site visit was conducted on March 7, 1995, with representatives of NMPC, FWS, NYSDEC, ADK, the city of Oswego, and NYRU. The purpose of the site visit

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[7]NMPC filed a copy of the letter indicating state concurrence with coastal zone consistency determination on January 2, 1997.

was to acquaint Commission staff with each of the developments and to obtain additional site-specific information.

The following entities filed comments during scoping:

Commenting Entity	Date of Letter
Adirondack Mountain Club	April 3, 1995
Oswego County Federation of Sportsmen's Clubs	April 4, 1995
New York Rivers United	April 4, 1995
Niagara Mohawk Power Corporation	April 6, 1995
New York State Department of Environmental Conservation	April 6, 1995
U.S. Fish and Wildlife Service	April 6, 1995
Environmental Protection Agency	April 12, 1995

We considered these comments as well as those from the scoping meetings in the environmental analysis section of the final EA.

H. Comments on the Draft Environmental Assessment

In response to the issuance of the draft EA on November 24, 1999, the following entities filed comments:

Commenting Entities	Date of Letter
NYSDEC	January 4 and January 26, 2000
FWS	January 6, 2000
Adirondack Mountain Club	January 28, 2000
Erie	January 28, 2000
City of Oswego	February 22, 2000

Appendix A includes the comment letters and our responses to the individual comments within them. We revised the EA in response to those comments.

V. ENVIRONMENTAL ANALYSIS[8]

In this section, we present a general description of the river basin, describe existing and proposed hydropower projects in the basin, and summarize the potential for cumulative impacts on environmental resources.

We begin our detailed assessment of the potential environmental impacts on area resources resulting from relicensing the Oswego River Project by first describing the affected environment. Then we use the existing state of each resource as the baseline for measuring and defining the effects of the proposed relicensing action. Next we describe the potential effects on each environmental resource resulting from the implementation of new operational procedures and environmental enhancement measures and the development of additional recreational facilities.

NYRU (letter dated March 28, 1996) recommends that we consider the impact that the project has on the economic values associated with recreation resources. The alternatives we consider as part of our analysis do not propose changes in project operation that would substantially affect socioeconomic resources. Although we initially included socioeconomic resources in our scoping document, after staff's independent analysis, we determined that the project would not affect these resources. No comments were filed that presented evidence that the project would affect these resources. We therefore eliminated socioeconomic issues from consideration because they would be largely unaffected by relicensing.

EPA (letter dated April 12, 1995) recommends that we consider the indirect and secondary impacts of unplanned growth and subsequent development in the project area. We do not anticipate any substantial land use changes as a result of relicensing. The project area is flanked on each side by state roads, without a great deal of land area between the roads and the project boundary. The Fulton and Varick developments are located in urbanized areas where future development is limited. We therefore eliminated land use issues from consideration because these resources would be largely unaffected by relicensing.

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[8]Unless otherwise indicated, the source of our information is NMPC's application filed on December 9, 1991, and its responses to requests for additional information dated October 6, 1992; August 9, 1993; December 14, 1993; December 31, 1993; January 20, 1994; and November 13, 1995.

A. General Description of the Locale

1. General Setting

The Oswego River is located in north-central New York State, and the project facilities are within Oswego County. Elevations in Oswego County range from 250 feet above sea level along Lake Ontario to more than 1,700 feet in the northeast on Tug Hill.

Oswego County is in the lee of prevailing northwest winds from Lake Ontario. Consequently, it is subject to both extremes of cold temperatures and heavy snowfall. During the winter months, cold, dry, polar, continental air masses moving across Lake Ontario pick up moisture. Areas within the county located close to the lake are often slightly warmer than higher outlying areas downwind in the county because of the lake's heat sink. As the moisture-laden cold air moves inland, the higher outlying areas receive significant snow accumulations from what are known as "lake-effect storms." Tug Hill to the east of Oswego receives more snowfall than any other place east of the Mississippi River, about 300 inches annually.

Oswego's average temperature is 47.3^{0}F. The daily mean temperature ranges from a maximum of 78.4^{0}F in July to a minimum of 16.9^{0}F in January. Total precipitation in Oswego averages 39.3 inches. Months with the greatest average precipitation are November, December, September, and October.

Oswego County is primarily rural with the exception of its 2 cities, Fulton and Oswego, and its 10 villages. There are also areas of medium and low-density residential land use along the Oswego River corridor, in the towns along the southern boundary of the county, at major crossroads, and near some Interstate 481 interchanges. Most industry is concentrated in and near the two cities except for the electric power generating industry, which is concentrated along the shore of Lake Ontario.

Outside of these residential and industrial areas, the county is characterized by forest, brush land, and agricultural tracts including highly productive muck farms. Most population growth is expected in the southern towns and along the Oswego River, which has been identified by the Central New York Water Quality Management Program as the most viable area for industrial development in Central New York.

Land uses in the city of Oswego are an interspersed concentration of industrial/commercial/residential activities. The land use patterns of Oswego reflect its geography and history, with industrial development along the river and railroad, and compact high-density residential areas along both banks.

Oswego County encompasses 954 square miles with a total population of 119,600 people. The county has grown more rapidly than any other county in central New York during the past 25 years, largely due to NMPC's construction and operation of nuclear and fossil fueled power plants. NMPC was the county's single largest employer and taxpayer. From 1950 to 1975, the rate of population growth in the county was 42 percent or about 1.7 percent per year. From 1980 to 1986, the population of Oswego County increased by 5 percent. The population is expected to increase by 32 percent during the 20 year period from 1975 to 1995. Most of the expected growth will occur in the Oswego River corridor and in the towns along the Onondaga County boundary.

2. Oswego River Basin

The Oswego River is formed at the confluence of the Seneca and Oneida rivers, located at Three Rivers, New York, approximately 23 RMs upstream of Lake Ontario (see figure 1). From its source to its mouth, the river drops about 119 feet in elevation. The river flows north towards the lake and represents the final outlet for the 5,121-square-mile Oswego River drainage basin.

NYSTA's original purpose was to provide dams for commercial navigation. The commercial traffic has decreased, and today recreational lockages are much more prevalent. Heightened recreational usage of the Oneida and Finger lakes has caused NYSTA to use its dams and gates to control the summer lake levels for boating. In spring and fall, NYSTA uses its structures to control flooding in the upstream river basin. The Corps conducted several flood protection studies in the drainage basin. Summertime streamflow is typically about 1,000 cfs, while spring and fall high flows frequently exceed 12,000 cfs.

Oswego River flows initially enter the Phoenix dam impoundment. Oswego Hydro Partners recently constructed a new hydro station at this site (FERC No. 4113) located at RM 21.7. NYSTA controls the flows below this dam through the use of Taintor gates. Once past Phoenix dam, water flow enters the Oswego Falls impoundment.

A license for Erie's Oswego Falls Project (FERC No. 5984) was issued on March 15, 1996. The project consists of two developments, Oswego Falls East and Oswego Falls West. These developments are located at RM 12.6 at opposite sides of Upper Fulton dam in the city of Fulton. The only significant storage volume for all the Oswego River hydro developments is located within this impoundment. Oswego Falls dam is fitted with 18-inch-high flashboards. Prior to the issuance of the 1996 license, NMPC fluctuated the Oswego Falls pond over the 18-inch flashboard height to maintain a flow

of 2,500 cfs in the river, with no minimum flow required in the bypassed reach. Because the remaining impoundments on the Oswego River are small in comparison, their observed inflows were significantly affected by the operating scheme at Oswego Falls. The 1996 license specifies that the operating regime of the Oswego Falls change to ROR mode, which stabilizes the flow entering the downstream projects. Once past the Oswego Falls Project, water flow enters the Fulton-Granby impoundment.

Erie's Granby Project (FERC No. 2837) and the Fulton development of its Oswego River Project (FERC No. 2474) are located at opposite sides of Lower Fulton dam in the city of Fulton. Lower Fulton dam is located at RM 11.6, approximately 1 mile below Upper Fulton dam providing a small impoundment for the Fulton development.

The Fulton development is located in the city of Fulton. It is bounded on the east by the Oswego Canal Lock 3 and a commercial section of downtown Fulton that has recently been redeveloped. North of the development is the "Lower Bridge," and to the south and west is the Oswego River. The city of Fulton's marina is located across from the Fulton development at Lock 3. The shoreline of Fulton development's impoundment is small and heavily urbanized. It has only sparse vegetation on the abutting shoreline.

NYSTA allows Erie to place 6 inches of flashboards on Lower Fulton dam. Under normal flow conditions, the Fulton development historically operated in conjunction with the Granby Project as a storage-and-release pulsing facility utilizing the flows provided by the upstream Oswego Falls Project. Currently, the Granby Project voluntarily operates in a ROR mode. Once past Lower Fulton dam, water flow enters the Minetto impoundment.

The Minetto development is located in the town of Minetto, between New York State (NYS) Route 48 on the west and the Oswego Canal Lock 5 on the east. Across Route 48 from the development is the former Columbia Mills, Inc. These structures are currently vacant, but efforts are under way to rehabilitate some of them to housing. Additional vacant and commercial structures are located between Route 48 and the river north and south of the Minetto development. Approximately 3 miles upstream from (south of) the Minetto development, also located on the west shore of the river, is the Central New York State Parks Commission's Battle Island State Park. Other land uses abutting the impoundment are primarily rural in nature, e.g., agriculture, forest, and dispersed single-family residences. Some industry is also located on this stretch of the river, the major one being Armstrong Cork Company. The Oswego County Resources Recovery Plant is located on the east side of this section of the river. The upstream end of the Minetto impoundment extends into the city of Fulton.

At the Oswego River Project's Minetto development, NYSTA allows Erie to place 10 inches of flashboards on the Minetto dam. Under normal flow conditions, the Minetto development is operated as a storage-and-release pulsing facility. Once past the Minetto dam at RM 5.1, water flow enters High Dam impoundment.

The High Dam Project (FERC No. 10551) at RM 1.9 is owned by the city of Oswego, and Erie provides operation and maintenance (O&M) services for the project. NYSTA allows the placement of 10 inches of flashboards on the dam. High Dam operates in ROR mode. Once past the High Dam Project, water flow enters the Varick impoundment.

The Varick development is in the city of Oswego between NYS Route 48 on the west and the Oswego River on the east. Lock 7 of the Oswego canal is across the river to the east. To the west, north, and south across State Route 48, homes predominate, with interspersed commercial structures. A new post office was constructed north of the Varick development. In 1988, NMPC donated 65 feet of the river and State Route 48 frontage land to the city of Oswego for the southern terminus of its Linear Park Project, which was constructed along the west side of the river. In 1990, NMPC provided an additional $225,000 and conveyed additional property and easements across the powerhouse for regional recreational enhancement, particularly fishing access and safety features adjacent to the Varick development. The Linear Park Extension opened in October 1991.

At the Oswego River Project's Varick development, NYSTA allows Erie to place up to 3 feet of flashboards on the Varick dam. Under normal flow conditions, the Varick development is operated as a storage-and-release pulsing facility with up to 3 feet of fluctuation. Although no minimum flow is maintained within the bypassed reach, Erie has an interim agreement with NYSDEC to regulate flows at the Varick development to minimize the possibility of stranding fish in the bypassed reach. The agreement calls for Erie to maintain flows in the bypassed reach for up to 72 hours, particularly during the salmonid spawning season, after either a significant increase or decrease in flow. This agreement could potentially curtail generation at the Varick development if spilling is required. Once past the Varick dam, water flow passes through the city of Oswego and enters Lake Ontario.

The Oswego River is the second largest major drainage basin in NYS both in terms of size and importance. The Oswego River Basin contains a great diversity of aquatic habitats, including both developed and undeveloped riverine segments and many of the major natural lakes in New York. Derived from an agricultural and municipal drainage basin, Oswego River waters are rich in nutrients and carry a high suspended

sediment load. Part of the pollution in the Oswego River Basin (specifically associated with the Oneida River) is derived from point and non-point sources surrounding Onondaga Lake and from contaminated lake sediments. In addition, natural underground salt deposits result in high salt concentrations in Onondaga Lake and Oneida River waters.

Major population centers and associated commercial developments use the water resources. The Oswego River proper (Three Rivers to Lake Ontario) was the focus of early commercial development in New York with the construction of the extension of the barge canal system to connect the Erie Canal with the eastern end of Lake Ontario. Nineteenth century mills at the original and subsequent dams fostered regional economic development, which continued water quality degradation before the advent of modern protection measures. The combination of population centers, commercial and industrial development, and the construction of dams modified aquatic habitats either directly by impounding free-flowing reaches or indirectly through degradation of water quality by municipal and industrial effluents.

B. Cumulative Impact Summary

An action may cause cumulative impacts on the environment if it overlaps in space or time with the impacts of other past, present, and reasonably foreseeable future actions. The individually minor impacts of multiple actions, when added together, may amount to collectively significant cumulative impacts. The existing environment shows the effects of past and present actions and provides the context for determining the cumulative impacts of future actions.

We reviewed the project's potential to cause adverse cumulative impacts. Given the project's location and design and the nature of the area's resources, we conclude that the project could affect water quality and quantity, fish habitat, and boating and other recreation in a cumulative manner. We consider cumulative impacts on these resources in individual resource sections (section V.C).

C. Proposed Action and Action Alternatives

In each of the following resource sections, we describe the environmental setting, Erie's proposed operating procedures and environmental measures, and the recommendations of resource agencies and other entities. We then provide our independent analysis and conclusions about the effects that the project may have on environmental resources, and we make recommendations to protect or enhance affected environmental resources. Lastly, we discuss any unavoidable adverse impacts on each

environmental resource as a consequence of relicensing the project with our recommended measures.

1. Geological Resources

a. Affected environment:

Physiographic Setting

The project facilities are entirely within Oswego County, which lies within two physiographic provinces: the Erie-Ontario Lowlands and the Tug Hill Uplands. The Erie-Ontario Lowlands are characterized by minimal relief in the tens of feet, and slopes in the range of 2 to 9 percent. Glacial features such as drumlins, ground moraines, kames, and outwash plains are the dominant landscape features. The resulting topography is a complex drainage pattern of poorly drained depressions between hills and ridges and slow-moving streams. The Tug Hill Uplands are broad ridges with a steep slope on the east side grading into the Black River Valley.

The topography in the area of the Oswego River Project is characterized by gently rolling slopes (0 to 6 percent) and elevations ranging from 250 to 300 feet NGVD in and around the city of Oswego, to about 500 feet in the surrounding area.

Geology

The bedrock formations of Oswego County formed from sediments that accumulated on the bottoms of ancient oceans that covered the area approximately 400 million to 500 million years ago. Three major bedrock groups or formations exist in Oswego County. The Clinton Group consists of shale with sandstone; the Medina Group and Queenston Formation consists mainly of red sandstone and red shale; and the Lorraine Group is generally comprised of dark shales and fine-grained sandstones. These formations dip in a southwesterly direction at a rate of about 50 feet per mile. Erosion has worn away the younger layers in the northern sections of the county so that the formations proceed from oldest to youngest as one moves south from the Lorraine Group to the Lockport Formation.

Although there are no major folds or faults known in the general vicinity, the project area is designated by the Corps as an area with moderate seismic activity. The nearest fault is the Clarendon-Linden, located about 90 miles to the west. The Oswego River Project facilities have been evaluated to Corps standards and to Standard Flood Designs; therefore, moderate earthquakes should have no effect on project operations.

(Erie is not required to submit a consultant's safety inspection report because the dams are not part of the license. NYSTA owns, maintains, and operates the dam at each development. However, the dams would be included in any new license issued for this project. Consequently, safety inspection reports would need to be filed with the Commission.)

Soils

There are 30 soil associations in Oswego County. The predominant soil association in the county is the sloping and very stony Worth-Empeyville, which covers 22.3 percent of the county's area.

The last ice retreated from Oswego County about 12,000 years ago. Ice advances generally smoothed the ground surface and deepened valleys with a north-south orientation. The Tug Hill and Finger Lakes Regions are the most distinctive glacial features in the Oswego River drainage basin.

The predominant glacial deposit in Oswego County is a till consisting of mixed gravel, sand, silt, and clay. Glacial till is a product of eroded material that was carried along at the bottom of the glacier, then deposited directly on the ground surface as the ice melted. Empeyville, Sodus, Scriba, Worth, Ira, and Westbury soils are the major soils in the county that formed from weathered glacial till.

The discharge of water from melting glacier fronts frequently approached flood proportions. This meltwater transported coarse-grained material and fragments from the ice and from the river valleys it excised. Some of the lakes fed by glacial meltwater were very shallow, with marl deposits. Vegetation that grew in and around these shallow, marsh-like lakes resulted in an accumulation of organic material. Carlisle, Palms, and Rifle soils formed in these organic deposits.

Streams flowing during and after glaciation deposited alluvium and formed alluvial fans in many areas of the county. Herkimer soils formed in alluvial fans, and Rumney and Middlebury soils formed in Pleistocene-Recent alluvium.

The soils in the vicinity of the Varick development were formed in glaciolacustrine deposits. They are deep, poorly to well-drained, moderately coarse-textured soils that have a fragipan, a soil layer restricting water movement. There has been modification by cuts and fills involved in urban residential and industrial development. The soils on both banks of the Oswego River in the immediate vicinity of the project development are classified by the Natural Resources Conservation Service

(NRCS) as Urban Land. The classification consists of large areas in which the original soil has been altered, removed for construction of buildings, or covered with asphalt, concrete, or similar material. It is not possible to identify distinct soil types because the properties of the soil material vary greatly from place to place.

The soils on the east bank of the Oswego River just south of the Varick development are classified by the NRCS as Ira and Sodus, very stony, moderately steep. This series consists of deep, moderately well-drained, moderately coarse-textured soils that have a fragipan. These soils formed in glacial till derived mainly from sandstone. The surface layer of these soils consists mainly of fine sandy loam. Slopes range from 15 to 25 percent.

The west bank just south of the Varick development consists primarily of modified soils in residential developments, but still has distinctive soil characteristics. Erosion is a moderate hazard if cover is removed.

The soils in the vicinity of the Minetto development were formed in glacial till. They are deep, well-drained, moderately coarse-textured soils that have a fragipan. There has been modification by "cuts and fills" involved in residential and industrial development on the west bank of the river. The soils that have not been modified to this extent are classified as Sodus, very steep. Slopes range from 35 to 45 percent.

The soils in the vicinity of the Fulton development were formed in glaciolacustrine deposits. At the retreat of the last ice sheet, the area was covered by glacial Lake Iroquois. Oneida Lake and Lake Ontario are its remnants. Upland areas are water-worked drainages and till soils. They are deep, range from poorly to well-drained, and moderately coarse-textured soils with a fragipan. The soils on the east bank are classified as Urban Land. The west bank soils are classified as Williamson (very fine sandy loam) and Middlebury (loam). The Middlebury soil is a nearly level soil that formed in recent alluvium deposited by flooding from streams. Slopes range from 0 to 3 percent. Stream bank erosion is a problem in some areas and special practices are needed to control it.

b. Environmental impacts: In its license application, NMPC identified several locations where construction and earth-disturbing activities are expected to occur for proposed fisheries and recreational enhancements at each of the three hydroelectric developments on the Oswego River. These sites are located adjacent to the Oswego River. We recommend several other environmental enhancements elsewhere in this final EA that could entail earth-disturbing activities (see sections V.C.3 and V.C.7 for a

discussion of specific measures). These proposed modifications could potentially result in minor impacts from soil erosion.

NMPC submitted sediment and erosion control plans for its proposed measures in its AIR responses to the Commission dated August 7, 1992, and December 14, 1993. Sediment and erosion control measures proposed by NMPC for the trails include minimizing the disturbance of vegetation, placement of hay bales and silt fences, erosion controls for construction materials, surfacing of the trails with wood chips or stone, and inspection and maintenance.

Installation and removal of in-channel cofferdams and construction of the recreational trails could increase turbidity in the river temporarily. Sediment control measures for on-shore staging areas would consist of silt fences, hay bales, construction mats, and similar materials to avoid soil erosion.

Our Analysis

We have reviewed the conceptual sediment and erosion control plans provided by NMPC, and they are consistent with generally accepted Best Management Practices. However, final, site-specific sediment and erosion control plans still would need to be developed for those environmental measures that involve ground-disturbing activity that the Commission approves in a license that may be issued for this project.

We, therefore, recommend that Erie finalize its existing conceptual erosion and sediment control plans, as appropriate, to include all measures approved by the Commission in the license issued for the project. The final sediment and erosion control plans should include appropriate measures specified in the WQC for this project. The plans should be developed in consultation with NYSDEC and FWS and submitted to the Commission for approval.

c. Unavoidable adverse impacts: There would most likely be minor, short-term erosion and increased turbidity associated with construction of the recommended recreational and fisheries measures even with implementation of Best Management Practices.

2. Water Resources

a. Affected environment:

Existing Water Quality

NYSDEC has designated the Oswego River in the project area as Class B and C waters (NYSDEC, 1996). For Class B waters, designated best usages are primary and secondary contact recreation and fishing; they also are suitable for fish propagation and survival. Best usage of Class C waters is fishing, and they also are suitable for fish propagation and survival. Class C waters are designated for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Specifically, the water classifications for the project area are as follows:

- From the mouth to Lock 6 (RM 0 to 1.8; Varick is at RM 1.4) = Class C
- From Lock 6 to the Village of Phoenix = Class B

The project area is considered non-trout water. For Class B and C non-trout waters, the minimum daily average dissolved oxygen (DO) concentration is 5 mg/l, and at no time shall concentrations be below 4 mg/l. In both Class B and C waters the monthly median value of total coliform is not to exceed 2,400 per 100 milliliters (ml)., and no more than 20 percent of the samples, from a minimum of five examinations, shall exceed 5,000 per 100 ml. For Class B and C waters, pH must be 6.5 to 8.5.

The impoundments formed by the dams on the Oswego River in the project area apparently do not stratify. Water quality data collected in studies done by LMS (1978) at High Falls and Oswego Falls and by the U.S. Geological Survey (USGS) at Lock 7 (USGS, 1992, as cited in Lowie et al., 1994) reveal little or no stratification during summer conditions. Water temperature and DO levels were monitored by the USGS at Lock 7 (RM 1.4; Varick Project) from 1971 to 1991. The DO levels fluctuated with water temperature but always met the criteria for Class B waters (Lowie et al., 1994).

NYSDEC measured DO concentrations of less then 4.0 mg/l below the Granby Project in 1991 (Lowie et al., 1994). NMPC also recorded low DO readings in 1992 on three occasions: June 21 (3.6 mg/l), July 11 (3.7 mg/l), and August 20 (3.8 mg/l) (Lowie et al., 1994). In addition, daily average concentrations recorded by NMPC at the Granby Project were below 5.0 mg/l on nine occasions during the summer. Low DO concentrations and elevated water temperatures may also occur during the summer months in some of the isolated pools in the bypassed reaches below the Varick and

Fulton developments (letter from Edward Miller, Environmental Analyst, NYSDEC, to the Commission, dated April 1, 1996). Erie monitors DO when the water temperature exceeds 50°F and river flows are less than 2,500 cfs. On occasion, when minimum DO concentrations are not met, Erie is required to increase spillage at the Granby Project to increase the downstream DO concentrations.

There are several point and non-point sources of pollution in the project area. Point sources include combined sewer overflows (CSOs) and industrial and municipal sewage treatment plants (STPs). Four regulated STPs and nine CSOs currently discharge into the Oswego River and Harbor (Lowie et al., 1994). Additionally, eight CSOs are located in the city of Fulton but are relatively inactive except during flooding. NMPC identified six discharges in the project area in its license application: Sealright Company, Fulton Water Pollution Control Facility, Oswego County Energy Recovery Plant, Armstrong Cork Company (now called Armstrong World Industries, Inc.), Oswego Vacuum Cooling Company, and the Minetto Sewer District Water Pollution Control Facility. All dischargers are still listed in EPA's Permit Compliance System (PCS, 1999) with the exception of the Oswego Vacuum Cooling Company. Additional dischargers listed in the PCS (1999) are the Fulton Cogeneration Association Project, Miller Brewing Company, The Nestle Company, Inc., Oswego West Side Sewage Treatment Plant, the Owens-Brockway Glass Container, Inc., and Pittston Petroleum Inc. Non-point sources include contaminated groundwater, agricultural runoff, leaching from hazardous waste sites (five inactive sites in the city of Fulton and in the towns of Volney and Granby; NYSDEC, 1990, as cited in Lowie et al., 1994), and atmospheric deposition.

Water quality has improved substantially since 1970. Although water transparency typically remains only 2 to 3 feet, nutrient and pollutant loadings have decreased as a result of State Pollution Discharge Elimination System (SPDES) restrictions on commercial and municipal users.

The Oswego River Remedial Action Plan (RAP) cites the Oswego harbor and river up to the Varick dam as part of the Area of Concern (NYSDEC, 1990, as cited in Lowie et al., 1994). The RAP identifies polychlorinated biphenyls (PCBs), dioxin, mercury, mirex, and ostachlorostyrene as present in fish tissue, sediment, and the water column. High levels of phosphorous also were identified as adding to poor water quality.

Water quality information also was collected as part of the Rotating Intensive Basin Studies (RIBS) in 1989 and 1990 (NYSDEC, 1992b, as cited in Lowie et al., 1994). In the RIBS, NYSDEC monitored pH, water hardness, turbidity, bacteria (coliform), heavy metals, and other contaminants. The water column, bottom sediment, and macroinvertebrate and fish tissue were sampled at 10 locations, including the

Minetto development and the Phoenix Project. Water column data showed parameters of concern to be iron, dissolved solids, phenols, and total and fecal coliform. The pH values ranged from 7.0 to 8.6, and the average pH for the 2-year study period was 7.7. This average value was little changed from the pH level of 7.8 found in the New York State Conservation Department's 1927 study at the Minetto development. Average total water hardness and turbidity at the Minetto development was 227 mg/l and 8 mg/l, respectively. Average total coliform at the Minetto development was 12,273 col/100 ml, and average fecal coliform was 463 col/100 ml. Contaminant analysis also found consistently elevated levels of mercury, PCBs, and the pesticides DDD and DDE in fish tissue collected near the Phoenix Project and Minetto development. In general, NYSDEC rated the water quality "fair" at the Minetto site.

The New York State Priority Water Problem List designates the section of the Oswego River from Phoenix to Oswego as non-supporting (i.e., impaired) of its best use "fishing" designation due to contamination and fluctuating water levels caused by channel modifications and flow regulation (NYSDEC, 1991, as cited in Lowie et al., 1994). The effects of fluctuating water levels, however, have been reduced since this study, with the conversion to ROR operations at the Oswego Falls (in 1996) and High Dam (in 1991) projects.

Existing Water Use and Quantity

Within the project area, water consumption is very limited. Potable water is drawn from wells and Lake Ontario. No known consumptive use of project water now occurs, and none is proposed. There are no existing minimum flows for water quality purposes and none are proposed.

The Oswego River is a highly flow-regulated waterway. Flows are regulated by a series of locks controlled by NYSTA, as well as by the hydropower facilities on the river. The minimum daily flow recorded at the USGS gage (No. 04249000) at Lock 7 from water years 1934 to 1985 was 261 cfs in 1985, the highest flow was 37,500 cfs on March 28, 1936, and the average flow was 6,740 cfs. Typical spring and fall flows are 8,000 to 15,000 cfs, and summer flows usually range between 1,000 and 5,000 cfs. Table 1 summarizes the average monthly flows measured at Lock 7.

Table 1. Average monthly flows for Oswego River at Lock 7 (approximately 0.5 mile downstream of the Varick development) (Source: NMPC, 1991).

Month	Flow (cfs)
January	7,820
February	7,930
March	12,000
April	13,300
May	8,350
June	5,140
July	3,560
August	2,490
September	2,720
October	3,670
November	5,660
December	8,260
Annual	6,740

b. Environmental impacts:

Construction-related Water Quality Impacts

Construction of proposed and recommended environmental measures could affect water quality by erosion and sedimentation. We discuss erosion and sedimentation in section V.C.1, geology and soils.

Operations-related Water Quality Impacts

Water fluctuations caused by store-and-release hydropower projects can affect water quality by altering the development and persistence of thermal stratification, by resuspending and redistributing sediments within the littoral zone, by leaching soluble material from the bottom in the littoral zone as water moves in and out of the interstices, and by changing sediment and nutrient retention (trap efficiency) (Hildebrand et al., 1980).

Erie proposes to change its project operation from a store-and-release mode to a ROR mode. In addition, Erie proposes to release at least 200 cfs to the upper bypassed reach at the Varick development and at least 75 cfs to the upper bypassed reach at the Fulton development. Bypassed reach flows pertain primarily to enhancing fish habitat and are therefore discussed in detail in section V.C.3.b.

NYSDEC, FWS, and NYRU recommend operating the project in ROR mode for the protection of water quality and aquatic habitat. In its April 12, 1995, letter to the Commission, EPA asked that potential impacts of project operation on surface water quality be evaluated.

Our Analysis

Converting the Oswego River Project to ROR operations as proposed by Erie would reduce daily water fluctuations in the project impoundment and the river reaches downstream of each development. Reducing water level fluctuations would stabilize shoreline areas through increased vegetative growth, thereby reducing erosion and subsequent turbidity caused by these fluctuations. Although some DO problems were identified, the uninterrupted river flows provided by operating ROR would minimize retention times in the impoundment, thereby lessening the potential for reduced DO levels. Switching to ROR operation would therefore represent a water quality enhancement. The addition of minimum flows to the Varick and Fulton bypassed reaches would prevent stagnation in isolated pools and eliminate occasional instances of excessive localized warming and associated low DO levels.

We recommend that Erie operate all the developments in its Oswego River Project in a ROR mode, minimize water fluctuations by maintaining pond levels at or near the top of the flashboards or dam crest, and release minimum flows in the bypassed reaches below the Fulton and Varick developments (see sections V.C.3.b and V.C.4.b for additional analysis of ROR operation and specific minimum flows). To achieve the full benefit of ROR operation at the Oswego River Project, other projects on the lower river also should be operated in ROR mode.

Operations-related Water Use Impacts

NYSTA regulates the Oswego River to provide sufficient water for the lock system during the navigation season (generally mid-April to mid-November). Each lock requires approximately 0.2 cfs/foot of lift for each lockage, which typically results in a daily average flow through the locks of 40 cfs, assuming 10 locking operations. The navigational channel is maintained at a width of 200 feet and a depth of 14 feet in the

canal, and 13 feet in the lock sills. Erie is required to maintain water levels at or above the dam crest during the navigation season.

In the original application, NMPC proposed the installation of pneumatic crest gates at the Minetto and Varick developments. NMPC later withdrew these proposed measures in its AIR response dated November 13, 1995.

In comments submitted to the Commission on June 2, 1995, the city of Oswego contends that the installation of a rubber dam at the Varick development may alter the operating head at High Dam during high river flow periods.

Our Analysis

The ROR mode is not expected to adversely affect the operation of the navigation canal. The estimated average flow for locking operations (40 cfs) is well below the minimum daily flow of 216 cfs measured in 1985, based on a record from 1933 to 1987.

We acknowledge the possibility that if a rubber dam or pneumatic crest gate is installed at Varick, it could reduce the operating head at the High Falls Project during high-flow events, thus minimally reducing potential generation at this project. The pneumatic crest gates, however, would be of the same height (2.5 to 3.0 feet) as the current flashboards at the Varick development. Our recommendation pertaining to the pneumatic crest gate at Varick is discussed in section V.C.3, Fisheries Resources, and section V.C.4, Terrestrial Resources.

Flow Monitoring

Erie proposes to develop and implement a flow monitoring plan to measure flows in the bypassed reaches and to demonstrate compliance with its proposed ROR operations.

NYSDEC and FWS requested flow monitoring at the project developments to verify ROR operations. NYSDEC made the following specific monitoring recommendations in its April 1, 1996, letter to the Commission:

- The licensee should submit a flow monitoring plan within 3 months of license issuance;

- The gaging system should be USGS-type unless justification for an alternative is provided;

- The gaging equipment should be able to determine stage and flow of stream(s) on which the project is located, all other project flows (including base flows and bypass and diversion flows), and project headpond and tailwater elevation;

- The licensee should keep accurate and continuous records of flow and stage data in NYSDEC format;

- All gages must be calibrated;

- Permanent staff gages should be installed for independent verification of headpond and tailwater elevations;

- Operating ranges and stage versus discharge rating should be calibrated at least annually, or when rating changes, and maintained for all sites;

- NYSDEC or an authorized representative should be provided access to the staff gages; and

- Headpond and tailwater elevations should be gaged and recorded to the nearest 0.1 foot.

Our Analysis

We agree that flow monitoring is appropriate to verify compliance with ROR operations and our recommended bypassed reach flows. Therefore, we recommend that Erie submit a flow monitoring plan to the Commission for approval after consulting with NYSDEC, FWS, and USGS. The plan should specify methods for gaging tailrace and bypassed reach flows, as well as headpond and tailwater elevations, the expected accuracy of the measurements taken, proposed quality assurance measures, and reporting procedures.

c. Cumulative impacts: Water quality in the project area would receive a cumulative benefit through the proposed ROR operating mode and the staff-recommended minimum flow releases in the bypassed reaches of the Fulton and Varick developments.

d. Unavoidable adverse impacts: Installation of new crest gate structures designed to minimize impoundment fluctuations at the Varick development may reduce net

operating head at the High Dam Project during high river flows. We consider this to be a minor, but long-term, impact.

3. Fisheries Resources

a. Affected environment: The tributaries to Lake Ontario, including the Oswego River, provide important contributions to the aquatic ecosystem and fishery of the lake. Given the current declining condition of the Lake Ontario fishery, including a declining forage base, future contributions from the Oswego River may be important to the protection of the lake's ecosystem.

The fishery in the Oswego River in the project area is a diverse mix of warm-, cool-, and coldwater species, including migratory and "resident" fish populations. A total of 61 taxa of fish have been collected in the Oswego River spanning the period from 1927 to 1989. Table 2 provides a list of species. The most recent relatively comprehensive fishery survey was conducted in the bypassed reaches of the three developments. During this survey, 31 species were collected; samples were dominated by centrarchids (38 percent as a group, comprising mostly smallmouth bass, pumpkinseed, and bluegill), freshwater drum (17 percent), and clupeids (13 percent as a group, comprising mostly gizzard shad. The NMPC entrainment study at the Minetto development collected 35 species, including three species previously not noted in the past: river chub, blueback herring, and rainbow smelt. Blueback herring are not native species but are believed to come from the Mohawk River drainage via the Erie Canal System (letter to the Commission from Willie Taylor, Director, Office of Environmental Policy and Compliance, U.S. Department of Interior, Washington, DC, May 26, 1995). NYSDEC, by letter dated April 1, 1996, characterized the fishery as having a severe predator/prey imbalance caused by ineffective reproduction of prey species and the loss of medium to large sized predators. NYSDEC attributes some of the population imbalances to operations at the seven hydropower facilities on the Oswego River. NMPC, in its license application, disputes the presence of a predator/prey imbalance and notes that recent sampling showed that the important game species are relatively abundant and, upstream of the Varick development, self-sustaining.

Table 2. Fish species collected in the Oswego River (Source: NMPC, 1991).

Sea lamprey	Common carp	Creek chubsucker	Rock bass
Lake sturgeon	Cutlips minnow	Silver redhorse	Pumpkinseed
Longnose gar	Goldfish	Unidentified	Bluegill
Bowfin	Chain pickerel	redhorse	Unidentified
American eel	Common shiner	White catfish	sunfish
Gizzard shad	River chub	Black bullhead	Largemouth bass
Alewife	Golden shiner	Brown bullhead	Smallmouth bass
Blueback herring	Satinfin shiner	Channel catfish	White crappie
Rainbow smelt	Emerald shiner	Tadpole madtom	Black crappie
Coho salmon	Bridle shiner	Trout-perch	Johnny darter
Chinook salmon	Spottail shiner	Burbot	Yellow perch
Rainbow trout	Spotfin shiner	Banded killifish	Logperch
(steelhead)	Mimic shiner	Brook silverside	Walleye
Atlantic salmon	Bluntnose	Brook stickleback	Freshwater drum
Brown trout	minnow	Threespine	
Northern pike	Fathead minnow	stickleback	
Eastern silvery	White sucker	White perch	
minnow		White bass	

A viable sport fishery exists in the Oswego River for small- and largemouth bass, white perch, and walleye. Other sport and pan fish include channel catfish, northern pike, yellow perch, bluegill, and black and white crappie. In addition to these resident species, NYSDEC stocks numerous chinook salmon, coho salmon, rainbow trout (steelhead, including Skamania steelhead), and brown trout, which provide an excellent spring and fall fishery below the Varick dam to Lake Ontario. NYSDEC also stocks lake trout to restore this native species to Lake Ontario and to provide a limited sport fishery. NMPC further indicates that with the removal of sources of water pollution in the Oswego River, fish populations expanded regardless of the operation of hydroelectric projects and the fishery developed to its present quality, which NMPC asserts is excellent both upstream and downstream of Varick. Using an average relative weight analysis, NMPC found that for 9 of 13 comparisons of various gamefish collected from the Oswego Falls and High Dam impoundments, the weight of the Oswego River fish was greater for their size than 75 percent of the populations over the geographic range of the species.

NYSDEC currently is considering trying to re-establish Atlantic salmon in the Oswego River. It began stocking in 1987 with just over 1,000 individuals, stocked again in 1989 and 1990, and stocked over 25,000 in 1992 (Lowie et al., 1994; life stage and

location were not specified). Fish Creek, a tributary of the Oswego River, was stocked with 10,000 Atlantic salmon fry in June 1997 (letter from Edwin Crosby, president, Atlantic Salmon Fish Creek Club, dated October 2, 1997). Other migratory species found in the Oswego River in the project area include lake sturgeon, American eel, alewife, and blueback herring. NYSDEC and FWS also have targeted American eel and lake sturgeon (state-listed threatened species) for restoration in the Oswego River (Lowie et al., 1994).

The Fulton and Varick developments have bypassed reaches, while the Minetto development does not because the powerhouse is integral with the dam, and the dam is backwatered by the High Dam impoundment (FERC No. 10551). The Fulton bypassed reach is 3,200 feet long and is divided into an upper and lower section. The upper section is about 600 feet long, extending from the base of the Fulton dam to the confluence with the Fulton development tailrace. The lower section extends approximately 2,600 feet from the downstream end of the upper section to the juncture of the Oswego River and the Granby development tailrace. The Varick bypassed reach also is divided into two sections: upper (900 feet long from the dam to the upstream edge of the confluence with the Varick development powerhouse discharge) and lower (900 feet long from the downstream end of the upper section to the downstream edge of the tailrace training wall).

The upper sections of the Fulton and Varick bypassed reaches are frequently dewatered. The upper section of the Fulton bypassed reach is composed primarily of bedrock with some variable-sized boulders, minor amounts of gravel and sand, and little cover (LMS, 1990). The upper section of the Varick bypassed reach is dominated by cobble and ledge (bedrock), with little or no pool habitat and no areas providing significant cover (LMS, 1990).

The bypassed reaches provide riffle habitat which is virtually absent elsewhere in the Oswego River. Riffle habitat generally is a primary production area for macroinvertebrates, minnows (Cyprinidae), and darters, which constitute much of the food base for other fish. Additionally, a variety of other fish use lotic habitat for spawning, including walleye, lake sturgeon, trout, and salmon.

b. Environmental impacts:

Project Operations and Impoundment Fluctuations

The Oswego River Project developments currently operate in a storage-and-release pulsing mode. Flashboard heights of 6 inches, 10 inches, and 3 feet at the Fulton, Minetto, and Varick developments, respectively, have allowed for water level fluctuations of these amplitudes. In its original proposal, NMPC proposed reducing water level

fluctuations at the Varick development from 2.5 feet to 1.0 foot and installing pneumatic flashboards at the Varick and Minetto developments. NMPC withdrew its proposal to install pneumatic flashboards at the Varick and Minetto developments by letter dated November 13, 1995. Table 3 shows surface areas for maximum and minimum impoundment levels.

Table 3. Surface areas at maximum and minimum impoundment levels at the Oswego River developments (Source: NMPC, 1991).

	Maximum impoundment (surface acres)	Minimum impoundment (surface acres)
Fulton	33	30
Minetto	350	323
Varick	32	29

NMPC later proposed, and NYSDEC, NYRU, and FWS have recommended, that the project be operated in a ROR mode. Additionally, NYSDEC, NYRU, and FWS have requested that water levels be maintained as close to the top of the flashboards or dam crest (when flashboards are absent) as technically feasible. All agencies also have recommended restrictions on flashboard replacement after failure to minimize impact on spawning fish. NYSDEC recommends no flashboard replacement between May 1 and June 30 and that the minimum bypassed flow be released while reinstallation occurs; FWS and NYRU recommend no flashboard replacement until after July 1 unless the design allows rapid reinstallation after failure. NYSDEC, FWS, and NYRU recommend installation of pneumatic flashboards or inflatable rubber dams wherever feasible in lieu of the current flashboard systems to allow pond elevations to be promptly stabilized after high flow events. NYSDEC also recommends that the licensee should replace the current breakaway flashboard system with a system that would achieve the same design purpose, yet retain the flashboards at the project site. NYSDEC further recommends that, within 1 year of license issuance, the licensee should file with the Commission a plan for eliminating seasonal water level fluctuations associated with the collapse of flashboards.

Our Analysis

Water level fluctuations caused by hydropower peaking/pulsing can cause a variety of impacts on water quality, including increased turbidity and reduced DO levels. In addition, projects operated in a peaking or pulsing mode can severely affect aquatic habitat above and below projects. In impoundments, water level fluctuations can adversely affect fish populations by changing spawning habitat, behavior, and success.

Impoundment fluctuations tend to reduce spawning habitat, can cause nest abandonment and exposure, may desiccate eggs and strand young fish, and can lead to the gradual loss of shoreline shelter as a result of erosion (Miracle and Gardner, 1980; Ploskey, 1983; von Geldern, 1983). Centrarchids are particularly susceptible to water level fluctuations because they spawn primarily in the shallow, littoral zone.

Downstream of projects, hydropower pulsing can strand fish and desiccate their eggs (Hildebrand et al., 1980) and can adversely affect macroinvertebrate populations (food source for fish) through scouring, desiccation, altered flow patterns, and creation of an unstable food supply (Fisher and LaVoy, 1972; Armitage, 1976; Covich et al., 1978). NYSDEC has documented numerous instances of fish stranding below the Varick development due to rapidly fluctuating water levels.

We agree that the Oswego River Project should be operated in a ROR mode and water levels should be maintained at or near to the top of the flashboards or dam crest if flashboards are absent. This would eliminate the daily fluctuations of water level in the three impoundments and downstream of the Fulton and Varick developments (the Minetto development tailrace water elevation is dictated by the water level of the High Falls impoundment). The stable water levels would stabilize aquatic habitat and enhance the fishery.

Currently, there are seasonal decreases in impoundment water levels when the flashboards fail. Typically flashboard failures can occur from the fall to spring and the flashboards are not replaced until flows subside enough to safely reinstall them (usually May or June). If flashboard failure occurs during the fall or winter, about 3 acres of shoreline habitat would be exposed at the Fulton development and 27 acres at the Minetto development until the flashboards are replaced in the spring. However, the change in water depth at full pond would be a maximum of 6 inches at Fulton and 10 inches at Minetto. Few fish would be expected to inhabit this depth during the fall, winter, and early spring. Similarly, macroinvertebrates would typically overwinter in deeper water and therefore would not likely to be subject to exposure due to flashboard failure.

If the flashboards were not reinstalled by early May, some centrarchid nest building could occur near the shoreline. Reinstallation of the flashboards at Fulton or Minetto would then result in the nests being in water 6 and 10 inches deeper than they were originally constructed, respectively. We conducted a literature review and found no evidence that minor increases in the surface elevation would have an adverse effect on centrarchid nesting success. In fact, an increase in year-class strength occurs in certain fishes, including crappie, after spring flooding (Kohler and Hubert, 1993). There may be

a slight increase in potential predation on eggs or fry in the nests, but centrarchids vigorously defend their nests from such encroachment (Scott and Crossman, 1973).

Most centrarchids build their nests throughout a fairly wide range of water depths (e.g., smallmouth bass nesting occurs in water 2 to 20 feet deep; Scott and Crossman, 1973). Nest building of smallmouth bass and white crappie, which both occur in project waters, begins when the water temperature reaches 55 to 57°F (Scott and Crossman, 1973). The water temperature did not reach this level until after May 18, 1994, based on data collected during the year-long entrainment study at Minetto (KA, 1995). During many years, the flashboards would be reinstalled before nesting of these two species began. Pumpkinseeds tend to nest in shallower water (6 to 12 inches deep; Scott and Crossman, 1973). Flashboard reinstallation after nest construction could result in pumpkinseed nests being in water that is deeper than preferred. However, pumpkinseed nest building does not begin until the water temperature reaches 68°F, which in 1994 did not occur until mid-June. Flashboards would most likely have been reinstalled before mid-June. Nest building of other centrarchids that occur in project waters begins at similar temperatures and therefore would not be expected to begin until well into June.

In the unlikely event that flashboard failure occurs during May or June (NMPC indicates in a response to agency comments dated May 13, 1996, that it could not recall any occurrences of flashboard failure after initial replacement in the spring), some centrarchid nests could be exposed and adversely affected. However, at Fulton and Minetto, most centrarchid nests would still be submerged because the majority would be constructed at depths greater than 10 inches.

We conclude that the fluctuations caused by the loss of the 6-inch and 10-inch flashboards at the Fulton and Minetto developments, respectively, are not likely to cause a substantial adverse impact on the fish or macrobenthic communities in their respective impoundments.

In response to our recommendation in the draft EA that Erie should develop a plan to minimize the loss of flashboards at Fulton and Minetto for aesthetic and safety reasons (see section V.C.7), Erie suggested that, if we continue to recommend minimizing board loss, it could reinforce the current breakaway flashboard system so that failures would only occur during major flood events (letter from Jerry Sabattis, Erie, to the Commission dated January 28, 2000). Implementation of a plan to reinforce the flashboards should reduce the potential for dewatering nearshore habitat during centrarchid spawning and nest occupation.

NYSDEC and FWS indicated during the September 12, 2000, Section 10(j) meeting that their primary concern was not with the increased water surface elevation that would occur when the flashboards are reinstalled or the potential for subsequent flashboard failure following reinstallation. They are concerned about nearshore habitat exposure that occurs with impoundment drawdowns below the dam crest that are necessary for safety reasons during flashboard reinstallation. Erie noted during the meeting that it typically draws down the Fulton impoundment by 1 foot and the Minetto impoundment by 6 inches during flashboard reinstallation. This allows a margin of safety for the workers reinstalling the flashboards if the units at the powerhouses experience an emergency shutdown, thus diverting all of the flow to the impoundments and, eventually, over the dam. This level of drawdown could expose some centrarchid nests (resulting in desiccation of eggs or fry) and other aquatic habitat. Erie's suggested reinforced flashboard systems would reduce the need for the reinstallation of flashboards at any time of the year. However, we now conclude that it would be prudent, during the expected rare occasions when flashboards would need to be reinstalled, to restrict the reinstallation of flashboards to a time frame outside the period when most centrarchid spawning is expected to occur (before May or after June). The collective benefits to the aquatic habitats, aesthetic resources (reduced project-related debris), and recreational user safety increase the attractiveness of Erie's suggestion. See section VII for our final recommendation regarding flashboard loss prevention and installation limitations.

In the draft EA, we noted that the seasonal 3-foot drop in water surface elevation associated with flashboard failure at the Varick development and the 3-foot increase in water surface elevation that occurs when they are reinstalled to have more potential for adverse impacts. Even though only 3 acres of substrate would be exposed, some overwintering macroinvertebrates could be subject to freezing or ice scouring; there could be increased potential for fish stranding as the water level rapidly drops; and, if flashboards are reinstalled after centrarchid nests are constructed, the additional 3 feet of water depth could reduce nesting success. We therefore recommended in the draft EA the installation of pneumatic crest gates at the Varick development dam to eliminate the decreases and increases in the impoundment water level associated with flashboard failure and reinstallation. We concluded that this recommendation should be protective of the aquatic habitat by keeping a relatively stable impoundment water level throughout the year.

In response to our recommendation in the draft EA that Erie should install pneumatic crest gates at the Varick development, NYSDEC commented that it did "...not believe that installation of pneumatic crest gates at Varick will have as significant a biological benefit as at other facilities on the river because of the relatively small, steep sided impoundment. From a dam safety point of view, however, they are an improvement

over the existing flashboards provided that spillway design capacities are maintained" (letter from K. P. Sanders, NYSDEC, to the Commission dated January 4, 2000). We explored this comment briefly during the September 12, 2000, Section 10(j) meeting. NYSDEC indicated that, although it considered the biological benefits of pneumatic crest gates to be minor at the Varick development, its primary concern was for downstream angler safety. Considering the heavy angler use of the Oswego River downstream of the Varick dam, NYSDEC found pneumatic crest gates to be warranted.

In response to our discussions at the Section 10(j) meeting, Erie commented that a flood level high enough to cause the flashboards to fail would preclude anglers from accessing the Varick bypassed reach in the first place (letter from J.L. Sabattis, Erie, to the Commission dated November 1, 2000). Erie noted that flashboard failure due to ice loading would cause a gradual bending of the flashboard pins and not an instantaneous blow-out of flashboards that could threaten anglers in the bypassed reach during the winter. Erie further commented that, in the unlikely event that floating debris, such as trees, should strike the flashboards and cause them to fail during non-flood events, only one or two sections of flashboards would fail which would not cause high enough flow to the bypassed reach to threaten anglers. Erie indicated that it would prefer to install pneumatic crest gates at all of its hydroelectric projects if it is feasible, but at the Varick development the prohibitive cost (which Erie now estimates to be over three times that originally estimated by NMPC) make it infeasible.

The above exchanges that occurred after the issuance of our draft EA essentially shifted the rationale for recommending pneumatic crest gates at Varick from an ecological to a safety measure. Through our Division of Dam Safety and Inspections at our New York Regional Office, we evaluated the existing flashboard system from a safety perspective and compared the safety aspects to those with pneumatic crest gates in place.

The following is a summary of our findings. The Varick dam flashboards are designed to fail sequentially in sections, with the lower height boards near the power intake designed to fail first and then progressing in sequence across the dam. The sequence of failure would move from the intake at the left abutment toward the deeper flashboard sections at the right dam abutment as the flows increase. The fall is the most popular time of the year for anglers to fish in the bypassed reach. Normally, flows in the river at this time of year are low, and overtopping of the flashboards infrequent. If flashboards are overtopped by high flows, anglers would not be able to effectively fish in the bypassed reach. The first section of flashboards would begin to fail when the flow was about 9.4 inches over the top of the flashboards, and anglers would have been unable to wade in most of the bypassed reach long before flows reached this level. Flashboard failure is not a sudden event; rather the pins supporting the flashboards begin to bend

until the boards break free. Each section would gradually fail, and the sequential failure would direct any anglers that could be wading in the bypassed reach away from the west side of the river towards Leto's Island, where safe exit from the river is practical. We do not recommend installing pneumatic crest gates at the Varick dam for the sole reason of avoiding unexpected flashboard failure.

We further assessed what we consider to be the extremely unlikely event of flashboard failure with little or no spillage over the dam. Flashboard failure without spillage could occur if there were material defects, poor installation, or impact from floating debris in the river. During a recent operation inspection, an angler fishing just downstream from the toe of the Varick dam was observed. There could be a hazard to anglers fishing on or near the toe of the dam if a section of flashboard failed suddenly and unexpectedly. We consider it prudent to assess on a case-by-case basis whether or not signs are needed warning anglers and other recreationists of the hazards at or near the toe of the dam. Based on recent angler activity near the toe of the Varick dam, it is appropriate for Erie to modify its existing signage to warn persons of these potential hazards (Erie's existing safety program at Varick is further discussed in section V.C.7.a, Recreational Resources). Because this recommendation pertains to public safety, the Commission can require that it be implemented without a specific license condition.

Based on NYSDEC's and Erie's comments and our analysis, we no longer recommend that Erie be required to install pneumatic crest gates at the Varick development. However, our withdrawal of this recommendation reinstates the agencies' concern that Erie replace the breakaway flashboard system at the Varick development with a system that would retain the flashboards at the project site. NYSDEC's recommendation for Erie to develop a plan for eliminating seasonal water levels associated with the collapse of flashboards, which we agreed with in the draft EA, is an appropriate mechanism to address a feasible means of reducing seasonal impoundment fluctuations and avoiding downstream dispersal of flashboard material at the Varick development in a manner that is agreeable to the agencies and Erie. Erie already proposes to replace the current flashboard systems at Fulton and Minetto with more robust systems that would only fail during very high flow events. This approach, which we discussed during the Section 10(j) meeting, was acceptable to the resource agencies. The greater height of the flashboards at Varick (up to 3 feet) may make reaching a mutually satisfactory resolution of this issue at Varick more challenging than at Minetto and Fulton. However, we are confident that, with FWS, NYSDEC, and NYSTA consultation, a feasible solution can be developed.

We agree with NYSDEC that the recommended minimum flow to the Fulton and Varick development bypassed reaches (discussed in the following subsection) should be

released to the bypassed reaches during flashboard replacement. This would minimize potential stranding or desiccation of aquatic organisms in the bypassed reach channel. There is no recommended minimum flow at the Minetto development.

The full benefits of ROR operation cannot be achieved in the lower Oswego River unless all projects operate in this mode. This would include the Oswego Falls Project upstream, the Granby Project which shares a dam with the Fulton development, and the High Dam Project located between the Minetto and Varick developments. NMPC proposed to operate all of its projects on the river in a ROR mode in a letter dated August 9, 1993, to the Commission and reiterated this proposal by letter dated May 13, 1996.

The Oswego Falls Project located upstream of the Fulton development controls the water flowing into the Oswego River Project. Oswego Falls has recently been relicensed and is required to operate ROR. Under the recent license amendment, High Dam is also required to operate in a ROR mode. Therefore, only the Granby Project would need a license amendment to ensure ROR operation throughout the lower Oswego River.

Bypassed Reach Flows

Erie currently has no minimum flow release or ramping requirements in the bypassed reaches below the Oswego River Project developments. Sections of the Fulton and Varick bypassed reaches receive no flow during much of the year other than leakage (12 cfs and 15 cfs at the Fulton and Varick developments, respectively). The Minetto development, however, has no dewatered bypassed reach because the impoundment for the High Dam Project provides a continuous backwatering to the base of the Minetto dam.

In 1993, habitat-based, instream flow incremental methodology (IFIM) studies were conducted in the Fulton and Varick bypassed reaches (KA, 1993). The general objective of these studies was to quantify changes in habitat area within a range of flows between 0 and 1,500 cfs to determine minimum flow releases that would maintain habitat for indigenous aquatic species.

Flow recommendations proposed by Erie, FWS, and NYSDEC developed based on the results of the IFIM studies are shown in table 4. For the Fulton Project, NMPC and the agencies came to agreement on a year-round release of 75 cfs into the upper bypassed reach, and a release of 375 cfs into the lower bypassed reach, which would increase to 875 cfs during the walleye spawning season. Flows would be provided into the lower bypassed reach by a combination of spills into the upper bypassed reach and flows passed through the project's turbines.

Table 4. Minimum flows proposed for Oswego River developments (Source: Staff).

Location	Erie proposed flow	Agency proposed flow (also supported by NYRU)
Fulton upper bypass	75 cfs year-round	same as Erie
Fulton lower bypass	375 cfs year-round 875 cfs during walleye spawning[a]	same as Erie except the units to be used to pass minimum flows are specified[b]
Minetto	no minimum	no minimum
Varick upper bypass	200 cfs year-round 300 cfs during salmon migration[c] 475 cfs during walleye spawning[a]	400 cfs year-round[d] 500 cfs during salmon migration[c] 800 cfs during walleye spawning[a]
Varick lower bypass	75 cfs year-round 150 cfs during salmon migration 200 cfs during walleye spawning	not specified[e]

[a] Based on NYSDEC's "Guidelines for establishing spillage periods to protect walleye spawning" (undated), NYSDEC and FWS recommend that spawning flows be maintained from March 15 until 30 days after average daily water temperatures of 50° F or higher are reached on four consecutive days after April 15. FWS and NYSDEC recommend that at the end of this period, flows be gradually ramped down in 100 cfs increments over at least a 24-hour period.

[b] NYSDEC specified that the larger unit should be used to pass 800 cfs during walleye spawning and the smaller unit should be used to pass 300 cfs during the rest of the year (in both cases, 75 cfs would be contributed from the upper bypass). FWS also specified that the large unit should be used to pass 800 cfs during walleye spawning, but that part of this flow could be passed via the smaller unit if the large unit went off line, with the rest of the flow passed via spill.

[c] NYSDEC and FWS recommend that salmonid passage flows be maintained from September 15-March 15.

[d] FWS recommends that the year-round minimum flow be increased to 500 cfs if Atlantic salmon are restored to the Oswego River in the future.

[e] NYSDEC assumed that 50 percent of the flows released into the upper bypass would pass into the lower bypass (the remainder would cross over into the tailrace channel). FWS based its flow recommendations on habitat in the upper bypass and stated that these flows would adequately water the lower bypassed reach under all operating scenarios.

Because the bypass of the Minetto development is fully backwatered by the Varick impoundment, NMPC, FWS and NYSDEC agreed that no minimum flows were required at this development.

NMPC and the agencies did not come to agreement on minimum flows for the upper and lower bypassed reaches for the Varick development. For the upper bypassed reach, NMPC proposed a year-round release of 150 cfs, increasing to 300 cfs during the salmon migration season and 475 cfs during the walleye spawning season. The agencies proposed a year-round release of 400 cfs, increasing to 500 cfs during the salmon migration season and 800 cfs during walleye spawning. Erie later modified the proposed year-round release from 150 to 200 cfs.

The stream channel near the Varick powerhouse has a unique configuration that makes it difficult to predict flow volumes that would be delivered into the lower bypassed reach. A wall divides the tailrace from the lower bypassed reach, but at the head of the tailrace channel flows may pass either from the upper bypassed reach into the tailrace or they may flow from the powerhouse into the lower bypassed channel depending on the water levels in each area. NMPC proposed a year-round release of 75 cfs for the lower bypassed reach, increasing to 150 cfs during the salmon migration season and 200 cfs during the walleye spawning season. The agencies did not propose a separate flow requirement for the lower bypassed reach. NYSDEC assumed that 50 percent of the flows released into the upper bypassed reach would flow into the lower bypassed reach, while FWS stated that it believed that flows recommended based on habitat conditions in the upper bypassed reach would "adequately water the lower bypassed reach."

The agencies state that their year-round flow recommendation of 400 cfs is designed to protect resident and forage fish base habitat, and that the 500 cfs release during the salmon migration period is necessary to protect adult salmon from snagging and enhance angler safety by preventing anglers from crossing the river channel.

NMPC proposed to implement channel modifications at Varick that may be able to achieve agency goals with less spilled flow by directing more flow into the lower

bypassed channel and by creating a series of deeper pools that would discourage anglers from crossing the river channel and reduce the incidence of snagging. This would be achieved by constructing a low weir near the base of the dam, a parallel flow diversion weir in the upper bypassed reach to direct flow to high value habitat areas, a tailrace backflow diversion weir to reduce the flow from the upper bypassed reach into the tailrace (thus enabling more flow to reach the lower bypassed reach), and by placing about 20 boulders (or similar structures) in the bypassed reach to serve as velocity refuges. NMPC emphasized that these plans were only conceptual and that they would be refined following agency consultation. NYSDEC recommended that NMPC implement the channel modifications outlined by NMPC in its December 14, 1993, response to AIR number 16. FWS stated that it would not oppose such a plan. Both agencies state that the plan must provide 100 percent of the habitat that would be provided by the agency-recommended flows.

Our Analysis

Commission staff concurs with the flows agreed to by NMPC and the agencies for the Fulton upper and lower bypassed reaches. Although the quality of habitat in the upper bypassed reach is limited for most species of fish, we agree with NMPC and the agencies that providing a continuous flow of 75 cfs to this reach should increase macroinvertebrate production and use of the reach by both forage and recreationally important species of fish. We also agree that the flows agreed to by NMPC and the agencies for enhancing walleye spawning habitat in the lower bypassed reach are appropriate. However, because the two units are in proximity to each other, we see no reason that these flows must be provided from the units specified by NYSDEC and FWS. We recommend that Erie be allowed to meet the agreed flows for the lower bypassed reach using flow passed via any combination of the larger unit, the smaller unit, or spill. We also concur with NMPC and the agencies that minimum flows are not necessary at the Minetto development.

NMPC and the agencies did not come to agreement on minimum flow releases for the upper and lower bypassed reaches at Varick. Table 5 summarizes predicted weighted usable area (WUA) at a range of flows recommended by NMPC and the agencies for the Varick upper bypassed reach. Table 6 gives WUA predicted at the same flows for the lower bypassed reach. We assumed that 50 percent of the spilled flow would pass into the lower bypassed reach. We focused our analysis on those species and life stages for which there were the most potential habitat under optimum conditions (as indicated by the maximum WUA/1,000 feet): longnose dace (juvenile and adult), white sucker (juvenile and adult), and caddisfly. We also focused on walleye spawning, because of the relatively large amount of potential habitat (a preferred spawning habitat consists of whitewater

below impassable falls and dams [Scott and Crossman, 1973]) and the importance of this species to sport fishing.

The year-round release of 400 cfs recommended by the agencies would provide substantially more habitat for most resident and forage species than the 200 cfs release flow proposed by Erie. We recommend adoption of the 400 cfs minimum proposed by the agencies.

Table 5. Percent of maximum WUA for all species in Varick upper bypassed reach (Source: KA,1993, as modified by staff).

Species	Lifestage	Maximum WUA/1,000 feet	% WUA at indicated spill flow (cfs) 150	200	400	475	800
Walleye	Spawning	65,039	12.5	18.0	41.3	50.4	77.8
	Fry	30	0.0	0.0	0.0	0.0	0.0
	Juvenile	2,882	1.0	6.5	20.8	34.5	37.9
	Adult	5,576	5.6	12.1	39.1	49.5	48.1
Longnose dace	Spawning	52,088	5.8	10.8	50.6	77.2	96.6
	Fry	29,467	57.5	55.5	32.5	28.6	11.9
	Juvenile	143,590	57.9	69.4	99.0	99.9	89.2
	Adult	146,815	28.9	38.5	69.6	78.3	98.0
White sucker	Spawning	44,533	30.7	41.0	77.9	86.3	99.5
	Fry	57,042	98.4	95.3	70.1	60.8	40.6
	Juvenile	255,345	82.4	91.1	99.9	97.1	78.7
	Adult	86,412	39.7	50.7	81.7	88.2	98.9
Smallmouth bass	Spawning	4,629	15.8	22.3	47.1	57.0	70.6
	Fry	668	31.7	43.9	48.4	60.9	78.6
	Juvenile	11,701	85.5	92.2	99.7	97.3	84.3
	Adult	807	95.7	100	92.3	90.2	76.6
Caddisfly	All	236,443	48.9	60.5	87.0	93.5	99.5

Table 6. Percent of maximum WUA for all species in Varick lower bypassed reach (Source: KA, 1993, modified by staff).

Species	Lifestage	Maximum WUA/1,000 feet	% WUA at indicated spill flow (cfs)[a] 150	200	400	475	800
Walleye	Spawning	25,712	18.2	23.8	48.0	58.1	85.2
	Fry	8,088	75.1	75.1	75.3	76.2	88.4
	Juvenile	10,366	48.1	50.1	61.5	68.8	92.1
	Adult	12,941	63.0	65.7	79.8	86.1	98.4
Longnose dace	Spawning	14,866	15.7	14.6	90.2	97.2	65.1
	Fry	47,544	82.8	66.0	35.4	32.9	28.4
	Juvenile	76,744	39.3	52.9	91.2	97.6	88.8
	Adult	76,119	23.7	31.4	66.9	77.3	95.3
White sucker	Spawning	23,374	40.8	49.5	80.0	88.3	97.0
	Fry	103,721	97.6	93.6	75.3	69.7	57.3
	Juvenile	183,566	81.0	87.2	100.0	98.7	83.2
	Adult	76,247	65.5	71.4	90.7	95.5	99.3
Smallmouth bass	Spawning	5,402	44.3	48.4	60.9	64.5	81.2
	Fry	2,056	50.4	54.1	75.9	86.0	98.6
	Juvenile	15,303	95.9	96.9	99.3	96.9	87.4
	Adult	1,397	99.0	99.7	89.6	86.0	78.9
Caddisfly	All	123,541	27.2	38.2	79.2	86.9	99.9

[a] Assumes that 50% of flow at the dam enters lower bypassed reach.

Similarly, the 800 cfs walleye spawning flow recommended by the agencies provides almost twice the amount of spawning habitat as the flow proposed by Erie. NMPC's fisheries surveys showed that substantial numbers of walleye were found in the Varick bypassed reach during the spawning season. NMPC states that "walleye were collected throughout the study reach during high flow, but were restricted to areas below the powerhouse and sluiceway when spill over the dam was diminished (Acres, 1989)." This observation supports the increases in available spawning habitat that were predicted by the IFIM results. Increasing the flow from 475 to 800 cfs increases the walleye spawning habitat available in the upper bypassed reach from 50 percent of maximum to 78 percent of maximum, and a comparable increase is predicted for spawning habitat

available in the lower bypassed reach. We recommend adoption of the 800 cfs flow release during the walleye spawning season as defined by NYSDEC.

The IFIM model indicates that the 500 cfs release flow recommended by the agencies from September 15 through March 15 is necessary to provide areas of adequate depth and velocity to discourage snagging of adult salmonids and to promote angler safety by discouraging anglers from crossing the river channel. At the 300 cfs flow proposed by Erie, only a small proportion of the stream channel has water depths exceeding 2 feet or velocities exceeding 2 ft/sec. The proportion of stream channel with greater depths and velocities is predicted to increase considerably at the 500 cfs flow release recommended by the agencies.

In the upper bypassed reach, the percentage of the wetted area with depths greater than 2 feet increases from 1 percent at 300 cfs to 3 percent at 500 cfs, and the percentage of wetted area with velocities exceeding 2 ft/sec increases from 8 percent to 27 percent. In the lower bypassed reach, the percentage of the wetted area with depths greater than 2 feet increases from about 17 percent to 19 percent, and the percentage of wetted area with velocities exceeding 2 ft/sec increases from about 20 percent to 35 percent. The total wetted area also increases by about 4 percent in the upper bypassed reach and about 2 percent in lower bypassed reach. In order to improve passage of adult salmonids, decrease the incidence of snagging and to improve angler safety, staff recommends adoption of a 500 cfs minimum flow released at the dam during the salmon migration season.

In its January 28, 2000, response to the draft EA, Erie questioned the basis for extending the salmonid migration season from its proposed end date of October 31 to our recommended end date of March 15. According to the license application, the fishery below Varick has been subject to intensive and increasing angler use year-round, supporting an estimated 127,000 angler-days in 1988. Although peak fishing activity occurs in the fall during the chinook salmon run, "the salmonid fishery is maintained through late spring primarily by the steelhead whose upstream migrations occur from early fall through early spring." Estimates for 1984 showed that the number of steelhead harvested (2,600 fish) was nearly as large as the number of chinook salmon (3,600 fish). Steelhead are of a size comparable to chinook salmon, and also are therefore likely to be vulnerable to snagging. We conclude that extending the flow for protecting migratory salmonids until March 15, as recommended by NYSDEC, is warranted.

The streambed modifications originally proposed by NMPC appeared to offer good potential to achieve agency management goals, potentially with reduced minimum flows. However, Erie withdrew this proposal by letter dated January 28, 2000. Because we

continue to recommend the agency-specified minimum flows, we see no advantage in continuing to recommend that Erie conduct a pilot study to provide a basis for potential flow reductions.

Upstream Fish Passage

No upstream passage currently is provided at any of the developments within the Oswego River Project, although some degree of upstream passage likely occurs through the New York State Department of Transportation (NYSDOT) canal locks during routine operation, as indicated by the occurrence of American eel in the project impoundments. In their *Fisheries Enhancement Plan for the Oswego River, New York, A Tributary to Lake Ontario* (Lowie et al., 1994), which the Commission accepted as a comprehensive plan, NYSDEC and FWS targeted Atlantic salmon, lake sturgeon (state-listed threatened species) and American eel for restoration in the Oswego River. Table 7 summarizes the time line presented in this plan for achieving restoration of these species.

The restoration plan calls for development of upstream passage strategies for lake sturgeon by 2010, and achieving densities of one adult sturgeon per 100 acres of habitat above Varick by 2020. The plan also has a target of achieving, if ecologically feasible, a run of 5,000 adult Atlantic salmon to the Oswego River by 2010, and trucking 1,000 adults annually above Phoenix Dam by 2015. The plan acknowledges several factors that may affect the time line for salmon restoration, including possible low viability of eggs from salmon residing in Lake Ontario and low DO levels in the lower Seneca River and in Onondaga Lake. For eels, the plan calls for establishment of a collection facility at Varick by 2000, downstream passage of adults by the year 2005, and re-establishment of eels to all suitable habitat in its historic range by 2010.

Table 7. Timeline for restoration of lake sturgeon, Atlantic salmon, and American eel to the Oswego River (Source: Lowie et al., 1994).

Year	Lake sturgeon	Atlantic salmon	American eel
1998	Develop lower Great Lakes restoration plan.		
2000		Determine if Atlantic salmon residing in Lake Ontario produce viable eggs.	Establish a collection facility at Varick to transfer juvenile eels upstream.

Year	Lake sturgeon	Atlantic salmon	American eel
2003	Assess habitat requirements to identify possible spawning and nursery sites.		
2005	Develop hatchery techniques and stocking strategies.		Establish adequate downstream passage for adults.
2010	Develop strategies for upstream passage.	If eggs are viable, generate a run of 5,000 adults to Oswego River through stocking in tributary areas.[a]	Establish eel in all suitable habitat of its historic range.
2015		Collect 1,000 adults annually at Varick and transport above Phoenix Dam. Also provide passage at Coughdenoy on the Oneida River.	
2020	Establish densities of one adult per 100 acres of habitat above Varick.		

[a] The Enhancement Plan identifies several problems that may affect timetables for restoration of Atlantic salmon. These include:

1. The timing of FERC licenses being granted
2. Whether or not the public would choose to restore extirpated species from the watershed
3. Low DO levels in the lower Seneca River and in Onondaga Lake. Improvement of DO conditions in Onondaga Lake is not expected to occur in the near future.

Erie proposes to establish a fund to cover its proportionate share of the capital cost of installing trap-and-transfer facilities for upstream movement of Atlantic salmon on or after 2010, "should restoration feasibility and program funding support implementation." Other hydroelectric project owners would be expected to fund their proportionate share of operating the facility and transporting upstream migrants.

Interior issued an initial prescription for the installation of downstream passage facilities at all three developments on March 26, 1996. On February 27, 2001, Interior issued a modified prescription for fishways for the Oswego River Project, which included the installation of ladders designed to provide upstream passage for American eel at all three developments, as well as downstream passage facilities designed to pass American eel and riverine species (discussed later in this section). The prescription specifies that all fishways should be fully operational no later than 2 years after the date of issuance of a new license and upstream passage facilities must be operated from April 1 through September 1. The prescription also specifies that the licensee should develop a fish passage evaluation plan in consultation with FWS for submission to the Commission for approval.

In its comments on the modified prescription, NYSDEC expressed support for the need for downstream passage for riverine species, but did not comment on the need for providing upstream passage for American eels. Erie provided extensive comments on Interior's modified prescription on April 16, 2001. Erie contends that Interior failed to demonstrate the need for providing upstream passage for American eels at the Oswego River Project. Erie's comments relating to providing upstream passage for American eels are summarized below:

- Erie contends that Interior failed to demonstrate that there has been a decline in the panmictic population of American eels. The Atlantic States Marine Fisheries Commission has acknowledged that available information on eel fisheries and biology are fragmented or incomplete, and has initiated a coastwide monitoring of elver abundance as a means to more accurately gage population trends (ASMFC, 2000).

- Reduced recruitment of eels to Lake Ontario as indicated by declines in the number of eels ascending the ladder at the Moses Saunders dam during the 1980s and 1990s are not related to passage conditions on the Oswego River, since all of the dams associated with the Oswego River Project were constructed around 1914.

- The dams on the Oswego River may not represent a migration barrier to American eels, which have been known to ascend past dams of much greater height (up to 180 feet high). The dams associated with the Oswego River Project are about 18 feet high.

- The existing navigation locks provide an alternative means of upstream passage. Some upstream passage is occurring because American eels were collected in the entrainment study conducted at Minetto.
- Installation of ladders at the three Oswego River developments would only facilitate passage as far as the Varick impoundment. No upstream passage facilities have been proposed for the other three dams on the Oswego River, including the High Dam Project immediately upstream of the Varick impoundment. Erie also notes that high waterfalls likely restricted the historical distribution of American eels in much of the Oswego River basin.

Although Interior did not include facilities for providing upstream passage for Atlantic salmon, lake sturgeon, or riverine species in its modified prescription, it requested that the Commission reserve its authority "to prescribe fishways for existing riverine fish species, American eel, and any fish species to be managed, enhanced, protected, or restored in the basin during the term of the license, as well as the authority to modify this Prescription for Fishways at any time, after review of new information or for other pertinent reasons."

NYSDEC has recommended that Erie develop a truck-and-transfer facility at the Varick development after consultation with NYSDEC and FWS. Although NYSDEC does not provide a target date for installation, it states that "the need to complete installation of the facility should be predicated on the future need to promote active upstream passage on the Oswego River as adopted as part of the Statewide Atlantic Salmon Plan." NYSDEC indicated that the truck-and-transfer option outlined in NMPC's December 14, 1993, submittal is acceptable. NYSDEC indicated that it also "does not want to extend the range of existing nonindigenous migratory salmonids or the sea lamprey, which may compete with indigenous species; therefore any means of upstream passage should be selective for the target species."

Our Analysis

We considered the need for and potential benefits of providing upstream passage for American eel, which Interior has included in its modified prescription, and plans proposed by Erie and NYSDEC for providing upstream passage for other riverine species of fish, for which Interior has requested that the Commission reserve its authority.

Counts of eels ascending the eel ladder at the Moses Saunders dam on the St. Lawrence River have shown a dramatic decline since the mid-1980's. Eel counts diminished from a peak of more than 1,000,000 eels per year in the early 1980s, to about 200,000 per year by the late 1980s, and then to less than 10,000 eels per year in the last

few years (Lary and Busch, 1997). These counts suggest a 100-fold reduction in the recruitment of American eels to the Lake Ontario-St. Lawrence River (LO-SLR) ecosystem. The reasons for this decline are unclear, but do not appear to be related to construction of the system of dams and locks on the Oswego River by the state of New York or of the Oswego River Project hydroelectric developments, all of which have been in operation since around 1914.

Given the apparent drastic reduction in recruitment of juvenile eels to Lake Ontario, it is unlikely that providing upstream passage at the Oswego River developments could provide any meaningful increase in the production of American eels from the LO-SLR ecosystem or in the total number of adult eels that are contributed to the single, panmictic spawning population. It is clear that the accessible eel habitat within the LO-SLR ecosystem, which supported commercial harvests exceeding 200,000 pounds per year throughout most of the 1970s and 1980s (Lary and Busch, 1997), are severely underutilized at current rates of recruitment. Although we acknowledge that a substantial fishery for American eel existed in the Oswego River during the late 1800s and early 1900s,[9] there seems to be little or no benefit in providing access to this habitat until recruitment levels approach the carrying capacity of the habitat that is already accessible to eels in the LO-SLR ecosystem.

Interior reports that Ontario Hydro has plans to construct an eel ladder at the Beauharnois Project in 2001 (Interior, 2001), which may increase the number of eels ascending the St. Lawrence River to the Moses Saunders dam (which currently must pass this downstream project using navigation locks). Although this holds some promise for the future, we conclude that construction of upstream passage facilities at the Oswego River Project is premature until sufficient recruitment of juvenile eels to the LO-SLR ecosystem has been demonstrated. We suggest that Interior modify the timing of the implementation of its prescription for upstream passage facilities for American eel until recruitment sufficient to seed the currently accessible habitat has been demonstrated.

Interior has requested a reservation of its authority to prescribe upstream fish passage facilities for riverine fish species. We concur with NYSDEC that a selective method of upstream passage, such as truck-and-transport with a fish sorting facility, is appropriate to facilitate migrations of indigenous species while preventing the spread of undesirable species, such as sea lamprey.

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[9]Lary and Busch (1997) report that, in 1902, the eel harvest from the Oswego River system amounted to 22,725 pounds, 26 percent of the total harvest for the Lake Ontario basin.

Atlantic salmon can be effectively passed upstream of hydroelectric facility by properly designed truck-and-transport facilities. The key issue pertaining to upstream Atlantic salmon passage on the Oswego River is whether sufficient spawning, nursery, and juvenile habitat exists to enable the establishment of a self-sustaining population. A study is currently being conducted by the State University of New York (SUNY) Department of Environmental and Forest Biology to determine Atlantic salmon use of Oswego River tributaries as spawning and rearing habitat. The results of this study should provide a basis to finalize Atlantic salmon restoration goals (including the projected size of the population that could be supported by the available habitat) and whether the funds and public support needed to achieve those goals are available. We agree with NYSDEC that the conceptual plans for the trap-and-transport facility submitted by NMPC on December 14, 1993, are acceptable until implementation of restoration measures are warranted.

There is currently no known available technology to effectively pass lake sturgeon upstream of hydroelectric projects. However, research is continuing in this regard, and these studies show promise that, in the future, effective facilities for upstream lake sturgeon passage may be developed (Kynard et al., 1998). The existing navigational locks may also serve as a means of upstream lake sturgeon passage if techniques to attract sturgeon to and through the locks could be developed. Given the goal of the resource agencies to restore lake sturgeon to the Oswego River Basin, we consider it appropriate that if a trap-and-transport facility is to be constructed, the final plans for this facility include consideration of the current state of the art in terms of upstream passage of lake sturgeon.

We conclude that, upon the establishment by FWS and NYSDEC of the specific need and feasibility of restoring migratory species to the Oswego River, Erie should develop a plan for upstream passage of Atlantic salmon and lake sturgeon for Commission approval after consultation with NYSDEC and FWS. The plan should build on the conceptual fish lift design plan submitted to the Commission on December 14, 1993, in response to AIR item number 11. The plan should include the following:

- establish the process that would be followed and the mechanisms that would be used to trigger the finalization and implementation of the plans for the truck-and-transport facility (e.g., number of adult Atlantic salmon reaching the base of the Varick dam);

- specify the entity that would be responsible for determining and monitoring conditions that could trigger plan implementation (i.e., how would the

number of adult Atlantic salmon reaching the base of the Varick dam be monitored and who would do the monitoring);

- specify the entities responsible for funding and operating the facility; and
- specify how upstream passage of lake sturgeon would be considered prior to finalization of the plan.

We also recommend that the Commission include a license article reserving its authority to require upstream fishways as may be prescribed by Interior in the future. This would enable measures to be taken, as appropriate, when management plans for American eels are finalized or if an alternative means of upstream passage besides trap-and-transport is later identified as a more effective means to achieve agency restoration goals.

Downstream Fish Protection/Passage

Erie currently does not provide downstream fish passage structures at any of the developments within the Oswego River Project. The only downstream passage routes for fish currently are through the turbines, spillage over the dam (when river flows exceed the hydraulic capacity of the turbines), or via the Barge Canal System (during the navigation season). Protection from turbine entrainment at the Oswego River Project developments for larger fish is provided by trashracks with clear-bar spacing of 2.1 inches at the Minetto and Fulton developments and 3.6 inches at the Varick development.

NMPC conducted a fish entrainment and mortality study at the Oswego River Project to estimate the number of fish passing through and killed by project turbines. The study took place from May 1994 to April 1995. Entrainment abundance sampling was conducted at the Minetto development; these data were used to extrapolate entrainment totals at the Fulton and Varick developments. A turbine mortality study also was conducted at the Minetto development; however, mortality data collected at another NMPC hydropower project, the Herrings site on the Black River, were used to determine mortality at the Fulton and Varick developments (due to similar plant configurations, i.e., turbine type, head). Table 8 summarizes pertinent fish entrainment and mortality data.

Approximately 382,685 fish were estimated to be entrained annually at the Fulton development, and 74,765 of these were estimated to be killed. At the Minetto development, an estimated 3,519,061 fish were entrained, and an estimated 722,472 were killed. At the Varick development, an estimated 2,892,405 fish were entrained, and 561,859 were estimated to be killed. Clupeids comprised 95 to 96 percent of all the entrained fish at the Oswego River developments; of this, 70 to 74 percent were gizzard

shad. The remaining 4 to 5 percent consisted mainly of centrarchids and minnows. Table 9 details the size distributions for commonly captured fishes during the entrainment study. For most species, entrainment was dominated by young-of-year fish.

Table 8. Summary of annual fish entrainment and mortality data at the Oswego River developments (Source: KA, 1995).

	Fulton		Minetto		Varick	
Species	Total entrained	Total mortality	Total entrained	Total mortality	Total entrained	Total mortality
American eel	24	9	255	15	168	62
Atlantic salmon	11	1	161	14	63	4
Alewife	60,354	12,071	827,433	165,487	486,803	97,361
Blueback herring	33,050	6,610	345,898	69,180	310,368	62,074
Black crappie	63	4	792	278	557	33
Brown bullhead	14	3	155	22	117	22
Bluegill	6,564	365	71,935	25,951	63,115	3,544
Channel catfish	157	31	1,041	123	658	131
Emerald shiner	217	41	7,883	1,409	3,830	728
Freshwater drum	126	24	1,333	104	1,107	213
Gizzard shad	274,902	54,981	2,177,677	435,535	1,964,539	392,910
Lepomis spp.	3,656	183	39,816	15,130	35,331	1,767
Largemouth bass	353	26	3,930	1,251	3,257	241
Pumpkinseed	467	31	5,095	1,712	4,414	287
Rock bass	57	6	912	179	449	51
Rainbow trout	5	<1	65	5	35	2
Rainbow smelt	435	83	4,868	3	8	2
Smallmouth bass	273	33	3,915	729	2,076	252
White bass	36	3	270	77	252	21
White crappie	68	4	749	285	666	33
Walleye	20	2	1,357	217	371	30
White perch	1,644	223	21,195	3,904	10,541	1,418
Yellow perch	62	7	713	115	355	38

Species	Fulton		Minetto		Varick	
	Total entrained	Total mortality	Total entrained	Total mortality	Total entrained	Total mortality
Other Species[a]	126	26	1615	748	3330	638
Totals	382,685	74,765	3,519,061	722,472	2,892,405	561,859

a Other species include banded killifish, brook stickleback, common carp, common shiner, fathead minnow, golden shiner, longnose gar, logperch, river chub, sea lamprey, spottail shiner, and white sucker.

Table 9. Length frequency distribution of commonly observed species in the entrainment catch (May 3, 1994-April 19, 1995) at the Minetto development (Source: KA, 1995).

Size (inches)	Gizzard shad	Alewife	Blueback herring	*Lepomis* spp.[a]	Smallmouth bass	Largemouth bass	Rainbow smelt	Walleye	Atlantic salmon	White perch
0.9	5	0	0	8	0	0	3	0	0	0
1.9	9	0	0	1,774	3	16	50	0	0	3
2.9	693	15	11	233	8	24	53	0	0	253
3.9	20,268	646	124	299	4	39	37	0	0	591
4.9	28,039	10,862	1,558	135	13	20	93	0	2	40
5.9	20,017	1,400	7,349	93	26	6	39	0	0	28
6.8	6,204	89	52	48	13	2	13	0	3	81
7.8	4,700	561	0	32	68	1	0	0	3	140
8.8	442	99	0	1	69	1	0	0	2	77
9.8	3	0	0	0	41	1	0	1	0	49
10.8	0	0	6	0	22	0	0	1	0	23
11.8	0	3	38	0	5	0	0	0	1	5
12.7	0	15	9	0	1	0	0	11	0	0
13.7	1	0	0	0	1	0	0	48	2	0
14.7	2	0	0	0	0	0	0	42	0	0
15.7	0	0	0	0	0	0	0	11	0	0
16.7	0	0	0	0	0	0	0	2	0	1
17.7	0	0	0	0	0	0	0	0	1	0
18.7	0	0	0	0	0	0	0	1	0	0
Total #	80,383	13,690	9,147	2,623	274	110	288	117	14	1,291
Mean Size	5.2	5.1	5.7	2.7	8.1	3.9	4.1	14.2	9.2	5.1

Inches

[a] *Lepomis* spp. includes unidentified sunfish, bluegill, and pumpkinseed.

Table 10. Summary of entrained fish potentially protected annually from entrainment mortality by the installation of 1-inch clear bar racks (Source: NMPC, 1995).

Common Name	Fulton	Minetto	Varick
Alewife	2.9	67.7	31.7
American eel	3.5	5.7	25.1
Atlantic salmon	0.0	4.1	0.4
Black crappie	0.2	2.8	2.1
Blueback herring	3.9	45.6	38.9
Bluegill sunfish	2.4	44.5	17.7
Brown bullhead	0.4	3.4	2.2
Channel catfish	30.2	108.6	125.5
Common carp	0.6	3.1	3.6
Freshwater drum	4.1	38.3	23.1
Gizzard shad	0.7	11.8	6.2
Largemouth bass	0.4	3.4	1.6
Rainbow trout	0.1	4.1	0.7
Rock bass	3.6	125.9	38.9
Smallmouth bass	13.4	443.0	152.1
Walleye	1.6	217.0	29.6
White bass	0.5	2.2	1.9
White perch	21.5	504.2	144.4
White sucker	0.0	6.9	3.6

Yellow perch	0.4	12.8	3.8
Total	90.4	1655.1	653.1

NMPC used the estimated width of each species and size class to estimate the number of fish that would be physically excluded from entrainment via the installation of 1-inch clear-spaced bar racks, and the number of those that were predicted to die during turbine passage if they were not excluded. Using this method, the total number of fish that would be excluded from entrainment was 644 fish at Fulton, 10,792 fish at Minetto, and 4,914 fish at Varick. NMPC's estimate of the number of fish protected from entrainment mortality was estimated at 90 fish at Fulton, 1,655 fish at Minetto, and 653 fish at Varick. The species composition of fish that might be protected from entrainment mortality with installation of 1-inch trashracks is shown in table 10.

NYSDEC and FWS disagreed with some of the methods used during the study and with the interpretation of study results. The NYSDEC and FWS also expressed concern about impacts of turbine entrainment and mortality on resident fish populations, particularly walleye, and future downstream migration of Atlantic salmon smolts. Both agencies recommended the installation of downstream passage facilities.

Pursuant to Section 18 of the FPA, Interior made an initial prescription for 1-inch clear-spaced trashracks and conveyance systems at the three developments within the Oswego River Project (letter from Interior to the Commission dated March 26, 1996). Interior's initial conditions for downstream fish passage included specific recommendations for 1-inch clear-spaced bar racks, entrances to fish bypasses, and attraction and conveyance flows.

NYSDEC provided design criteria for downstream fish passage in its April 1, 1996, letter to the Commission, which are as follows:

- all water entering turbines must pass through the exclusionary devices;
- the maximum width of the device opening should not exceed 1 inch;
- the maximum approach velocity, as measured 1 foot in front of the device, should not exceed 2 feet per second (fps);
- a fish passage facility should be provided immediately adjacent to the exclusionary device;
- attraction flows should equal 2 to 3 percent of the maximum plant capacity;

- the attraction flow and bypass should maintain uniform distributions of velocity at the entrance, and no flow separations, backflow, or eddies should occur;

- where feasible, bypassed reach flow releases can be utilized as a fish passage flow;

- velocities at the bypass entrance should be 2.5 fps;

- minimum bypass entrance width should be 2 feet;

- minimum entrance depth to the bypass should be 1 foot where walleye are not present; a second bottom-oriented entrance should be provided for walleye;

- minimum conveyance depth should be 6 inches with appropriate freeboard provided to prevent fish from jumping from the conveyance;

- all conveyance surfaces should be smooth, and joints should be evenly matched and smooth with no edges to injure fish;

- transport velocities should be between 4 and 8 fps;

- all transitions should be gradual to prevent flow separation and rapid changes in velocity;

- a recovery plunge pool should be provided, and the outlet should be located in an area where predation will be minimal;

- the exclusionary device should be evaluated to assure that excessive fish impingement is not occurring, and verification of approach velocities and any subsequent assessment plans should be submitted to NYSDEC for comment;

- Erie should consult with NYSDEC to develop a plan using test fishes to monitor the effectiveness of the downstream fish passage facilities; and

- Erie should consult with NYSDEC and FWS to develop protective devices to preclude outmigrating Atlantic salmon smolts from entering project

turbines and to provide safe passage to the lower Oswego River and Lake Ontario.

In response to Interior's initial prescriptions and NYSDEC's recommendations, NMPC, by letter dated May 13, 1996, agreed "...to installation of the lowest cost 1-inch trashrack protection system with associated downstream fish passage accommodations (essentially consistent with the initial prescription of downstream passage facilities provided in Interior's March 26, 1996, letter), in 2010 or afterward, triggered by some measure of successful restoration of Atlantic salmon in the Oswego River."

On February 27, 2001, Interior filed a modified prescription and administrative record including responses to comments received on the preliminary prescription (Interior, 2001). The modified fishway prescription included provisions for providing upstream passage for American eels and downstream passage for American eels and seven riverine species. Key components of the downstream passage facilities described in the modified prescription are as follows:

- Downstream passage facilities prescribed at all three facilities involve applying seasonal overlay racks or punch plates on the existing trashracks or modifying the clear spacing between the bars of the existing racks. At Minetto, Interior also provides an option of installing the overlays at the pier fronts upstream of the existing racks to reduce approach velocities. A maximum clear spacing of 1 inch between bars (or 1 inch maximum diameter punch plate holes) is specified, but Interior indicates that this spacing is subject to change prior to construction based on sampling of American eels below the Varick dam and in the Oswego River.

- Downstream passage facilities at all sites include bypasses and attraction flows that amount to 5 percent of plant capacity at Fulton and at Minetto and 3 percent of the plant capacity at Varick. At Fulton, surface and deep bypass entrances would be provided by modifying the existing log/ice sluice spillway on the left side of the forebay. At Minetto, surface and deep bypasses would be provided at two locations on the left and right sides of the powerhouse. At Varick, surface and deep bypasses would be provided via a sluice or channel through the unused turbine bay at the left side of the powerhouse.

- At each of the four bypasses (one at Fulton, two at Minetto, and one at Varick), Interior provides an option of using a screened pump-back facility to recycle all but a 20 cfs conveyance flow to the forebay. At Fulton, a

plunge pool would be required at the bypass discharge, which must have a depth of approximately 5 feet to meet FWS design criteria of 1/4 of the differential head (17 feet).

Erie provided extensive comments on Interior's modified prescription on April 16, 2001. Erie contends that Interior failed to demonstrate the need for providing downstream passage for American eels and riverine fish species at the Oswego River Project. Erie's comments relating to downstream passage are summarized below:

- Interior provides no evidence that the existing fish populations in the project area are being adversely affected by the project.

- Interior provides no specific evidence that populations of resident fish and American eels would benefit from installation of the prescribed fishways.

- The argument that passage is necessary to provide access to necessary habitats is not supported by any site-specific evidence.

- If passage is required by riverine species to access "necessary habitats," how does implementing the proposed downstream passage measures help to fulfill this need if there is no provision to provide upstream passage?

- The studies that Interior cites that have documented movements of individual fish in other river systems do not support a conclusion that large proportions of the populations exhibit these movements, that these movements are required to access necessary habitats, or that such a need exists to access specific habitats in the vicinity of the Oswego River Project.

- The effectiveness of the prescribed fishways for passing the species of interest is unknown, and the installation of close-spaced overlays may contribute to fish impingement.

- The results of recent laboratory studies by the Electric Power Research Institute (EPRI) suggest that bar racks do not induce "searching movements" of fish that are too small to be physically excluded. Erie also noted that Interior provides no basis for its expectation that closer spaced bar racks would increase such behavioral avoidance.

- Erie believes that the use of perforated plate is not a viable option due to large amounts of trash and debris in the Oswego River.

- Erie questions the basis for Interior's conclusion that the release mechanisms for providing minimum flows to the bypassed reaches at Varick and Fulton would provide safe or effective downstream fish passage.

- More research should be directed at the use of lockage flows for providing downstream passage.
- Most of the administrative record filed by Interior has little, if any, relevance to the conclusions drawn in the prescription and provides no basis to judge many of the technical recommendations such as the need for specific levels of bypass flow (Interior has recommended 3 to 5 percent of station capacity).

Our Analysis

High water velocities immediately in front of the trashracks could result in fish impingement under certain conditions. NMPC estimates of through-rack velocities that would occur with 1-inch replacement racks range from 3.7 fps at Fulton to 4.4 fps at Minetto (KA, 1995). Recent experience at the Chippewa Falls Project in Wisconsin has shown that large numbers of adult fish (black crappie, northern pike, and lake sturgeon) can become impinged when bar rack overlays become partially clogged with debris during high flow events (Everhart, 1997). Debris accumulation also has increased the labor required to clean the racks and caused substantial generation losses due to head loss and debris-related shutdowns. Similar problems may occur at the Oswego River sites, where the predicted water velocities are even higher than they are at Chippewa Falls.[10] In its modified prescription, Interior provided the basis for its calculations indicating that the average velocities measured several feet upstream of the racks are less than 2 fps at Fulton and Varick and approximately 2.4 fps at Minetto. Interior also notes that while installation of 1-inch overlays increases the through-slot velocity, it does not influence the approach velocity upstream of the racks. Although we acknowledge that it is hard to predict whether the increase in through-slot velocities would result in increased impingement, we conclude that operational experience with the 1-inch overlays installed at Chippewa Falls suggests that such overlays can contribute to high rates of impingement of large fish under conditions with high debris loads.

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[10]The design velocity through the racks at Chippewa Falls is 3.2 fps (Lloyd Everhart, Northern States Power Company, personal communication to Fred Winchell, Alden Research Laboratory, Inc., Holden, MA, on June 17, 1999).

The number of fish killed during turbine passage at the Oswego developments were estimated using mortality rates determined from studies conducted at the Minetto and Herrings developments using tailrace net recovery techniques. The average mortality rate estimated from these studies was approximately 20 percent. We conclude that these mortality estimates are unreliable due to injuries inflicted during collection, as shown by high and variable mortality of control fish collected in the tailrace net. Most recent studies using balloon tags have documented substantially lower rates of mortality. Studies conducted at sites with propeller or Kaplan turbines similar in speed and flow capacity to the turbines at Fulton and Varick have generally shown mortality rates in the 7 to 8 percent range (table 11), and studies conducted at Francis turbines similar to those in place at Minetto show an average mortality of about 5 to 6 percent (table 12).

The entrainment study conducted at Minetto found that the great majority of entrained fish were small gizzard shad, blueback herring, and alewives and therefore unlikely to be excluded from entrainment by 1-inch trashracks. Very few large sport fish were entrained (KA, 1995). NMPC reports an excellent fishery for northern pike, smallmouth bass, largemouth bass, white perch, and walleye in the Oswego River. Substantial impacts on this fishery from entrainment mortality have not been shown.

The effectiveness of angled bar racks or rack overlays as described in Interior's preliminary prescription has not been conclusively demonstrated for warm and coolwater species. Studies conducted at the Upper Greenwich Project, on the Batten Kill River in New York, using released fish found that 21 percent of largemouth bass (3.3 to 10.8 inches in length) and 36 percent of brown trout (4.8 to 7.7 inches in length) moved downstream through the turbines despite installation of an angled bar rack designed to meet NYSDEC and Interior's specifications (ERC, 1996). For resident fish (primarily bullhead, rock bass, and sunfish species), data from this study indicate that 68 percent of the fish moved through the turbines and only 32 percent used the bypass.

Recent laboratory studies funded by EPRI indicated that bar racks oriented at 45 and 90 degrees to the flow were relatively ineffective in guiding several resident species of fish to a bypass (Amaral et al., 2001). In tests conducted with a rack with 1-inch clear spacing angled at 45 degrees to the approach flow, the average diversion efficiency at approach velocities ranging from 1 to 3 fps was 44.0 percent for smallmouth bass, 48.6 percent for golden shiners, 15.2 percent for lake sturgeon, and 62.6 percent for American eel.[11] In tests conducted with a rack oriented at 90 degrees to the approach flow (tested

[11]The average length of fish tested with 45-degree racks was 2.8 inches for

(continued...)

only at 1 fps and a 2-inch clear spacing), the diversion efficiency was 53.3 percent for smallmouth bass, 8.4 percent for walleye, and 0.0 percent for lake sturgeon.[12] Although better guidance was achieved when the rack was oriented at 15 degrees to the flow, applying such a configuration at the Fulton, Minetto, or Varick sites would involve a very large facility and much higher construction costs. There is also a question as to whether

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[11](...continued)
smallmouth bass, 3.1 inches for golden shiner, 6.0 inches for lake sturgeon, and 22 inches for American eel.

[12]The average length of fish tested with 90-degree racks was 3.7 inches for smallmouth bass, 3.0 inches for walleye, and 5.2 inches for lake sturgeon.

Table 11. Passage survival rates reported from balloon tag studies conducted at propeller and Kaplan turbines similar to Fulton and Varick (Source: RMC, 1990, 1992, 1993a, 1994).

Station	Turbine type	Design turbine discharge (cfs)	Runner speed (rpm)	Head (ft)	Species tested	Avg. fish length (in)	1-hr mortality estimate[a] (%)	48-hr mortality estimate[a] (%)
Chalk Hill, MI-WI	propeller/Kaplan	1331	150	29	Bluegill	4.05	3.0	3.0
Chalk Hill, MI-WI	propeller/Kaplan	1331	150	29	Bluegill	6.02	2.0	n.a.[c]
Chalk Hill, MI-WI	propeller/Kaplan	1331	150	29	W. Sucker/R. Trout	4.68	9.0	8.0
Chalk Hill, MI-WI	propeller/Kaplan	1331	150	29	W. Sucker/R. Trout	10.27	3.0	n.a.[c]
Craggy Dam, NC @ 13 deg blade angle[b]	propeller/Kaplan	600	229	21	Channel catfish	7.08	7.0	8.0
Craggy Dam, NC @ 13 deg blade angle[b]	propeller/Kaplan	600	229	21	Channel catfish	7.08	10.0	11.0
Craggy Dam, NC @ 13 deg blade angle[b]	propeller/Kaplan	600	229	21	Channel catfish	10.90	19.0	20.0
Craggy Dam, NC @ 28 deg blade angle	propeller/Kaplan	600	229	21	Channel catfish	10.90	7.0	7.0
Craggy Dam, NC @ 13 deg blade angle[b]	propeller/Kaplan	600	229	21	Bluegill	3.93	4.0	n.a.[c]
Craggy Dam, NC @ 13 deg blade angle[b]	propeller/Kaplan	600	229	21	Bluegill	6.10	14.0	n.a.[c]
Crescent, NY	propeller/Kaplan	1518	144	27	Blueback herring	3.58	4.0	n.a.[c]
Townsend Dam, PA, @ 60% gate[b]	propeller/Kaplan	1500	152	16	Rainbow trout	5.47	5.6	7.4
Townsend Dam, PA, @ 60% gate[b]	propeller/Kaplan	1500	152	16	Rainbow trout	13.54	13.5	13.5
Townsend Dam, PA, @ 75% gate	propeller/Kaplan	1500	152	16	Rainbow trout	5.47	0.0	0.0
Townsend Dam, PA, @ 75% gate	propeller/Kaplan	1500	152	16	Largemouth bass	8.54	3.2	3.2
Townsend Dam, PA, @ 60% gate[b]	propeller/Kaplan	1500	152	16	Largemouth bass	4.01	0.0	0.0
Townsend Dam, PA, @ 60% gate[b]	propeller/Kaplan	1500	152	16	Largemouth bass	8.54	14.0	14.0
					Average	**7.07**	**7.0**	**7.9**
Fulton Unit 1	**propeller**	**748**	**150**	**17**				
Fulton Unit 2	**propeller**	**413**	**200**	**17**				
Varick	**propeller**	**1398**	**129**	**19**				

[a] Estimates adjusted for control survival

[b] Tests conducted under "worst case" turbine operating conditions

[c] Estimate considered unreliable due to control survival of less than 90%

Table 12. Passage survival rates reported from balloon tag studies conducted at Francis turbines similar to Minetto (Source: RMC, 1993b; NAI, 1996a, 1996b).

Station	Turbine type	Design turbine discharge (cfs)	Runner speed (rpm)	Head (ft)	Species tested	Avg. fish length (in)	1-hr mortality estimate[a] (%)	48-hr mortality estimate[a] (%)
Vernon, VT/NH	Francis	1833	74	34	American shad	3.7	5.3	n.a.[c]
Vernon, VT/NH, Unit 10 @ 75% gate[b]	Francis	1833	74	34	Atlantic salmon	6.0	4.0	5.0
Vernon, VT/NH, Unit 10 @ 100% gate	Francis	1833	74	34	Atlantic salmon	6.2	0.0	0.0
Vernon, VT/NH, Unit 10 @ 75% gate[b]	Francis	1278	133	34	Atlantic salmon	5.6	14.9	4.9
White Rapids, WI	Francis	1540	100	29	White sucker	8.0	7.0	4.0
White Rapids, WI	Francis	1540	100	29	White sucker	4.4	0.0	n.a.[c]
White Rapids, WI	Francis	1540	100	29	Bluegill	3.5	5.0	n.a.[c]
White Rapids, WI	Francis	1540	100	29	Bluegill	6.1	0.0	n.a.[c]
					Average	**5.4**	**4.5**	**3.5**
Minetto	**Francis**	**1501**	**72**	**17.22**				

[a] Estimates adjusted for control survival

[b] Tests conducted under "worst case" turbine operating conditions

[c] Estimate considered unreliable due to control survival of less than 90%

positive guidance results obtained in a relatively small flume (6 ft wide) could be replicated in a field installation with much larger overall dimensions.

Additional information on the effectiveness of close-spaced racks is available from another study that was recently completed at the Foote Hydroelectric Project (FERC No. 2436) on the Au Sable River in Michigan (Consumers Energy, 2000). The study used full-flow tailrace netting at screened and unscreened units to evaluate the effectiveness of racks with 0.75-inch clear openings that were placed in stop log slots upstream of the existing trashracks, which had a clear spacing of 2.81 inches. The racks were designed with horizontal bars on the theory that more fish would be excluded because most fish are taller than they are wide. A total of 16 paired, 48-hour sampling events was conducted between April and November of 1999. Project flow records indicate that approach velocities to the screens were less than 2 fps during most sampling events, with a maximum of 2.3 fps when the units were operated at maximum capacity. After adjusting for collection efficiency of the sampling net (which generally exceeded 85 percent), the total number of fish entrained during the sampling periods was estimated to be 727 fish at the unscreened unit and 624 fish at the screened unit. The effectiveness of the bar screens was estimated to be -1.6 percent for fish less than 3 inches (more fish collected at the screened unit than at the unscreened unit), 9.9 percent for fish 3 to 6 inches, 61.3 percent for fish 6 to 9 inches, and 100 percent for fish over 9 inches long. The total number of fish that were protected from entrainment over 768 hours of sampling was estimated to be -14 fish less than 3 inches, 36 fish from 3 to 6 inches, 73 fish from 6 to 9 inches, and 8 fish over 9 inches long. The study also documented the impingement of 18 fish on the close-spaced bar racks, although two of these were in an advanced state of decomposition.

We conclude, based on the studies reviewed above, that the installation of close-spaced bar rack overlays is unlikely to be effective for protecting fish that are too small to be physically excluded by the racks. We also note that the existing racks are of sufficiently close spacing to protect many of the larger and most valuable game fish (2.1-inch clear spacing at Fulton and Minetto and 3.6-inch clear spacing at Varick). For the eight target species identified by Interior for passage, Erie's estimate of the total number of fish that would be physically excluded and protected from entrainment mortality each year using 1-inch overlays at all three developments is as follow: 0 rainbow smelt, 34 American eel, 264 channel catfish, 5 largemouth bass, 608 smallmouth bass, 248 walleye, 670 white perch, and 17 yellow perch. Although we acknowledge that these fish would likely contribute to the fisheries downstream of each development, we conclude that this benefit would be relatively small in relation to the existing fishery. Estimates of the number of fish harvested annually in the lower Oswego River during the 1984 Great Lakes Angler Survey (provided by NMPC in the license application) were: 3,600 chinook salmon, 730 coho salmon, 2,600 steelhead, 6,800 brown trout, 550 walleye,

4,800 smallmouth bass, 9,600 yellow perch, and 10,000 white perch and white bass. The estimated total of 1,846 sport fish that would be protected from entrainment mortality by the installation of trashrack overlays and bypasses would probably not result in a discernable improvement to a fishery that supports an estimated angler harvest exceeding 35,000 fish per year.

We conclude that installation of downstream passage facilities is not warranted at this time for the following reasons: (1) high water velocities present at the intakes of the Fulton, Minetto, and Varick developments could make it difficult to design effective downstream passage facilities and may result in more fish losses from impingement than would be successfully passed downstream via the downstream fish passage facilities; (2) the number of fish being killed at these developments is probably considerably less than that reported in the entrainment study; (3) no adverse impacts on the fishery have been demonstrated; (4) studies conducted to date have not demonstrated the efficacy of bar racks for passing most of the coolwater and warmwater species of fish present at these developments; (5) the Atlantic salmon fishery is not yet established in this segment of the Oswego River; and (6) because the number of fish that would be protected from entrainment mortality is small in comparison to the number harvested by anglers, it is unlikely that a perceptible improvement in the fishery would result. We request that Interior reconsider its modified prescriptions based on these six factors. We would recommend that the effectiveness studies initially included in Interior's prescription and recommended by NYSDEC be implemented at any development where downstream fish passage is installed. We recommend that the need for downstream passage facilities at all three developments be reconsidered after the feasibility of restoring Atlantic salmon to the Oswego River has been fully evaluated and a firm timetable has been set for restoration.

If Interior does not modify the timing of implementing its prescription for providing upstream passage for American eel, which we advised earlier, we still recommend that Interior consider postponing the construction of downstream passage facilities until the number of eels that are successfully passed upstream can be determined and the potential benefits of installing downstream passage facilities can be evaluated more completely. Although we recognize that implementing fish passage measures may be consistent with FWS management objectives, we conclude that it is appropriate for the prescribing agency to weigh the potential magnitude of the benefit to the fishery against the economic and environmental costs, which include increases in CO_2 emissions associated with generation losses caused by bypass attraction flows and by increases in head loss.

Resource Mitigation Fund

NYRU, in its letter dated March 28, 1996, recommended a resource mitigation fund be set up to contain money paid by NMPC for past use of the Oswego River and to mitigate for damages to the river's fishery. Money from the fund would be allocated by a newly formed river council to various means of enhancing the river ecosystem.

We see no evidence that current operation of this project is adversely affecting populations of fish. We are recommending the implementation of various environmental measures such as operating the project in ROR mode, maintaining the impoundments at or near the top of the flashboards or dam crest, installing more robust flashboard systems at all three developments to minimize impoundment fluctuations due to flashboard failures, and releasing minimum flows to the Fulton and Varick bypassed reaches. We therefore do not recommend that the Commission include the establishment of a resource mitigation fund in any license issued for this project.

c. Cumulative impacts: The fisheries in the project area, and to some extent in Lake Ontario, would have a cumulative benefit from the proposed ROR operating mode, recommended minimum flow releases, and, if installed, upstream eel passage and downstream fish protection and passage at each of the developments within the Oswego River Project.

d. Unavoidable adverse impacts: Some fluctuations in impoundment levels could still occasionally occur due to failure and re-installation of flashboards at all three developments. Some entrainment and turbine mortality would still occur despite installation of downstream fish protection/passage facilities. The incidence of impingement may increase with the installation of Interior's modified downstream fish passage prescription, especially at Minetto, where the approach velocity would be about 2.4 fps, thus exceeding agency guidelines for minimizing impingement.

4. Terrestrial Resources

a. Affected environment: The Varick, Minetto, and Fulton developments of the Oswego River Project occur at lock and dam facilities along the Oswego River portion of the New York Barge Canal system. The lands surrounding the project area, with the exception of the cities of Fulton and Oswego, are primarily rural. The Varick development is located within the urban portions of the city of Oswego, and the Fulton development is within the city limits of Fulton.

Botanical Resources

Natural vegetation in the Oswego River Project area consists of a variety of cover types including: landscaped lawns, hardwood riparian areas, coniferous stands, and agricultural croplands. Dominant deciduous upland forest species include sugar maple, red oak, American beech, basswood, black cherry, and white ash. In lowlands and more poorly drained soils, hemlock typically mixes with species such as elm, red maple, black willow, green ash, and alder. In general, the project lands consist of fragmented cover types, none of which greatly predominates over any other.

Vegetation near the Fulton development is limited to narrow bands of land along the shoreline of the river. Staghorn sumac, tree of heaven, and other shrubby species comprise the majority of the existing vegetation. Willow is also fairly abundant along the river bank. Poorly developed stands of sugar maple and American elm are also represented. In other areas along the river, however, the vegetation is more characteristic of the indigenous elm-red maple-northern hardwood forest zone.

Wetlands identified by NMPC within the project boundaries include those identified by NYSDEC (wetlands 12.4 acres or larger) and the FWS National Wetland Inventory (NWI). No NYSDEC-designated wetlands exist adjacent to the Fulton or Varick impoundments. Four NYSDEC-designated wetlands are associated with the Minetto impoundment, two along the river shoreline, one each in association with Tannery and Black Creeks.

NMPC identified 26 NWI wetlands associated with the project impoundments; seven of which occur along Black and Tannery creeks. Most of the wetlands are relatively small (less than 10 acres). Wetland types include lacustrine, riverine, open water, forested, scrub-shrub, and emergent.

Wildlife Resources

NMPC describes the Oswego River watershed as a mosaic of populated, rural, and agricultural areas, forests, and wetlands. This diversity of habitats provides for a variety of wildlife species. Within the project boundaries, mixed woods and wetland riparian lands exist around the impoundment shorelines. However, the habitat types are limited by the residential, commercial, and industrial lands surrounding the project lands.

The fragmented habitat typical of the project area limits wildlife diversity to those species with small home ranges or a tolerance for human disturbance. Mammals characteristic to such coverages include deer, raccoon, opossum, and woodchucks. The

project area provides suitable habitat for a variety of reptiles and amphibians common to the area. Waterfowl and semi-aquatic species benefit from natural areas along shorelines. NMPC identifies 119 species that could occur within the project area. The Oswego-Fulton Christmas Bird Count, centered at the Minetto development, documented the occurrence of 58 species during December 1987.

Threatened and Endangered Species

According to a letter from FWS to NMPC, except for occasional transient species, no federally listed or proposed threatened or endangered species are known to occur in the project area (letter from N.R. Chupp, Area Manager, Harrisburg Area Office, FWS, Harrisburg, PA, dated December 28, 1981, to NMPC). This was confirmed by letter to the Commission dated June 14, 1999. FWS stated that no further consultation pursuant to Section 7 of the Endangered Species Act was necessary for this project (letter from David A. Stilwell, Acting Field Supervisor, FWS, Cortland, New York, dated June 14, 1999).

The state-threatened lake sturgeon (*Acipenser fluvescens*) has been observed in the Oswego River downstream of the Varick dam as recently as 1982. The New York State Breeding Bird Atlas Project indicates the presence of six rare birds in the project area: the state-threatened red-shouldered hawk; and species of concern which include the common nighthawk, Cooper's hawk, eastern bluebird, grasshopper sparrow, and the upland sandpiper. Of these, the eastern bluebird and upland sandpiper are the only confirmed breeders.

b. Environmental impacts: Impoundment fluctuations can create unstable and unfavorable environmental conditions for both plants and wildlife. Erie presently operates the Fulton, Minetto, and Varick developments in the store-and-release pulsing mode, causing daily fluctuations in pond water levels. In general, hydroelectric impoundments with extreme fluctuations in water surface elevations exhibit reduced plant species diversity and reduced plant biomass or productivity, and provide less value for wildlife, especially waterfowl breeding and hibernating reptiles and amphibians. Seasonal fluctuations appear especially larger at the Varick development, where up to 3-foot-high flashboards are present. These flashboards are normally washed away by late fall or early spring high flows, causing a decrease in impoundment water surface elevation, and are replaced about June 1 of each year, causing a sudden increase in impoundment water surface elevation. The fluctuations due to flashboard failure and replacement at the other impoundments are less: 0.5 foot at the Fulton development and 0.83 foot at the Minetto development.

NMPC, in its letter to the Commission dated August 9, 1993, proposed to change the operation of all of its projects on the Oswego River (including Oswego Falls, Granby, High Dam, and the Oswego River Projects) to ROR mode, thereby reducing the daily fluctuations from the previous levels under the store-and-release pulsing mode of operation. Flashboards would still be present at each development, but water levels in the ponds would be maintained at either the top of the flashboards, when installed, or at the dam crest.

NYSDEC recommended in its April 1, 1996, letter that, for the protection of fish and wildlife resources, NMPC (Erie) should be required to operate each of the project developments in a strict ROR mode. NYSDEC also recommended that NMPC (Erie) operate each of the stations such that the impoundment elevation is maintained as close as is technically feasible to the top of the dam or flashboards. Interior made comparable recommendations in its March 26, 1996, letter. The Oswego Falls Project upstream of the Fulton development and the High Dam Project between the Varick and Minetto developments are currently licensed to operate ROR. The existing license for the Granby Project, across the dam from the Fulton development, does not yet require ROR operation at that project and would need a license amendment to require ROR operation (Granby is currently voluntarily operated in a ROR mode, according to the August 9, 1999, Commission inspection report). Granby must operate in parallel with the Fulton development because they share the same reservoir.

Interior suggested (letter from W.R. Taylor, Director, Office of Environmental Policy and Compliance, U.S. Department of the Interior, Washington, DC, dated March 26, 1996, to the Commission) the use of pneumatic control devices or rubber dams, wherever feasible, to allow pond elevations to be promptly stabilized after high flow events. NYSDEC recommended in its April 1, 1996, letter, that breakaway flashboards be replaced with a hydraulic gate system, an inflatable bladder, hinged or pivoting flashboards that can be manually tripped and easily reset, or a system where flashboards are permanently attached to the dam by either a cable or chain. NYSDEC states that this would protect wildlife resources above the project dams, presumably by creating more stable water levels throughout the year.

EPA expressed concern about the effects on wetlands of project modifications increasing reservoir surface area and depth, and construction and operation activities (letter from Laura J. Livingston, Assistant Chief, Environmental Impacts Branch, U.S. Environmental Protection Agency, Region II, to the Commission, dated April 12, 1995). NYRU notes the value of wetlands as potential spawning and nursery sites for fish (letter from Bruce Carpenter, Executive Director, NYRU, dated March 28, 1996, to the Commission). NYRU assumed wetland habitat would increase under the proposed

improved flow schedules, but NYRU recommends a 1-year monitoring program to ensure no significant impacts.

Our Analysis

The operation of all the developments, including the other lower river projects, in ROR mode should improve the habitat conditions within the project area. The proposed conversion in project operation, from a storage-and-release pulsing mode to ROR, positively addresses two existing environmental issues: daily impoundment fluctuation and fluctuating baseflows downstream. The elimination of daily water level fluctuations, such that the instantaneous downstream flow is equal to the inflow to the project impoundment, would allow vegetation to stabilize along the shoreline, decrease sedimentation and erosion, and improve near shore wildlife habitat.

At the Varick development, the large seasonal fluctuations due to flashboard failure and replacement would likely continue to adversely affect plant and wildlife populations without corrective action. According to NMPC, the 2.5- to 3-foot-high flashboards at the Varick dam typically wash away by late fall or early spring floods. When the flashboards are lost, the impoundment level typically drops 3 feet. This potentially could result in the loss of aquatic furbearer denning sites, increased mortality of bottom hibernating reptiles and amphibians, and an alteration of plant species composition due to the exposure of roots. Waterfowl nesting season (approximately April 1st to July 15th) occurs during the period of typical flashboard failure. When they are replaced at the beginning of June, the impoundment level rises 3 feet. The sudden rise in water level could inundate shoreline nest sites of mammals and waterfowl. More stable seasonal water levels in this zone likely would result in the establishment of a vegetated littoral zone and a more robust and diverse aquatic-terrestrial transition zone.

We agree with NYRU that wetlands would be enhanced with the stable impoundment water levels associated with ROR operation. We also conclude that wetlands would be enhanced further because of seasonal water surface stability that would be achieved with the replacement of the breakaway flashboard system at Varick with an alternative system that, during most years, would not fail. We can envision no circumstances where more stable impoundment water levels could have a negative effect on wetlands. We therefore do not agree that the 1-year wetland monitoring plan recommended by NYRU is necessary and do not recommend inclusion of this measure in the new license for this project. The benefit of documenting expected growth does not warrant the expenditure of additional time and money.

We, therefore, recommend that, in addition to operating all the developments and other Oswego River projects in ROR mode, Erie should install an alternative system at the Varick impoundment to stabilize impoundment elevations (at the current crest of flashboard elevation of 270 feet msl), while allowing the passage of water during high flow events and ice during the spring melt. This recommendation would also benefit fisheries and macroinvertebrate resources, as discussed in section V.C.3, and would therefore benefit wildlife that feed on aquatic organisms. We consider the seasonal fluctuations associated with flashboard failure of 0.5 foot at the Fulton development and 0.83 feet at the Minetto development to be within the range that shoreline vegetation and wildlife would experience along natural lakes. Species inhabiting shoreline areas would be expected to have developed mechanisms that adapt to minor water fluctuations. Replacing the breakaway flashboard systems at these two developments with pneumatic crest gates would therefore provide only marginal benefits to the shoreline terrestrial community, and we do not recommend incorporation of this measure into the license for this project.

In response to our recommendation in the draft EA that Erie should develop a plan to minimize the loss of flashboards at Fulton and Minetto for aesthetic and safety reasons, Erie suggested that it could reinforce the current breakaway flashboard system so that failures would only occur during major flood events (letter from Jerry Sabattis, Erie, to the Commission, dated January 28, 2000). Implementation of a plan to reinforce the flashboards should further stabilize the impoundment water surface elevations over that achieved by ROR operations and provide a small incremental benefit to riparian habitat.

We conclude that the continued operation of the Oswego River Project, along with the proposed operational changes, would have no effect on federally listed threatened or endangered species. In addition, the proposed operational changes would benefit terrestrial resources, potentially increasing wetland habitat and wildlife resources.

c. Unavoidable adverse impacts: Vegetative clearing associated with the development of trails or canoe portages would represent a minor, long-term unavoidable adverse impact. Wildlife disturbance during the construction of certain recreational facilities (section V.C.7) would represent a short-term minor adverse impact, and any displacement would represent a long-term, minor adverse impact.

5. Aesthetic Resources

a. Affected environment: The Oswego River Project area is primarily rural except for the cities of Fulton and Oswego. Areas of medium- and low-density residential and commercial land use are concentrated along the Oswego River corridor. Most industry is

concentrated in and near the two cities. Outside of these residential and industrial areas, Oswego County is characterized by forest, brush land, and agricultural tracts.

The project area lies within the Erie-Ontario lowlands, which are characterized by minimal relief in the tens of feet and slopes in the range of 2 to 9 percent. Floodplains in the area are largely restricted to the narrow, steep shoreline. The river water is rich in nutrients and sediments from agricultural runoff and a municipal drainage basin, and transparency remains at 2 to 3 feet. The river drops approximately 119 feet from its source at Three Rivers to its mouth at Lake Ontario. Locks operated by the NYSTA exist at all three developments to provide navigation lifts.

Fulton Development

The Fulton development is the most upstream development, and is bounded on the east by the Oswego Canal Lock 3 and a redeveloped commercial section of downtown Fulton. The main commercial downtown street is one block away. The city of Fulton's marina is located across from the Fulton development at Lock 3. The shoreline of the impoundment is small and heavily urbanized. The sparsely vegetated peninsula dividing the tailrace from the bypassed reach, also bears the supports from the Oneida Street concrete bridge. The concrete buttress dam is 509 feet long and 15 feet high and abuts the Granby powerhouse on the opposite shore.

The Fulton development is highly visible from various locations: the Oneida Street bridge, the relatively large parking area behind the commercial buildings, the city's park and marina next to the lock, the lock itself, and the opposite side of the river. Because of the high use of this downtown area, public amenities have been added, including benches, lighting, grills for picnicking, and some signage. Extensive painted railings have been installed for public safety around the lock and the development area, and these are in good condition. The brick and metal powerhouse is surrounded with galvanized metal railings. The character of this area is urban industrial and urban recreational, with the marina, linear parks, and obvious fishing areas. The area appears active and well maintained.

Minetto Development

The Minetto development, located in the town of Minetto, is situated between NYS Route 48 on the west and the Oswego Canal Lock 5 on the east. The former Columbia Mills, Inc., whose structures are currently vacant, occupies land along Route 48 within view of the Minetto facility. Additional vacant commercial structures occupy industrial parcels along the shoreline north and south of the Minetto development and are interspersed with other active industry located along this stretch of the river. Other land

uses abutting the impoundment are primarily rural in nature, and include agriculture, forest, and dispersed single-family residences scattered along Route 481, which parallels the river on its eastern shore.

The concrete gravity dam is curved and the red brick powerhouse, typical of early 20th century industrial architecture, is perpendicular to the river flow and directly over it, connecting the west bank with the lock in the middle of the river. The dam connects the lock with the eastern shoreline, which is relatively steeply sloped and heavily vegetated. The public has access to the lock from the west via a metal catwalk suspended over the intake face of the powerhouse. Views of the project facilities are limited by the existing commercial buildings on the west and the heavy vegetation on the east. They are most visible to people recreating here, especially those who boat, fish, and hike.

Varick Development

The Varick development is the largest of the three developments, and is located in the city of Oswego between NYS Route 48 on the west and the Oswego River on the east. Leto's Island divides the Varick bypassed reach and tailrace from Lock 7 on the east side of the river. Mixed residential, commercial, and industrial land uses surround the development, and a new post office stands north of the Varick powerhouse. The gravity masonry dam consists of two sections: a curved section measuring 480 feet in length, and a straight section 250 feet in length, both of which are 13 feet high. The large, red brick powerhouse displays architecture similar to the many abandoned mill buildings along the river from Oswego to Fulton. The forebay is relatively long, and separates the powerhouse from the dam.

Views of the vegetated shorelines of the river and the hydropower facilities at the Varick development are available intermittently from the adjacent roads along the top of the riverbanks. An existing, universally accessible, linear park extends along the west bank, from the southernmost tip of the forebay island north towards downtown Oswego and Lake Ontario. The linear park consists of a concrete walk along the shoreline bulkhead, with railings and lights, and a suspended wood structure along the face of the powerhouse. A stone wall divides most of the tailrace from the bypassed reach which is very wide with exposed bedrock.

Because of its proximity to downtown Oswego, its adjacent linear park, the popularity and success of recreational fishing in the bypassed reach, and the recreational use of Leto's Island on the opposite side of the reach, many people use and see the Varick development. The river is very wide at this point, and the character of the area is early industrial and modern commercial and recreational.

b. Environmental impacts: The operational changes, minimum flow regime, and recreational enhancements proposed by NMPC and the agencies have the potential to affect the aesthetic resources of the project area.

ROR Operation and Minimum Flows

Erie proposes to operate the Oswego River Project, along with the Oswego Falls and Granby Projects, in a ROR mode with minimum flows of at least 75 cfs to the upper bypassed reaches below the Fulton development and at least 150 cfs to the upper bypassed reach below the Varick development. The agencies recommend ROR operation with similar or higher minimum flows to the bypassed reaches of the Fulton and Varick developments. We discuss the specific seasonal bypassed reach flows in the fisheries resources section (V.C.3).

Our Analysis

ROR operation would allow impoundment water level fluctuations to be minimized, thereby allowing shoreline vegetation to become more fully established and substantially reducing the amount of exposed substrate that currently is visible during daily drawdowns. The shoreline soils beneath the more established vegetation would be less prone to erosion, thereby reducing water turbidity. ROR operation would improve the project's aesthetic resources by enhancing shoreline vegetation, reducing exposed shoreline substrate, reducing erosion, and reducing water turbidity. A relatively constant water level would also allow a relatively constant and safe use of the shoreline edge.

Based on release of the minimum flows, the bypassed reaches would be continuously watered. There would be more riffles, which are attractive aesthetically, and there would be more sound, which is also attractive.

The increased amount of water would provide greater visual interest; greater sound benefits; and, because it would change over the course of a year, variation. Minimum flow levels in the Varick bypassed reach are largely responsible for defining the reach's character in terms of magnitude, sound, and spray. Variations in flow would alter these characteristics. Lower flows may expose rock formations or vegetation that is submerged at higher flows. At higher flows, the character may be explosive and powerful, or there may be only a negligible difference in character if the reach is very broad and flat, and it takes a great deal of water to change the percentage of the reach under water. Sound and spray levels generally can be expected to increase with flow level. In summary, all flows proposed by Erie and recommended by the agencies would be acceptable for visual resources and would be considered an improvement over existing conditions.

Recreational Facilities

Erie proposes to provide signage to improve access to recreational facilities including canoe portage routes, and proposes to work cooperatively with the city of Fulton and the NYSTA Canal Commission to continue to improve parks, picnic facilities, trails for angler access, and pedestrian walkways. We provide the specifics of these proposals in the recreational resources section (V.C.7).

Interior recommends that Erie submit a plan to monitor and evaluate recreational use of the project area to determine whether existing access and other facilities are meeting the needs of the public interested in using and enjoying fish and wildlife resources. NYSDEC recommends (letter dated April 1, 1996) specific recreational enhancements at each of the three developments and concurs with Interior's proposed recreation plan. ADK has also requested specific improvements. The specific recommendations are discussed in the recreational resources section (V.C.7).

Our Analysis

Improved recreational opportunities could improve aesthetic resources by allowing a greater number of people to experience these areas, improving safety, and creating specific destinations and travel routes, thereby decreasing informal footpaths and possible misuse of these sites.

Improved recreational facilities would enhance aesthetic resources if they are designed appropriately and properly maintained. Materials used should be consistent with existing materials at each of the three developments, and should also be consistent with the different characters of the developments. We recommend that Erie consult with state and local agencies to develop material selections, construction detailing, and, most importantly, maintenance plans and agreements for any required recreational facilities. This additional consultation should be part of the consultation orginally proposed by NMPC as part of the implementation of its Comprehensive Recreation Plan, that we recommend be updated, as discussed in section V.C.7.b.

Maintenance

Erie proposes to make visual and aesthetic improvements to the powerhouse and immediate surroundings by reconditioning the existing structures, landscaping, fencing, and signage at the Varick development and, in addition to the above, cleaning the brick facades of the powerhouses at the Fulton and Minetto developments. These proposals have the potential to affect the integrity of historic resources in the project area, which

include the dams and intake structures, which are contributing elements to the State Barge Canal System, which is eligible for the National Register of Historic Places (NRHP); see section V.C.6, Cultural Resources. NMPC proposed to include these non-routine maintenance activities in the CRMP required under the PA executed in July 1996.

Our Analysis

Maintenance of existing (and proposed) structures and features is a key issue relative to aesthetic resources. Without adequate maintenance, all elements, and the sites they occupy, look unkempt, uncared-for, and may contribute to the misuse of the area. Of the three developments, the Fulton development appears to be the best maintained, probably because of its proximity to the lock and to downtown Fulton. However, all three developments would benefit from continued maintenance. The powerhouses at Fulton and Minetto are immediately adjacent to the NYSTA barge canal locks, which receive high visitor use from recreational boaters. The Varick powerhouse is a focal point on the Varick bypassed reach that receives the highest visitor use in the project from anglers in the bypassed reach.

We concur with Erie's proposed measures to increase the level of maintenance at project facilities to enhance the project's aesthetic resources.

c. Unavoidable adverse impacts: There would be no unavoidable adverse impacts on aesthetic resources as a result of the relicensing of the Oswego River Project.

6. Cultural Resources

a. Affected environment: Citizens Electric Company built the original Fulton development on the east side of the Oswego River in 1884. The Fulton Light, Heat and Power Company was formed in 1902 and built the new Fulton powerhouse between 1924 and 1928. Columbia Mills began construction of the Minetto Hydroelectric Plant powerhouse in 1914, and Northern New York Power Corporation completed the project in 1915. At about the same time, the state of New York reconstructed the Oswego canal and dam for Lock 5. General Development Corporation began construction of the Varick Hydroelectric Plant powerhouse in 1925. General Development Corporation merged with the Oswego River Power Corporation in 1925, and the new company completed the Varick development in 1926. All three powerhouses were purchased and resold over the years. They were owned by NMPC from its incorporation in 1950 until the Commission approved the transfer of the Oswego River Project to Erie in 1999.

In a letter to NMPC dated June 15, 1983, the New York State Historic Preservation Officer (SHPO) issued its opinion that the Fulton powerhouse and "other buildings associated with the site" did not meet NRHP criteria, due to loss of historical integrity. The Varick and Minetto developments' facilities were surveyed by an historian retained for this purpose by NMPC, in a study encompassing all of NMPC's project facilities in New York State. Results of this study are documented in the report entitled "A History of Hydroelectric Power in New York State" prepared by Duncan M. Hay (1991). This study concluded that the NMPC's facilities at the Varick and Minetto developments did not meet NRHP criteria.

Although Erie owns the powerhouses, the dams and intake structures associated with the Fulton, Varick, and Minetto developments are elements of the Oswego Canal, which is part of the State Barge Canal System. The State Barge Canal System, which is owned by NYSTA, has been evaluated as eligible for inclusion in the NRHP (Beyer Blinder Belle, 1995b). As a result of this evaluation, the dams and intake structures at the Fulton, Varick, and Minetto developments are contributing elements to the NRHP linear resource.

No prehistoric or historic archeological sites included or eligible for inclusion in the NRHP have been recorded within the Oswego River Project boundaries.

b. Environmental impacts: The National Historic Preservation Act of 1966 (NHPA) seeks to encourage preservation of the nation's historic and cultural resources for future generations. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties.

Historic and Architectural Resources

NMPC originally proposed to install pneumatic crest gates at the Minetto and Varick developments. NMPC subsequently withdrew these enhancements. As we discussed in sections V.C.3, Fishery Resources, and V.C.4, Terrestrial Resources, we recommend the installation of more robust dam crest structures at the Fulton, Minetto, and Varick developments to control impoundment fluctuations.

The New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) determined that relicensing the Oswego River Project, including the Fulton, Minetto, and Varick developments, would have no effect on archeological or historic resources listed or eligible for listing on the NRHP (letter from Julia Stokes, Deputy Commissioner for Historic Preservation, NYSOPRHP, to Jerry L. Sabattis, Hydro Licensing Coordinator, NMPC, dated April 11, 1991). The SHPO further commented

that the originally proposed installation of pneumatic crest gates at the Minetto and Varick developments would have no effect on archeological or historic resources (letter from Julia Stokes, Deputy Commissioner for Historic Preservation, NYSOPRHP, to Scott Shupe, Associate Senior Environmental Analyst, NMPC, dated December 16, 1992, submitted to the Commission by letter dated December 14, 1993).

Archeological Resources

Because of the possibility that there are undiscovered properties in the project area that could be adversely affected by the construction of fish passage or recreational facilities, Erie proposes to consult with the SHPO prior to undertaking any ground-disturbing activities. The staff's recommended alternative includes some environmental measures that have the potential to affect as yet unknown archeological sites.

Our Analysis

A PA among the Commission and the SHPO, with NMPC, Moreau Manufacturing Company, and Beebee Island Corporation concurring, was executed on July 19, 1996, for managing historic properties that may be affected by licenses issuing for the continued operation of 14 hydroelectric projects in New York State, including the Oswego River Project. The PA commits the licensee to prepare a CRMP for each project in consultation with the SHPO, within 1 year of the Commission's issuance of a license for that project. The PA also provides interim procedures to consult with the SHPO prior to commencing any project-related land-clearing or land-disturbing activities, or embarking on any other project-related activities that could affect historic properties, such as NRHP-eligible project facilities.

While there are now no prehistoric or historic archeological sites included or eligible for inclusion on the NRHP within the Oswego River Project boundaries, the CRMP would provide a process to deal with the discovery of as yet unknown archeological sites. It would also provide a process for resolving any project-related adverse effects on elements of the NRHP-eligible Oswego Canal. Preparation of the CRMP and its implementation would ensure that appropriate actions to identify, evaluate, and manage historic properties at the Oswego River Project would be taken by the licensee over the term of the new license.

c. Unavoidable adverse impacts: There would be no unavoidable adverse impacts on cultural resources from operation of the Oswego River Project.

7. Recreational Resources

a. Affected environment: Fishing and pleasure boating are the two principal recreational activities in the Oswego River Project area that would be affected by Erie's proposal. We estimate recreational use for these two activities at 218,000 visitor days per year.

Fishing

Fishing in the Oswego River Project area is a major recreational activity in two distinct reaches: above and below the Varick dam. Fishing below the dam concentrates on stocked lake salmonids, such as chinook salmon, coho salmon, steelhead (rainbow) trout, and brown trout. Fishing above the dam focuses on resident and non-resident warmwater species, such as walleye, bullheads, smallmouth bass, largemouth bass, pumpkinseed, and yellow perch.

The greatest number of anglers fish below the Varick dam. In 1988, NYSDEC estimated use of 127,000 angler days in the 1.4-mile-reach between the Varick dam and Lake Ontario. This was a 170 percent increase over a 1977 estimate of 47,000 angler days. Fishing occurs throughout the year and intensifies during the spawning runs and migration of the different targeted species. Chinook salmon, coho salmon, steelhead (rainbow) trout, and brown trout are the attraction from early fall to late spring. Peak fishing takes place between early September and mid-October when chinook salmon make their spawning run.

Access for bank fishing in the Oswego River below the Varick dam is available from the east and west sides. The city of Oswego has developed the West Side Linear Park, which extends from Bridge Street south to the forebay island. The walkway is cantilevered around the tailrace end of the Varick powerhouse. A chainlink fence prevents people from fishing along the tailrace segment of the walkway. A stairway extends to the riverbank from the forebay island at the southern end of the walkway to provide access for wading anglers. Anglers fish from over the walkway railing at the northern segment of the walkway. At the height of the fishing season, when as many as 2,500 anglers fish in the bypassed reach at one time, bank anglers stand elbow-to-elbow along the full length of the walkway. Access to the walkway from the street is provided at the middle and at the northern ends. A free, 36-car public parking lot is just north of the project powerhouse. A barrier-free ramp extends down from the parking lot to the walkway and provides access for persons with disabilities. There is no public access from Route 48 to or from the southern end of the walkway.

Access for anglers from the eastern bank is primarily from Leto's Island, a privately owned island located between NYSTA Lock 7 and the Varick bypassed reach. There is fee parking for 200 vehicles on the island. Drift boats also can be launched from Leto's Island.

Angler safety is a concern in the Varick bypassed reach. If the power plant suddenly shuts down, water that would pass through the powerhouse is redirected to the bypassed reach. When this occurs, the water level in the bypassed reach can rise 2½ to 3 feet in a short period of time. Anglers have 3 to 10 minutes to exit the river to the safety of the bank. Erie implements a Fisherman Alert System (FAS) to warn anglers of the danger of a rapid river rise. The system is activated by sudden rises in the impoundment level or the wicket gate settings, by remote initiation at Erie Regional Control, or manually by on-site Erie staff or fire department personnel. The system includes a visual and audible alert system (including a pre-recorded evacuation message) that is triggered by system activation. Erie has developed and distributes safety-related recreation brochures and videos, and there are posted warnings of the danger throughout the bypassed reach. The warning signs are concentrated in the areas of greatest use and greatest danger. Anglers may exit the river on the east side of the bypassed reach at Leto's Island or via stairs to the forebay island.

Upstream of the Varick dam, walleye, catfish, and bullheads are the most sought after species. In 1988, NYSDEC estimated use in this reach at 32,000 angler days. Angler use has remained constant since 1977, when a similar survey estimated angler activity above Varick at 32,000 angler days.

Access to the Oswego River for fishing above the Varick dam is principally from the shoreline and the NYSTA transportation locks. Routes 48 and 481 parallel the river on the west and east sides, respectively. The banks are moderately steep along the river, but many anglers park along the roadside and informally access the river to fish between the highway guardrail and the bank. At the Fulton development, NMPC estimated tailwater fishing in its 1990-1991 Form 80 report at 800 anglers. Lock No. 3 is ranked second in the state in total angler trips in a 1982 survey of angler activity at 50 canal locks statewide. The lock has good access from the center of the city of Fulton and an adjacent municipal parking lot. NMPC reported some tailrace fishing at the Minetto development (NMPC estimated 40 anglers in its 1990-1991 FERC Form 80 report), but access is limited because of the adjacent Columbia Mills and a river retaining wall on the west shore adjacent to the tailrace. Canal Lock No. 5 is in the middle of the river and separated by the powerhouse from the road.

Pleasure Boating

The Oswego River Project is located along the Oswego Canal reach of the New York State Barge Canal (NYSBC). The NYSBC is a major statewide recreational feature operated by NYSTA that includes the Erie Canal and its 524 miles of interconnected canal systems from Buffalo to Albany and up to Lake Champlain. Principally developed between 1817 and 1825 as a commercial transportation canal, today the majority of the traffic on the NYSBC is recreational boating.[13] The NYSBC has been developed as the east-west spine of the state's recreational system (NYSOPRHP, 1989). There are over 200 miles of trails for hiking, bicycling, horseback riding, ski touring, snowmobiling, and nature walks along the shores of the canal. Parks along the canal provide areas from picnicking and nature study and access to the canal for canoeing, fishing, and boating. Recent plans by NYSTA's Canalway Commission call for expansion of recreational uses of the NYSBC (Beyer Blinder Belle, 1995a).[14] Typical watercraft include 20-foot or longer power cruise boats. Historic replica steel barges, which are available for charter, are also found on the canal. NYSTA charges $25 per year for a permit to use the locks. Boats more than 49 feet in length are charged $100 per year. Boat speeds on the canal are limited to 10 miles per hour.

The Oswego Canal is the most heavily used reach of the NYSBC. It extends north from the Erie Canal in Syracuse to form a link to Lake Ontario. The Canal is part of a wider regional link that connects Canada, the St. Lawrence Seaway, and New York City. The reach includes 7 boat locks between Syracuse and Lake Ontario. Locks 2 and 3 are located in the city of Fulton; Lock 5 is adjacent to the Minetto development; and Locks 6, 7, and 8 are in Oswego. Average peak July use for the 7 locks on the Oswego Canal in 1994 was 994 boats per lock for an estimated maximum monthly use of 21,000 visitor days for the seven locks.[15] In 1992, NYSTA recorded 19,311 craft going through the Oswego Canal locks for a total of 57,933 visitor days.

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[13]In 1951, the canal carried 5.2 million tons of cargo. In 1994, it carried only 68,000 tons (New York Times, June 30, 1995).

[14]The Canalway Commission was created in 1992 through legislation that transferred the Office of Canals, the agency that controls and maintains the Barge Canal, from the New York Department of Transportation to NYSTA. The Commission was charged with developing a NYSBC Recreation Plan.

[15]NYSDEC estimates an average of 3 persons/boat.

Lock 5, which is immediately adjacent to the Minetto development, had a peak July use in 1994 of 970 boats or 2,910 visitor days. Lock 3, which is immediately adjacent to the Fulton development, had a peak July use in 1994 of 942 boats or 2,826 visitor days.

Public docking and boat launches between the city of Fulton and Lake Ontario are available at the following locations: a city dock and marina for transient boaters in the city of Fulton upriver from the NYSTA Lock 3 and the Fulton development; a city boat ramp at Fulton Park on the east bank downstream of Lock 3; and a town boat ramp on the west bank at Minetto Park upriver from the Minetto development. Temporary docking is available at the East Side Linear Park and at Oswego Marina downriver from Lock 8. Battle Island State Park is located between the Fulton and Minetto developments. It has an 18-hole golf course, but there are no public boat launch facilities.

b. Environmental impacts: NMPC's Comprehensive Recreation Plan, filed in response to a request for additional information, includes several proposals that would enhance the project's recreational resources. At the Varick development (see figure 4), NMPC proposed to: (1) provide tailrace fishing access and a pedestrian walkway (completed in 1991); (2) install the FAS (completed in 1991); and (3) assist the city of Oswego in developing the planned "Varick Impoundment Trail" south of the pedestrian bridge over the development's headgates (proposed to be developed by the city of Oswego). At the Minetto development, NMPC proposed to add identification signs. At the Fulton development (see figure 2), NMPC proposed to: (1) work with NYSTA to provide pedestrian and angler access to tailrace island by brushing out access, laying a woodchip trail, and installing fences and signs; (2) work with NYSTA to improve shoreline fishing at the canal Lock No. 2 island, upstream of the Fulton development; (3) work with the city of Fulton to designate parking spaces for anglers in the adjacent municipal lot; (4) contribute to the development of the Granby Trail on the west side of the Oswego River between the Granby Project and the Oswego Falls Project; and (5) add identification signs.

In addition to NMPC's proposed enhancements, state and federal agencies and private organizations have recommended enhancements that would affect recreational resources. NYSDEC (letter dated April 1, 1996) makes development-specific recommendations. For the Varick development, it recommends that Erie: (1) coordinate plans with the city of Oswego to provide a pedestrian footbridge for access to the forebay island from Route 48; (2) develop a trail from the parking lot about 400 feet upstream of the dam to the footbridge; and (3) provide $1,000 for picnic facilities on the island. For the Minetto development, it recommends that Erie coordinate with the village of Minetto to provide adequate parking facilities, a trailered boat launch downstream of the project's

tailrace, picnic facilities, and fishing access to the tailrace area consistent with the safe operation of the project. For the Fulton development, NYSDEC recommends that Erie coordinate with the city of Fulton to provide adequate parking and access to the Oswego River upstream of the powerhouse and to the tailrace for fishing, hunting, and trapping where applicable.

NYSDEC recommends that a recreational plan addressing the recommended recreational improvements be completed within 1 year of the issuance of the license and that construction activity begin within 2 years and be completed within 5 years of the issuance of a license. NYSDEC also recommends that Erie replace its current breakaway flashboards with a system that would achieve the same design purposes yet retain the flashboards at the project site. NYSDEC states that a new system is needed to eliminate the potential hazards to commercial or recreational boating associated with breakaway flashboards.

The Oswego County Department of Planning and Community Development (OCDPCD) (letter filed July 3, 1995) submitted comments referencing its 1992 Oswego River Scenic Assessment. It recommends that a roadside scenic overlook proposed on Route 48, just south of the Varick forebay, be included as a recreational enhancement. It also recommends that Erie complete the proposed upgrade of the Minetto boat launch at the Minetto impoundment that was not completed by NYSDOT as part of the Minetto Bridge reconstruction.

Interior (letter dated March 26, 1996) recommends that, within 6 months of the issuance of any new license, Erie should prepare a plan to monitor and evaluate recreational use of the project area to determine whether the existing access and facilities are meeting the public's interest in using and enjoying the project's fish and wildlife resources. It recommends that the studies and report address four consecutive seasons and that the data for each season should include: (1) recreational use figures for each project site; (2) results of visitor satisfaction surveys; (3) discussion of the adequacy of Erie's recreational facilities at each project site; (4) discussion of the need for additional recreation at each project site; (5) any plans proposed by Erie to accommodate or control visitation at each project site; and (6) documentation of consultation and comments on the report.

Interior also recommends that the monitoring and assessment studies begin within 1 year and be completed within 2 years of license issuance. The final report would be submitted to the Commission within 2½ years of license issuance. Starting in the sixth year after issuance of any new license and every sixth year thereafter on the license anniversary, Interior recommends that Erie be required to file a recreation report with the

Commission that specifically identifies the results pertinent to each project and user group. Erie would also be required to make the collected raw data available to interested parties upon their request within 90 days after study completion. Interior further recommends that Erie consult with FWS, National Park Service, NYSDEC, NYSOPRHP, and private user groups on the development of the reports. Consultation would also determine how the project facilities meet the needs of people with disabilities in keeping with the Americans with Disabilities Act.

NYRU (letter dated March 28, 1996) concurs with NMPC's proposed recreational enhancements. It states that additional access for fishing or boating would further enhance recreational opportunities and requests that alternatives for improved access be analyzed as part of this document.

ADK (letter dated March 29, 1996) makes recommendations for two, site-specific enhancements that Erie should implement as part of the project: (1) a safe canoe portage around the Minetto development, and (2) portage route signs placed in cooperation with NYSBC at the Fulton development. It also recommends that the recreational features for the project be developed so that they are consistent with NYSTA's Barge Canal Recreation Plan and that a reopener clause be included to examine pedestrian passage around the Minetto and Varick developments if riverwalks are built both upstream and downstream of the developments. Erie is willing to erect canoe portage signs at the Minetto and Fulton developments, but indicated that it will not provide access to the river on land which it does not own outside of the project boundary (letter in response to 10(j), May 13, 1996).

In its comments dated January 28, 2000, Erie proposes an alternative location for the canoe portage on the eastern shore on NYSTA land near the eastern abutment of the Minetto dam.

Our Analysis

We concur with most of NMPC's proposals to enhance use of the project's recreational resources. NMPC's proposed improvements to provide tailrace fishing and a pedestrian walkway at the Varick development were completed through NMPC's participation with the city of Oswego in the expansion of the West Side Linear Park and the provision of an easement for a walkway that is cantilevered over the powerhouse tailrace in 1991. In addition, NMPC proposed two items that would affect angler safety at the Varick development. It has installed an FAS that warns anglers in the bypassed reach of rapid water level rises through signs and audible signals. We recommend that Erie continue to operate the FAS. NMPC also originally proposed to place channel weirs in

the riverbed of the bypassed reach that would prevent anglers from wading too far from shore. NMPC believed that the weirs also would encourage a redistribution of angler activity by providing good angler opportunities at more areas throughout the bypass. Presently, anglers crowd at the base of the dam. Erie withdrew the proposed channel modifications to the Varick bypassed reach by letter dated January 28, 2000.

We agree with NMPC's proposal to assist the city of Oswego with the development of the Varick Impoundment Trail, which would extend south of the development on the west bank of the impoundment. Recommendations related to this trail were received from OCDPCD and NYSDEC. OCDPCD's recommendation that Erie develop a scenic overlook and roadside pull-out on Erie land just south of the project forebay affects the same area through which the planned trail would pass. NYSDEC's recommendations that Erie coordinate plans to provide pedestrian access across the project headworks and to provide picnic facilities on the forebay island also relate to the same area. NMPC (AIR response dated December 14, 1993), indicates that picnicking on Forebay Island is not feasible or safe because of the steep topography, but notes its continued involvement in interagency planning to overcome these difficulties. NMPC further notes that the trail from the canal headworks leading upstream (south) along the river is not feasible because it would be located outside of the project boundary and restricted by steep topography.

Access to the forebay island from the southern end via a pedestrian bridge over the power canal headwork and extension of the West Side Linear Park would create an additional access point to the Varick bypassed reach. Access is presently limited to the eastern bank and from the northern end on the western bank. A southern access point would help to reduce crowding at other locations by providing an option for anglers seeking access to the river. It would also contribute to angler safety by creating another egress point from the river and an additional access point for emergency personnel. We conclude that a safe route between the Varick Impoundment Trail and the southernmost end of the West Side Linear Park can be developed.

Therefore, we recommend that Erie's contribution to the development of the Varick Impoundment Trail include extending the existing West Side Linear Park an additional 250 feet along the eastern bank of the forebay island to connect with the pedestrian walkway to be developed across the development's headworks by the city of Oswego. The development of the additional trail would be contingent upon the city of Oswego developing the pedestrian walkway, and therefore coordination between Erie and the city of Oswego would be needed. We recommend that OCDPCD and NYSDEC's recommendations for a scenic overlook, additional parking on Route 48, and trail for access to the parking, be included as part of Erie proposal to assist the city of Oswego in the development of the Varick Impoundment Trail.

We agree with NMPC's proposed enhancements for the Fulton development. Fulton's Lock No. 3 is one of the most popular locks on the barge canal system for angler activity. Providing designated parking and improving access to the tailrace would create more angling opportunities. Similar enhancement recommendations were made by NYSDEC for this area. ADK recommends that portage route signs be included as part of the enhancements. NMPC's improved angler access to tailrace fishing in Lock No. 2 would also provide increased angler opportunities in an area of high demand. We recommend that Erie implement its proposed enhancements to angler access at the Fulton development and that it include signs marking a portage route as recommended by ADK. We also recommend that Erie contribute to the development of the Granby Trail between upper and lower Fulton dams on the west side of the project impoundment.

We do not agree with NYSDEC's recommendation that Erie coordinate with the village of Minetto to provide adequate parking facilities, a trailered boat launch downstream of the project's tailrace, picnic facilities, and fishing access to the tailrace. Our review of current site conditions indicates that there is presently adequate access to this reach of the Oswego River for powerboats via the NYSTA lock system. There is limited space to develop such a facility adjacent to the road, and the lack of power boat access has not been identified as a project need.

We agree with NYSDEC's recommendation to replace the existing breakaway flashboard system at the Varick development and with Erie's current suggestion to reinforce the flashboard system at the Fulton and Minetto developments (which is conditioned on our continued recommendation to minimize loss of flashboard material). Flashboard failure is most likely to occur after ice-out in the early spring and could occur as late as June 1, after the start of the recreational boating season. Flashboards vary in height from 36 inches at the Varick dam, 10 inches at the Minetto dam, and 6 inches at the Fulton dam. Accumulation of even 6-inch flashboards could prove hazardous to boaters and would be unsightly. Our recommended installation of an alternative flashboard system at the Varick development (see sections V.C.3 and V.C.4) would address this recreational safety issue at the Varick development. Erie's suggestion to reinforce the flashboard systems at the Fulton and Minetto developments would reduce the number of failures and associated downstream debris deposition. NYSDEC indicated at the September 12, 2000, Section 10(j) meeting that Erie's suggested reinforced flashboard systems should address its concerns about aesthetics and angler safety. Therefore, as discussed in section V.C.3.b, Fisheries Resources, we recommend that Erie file a plan, developed in consultation with NYSDEC, FWS, and NYSTA, for Commission approval, for the replacement of the breakaway flashboards at the Varick, Minetto, and Fulton developments, or the reinforcement of the existing flashboards so that failure only occurs during substantial flood (i.e., 100-year floods) or unusual ice-loading events.

We concur with Interior's recommendation that Erie should prepare a plan to monitor and evaluate recreational use of the project area to determine whether the existing access and facilities are meeting the public's interest in using and enjoying the project's fish and wildlife resources. Recreation within the project area is dynamic and needs to be monitored at a level beyond the standard Commission-required 6-year Form 80 Report. A 170 percent increase in angler activity over an 11-year period is a good indicator of such dynamic change. Current capacity is at or exceeds capacity of 2,500 anglers per day during the peak season from early-September to mid-October. In addition, potential danger to anglers from a sudden power plant shut-down, which can be heightened by overcrowding, is an issue at the Varick development and should be monitored regularly.

The city of Oswego and NYSTA have ongoing plans to further promote and develop use of the Oswego River for recreational use by anglers and boaters. We recommend that Erie consult with the following entities in developing our recommended recreational monitoring and assessment study plans and in developing the report that would result from implementation of the plan: FWS, National Park Service, NYSDEC, NYSOPRHP, NYSTA, the city of Oswego, the city of Fulton, the town of Minetto, ADK, NYRU, the Oswego County Federation of Sportsmen's Clubs, and the Syracuse Center for Independent Living. We also recommend that at least one survey question asked at the Varick bypassed reach address anglers' understanding of Erie's FAS system to help determine and improve its effectiveness, if necessary.

We agree that there is a need for canoe portage around the Minetto development. The location of Lock 5 in the center of the river can be difficult to enter for canoeists because of potential strong currents on both sides of the upstream entrance to the lock.

We recommend that Erie develop a portage trail on the east bank of the river as suggested by ADK, either at a location beginning just north of the Minetto bridge and extending about 1,200 feet north to a put-in north of the Minetto dam (see figure 3), or at an alternative location near the dam abutment proposed by Erie (letter from Jerry L. Sabattis, Erie, to the Commission dated January 28, 2000). At the first location the bank is steep, but there is ample room within the existing right-of-way to develop switchback or diagonal trails and create a walkable grade. A cooperative agreement with NYSTA would be needed to implement the alternative location proposed by Erie. Both locations are preferable to one on the western bank that would need to be twice as long and would pose a safety threat to canoeists from passing traffic. We further recommend that the eastern portage route include a designated canoe rest about halfway along the trail if a route longer than 1,000 feet is selected. We recommend that Erie consult with ADK, NYSTA, and NYSDEC to determine the most appropriate route for the canoe portage at Minetto.

The applicant submitted a Comprehensive Recreation Plan to the Commission by letter dated December 14, 1993. Since 1993, some of the proposed measures may have been implemented, some measures may no longer be appropriate (e.g., channel modifications at the Varick bypassed reach), many measures are still applicable, and we recommend additional measures not specified in the Comprehensive Recreation Plan (e.g., establishing a canoe portage route at Minetto and coordinating with the city of Oswego to determine if the West Side Linear Park trail should be extended to connect with a pedestrian bridge). Consequently, we recommend that Erie update its existing Comprehensive Recreation Plan, in consultation with the city of Oswego, the city of Fulton, the town of Minetto, NYSDEC, NYSTA, NYSOPRHP, OCDPCD, NYRU, and ADK, and submit it to the Commission for approval.

We also considered ADK's recommendations as they relate to canal operation, the need for a license reopener to deal with pedestrian passage around the Minetto and Varick developments, and ensuring that the recreational features are consistent with the New York State Canal Recreationway Plan (NYSCRP). We recommend inclusion of data on canal operation and use by recreational boaters in the recreational use and monitoring plan, as well as consultation with ADK in the preparation of the plan and subsequent reports. We recommend providing pedestrian access around the Varick development, and it is presently possible at the Minetto development; therefore, we do not consider a reopener specific to this issue to be necessary, though it should be noted that a general reopener article is included in all licenses. We also note that we reviewed the NYSCRP and find the proposed project consistent with it.

c. Cumulative impacts: Our recommended canoe portage around the Minetto and Fulton projects, in addition to the current passage available through the NYSBC, would provide beneficial cumulative impacts on recreational boating opportunities in the region by facilitating canoe portage around these two dams. Our recommended extension of the West Side Linear Park to connect with the proposed Varick Impoundment Trail and Erie's proposed cooperative development of fishing areas upstream and downstream of the Fulton dam would provide beneficial cumulative impacts on recreational fishing opportunities in the region by providing additional fishing access points on the river.

d. Unavoidable adverse impacts: There would be short-term, minor effects on recreational use of Forebay Island during the construction of walkways.

D. No-action

Under the no-action alternative, the project would continue to operate under the terms and conditions of the original license, and no new environmental measures would be implemented.

VI. DEVELOPMENTAL ANALYSIS

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

A. Power and Economic Benefits of the Project

Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division,[16] 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 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.

The replacement energy and capacity values used in our analysis were developed for the Vischer Ferry, Crescent, and School Street Projects. We consider these values to be applicable to the Oswego River Project because the applicant is the same and all the projects are located within the NYISO market.

To determine the impact of operational changes at these peaking projects, generation and annual power benefit were modeled taking into account peak versus off-peak generation and power value rate. Each enhancement affecting project generation was modeled, and the total annual generation and power value were used to develop a composite project power value rate for each operational scenario. These composite rates were used as part of our analysis of the economic feasibility of project alternatives.

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[16] 72 FERC ¶ 61,027 (July 13, 1995).

For our economic analysis of the alternatives, we use the assumptions, values, and sources shown in table 13. The proposed action consists of the operation of the Oswego River Project with Erie's proposed environmental measures as shown in table 14.

Table 13. Staff's assumptions for economic analysis of the Oswego River Project (Source: Staff).

Assumption	Value
On-peak energy value[a] 2001	26.55 mills/kWh
Off-peak energy value[a] 2001	18.67 mills/kWh
On-peak capacity value[a] 2001	$55.15/kW-yr
Period of analysis	30 years
Interest/discount rate[b]	10 percent
Cost of money[b]	10 percent
Bond/debt ratio[c]	0.5
Federal tax rate	34 percent
Local tax rate	3 percent
Insurance rate	0.25 percent of cost of construction
Term of financing	20 years
O&M costs (2001$)[d]	$401,650
Net investment (2001$)[e]	$1,377,900
Escalation Rate	0 percent

[a] Energy and capacity valuation from the April 12, 1999, staff memorandum entitled "Evaluation of total power generation and economic impacts of pre-relicense, existing, and proposed operation restriction conditions for the Vischer Ferry Project No. 4679, Crescent Project No. 4678, and School Street Project No. 2539." These values were escalated using a GDP deflator of 104.7 for 2000 and 108.95 for 2001 to account for inflation.

[b] Discount rate of 10 percent is typical for this type of analysis and reflects the average cost of debt financing.

[c] Assuming 50 percent of project capital costs would be financed, while remainder would be paid for out of internal capital.

[d] NMPC provided O&M costs of $306,980 in 1989 dollars; using a GDP deflator of 83.27 for 1989 and 108.95 for 2001 yields an annual O&M cost of $401,650 in 2001 dollars; annual FERC fees were assumed to be accounted for in the annual O&M cost.

[e] 1991 project net investment was provided by the applicant. The staff estimated project depreciation from 1991 to 2001 and added the value of new construction during that period to arrive at the current net investment value for this analysis; NMPC did not provide license application cost data; this cost was assumed to be accounted for in the net investment cost item.

Based on the assumptions in table 13 and the costs of enhancements shown in table 14, we estimate that the annual cost of Erie's proposed Oswego River Project would be about $1,148,910 (15.91 mills/kWh), or about $891,750 (12.35 mills/kWh) less than the annual power value of $2,040,660 (28.27 mills/kWh). The estimated annual output of the project would be 72.194 GWh.

Table 14. Summary of environmental measures, costs, and annual costs of the currently proposed project (Source: Staff).

Environmental measures	Capital cost of environmental measures (2001$)[a]	Cost of O&M (2001$)	Annual cost (2001$)
ROR operation	$0	$0	$9,970[b]
Varick minimum flow (475 cfs March 15-May 31; 300 cfs Sept. 15-March 15; 200 cfs June 1- Sept. 15)	$213,430 (NMPC)	$0	$60,630[c]
Fulton base flow (75 cfs to upper bypassed reach year round)	$0	$0	$0[d]
Develop and implement flow monitoring plan	$78,100 (Staff)	$5,200 (Staff)	$17,110
Provide trap and truck for upstream fish passage at Varick by 2010	$1,448,190 (NMPC)	$0	$220,870[e]

Environmental measures	Capital cost of environmental measures (2001$)[a]	Cost of O&M (2001$)	Annual cost (2001$)
Fish protection and downstream passage at Fulton (an Interior modified prescription but staff does not recommend implementation of measure)	$85,520 (NMPC)	$2,530 (NMPC)	$16,650[f]
Fish protection and downstream passage at Minetto (an Interior modified prescription but staff does not recommend implementation of measure)	$358,720 (NMPC)	$6,790 (NMPC)	$80,250[g]
Fish protection and downstream passage at Varick (an Interior modified prescription but staff does not recommend implementation of measure)	$352,060 (NMPC)	$14,510 (NMPC)	$76,420[h]
Downstream fish passage effectiveness studies at all three developments (an Interior modified prescription but staff does not recommend implementation of measure)	$333,180 (NMPC)	$0	$50,810
Fulton tailrace fishing access	$28,960 (NMPC)	$0	$4,420
Assist NYSTA with angler access at Lock 2 Island near Fulton	$10,410 (Staff)	$0	$1,590
Granby Trail at Fulton	$16,220 (NMPC)	$0	$2,470
Varick Impoundment Trail	$98,480 (NMPC)	$0	$15,020
Aesthetic and other project enhancement measures - 3 sites	$308,170 (NMPC)	$0	$47,000
Totals	$3,331,430	$29,030	$603,210

[a] Costs adjusted to 2001dollars using the GDP deflator, as needed. The source of the original estimate is indicated in parenthesis.

[b] Although the overall annual generation at each project is unchanged due to the shift from peaking to ROR operations, the composite power value rate for the project is reduced from 28.40 mills/kWh to 28.27 mills/kWh due to the shift from peak to off-peak generation, reducing the overall annual project power value.

[c] By letter dated January 28, 2000, Erie increased its proposed summer minimum flow from 150 to 200 cfs. The minimum flow requirement at Varick reduces annual project generation by 0.994 GWh. This reduction in average annual generation reduces the annual power value by $28,090.

[d] Due to the low hydraulic capacity when compared to river flows at the Fulton site, this minimum flow requirement does not reduce project average annual generation. However, minimum flows may reduce generation at the Granby Project, which shares the dam with the Fulton development. It is not possible for us to quantify these costs.

[e] An unknown portion of this cost may be contributed by other hydroelectric projects on the Oswego River. This cost is included as part of the total cost of Erie's proposal; however, because we recommend that upstream passage be addressed as a reopener clause, this cost will be removed from the final cost of our recommended alternative.

[f] Hydraulic losses due to reduced Fulton trashrack spacing reduce annual project generation by 0.038 GWh. This corresponds to a loss of $1,080 in annual power benefits.

[g] Hydraulic losses due to reduced Minetto trashrack spacing as well as fish conveyance flow requirements at Minetto of 150 cfs reduce annual project generation by 0.663 GWh. This corresponds to a loss of $18,750in annual power benefits.

[h] Hydraulic losses due to reduced Varick trashrack spacing reduce annual project generation by 0.291 GWh. This corresponds to a loss of $8,220 in annual power benefits.

B. Proposed Action with Additional Staff-recommended Measures

In this section, we present the annual costs of the proposed action with additional staff-recommended measures. Table 15 presents a summary of the incremental costs of staff and agency-recommended measures over Erie's proposed measures.

Based on the assumptions in table 13 and the costs of the measures shown in tables 14 and 15, we estimate that the annual cost of the Oswego River Project as proposed by Erie , including additional staff-recommended measures only and excluding Erie - proposed measures not recommended by staff and the Varick trap and truck facility, would be $829,570 (11.83 mills/kWh), or about $1,198,810 (16.44 mills/kWh) less than the annual power value of $2,028,380 (28.27 mills/kWh). The estimated average annual output of the project would be 73.945 GWh.

Table 15. Summary of staff-estimated costs, and current annual costs of additional staff and agency-recommended or required measures (Source: Staff).

Environmental measures	Capital cost of environmental measures (2001$)	Cost of O&M (2001$)	Annual cost (2001$)
Fish protection and downstream passage at Fulton (an Interior modified prescription but staff does not recommend implementation of measure)	$964,480 (Erie)	$0[a]	$147,090[b]
Fish protection and downstream passage at Minetto (an Interior modified prescription but staff does not recommend implementation of measure)	$1,056,280 (Erie)	$0[a]	161,090
Downstream fish attraction flow and conveyance flow of 375 cfs from March 1 through December 31 at Minetto (5% of hydraulic capacity)	$0	$0	$15,110[c]

Environmental measures	Capital cost of environmental measures (2001$)	Cost of O&M (2001$)	Annual cost (2001$)
Fish protection and downstream fish passage at Varick (an Interior modified prescription but staff does not recommend implementation of measures)	$797,940 (Erie)	$0[a]	$121,700
Downstream fish attraction flow and conveyance flow of 168 cfs at Varick from March 1 through December 31; 3% of hydraulic capacity (an Interior modified prescription but staff does not recommend implementation of measure)	$0	$0	$18,300[d]
Upstream eel passage at Fulton (an Interior modified prescription but staff does not recommend implementation of measure)	$208,400 (Erie)	$500 (staff)	$32,280[e]
Upstream eel passage at Minetto (an Interior modified prescription but staff does not recommend implementation of measure)	$61,000 (Erie)	$500 (staff)	$9,800[e]
Upstream eel passage at Varick (an Interior modified prescription but staff does not recommend implementation of measure)	$98,000 (Erie)	$500 (staff)	$15,450[e]
Flashboard recovery plan and implementation at Fulton and Minetto or reinforce existing flashboard systems to only fail during substantial flood events	$49,970 (Erie)	$0	$7,620[f]
Alternative flashboard system plan and implementation at Varick	$120,000 (staff)	$0	$18,300[f]

Environmental measures	Capital cost of environmental measures (2001$)	Cost of O&M (2001$)	Annual cost (2001$)
Provide minimum flow during flashboard replacement at Fulton and Varick	$0	$0	$0[g]
Varick - bypassed reach flows (800 cfs March 15-May 31; 500 cfs Sept. 15-March 15; 400 cfs June 1-Sept. 15)	$0	$0	$25,220[h]
Varick forebay park access trail	$0[i]	$0	$0
Parking spaces for scenic overlook at Varick Impoundment Trail	$510 (staff)	$0	$80
Minetto - Canoe portage	$7,290 (staff)	$0	$1,110
Recreational monitoring and evaluation plan for all 3 sites	$104,110 (staff)	$0	$15,880
Update the existing Comprehensive Recreation Plan	$25,0000 (staff)	$0	$3,810
Varick bypassed reach modification design[j]	$158,530 (NMPC)	$0	$24,180
Pneumatic crest gates at Varick[j]	$1,754,240	$2,080	$189,550[k]
Pneumatic crest gates at Minetto[j]	$364,380 (NMPC)	$1,040 (staff)	$34,310[l]
One year wetland monitoring plan[j]	$52,050 (staff)	$0	$7,940
Trailered boat launch downstream of Minetto tailrace[j]	$78,080 (staff)	$1,040 (staff)	$12,950
Parking facilities, picnic facilities, and tailrace angler access at Minetto[j]	$27,070 (staff)	$830 (staff)	$4,960

Environmental measures	Capital cost of environmental measures (2001$)	Cost of O&M (2001$)	Annual cost (2001$)
Complete boat launch on Minetto impoundment[j]	$20,820 (staff)	$520 (staff)	$3,700
Total for all additional measures recommended by staff and all Interior modified prescriptions	$3,492,980	$1,500	$592,840
Total for all measures, including Erie's measures from table 14 (except trap and truck), staff's recommended measures, and Interior's modified prescription	$5,376,220	$30,530	$975,180
Total for all measures recommended by staff (excludes all measures related to upstream and downstream fish passage)	$1,060,640	$5,200	$230,230

[a] Assumes no additional O&M cost beyond those set in KA, 1995.

[b] Assumes no generation losses beyond those due to the applicant's fish protection measures.

[c] The incremental fish attraction and conveyance flow requirement at Minetto (over the 150 cfs accounted for in Erie's downstream fish passage costs presented in table 14) reduces annual project generation by 0.535GWh.

[d] Interior's modified downstream fish passage prescription for Varick entails the release of attraction and conveyance flows to the powerhouse tailrace. Consequently, this flow cannot contribute to the specified minimum flow to the bypassed reach from the dam and would represent an incremental loss in power benefits and reduces annual project generation by 0.647 GWh.

[e] Any required transport flows for upstream eel passage would be negligible and would not contribute substantially to additional generation losses.

[f] There would be energy gains from increased head associated with less frequent flashboard failures. However, these gains currently cannot be estimated.

[g] Implementation of Erie's suggested flashboard stabilization plan at Fulton and our recommended alternative flashboard system at Varick should make flashboard failures infrequent. Therefore, the cost to maintain bypassed reach minimum flows during flashboard reinstallation would be incidental.

[h] The minimum flow to the bypassed reach at Varick does not include fish attraction and conveyance flows and reduces annual project generation by 0.892 GWh.

[i] It was assumed that the cost for this enhancement was included in the $$98,480 (2001$) that Erie proposes to contribute to the city for unspecified improvements to the Varick Impoundment Trail.

[j] Not recommended by staff.

[k] Installation of pneumatic flashboards at Varick assumes that head at Varick would be raised 3 feet year round instead of only between June 1 and December 15. With this assumption, project annual generation would increase by 2.833 GWh. This increase corresponds to an increase of $80,080 in annual power benefits. With installation of the pneumatic crest gates, Erie's proposed $213,420 capital costs to enable directed minimum flow releases would not be necessary, and we reduced the capital costs for this measure accordingly.

[l] Installation of pneumatic flashboards at Minetto assumes that head at Minetto would be raised 0.83 foot year round instead of only between June 1 and December 15. With this assumption, project annual generation would increase by 0.789 GWh. This increase corresponds to an increase of $22,300in annual power benefits.

C. No-action

Under no-action, the project would continue to operate under the current mode of operation, and no new environmental measures would be implemented.

The annual cost of no-action would be about $611,800 (8.25 mills/kWh). The estimated average annual output of the project would be 74.180 GWh. This would provide an annual power benefit of $2,106,770 (28.40 mills/kWh). The resulting annual net benefit for no-action would be about $1,494,970 (20.15 mills/kWh).

D. Economic Comparison of the Alternatives

Table 16 presents a summary of the current annual net benefits for no-action, proposed action, the proposed action with additional staff-recommended measures, and the proposed action with additional staff-recommended measures as well as Interior's modified prescription.

The additional enhancements proposed by Erie would increase annual costs by $537,110 and decrease annual power benefits by $66,110 for a total decrease in annual net benefits of $603,220. The annual generation would decrease from 74.180 GWh to 72.194 GWh.

Our recommended enhancements, excluding Interior's upstream eel passage and downstream fish protection and passage measures as well as the Varick trap and truck facility included in Erie's proposal, would decrease annual costs by $319,340 below Erie's proposal and decrease annual power benefits by $12,280 for a total increase in annual net benefits of $307,060. The annual generation for the proposed project with staff recommendations would be 73.945 GWh.

Table 16. Summary of the current annual net benefits for no-action, proposed action, and the proposed action with additional staff-recommended measures (both with and without Interior's modified prescription) (Source: Staff).

	Proposed action	Proposed action with additional staff-recommended measures[a,b]	Proposed action with additional staff-recommended measures and Interior's modified prescription[a]	No-action
Installed capacity[c] (MW)	18.05	18.05	18.05	18.05
Annual generation (GWh)	72.194	73.186	70.120	74.180
Annual power benefit: (thousands $) (mills/kWh)	$2,040.7 28.27	$2,028.4 28.27	$1,982.0 28.27	$2,106.8 28.40

	Proposed action	Proposed action with additional staff-recommended measures[a,b]	Proposed action with additional staff-recommended measures and Interior's modified prescription[a]	No-action
Annual cost: (thousands $) (mills/kWh)	$1,148.9 15.91	$829.6 11.83	$1,462.3 20.99	$611.8 8.25
Annual net benefit: (thousands $) (mills/kWh)	$891.8 12.36	$1,198.8 16.44	$519.7 7.28	$1,495.0 20.15

[a] Excluding costs associated with Erie's proposed trap and truck.

[b] Interior's modified prescription, a portion of which is included in Erie's proposal, is excluded from this alternative.

[c] Installed capacity assumed unchanged despite increases or decreases in net head due to increased trashrack head losses and raised flashboards.

Our recommended enhancements, including Interior's modified prescription and excluding the Varick trap and truck facility, would increase annual cost by $313,360 above Erie's proposal and decrease annual power benefits by $58,630 for a total decrease in annual net benefit of $371,990. The annual generation for the proposed project with staff recommendations and Interior's modified prescription would be 72.953 GWh.

E. Pollution Abatement

The Oswego River Project annually generates about 74.180 GWh 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 74.180 GWh of hydropower generation would be replaced by an equal amount of natural gas-fired generation, generating electrical power equivalent to that produced by the Oswego River Project would require combustion of

about 766 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 $37,980 (2001) 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 non-developmental 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 Oswego River Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

D. 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 additional staff-recommended measures as the preferred alternative.

We recommend this alternative because: (1) issuance of a license would allow Erie to continue to operate the project as a dependable source of electric energy; (2) the 18.05-MW 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 measures would improve water quality, protect aquatic and terrestrial resources, improve public use of recreational facilities and resources, improve multiple use and management of project lands, improve aesthetic resources, 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 Oswego River Project:

- finalize the existing conceptual sediment control plans to reflect site-specific conditions associated with ground-disturbing activities that we recommend and the Commission approves;

- operate in instantaneous ROR mode with impoundment water surface level maintained at or near the top of the dam crest or flashboards;

- provide seasonal minimum flows of 400/500/800 cfs at the Varick development bypassed reach and 75/375/875 cfs at the Fulton development bypassed reach, including during flashboard replacement;

- develop a flow monitoring plan for the project that includes methods for gaging tailrace and bypassed reach flows and headpond and tailwater elevations;

- finalize the design of fish protection and downstream passage facilities at all three developments and operate them from March 1 through December 31;t

- finalize the design of upstream American eel passage facilities at all three developments and operate them from April 1 through September 1;

- study the effectiveness of installed fish passage facilities at all three developments;

- develop a plan for future selective upstream passage when resource agency restoration goals for Atlantic salmon and lake sturgeon are finalized (an issue-specific reopener condition);

- develop a plan to minimize downstream loss of flashboards at Fulton and Minetto;

- develop a plan to replace the existing breakaway flashboard system at Varick with a system that minimizes impoundment fluctuations and downstream debris deposition due to flashboard failures;

- reinstall flashboards before May 1 or after June 30, if flashboards should need replacement for any reason;

A. provide minimum flows during flashboard replacement at Fulton and Varick, as appropriate;

- make aesthetic improvements at all three developments;
- implement the Programmatic Agreement;
- provide pedestrian and angler access to the Canal Lock No 3 island downstream of the Fulton development by establishing a woodchip trail and installing fences and signs;;
- assist NYSTA in improving shoreline fishing at the Canal Lock No 2 island, upstream of the Fulton development;
- assist with the city of Fulton's Granby Trail from the Granby Project to the Oswego Falls Project;
- develop a canoe portage route at the Minetto development and provide signage for the portage routes at Fulton and Minetto;
- assist with the development of the city of Oswego's planned Varick Impoundment Trail, including a scenic overlook and extending the West Side Linear Park Trail to connect with the city of Oswego's planned pedestrian bridge across the development's headworks (if this bridge is constructed);
- develop a plan to monitor recreational use; and
- update the Comprehensive Recreation Plan submitted to the Commission on December 14, 1993, to reflect current conditions and the recreational enhancements specified in any new license issued for this project.

The implementation of these measures would: improve water quality, fisheries, aesthetics, and recreational resources; increase access to the river in the project area; and provide for downstream fish passage.

The cost of our recommended environmental measures reduces the existing power benefits of the project beyond those of the project as proposed by Erie, but the reduction is warranted by the resource enhancement and public benefit associated with these measures. Specifically, we consider four measures that would reduce the economic benefits of the project: (1) required flows and flow monitoring, (2) upstream and downstream fish passage, (3) impoundment water level control, and (4) recreational enhancements.

1. Required Flows and Flow Monitoring

We conclude that the multispecies, fishery management objectives for the Oswego River require specification of seasonal instream flows at the project developments to protect and enhance fish habitat. Our recommended minimum flows, which are the same as Erie's at the Fulton development, but more than Erie's at the Varick development bypassed reaches, would enhance habitat in these areas.

We calculate the incremental cost over Erie's proposal of providing the specified flows to be about $25,220 annually.

2. Upstream and Downstream Fish Passage

The largest net annual cost would be spent on upstream and downstream fish passage. We estimate that $520,820 annually over Erie's estimated costs would be spent on designing, constructing, operating, and testing passage facilities at all three developments. This figure includes full-flow exclusion devices, downstream fish attraction and conveyance flows at Minetto and Varick, and upstream eel passage at all three developments. The estimated annual cost for NMPC's originally proposed downstream fish protection and passage, plus effectiveness studies, would be about $224,130.

We conclude, based on our independent analysis, that the high cost of downstream fish passage is not warranted until plans to restore Atlantic salmon to the Oswego River are finalized. We also conclude that Interior's modified prescription may only be marginally effective in preventing small fish from being entrained and could result in high fish mortality because of impingement. We conclude that construction of upstream eel passage facilities at the Oswego River Project is premature until sufficient recruitment of juvenile eels to stock habitat in Lake Ontario and the St. Lawrence River is demonstrated. The total estimated annualized cost for fish protection, passage, and effectiveness studies would be $744,950. Although we recognize that implementing fish passage measures may be consistent with FWS management objectives, we conclude that it is appropriate for the prescribing agency to weigh the potential magnitude of the benefit to the fishery against the economic and environmental costs, which include increases in CO^2 emissions associated with generation losses caused by bypass attraction flows and by increases in head loss. Because the modified prescription for upstream eel passage and downstream fish passage is mandatory, we must recommend that it be included in the license for this project, regardless of our analysis.

3. Impoundment Water Level Control

Flashboards are used at all three Oswego River Project developments. The highest flashboards are found at the Varick development. The flashboards are designed to fail at high flows to protect project facilities and prevent flooding upstream. Their failure potentially results in impoundment water level fluctuations that can affect fish and wildlife resources at critical times of the year. At the Fulton and Minetto developments, implementing a plan to reinforce the existing flashboards to minimize board material accumulation downstream of the dams, as suggested by Erie, would improve aesthetic conditions and avoid impoundment water fluctuations associated with flashboard failures during most years. Although we recommended in the draft EA that Erie install pneumatic crest gates at the Varick development, which would have prevented impoundment fluctuations and downstream debris accumulation due to flashboard failure, we now conclude that the expected high cost of installing these new gates is not worth the limited ecological benefit that would accrue from implementing this measure. Instead, we recommend that Erie consult with FWS, NYSDEC, and NYSTA (which owns the project dams and would need to ensure that appropriate depths are maintained during the navigation season) to develop a plan to replace the existing flashboard system at Varick with one that would minimize impoundment fluctuations and downstream debris deposition. This could entail a reinforced flashboard system, hinged flashboards that could quickly be reset after tripping, partial pneumatic crest gates, rubber dam, or other alternatives developed during consultation.

Although reinforcing the flashboard systems at Fulton and Minetto, and implementing an alternative to the current flashboard system at Varick should minimize impoundment fluctuations and debris accumulation from flashboard failure, if not designed properly, flashboards that do not fail during flood events could increase the potential for flood damage to shoreline properties. Therefore, the plan for any new flashboard or alternative system should be designed in consultation with the NYSDEC, FWS, and NYSTA and should specify how the following objectives would be met: (1) impoundment fluctuation minimization; (2) flashboard debris retention on site; (3) retention of flood control capabilities; and (4) maintenance of water depths that are suitable for navigation. The plan would be submitted to the Commission for approval prior to implementation. We estimate that these enhancements would have an annual cost of about $25,920 each year over the cost of Erie's proposed project. This cost includes some benefit from the ability to operate the Varick development with a higher water level for a longer part of the year.

4. Recreational Enhancements

We recommend that Erie submit a plan to monitor recreational use. We also recommend that Erie submit a revised Comprehensive Recreation Plan that reflects current conditions and includes the additional enhancements that we recommend that are not reflected in the 1993 plan. After the Commission approves the recreational monitoring plan and the revised Comprehensive Recreation Plan, Erie should construct and operate the approved recreational enhancements and conduct recreational monitoring in accordance with the approved plans.

The demand for recreational facilities in the project area would probably continue to rise as a consequence of increases in population and the proportion of the public that participates. We have calculated that the annual incremental cost to Erie for monitoring and evaluating recreational use, constructing a parking area at a scenic overlook with a connecting trail to the Varick Impoundment Trail, extending the existing West Side Linear Park an additional 250 feet to connect with the pedestrian walkway to be developed by the city of Oswego across the development's headworks, developing a canoe portage at Minetto and portage signage at Fulton and Minetto, and updating the Comprehensive Recreation Plan would be about $20,880.

B. Conclusion

Based on our review of the agency and public comments filed on the project and our independent analysis pursuant to sections 4(e), 10(a)(1), and 10(a)(2) of the FPA, we conclude that licensing the project as proposed by Erie with the additional staff-recommended measures would provide for the best comprehensive use of the Oswego River.

VIII. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations of federal and state fish and wildlife agencies for the protection, mitigation of adverse impacts on, and enhancement of such 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 such agency.

NYSDEC and Interior commented on the Oswego River Project. In response to the Notice of Application Ready for Environmental Analysis, NYSDEC submitted comments and recommendations in a letter dated April 1, 1996. Interior submitted a letter dated March 26, 1996, with comments, terms and conditions, and initial prescriptions. We have evaluated all recommendations in the water, fishery, and terrestrial resources sections of this final EA, and we present our conclusions concerning the merits of these recommendations there. In table 17, we summarize NYSDEC's and Interior's recommendations, show the annual cost of environmental measures, indicate if they are within the scope of 10(j), and state whether they are recommended for adoption under the staff's alternative.

As table 17 shows, we determined that 19 of the 25 recommendations made by fish and wildlife agencies are within the scope of Section 10(j) of the FPA. We recommended against adoption of 2 of the 19 measures in the draft EA but resolved these apparent inconsistencies with the FPA through discussions, pursuant to Section 10(j) of the FPA. Each recommendation refers to all three developments unless otherwise specified.

Table 17. Analysis of fish and wildlife agency recommendations for the Oswego River Project (Source: Staff).

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost of measure	Staff recommending adoption?
1. Operate ROR	Interior NYSDEC	Yes	$9,970	Yes
2. Maintain impoundment level at or near dam crest or top of flashboards	Interior NYSDEC	Yes	Included in 1	Yes
3. Reinstall flashboards after July 1	Interior	Yes	$0[a]	Resolved; FWS agreed to accept NYSDEC time frame specified in 4.

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost of measure	Staff recommending adoption?
4. Reinstall flashboards before 5/1 or after 6/30	NYSDEC	Yes	$0[a]	Yes, resolution reached at Section 10(j) meeting
5. Develop and implement a flow monitoring plan	Interior NYSDEC	Yes	$17,110	Yes
6. Provide a minimum flow of 375 cfs to the Fulton bypassed reach as measured below the tailrace, and provide 75 cfs as measured at the dam	Interior NYSDEC	Yes	$0[b]	Yes
7. Provide 55 cfs fish passage attraction flow at Fulton (considered part of the 75 cfs release at the dam)	Interior	Yes	$0[b]	Yes
8. Provide a minimum flow of 875 cfs, or inflow, into the Fulton bypassed reach released from March 15 through at least May 19, ramped down in 100 cfs increments over 24 hours	Interior NYSDEC	Yes	$0[b]	Yes
9. Provide a minimum flow of 400 cfs or inflow into the Varick bypassed reach year-round, 500 cfs from September 15 through March 15, and 800 cfs from March 15 to May 19, ramping down at 100 cfs increments over a 24-hour period	Interior NYSDEC	Yes	$85,850	Yes

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost of measure	Staff recommending adoption?
10. Design all minimum flow release structures to provide safe transport for fish	Interior	Yes	Assume included in the cost of 9 &16	Yes
11. Develop and implement a recreational use monitoring plan	Interior	No[c]	$15,880	Yes, under 10(a)
12. Schedule for recreational monitoring	Interior	No[c]	$0	No, Commission retains authority to establish schedules
13. Bypass flows to be maintained during flashboard reinstallation	NYSDEC	Yes	$0[a]	Yes
14. Plan to eliminate water fluctuations due to collapse of flashboards	NYSDEC	Yes	Included in 1 and 22	Yes
15. Varick-stream bed modifications (pilot study)	NYSDEC	Yes	$24,180	Resolved; NYSDEC agreed that as long as license included its minimum flows at Varick, this measure is unnecessary

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost of measure	Staff recommending adoption?
16. Design and install downstream fish protection and passage devices	NYSDEC	Yes	$636,610[d]	Yes; although we conclude this measure is not necessary, we must recommend it because it is a mandatory prescription by Interior
17. Fish attraction flows of at least 20 cfs	NYSDEC	Yes	Included in 16	Yes
18. Study effectiveness of fish exclusion	NYSDEC	Yes	$50,810	Yes
19. Monitor fish passage	NYSDEC	Yes	Included in 18	Yes
20. Salmon smolt protection device	NYSDEC	Yes	Included in 16	Yes
21. Plan for selective upstream passage structure for Atlantic Salmon and Lake Sturgeon consistent with December 14, 1993, conceptual drawings, including the trap-and-truck facility at the Varick development	NYSDEC	Yes	$220,870	Yes, in concept, for later implementation
22. Replace breakaway flashboards with a system that would retain flashboards at project site	NYSDEC	No[c]	$25,920	Yes, under 10(a)

Recommendation	Agency	Within scope of Section 10(j)?	Annual cost of measure	Staff recommending adoption?
23. Recreation plan	NYSDEC	No[c]	$0	Yes, under 10(a)
24. Schedule for plan preparation and implementation	NYSDEC	No[c]	$0	No, Commission retains authority to establish schedules
25. Site access	Interior	No[c]	$0	Yes, under 10(a), with proper notification of the licensee.

[a] Implementation of Erie's suggested flashboard stabilization plan should make flashboard failures infrequent. Therefore, the cost associated with reinstalling flashboards after June 30 and maintaining bypassed reach minimum flows during flashboard reinstallation would be incidental.

[b] At the Fulton development, there would be no cost for a minimum flow of 75 cfs from the dam due to the low hydraulic capacity of the turbines relative to river flows. However, minimum flows may reduce generation at the Granby Project, which shares the dam with the Fulton development. It is not possible for us to quantify these costs. Providing 375 or 875 cfs through the units does not result in a cost. The 55 cfs fish attraction and conveyance flow is assumed to be part of the 75 cfs.

[c] Not a specific measure to mitigate, protect, or enhance fish and wildlife resources; considered under Section 10(a) of the FPA.

[d] This includes the annualized capital cost of fish protection and downstream passage structures prescribed by Interior including 45° trashracks for all three projects,

generation losses due to increased head losses at all three projects, and generation losses due to fish passage flow requirements.

Only two 10(j) recommendations were not recommended for adoption in the draft EA. Staff initially did not recommend either Interior's recommendation that flashboards not be reinstalled until after July 1 or NYSDEC's recommendation that flashboards either be reinstalled before May 1 or after June 30 for adoption (recommendations 3 and 4). Because we recommended that Erie install pneumatic crest gates at Varick in the draft EA, our analysis focused on the consequences of flashboard reinstallation at Fulton and Minetto. We found both recommendations may be inconsistent with the substantial evidence standard of Section 313 (b) of the FPA.

In an effort to resolve the inconsistencies of the two remaining measures with the FPA, we held a Section 10(j) meeting on September 12, 2000, in Cortland, New York. At this meeting, we explained the basis for our conclusions in the draft EA. FWS (representing Interior) and NYSDEC explained the basis for their recommendations and resolution of the two remaining issues was reached. We issued a summary of this meeting on October 2, 2000.

In the draft EA, we found no evidence that the 6 and 10 inch increase in water surface elevation that would occur when flashboards are reinstalled during May or June at the Fulton and Minetto developments, respectively, would adversely influence centrarchid spawning or other aquatic life. We also found that there was no evidence that the flashboards at these two developments had failed during May or June, following reinstallation, which could adversely affect any centrarchid nests in the dewatered zone.

NYSDEC and FWS indicated that their primary concern was with impoundment drawdowns below the crest of the dam that were necessary for safety reasons during flashboard reinstallation. Erie noted that they typically drew the Fulton impoundment down by 1 foot and the Minetto impoundment by 6 inches during flashboard reinstallation. This level of drawdown could expose some centrarchid nests (resulting in desiccation of eggs or fry) as well as other aquatic habitat. Erie commented during the meeting that in response to aesthetic and safety concerns pertaining to failed flashboard debris expressed in the draft EA, it proposed to install reinforced flashboard systems at the Fulton and Minetto developments. These reinforced systems would be designed to fail only in the event of a 100-year flood and would make the need for flashboard reinstallation infrequent. The other meeting participants agreed that the need to replace flashboards would be diminished with Erie's new flashboard systems in place, but the resource agencies continued to recommend a prohibition of flashboard reinstallation during May and June to cover those years when the flashboards needed to be replaced for any reason.

NYSDEC also indicated that they would like to review the design of the new flashboard systems to ensure that they would not increase the potential for flooding along the impoundments. We indicated that we could address this concern by having Erie consult with NYSDEC on its proposed designs prior to them being submitted to the Commission for approval. We asked FWS if they would be willing to accept the reinstallation time frame specified by NYSDEC (before May 1 or after June 30), and FWS indicated that this would be acceptable to them. We now conclude that a flashboard reinstallation prohibition during the centrarchid spawning period, although likely to be infrequently needed, is justified. We consider this issue to be resolved.

We now do not recommend that Erie install pneumatic crest gates at Varick. Instead, we recommend that Erie develop a plan to replace the existing flashboard system at Varick with a system that minimizes impoundment fluctuations and downstream debris dispersal due to flashboard failures. Our recommendation is consistent with NYSDEC's recommendations 14 and 22. If flashboards of some type are retained at Varick, then the restriction on flashboard replacement that was agreed to during the Section 10(j) meeting would also be applicable to the Varick development.

In the draft EA, we agreed with NYSDEC's recommendation that Erie conduct its proposed stream bed modification pilot study at the Varick bypassed reach (recommendation 15). However, in response to our flow recommendations in the draft EA, Erie withdrew its proposal to conduct this pilot study by letter dated January 28, 2000. We asked NYSDEC during the Section 10(j) meeting if it would be acceptable to them if we did not recommend this pilot study, which we consider to be within the scope of Section 10(j). NYSDEC replied that as long as its recommended minimum flow regime at the Varick bypassed reach continued to be endorsed by Commission staff, it would not object to deleting its recommended pilot study as a license requirement. Consequently, we no longer recommend that Erie be required to conduct this pilot study.

Recommendations Outside the Scope of Section 10(j)

We determined that 6 of the 25 recommendations of the federal and state fish and wildlife agencies are outside the scope of Section 10(j) because they are not specific measures to protect fish and wildlife. We consider these recommendations under the public interest standards of Section 4(e) and the comprehensive development standard of Section 10(a) of the FPA. We determined that two of these recommendations are not in the public interest; therefore, we do not recommend them for the reasons cited below:

- We do not recommend that Erie follow the timing proposed by Interior for recreational monitoring. The timing should be set at the time of license

issuance and in consideration of Form 80 requirements. Thus the Commission should retain authority to establish this schedule.

- Similarly, we do not recommend that Erie follow the timing proposed by NYSDEC for preparation of the recreation plan and construction of recreational facilities. The Commission should retain authority to establish this schedule.

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 or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. Under Section 10(a)(2), federal and state agencies filed a total of 43 qualifying comprehensive plans of which we identified 4 New York and 3 United States comprehensive plans to be applicable. We did not find any conflicts. We list comprehensive plans relevant to this project in section XI.

X. FINDING OF NO SIGNIFICANT IMPACT

We conclude that none of the resources that we studied—including geologic, water quantity and quality, fisheries, terrestrial, aesthetic, cultural, and recreational resources—would experience significant adverse impacts under the proposed action.

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.

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XII. LIST OF PREPARERS[17]

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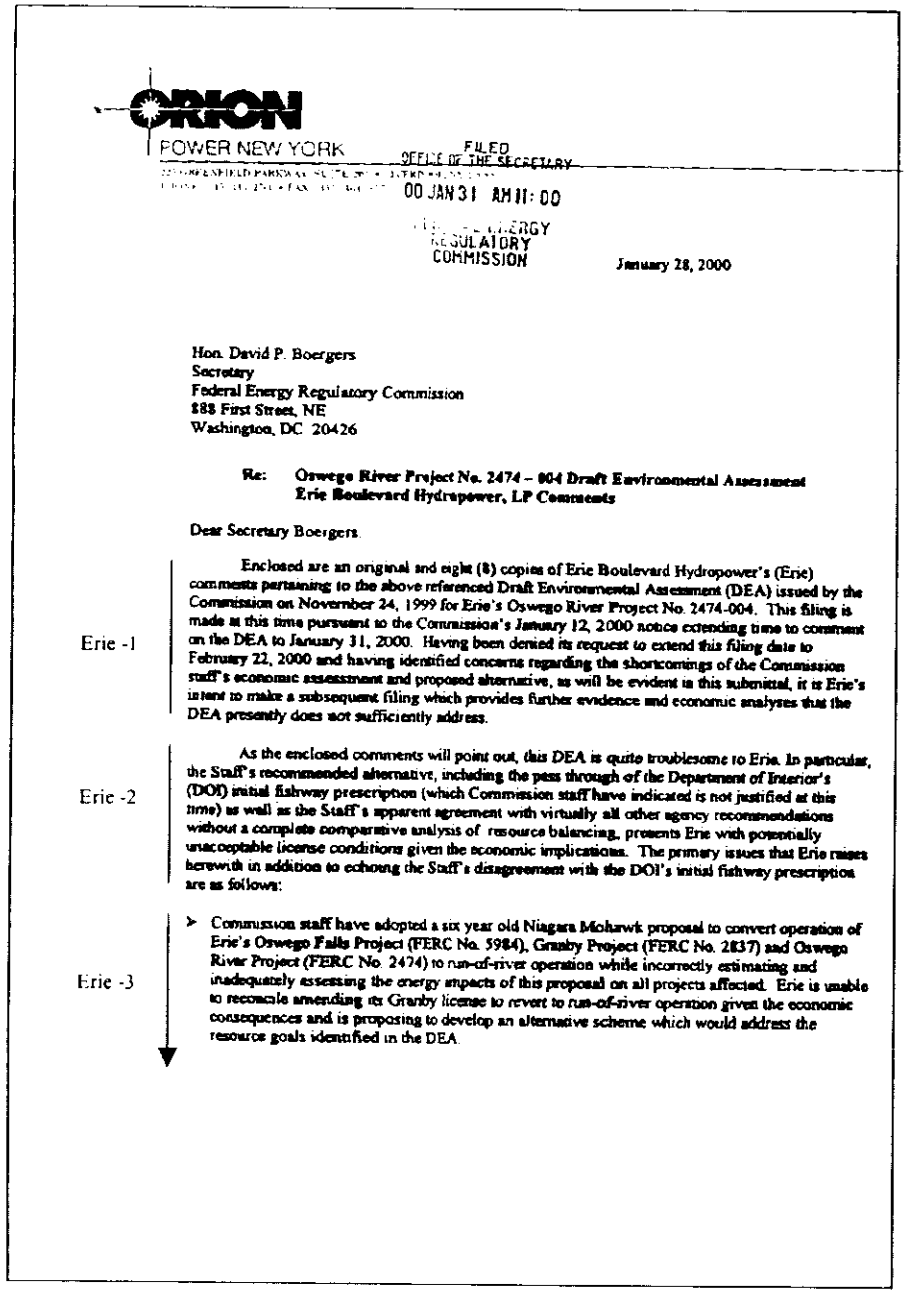
[17]Based on a document originally prepared by Stone and Webster Environmental Technology Services, Inc.

APPENDIX A

Letters of Comment on the Draft Environmental Assessment and Staff Responses

List of Letters of Comment on the Draft Environmental Assessment

Attachments to comment letters or stand-alone tables have not been reproduced in this final EA because they don't provide specific commentary on the draft EA.



ORION POWER NEW YORK

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OFFICE OF THE SECRETARY
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FEDERAL ENERGY REGULATORY COMMISSION

January 28, 2000

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

Re: Oswego River Project No. 2474 – 004 Draft Environmental Assessment
Erie Boulevard Hydropower, LP Comments

Dear Secretary Boergers:

Erie -1 Enclosed are an original and eight (8) copies of Erie Boulevard Hydropower's (Erie) comments pertaining to the above referenced Draft Environmental Assessment (DEA) issued by the Commission on November 24, 1999 for Erie's Oswego River Project No. 2474-004. This filing is made at this time pursuant to the Commission's January 12, 2000 notice extending time to comment on the DEA to January 31, 2000. Having been denied its request to extend this filing date to February 22, 2000 and having identified concerns regarding the shortcomings of the Commission staff's economic assessment and proposed alternative, as will be evident in this submittal, it is Erie's intent to make a subsequent filing which provides further evidence and economic analyses that the DEA presently does not sufficiently address.

Erie -2 As the enclosed comments will point out, this DEA is quite troublesome to Erie. In particular, the Staff's recommended alternative, including the pass through of the Department of Interior's (DOI) initial fishway prescription (which Commission staff have indicated is not justified at this time) as well as the Staff's apparent agreement with virtually all other agency recommendations without a complete comparative analysis of resource balancing, presents Erie with potentially unacceptable license conditions given the economic implications. The primary issues that Erie raises herewith in addition to echoing the Staff's disagreement with the DOI's initial fishway prescription are as follows:

Erie -3
- Commission staff have adopted a six year old Niagara Mohawk proposal to convert operation of Erie's Oswego Falls Project (FERC No. 5984), Granby Project (FERC No. 2837) and Oswego River Project (FERC No. 2474) to run-of-river operation while incorrectly estimating and inadequately assessing the energy impacts of this proposal on all projects affected. Erie is unable to reconcile amending its Granby license to revert to run-of-river operation given the economic consequences and is proposing to develop an alternative scheme which would address the resource goals identified in the DEA.

A-1

Responses to Comments of Erie Boulevard Hydropower, LP on the Draft Environmental Assessment for the Oswego River Project January 28, 2000

ERIE-1 No response required.

ERIE-2 Opinion noted.

ERIE-3 Each of these issues here is discussed in detail later in the comment letter. Therefore, we provide our responses to the detailed comments rather than to the summary.

Erie -3 cont.

- Commission staff is proposing agency recommended minimum flows at the Varick Development that result in significant detrimental generation losses to Erie without demonstrating that the incremental environmental benefits justify the cost. Commission staff's estimate of generation impacts is greatly understated. Erie is proposing a revision to Niagara Mohawk's prior flow proposal which presents a reasonable balance of aquatic and hydro power resource considerations.
- Commission staff have proposed a costly ($720,000) channel modification pilot study at the Varick Development that cannot be successfully implemented given the controversial agency instream flow objectives affecting the river stretch in question.
- Commission Staff is proposing a $1,863,000 pneumatic flashboard system at the Varick Development, which Staff have estimated to cost only $500,000, to stabilize water levels affecting only 3 acres of aquatic habitat that is subject to natural fluctuations beyond the control of the licensee.
- Commission staff have assumed that provision for a minimum base flow below the Fulton Development is of no consequence to hydro generation while failing to account for the resultant loss of generation at the Granby Project resulting from the integrated operation of these generating facilities.
- Commission staff have proposed a costly recreation use survey recommended by the DOI without giving consideration to more reasonable alternatives. A practical alternative is proposed in the enclosed comments by Erie.

Erie -4

Erie is committed to the goal of being a good steward of the hydro power resources it acquired from Niagara Mohawk, while achieving its predominant business objective of sustaining operation at a cost that is viable in a competitive energy market. Erie is striving to pursue a licensing scheme that provides a reasonable balance of measures addressing non-power resource needs. Despite the difficult challenge that these competing goals present, Erie is optimistic that it can develop a scheme for operation of the Oswego River incorporating recommendations discussed herewith which would be in concert with the resource objectives promoted in the DEA.

Erie -5

Under separate cover we will be submitting a follow up report which provides a more detailed evaluation of the DEA relative to its assessment of project economics.

Erie -6

If there should be any comments or questions concerning this letter and enclosure, please do not hesitate to contact the undersigned at (315) 413-2787.

Very truly yours,

Jerry L. Sabattis

Jerry L. Sabattis
Erie Boulevard Hydropower, LP.

Cc: Ms. Carol Sampson FERC
Service List
Mr. Sam Hirschey, Erie
Mr. William J. Madden, Jr. Esq., Winston & Strawn

ERIE-4 Opinion noted.

ERIE-5 We have not received this follow-up report.

ERIE-6 No response required.

ERIE BOULEVARD HYDROPOWER, L.P.
LIVERPOOL, NEW YORK

OSWEGO RIVER PROJECT (NO. 2474)
COMMENTS ON COMMISSION STAFF'S DRAFT ENVIRONMENTAL ASSESSMENT

A. INTRODUCTION

I. Transition Process

Erie -7

In February 1999, NMPC and Erie Boulevard Hydropower, L.P. (Erie), submitted to FERC its joint application for transfer of NMPC's hydro assets to Erie, in accordance with Section 8 of the Federal Power Act and 18 CFR, Part 9 of the Commission's regulations. On July 26, 1999, FERC issued the Order Approving the asset transfer. Erie has assumed the responsibilities of owning, maintaining and operating the hydro assets that were transferred.

II. Format of This Response

Erie -8

Erie has evaluated the Recommended Alternative for relicensing of the Oswego Hydro Project as summarized in Section VII of the DEA, and as discussed in other sections of the DEA. Section B, below, provides a summary of Erie's overview of the Oswego River Project DEA process. Section C, provides specific responses to each of the items recommended by FERC Staff in Section VII of the DEA. For each item in Section C, Erie indicates whether it agrees or disagrees with Staff's recommendation and, where disagreement is indicated, provides its rationale for the disagreement. Section D, provides an analysis and comparison of Staff's and Erie's energy estimates.

ERIE-7 No response required.

ERIE-8 No response required.

B. OVERVIEW OF THE OSWEGO RIVER DEA PROCESS AND PROBLEMS WITH FERC'S ANALYSIS IN DEVELOPING THE DEA

Erie -9

The Commission Staff's Draft Environmental Assessment (DEA) was prepared under the requirements of the National Environmental Policy Act (NEPA) and the Federal Power Act (FPA). The discussion below highlights the difficulties inherent in the methods Staff have used to conduct their analyses in the DEA, and areas of clarification necessary before a Final EA (FEA) is issued.

1. The DEA Struggles Unsuccessfully with the "Initial" Fishway Prescription

Erie -10

DOI's "initial prescription" of March 26, 1996 is problematic, both for Commission Staff and Erie. Since the provisions of the FPA do not contemplate implementing an "initial fishway prescription", Commission staff has chosen to treat DOI's initial prescription as if it were likely to be finalized and submitted under the provisions of Section 18 of the FPA, despite the fact the DOI has not provided any information or substantial evidence as a basis for a prescription. Moreover, there is no evidence in the record before the Commission which indicates that there is any justification for downstream fish passage other than as proposed by Erie.

The "initial prescription" has no weight biologically or statutorily and at best constitutes an undefined concept that DOI may (or may not) develop further at a later date. DOI's stated intention of developing a "modified" prescription after review of Commission Staff's DEA (and a "final" prescription after then receiving comments on the "modified" prescription) certainly allows for the interpretation that DOI would reconsider its "initial" prescription upon reviewing the comprehensive analysis in the DEA. DOI's approach indicates that its "final" prescription would not be filed with the Commission until well after all comment periods on the Commission's DEA had passed.

Erie -11

Staff has correctly concluded that downstream fish passage is not needed at this time, and has acknowledged Erie's willingness to provide downstream passage when

B - 1

ERIE-9 Opinion noted.

ERIE-10 Interior submitted its modified fishway prescription, and associated administrative record, for the Oswego River Project by letter dated February 27, 2001. We modified our analysis of the need for downstream fish passage in section V.C.3.b of the final EA to reflect Interior's revised prescription. Our conclusion that downstream passage is not currently warranted (based on the uncertainty of plans to restore anadromous fish to the Oswego River basin) remains unchanged.

ERIE-11 No response required

Atlantic salmon introduction efforts warrant it. Staff has also appropriately recommended that DOI reconsider its initial prescription for a number of reasons:

1) high water velocities present at the intakes of the Fulton, Minetto, and Varick Developments could make it difficult to design effective downstream passage facilities and may result in more fish losses from impingement than would be successfully passed downstream via the downstream fish passage facilities;

2) the number of fish being killed at these developments is probably considerably less than that reported in the entrainment study;

3) no adverse impacts on the fishery have been demonstrated;

4) studies conducted to date have not demonstrated the efficacy of bar racks for passing most of the coolwater and warmwater species of fish present at these developments; and

5) the Atlantic salmon fishery is not yet established in this segment of the Oswego River.

Erie -11 cont.

Given the unidentified nature of an "initial" prescription, Commission Staff did what seemed reasonable, namely, to recommend that DOI reconsider its "initial" prescription, based on the scientific facts in the record before the Commission.

II. The DEA Does Not Adequately Balance Power and Non-Power Benefits

While Staff attempted to consider the serious biological and economic harm that would result from DOI's "initial" prescription for downstream fish passage by developing a staff recommended alternative, Staff's analysis did not provide equal or reasonable analysis of Erie's proposal to install downstream fish passage based on a trigger date associated with introduction of Atlantic salmon to the Oswego River. The fish passage measures proposed by Erie, to be implemented at a future time when biologically

Erie -12

B - 2

A-5

ERIE-12 In section VII.A.2 of the draft EA, we stated that downstream fish passage is unwarranted until plans to restore Atlantic salmon to the Oswego River are finalized. As we also stated in section V.C.3 of the draft EA, we considered these plans to include establishing the feasibility of restoring Atlantic salmon populations and a firm timetable for restoration. It is most appropriate for the applicable resource agencies (FWS and NYSDEC) to determine the specific triggering mechanism that would signal the need for installation of downstream passage facilities, should Atlantic salmon restoration be deemed feasible in the future.

Erie -12 cont

justified, would have provided significant relief to the economic harm that will result from requiring installation of downstream passage facilities within the timetable proposed by DOI's "initial" prescription.

Erie -13

Section 10 (a)(1) of the FPA requires that the Commission ensure that project it adopts in a license will be best adapted to a comprehensive plan for a balanced consideration of resource purposes, including the improvement and utilization of waterpower development, adequate protection, mitigation and enhancement of fish and wildlife, and other beneficial public uses. The DEA does not adequately fulfill this statutory obligation. The staff recommended alternatives are not supported by a thorough quantitative assessment comparing the various alternative measures considered in the DEA. In addition, when cost and energy estimates are provided they are not substantiated and sometimes appear to be arbitrary and woefully inaccurate, as Erie's comments below will point out. Consequently, a number of measures proposed by Commission Staff in the DEA do not reflect a best adapted balancing of resources wherein the resource benefits are commensurate with the cost.

Erie -14

No comprehensive economic analysis is included in the DEA which will reflect the effects of the alternative combinations of protection, mitigation and enhancement measures on the economic viability of the Oswego River Project. From a cumulative effects standpoint, this analysis needs to take into account the effects of the proposed measures on the economics of other projects on the Oswego River, such as Erie's Granby Project (FERC No. 2837).

B - 3

A-6

ERIE-13 Opinion noted.

ERIE-14 Table 15 of the draft EA listed costs of various alternative enhancement and protection measures that we considered. We adopt some of these recommendations, but not others. Our analysis and comprehensive development reflect our assessment of alternative combinations of measures. Our only recommendation that would have a substantive effect on the economics of other projects on the Oswego River would be operation of the Fulton development in a ROR mode. As we pointed out in section V.C.3 of the draft EA, because the Fulton development shares its dam with the Granby Project, the Granby license would have to be amended to ensure that both powerhouses operate in a ROR mode. This would entail a cost due to lost peak generation capability, although quantifying this cost would be difficult because it depends on flow mix through both powerhouses.

C. SPECIFIC ITEM RESPONSES FOR SECTION VII OF THE OSWEGO RIVER DEA

ITEM 1: Finalize Sediment and Erosion Control Plans: Staff recommends that Erie should work with the NYSDEC and USFWS to customize the Sediment and Erosion Control Plans submitted in the 12/93 AIR response to individual site specific activities.

RESPONSE:

Erie -15

Erie agrees with the need to develop site specific soil and erosion control plans.

Staff indicates that the soil and erosion control plans provided in the 12/93 AIR response (see Item 2 and Item 3 of the 12/93 AIR response for the detailed soil and erosion control plans for Varick and Fulton, respectively) represent generally acceptable Best Management Practices. Staff further directs that Erie work with the NYSDEC and the USFWS to develop site specific soil and erosion control plans for any ground disturbing activities that the Commission approves in the Licensing Order. Erie will work with the NYSDEC and the USFWS to address site specific soil and erosion control issues on an as-needed basis.

ERIE-15 No response required.

ITEM 2: Run of River Operation: FERC has agreed with Erie's proposal to operate the Oswego River Project in a run of river mode.

RESPONSE:

In the DEA, a great deal of emphasis is placed on the potential improvements to many current environmental resources on the Oswego River as a result of conversion of the current operating mode from storage and release to run-of-river. Indeed, Niagara Mohawk recognized the potential environmental benefits run-of-river operations could achieve on the Oswego River in submitting its proposal in its letter dated August 9, 1993. Said letter specifically stated:

"In light of the foregoing conclusion from its ongoing consultation and AIR studies, Niagara Mohawk hereby proposes the following:

1. *Conversion of the pending application for the Oswego Falls Project No. 5984 to strick run-of-river operation. In so doing the originally proposed pond fluctuation of 18 inches for daily storage and release is no longer proposed.*

2. *Conversion of the licensed Granby Project No. 2837 to operate in a run-of-river mode in conjunction with the Oswego Falls Project pursuant to FERC approval of this proposal and subsequent completion of the unit number 2 conversion to Kaplan design as described earlier.*

3. *Conversion of the pending application to relicense the Oswego River Project No. 2474 to revert to run-of-river operation commensurate with FERC approval and the Granby conversion proposed above."*

Erie -16

As successor to Niagara Mohawk, Erie does not deny that stabilization or water levels along the affected stretch of the Oswego River resulting from conversion to run-of-river operation could result in the benefits identified in the DEA. Unfortunately, as stated in the DEA, conversion of the Granby Project No. 2837 to run-of-river operation is an absolute prerequisite to achieving run-of-river operation with the Oswego River Project. However, as Niagara Mohawk indicated in its August 9, 1993 letter, operation of the Granby Project in a run-of-river mode would result in a loss of approximately 5.0 GWH of annual generation. Therefore, as quoted above, Niagara Mohawk stated that conversion of the Granby Project to run-of-river operation was subject to first achieving the physical conversion of one of the Granby turbine units to a Kaplan design to attempt to recover most, if not all, of the lost generation with a design which would more efficiently operate in a run-of-river mode.

Erie -17

Since proposing to convert Granby Project to run-of-river operation more than six years ago, Niagara Mohawk has been unable to come up with an economically feasible Kaplan conversion scheme. Erie, the new owner, is yet to re-evaluate this proposal to determine its feasibility. Considering that Niagara Mohawk's prior evaluation was done in an era when energy values were projected to be significantly higher than they are today, it remains doubtful that Kaplan conversion will prove to be economical to Erie.

Erie -18

Erie has developed a refined energy analysis as discussed in more detail in Section D of this response using assumptions reflecting proposed new license conditions described in the DEA.

ERIE-16 No response required.

ERIE-17 Opinion noted.

ERIE-18 No response required.

Erie -19

Niagara Mohawk has also experimentally operated the Granby Project in a run-of-river mode since implementing the run-of-river operations monitoring plan for the Oswego River Project No. 5984 pursuant to License Article 402. This experimental operations has reaffirmed assumptions used in the energy analysis regarding the limitations the Granby Project poses. This new analysis yields an energy loss at the Granby Project resulting from run-of-river operation of 7,388 MWH (see Section D). Add to this the amount of Granby generation loss resulting from the Fulton Development minimum flows proposed in the DEA (much which would be discharged through one of the Fulton turbines) plus fish attraction flow losses associated with the Interior's fishway prescription for Fulton, and the total generation loss to Granby becomes 10,961 MWH, over 18 percent of the Granby's current. average annual.

A loss of over 18 percent of Granby's generation revenues will render this project uneconomic. Some of the energy losses at Granby would translate to energy gains at Fulton because greater annual flow volumes would be diverted through Fulton Development. Thus, that facility would gain approximately 2,500 MWH of annual generation from the DEA proposed operations scenario, nearly a quarter of the estimated losses at Granby (see response to Section D). However, despite these potential gains in generation, the Fulton Development also would no longer be economical if subjected to the costly installation of Interior's prescribed fishway.

Erie -20

The DEA reflects a number of measures suggested and proposed by Niagara Mohawk more than six years ago (such as modifications to the Granby units and run-of-river operations) but the DEA fails to address some rather significant economic changes which have occurred since then and the impact of those changes on the financial feasibility of the Oswego River Project. Those changes are material and accordingly Erie is not able to support or accept the kind of amendment to its Granby license which Niagara Mohawk proposed in 1993 and hereby respectfully withdraws that proposal from consideration. Moreover, we believe when the DEA is revised to reflect the above described economic analysis the Commission could not consistent with its Federal Power Act responsibilities support or accept such an amendment.[1]

[1] We are aware that at the time Niagara Mohawk made the proposal to reconfigure the Granby units and to initiate run-of-river operations on the affected reach of the Oswego River, it was doing so on the expressed request that it not be required to perform expensive instream flow studies below the Varick development. Erie believes that an alternative operations scheme for the Oswego River Project can be developed that will achieve virtually the same benefit to the river reach below the Varick Development as run-of-river operations while ameliorating the above described economic impacts to Granby Project. Pending further evaluation to scope our such alternatives, we will be consulting with the agencies on this matter prior to submitting any alternative scheme for consideration by the Commission.

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ERIE-19 We concluded, based on the results of our energy modeling for this project, as indicated in footnote "d" of table 14 of the draft EA, that due to the low hydraulic capacity of the turbines compared to river flow at the Fulton site, Erie's proposed minimum flow of 75 cfs to the upper bypassed reach would not reduce project annual generation. We acknowledge that minimum flows at Fulton could affect generation at the Granby Project, and added text accordingly to the text of the appropriate footnote in table 14. Erie's comment indicates that the cost of lost generation associated with the minimum flow would be compounded by the cost of lost generation associated with fish attraction flows associated with downstream fish conveyance (Interior estimates this to be 55 cfs). However, fish conveyance flows would be included in the 75 cfs minimum flow and would not represent an incremental cost of lost generation. Therefore, the lost generation that Erie attributes to our recommended (and Erie's proposed) flow regime at Fulton is overstated. In our response to Erie-14, we acknowledge that converting to ROR would represent a loss of peaking generation capability at the Granby Project, but the costs are difficult to quantify because they depend on how Granby is operated with the Fulton development. If the originally proposed conversion of Granby Unit 2 to a Kaplan turbine reduces the economic impacts of the proposed operating regime that NMPC negotiated with the resource agencies, it is up to Erie to pursue this option.

ERIE-20 The Commission will address any license amendment for the Granby Project in a separate proceeding. *(Response to ERIE-20 continued on following page)*

Response continued from previous page.

We recognize that the energy market has undergone substantial changes since 1993 and accounted for this by using energy and capacity values that we developed for the School Street Project (among others) in 1999 for our developmental analysis (see footnote "a" of table 13 of the EA). We also acknowledge that predicting energy market responses in a deregulated energy environment is not an exact science.

ITEM 3: Seasonal Minimum Flows: FERC has agreed with Erie's proposal for minimum/base flows at Fulton and Minetto but proposes higher flows at Varick.

RESPONSE:

Erie disagrees with Staff's recommendation regarding minimum flows at Varick. Erie proposes to increase the year-round minimum flow from 150 cfs to 200 cfs, and continues to propose, seasonally, 300 cfs for salmonid passage and 475 cfs for walleye spawning.

NMPC and the agencies jointly conducted an IFIM study of the Varick Development bypass reach. In that study, the reach was divided into an upper and lower reach. In subsequent analyses, minimum flow was proposed by agencies and NMPC based on the effects of flows on the upper reach.

Erie -21 Although modeling results were created for the lower reach, the distribution of spillage flows released at the dam to the lower reach cannot be easily predicted due to channel configuration complexities. NYSDEC assumed that 50% of flow released to the upper reach would influence the lower reach; USFWS assumed that a flow recommendation based on habitat conditions in the upper reach would adequately water the lower reach as well. Thus the habitat protection recommendations are primarily driven by IFIM results from the upper reach.

Instream flow management objectives stated by agencies were to

1. protect resident and forage fish base habitat, and
2. to protect adult salmon from snagging, and
3. enhance angler safety by preventing anglers from crossing the channel

Erie -22 Erie notes that of these objectives, only item (1) is related to biological habitat impacts. Items (2) and (3) pertain to non-impact issues of enforcement and management of anglers. With regard to item (3), Erie concludes that the DEA assumes that the specified flow is deemed adequate to discourage wading across the channel, and thereby resolves a safety and access issue. However, Erie believes that angler safety in the Oswego River should not be the responsibility of the Project. There is no scientific basis for assuming that the proposed "anti-wading" flow would enhance angler safety in this reach. It could just as easily increase the risk to wading anglers, which would produce an unnecessary risk to Erie.

Erie -23 **Protect resident and forage fish base habitat.** A total of 17 species and lifestages were evaluated in the IFIM study. Bovee, *et al.*, (1998) warn that selection of too many species "*...may facilitate getting the study started but will ultimately make the analysis of alternatives more difficult*". This is in part because it is unlikely that any single flow recommendation will satisfy habitat maintenance objectives for all these evaluation life stages. During the analysis, therefore some basis for prioritizing and justifying key lifestages should occur.

Information exists within the study to allow one to do so. For example, the Weighted Usable Area (WUA) data clearly show that very little suitable habitat exists for most walleye lifestages at any flow, other than spawning (Table 5 of DEA). The IFIM report (KA 1993) states that "*The*

ERIE-21 No response required.

ERIE-22 Erie is responsible for the safety of the public in proximity to project features. Our Division of Dam Safety and Inspections ensures that all projects under Commission jurisdiction are operated safely. Erie proposed measures, including the originally proposed channel modifications and the Fisherman Alert System, at the Varick development, to address angler safety. The flows proposed by the agencies would most likely discourage anglers from wading across the channel. The primary justification for the recommended flows, however, is the protection and enhancement of fisheries resources.

ERIE-23 We agree that the IFIM results indicate that the upper and lower Varick bypassed reaches could provide relatively large amounts of habitat under optimum conditions for walleye spawning, white sucker juvenile, longnose dace (juvenile and adult), and caddisfly. The amount of potential white sucker adult habitat is also comparable to that available for the species and life stages that you cite. We modified the text of section V.C.3.b of the EA to reflect our focus on these species and life stages when developing our flow recommendations for the Varick bypassed reach. Our recommended flows are predicted to provide increases in the habitat available for each of these lifestages when compared to the flows recommended by Erie.

nearly uniform bedrock and boulder substrate, relatively swift current and shallow depths preclude the use of the upper bypass by walleye fry... only trivial, marginal habitat (exists) *for juvenile and adult walleye*".

Similar trends are in evidence among other species and lifestages. For example, relatively little WUA exists at any flow for spawning, fry or adult lifestages of either white sucker or smallmouth bass. However, significantly more WUA is available for the juvenile life stage of white sucker. The report indicates that the reach is of "very low value" to smallmouth bass because this species does "*not readily utilize areas with bedrock substrate, and typically prefers areas with depths greater than 2 ft and currents less than about 1 ft/s)*." The WUA data and study report both indicate that the reach provides poor habitat for longnose dace fry, as flows greater than 50 cfs rapidly decrease the WUA. It follows that with unsuitable fry conditions, the strategic value of a spawning-based flow for this species is questionable.

Erie -23 cont.

Erie's conclusion is that the most appropriate lifestages for evaluating flows include walleye spawning, white sucker juvenile, longnose dace (juvenile/adult), and caddisfly.

Walleye spawning. Erie proposes to release a flow of 475 cfs for walleye spawning. Erie also notes that the reach has relatively little strategic habitat for walleye management purposes at any flow. Walleye that spawn in this reach are those that are part of the Lake Ontario walleye population. As Niagara Mohawk noted in the past (letter to Mr. David Stilwell, USF&WS, July 20, 1994), the Lake Ontario walleye population was reportedly in good health irrespective of the absence of a designated spawning flow at the Varick Project. Attachment A to NMPC's 7/20/94 letter (see attached) provides the 1992 annual report of Ontario Ministry of Natural Resources on walleye populations in eastern Lake Ontario indicating a walleye population well within the historic range for this species and exhibiting many strong year classes. With the many tributary streams to, and shoal areas in, Lake Ontario proper providing walleye spawning habitat, the optimization of a minimum flow regime at Varick to create one additional acre of habitat does not appear to be essential to maintaining the fishery. For that reason, Erie's proposal, which produces about 50% of the theoretical maximum Weighted Usable Area should be adequate.

Erie -24

However, rather than following the arbitrary calendar dates found in the DEA, Erie proposes to adopt a water temperature-driven schedule of flow releases in accordance with the walleye spawning flow guidelines adopted at other hydroelectric projects in New York, such as the Raquette River. The guidelines recommend that the release begin once ambient water temperature has reached 4° C for four consecutive days following March 15. To allow for incubation, the flow release ceases 30 days following attainment of 10° C for four consecutive days

Erie -25

Forage fish base habitat. As discussed above, the most relevant criteria to evaluate this habitat management objective are white sucker juvenile, and longnose dace juvenile and adult habitat, and caddisfly suitability. Although the DEA states that a discharge of 400 cfs "*would provide substantially more habitat... than the 150 cfs release..*", a review of Table 5 reveals that the difference for these lifestages and species may not be as dramatic. For example, 150 cfs produces over 80% of juvenile white sucker maximum WUA, about 50% of caddisfly WUA, and almost 60% of juvenile longnose dace WUA. Only adult longnose dace WUA is less than 50% at 150 cfs.

Erie -26

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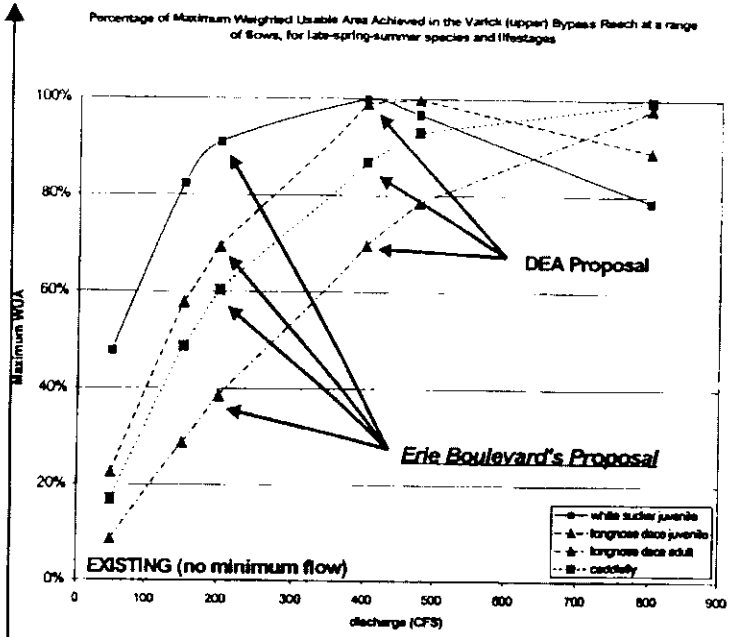
ERIE-24 NYSDEC places a very high priority on optimizing spawning conditions for walleye in the Oswego River. We modified the text of section V.C.3.b of the EA to emphasize the basis for our recommended flows to the Varick bypassed reach during the walleye spawning season. We continue to conclude that the higher flows recommended in the draft EA are justified based on the relatively large gains in habitat. The fact that walleye populations in Lake Ontario are "well within the historic range for this species" does not preclude us from selecting a flow recommendation that provides a substantial enhancement over existing conditions

ERIE-25 In section V.C.3.b of the draft EA, we recommended the 800 cfs minimum flow release during the walleye spawning season "as defined by NYSDEC." NYSDEC offered its definition in its April 1, 1996, letter to the Commission, and this is reflected in footnote "a" of table 4 of the draft EA. The temperature driven end of the walleye spawning season recommended by NYSDEC and proposed by Erie is also reflected in this footnote. In tables 14 and 15 of the developmental analysis section, we conservatively assumed, for cost purposes only, that the end of the spawning season would be on May 31. If Erie wishes to consult further with the agencies on redefinition of the beginning of walleye spawning season using temperature-based criterion, the Commission should be notified of any change in the currently defined criteria.

Erie -26 cont.



While Erie does not argue that the agency-preferred base flow alternative would provide somewhat more WUA, we disagree that the "substantial" increases are evident, relative to the amount of energy and revenue foregone to produce the relatively small increase in WUA. Appendix C of KA (1993) provides WUA data for other intermediate flow increments between 150 and 400 cfs. Erie notes that a discharge of 200 cfs increases the WUA yield to over 90% of white sucker maximum WUA, about 60% of caddisfly WUA, and almost 70% of juvenile longnose dace WUA (Table 1, Figure 1)

Table 1. The percentage of Maximum Habitat (Weighted Usable Area) achieved for selected lifestages in the upper Varick Project bypass reach.

	percentage of maximum WUA achieved at specified CFS					
Species and lifestage	50	150	200	400	475	800
Walleye spawning	2.7%	12.6%	18.3%	41.8%	49.8%	78.8%
White sucker juvenile	47.8%	82.4%	91.1%	99.9%	96.7%	78.7%
Longnose dace juvenile	22.6%	57.9%	69.4%	99.0%	99.9%	89.2%
Longnose dace adult	8.6%	28.9%	38.5%	69.6%	78.3%	98.0%
Caddisfly	16.9%	48.9%	60.5%	87.0%	93.0%	99.6%

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ERIE-26 Our recommended flows would provide more habitat than the flows proposed by Erie in both the upper and lower bypassed reaches for each of the target forage species and lifestages (discussed in Erie-23). Our recommended flows are consistent with those proposed by the FWS and NYSDEC and with the flows recommended in the IFIM report itself. Further, photographs taken at calibration flows measured in the IFIM study (provided in Appendix F of the IFIM report) show that most areas of the bypassed reach offer little cover at low flows, while increased water depth and turbulence provide much improved conditions at higher levels of flow. The incremental gains in fish habitat that our recommended flows would achieve in this heavily fished reach downstream of the Varick dam warrant the associated costs.

The FERC DEA compares the relative amount of WUA created by various flow proposals to the theoretical maximum WUA capable of occurring in the reach. Erie believes it is also important to consider the amount of WUA created by flow proposed by Erie *vs* existing conditions of no minimum flow. These data are presented in Table 1 and Figure 1, and show that a minimum flow of even 150 cfs substantially increases WUA over that occurring presently (represented by the 50 cfs WUA). However, relative to FERC's analysis, Erie notes that a flow of 200 cfs would in general provide 60-90% of the maximum potential habitat quality for those species and lifestages most likely to benefit during the late spring and summer months. Only adult longnose dace WUA is less than 50% at 200 cfs; however it should be noted that an extremely high discharge (950 cfs) is required to absolutely maximize WUA for this species. The IFIM report states (p. 44) that "*During the late spring and summer, little habitat is provided for game species. The dominant habitat is suitable for only forage fishes and Hydropsychid evaluation species. As such optimizing the reach may not be appropriate, although some minimum flows should be maintained to provide additional habitat.*"

Erie -26 cont.

It is not clear from any management objectives or agency consultation that maximizing habitat for these species is a necessary use of water in the reach. A flow of 200 cfs that is achieving relatively high levels of WUA such as these should be adequate for the type of reach and habitat management potential in this reach. From the above data, it can be determined that 200 cfs generally provides almost as much habitat than the 400 cfs agency-preferred minimum flow. Erie's 200 cfs proposal would achieve 91.2 percent of the potential white sucker juvenile habitat, 70.1 percent of the potential longnose dace juvenile habitat, 55.3 percent of the potential longnose dace adult habitat and 69.5 percent of potential caddisfly habitat that a flow of 400 cfs would achieve. However, 200 cfs would cost Erie 620 MWH per year to provide whereas 400 cfs would cost 1,660 MWH per year (assuming the releases would be during the same schedule assumed in Erie's proposal as discussed below) or 268 percent of the energy which would be lost to provide 200 cfs. Therefore, the relatively small relative gains in habitat at 400 cfs *vs.* 200 cfs do not justify the cost of an additional 1,040 MWH per year in lost generation.

Protect Adult Salmon from Snagging. Runs of introduced, non-native salmon enter the Oswego River from lake Ontario beginning in September. These fish originate from hatchery plantings. The management of these fish does not require that they ascend the Oswego River and reproduce, but, rather, it is intended that all are harvested by anglers in the area downstream from the Varick dam using traditional angling techniques. Reports exist that some of these fish are harvested by snagging rather than by legal and traditional angling, and during the IFIM study, NYSDEC expressed an interest in exploring what set of hydraulic conditions could potentially alleviate this management problem. At that time, it was assumed that providing sufficient overall water depth would broaden the zone of passage for fish approaching the dam, and thus they would more likely be able to avoid the snaggers. Although various runs pulse into the reach throughout the fall, and some remain there through winter, the fishery and snagging activities are not necessarily chronic throughout that period, and do not occur 24 hours per day.

Erie -27

The DEA adopts a flow of 500 cfs to address this issue. The criterion appears to be based on a finding that 500 cfs was reported in the IFIM study to be the inflection point at which a substantial amount of the channel width was over 0.5 ft deep, thus enabling salmon to maneuver and presumably escape snaggers. The original study predicated snagging avoidance on the assumption that increased maneuverability in the channel would allow fish to avoid capture as

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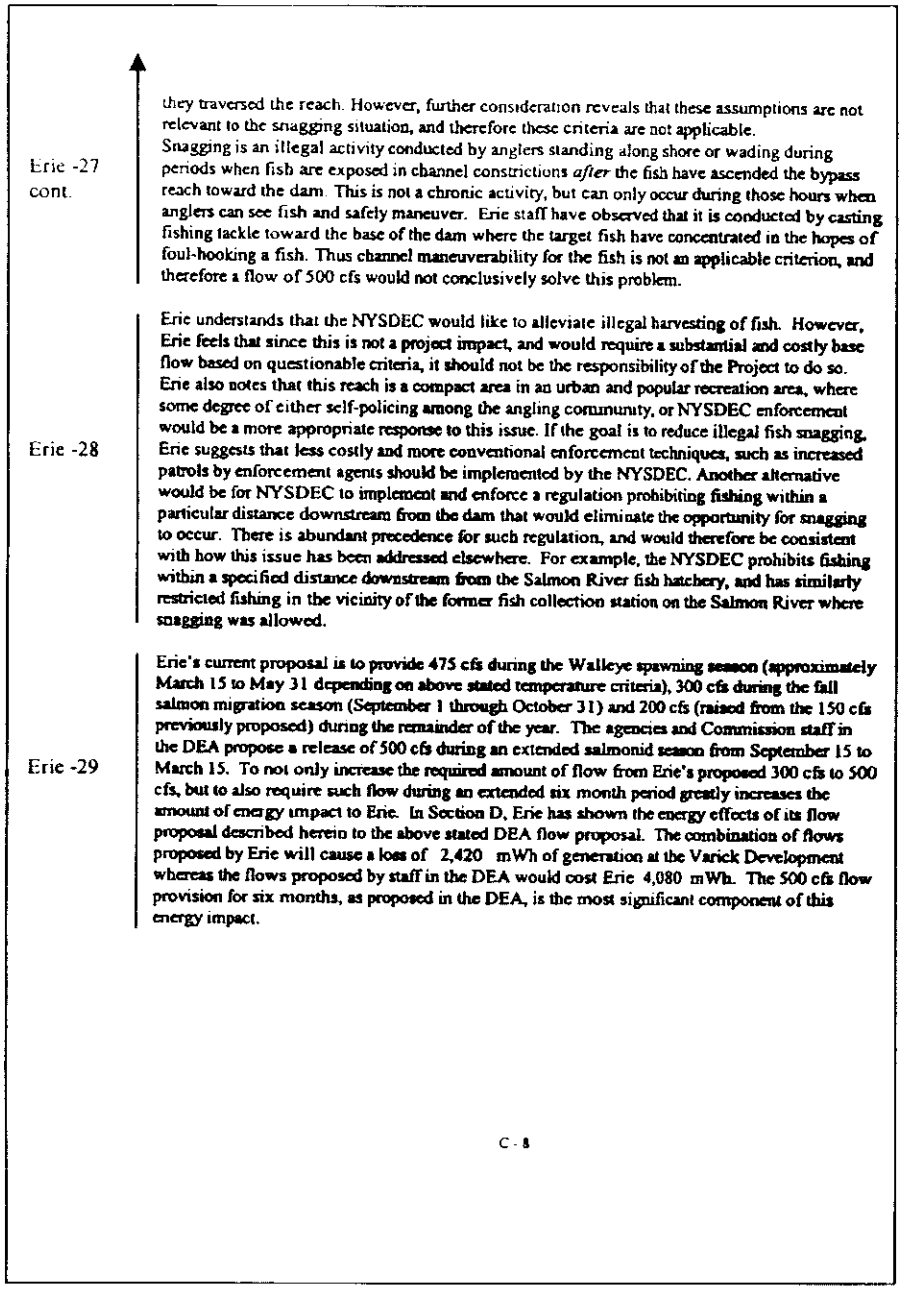
ERIE-27 NYSDEC supports its 500 cfs recommendation for the salmonid migration season by stating that increases in surface turbulence would reduce the ability of anglers to see large fish in the deeper holding areas. This flow level is consistent with the flow recommended by the authors of the IFIM study, although Erie now appears to be distancing itself from that conclusion. From our review of the photographs of the upper bypassed reach provided in Appendix F of the IFIM report, it is apparent that very little surface turbulence was present in the upper bypassed reach at the 220 cfs release flow, while a considerable degree of turbulence is apparent in many areas at the 790 cfs release flow. We conclude that the available data support a flow of 500 cfs to reduce the incidence of snagging. We note your opinion that only those fish that reach the base of the dam are subject to snagging.



they traversed the reach. However, further consideration reveals that these assumptions are not relevant to the snagging situation, and therefore these criteria are not applicable.

Erie -27 cont.

Snagging is an illegal activity conducted by anglers standing along shore or wading during periods when fish are exposed in channel constrictions *after* the fish have ascended the bypass reach toward the dam. This is not a chronic activity, but can only occur during those hours when anglers can see fish and safely maneuver. Erie staff have observed that it is conducted by casting fishing tackle toward the base of the dam where the target fish have concentrated in the hopes of foul-hooking a fish. Thus channel maneuverability for the fish is not an applicable criterion, and therefore a flow of 500 cfs would not conclusively solve this problem.

Erie -28

Erie understands that the NYSDEC would like to alleviate illegal harvesting of fish. However, Erie feels that since this is not a project impact, and would require a substantial and costly base flow based on questionable criteria, it should not be the responsibility of the Project to do so. Erie also notes that this reach is a compact area in an urban and popular recreation area, where some degree of either self-policing among the angling community, or NYSDEC enforcement would be a more appropriate response to this issue. If the goal is to reduce illegal fish snagging, Erie suggests that less costly and more conventional enforcement techniques, such as increased patrols by enforcement agents should be implemented by the NYSDEC. Another alternative would be for NYSDEC to implement and enforce a regulation prohibiting fishing within a particular distance downstream from the dam that would eliminate the opportunity for snagging to occur. There is abundant precedence for such regulation, and would therefore be consistent with how this issue has been addressed elsewhere. For example, the NYSDEC prohibits fishing within a specified distance downstream from the Salmon River fish hatchery, and has similarly restricted fishing in the vicinity of the former fish collection station on the Salmon River where snagging was allowed.

Erie -29

Erie's current proposal is to provide 475 cfs during the Walleye spawning season (approximately March 15 to May 31 depending on above stated temperature criteria), 300 cfs during the fall salmon migration season (September 1 through October 31) and 200 cfs (raised from the 150 cfs previously proposed) during the remainder of the year. The agencies and Commission staff in the DEA propose a release of 500 cfs during an extended salmonid season from September 15 to March 15. To not only increase the required amount of flow from Erie's proposed 300 cfs to 500 cfs, but to also require such flow during an extended six month period greatly increases the amount of energy impact to Erie. In Section D, Erie has shown the energy effects of its flow proposal described herein to the above stated DEA flow proposal. The combination of flows proposed by Erie will cause a loss of 2,420 mWh of generation at the Varick Development whereas the flows proposed by staff in the DEA would cost Erie 4,080 mWh. The 500 cfs flow provision for six months, as proposed in the DEA, is the most significant component of this energy impact.

C - 8

ERIE-28 We consider the provision of a minimum flow designed to reduce snagging to be reasonable. Erie suggests that snagging could be reduced via increased enforcement by NYSDEC personnel or self-policing among the angling community. NYSDEC stated that the current situation "destroys the quality of angling for the ethical majority of fishermen." Increasing flows to provide surface turbulence would provide an unobtrusive means to reduce the incidence of snagging. If the increased flows alone are insufficient to eliminate the practice, they should at least serve to facilitate enforcement because anglers attempting to snag fish should be easier to detect and apprehend. As NYSDEC points out, the continued practice of snagging also has implications for the future restoration of both lake sturgeon and Atlantic salmon.

ERIE-29 Our basis for extending the seasonal minimum flow for salmonid migration through the winter to March 15 is primarily to support the steelhead run that occurs during that time frame. This provides a unique winter fishery during a period when there are limited angling opportunities elsewhere. We modified the text of section V.C.3.b to further address our rationale for accepting the resource agencies' time frame for salmonid migration.

Erie -30

ITEM 4 : Develop Pilot Study of Bypass Reach Streambed Modifications at Varick: Staff recommends that Erie should work with the NYSDEC and USFWS to develop a pilot study of bypass reach modifications that could potentially reduce the level of bypass reach flows while developing the level of habitat enhancement that the agencies request.

RESPONSE:

Erie has re-evaluated the concept of streambed modifications at Varick and has determined that this proposal is no longer viable. As FERC has noted, streambed modifications might afford a reduction in minimum flow levels at Varick. Agency comments on this proposal tend to indicate that such an outcome is highly unlikely.

In its January 10, 1994 comment letter on the 12/93 AIR submittal package, the USFWS stated (see Item 16, page 4 of the letter) that, "*the main unresolved issue (regarding minimum flows) was what percentage of the optimum habitat in an unaltered channel should be the goal of habitat modifications*". The USFWS continued: "*...and let the models show us what we can achieve with reasonable flows, (maybe greater that 100% in some instances).*"

By letter dated April 1, 1996, the NYSDEC stated "*We do not agree with the enhancement criteria as proposed by NMPC...Our selected flow releases, in the absence of stream bed modifications were determined to be appropriate for meeting our resource management objective for the Varick bypassed reach. To meet our primary objective,...the enhanced reach would have to provide habitat of the same or greater quantity...and same or greater quality when compared to that available under existing channel conditions as maintained by the agency-endorsed flow releases.*"

In its July 20, 1994 reply letter to the USFWS' January 10th letter, NMPC stated (see Item 16, page 5 of the letter) *that "optimum habitat flow levels are not necessary"* in the Varick bypassed reach, given NYSDEC habitat management objectives of conserving *adequate* habitat. The NMPC letter further stated that walleye spawning habitat seems to be the main issue of concern in the Varick bypassed reach. The letter noted that: "If optimum habitat flows were to be provided at Varick, approximately one (1) acre of good quality walleye habitat would be created." Attachment A to NMPC's 7/20/94 letter (see attached) provides the 1992 annual report of the Ontario Ministry of Natural Resources (OMNR) on walleye populations in eastern Lake Ontario indicating a walleye population well within the historic range for this species and exhibiting many strong year classes. With the many tributary streams to, and shoal areas in, Lake Ontario proper providing walleye spawning habitat, the optimization of a minimum flow regime at Varick to create one additional acre of habitat does not appear to be essential to maintaining the fishery.

Based on the costs provided in the 12/93 AIR response package (see Item 16) updated to reflect 1999 dollars, the projected cost to conduct and evaluate the pilot study and construct the channel modifications would be $720,000. As discussed above, even if channel modifications were to be pursued, the agencies' desire to develop "optimum, or greater than optimum" flow conditions could require flow levels near what they have requested without channel modifications. In addition, maintaining the channel conditions to reflect agreed-on flow and depth parameters would be a constant maintenance problem. Erie (see response to Section C, Item No. 3 above) has proposed to increase the year round minimum flow to 200 cfs. This would provide a flow

ERIE-30 Both FWS and NYSDEC show consistent interest and support for the concept of pursuing channel modifications in the Varick bypassed reach to potentially reduce the flows released from the dam for habitat enhancement purposes. We see no indication in their comments that they expect to maximize the potential habitat for all lifestages modeled. Our recommendation in the draft EA would only require construction of the channel modifications if the pilot study results caused us to reduce our recommended flow regime. There would be an element of risk involved in conducting the pilot study if the outcome did not alter the conclusions of the resource agencies regarding appropriate flows to the bypassed reach, but the costs at risk would not be the entire $720,000 that Erie cites (which included construction costs). Erie would have been able to assess the costs of constructing the channel modification compared to the costs of releasing our recommended minimum flows for the duration of the term of the license. We will accept your withdrawal of your proposal to conduct this pilot study. Erie would still be free to discuss with resource agencies the potential for this type of study in the future. The outcome could serve as a basis for a license amendment, especially if the resource agencies endorsed the modified flow regime.

Erie -30 cont.

depth of up to one foot over 80% of the upper bypass reach and flow depths between 1 and 2 feet over 20 % of the reach (see Table 1 in KA (1993)). Erie will provide this increased level of flow in the unaltered Varick bypass reach.

Erie -31

Erie will modify the existing flashboard system to allow spillage of this flow from notches in the flashboards on the eastern portion of the dam, which is the portion of the upper bypass reach where the best spawning substrates occur. This will maximize the efficiency for the spilled flow to wet the most strategic portion of the upper reach habitat by concentrating the spill at the most strategic location. Erie proposes to facilitate these releases by a combination of modification including installing a series of notches along the top of the flashboards and rehabilitating the three NYSTA gates adjacent to the western abutment of the dam to allow provision of releasing higher flow levels at different times of the year (see item 3 above). The notches would be sized to pass the required spillage at normal pond levels. Erie estimates the cost to rehabilitate the gates would be $200,000, while the estimated the cost to install the flashboard notches will be $5,000.

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ERIE-31 We modified table 14 in the developmental analysis section of the EA to reflect Erie's estimate of the capital costs associated with releasing minimum flows to the Varick bypassed reach. However, with the installation of our originally recommended pneumatic crest gate, minimum flow could be directed to the portion of the channel where the most habitat gains would be achieved by adjusting the height of crest gate panels without rehabilitating the NYSTA gates or notching the flashboards. Therefore, we deleted the $205,000 that you cite would be the cost of these measures from the estimated cost of installing the pneumatic crest gates. We now recommend that instead of installing pneumatic crest gates at Varick, that Erie develop a plan to replace the existing flashboard system at Varick with a system that minimizes impoundment fluctuations and downstream debris deposition due to flashboard failures. This new system could allow Erie to meet the resource agencies' and our objectives in a less costly manner than the pneumatic crest gates that we originally proposed.

ITEM 5: Develop Flow Monitoring Plans: Staff recommends that Erie should work with the NYSDEC and USFWS to develop a flow monitoring plan for the Project that includes methods for gaging tailrace and bypassed reach flows and headpond and tailwater elevations.

RESPONSE:

Erie will develop a flow monitoring plan for the Project

A standard article in the Licensing Order will address flow monitoring issues. In accordance with this License Article Erie will develop a flow monitoring plan that will include the following, as directed by the Commission:

Erie -32

- Utilize gaging devices that will measure water surface elevations to 0.1' accuracy. These gages will record headpond and tailwater elevations at each Project development
- Maintain and calibrate the gaging devices in accordance with manufacturer's instructions
- Install and maintain staff gages at each development to ensure the ability of the public to view the water surface elevations of the headpond and tailwater and any other locations where a specific water surface elevation may be necessary to be maintained
- Make records associated with the flow monitoring plan accessible to the agencies on a periodic or as-needed basis

Erie will develop this plan in consultation with the agencies and will submit the proposed plan to FERC for approval on the schedule that is given in the Licensing Order.

ERIE-32 No response required.

ITEM 6: Provide Downstream Fish Protection/Passage at All Three Sites: FERC requests that Erie provide protection/passage facilities for resident species shortly after license issuance.

RESPONSE:

Erie -33

Erie does not believe that downstream fish protection measures at this project are warranted at this time.

Erie credits the FERC with concluding that the prescription developed by the Department of Interior is not needed, and that the prescription would be technically flawed.

It would

1. in fact likely lead to impingement of fish on the proposed racks due to estimated increases in near-field water velocities.

2. The entrainment study conducted by Niagara Mohawk utilized highly conservative estimates of fish entrainment loss based on conservative interpretation of field data and literature. Thus fish loss due to entrainment passage may be overestimated.

3. No adverse impacts to the fishery have been identified. The majority of fish entrained at the Project developments are young-of-year dominated by gizzard shad and blueback herring, two exotic, highly fecund invasive species that are subject to no management objectives in this basin (Niagara Mohawk, 1995). In fact, Great Lakes fishery managers concerned about the negative impacts of blueback herring invasion of Lake Ontario are presently investigating the need and means to reduce the influx of this species to the Great Lakes (NY Sea Grant Blueback Herring workshop, Shackelton Point, NY, June 1998). Enhanced downstream passage would promote the further undesired invasion of this species. Gizzard shad are also a non-native, invasive species. This species experiences large-scale winter die-offs in this river basin that eclipse any impacts associated with entrainment (Niagara Mohawk, 1995).

4. Studies Conducted to Date have not demonstrated the efficacy of bar racks for passing the types of fish entrained. Other than the aforementioned species, the remainder of entrained fish at this project is comprised of relatively small numbers of predominantly young-of-year lifestages of common warm water fish. No negative impact to these populations has been related to entrainment. Further, it is unlikely that the proposed fish protective devices would divert or protect many of these individuals from entrainment.

5. The Atlantic salmon fishery is not yet established in this River. Erie agrees that the need for downstream fish passage and protection should be focused solely on needs resulting from the future successful reintroduction of Atlantic salmon. Angled louver alternatives similar to those proposed for the developments of these projects have, been shown to be effective under some limited site conditions for diversion of Atlantic salmon smolts (Ducharme, 1972).

ERIE-33 We make no recommendation on the timing of downstream fish protection and passage. Interior's initial and modified prescriptions specify the time frame. Section V.C.3.b of the EA is consistent with Erie's comments.

Atlantic salmon do not presently inhabit this river basin, having been extirpated many decades ago by changes in water quality, habitat, access, land use, and management, overfishing of the fishery for other competitor and predator species. Atlantic salmon restoration would be the biological result of changes in habitat and water quality management, fishery management and stocking practices engendered by a management plan consistent with initiation of a comprehensive restoration effort for Atlantic salmon in Lake Ontario. Any such plan would need to be enacted after successfully completing the New York State SEQRA process that documents public/stakeholder approval and commitments to the economic impacts associated with such a large-scale restoration.

Erie -33 cont.

At present there is no recognized restoration plan underway that would trigger a need for Atlantic salmon passage. Erie is aware of long-standing interest in restoring runs of Atlantic salmon to this river basin as one part of the overall effort to restore the historic fishery of Lake Ontario. However, Erie also understands that no formal public support has been solicited or any formal plans developed by the NYSDEC to achieve this goal. Any such effort will require a dedicated program with the support of resource agencies and the public and preceded by the development and adoption of a focused management plan that identifies the implementation and funding of specific goals and strategies. To date, these elements have not emerged.

Erie remains committed to a fish protection and passage design suitable for downstream passage of Atlantic salmon in support of the proposed restoration of this species in the river basin. However, it is premature to implement these measures at present, as there is no formal plan or program underway, and no biologically based triggers to justify downstream passage for smolt. The feasibility and commitment to this restoration effort on the part of resource agencies has not yet been demonstrated, nor has a formal plan and schedule been developed, ratified and implemented.

Erie -34

The DEA also targets lake sturgeon and American eel as downstream passage targets. Erie elsewhere (see response to Item 8 below) questions the biological value of moving Lake Ontario populations of lake sturgeon upriver. We see this as counterproductive to maintaining or enhancing existing stocks of this species. It follows therefore that if such upstream transport is not recommended that the need to provide downstream passage for this species is not necessary.

Erie -35

With respect to American eel, Erie has been closely following emerging concerns about American eel management, and is aware of assumptions that enhanced downstream fish passage may be a strategic component in eel stock management. Erie understands that resource agencies assume that some number of juvenile eels ascending the St. Lawrence River may elect to penetrate the Oswego River basin and reside there during the years required for maturation. At some point these eels would migrate to sea prior to spawning. However, eels do not return to native rearing grounds and thus there is no evidence of any obligatory need and mechanism to prompt eels to ascend the Oswego River. Such habitat exploitation may be only incidental or opportunistic. If so, influences of this hydroelectric project upon the single, world-wide panmictic population of eel may in fact be limited, and that much more significant influences are exerted by actions occurring in the species range outside this watershed. Erie also notes that at present no biologically effective fish passage designs have been identified that pass adult eel downstream. For these reasons, Erie concludes that existing agency-proposed measures for downstream fish passage are premature at this time, as the evidence does not conclusively show they would benefit eels. Erie believes that it would be prudent to commit to downstream passage

Erie -36

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ERIE-34 Our EA does not target lake sturgeon and American eel for downstream passage. Table 7 of the EA presents agency goals from the fisheries management plan for the Oswego River. Identification of those species that resource agencies have targeted for restoration gives an appropriate perspective for our analysis of the need for upstream and downstream fish passage. If management plans that call for specific upstream passage plans for sturgeon or eels are finalized, downstream passage technologies would be a factor in determining the efficacy of such plans.

ERIE-35 Opinion noted. In its modified fishway prescription, Interior included upstream American eel passage. We modified section V.C.3.b of the final EA to include our analysis of upstream eel passage.

ERIE-36 We concur with Erie's observation that the technology for passing eels downstream is not yet fully mature, and we question the potential efficacy of Interior's designs for the initial and modified prescriptions for downstream passage at the Oswego River developments. We also concur that Interior should document that increasing access to additional rearing habitat would benefit the population of American eels before it issues a final prescription for this project. At present, it does not appear that a sufficient number of eels ascend the St. Lawrence River to fully seed the habitat that is accessible to eels in the St. Lawrence River, Lake Ontario, and its tributaries. Interior's administrative record, submitted with its modified prescription, does not address this point.

Erie -36 cont.

for eels only after habitat upstream from the Project is conclusively shown to be strategic for meeting documented management goals, *and* biologically effective downstream passage devices have been identified and developed.

Table 14 of the DEA contains costs provided by NMPC in 1995, presumably escalated to 1999 dollars. The costs prepared in 1995 by NMPC were not based on the initial USDOI prescription, assumed simple dam notching for passage, did not include indirect costs such as engineering and permitting and did not include the cost to recycle attraction water.

Since the 1995 cost opinions were prepared, the USDOI's initial prescription for the projects has significantly increased the complexity and flow requirements from those assumed in 1995. Erie has developed current opinion of costs for the various fish protection/passage alternatives proposed by the USDOI in its initial prescription (3/96). Due to the level of attraction flow specified by the USDOI (5%), Erie has included the cost to recirculate the attraction flow (pump-back system) to recover as much of the attraction flow for generation as feasible, after fish have entered the passage system.

Erie -37

As the table below shows, he current opinion of costs are significantly higher than those prepared by Staff, as indicated in Table 15 of the DEA. Erie questions the basis and validity of the costs prepared by Staff. Staff appears to have somewhat arbitrarily assigned an equal capital cost for each project, regardless of the significant differences in the prescribed protection/passage details. By inspection it should be obvious that the prescribed passage system for Fulton, with a single entrance, would be significantly less complex and costly than that prescribed for Minetto, with multiple entrances and five times the rack area. Even if the Staff costs contained only the rack replacement, without passage, the rack areas being replaced or modified at each project varies substantually and would result in differing costs.

Erie believes there is little to no basis for Staff's costs. Erie also questions whether Staff included the cost for indirect expenses, such as engineering and permitting, into the costs. The table below provides a comparison of costs between Staff prepared estimates and Erie's opinion of costs. Erie' opinion of costs contain the cost of indirect costs (engineering, permitting, and administration), contingency and the cost for an assumed two years of effectiveness testing. The current opinion of costs also contain the cost to provide recycling chamber(s) to reduce the lost generation due to the large amount of attraction water prescribed by the USDOI. Detailed information regarding the basis for Erie's opinion of costs is contained in attached cost tables (Tables: 1.0, F-1, M-1, M-2, V-1, V-2, and V-3).

Erie -38

C - 14

ERIE-37 We obtained the direct capital costs and operation and maintenance costs for fish protection and downstream passage from table 6.4 of KA, 1995. Most indirect costs that you cite would be included in overall project administration costs or accounted for in our calculations of the annualized costs (which accounts for the cost of financing). The decision to add costs to recycle attraction water is based on economics and certainly could be implemented by Erie if the overall benefit of the system in terms of minimizing lost generation revenue is justified. This would result in a net decrease in the annualized costs that we present. Table 15 in the EA represents the estimated incremental costs of staff- or agency-recommended environmental measures. Consequently, to determine the total estimated cost for fish protection and passage at each development, the cost for proposed measures, presented in table 14, must be added to the costs in table 15. We consider our incremental costs for fish protection and passage presented in the EA to be reasonable.

ERIE-38 As acknowledged in our response to ERIE-37, our estimated incremental costs were based on a degree of professional judgment. However, the total capital cost estimates for fish protection that Erie presents support our estimate. For example, Erie's total estimate for capital costs of Fulton fish protection and passage, including the cost of a pumpback system and

(Response to ERIE-38 continued on following page)

Response continued from previous page.

effectiveness testing, is $1,074,000. As noted in our previous response, we assume that Erie would only install a pumpback system if it was economically feasible and its cost could be recovered by additional generation revenue. We did not include the cost of a pumpback system in our estimates, but if it were added, the annualized cost, which accounts for capital costs and energy gains, would be less. Deleting the cost of the pumpback system from Erie's estimate yields a total cost of $952,000. Our estimated capital cost for fish protection at Fulton is $81,270 (from table 14 of the draft EA) plus $1,000,000 (from table 15 of the draft EA) for a total cost of $1,081,270. If we add to this the Fulton development's share of the effectiveness studies, which is $105,547 (also from table 14 of the draft EA), our comparable cost is $1,186,817. Although our costs are higher than Erie's, they are reasonably similar. Using the same process, our estimated capital cost for fish protection, passage, and effectiveness studies at Minetto is $1,446,457, whereas Erie's estimated costs without pumpback systems ranges from $1,323,000 to $2,160,000. Our costs again are comparable to Erie's. For Varick, our estimated capital cost is $1,440,127 and Erie's, without pumpback, range from $1,076,000 to $2,732,000. Erie provided more recent estimates of the cost of downstream fish passage facilities, in its April 16, 2001, response to Interior's modified downstream fish passage prescription. We consider these costs to be reasonable, and modified table 15 to reflect the estimated incremental cost of the modified prescriptions (without pumpback).

Erie -38 cont.

Comparison of Fish Passage/Protection costs

Project	Description	DEA Table 15	Current Opinion of Costs
Fulton			
	Side Sluice to Spillway Toe	$1,000,000	$1,074,000
Minetto			
	USDOI Alt. A: Multiple Entrances	$1,000,000	$2,922,000
	USDOI Alt. A: Twin Entrances	$1,000,000	$2,085,000
Varick			
	USDOI Alt. A: Passage at Canal Entrance	$1,000,000	$3,006,000
	USDOI Alt. B: Passage at Mud Gate	$1,000,000	$1,859,000
	USDOI Alt. C: Passage at Project	$1,000,000	$1,343,000

Erie -39

As noted above, the costs associated with recirculation of the attraction flow has been included in the opinion of costs. However, the DEA also proposes to require testing of the protection facility after installation (see Erie's response to Item 7 for a discussion regarding effectiveness testing). As correctly indicated by Staff in the DEA, the prescribed facilities are unlikely to be effective and resource agencies will likely require modifications. Since established criteria for passage efficiency has not been established, there is a significant chance that the amount of attraction flow will be increased. The assumption that the amount of attraction flow may change is based on the limited ability to modify physical structures after installation and that typical system modifications include increased attraction flow. Increasing the attraction flow would negate or limit any benefit gained by recirculation of the initial attraction flow amounts. In determining the annual cost for development impacts as a result of passage measures, Erie assumed that ultimately the attraction water would not be recirculated. In addition, due to the limited review time allotted to Erie by FERC to respond to the DEA, a detailed analysis of the cost benefits of actually installing a pump-back system was unable to be performed.

LITERATURE CITED (This section):

Niagara Mohawk Power Corporation, 1995. Oswego River Project, FERC No. 2474. Fish entrainment and mortality study. Final Report. Prepared by Kleinschmidt Associates, Pittsfield, ME.

Ducharme, L.J.A., 1972. An application of louver deflectors for guiding Atlantic salmon (*Salmo salar*) smolts from power turbines. Journal. Fish. Res. Bd. Can. 29(10):1397-1404.

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ERIE-39 Opinion noted. We customarily recommend developing plans to evaluate the effectiveness of fish passage facilities in consultation with appropriate resource agencies, in this case, FWS and NYSDEC. Before submitting plans to the Commission, the licensee typically would be given an opportunity to make its case for agreeing or disagreeing with the input provided by the agencies. The Commission would weigh the evidence presented to determine what, if any, modifications to the effectiveness plans should be implemented and incorporate such measures into the final, approved plan.

ITEM 7: Provide Downstream Fish Passage Effectiveness Studies: **FERC requests that Erie develop and implement fish passage effectiveness studies.**

RESPONSE:

Erie -40 | Erie disagrees that Erie should be responsible for conducting fish passage effectiveness studies at the Project. As discussed under Item 6 above, Erie believes that there is justification for downstream passage for specific species and lifestages, however, for several biological and/or design reasons, it is not appropriate to implement these measures now.

Erie -41 | Erie is concerned that there is considerable subjectivity involved in judging the "effectiveness" of a fishway by arbitrary use of passage rate efficiency standards or other means. The true test of the fishway effectiveness is to assess over a long period whether or not the scientifically targeted run size is returning to the river irrespective of the rate at which individuals pass through a fishway. Erie feels that the fishway design alternatives being considered are those conceptualized by DOI, and therefore it is not the responsibility of the Licensee to validate these designs once installed. This is especially true if the effectiveness criteria are questionable and the licensee is given an open-ended requirement to expend additional resources to modify the structure or its operation if the DOI design is deemed "ineffective".

Erie -42 | Erie does not object to working collaboratively with resource management agencies following the installation to monitor the timing and magnitude of the returning fish.

ERIE-40 Opinion noted.

ERIE-41 See our response to ERIE-39.

ERIE-42 No response required.

ITEM 8: Provide Upstream Fish Passage for Atlantic Salmon, American Eel and Sturgeon: FERC requests that Erie develop and implement upstream passage for migratory species when agencies indicate the need is present.

RESPONSE:

Erie agrees that upstream passage facilities for Atlantic salmon should be provided, once the targeted numbers of adult Atlantic salmon exist.

The objective of upstream fish passage at the Varick Development is to support the proposed restoration of Atlantic salmon to the Oswego River basin. It has been agreed that this would be accomplished by providing a trap and truck facility that would expedite the upstream movement of breeding adult salmon to segments of the watershed capable of providing spawning habitat. Installation and operation of the facility would be triggered by the return to the river of a target number of 1,000 adult fish by the year 2015. This in turn would be the biological result of changes in habitat management, fishery management and stocking practices engendered by a management plan consistent with initiation of a comprehensive restoration effort for Atlantic salmon in Lake Ontario. At present there is no recognized restoration plan underway that would trigger a need for Atlantic salmon passage. Erie is aware of long-standing interest in restoring runs of Atlantic salmon to this river basin as one part of the overall effort to restore the historic fishery of Lake Ontario. However, Erie also understands that no formal public support has been solicited or any formal plans developed by the NYSDEC to achieve this goal. Any such plan would need to be enacted after successfully completing the New York State SEQRA process that documents public/stakeholder approval and commitments to the economic impacts associated with such a large-scale restoration.

Erie -43

Under the jointly developed NYSDEC/USDOI/USFWS 1994 Fisheries Enhancement Plan for the Oswego River, the construction of a trap and transfer facility at the Varick Development is base upon a target number of 1,000 adult Atlantic salmon present at the development by 2015. Presently, neither the NYSDEC nor the USFWS is currently participating in the restoration of Atlantic salmon in Lake Ontario, and Erie is unaware of any new or updated plans for such a restoration to occur in the near future. Erie is unaware of any recent stockings of Atlantic salmon by the NYSDEC in the Oswego River downstream of the Varick Development. The stocking of 10,000 fry in 1997 by the Atlantic Salmon Fish Creek Club to the best of our knowledge was not part of any restoration efforts by the NYSDEC or USFWS.

The restoration of Atlantic salmon to Lake Ontario does have several critical issues which are noted in the DEA: possible low viability of eggs from salmon residing in Lake Ontario, low DO levels in lower Seneca River and Onondaga Lake; availability of adequate spawning an rearing habitat, and the acceptance of the public to favor such a restoration effort. If a restoration effort is eventually started it may take well past 2015 before target numbers of adult Atlantic salmon are present downstream of the Varick Development and therefore installation dates for the trap and transfer facility may be further extended out into the future.

Erie -44

Upstream passage for other species noted in the DEA including lake sturgeon and American eel were not the focus of the trap and truck program. Although prior to construction of the lock and dam system, sturgeon may have ascended the Oswego River a slight distance upstream from the Project, it is not likely that populations of Lake Ontario lake sturgeon historically ascended the

ERIE-43 No response required.

ERIE-44 We concur that the resource agencies should document the population benefits that they would expect from providing upstream passage for Atlantic salmon, American eel, and lake sturgeon. The technology for passing all three of these species downstream is not mature at this time, and we have specific concerns about the designs proposed in Interior's initial and modified prescriptions. Our recommendation in the draft and final EA to include a reopener condition in the license for Erie to develop a plan for upstream passage when the restoration goals for Atlantic salmon and lake sturgeon are finalized would allow documentation of the assessments of the expected population benefits prior to requiring upstream passage.

Erie-44
cont

Oswego River to its upper reaches Although lake sturgeon are reported to exist in the Finger Lakes region of the watershed, these fish are most likely a distinct population that does not migrate to or from Lake Ontario. Little additional lake sturgeon adult or spawning habitat exists in the segments of the Oswego River above the project. Erie therefore does not see a biological benefit to transporting members of the Lake Ontario sturgeon population arriving in the vicinity of the Varick spillway to upstream segments of the Oswego River basin.

ITEM 9: Install Pneumatic Crest Gates at Varick: FERC requests that Erie install pneumatic crest gates at Varick to reduce impoundment fluctuation effects from loss of conventional flashboards.

RESPONSE:

Erie -45 Erie disagrees with Staff's recommendation to install pneumatic crest gates at Varick. Erie has re-evaluated the cost to install a pneumatic system on the Varick dam. The current cost (see attached Table VD-1) is $1,863,000, based on vendor quoted prices and actual construction costs from other installations. Erie questions the basis of Staff's estimated cost for this installation at $500,000. Erie's opinion of costs include indirect costs and the cost to install a pneumatic system on the main dam and the canal spillway. Staff appears to have not included the indirect costs and to have prepared costs for the main dam only. The canal spillway is also equipped with flashboards which, since the basis of the requirement is limiting pond fluctuation, would also need a pneumatic system. In addition, Staff overestimates the amount of increased generation resulting from such a system. Staff estimates that the pneumatic flashboard system would result in an energy increase of 2,883 mWh whereas Erie estimates the energy gain at only 1,804 mWh (see Section D). However, Erie's main concern is that Staff is recommending installation of this costly system despite the fact that the biological benefit of installing such a system is minimal.

Erie -46 In the Department of Interior's March 26, 1996 letter submitting comments, recommended terms and conditions and prescriptions, DOI stated: "The department recommends the use of pneumatic crest control devices or rubber dams, wherever feasible, to allow pond elevations to be promptly stabilized after high flow". Considering the cost relative to the minimal energy benefits, pneumatic flashboards are not economically feasible nor would this measure provide environmental benefits commensurate with the cost.

Erie has also evaluated the occurrence of impoundment fluctuations at Varick during the months of April through July, the season assumed in the DEA when fish spawning and bird and mammal nesting occurs. The attached impoundment elevation duration table (Table 1) shows the level of impoundment fluctuation based on a wide range of flow exceedence levels during the months of April through July. As can be seen, noting that the normal impoundment level with stable boards in place is elevation 270.0 (USGS), the impoundment can still fluctuate above the normal pond elevation by up to 3.2 feet during this period.

Erie -47 In its January 4, 2000 comment letter on the Oswego River Project DEA, the NYSDEC stated (see page 2, item 6 of the letter) that: "*We do not believe that the installation of pneumatic crest gates at Varick will have as significant a biological benefit as at other facilities on the river because of the relatively small, steep-sided impoundment*". As further discussed below, the biological impact to fishery resources in the Varick impoundment due to loss of flashboards during the spring is minimal and does not justify the expenditure for a pneumatic system as recommended by Staff.

Flashboards are typically installed at the dam by June. Erie notes that impoundment levels in June remain stable (i.e within 2 feet of the top of boards) for nearly 100% of the time (see Table 1) once flashboards have been erected, as failures are relative rare. The existing flashboards are designed to fail once water depth over the board exceeds 24 in. This occurs very infrequently during the spring centrarchid spawning period (June).

C - 19

ERIE-45 As we pointed out in our response to Erie-37, many indirect costs that Erie claims are not accounted for in our developmental analysis are incorporated when we derive the annualized cost from the total estimated capital cost of a specific enhancement. The basis for our cost was NMPC's response to AIR 15, submitted to the Commission on December 14, 1993 (table 10, page 51). However, because Erie has access to more detailed site-specific information that would influence the cost of installing pneumatic crest gates, we incorporated Erie's estimate into section VI.B of the EA. Our opinion is that Erie's costs are on the high side of expected range of cost for this measure. For example, Erie provides no basis for replacing the existing 250-feet-long, 10-inch high flashboards at the intake canal entrance with a rubber dam that is 1.5 feet high. Reinforcing the existing 10-inch flashboards or installing an alternative rigid structure could be more cost effective. Erie's administrative costs ($169,000) also appear to be excessive.

ERIE-46 We reviewed our estimate of gained generation associated with the installation of the pneumatic crest gates at Varick and stand by them. Our analysis accounted for actual head and an existing typical mid-winter flashboard failure. We estimate that, on average, an estimated 2,883 MWh would be gained each year with the installation of the pneumatic crest gates. We note Erie's and NYSDEC's opinion that the biological benefits of this measure would be minimal.

Erie -47 cont.

Subsequent fluctuations during June are due to changes to project inflow beyond the control of the project, and result in relatively short-duration increases of pond elevation of up to el. 271.8 ft, USGS. As a result, the risk to nest-spawning species such as centrarchids is small, as the potential for sudden dewatering or extended periods of shallowing is small. Conversely, the periods of elevation increases are relatively brief, and it is therefore unlikely that these conditions would induce fish to establish nests too high in impoundment bed embankments. Erie also notes that the acreage in this impoundment is very small, and that only a limited amount of the riverwide spawning recruitment potential occurs in this impoundment. Given the high productivity of fish reported in this basin, there is not likely to be a great affect on the fishery resulting from rare impoundment elevation increases occurring from extremely infrequent flashboard failure.

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ERIE-47 We recognize that, during periods of spillage, even with pneumatic crest gates, Erie would have little control over the maximum water surface elevation when the hydraulic capacity of the turbines is exceeded. We do not agree with Erie's characterization that impoundment water surface elevation fluctuations of 2 feet are "stable." The effects that we are trying to avoid would not be readily apparent from the information that Erie presents in table 1. Should the existing flashboards at Varick fail during the centrarchid spawning period, centrarchid nests could be dewatered and most likely, eggs or young in the nests would be adversely influenced. It would be in Erie's best interest to reinstall the flashboards as quickly as possible to maximize the available head and associated generation (which would require the Varick impoundment to briefly be drawn down below the dam crest for safety reasons, also potentially exposing centrarchid nests). Therefore, the percentage of time during May, June, or July when the water surface was at the dam crest probably would be low. We also note, based on information from the Hoosic Project (FERC No. 2616), that flashboard failures are not always linked to high flow events, as Erie seems to assume. However, based on NYSDEC's comment that there would be minimal biological benefit from the pneumatic crest gates and our conclusion that angler safety would not be enhanced by pneumatic crest gates, we altered our recommendation in the final EA to require Erie to develop a plan to replace the existing flashboard system with a system that would minimize impoundment fluctuations and retain flashboard debris on site, to the extent feasible.

ITEM 10: Develop a Plan to Prevent Loss of Flashboards at Fulton and Minetto: Staff recommends that Erie should install trippable/retrievable boards that will ensure that the boards will not break away and move downriver.

RESPONSE:

Erie disagrees with Staff's recommendation that trippable/retrievable flashboards need to be installed at Fulton and Minetto. The current boards consist of 6" (nominal 2" x 6") and 10" (nominal 2" x 10") dimension lumber attached to steel pins across each dam at the Fulton and Minetto developments respectively.

Agency comments regarding this issue refer to the unsightly appearance of flashboard material accumulating in the Oswego River and the potential for boaters being impacted by board material moving downriver. No specific documentation (e.g. reports from boaters or others claiming to have been struck by board debris) or evidence (photos) of trash accumulations that show large amounts of 2" x 6" and/or 2" x 10" boards have been able to be found in Orion's records. In fact, due to the small size of these flashboard systems, loss of all the boards at Fulton or Minetto is uncommon. Generally, as Staff indicates, these failures occur prior to the commencement of the boating season on the river.

Erie -48 The Oswego River, covering a drainage area of approximately 5,000 square miles, produces a heavy level of debris load, especially during the spring runoff period, which is typically when flashboards fail on the river. It is common to see large trees, metal drums, large timbers and other debris from upriver passing through the lower Oswego River. While the partial failure of these small flashboard systems do add to the debris load in the river, their impact is negligible.

Erie does not believe that the cost of developing a trippable/retrievable flashboard system at each of these developments is necessary. However, should staff continue to recommend limiting board material loss, Erie suggests that the Staff consider reinforcing the existing system to minimize the loss of board material occurrence, rather than require the costly need to prevent material loss entirely. Erie believes that the existing board system can be reinforced to reduce the occurrence of material loss to allow loss only during significant flood events, such as the 100 year flood. Due to the small height of the boards, it is evident that no significant increase in water levels would occur during flood events below the 100 year flood level. Erie's opinion of costs to reinforce the existing system is approximately $24,000 per development.

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ERIE-48 Our recommendation does not necessarily require Erie to replace the existing breakaway flashboards with trippable flashboards at Fulton and Minetto. The plan developed with the resource agencies could also entail such procedures as conducting a search for flashboard debris, including pins, following flashboard failure. However, Erie's alternative suggestion to reinforce the flashboard system so that failure would only occur during major (i.e., 100-year) flood events should address our concern for aesthetic degradation and recreational user safety (boaters and wading anglers). It should also serve to address the concerns of the resource agencies with dewatering of shoreline centrarchid spawning habitat associated with flashboard failures, especially at Minetto (see FWS-2). We modified the text of section V.C.7.b of the EA to recommend that Erie develop a plan to replace or reinforce the existing breakaway flashboard system to minimize downstream debris deposition associated with flashboard failures at Fulton and Minetto. We modified section V.B, Development Analysis, to reflect Erie's estimated cost to reinforce the existing flashboard systems at Fulton and Minetto.

ITEM 11: Implement Aesthetic Improvements at All Three Developments: Staff recommends that Erie should perform aesthetic improvements as proposed in the 12/93 AIR response No. 15 (Comprehensive Recreation Plan).

RESPONSE:

Erie -49

Erie agrees with the need to implement aesthetic improvements at each of the developments. As noted in the 12/93 AIR response, maintaining the integrity of the powerhouse superstructures including brick facades, doors, windows, (including paint condition) and appurtenant facilities are important considerations for the maintaining the aesthetic appearance of these structures.

ERIE-49 No response required

ITEM 12: Implement the Programmatic Agreement: Staff recommends that Erie should add the Oswego River Project to the 7/11/96 PA.

RESPONSE:

Erie -50

Erie agrees with Staff's recommendation that the 7/11/96 Programmatic Agreement be modified to add the Oswego River Project to Appendix A to ensure that any unknown historic or archaeological resources that may be discovered when any site excavations occur are handled in an appropriate manner. The modifications to Appendix A will be fashioned after the other Erie sites covered in the 7/11/96 PA.

ERIE-50 No response required.

ITEM 13: Provide Canoe Portages/Signs at Fulton and Minetto: Staff recommends that Erie should add signage at the Fulton Development to direct canoeists to take- out/put-in points and to develop a new portage at Minetto on the east side of the river.

RESPONSE:

Erie -51

Erie is in partial agreement with Staff's recommendations regarding canoe portages at Fulton and Minetto.

FULTON: At the Fulton Development, a canoeist can enter or exit the Fulton impoundment at the City of Fulton's marina facility located just upstream of Lock No. 3 on the east side of the river. During the normal navigation season, the City installs floating docks in the marina (see photo 1) that facilitate docking boats and provide egress onto the walkway adjacent to the lock structure. Traversing down the lock structure a set of wide, recently refurbished steel stairs lead down to the river below the lock (see photo 2). At this point a canoeist can put in to the river and continue downstream. Conversely, moving upriver, a canoeist can take out at the point below the lock, traverse the stairs and put in at the marina above the lock. Erie will install appropriate signage that will identify this route for canoeists. It should be noted that use of the lock for passage around the Fulton dam is also available for canoeists during the navigation season.

Erie -52

MINETTO: At the Minetto Development, Lock No. 5 is located in the river away from either shoreline. As noted above for the Fulton Development, use of the lock is available for canoeists seeking passage around the Minetto dam. As Staff have also noted, a take-out/put-in point exists at NYSTA's boat launch that is located on the west shore of the river above the dam and lock facilities (see photo 3). A portage utilizing the NYSTA boat launch is technically feasible and would be on publicly owned land but would require a fairly lengthy walk along the shoulder of the adjacent roadway and reentering the river below the lock.

Erie -53

The Adirondack Mountain Club (ADK) has suggested that Erie construct a portage on the east side of the river on steep-terrained land to afford a shorter route around the dam. The proposed route would start just below the highway bridge and traverse the land through a series of cut-back trails that would lessen the impact of the terrain. Erie has considered this potential new route and has determined that the proposed route would be on land that is both not-owned by Erie and is outside of the Project Boundary for the Minetto Hydro Development. In addition to the lack of ownership of this land, the steep terrain (approaching 40% grade or steeper) would require a significant investment in soil stabilization techniques to ensure the stability of the slope was not compromised by this series of cutback trails. Due to these considerations, Erie cannot support development of a portage on the east side of the river, as requested and depicted by ADK.

Erie -54

Erie -55

However, Erie notes that passage around the east side of the dam is currently possible in the vicinity of the eastern abutment of the dam. NYSTA recently rehabilitated the Minetto dam and cleared, grubbed and re-seeded the embankment area around the abutment. While fairly steep in grade, this area has been cleared of the tangle of shrubs and trees evident along the rest of the eastern shoreline. The boater restraining barrier (a series of buoys cabled together) is located approximately 200 feet upstream of the dam. Erie proposes that a new section of boater restraining barrier could be installed parallel to the eastern shoreline, tying into the existing barrier system, and terminating approximately 20 feet upstream of the eastern dam abutment (see photo 4). Once out of the water, a canoeist would be guided around the abutment to an area just

C - 24

ERIE-51 No response required.

ERIE-52 We share Erie's view that portage on the western shore would be quite lengthy.

ERIE-53 We would recommend that any lands required for installation of our recommended canoe portage on the eastern shore be incorporated into the project boundary.

ERIE-54 We agree that the terrain is steep along the eastern shore and soil erosion and control measures would be necessary to implement the route suggested in the draft EA.

ERIE-55 Erie's new proposal could offer a safe, shorter canoe portage around the eastern abutment of the Minetto dam. We modified the EA to recommend that Erie consult with ADK, NYSTA, and NYSDEC on the alternative portage route and develop design drawings for this alternative.

Erie -55 cont.

below the eastern abutment training wall where put-in access to the river could be done - a total portage of approximately 100 feet (see photo 5). Large stone rip rap armors the shoreline in these areas providing stable footing for ingress and egress of the river. As noted above, since the land is owned by NYSTA, a public agency of New York State, access to and use of this area by the public should not be an issue.

ITEM 14: Develop Recreational Access/Facilities at Varick Island: Staff recommends that Erie should assist the City of Oswego to develop the Varick Impoundment Trail, access to Varick Island and facilities on Varick Island.

RESPONSE:

Erie -56

Erie disagrees with Staff's recommendations regarding further access to and development of Varick Island.

In the transfer of assets that occurred when Erie took over the Varick development from Niagara Mohawk, Varick Island was not transferred to Erie and thus remains under the ownership of Niagara Mohawk. At the time that Niagara Mohawk was working with the City on development of the extension of the Westside Linear Park across the powerhouse tailrace and onto Varick Island, Niagara Mohawk was negotiating with the City of Oswego to transfer ownership of Varick Island to the City for the purpose of allowing the City to develop the Island. The funding for the majority of this development work was to be pursued by the City through various grants and loans that were available to them. To date, this transfer of the Island to the City by Niagara Mohawk has not occurred.

Since ownership and development of Varick Island remain issues between Niagara Mohawk and the City, Erie is not a part of this activity and will not fund additional work on Varick Island. Erie will continue to grant the City an easement for operation and maintenance of the extension of the West Side linear park walkway across the face of the Varick powerhouse. Upon completion of the land transfer between Niagara Mohawk and the City, Erie will amend the license for Project No. 2474 to remove Varick Island from the Project Boundary.

C - 26

ERIE-56 Although Erie may not be a party to the negotiations between NMPC and the city of Oswego concerning the transfer of Varick Island, this property remains in the current project boundary and Erie, as a subsequent licensee, is responsible for the project as licensed. Assisting the city in completing the recreational trail and providing additional access to Varick Island would help ameliorate the overcrowding of areas currently available for fishing and other recreation. However, we recognize that if the city's plan to construct a pedestrian walkway across the Varick development's headgates do not materialize, the need for Erie to extend the West Side Linear Park trail an additional 250 feet would be diminished. We modified the text of section V.C.7.d (Recreational Resources) to reflect the contingent nature of the development of this trail and that Erie should coordinate with the city of Oswego its plans for the Varick Impoundment Trail. We also adjusted our recommendation in section VII.A (Comprehensive Development and Recommended Alternative) of the final EA to reflect this cooperative approach.

ITEM 15: Develop a Plan to Monitor Recreation Usage: FERC requests that Erie consult with the agencies and develop a plan to monitor recreational use of the Oswego River Project area.

RESPONSE:

Erie agrees with Staff's conclusion that recreation "...in the project area is dynamic and needs to be monitored at a level beyond the standard Commission-required 6-year Form 80 Report." Erie does not believe, however, that it is necessary to monitor recreational use, particularly fishing, when data is already periodically collected, and when the recreation sites offering access are owned and managed by entities other than Erie.

Erie does not own formal recreation sites at any of the three developments that provide access to Project waters: Access is provided from multiple public and private recreation sites. Erie has assisted in funding public access projects in the past, but management of these sites is controlled by the local municipalities and private owners. Erie does take significant measures to ensure angler safety in the tailwaters of each development. Erie does not accept responsibility for monitoring recreational use at locations that are outside of its control.

Erie -57

Erie proposes to periodically consult with state and local agencies and organizations that are responsible for managing the recreation resources in the Project area, and obtain estimates of recreational use from these organizations. Information obtained will be summarized and filed with the FERC in a memorandum report. Data will be collected on a six (6) year cycle to coincide with the FERC Form 80 filing requirements.

The primary recreation activities that occur in this section of the Oswego River are boating and fishing from the shoreline and while wading. Boating appears to be primarily transient, as boat traffic uses the Oswego River as a thruway and typically does not stop for recreation pursuits in the study area. This boat traffic is already monitored through records kept by the New York State Thruway Authority at locks along the river. Recreational fishing is a popular activity, particularly downstream of the Varick development. Fishing effort on the Oswego River, including the Project area, is monitored periodically by the New York Department of Environmental Conservation (DEC). Additional estimates of recreational use may also be maintained by local municipalities for the recreation sites they own and maintain, and from local and regional tourism departments.

The following documents are available from the DEC, all of which provide angler data for the study area. Angler data provided in the following reports includes estimates of the number of anglers and angler days, expenditures, trip characteristics, species sought, angler satisfaction and trends in fishing.

New York State Department of Environmental Conservation, 1997. New York Statewide Angler Survey 1996 Report 1: Angler Effort and Expenditures. Division of Fish and Wildlife, Albany, NY. Prepared by N.A. Connelly, T.L. Brown, and B.A. Knuth.

_____, 1990. Estimated Angler Effort and Expenditures in New York State Counties. Division of Fish and Wildlife, Albany, NY.

ERIE-57 The responsibility for providing public access to project waters for recreational use rests with the project licensee. The Oswego Project is fortunate to have a variety of public access locations that Erie has supported. Erie's financial support, however, does not eliminate its responsibility to provide access or to monitor recreational use to determine if the access is sufficient to meet the needs. The Oswego Project waters are highly used for recreation, and we continue to agree with Interior that the additional monitoring is necessary to help Erie plan for and address the future recreational demands at the project. The sources of recreational use data that Erie cites could certainly be used as a component of the monitoring that we recommend.

D. RE-ANALYSIS OF FLOW AVAILABILITY AND ENERGY POTENTIAL

Re-Analysis of Original 1991 License Application

In responding to this DEA, Erie felt compelled to re-analyze the flow availability and energy potential of these developments and the corresponding energy impacts of the various environmental measures suggested within the DEA. This analysis was performed because:

Erie -58

- Approximately thirteen years of additional daily flow record is available (25% more data) since last updating the flow-duration curves that are paramount in estimating the energy effects.
- The last energy update of these developments was reported in Attachment 2 of Niagara Mohawk's August 9, 1993 correspondence to FERC, over 6 years ago. Since then, changes to the proposed operations have occurred. Varick and Minetto currently are not scheduled for turbine upgrades as proposed in 1993. In addition, Granby is not scheduled for Kaplan rehabilitation of one turbine as was planned in 1993.
- Previous energy estimates were made using annual or seasonal duration-curves at best. In was felt that monthly energy effects should be estimated for this update.

Flow Analysis

Erie -59

The daily flow record for water years 1934 – 1998 from the USGS gage at Lock 7 (No. 04249000) on the Oswego River was used to develop monthly flow-duration curves. Previous analyses used flows for water years 1934-1985.

As can be seen in the table below, FERC omitted May's flow and then applied a one-month offset to the remaining monthly flow estimates. In addition, the table shows that the annual estimate of flows has changes by the addition of thirteen years of daily flows. These results required a complete re-analysis of the energy component of the original license.

D - 1

ERIE-58 We conducted an independent assessment of the energy consequences of various alternatives, in essence based on some of the reasons that Erie cites. We included the results of this analysis in the EA. For consistency with the period of record reflected in Erie's license application, we used flows for water years 1934 to 1985 in our analysis.

ERIE-59 Table 1 of the draft EA contained a typographical error (the average flow for April was omitted), and we corrected this table to be consistent with the average monthly flow information in the license application. The application indicates that average monthly flow for April is 13,300 cfs, rather than the 13,000 that Erie indicates in its table of average daily flows. However, we did not use any of the information in table 1 of the draft EA for our updated energy analysis.

Erie -59

Average Daily Flow (cfs)			
Month	FERC's[1] DEA	Niagara Mohawk's License Submittal Water Years (1934-1985)	Erie's Analysis Water Years (1934-1998)
Jan	7820	7820	8510
Feb	7930	7930	9640
Mar	12000	12000	11730
Apr	8350	13000	13660
May	5140	8350	9330
Jun	3560	5140	6490
Jul	2490	3560	4880
Aug	2720	2490	3280
Sep	3670	2720	3050
Oct	5660	3670	4130
Nov	8260	5660	6300
Dec	6740	8260	9310
Annual	6200	6740	7510

Energy Analysis

Using the newly developed flow-duration curves[2], monthly energy estimates were performed for the Fulton, Granby, Minetto and Varick hydro developments.

Although the Granby hydro development is not part of license 2474, impacts to its energy potential will result, and must be accounted for, to allow for balancing of environmental measures, as recommended in FERC's DEA, to occur.

The following energy estimates were performed for each development and are summarized below:

Erie -60

- *Existing Operation* – estimates the energy potential assuming continued operation of each development as defined in their current FERC license.
- *DEA ROR Only* - estimates the energy potential of changing each developments' existing operation from a pulsing to run-of-river operation as recommended in the DEA.
- *DEA ROR + Minimum and Base Flows* - estimates the energy potential of changing each developments' existing operation from a pulsing to run-of-river operation with the added environmental concession of supplying minimum and base flows, as recommended in the DEA. Therefore, differences in this operation and the *DEA ROR Only* operation establish the energy loss of providing minimum and base flows.

[1] FERC's DEA, Table 1, page 36.
[2] See Attachment A.

D - 2

A-37

ERIE-60 As indicated in our response to ERIE-58, we conducted an independent energy analysis based on updated information. Our analysis considered weekly average flow data obtained from the USGS Internet site through water year 1985, rather than monthly flow duration. We reassessed our energy modeling results based on Erie's comment. Our energy estimates are reasonably similar to Erie's at Fulton and at Minetto but differ for the Varick development. Erie assumed that fish attraction and conveyance flows would not be included in the minimum flows that we recommend releasing to the upper bypassed reach. We assumed that the fish attraction and conveyance flow would be released to the upper bypassed reach (consistent with one of Interior's initial downstream fish passage prescriptions). However, Interior's modified downstream fish passage prescription for Varick (filed after the draft EA was issued) specifies that the downstream passage facilities should be installed at the powerhouse, not the intake canal headgates. Therefore, the fish conveyance flow of 168 cfs (specified in the modified prescription) could not be included in the minimum flow released to the upper bypassed reach. Consequently, we now include the cost of lost energy associated with fish conveyance at the Varick development, thus bringing our energy estimates for Varick closer to those estimated by Erie. Given the similarities in energy modeling results, we stand by the approach that we used.

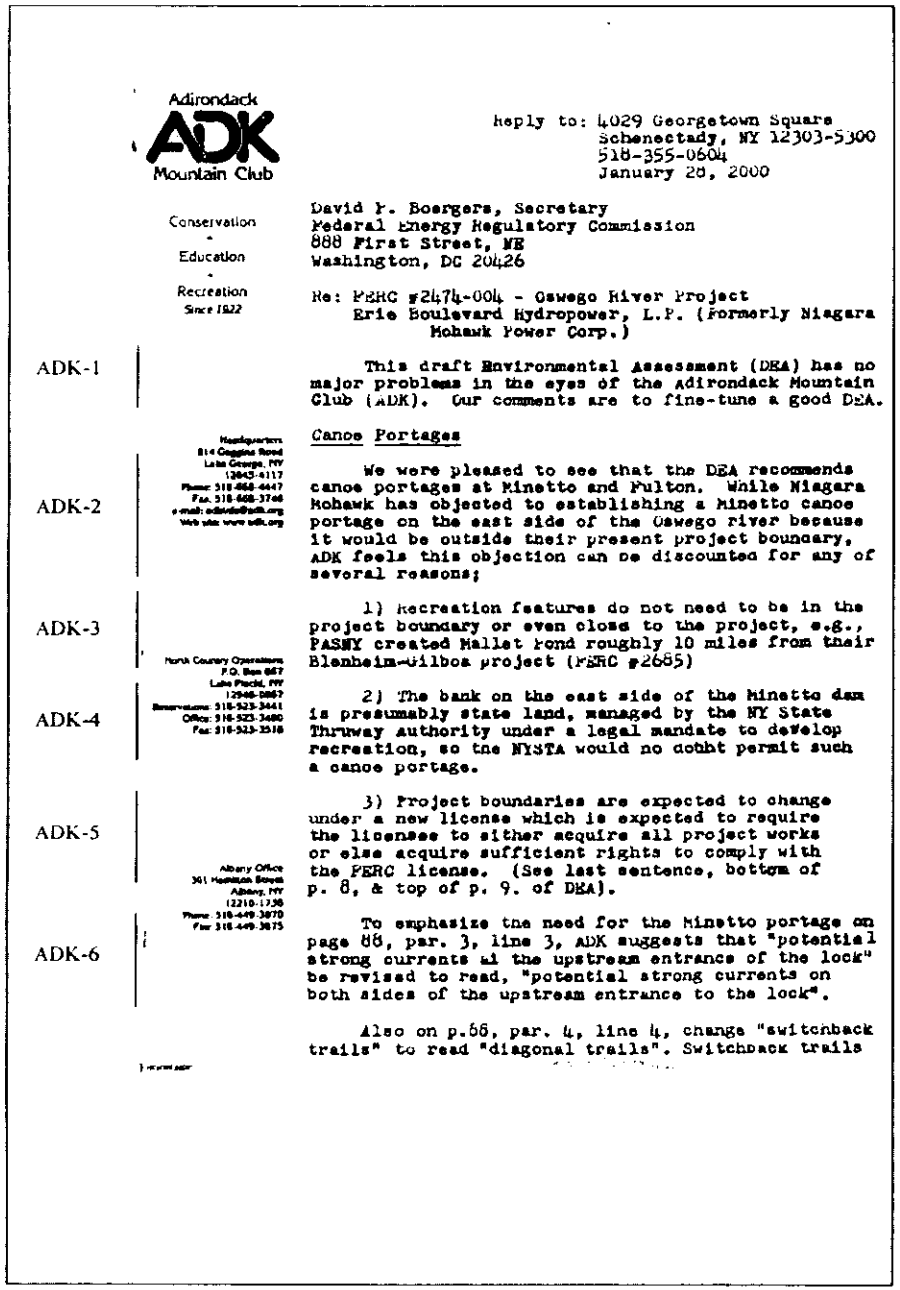
Erie -60 cont

- *DEA ROR + Minimum and Base Flows + Fishway Flows* - estimates the energy potential of changing each developments' existing operation from a pulsing to run-of-river operation with the added environmental concession of supplying minimum, base flow and fishway flows, as recommended in the DEA. Therefore, differences in this operation and the *DEA ROR + Minimum and Base Flows* operation establish the energy loss of providing fishway flows.

- *DEA ROR + Minimum and Base Flows + Fishway Flows + Pneumatic FBs* - estimates the energy potential of changing each developments' existing operation from a pulsing to run-of-river operation with the added environmental concession of supplying minimum, base flow and fishway flows, and installing pneumatic flashboards, as recommended in the DEA. Therefore, differences in this operation and the *DEA ROR + Minimum and Base Flows + Fishway Flows* operation establish the energy gain of installing pneumatic flashboards.

The energy estimates were performed on a monthly basis with detailed estimates of On-peak and Off-peak generations being made (See Attachment B for details). This energy study is more detailed than previous studies conducted for this license. Since 1993, the business environment within the State of New York has changed dramatically. Since the creation and implementation of the New York Independent System Operator (NYISO) in November of 1999 to run a deregulated electric energy market, the importance and economic value of On-peak generation has become clearer. Therefore, a breakdown of generation into On-peak and Off-peak components is essential in any analysis conducted to determine the financial consequences of accepting any FERC proposed license conditions. The On-peak period has been assumed to occur from 7am to 10pm, Monday through Saturday, or for 84 hours per week.

The results of each development's monthly energy simulations can be summarized into annual energy impacts at each development and for various environment measures as shown below.



Adirondack ADK Mountain Club

Conservation
Education
Recreation
Since 1922

Reply to: 4029 Georgetown Square
Schenectady, NY 12303-5300
518-355-0604
January 28, 2000

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

Re: FERC #2474-004 - Oswego River Project
Erie Boulevard Hydropower, L.P. (Formerly Niagara Mohawk Power Corp.)

ADK-1 This draft Environmental Assessment (DEA) has no major problems in the eyes of the Adirondack Mountain Club (ADK). Our comments are to fine-tune a good DEA.

Canoe Portages

ADK-2 We were pleased to see that the DEA recommends canoe portages at Minetto and Fulton. While Niagara Mohawk has objected to establishing a Minetto canoe portage on the east side of the Oswego river because it would be outside their present project boundary, ADK feels this objection can be discounted for any of several reasons;

ADK-3 1) Recreation features do not need to be in the project boundary or even close to the project, e.g., PASNY created Mallet Pond roughly 10 miles from their Blenheim-Gilboa project (FERC #2685)

ADK-4 2) The bank on the east side of the Minetto dam is presumably state land, managed by the NY State Thruway Authority under a legal mandate to develop recreation, so the NYSTA would no doubt permit such a canoe portage.

ADK-5 3) Project boundaries are expected to change under a new license which is expected to require the licensee to either acquire all project works or else acquire sufficient rights to comply with the FERC license. (See last sentence, bottom of p. 8, & top of p. 9. of DEA).

ADK-6 To emphasize the need for the Minetto portage on page 88, par. 3, line 3, ADK suggests that "potential strong currents at the upstream entrance of the lock" be revised to read, "potential strong currents on both sides of the upstream entrance to the lock".

Also on p.88, par. 4, line 4, change "switchback trails" to read "diagonal trails". Switchback trails

Responses to Comments of
Adirondack Mountain Club
on the Draft Environmental Assessment for the
Oswego River Project
January 28, 2000

ADK-1 No response required.

ADK-2 No response required.

ADK-3 We would require Erie to incorporate into the project boundaries any canoe portage at Minetto that is required under a new license. Our policy is to include project-related recreational facilities within project boundaries. Sometimes we establish "islands" to incorporate noncontiguous property, but this canoe portage would be adjacent to the existing boundary.

ADK-4 Opinion noted.

ADK-5 Agreed. Please see our response to ADK-3.

ADK-6 Agreed. We modified the text of section V.C.7 of the EA, Recreational Resources, accordingly.

ADK-7

preclude the carrying of a canoe on one's shoulders when going downhill, unless one repositions the canoe so the forward end dips down, enabling one to clear the hill at each switchback turn. This canoe position interferes with vision ahead.

Trapping

ADK-8

Per p.84, par. 1, ADK notes that at the Fulton project, DEC has requested access above and below the powerhouse for "fishing, hunting and trapping where applicable". This project is in the City of Fulton's downtown area with very little land and many visiting fishermen who either wade or fish from the bank. It is the second most popular lock for fishing (out of 50) per the quoted survey. The amount of land without buildings or project features is minimal for all these visitors. Hence it seems highly inappropriate to suggest trapping in such a heavily used urban area, but the "Our Analysis" did not comment on the trapping proposal.

Salt Pollution

ADK-9

On page 28, end of paragraph 2, ADK noted the statement "Polluted Onondaga Lake contributes abnormally high salt." This combines two separate concepts. Onondaga Lake is a notable source of man-made or avoidable pollution. However salt is a natural pollutant. Syracuse is nicknamed Salt City because of the 19th century salt industry which boiled off water to obtain salt and the Salt Museum preserves a record of that heritage. As mining equipment developed, it became more economic to go underground to directly mine the salt, which is still being done in the state. This salt stratum could be mentioned in the geology discussion on pp. 29-30.

Rewording is suggested as "Onondaga Lake contributes pollution. Also, underground salt deposits lead to high salt concentrations." This would indicate there is not much hope of changing the salt pollution.

Change of Applicant

ADK-10

In most cases, the DEA wording correctly refers to Erie Boulevard Hydropower as the present owner of the former Niagara Mohawk hydropower plants. In FERC terms, this also means Erie is correctly called the applicant for #2474 and the licensee for other Oswego River projects. There are a few places where this is not up to date:

Page 2, last paragraph has Erie as a future owner

Page 26, first paragraph has NMPC owning Oswego Falls (FERC #5984) still.

ADK-7 Erie proposed an alternative location for the canoe portage that would eliminate the need for the switchback or diagonal trail. We recommend that Erie develop a final design for canoe portage on the eastern shoreline around Minetto dam in consultation with ADK, NYSTA, and NYSDEC.

ADK-8 Opinion noted. We considered the need for access to project waters in the EA. The activities that the public engages in once access is gained are appropriately addressed by local, state, and federal resource agencies.

ADK-9 We agree, and we revised section V.A.2 of the EA, accordingly.

ADK-10 We modified the EA to reflect ADK's suggested changes. The Commission denied a rehearing request on its order of July 26, 1999, transferring 29 projects, including the Oswego River and Oswego Falls projects to Erie, subject to filing certified copies of all instruments of conveyance with the Commission. When the draft EA was issued, the instruments of conveyance had not yet been filed, which meant that NMPC still owned the Oswego River and Oswego Falls projects (and leading to some ambiguity in the draft EA text). On April 28, 2000, Erie filed the appropriate documentation and on May 31, 2000, the Commission notified Erie that it had fulfilled the requirements for the transfer of both licenses and associated ownership, thus eliminating the previous ambiguity.

Project 2L7L
January 2d, 2000

Adirondack Mountain Club

Other Minor Glitches

ADK-11 Page ix, par. 1, lines 6 & 7: Towns in New York do not include cities. Thus the project location should be changed from "towns of Granby, Volney, Minetto, and Oswego" to "cities of Oswego and Fulton and town of Minetto".

ADK-12 Page 27, par. 1, line 6: Change "Recovery Plan" to "Recovery Plant".

ADK-13 Page 47, Table 4, last location: Change "Varick lower tyass" to "Varick lower bypass"

ADK-14 Page 66, par. 2, line 5: There is no "village of Minetto". The cluster of buildings near the Minetto development is an unincorporated hamlet in the Town of Minetto, served by a Minetto post office. The intent could be either the hamlet or town, so that is left to PSRC to decide.

Conclusion

ADK-15 The aesthetics of the Oswego river are surprisingly good for an area close to population centers. Presently fishermen are heavy users of this area. Additional facilities for them are needed, but other recreational uses such as canoeing, walking along the river, and picnicing should also be encouraged with new facilities. Such facilities are proposed in this DEA.

Betty Lou Bailey

Betty Lou Bailey, Chrm.
Lance Route Subcommittee
Conservation Committee

cc: Service list
C. T. Raabe PSRC
R. Ringlee ADK
K. Sanders DEC
H. Gosselman NYSConsC
J. Caffry ADK

ADK-11 We agree and corrected the EA to refer to the cities of Fulton and Oswego

ADK-12 We corrected this typographical error.

ADK-13 We corrected this typographical error.

ADK-14 We intend consultation to occur with the town of Minetto and revised the text to clarify this.

ADK-15 Opinion noted.

ORIGINAL

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 LUKER ROAD
CORTLAND, NY 13045

OFFICE OF THE SECRETARY
FILED
00 JAN 21 PM 4:01
FEDERAL ENERGY REGULATORY COMMISSION

January 6, 2000

Mr. David Boergers, Secretary
Federal Energy Regulatory Commission
Mail Code: DLC, HL-11.2
888 First St., NE
Washington, DC 20426

RE: **OSWEGO RIVER HYDROELECTRIC PROJECT (FERC #2474)**
Comments on Draft Environmental Assessment

Dear Mr Boergers:

FWS-1 The U.S. Fish and Wildlife Service (Service) has reviewed the November 24, 1999, "Notice of Availability of Draft Environmental Assessment" (DEA) for the subject project. The Service's comments, terms and conditions, and prescriptions were filed by the U.S. Department of the Interior (Department) on March 26, 1996. The Federal Energy Regulatory Commission (FERC) accepted most of the Service's recommendations that were submitted under Section 10(j) of the Federal Power Act. Therefore, the Service concurs with most aspects of the DEA.

FWS-2 The DEA did not concur with the Service's recommendation to withhold reinstallation of flashboards until after July 1. This recommendation would be a moot point at those sites where pneumatic crest gates are installed. Since FERC has only required pneumatic crest gates at Varick, the issue is still pertinent at Minetto and Fulton. FERC did not require pneumatic crest gates at Minetto due to the low height of the flashboards (10"). However, since the impoundment must be drawn down to allow reinstallation of the flashboards, the actual water level fluctuation is much greater than 10". There are many valuable low-lying habitats around the Minetto impoundment that are impacted by these fluctuations. Therefore, the Service continues to recommend that flashboard installation be delayed until the end of the Centrarchid spawning season. In lieu of this delay, pneumatic crest gates or a similar device could be installed.

FWS-3 The FERC accepted the Department's fishway prescriptions, although the DEA concluded that the measures were not necessary. The Service does not concur with FERC's conclusions regarding the need for fishways nor their rationale to support these conclusions. However, since this discussion falls under the auspices of the Department's Section 18 prescription authority, we will provide our comments on that issue under separate cover when we file our modified prescription.

FERC DOCKETED
JAN 21 2000

000127-0483

Responses to Comments of
U.S. Fish and Wildlife Service
on the Draft Environmental Assessment for the
Oswego River Project
January 6, 2000

FWS-1 No response required.

FWS-2 In response to the draft EA, in particular our recommended development of a plan to minimize the loss of flashboard material downstream of the Fulton and Minetto developments, Erie stated that it could reinforce the flashboard systems so that they would only fail during extreme flood events. Such reinforcement should reduce the incidence of flashboard failure, especially during the centrarchid spawning season. During the Section 10(j) meeting, it was apparent that the primary concern of FWS and NYSDEC with flashboard reinstallation was with the drawdown below the crest of the dam required to protect workers on the dam from potential unexpected spillage. Erie indicated during the meeting that the drawdown at Fulton was about 1 foot below the crest and at Minetto, about 6 inches. Although Erie's suggested reinforced flashboard system would minimize the need for flashboard reinstallation, at the meeting, we agreed that it would be prudent to restrict flashboard reinstallation to periods outside the centrarchid spawning period (i.e. before May or after June). We modified section V.C.3 of the final EA to reflect our acceptance of this recommendation. Please see also our responses to ERIE-47 and ERIE-48.

FWS-3 No response required.

FWS-4

We appreciate the opportunity to review the DEA and commend the FERC for generally recognizing the valuable fish and wildlife resources of the Oswego River. If you have any questions or need additional information, contact Steve Patch at (607) 753-9334.

Sincerely,

David A. Stilwell
Field Supervisor

cc: NYRU, Rome, NY (B. Carpenter)
NYSDEC, Cortland, NY (L. Wedge)
DOI, Newton Corner, MA (J. Stolfo)
NPS, Boston, MA (K. Mendik)
FWS, Hadley, MA (A. Hoar, C. Orvis)

FWS-4 No response required.

ORIGINAL

New York State Department of Environmental Conservation
Division of Environmental Permits, Room 538
50 Wolf Road, Albany, New York 12233-1750
Phone: (518) 457-2224 • FAX: (518) 457-7758
Website: www.dec.state.ny.us

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OFFICE OF THE SECRETARY
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FEDERAL ENERGY
REGULATORY
COMMISSION

John P. Cahill
Commissioner

January 4, 1999

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

Re: Comments on Oswego River Project No. P- 2474-004

Dear Mr Boergers:

NYDEC1-1 This letter provides comments regarding the Federal Energy Regulatory Commission's Draft Environmental Assessment (DEA) for the Oswego River, Project No. P-2474-004. This DEA addresses the relicensing of the Oswego River Hydroelectric Project, which is comprised of three developments (Fulton, Minetto, and Varick).

NYDEC1-2 1. We agree with the recommendation to operate the project(s) in Instantaneous Run of River (IROR) mode at or near the top of the dam crest or flash boards. Operation in this manner should significantly restore and help maintain the aquatic resources of the river.

NYDEC1-3 2. We agree with the recommended seasonal minimum flows in the bypassed reaches. These flows are needed to adequately restore the aquatic resources of the bypassed reaches.

NYDEC1-4 3. We agree with the recommendation to implement a pilot study of streambed modifications in the Varick bypassed reach so long as any recommended actions result in: (1) no net loss of habitat compared to that provided by the proposed seasonal base flows; (2) increased angler safety over baseflow conditions in the unmodified situation; and (3) conditions that are more conducive to ethical angling (i.e., areas of refuge for the fish where water depth is sufficient to discourage snagging).

NYDEC1-5 4. We agree with the recommendation to provide and study the effectiveness of downstream fish passage at all of the facilities. However we disagree with the idea of downstream fish passage being contingent on Atlantic salmon restoration plans. We feel that the levels of entrainment mortality occurring at these projects on the species currently inhabiting the river above and below these projects is unacceptable. The results of the entrainment study at the Minetto project clearly showed that entrainment mortality was high enough to have substantial effects on

JAN 10 2000

Responses to Comments of
New York State Department of Environmental Conservation
on the Draft Environmental Assessment for the
Oswego River Project
January 4, 2000 (year shown on letter is incorrect)

NYSDEC1-1 No response required.

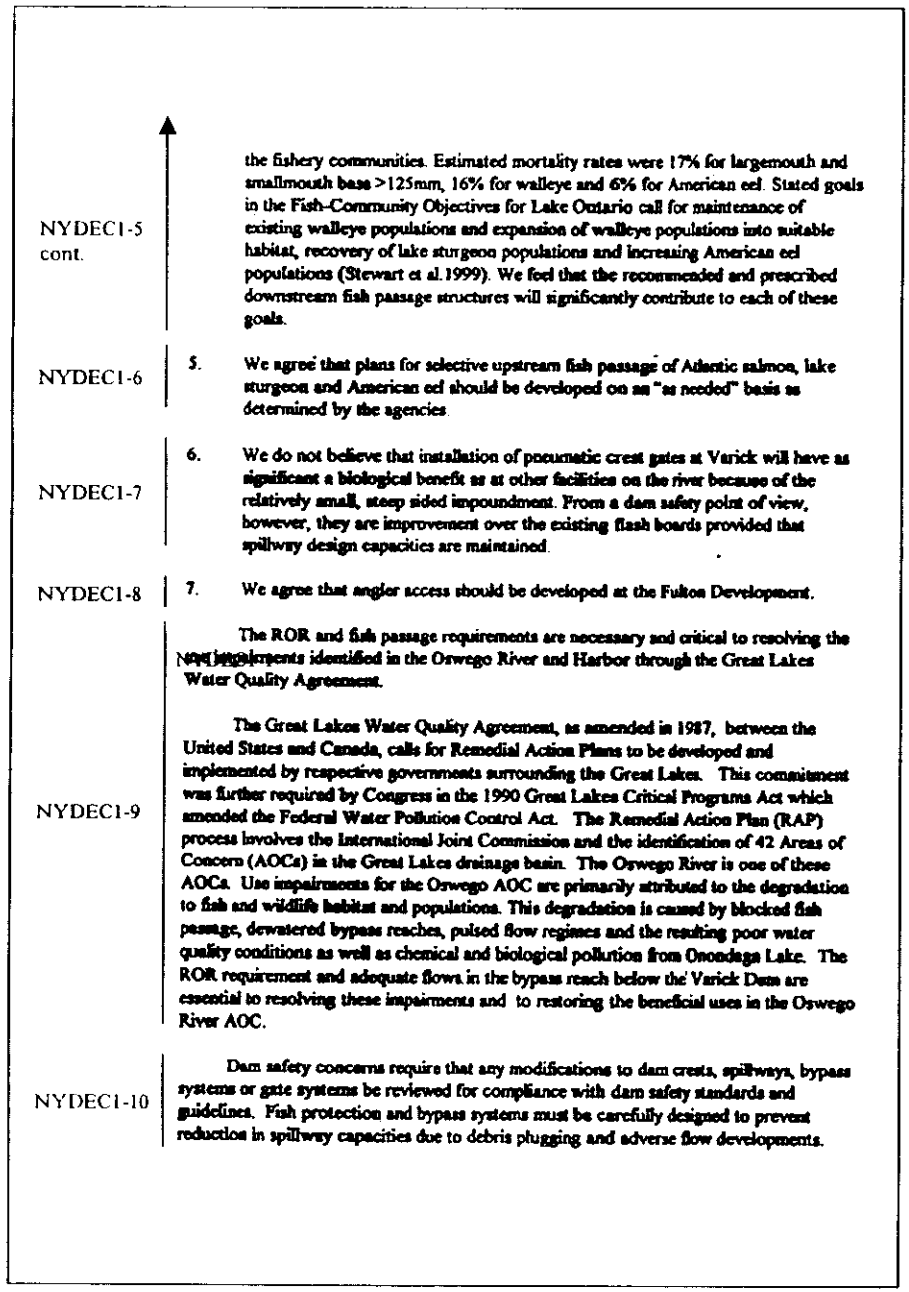
NYSDEC1-2 No response required.

NYSDEC1-3 No response required.

NYSDEC1-4 Erie withdrew its proposal to pursue channel modifications. We continue to recommend seasonal minimum flows to the Varick bypassed reach consistent with NYSDEC's recommended regime. Therefore, in light of Erie's withdrawal of this proposed measure, we no longer see a benefit in continuing to recommend that Erie conduct a pilot study. We modified the text of section V.C.3.b (Fisheries Resources) to reflect the shift in our conclusion. NYSDEC concurred with our deletion of this recommendation at the Section 10(j) meeting. Please see also our response to ERIE-30.

NYSDEC1-5 We detailed our concerns in the draft EA on the potential efficacy of the downstream fish passage structures initially prescribed by Interior. Analysis of the fish protection alternative presented in KA (1995) found that the trashrack overlays initially prescribed by Interior for the Fulton, Minetto, and Varick developments would result in through-slot velocities of 3.7, 4.4, and 4.3 fps, respectively.

(Response to NYSDEC1-5 continued on following page)



NYDEC1-5 cont.

the fishery communities. Estimated mortality rates were 17% for largemouth and smallmouth bass >125mm, 16% for walleye and 6% for American eel. Stated goals in the Fish-Community Objectives for Lake Ontario call for maintenance of existing walleye populations and expansion of walleye populations into suitable habitat, recovery of lake sturgeon populations and increasing American eel populations (Stewart et al.1999). We feel that the recommended and prescribed downstream fish passage structures will significantly contribute to each of these goals.

NYDEC1-6

5. We agree that plans for selective upstream fish passage of Atlantic salmon, lake sturgeon and American eel should be developed on an "as needed" basis as determined by the agencies.

NYDEC1-7

6. We do not believe that installation of pneumatic crest gates at Varick will have as significant a biological benefit as at other facilities on the river because of the relatively small, steep sided impoundment. From a dam safety point of view, however, they are improvement over the existing flash boards provided that spillway design capacities are maintained.

NYDEC1-8

7. We agree that angler access should be developed at the Fulton Development.

NYDEC1-9

The ROR and fish passage requirements are necessary and critical to resolving the [illegible] requirements identified in the Oswego River and Harbor through the Great Lakes Water Quality Agreement.

The Great Lakes Water Quality Agreement, as amended in 1987, between the United States and Canada, calls for Remedial Action Plans to be developed and implemented by respective governments surrounding the Great Lakes. This commitment was further required by Congress in the 1990 Great Lakes Critical Programs Act which amended the Federal Water Pollution Control Act. The Remedial Action Plan (RAP) process involves the International Joint Commission and the identification of 42 Areas of Concern (AOCs) in the Great Lakes drainage basin. The Oswego River is one of these AOCs. Use impairments for the Oswego AOC are primarily attributed to the degradation to fish and wildlife habitat and populations. This degradation is caused by blocked fish passage, dewatered bypass reaches, pulsed flow regimes and the resulting poor water quality conditions as well as chemical and biological pollution from Onondaga Lake. The ROR requirement and adequate flows in the bypass reach below the Varick Dam are essential to resolving these impairments and to restoring the beneficial uses in the Oswego River AOC.

NYDEC1-10

Dam safety concerns require that any modifications to dam crests, spillways, bypass systems or gate systems be reviewed for compliance with dam safety standards and guidelines. Fish protection and bypass systems must be carefully designed to prevent reduction in spillway capacities due to debris plugging and adverse flow developments.

The approach velocity with Interior's modified prescription would be 2.4 fps at Minetto (but less than 2 fps at Fulton and Varick). Such high through-slot and approach velocities could cause substantial impingement of larger fish, especially under high rates of debris loading. We modified section V.C.3.b (Fisheries Resources) to document our continued concern with Interior's modified downstream fish passage prescription. We cannot justify the cost of these facilities or the lost generation associated with bypass flows without a reasonable expectation that their construction would improve the survival of fish moving past these developments.

NYSDEC1-6 No response required.

NYSDEC1-7 Please see our responses to ERIE-47, ERIE-48, and FWS-2.

NYSDEC1-8 No response required.

NYSDEC1-9 Opinion noted.

NYSDEC1-10 We added text to section VII.A.3 to specify that Erie should consult with NYSDEC, FWS, and NYSTA in the development of our recommended plan to replace the existing flashboard systems at all three developments. Our D2SI would continue to ensure that project features are designed, maintained, and operated in a safe manner.

NYDEC1-11 As noted in the DEA, the Granby Project (FERC # P-2837) shares the dam and impoundment with the Fulton Development. How will the changes in operations at Fulton Development affect the existing Dissolved Oxygen Monitoring and Spillage Agreement for the Granby Project between the applicant and NYSDEC?

NYDEC1-12 One note of correction to the DEA is on page 33. In the second paragraph from the bottom the third sentence should read: For class B, C and D waters the monthly median value, and more than 20% of the samples from a minimum of 5 examinations for total coliform shall not exceed 5000 per 100ml.

Thank you for the opportunity to comment in this matter.

Sincerely,

Kent P. Sanders
Environmental Analyst I

Reference

Stewart, T.J., R.E. Lange, S.D. Orsatti, C.P. Schneider, A. Mathers, M.E. Daniels. 1999. Fish-community objectives for Lake Ontario. Great Lakes Fish. Comm. Spec. Pub. 99-1. 56p.

cc's 14 copies FERC, Service List

NYSDEC1-11 The existing Dissolved Oxygen Monitoring and Spillage Agreement for the Granby Project between Erie and NYSDEC would remain unchanged by changes in Fulton development operations. If this agreement is a condition of the license for the Granby Project, it could not be altered without a license amendment.

NYSDEC1-12 We modified the text of section V.C.2.a of the EA to reflect your suggested changes.

New York State Department of Environmental Conservation
Division of Environmental Permits, Room 538
50 Wolf Road, Albany, New York 12233-1750
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John P. Cahill
Commissioner

January 26, 1999

ORIGINAL

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

00 JAN 31 PM 3:02
FEDERAL ENERGY REGULATORY COMMISSION

Re: Additional Comments on Oswego River Project No. P- 2474-004

Dear Secretary Boergers:

NYSDEC2-1 This letter provides additional comments regarding the Federal Energy Regulatory Commission's Draft Environmental Assessment (DEA) for the Oswego River, Project No. P-2474-004. This DEA addresses the relicensing of the Oswego River Hydroelectric Project, which is comprised of three developments (Fulton, Minetto, and Varick).

NYSDEC2-2 DEC Staff would like to reemphasize the importance of run of river operations for the Oswego River system and adequate bypass flows.. We believe that these license conditions are crucial to resolve the Habitat Use Impairment for the Oswego Remedial Action Plan (RAP). These conditions would eliminate the potential for salmon and walleye to become trapped in the Varick bypass when spillage is stopped as well as provide and enhance spawning areas for several species.

Staff would also like to take this opportunity to provide some technical clarification as to two passages in the DEA.

NYSDEC2-3 On Page 33, the DEA states: " The monthly median value of total coliform is not to exceed 2,400 per 100 milliliters (ml) in class B water. In class C, 20 percent of the samples from a minimum of five examinations of total coliform are not to exceed 5,000 per 100 ml." This paraphrasing of New York's water quality standard is not correct and may lead to confusion and misinterpretation. The statement should read :"In both Class C and B waters the monthly median value of total coliform is not to exceed 2400 per 100 milliliters (ml) and no more than 20 percent of the samples, from a minimum of five examinations, shall exceed 5,000 per 100ml."

NYSDEC2-4 On page 34, the DEA implies a relationship between the dissolved oxygen (DO) levels in isolated pools in the Fulton bypass reach and the DO Monitoring and Spillage Agreement between Niagara Mohawk and NYSDEC for the Granby Project. The DO monitoring samples are taken in the upstream reservoir of Lock 3, not in the bypass reach. While the spillage required under the agreement does increase flows and DO in the bypass reach, the

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Responses to Comments of
New York State Department of Environmental Conservation
on the Draft Environmental Assessment for the
Oswego River Project
January 26, 2000 (year shown on letter is incorrect)

NYSDEC2-1 No response required

NYSDEC2-2 Opinion noted

NYSDEC2-3 We modified the text of section V.C.2.a of the EA to reflect your suggested changes.

NYSDEC2-4 We modified the text of section V.C.2.a of the EA to reflect your suggested changes.

NYSDEC2-4 cont.

agreement was designed to maintain the DO standard in the downstream Fulton-Minetto pool. The Fisheries Enhancement Plan for the Oswego River (Lowrie C. et al, 1994), cited in the DEA, may have misinterpreted the intent of the DO Monitoring and Spillage Agreement.

NYSDEC2-5

While not a subject of this license the DO Monitoring and Spillage Agreement needs to remain in effect, even with run of river operations, to ensure that the DO standards below Fulton / Granby are maintained.

Thank you for the opportunity to comment in this matter.

Sincerely,

Kent P. Sanders
Environmental Analyst I

cc's 14 copies FERC, Service List

NYSDEC2-5 Please see our response to NYSDEC1-11.

MUNI-GEN, L.L.C.

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Arlington, Virginia 22205

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February 22, 2000

Mr. David P. Boergers, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Room 1-A
Washington, D.C. 20426

RE: **Erie Boulevard Hydropower, L.P. – Oswego River Project**
Project No. 2474-004,

City of Oswego's Comments to November 1999 DEA

Dear Mr. Boergers:

OSWEGO-1 By letter dated January 5, 2000, the City of Oswego, New York ("City"), requested additional time to file its comments to the Staff's Draft Environmental Assessment ("DEA") for Project No. 2474's relicensing by Erie Boulevard Hydropower, L.P. ("Erie"). As of today's date the Commission has not acted upon the City's request for additional time; therefore, the City requests that the Commission accept these comments for filing.

The City's comments, where appropriate, attempt to follow the DEA's outline.

OSWEGO-2 Summary – Orion Power New York. The DEA, at footnote 1, states that Erie is doing business as Orion Power New York. The Commission should clarify the relationship of Erie and Orion Power New York. If Orion Power New York is a separate legal entity, then it must be acting as Erie's agent, and not as its alter ego as suggested in the DEA. In either case, given the substituted applicant/incumbent status of Erie, a clear and unequivocal analysis of how an applicant is doing business would be appropriate.

OSWEGO-3 Please also correct the reference to the location of part of the project in the town of Oswego. The Varick development is located in the City of Oswego and plays a significant role in the City's linear park and riverfront revitalization programs.

OSWEGO-4 II. A. – Jurisdiction. The Commission's discussion of navigable waterways should include the possibility of pre-1920 permits and the impact thereon, if any, upon its jurisdiction to relicense the individual sites comprising the Oswego River Project. The Commission is obligated to make, even in

Responses to Comments of
the City of Oswego
on the Draft Environmental Assessment for the
Oswego River Project
February 22, 2000

OSWEGO-1 On January 12, 2000, we extended the deadline for commenting on the draft EA from January 8, 2000, to January 31, 2000, to account for the holidays.

OSWEGO-2 Our EA addresses the environmental consequences of relicensing the Oswego River Project, not the relationship of Erie, the current licensee, with Orion Power New York. In the final EA, we deleted the reference to Orion Power New York from footnote 1 of the summary because it is not germane to the EA.

OSWEGO-3 We made the suggested correction in the final EA.

OSWEGO-4 The Commission has determined that the Oswego River Project is within its jurisdiction. Any discussion of the basis for the Commission's jurisdiction to relicense the individual developments of the Oswego River Project is more appropriate in a license order.

OSWEGO-4 cont

a relicensing proceeding, a preliminary determination of its jurisdictional basis. The City is aware that several projects located on the Oswego River, including the Minetto Project, were built prior to 1920. Given the historic development of the Oswego Canal, the Commission's discussion of navigable waterways should encompass pre-1920 authorization to develop the Erie and Oswego canals.

III. A. 2. a. – **NYSTA Permits and Hydroelectric Easement.** The DEA states that the NY State Thruway Authority permits the use of flash boards at the sites. The authority of the NYSTA to permit or preclude the use of flash boards, gates, etc., should be discussed as the exercise of that state authority could involve issues of federal preemption. Furthermore, the discussion of state authority to control the use of flash boards should also encompass the issue of the NYSTA's hydroelectric easement program, especially as that program could affect future compliance with article 5 requirements.

OSWEGO-5

The NYSTA easement program and its impacts upon the project's economic feasibility should be assessed. The possible ramifications of the easement program are discussed in the attached March 31, 1995 letter from Niagara Mohawk to MDI Associates, a consultant to the NYSTA's hydroelectric easement program.

The City notes herein its concern that Niagra Mohawk had stated in its March 1995 letter to MDI that further negotiations should be held in abeyance until it decided whether to accept the expected new license. Also, the statements in that letter regarding the "economic distress that the low head Niagara Mohawk hydros on the Oswego River find themselves in" should be considered in assessing the licensing of the project as Erie now stands in the shoes of its predecessor applicant.

It would not be in the public interest to issue a new license and then have the anticipated public benefits thwarted by a claim of economic hardship due to changes in project operation and/or the imposition of a state hydroelectric easement for the operation of the projects or even just the installation of flash boards. Moreover, such considerations should not be used to delay acceptance of the license if and when issued as was done with regard to the license for Project No. 5984.

OSWEGO-6

III. A. 2. b. – **Run-of-River Operation.** The City of Oswego supports fully the operation of all projects on the Oswego River in a run-of-river mode. The DEA documents that past operation of the projects did not optimize power production from available water resources. The attached letter from Niagara Mohawk, dated March 19, 1992, together with the letter to MDI, documents the inefficient operation of the Oswego River projects. Moreover, the impacts of the current operation upon the High Dam Project, Project No. 10551, which is owned by the City and is operated in a ROR mode.[1] The High Dam Project consists of four units, two of which are full Kaplan units. Hence, operation of the Oswego River, as proposed by Niagra Mohawk in 1993, would be beneficial for the High Dam

[1] The DEA incorrectly states, at page 25, that the High Dam project is leased to Erie. Erie provides O&M services for the operation of the project, which are constrained in part by the operation of its other projects on the Oswego River. See March 19, 1992 letter.

OSWEGO-5 The Commission requires all applicants for new licenses to operate hydroelectric projects to obtain appropriate control over all features that are necessary for project purposes. That control is typically obtained by direct ownership or acquisition of easements from the owner, which in this case is NYSTA. If a new license is issued for this project, Erie would be free to accept or reject the new license and its associated conditions.

OSWEGO-6 We modified the text of the EA to reflect the fact that Erie only provides operation and maintenance services to the High Dam Project, as requested in Oswego's footnote to its comments. Otherwise, no response required.

OSWEGO-6 cont. Project as well, which currently experiences some wastage of flows due to the operation of the Erie Plants, which are not fully automated or include variable-regulated units.

OSWEGO-7 **Article 5.** The City believes that the DEA should assess whether any additional property rights or interests are needed by the applicant in order to comply with standard article 5 and the public policy served thereby. For example, the application filed in 1991 clearly states in describing the property interests contained in the project's boundary as including those held then by Niagara Mohawk and others. Since then additional properties may have been transferred by Niagara Mohawk. These interest would include interests in the Varick Island transferred to the City of Oswego. The Varick Island transferred was part of a settlement with the DEC resulting in a Consent Order addressing a 1988 fish kill below the Varick Dam.. The fish kill was caused by the stranding of fish during installation of flash boards on Varick Dam

OSWEGO-8 **Prior Operating and Compliance History.** The DEA does not discuss the fish kill incident, or changes in plant operation to minimize the potential for future occurrences. The absence of a compliance history should be explained or one provided as the substitution of applicants is not intended to have the EA written on a clean slate. This especially need herein where Erie has not yet accepted the current annual license and operates the project with the same management as that under its predecessor.

OSWEGO-9 **Fish Passage Facilities.** The DEA would benefit from an assessment of the need for uniformed trash racks for all Oswego River Projects. At present, it is the City's understanding, that only the High Dam (Project No. 10551) and Phoenix (Project No. 4114) sites have trash racks with one-inch bar spacing. Given the apparent change in the immediate need for trash racks with such close spacing, the DEA should have considered an uniformed policy for trash racks at all sites on the Oswego River.

OSWEGO-10 **Comprehensive Plans.** Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. The list of plans considered in the DEA should be updated. For example, there is no mention of the Central New York Canal Corridor Initiative, which is a state and federal program that has established a framework for the comprehensive canal development in Cayuga, Madison, Onondaga and Oswego Counties. This plan and program clearly encompasses the Oswego River Project. Furthermore, there is no discussion of the City of Oswego's Riverfront Revitalization Plan, which would be applicable to the Varick Development.

OSWEGO-11 **Cooperative Agreements and Contributions.** There are several instances in the DEA wherein the applicant evidently is obligated to make contributions towards recreational facilities, fish passage facilities, etc. These contributions and/or the associated plans related thereto should be finalized prior to the issuance of a final EA.

OSWEGO-7 The purpose of the EA is to assess environmental effects of the project, which have nothing to do with who owns property. Standard Article 5 gives any licensee 5 years to acquire property rights to operate the project.

OSWEGO-8 The compliance history of a project is not included in the Commission's NEPA document prepared in support of its licensing decisions. The Commission typically assesses an applicant's compliance history in its licensing order.

OSWEGO-9 As noted in the EA, the need for fish protection and downstream fish passage is heavily dependent on site-specific factors. The high approach and through-slot velocities at the three Oswego River developments are functions of the site-specific configurations of each facility. Different configurations could create lower approach velocities that would render fish protection with 1-inch trashracks more feasible. It also is prudent to consider the results of current studies in our assessment of the practicality of recommending fish protection. When relicensing decisions were made for the High Dam and Phoenix projects, studies had not yet been conducted to assess the effectiveness of 1-inch trashracks for excluding cool- and warmwater species of fish. Such iterative considerations, in many cases, preclude establishing a uniform policy for using narrow-spaced trashracks for fish protection.

OSWEGO-10 The list you refer to is the list of comprehensive plans approved by the Commission under *(Response to OSWEGO-10 continued and the complete response to OSWEGO-11 on following page)*

OSWEGO-12 **Staleness of Data and Binding Effect of Prior Application Proposals.** A significant amount of the data contained in the DEA appears to be dated. All financial data and studies should be reviewed and revised as appropriate. However, such a review should not be used as an opportunity for the applicant to amend its relicensing proposal or that of its predecessor applicant.

Please call me should you have any questions with regard to this filing.

Sincerely,

Paul V. Nolan, Esq.
Consultant to the City of Oswego

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in these proceedings subject to the Commission's July 26, 1999 order pursuant to §385.2010 of the Commission's regulations.

Dated this 22nd day of February 2000,

Paul V. Nolan, Esq.
Consultant to the City of Oswego

cc: Hon. John J. Gosek - Mayor of Oswego
Edward Izyk – City Attorney
FERC Secretary – Original and eight copies
Service List for Project No. 2474 (attached)

Order No. 481-A. Neither plan cited has been filed with the Secretary of the Commission. In section V.C.7 of the draft EA, we considered the New York State Canal Recreationway Plan and the Oswego River Scenic Assessment provided by Oswego County in 1995. The Commission's records do not show that the city filed its Riverside Revitalization Plan with the Secretary.

OSWEGO-11 Our EA makes numerous recommendations that pertain to the Oswego River Project based on our review of the record for this proceeding. Our recommendations, should they be adopted by the Commission, would not become binding until the license order for this project is issued. The applicant is free to voluntarily pursue any of our recommendations in the draft EA, but any requirement would be implemented as a result of a Commission order.

OSWEGO-12 We based the EA on the information available on the record for this proceeding. In some cases, updated information was filed in response to the draft EA and we incorporated this information, as appropriate, into the final EA. Please see our responses to ERIE-20, ERIE-31, ERIE-37, ERIE-38, ERIE-45, ERIE-48, ERIE-56, ERIE-58, and ERIE-60.