NEW YORK STATE OF OPPORTUNITY. | NY Power Authority

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January 21, 2020

VIA ELECTRONIC FILING

Secretary Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Crescent Hydroelectric Project, FERC Project No. 4678
Vischer Ferry Hydroelectric Project, FERC Project No. 4679
Revised Study Plan and Responses to Comments on PSP

Dear Secretary Bose:

On May 3, 2019, the Power Authority of the State of New York (Power Authority), licensee of the Crescent and Vischer Ferry Hydroelectric Projects (Projects), FERC Nos. 4678 and 4679, respectively, filed a Pre-Application Document (PAD) and Notices of Intent to seek new licenses for the Projects. On June 10, 2019, the Federal Energy Regulatory Commission (FERC, or Commission) issued Scoping Document 1 (SD1) for the Projects' relicensing, and on July 10-11, 2019, FERC held scoping meetings and Project site visits. Agencies, non-governmental organizations, and other stakeholders provided their comments on SD1 and requested certain resource studies. On September 23, 2019 the Power Authority filed a Proposed Study Plan (PSP) with the Commission and held a PSP meeting on October 23, 2019. Comments on the PSP were due to FERC on or before December 22, 2019.

In accordance with the Integrated Licensing Process (ILP) schedule included in SD1, the Power Authority hereby provides its Revised Study Plan (RSP), responses to comments on the PSP, and responses to FERC's additional information requests.

In response to stakeholder comments on the PSP the Power Authority is proposing seven studies to be conducted as one-year studies in 2020 (the first study season), as follows:

- Water Quality Study
- Fish Entrainment Study
- Blueback Herring Migration Study
- Fish Community Study
- Aquatic Mesohabitat Study
- Bald Eagle Study
- Recreation Study

Each of the proposed studies is described in detail in the RSP. Other studies that were requested by stakeholders are not being proposed by the Power Authority because the Power Authority believes that these studies do not meet certain FERC Study Plan Criteria, as presented in SD1.

In May 2019, New York Governor Andrew M. Cuomo convened a Reimagine the Canals Task Force (Task Force) to identify ideas/solutions that promote economic development, recreation, and resiliency along the New York State Canal System. Earlier this month, and since the Power Authority filed its Proposed Study Plan in this relicensing effort, Governor Cuomo on January 6, 2020 announced an initiative to reimagine the canals based on recommendations and findings outlined in a Reimagine the Canals Task Force Report released the same day. The announced proposal for the lower Mohawk River, as it relates to the Projects, focuses on flooding resiliency improvements and incorporates various recommendations from the Task Force Report, including the development of an Ice Jam Monitoring and Early Warning System to better alert communities to potential flooding; and further assessments of potential river channel modifications, use of icebreakers/cutters, and possible retrofits to the Vischer Ferry Dam to mitigate ice jams and seasonal flooding on the Mohawk River.

As a result of the Governor's announcement and anticipated work of the Task Force, the Projects' operations and infrastructure may materially change in the future, and current environmental conditions may not be representative of conditions that will exist once the announced initiative is implemented. The Power Authority may consequently need to request procedural and other adjustments to this ongoing relicensing effort to ensure that as additional information emerges from the Reimagine the Canals initiative, it is appropriately accounted for in the relicensing effort and the Power Authority's proposed action.

The Power Authority looks forward to continuing to work with the Commission, resource agencies, Native American nations, local governments, and members of the public on the relicensing of the Crescent and Vischer Ferry Projects. If you have any questions regarding the enclosed PSP, please do not hesitate to contact me. Information regarding the relicensing of the Crescent and Vischer Ferry Projects can be found at the Power Authority's relicensing website at http://www.nypa.gov/cvf.

Sincerely,



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Revised Study Plan
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REVISED STUDY PLAN
FOR THE
CRESCENT AND VISCHER FERRY HYDROELECTRIC PROJECTS
FERC NO. P-4678 AND P-4679





Prepared for:

NEW YORK STATE OF OPPORTUNITY. | NY Power Authority

Prepared by:

Kleinschmidt

JANUARY 21, 2020

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LIST OF ABBREVIATIONS

ADCP	Acoustic Doppler Current Profiler
APE	Area of Potential Effect
BCD	Barge Canal Datum
CVF or Projects	Crescent and Vischer Ferry Projects
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
DO	dissolved oxygen
DOE	Department of Energy
EA	Environmental Assessment
EAP	Emergency Action Plan
ESA	Endangered Species Act
FERC or Commission	Federal Energy Regulatory Commission
FPA	Federal Power Act
FPC	Federal Power Commission
GIS	Geographic Information System
HEC	USACE Hydrologic Engineering Center
HEC-HMS	USACE Hydrologic Engineering Center's Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center River Analysis System
ILP	Integrated Licensing Process
LiDAR	Light Detection and Ranging
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NYSCC	New York State Canal Corporation
NYNHP	New York Natural Heritage Program
NYPA	New York Power Authority
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OPRHP	New York State Office of Parks, Recreation, and Historic Preservation
O&M	operation and maintenance
PAD	Pre-Application Document
PME	Protection, Mitigation, and Enhancement
Power Authority	New York Power Authority

PSP	Proposed Study Plan
RSP	Revised Study Plan
RTE	Rare, Threatened, and Endangered
SAV	submerged aquatic vegetation
SCORP	State Comprehensive Outdoor Recreation Plan
STID	Supporting Technical Information Document
T & E Species	Threatened and Endangered Species
U.S.	United States
USACE	United States Army Corps of Engineers
USDOI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1 INTRODUCTION

The Power Authority of the State of New York (Power Authority or NYPA) is relicensing the Crescent and Vischer Ferry Hydroelectric Projects (FERC Nos. 4678 and 4679) (Projects). The Projects are located on the Mohawk River, about 4 and 14 miles, respectively, upstream from its confluence with the Hudson River in New York. The Power Authority is using the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP) as outlined in 18 C.F.R. Part 5.

In accordance with 18 C.F.R. §§ 5.5 and 5.6, the Power Authority filed its Notice of Intent (NOI) and Pre-Application Document (PAD) on May 3, 2019, which included the Power Authority's preliminary issues and studies list for the Projects. These studies included: 1) a water quality study; and 2) a recreation site inventory and condition assessment.

The Commission issued its Scoping Document 1 (SD1) on June 10, 2019. On July 10, 2019, the Commission conducted environmental site visits to each of the Projects in conjunction with the public scoping meetings on July 10-11, 2019 in Clifton Park, New York, where potential issues were identified by agencies, stakeholders, and the public. Subsequently, the Power Authority received comments on the PAD and the study plans, as well as requests for additional studies and additional information. The Power Authority reviewed these comments, study requests, and additional information requests and developed and filed a Proposed Study Plan (PSP) on September 23, 2019. The Power Authority held a meeting to discuss the PSP on October 23, 2019. Written comments on the PSP were received through December 23, 2019.

The Power Authority has prepared this Revised Study Plan (RSP) in response to the verbal comments received at the Power Authority's PSP meeting and in subsequent discussions with agencies, as well as those comments submitted in writing. The RSP builds on the studies that were initially proposed in the PSP. No new studies have been added to the RSP; the Power Authority proposes the following seven first year, single season studies that were requested by stakeholders: 1) Water Quality Study, 2) Fish Entrainment Study, 3) Blueback Herring Migration Study, 4) Fish Community Study, 5) Aquatic Mesohabitat Study, 6) Recreation Study, and 7) Bald Eagle Study. The Power Authority believes that these seven first season, single year studies are relevant to the Projects and enable FERC to analyze the effects of continued operation of the Projects.

In May 2019, New York Governor Andrew M. Cuomo convened a Reimagine the Canals Task Force (Task Force) to identify ideas/solutions that promote economic development, recreation, and resiliency along the New York State Canal System. On January 6, 2020, Governor Cuomo announced an initiative to reimagine the canals based on recommendations and findings outlined in a Reimagine the Canals Task Force Report released the same day. The announced proposal for the lower Mohawk River, as it relates to the Projects, focuses on flooding resiliency improvements and incorporates various recommendations from the Task Force Report, including the development of an Ice Jam Monitoring and Early Warning System to better alert communities to potential flooding; and further assessments of potential river channel modifications, use of icebreakers/cutters, and possible retrofits to the Vischer Ferry Dam to mitigate ice jams and seasonal flooding on the Mohawk River.

As a result of the Governor's announcement and anticipated work of the Task Force, project operations and infrastructure may materially change in the future, and current environmental conditions may not be representative of conditions that will exist once the announced initiative is implemented. The Power Authority may consequently need to request procedural and other adjustments to this ongoing relicensing effort to ensure that as additional information emerges from the Reimagine the Canals initiative, it is appropriately accounted for in the relicensing effort and the Power Authority's proposed action.

Stakeholders may provide comments on the RSP by February 5, 2020 - within 15 days of this filing. Written comments must be filed directly with the Commission using the eFiling system at http://www.ferc.gov/docs-filing/efiling.asp or by regular mail at Federal Energy Regulatory Commission, 888 First Street, N.E. Washington, DC 20426. Hardcopy filings and submissions to be delivered to the Commission, other than those sent via the United States Postal Service (USPS), must be sent to the Commission's off-site security screening facility at 12225 Wilkins Avenue, Rockville, MD 20852.

The Commission will subsequently issue its Study Plan Determination by February 20, 2020.

The RSP is divided into three sections:

1. Proposed study plans;
2. A discussion of additional study requests; and
3. Appendices with a listing of PSP comment letters and a matrix that summarizes the comments received on the PSP, along with a brief response to each item.

2 PROPOSED STUDIES

In its PSP, the Power Authority proposed seven studies and developed study plans for each of the studies. The Power Authority received PSP comments from stakeholders on the studies related to water quality, fish entrainment, blueback herring migration, fish community and composition, aquatic mesohabitat, and recreation. Comments were also received reiterating requests for additional studies, including requests for an American eel study and a Vischer Ferry ice jam flooding study. Comment letters received on the PSP are provided in Appendix A, while Appendix B summarizes those comments and the Power Authority's responses. In response to these study comments, the Power Authority has revised the study plans for the seven studies proposed in the PSP. The Power Authority is not proposing to conduct any additional studies during the first study season.

2.1 Water Quality Study

2.1.1 General Description of Proposed Study

The Power Authority proposed a water quality study in the PSP. The purpose of the water quality study is to collect certain water quality data and evaluate current water quality conditions at the Projects for those parameters potentially affected by operation of the Projects. The proposed study plan includes utilizing standard sampling methodologies such as in-situ water quality monitors to continuously record dissolved oxygen (DO) and water temperature data, and to conduct bi-weekly sampling of other water quality parameters for the warm season period May through October 2020.

2.1.2 Geographic Scope

The geographic scope of this study encompasses the Projects' powerhouse tailwaters, as well as the lower end of the Project impoundments, immediately upstream of the powerhouse intakes. To assess the effects of each Project on water quality, the study plan proposes sampling sites in each of the Project impoundments just upstream of the powerhouses, and in each of the powerhouse tailwaters.

2.1.3 Study Goals and Objectives

The goal of this study is to evaluate the effects, if any, of each Project on water quality and to determine compliance with State of New York water quality standards. The objectives of this study are to collect continuous DO and temperature data in the Projects' impoundments and

tailwaters during the summer and early fall months (i.e., the period when elevated water temperature and low DO levels are most likely to occur in waters released through the Projects), and to collect additional water quality data for pH, conductivity, and turbidity in the Projects' impoundments, sufficient to characterize current water quality at each Project.

2.1.4 Relevant Resource Management Goals and Public Interest Considerations

The Mohawk River at the Crescent and Vischer Projects is classified by NYSDEC as Class A waters, except for the Barge Canal section associated with the Crescent Project, which is classified as Class C waters. The Barge Canal section classified as Class C includes the Waterford Flight portion of the canal from Lock E-6 where it joins the Mohawk River at the Crescent Project down to Lock E-2, approximately 1.5 miles further down the canal.

Class A waters are described as a source of water supply for drinking, culinary or food processing purposes, primary and secondary contact recreation, and fishing. The waters shall be suitable for fish, shellfish and wildlife propagation and survival (6 NYCRR § 701.6).

Class C waters are described as suitable for fish, shellfish and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes (6 NYCRR § 701.8). Applicable water quality standards for Crescent and Vischer Ferry Project waters are provided in the PAD (see Table 4.3-7).

2.1.5 Existing Information and Need for Additional Information

Existing water quality information for the Mohawk River in the vicinity of the Projects was gathered during PAD development. The USGS works collaboratively with NYSDEC to collect water quality data in the Mohawk River basin. There are two long term water quality monitoring stations within the vicinity of the Projects: Cohoes (located approximately 1.75 miles downstream of the Crescent Dam) and Latham (located approximately 4.5 miles downstream of the Vischer Ferry Dam and 5.75 miles upstream of the Crescent Dam). Table 4.3-8 in the PAD shows the results from these stations for years that data are available.

Additionally, water quality is monitored continuously along a portion of the Mohawk River as part of the Hudson River Environmental Conditions Observing System (HRECOS). There are three monitoring locations along the Mohawk River: at Ilion, New York; at Lock E-8; and at the Rexford Bridge. The Ilion monitoring location is approximately 60 miles upstream of the Vischer

Ferry Dam and is above the Little Falls Project on the Mohawk River. Lock E-8 is located approximately 7 miles upstream of the Vischer Ferry Dam. The Rexford Bridge station is located approximately 3.9 miles (or 4.3 river miles) upstream of the Vischer Ferry Dam. Table 4.3-9 in the PAD shows the available data from the Rexford Bridge and Lock E-8 stations.

Water quality data collected in the lower Mohawk River does not suggest any adverse water quality conditions directly related to the operation of the Crescent and Vischer Ferry Projects. However, because certain water quality parameters, particularly DO and temperature, can be affected by the operation of hydropower projects, updated information on DO and temperature conditions immediately upstream and downstream of the dams/powerhouses is needed to confirm that the Project operations are not having adverse effects on river water quality, and that Project discharges meet applicable water quality standards for these parameters. The Power Authority is not proposing to collect nutrient or chlorophyll-a data for the Projects, as those water quality parameters are not affected by the run-or-river operation of the Crescent and Vischer Ferry Projects.

2.1.6 Project Nexus

The operation of the Projects has the potential to affect certain water quality conditions, primarily temperature and DO, which are critical to aquatic habitat, particularly during the warmer, lower flow periods in the summer. The proposed water quality study will evaluate DO and temperature conditions in the Project impoundments and tailwaters and determine if the waters discharged from the Projects meet applicable New York State water quality standards for these parameters.

2.1.7 Methodology

Task 1. Consultation

The Power Authority consulted with NYSDEC and USFWS water quality staff regarding the planned location of the impoundment and tailwater monitoring locations to be used for continuous DO and temperature monitoring. Based on the discussion, the selected locations have been chosen to be as representative of impoundment and tailwater conditions as possible, while ensuring the safety and security of the instruments and monitor operations/maintenance personnel.

Task 2. Field Work

The Power Authority will conduct a single season study to monitor DO and temperature in the lower impoundment and powerhouse tailwater of each Project using a continuous monitor such as a Hydrolab Datasonde or other self-contained monitor and data logger. The approximate monitor locations are illustrated in Figures 2-1 and Figure 2-2. The upstream monitors will be located at approximately mid-depth of each project's intake. The tailrace monitors will be placed at approximately mid-depth of the water column. Tailrace monitors will also be located such that they will monitor turbine discharge regardless of turbine operation. DO and temperature data will be recorded in 30-minute intervals for the period May through October (six months), as weather and river flow conditions allow. A 30-minute interval will sufficiently categorize the water quality at these run-of river-projects while conserving battery life of the monitors. The continuous monitors will be maintained approximately weekly. The maintenance schedule will be followed as closely as practicable but will consider weather and safety-related issues (e.g., high river flows). At each maintenance check, the monitors will be cleaned, and a spot check of DO and temperature will be collected using a hand-held device to confirm constant monitor data and to account for potential instrument drift and/or fouling. Instrument calibration and maintenance will follow manufacturers guidelines and the USGS 2006 "Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Station Operation, Record Computation, and Data Reporting" (Wagner, et.al., 2006).

In addition to the continuous monitoring, on a bi-weekly basis for the same period (May-October), the Power Authority will collect water quality profiles at each continuous monitoring location. Data will be collected at 1-meter intervals from the surface to the bottom. Data collected will include DO, water temperature, pH, turbidity, and conductivity using a hand-held multiprobe.

The Power Authority will also collect river flow data from the downstream USGS Cohoes gage, as well as daily rainfall and air temperature data which will be used to evaluate changes in DO and temperature conditions in response to changes in river flow and weather conditions.

Figure 2-1. Crescent Project Proposed Water Quality Monitoring Locations

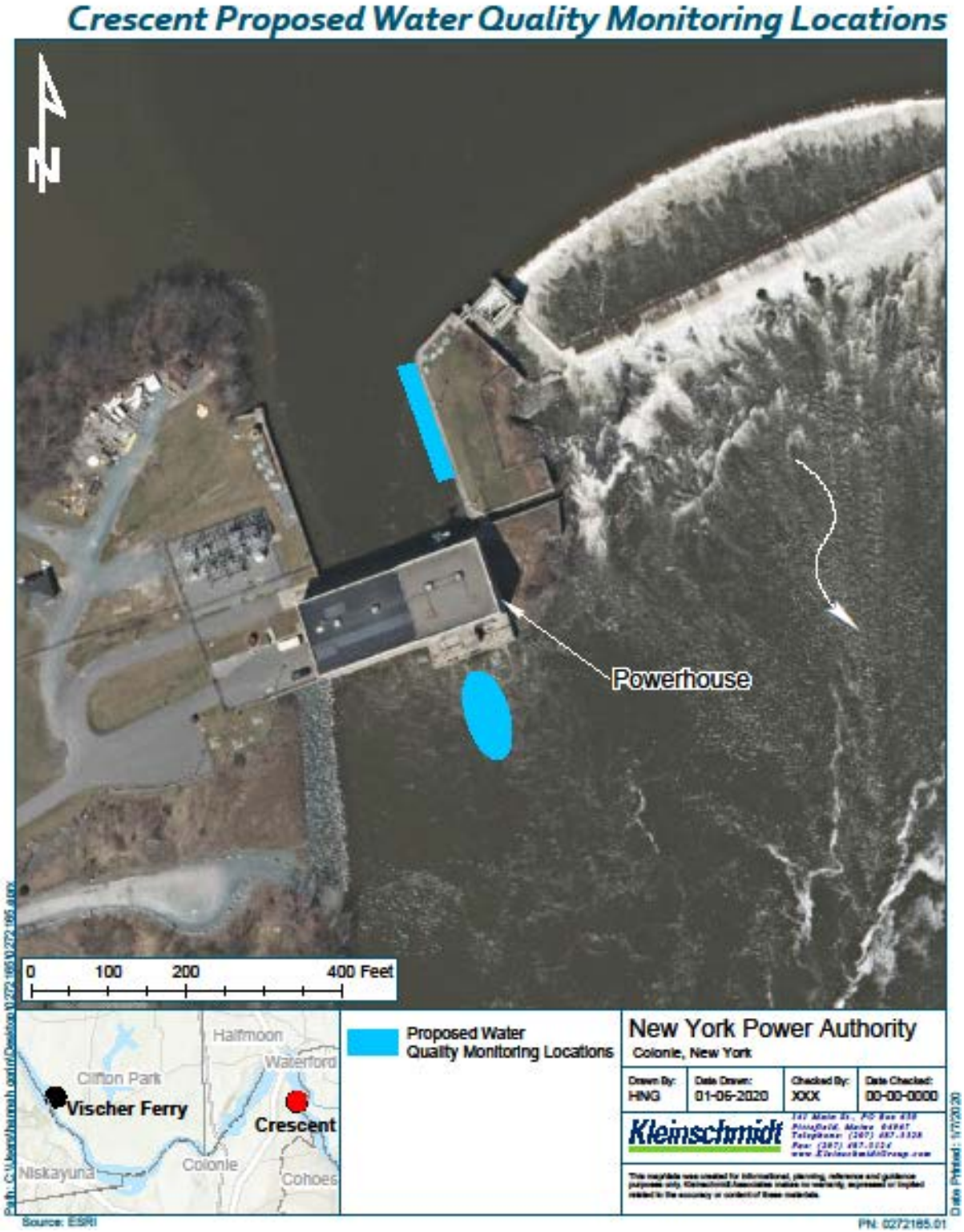
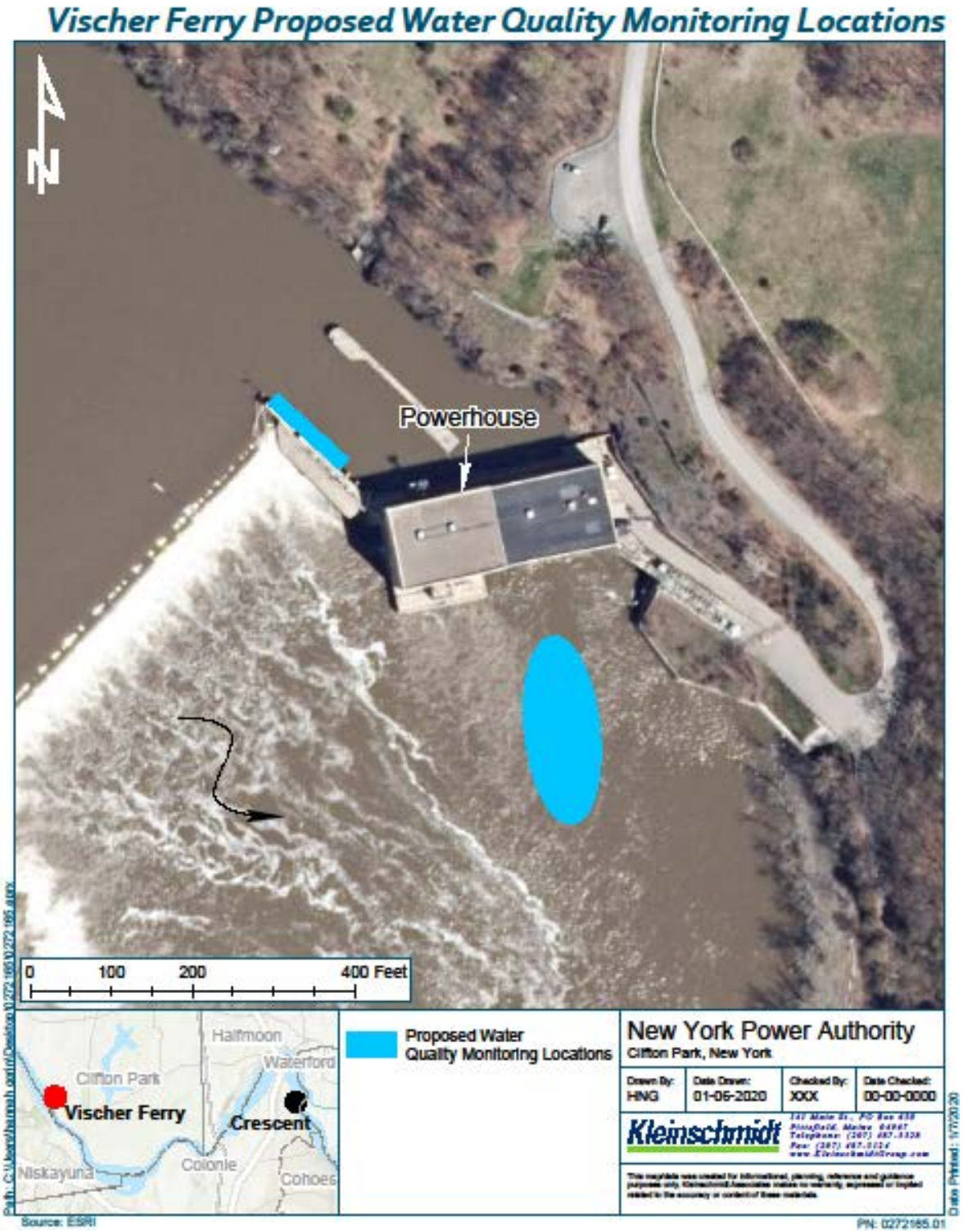


Figure 2-2. Vischer Ferry Project Proposed Water Quality Monitoring Locations



Task 3. Data Analysis

The Power Authority will download all data collected by the continuous monitors and create a water quality database for the Projects. All data will be reviewed following standard quality assurance/quality control protocols, and any anomalous or erroneous data will subsequently be removed from the final dataset. Removed data will be documented with the reasons for removal. Additional grab-sample data for DO, water temperature, pH, turbidity, and conductivity will also be entered into the database. Collected data will be analyzed along with information on river flow (from the USGS Cohoes gage), rainfall, and air temperature data to evaluate trends in DO and temperature conditions upstream and downstream of each Project, and to assess any observable changes in DO and temperature conditions that may be attributable to Project operations. DO and temperature data will also be compared to state water quality standards for these parameters to determine compliance with state standards. Other water quality parameters collected will also be evaluated with respect to applicable state water quality standards.

Task 4. Study Report

The Power Authority will prepare a comprehensive water quality study report. The final study report will be included in the Initial Study Report (ISR) which is scheduled to be filed with FERC in February 2021.

2.1.8 Proposed Deliverables and Schedule

The Power Authority proposes to perform this study in 2020. Study reporting will be conducted in accordance with the Process Plan and Schedule (18 C.F.R. § 5.6(d)(1)), as provided in the PAD, and the FERC's SD1.

Task	Schedule
Task 1. Consultation	December 2019-April 2020
Task 2. Field Work	May-October 2020
Task 3. Data Analysis	November-December 2020
Task 4. Final Study Report	February 2021 (as part of ISR)

2.1.9 Level of Effort and Cost

The estimated cost for the water quality study at the Crescent and Vischer Ferry Projects is approximately $120,000.

2.1.10 References

Hudson River Environmental Conditions Observing System (HRECOS). 2019a. Current Data. Website: http://hudson.dl.stevens-tech.edu/hrecos/d/index.shtml. Accessed March 25, 2019.

Hudson River Environmental Conditions Observing System (HRECOS). 2019b. Historical Data. Website: http://www.hrecos.org/index.php?option=com_content&view=article&id=143&Itemid=54. Accessed March 25, 2019.

New York State Department of Environmental Conservation (NYSDEC). 2018. Water Quality Standards and Classifications. https://www.dec.ny.gov/chemical/23853.html. Accessed December 10, 2018.

United States Geological Survey (USGS). 2018c. National Water Information System: USGS 01356400 Mohawk River Near Latham, NY. Website: https://nwis.waterdata.usgs.gov/usa/nwis/qwdata/?site_no=01356400

United States Geological Survey (USGS). 2018d. National Water Information System: USGS 01357500 Mohawk River at Cohoes, NY. Website: https://waterdata.usgs.gov/nwis/inventory/?site_no=01357500

Wagner, R.J., Boulger, R.W., Jr., Oblinger, C.J., and Smith, B.A. 2006. Guidelines and standard procedures for continuous water-quality monitors—Station operation, record computation, and data reporting: U.S. Geological Survey Techniques and Methods 1–D3, 51 p. + 8 attachments; accessed April 10, 2006, at *http://pubs.water.usgs.gov/tm1d3*.

2.2 Fish Entrainment Study Plan

2.2.1 General Description of Proposed Study

The Power Authority proposes to conduct a study to evaluate the potential for fish entrainment and impingement at the Projects. FERC and other resource agencies and stakeholders requested a fish entrainment and impingement study to evaluate the potential for impingement, entrainment, and survival of migratory and resident game fish at the Projects. The proposed study will be conducted as a desktop study, utilizing existing databases and information to evaluate the potential for entrainment and impingement at the Projects, and to assess turbine mortality/survival rates for both resident and migratory fish.

2.2.2 Geographic Scope

The study area includes the Crescent and Vischer Ferry Projects. The proposed study will evaluate conditions in and around the Projects' powerhouses and intake structures, as well as the downstream end of the Projects' impoundments, in the vicinity of the dams.

2.2.3 Study Goals and Objectives

The primary goals and objectives of this study are to provide a literature-based assessment of the potential for fish entrainment and impingement at the Projects, and to use existing databases, tools, and models to evaluate potential turbine survival rates for representative resident and migratory fish species/lifestages at the Projects.

2.2.4 Relevant Resource Management Goals and Public Interest Considerations

The NYSDEC manages the Mohawk River in the vicinity of the Projects as a mix of warm-water and cool-water species, which includes abundant game species such as smallmouth bass and walleye. The fish community is dominated by warm-water species and is used extensively by recreational anglers (NYSDEC, 2018). The river is also managed for diadromous species including, primarily, the anadromous blueback herring. NYSDEC's fishery management goals for the Mohawk River are multi-faceted and recognize that the fisheries of the Mohawk River watershed, like many inland waters, are in a state of transition (NYSDEC, 2018). Management of the Mohawk River fishery is complicated by the continuous influx of new species through the New York State Canal System and must balance the need to provide desirable fishing opportunities for sportfish while also trying to sustain native biodiversity (NYSDEC, 2018).

2.2.5 Existing Information and Need for Additional Information

During preparation of the PAD, existing information was compiled regarding the physical characteristics of the Crescent and Vischer Ferry Projects, including information on the Projects' powerhouses, intakes and turbines. The PAD provides information on the Projects' facilities in Sections 3 and 4.4.3, respectively. The PAD also provides a list of fish species known to occur in the Mohawk River in the vicinity of the Projects (see Table 4.4-1 in the PAD). In addition, the passage of juvenile blueback herring has been studied at the Project, as has the effectiveness of the existing acoustic deterrent systems operational at both Projects for reducing Project entrainment.

Although there is significant information on the fish species found in the lower Mohawk River and the effectiveness of the Projects' acoustic deterrent systems in reducing turbine passage by juvenile blueback herring, information on the potential for fish entrainment and impingement of other resident and migratory species at the Projects has not previously been assessed. An evaluation of the potential for fish entrainment and turbine passage survival at the Projects for both resident and migratory species will assist in understanding the potential impacts to the fish community.

2.2.6 Project Nexus

Hydropower projects have the potential to entrain and/or impinge both resident and migratory fish species. Although the Crescent and Vischer Ferry Projects are currently operated with seasonal deployment of a hydroacoustic deterrent system designed to route fish away from the Project powerhouses, there is still some potential for fish entrainment and/or turbine passage. This study will provide insight on the potential for fish entrainment and impingement at the Projects and will consider the potential effects of continued Project operation on the fisheries resources within the Project area.

2.2.7 Methodology

The Power Authority proposes to conduct a literature-based study of entrainment and impingement and turbine survival at the Projects using a review of relevant biological criteria, analysis of physical Project characteristics, and existing information on turbine survival rates developed from studies of other conventional hydropower projects. This is an approach that has been used throughout the U.S. and is a generally accepted method for evaluating entrainment and impingement.

Task 1. Describe Intake and Turbine Configurations

The first step in evaluating the potential for fish entrainment and survival is to consider the physical features of the Projects' impoundments, intake structures, and turbine units (including both Francis and Kaplan turbines) that may affect entrainment and turbine passage survival. Features and dimensions of the Projects will be obtained from the Power Authority, including engineering drawings and available bathymetric and/or physical surveys of the impoundments, including substrate information. This information will be used to examine important characteristics, including rack spacing and intake depths, and estimate intake velocities at various flow rates.

Task 2. Field Collection of Intake Velocities

The Power Authority will collect velocity, water depth, and substrate data from the impoundment, as needed to confirm the information calculated or determined from existing information in Task 1. Water velocity and depth measurements in the vicinity of the intake structures at both Projects will be collected using an Acoustic Doppler Current Profiler (ADCP). Substrate information will also be confirmed with the ADCP methodology. Velocity measurements will be collected along pre-determined transects in front of and adjacent to the intake structures during varying combinations of unit operations, including full station operation. These data will then be used to verify the relative magnitude of calculated intake velocities and flow.

Task 3. Water Quality Data Analysis

Impoundment water quality data (DO and temperature) will be analyzed because the potential for fish entrainment, and subsequent potential turbine survival, can be affected by the vertical temperature profile and location of a thermocline and the dissolved oxygen (DO) concentration near the intake structures.

Water quality measurements, including DO and temperature, will be collected as part of the water quality study (see Section 2.1) and will include vertical profile data from the lower end of each impoundment. This data will be used to evaluate potential DO and thermal stratification near the intake structures and to consider how any observed stratification characteristics, such as the depth of the thermocline, might affect fish movement and use in the vicinity of the intake structures.

Task 4. Impingement Analysis

A summary of the existing fish assemblage in both impoundments appears in the PAD (see Table 4.4-1). Life history characteristics and habitat preferences of each species at different life stages will be reviewed in relation to reservoir intake configuration and water quality conditions. Based on these considerations, the fish species included in the entrainment analysis will be selected by determining which fish species, and at what life stages, are most likely to be present near the intake structures.

The potential for impingement on an intake trash rack depends on rack spacing and the size and swim characteristics of various fish species and lifestages. Not all fish species occurring in the impoundments are equally susceptible to impingement because of their habitat use, behavior, and swimming abilities relative to the Project intake velocities. After determining which fish species have the potential to be present in the area of the intake structures, an analysis will be performed to estimate the body length and width of fish that would be physically excluded by the bar rack spacing at each intake structure, and, thus, at risk for potential impingement. The potential for involuntary impingement of these species will then be assessed by comparing swim speed thresholds to intake velocity.

Task 5. Entrainment Analysis

Using standard literature sources, the Power Authority will develop a summary of the life history traits and habitat requirements of fish species as they relate to affecting entrainment at the Projects. Habitat use, swimming performance, behavior, and life stages, for example, are factors affecting entrainment potential. This process will index species and life stages of resident fish across a range from “most” to “least” prone to involuntary entrainment. The potential for involuntary entrainment of the most susceptible species will be assessed by comparing swim speed thresholds to intake velocity.

Based on existing scientific literature and the information compiled in Tasks 1 through 3, comparable projects will be identified, and the results from studies of turbine survival at those projects will be applied, in conjunction with the broader analysis, to estimate the likelihood of fish entrainment and survival at the Crescent and Vischer Ferry Projects.

Task 6. Assessment of Turbine Passage Survival

Investigations of fish turbine passage survival have been independently conducted at numerous hydroelectric projects throughout the country, providing a considerable data set from which a

reasonable estimate of turbine passage survival at the Projects can be made. Winchell et al. (2000) summarized turbine passage survival data reported in the EPRI (1997) database by turbine type, turbine characteristics, and fish size. Based on the consistency of results from numerous studies, it is apparent that fish size rather than species is the primary variable in determining the probability of survival through turbines, with smaller fish being more likely to survive turbine passage (Franke et al., 1997; Winchell et al., 2000). Species-specific estimates of fish mortality through various turbine types (EPRI, 1992) indicate that survival rates across species are generally uniform for each specific turbine type. To estimate survival of fish that may be entrained and passed through the turbines at the Projects, survival studies conducted at similar hydroelectric facilities with similar turbine types and hydraulic capacities to those at the Crescent and Vischer Ferry Projects will be examined and discussed.

Additionally, calculated estimates of turbine passage survival performed by the Department of Energy (DOE) (Franke et al., 1997) will be used to estimate the survival rate using a blade-strike model. The model uses various turbine, fish and operations characteristics to calculate a strike and mortality probability. The Franke blade-strike model will be applied to a subset of fish species/lifestages that are considered representative of other species/lifestages with similar physical characteristics, and will be used to predict turbine mortality associated with both the Kaplan and Francis units.

Task 7. Study Report

Study results will be presented in a final entrainment study report. The study report will discuss the assessment of entrainment and impingement of various species and lifestages that are representative of Project fish communities. The report will also provide the results of turbine survival/mortality estimates. The final study report will be included in the Initial Study Report (ISR) which is scheduled to be filed with FERC in February 2021.

2.2.8 Proposed Deliverables and Schedule

The Power Authority proposes to perform this study in 2020. Study reporting will be conducted in accordance with the Process Plan and Schedule (18 C.F.R. § 5.6(d)(1)), as provided in the PAD, and the FERC's SD1.

Task	Schedule
Tasks 1, 3-6. Literature Search and Analyses	March - September 2020
Task 2. Collection of Field Velocity Data	May - June 2020
Task 7. Final Study Report	February 2021(as part of ISR)

2.2.9 Level of Effort and Cost

The Power Authority believes the proposed level of effort will adequately assess fish entrainment, impingement and turbine survival at the Crescent and Vischer Ferry Projects. The proposed approach is consistent with methods accepted by FERC at numerous other hydroelectric projects. The estimated cost for this desktop study as proposed is approximately $65,000.

2.2.10 References

Carlson, D.M., Daniels, R.A., and Wright, J.J. 2016. Atlas of Inland Fishes of New York. New York State Museum Record 7. Website: http://www.nysm.nysed.gov/common/nysm/files/atlasofinlandfishes.pdf. Accessed December 12, 2018.

Electric Power Research Institute (EPRI). 1992. Fish entrainment and turbine mortality review and guidelines. Technical Report TR-101231, Project 2694-01. Electrical Power Research Institute, Palo Alto, California. 282 p.

Electric Power Research Institute (EPRI). 1997. Turbine entrainment and survival database-field tests. Technical Report TR-108630. Electric Power Research Institute, Palo Alto, California. 13 p.

Franke, G.F., D.R Webb, R.K. Fisher, Jr., D. Mathur, P.N. Hopping, P.A. March, M.R. Headrick, I.T. Laczo, Y. Ventikso, and F. Sotiropoulos. 1997. Development of environmentally advanced hydropower turbine system design concepts. Report 2677-0141. U.S. Department of Energy, Idaho Falls, Idaho. 456 p.

NYSDEC, 2018. Mohawk River Action Agenda 2018-2022 (DRAFT). NYSDEC Mohawk River Basin Program 625 Broadway Albany, New York 12233-3502.

Winchell, F., S. Amaral, and D. Dixon. 2000. Hydroelectric turbine entrainment and survival database: an alternative to field studies. Hydrovision 2000: New Realities, New Responses. HCI Publications, Kansas City, MO.

2.3 Blueback Herring Downstream Migration Study

2.3.1 General Description of Proposed Study

In the PSP, the Power Authority proposed a Blueback Herring (BBH) study that focused on upstream migration of adult BBH through the Projects via the canal locks. The adult upstream BBH study proposed in the PSP was based largely on the Power Authority's belief that previous studies conducted on downstream BBH migration and passage at the Projects had been thoroughly studied during Project redevelopment and installation and monitoring of the acoustic deterrent systems deployed at each of the Projects.

Despite the availability of a number of studies that examined downstream passage of BBH, during the PSP review, stakeholders and FERC clarified that their primary interest focused on two areas: the distribution of downstream migrating adult and juvenile BBH through the various passage routes; and adult and juvenile BBH passage survival through these routes. A number of factors currently exist that limit the ability to accurately conduct studies to address these questions.

Regarding downstream passage distribution, the Crescent Power Plant's fish deterrent system has been in operation since its installation in 2008. Over the past year, the system has experienced operational abnormalities. The Power Authority's troubleshooting concluded that the power cable experienced water intrusion compromising the power needs of the sound projectors. The Power Authority is currently in the process of ordering a new submarine power cable and has notified the resource agencies. The tentative date for the new installation will be in Summer of 2020. In the meantime, the Power Authority will reinstall the current fish deterrent system in the spring to ensure compliance with its FERC license, will advise the resource agencies of the current system's efficacy, and will provide updates on the installation of the new system. Conducting passage route studies, therefore, would not be representative of normal deterrent system operation conditions in 2020.

Additionally, some of the recommendations made by the Reimagine the Canals Task Force could alter conditions at the Projects and, in turn, the available passage routes for downstream migrating fish. As such, the applicability of empirical survival studies on the various passage routes could be reduced in the near future.

Considering all the above, and understanding stakeholder interest in evaluating the overall effect of the Projects and their operation on downstream passage of BBH, the Power Authority

proposes instead to conduct a white paper assessment of downstream passage survival of adult and juvenile Blueback Herring (BBH) at the Projects in 2020. The assessment will be designed to evaluate "whole station survival" for juvenile and adult BBH, and will consider passage survival through each of the turbine types, the spillway notches, sluiceways, spillways and the locks. The assessment will include empirical data previously collected at the Projects and at similar passage routes at other facilities. Additionally, theoretical survival rates will be estimated using accepted methodologies for passage routes where empirical data is unavailable and/or deemed insufficient.

Depending on a number of factors, the distribution of downstream migrants through each passage route may vary. The Power Authority will develop a model considering a range of likely passage distribution options, and the conditions under which the various routes are utilized and to what degree, thereby providing a range of total passage survival estimates.

2.3.2 Geographic Scope

The geographic scope of this study includes Project turbines, sluiceways, spillways, flashboard notches, and the canal and lock facilities associated with each Project.

2.3.3 Study Goals and Objectives

The goals and objectives of this study are to use existing and theoretical data to estimate adult and juvenile BBH downstream passage whole station survival associated with the Crescent and Vischer Ferry Projects.

2.3.4 Relevant Resource Management Goals and Public Interest Considerations

Blueback herring are the primary anadromous fish species that utilize the Mohawk River. Blueback herring are native to the Hudson River basin and have historically gained access to the Mohawk River following the construction of the Barge Canal and lock system. Thus, blueback herring have been documented in the lower Mohawk River for many decades. The Mohawk River, in the vicinity of the Projects, is managed by the NYSDEC as a mixed cool-water and warm-water fishery. The fish community is dominated by warm-water species and is used extensively by recreational anglers (NYSDEC, 2018). The river is also managed for anadromous blueback herring. NYSDEC's fishery management goals for the Mohawk River are multi-faceted and recognize that the fisheries of the Mohawk River watershed, like many inland waters, are in a state of transition (NYSDEC, 2018). Management of the Mohawk River fishery is complicated by the continuous influx of new species through the New York State Canal

System and must balance the need to provide desirable fishing opportunities for sportfish while also trying to sustain native biodiversity (NYSDEC, 2018). The NYSDEC also has an interest in the blueback herring run in the lower Mohawk River. The Atlantic States Marine Fisheries Commission (ASMFC) regulates river herring stocks in New York and has the stated goal to protect, enhance, and restore East Coast migratory spawning stocks of blueback herring in order to achieve stock restoration and maintain sustainable levels of spawning stock biomass.

2.3.5 Existing Information and Need for Additional Information

Blueback Herring have been extensively studied throughout their range. Existing information on blueback herring in the Mohawk River in the vicinity of the Projects was gathered during PAD development. Blueback herring are native to the Hudson River and migrate up the Hudson and various tributaries to spawn in the spring. Historically, blueback herring utilized the Barge Canal and its associated lock system to initially gain access to the Mohawk River. Today, herring continue to use the canal system for upstream migration. Spawning occurs in the Mohawk River and generally begins when water temperatures reach 10-15 ^{o}C. Over the past two decades the blueback herring runs have been in decline all along the eastern seaboard, including in the Mohawk River (Limburg and Ringler, 2012). However, in 2019 the National Oceanic and Atmospheric Administration (NOAA) completed a comprehensive blueback herring status review under the Endangered Species Act (ESA). Based on the best data available, NOAA determined that listing blueback herring as threatened or endangered under the ESA was not warranted at that time (NMFS 2019).

Because the canal and lock system provide upstream passage for blueback herring at the Projects, the Power Authority and resource agencies have focused attention on providing outmigrating herring with safe and effective downstream passage. To this end, the Power Authority has, for many years, installed and operated an acoustic deterrence system in combination with downstream passage facilities at both Projects to enhance downstream passage for both adult and juvenile herring and to minimize turbine passage. As a result of studies that have been done on both turbine passage and the effectiveness of the acoustic deterrent system, a reasonable body of site-specific information is known about downstream migration of blueback herring. For example, the Power Authority studied juvenile blueback herring movements in relation to the hydroacoustic deterrence system at the Crescent Project in 2012 (Normandeau, 2013). As part of this study, the Power Authority obtained estimates of juvenile herring abundance and densities, the timing of the juvenile herring outmigration run,

and the effectiveness of the hydroacoustic system in deterring juvenile herring away from the powerhouse (Normandeau, 2013). There has not, however, been a holistic assessment of downstream migration and whole station survival at the Projects.

2.3.6 Project Nexus

The proposed BBH study will provide information on the downstream passage survival of each potential passage route for adult and juvenile BBH and allow for total station survival estimates at each Project.

2.3.7 Methodology

The proposed study will utilize existing and calculated data to assess the distribution and survival of adult and juvenile BBH through each of the downstream passage routes at the Crescent and Vischer Ferry Projects. Data will be assembled to evaluate total station survival based on a range of downstream passage distribution scenarios.

Task 1. Consultation

The Power Authority will initially consult with the resource agencies, NYSDEC and USFWS, to identify applicable BBH studies, professional organizations, and/or individuals with specific expertise that should be considered as potential data sources. The deliverable for this task will be a memo that identifies potential data sources. The Power Authority will consult with the resource agencies over the course of the study to obtain input and provide updates on study progress. The Power Authority will also consult with the New York State Canal Corporation (NYSCC) to identify typical lock operations during the migration season.

Task 2. Data Collection

The general methodology proposed to achieve study goals and objectives is to conduct a desktop evaluation based on existing information to assess potential downstream passage survival as it may apply to the Projects. Fish passage survival at hydropower projects is an issue considered at facilities around the world. As such, many different evaluations have been conducted that include empirical measurements and theoretical calculations. Therefore, conducting a desktop evaluation on the volume of work completed on this topic along with site-specific considerations including theoretical effectiveness, is consistent with commonly accepted practices in the hydroelectric industry and is particularly appropriate for the Projects due to both existing site-specific information as well as BBH data collected elsewhere.

The list below provides a stepwise progression of the component study tasks.

1) In consultation with the resource agencies, identify existing studies, fisheries professionals with site-specific knowledge, other BBH researchers, and methodologies to assess BBH survival.

2) Obtain information from the results of task 1 and evaluate applicability of those results to the Crescent and Vischer Ferry Projects. The study report will include an annotated bibliography of the information obtained.

3) Use applicable data or methodologies to estimate downstream passage survival at each of the passage routes for juvenile and adult BBH.

4) Develop a model that illustrates total station survival at each project for a range of downstream migrant distribution scenarios. This will include a discussion on likely distribution scenarios based on factors such as river flow and existing deterrent efficiency studies.

Task 3. Reporting

The Power Authority will prepare a BBH downstream migration survival study report. The final study report will be included in the Initial Study Report (ISR) which is scheduled to be filed with FERC in February 2021.

2.3.8 Proposed Deliverables and Schedule

The Power Authority proposes to perform this study in 2020. Study reporting will be conducted in accordance with the Process Plan and Schedule (18 C.F.R. § 5.6(d)(1)), as provided in the PAD, and the FERC's SD1.

Task	Schedule
Task 1. Consultation/Meetings	March - April 2020
Task 2. Data Collection	March - August 2020
Task 3. Data Analysis	Fall 2020
Task 4. Final Study Report	February 2021 (as part of ISR)

2.3.9 Level of Effort and Cost

The estimated cost for the blueback herring downstream passage survival study is approximately $75,000.

2.3.10 References

Dunning, D.J. and C.D. Gurshin. 2012. Downriver Passage of Juvenile Blueback Herring Near an Ultrasonic Field in the Mohawk River. *North American Journal of Fisheries Management*. 32:365-380.

Gurshin, C.W.D., M.P. Balge, M.M. Taylor, and B.E. Lenz. 2014a. *Importance of Ultrasonic Field Direction for Guiding Juvenile Blueback Herring Past Hydroelectric Turbines.* 144th American Fisheries Society Annual Meeting, Quebec, Canada. 21 August.

Gurshin, C.W.D., M.P. Balge, M.M. Taylor, and B.E. Lenz. 2014b. *Importance of Ultrasonic Field Direction for Guiding Juvenile Blueback Herring Past Hydroelectric Turbines*. North American Journal of Fisheries Management, 34:6, 1242-1258, OI:.1080/02755947.2014.963749.

Mathur, D., P.G. Heisey, K.J. McGrath, and T.R. Tatham. 1996. *Juvenile Blueback Herring (Alosa aestivalis) Survival via Turbine and Spillway.* Water Resources Bulletin of the American Water Resources Association. Vol. 21, No. 1. February.

National Marine Fisheries Service (NOAA). 2019. Website: https://www.fisheries.noaa.gov/action/not-warranted-listing-determination-alewife-and-blueback-herring.

Normandeau Associates. 2009. Hydroacoustic Studies of the Downstream Passage of Juvenile Blueback Herring in the Presence of Ultrasound at the Crescent Hydroelectric Project, Mohawk River, New York.

Normandeau Associates. 2012. Hydroacoustic Studies of the Downstream Passage of Juvenile Blueback Herring after Reconfiguration of the Ultrasound at the Crescent Hydroelectric Project, Mohawk River, New York. 2012.

2.4 Fish Community Study

2.4.1 General Description of Proposed Study

The Power Authority is proposing to conduct an assessment of the existing fish community in the lower Mohawk River in the vicinity of the Crescent and Vischer Ferry Projects. The purpose of the study is to evaluate the species composition and relative abundance of the fish community at the Projects using existing fisheries survey data that has been collected by NYSDEC and other agency or university researchers.

2.4.2 Geographic Scope

The geographic scope of this study is the lower Mohawk River in the vicinity of the Crescent and Vischer Ferry Projects. The Crescent impoundment is approximately 10 miles long and the upstream terminus of the impoundment is located at the Vischer Ferry dam. The Vischer Ferry impoundment is 10.3 miles long and the upstream terminus of the impoundment is located at Lock E-8 in Schenectady.

2.4.3 Study Goals and Objectives

The goal of the study is to utilize existing fisheries data for the lower Mohawk River to conduct a comprehensive desktop assessment of the fish community at the Crescent and Vischer Ferry Projects, including a determination of species composition and relative abundance.

2.4.4 Relevant Resource Management Goals and Public Interest Considerations

The NYSDEC manages the Mohawk River in the vicinity of the Projects as a mix of warm-water and cool-water species, which includes abundant game species such as smallmouth bass and walleye. The fish community is dominated by warm-water species and is used extensively by recreational anglers (NYSDEC, 2018). The river is also managed for diadromous species including, primarily, the anadromous blueback herring. NYSDEC's fishery management goals for the Mohawk River are multi-faceted and recognize that the fisheries of the Mohawk River watershed, like many inland waters, are in a state of transition (NYSDEC, 2018). Management of the Mohawk River fishery is complicated by the continuous influx of new species through the New York State Canal System and must balance the need to provide desirable fishing opportunities for sportfish while also trying to sustain native biodiversity (NYSDEC, 2018).

2.4.5 Existing Information and Need for Additional Information

There is existing information on the fish and the fish community in the lower Mohawk River in the vicinity of the Projects. Reports and studies of the Mohawk River fish community produced by NYSDEC, the U.S. Geological Survey (USGS) and other agency and university researchers were gathered during PAD development. Section 1.4 of the PAD gives an extensive description of the fish and aquatic habitat around the Project area, and the PAD also provides a list of fish species known to occur in the Mohawk River in the vicinity of the Projects (see Table 4.4-1 in the PAD). At least 62 fish species have been documented in the Mohawk River and the Canal System from Lock E-6 in Waterford to Lock E-20 in Rome, New York from 1934 through 1983 (McBride, 2009). Fish communities have been sampled several times between 1934-2016, using a variety of methods. Some of the more recent research and studies have been documented in the following reports and technical papers.

- Bureau of Fisheries. 2015 - 2016. Bureau of Fisheries Annual Report. New York State Department of Environmental Conservation.
- Bureau of Fisheries. 2014 - 2015. Bureau of Fisheries Annual Report. New York State Department of Environmental Conservation.
- Connelly, N.A. and Brown, T.L. 2009. New York Statewide Angler Survey, Report 1: Angler Effort and Expenditures. New York State Department of Environmental Conservation Bureau of Fisheries. Website: http://www.dec.ny.gov/docs/fish_marine_pdf/nyswarpt1.pdf. Accessed January 2019.
- George, S.D., Baldigo, B.P., and Wells, S.M. 2016. Effects of Seasonal Drawdowns on Fish Assemblages in Sections of an Impounded River–Canal System in Upstate New York, Transactions of the American Fisheries Society, 145:6, 1348-1357
- Hattala, K.A., A.W. Kahnle, and R.D. Adams. 2011. Sustainable Fishing Plan for New York River Herring Stocks. Bureau of Marine Resources, Hudson River Fisheries Unit, and Hudson River Estuary Program of New York State Department of Environmental Conservation. Website: http://www.asmfc.org/uploads/file/NY_RiverHerring_SFMP.pdf. Accessed January 2019.
- Limburg, Karin and R. Ringler. 2012. Final Report to Cornell Water Resources Institute for blueback herring research on the Mohawk River. **"**Relative Abundance of Blueback Herring (*Alosa aestivalis*) in Relation to Permanent and Removable Dams on the Mohawk River**".** Water Resources Institute, Cornell University. April 15, 2012.
- McBride, N.D. 2009. Lower Mohawk River Fisheries. New York State Department of Environmental Conservation, Stamford.
- McBride, N.D. 1994. A fisheries management plan for the lower Mohawk River. New York State Department of Environmental Conservation, Albany.

- McBride, N.D. 1985. Distribution and relative abundance of fish in the lower Mohawk River. New York State Department of Environmental Conservation, Stamford.

- USGS. 2015-2016. American eel in tributaries to the Mohawk River. The USGS, SUNY ESF, and DEC screening survey of tributaries for American eel.

- Wells, S, Limburg, K. and D Legard, C. 2013. Tracking Blueback Herring in the lower Mohawk River. February 2013. Conference: NY Chapter AFS, At Watertown, NY

- Wells, S. 2018. New York State Department of Environmental Conservation (NYSDEC). Bureau of Fisheries Technical Brief #2018040. Crescent Lake (H-240) Black Bass Survey (Survey #: 418011).

Based on these surveys, the NYSDEC and others have provided general descriptions of the fish community in the lower Mohawk River, but more recently collected fisheries data has not been utilized to provide a current, comprehensive assessment of the fish community in the lower Mohawk River. Thus, although NYSDEC and others have studied and sampled the fish community in the lower Mohawk River for many years, there has been no effort to use the collected fish data to conduct an overall assessment of the fish community since McBride in 2009. The Power Authority's proposed study will gather relevant fisheries data from various sources and will make an updated assessment of the fish community in the Projects' boundaries.

The Power Authority believes that these same studies and fisheries survey efforts provide a great deal of information regarding the status of American eel in the lower Mohawk River. While not all the fish surveys listed above have targeted eel, many of these surveys have utilized methods that would capture eels, if eels were present in the area. Further, one of the identified survey efforts (USGS 2016) specifically targeted American eel in the tributaries of the lower Mohawk River. Specifically, USGS e-surveyed (via electrofishing) 20 tributary sites on the north side of the Mohawk in 2015, and 15 tributary sites on the south side of the Mohawk in 2016. Surveys were conducted using backpack electrofishing, and sampling time generally ranged from 600-1200 seconds depending on the quantity of accessible habitat. According to the USGS, no eels were captured or observed during any of the 35 surveys (George, email correspondence, Jan 2, 2020).

2.4.6 Project Nexus

Crescent and Vischer Ferry Project waters provide habitat for an array of native and non-native fish species, including both resident and migratory species. The proposed study will use existing

data to develop an assessment of the fish community found at the Projects, which in turn can be used to consider how the existing fish community may be affected by Project operations.

2.4.7 Methodology

Task 1. Consultation

The Power Authority consulted with NYSDEC to discuss the availability of and access to existing fish survey data that the agency has collected on its own, or in cooperation with other agencies and researchers, over the past 20 years. Based on these discussions the NYSDEC identified several reports and supporting fish survey data that it has begun providing to the Power Authority for use in the proposed Fish Community study (Table 2-1). Once the data transfer is completed, the Power Authority will again consult with NYSDEC to review the data and confirm that all the available data was shared with NYPA. The consultation will also be used to discuss and identify other agencies and researchers that likely have additional fisheries data. It recognized that each dataset may have been collected for a specific research purpose, but the Power Authority believes that collectively the research data will contribute to a characterization of the fish assemblage in the vicinity of the Projects.

Task 2. Background Research

The Power Authority proposes to continue working with staff at NYSDEC and other identified researchers to obtain fisheries reports as well as any summary and raw data in their files regarding fishery surveys. Table 2-1 is a summary of the various fish surveys that NYSDEC has provided to the Power Authority to date that have been conducted in the lower Mohawk River in the vicinity of the Crescent and Vischer Ferry Project. The Power Authority will contact individuals and organizations identified by the NYSDEC to obtain the identified data and reports. This information may be available in hardcopy only or in a variety of electronic formats. All information will be converted to an appropriate electronic format which may consist of scanned versions of hardcopy reports. Once the data is obtained, an annotated bibliography of all studies will be created and to the extent practical, data from all sources will be assembled into a single electronic database.

Table 2-1. Mohawk River Fish Surveys Near the Crescent and Vischer Ferry Projects

Study/Title	Date	Mohawk River Location	Study Team/ Author	Species	Study Type/ Information	Effort Summary
Fisheries Survey of the Crescent Lake Area of the Mohawk River	1980	Crescent Dam to Lock 7	NYSDEC - Norman McBride	All species	Fish Assemblage	Electrofishing, trap nets, gill nets
JBBH Survival in powerhouse/ turbine passage and spillage over the dam at Crescent Hydro	1992	Crescent	RMC Environmental	JBBH	Turbine Survival Study	Hi-Z Tagging
JBBH Survival via Turbine and Spillway	1996	Crescent	Normandeau	JBBH	Turbine Survival Study	Hi-Z Tagging
Spawning Stock Characteristics of Alewife and Blueback Herring in the Hudson River Estuary and Tributaries, including the Mohawk River 1999-2001	1999-2001, Report 2008	Hudson, Lower Mohawk	Normandeau	Alewife/Blueback Herring	Spawning Stock Assessment	Several gear types, size, age structure, repeat spawning, sex ratio, mortality rates, spawning populations, tagging, retention, mark and recapture
Spawning Stock Characteristics of Alewife and Blueback Herring in the Hudson River Estuary and Tributaries, including the Mohawk River 1999-2001	1999-2001, Report 2008	Hudson, Lower Mohawk	Normandeau	Alewife/Blueback Herring	Spawning Stock Assessment	Several gear types, size, age structure, repeat spawning, sex ratio, mortality rates, spawning populations, tagging, retention, mark and recapture
Final Report on Fish Protection Studies at the Crescent Hydro Project	2002	Crescent and Vischer Ferry Projects	NYPA - Quentin E. Ross	Blueback Herring	Sound Deterrent	Hydroacoustic: High-Frequency Transducers

Study/Title	Date	Mohawk River Location	Study Team/ Author	Species	Study Type/ Information	Effort Summary
Feasibility assessment of methodologies to conduct an adult BBH mark and recapture study at the Crescent Hydro Project	2005	Crescent	Normandeau	Blueback Herring	Tagging Feasibility	
Site survey of Crescent Dam: In preparation for 2007 pilot BBH migration study	2006	Crescent	Kleinschmidt		Frequency Feasibility	
Abstract - Survey 406002 - Norman D. McBride	8/22/2007	Locks 8-9, 10-11, 14-15	Division of Fish, Wildlife and Marine Resources, Bureau of Fisheries	Smallmouth Bass	Abundance/ Size Structure	Electrofishing - lock 8-9: 76 SMB in 5.34hrs, lock 10-11: 40 SMB in 5.63 hrs., lock 14-15: 42 SMB in 6.1 hrs.
Abstract - Survey 405001 - Norman D. McBride	3/28/2008	Locks 8-9, Below Lock 7 and Vischer Ferry Hydro	Division of Fish, Wildlife and Marine Resources, Bureau of Fisheries	Rock Bass, White Perch, common carp	Toxic Substances Monitoring	Electrofishing
Effect of an ultrasonic system on adult BBH at Crescent Hydro	2009	Crescent	Kleinschmidt	Blueback Herring	Ultrasound effect	Radio Tagging 102 BBH
Hydroacoustic studies of the downstream passage of JBBH in presence of Ultrasound at Crescent Hydro	2009	Crescent	Normandeau	JBBH	Ultrasound effect	
Abstract - Survey 412007 - Scott Wells	5/23/2012	Lower River	Division of Fish, Wildlife and Marine Resources, Bureau of Fisheries	Blueback Herring	electrofishing/gut analysis	Electrofishing - 1000 BBH in 5.25 hrs.

Study/Title	Date	Mohawk River Location	Study Team/ Author	Species	Study Type/ Information	Effort Summary
Relative abundance of BBH in relations to permanent and removable dams on the mohawk river	2012	Mohawk River	SUNY	Blueback Herring	BBH spawning runs	Electrofishing
Downriver passage of JBBH near an ultrasonic field in the Mohawk River	2012	Crescent	Normandeau	JBBH	echo integration of backscatter	
Target strength measurements of JBBH from the Mohawk, NY	2012	Crescent	Normandeau	JBBH	Target Strength	
Tracking Blueback Herring in the lower Mohawk River	2013	Lower River	NYSDEC, SUNY ESF	River Herring	Tracking Herring Stock	Electrofishing - 1000 BB in 5.25 hrs.
Hydroacoustic studies of the downstream passage of JBBH after reconfiguration of the Ultrasound at Crescent Hydro	2013	Crescent	Normandeau	JBBH	Hydroacoustics	reconfigured ultrasound (more exposure)
Importance of Ultrasonic field direction for guiding JBBH past hydroelectric turbines	2014	Crescent	Normandeau	JBBH	Hydroacoustics	
Spatiotemporal trends in fish assemblages of the Mohawk River	2014 - 2015	Entire Mohawk	USGS, NYSDEC	All species	Fish Assemblage	Electrofishing

Study/Title	Date	Mohawk River Location	Study Team/ Author	Species	Study Type/ Information	Effort Summary
Abstract - Survey 408002 - Norman D. McBride	2/27/2015	Downstream of Lock E7	Division of Fish, Wildlife and Marine Resources, Bureau of Fisheries	Spottail shiner, emerald shiner, trout-perch, bluegill, smallmouth bass, yellow perch	Fish disease Monitoring	Electrofishing
	2015 – 2016; 2019	Mohawk River Tributaries	USGS, NY Science Center, Scott George	Target American eel and document all species	American Eel Survey	Electrofishing at 55 sites in 30 tributary streams; no eel collected
Scott D. George, Barry P. Baldigo & Scott M. Wells (2016) Effects of Seasonal Drawdowns on Fish Assemblages in Sections of Impounded River-Canal System in Upstate New York, Transactions of the American Fisheries Society, 145:6, 1348-1357.	2016	Permanent Lower Section, 35.2km section between Locks 6 and 8	USGS, NY Science Center, NYSDEC	All species		Electrofishing CPUE: 140-342 fish/h in lower section 3264 individuals from 38 species
Macroinvertebrate Community Structure in the Mohawk River (NY, USA): Gradients in water quality conditions and implications for restoration	6/1/2017	Mohawk River	Onondaga Environmental Institute	Macroinvertebrates	Macroinvertebrate community study - water quality	Multiplate sampling at 56 sites
	8/31/2018	Crescent Lake	NYSDEC - Scott Wells	Black Bass		Electrofishing - 27 run, 8.9 hrs.

Task 3. Data Analysis

The Power Authority will analyze all collected data to characterize the Mohawk River fishery in the vicinity of the Crescent and Vischer Ferry Projects. Depending on the data available, analysis may include species composition, relative abundance, fish condition factors, creel data, and temporal changes.

Task 4. Study Report

The Power Authority will prepare a final study report that characterizes the Crescent and Vischer Ferry fish community. The final study report will be included in the Initial Study Report (ISR) which is scheduled to be filed with FERC in February 2021.

2.4.8 Proposed Deliverables and Schedule

The Power Authority proposes to perform this study in 2020. Study reporting will be conducted in accordance with the Process Plan and Schedule (18 C.F.R. § 5.6(d)(1)), as provided in the PAD, and the FERC's SD1.

Task	Schedule
Task 1. Consultation	March - May 2020
Task 2. Background Research	Spring and Summer 2020
Task 3. Data Analysis	Fall 2020
Task 4. Final Study Report	February 2021 (as part of ISR)

2.4.9 Level of Effort and Cost

The estimated cost for the Fish Community study is approximately $35,000.

2.4.10 References

Bureau of Fisheries. 2015 - 2016. Bureau of Fisheries Annual Report. New York State Department of Environmental Conservation.

Bureau of Fisheries. 2014 - 2015. Bureau of Fisheries Annual Report. New York State Department of Environmental Conservation.

Connelly, N.A. and Brown, T.L. 2009. New York Statewide Angler Survey, Report 1: Angler Effort and Expenditures. New York State Department of Environmental Conservation Bureau of Fisheries. Website: http://www.dec.ny.gov/docs/fish_marine_pdf/nyswarpt1.pdf. Accessed January 2019.

George, S.D., Baldigo, B.P., and Wells, S.M. 2016. Effects of Seasonal Drawdowns on Fish Assemblages in Sections of an Impounded River–Canal System in Upstate New York, Transactions of the American Fisheries Society, 145:6, 1348-1357

George, S.D. (USGS). 2019. Personal Communication - Email to R. Daly (NYPA) January 2, 2020.

Hattala, K.A., A.W. Kahnle, and R.D. Adams. 2011. Sustainable Fishing Plan for New York River Herring Stocks. Bureau of Marine Resources, Hudson River Fisheries Unit, and Hudson River Estuary Program of New York State Department of Environmental Conservation. Website: http://www.asmfc.org/uploads/file/NY_RiverHerring_SFMP.pdf. Accessed January 2019.

Limburg, Karin and R. Ringler. 2012. Final Report to Cornell Water Resources Institute for blueback herring research on the Mohawk River. **"**Relative Abundance of Blueback Herring (*Alosa aestivalis*) in Relation to Permanent and Removable Dams on the Mohawk River**".** Water Resources Institute, Cornell University. April 15, 2012.

McBride, N.D. 2009. Lower Mohawk River Fisheries. New York State Department of Environmental Conservation, Stamford.

McBride, N.D. 1994. A fisheries management plan for the lower Mohawk River. New York State Department of Environmental Conservation, Albany.

McBride, N.D. 1985. Distribution and relative abundance of fish in the lower Mohawk River. New York State Department of Environmental Conservation, Stamford.

USGS. 2015-2016. American eel in tributaries to the Mohawk River. The USGS, SUNY ESF, and DEC screening survey of tributaries for American eel.

Wells, S, Limburg, K. and D Legard, C. 2013. Tracking Blueback Herring in the lower Mohawk River. February 2013. Conference: NY Chapter AFS, At Watertown, NY.

Wells, S. 2018. New York State Department of Environmental Conservation (NYSDEC). Bureau of Fisheries Technical Brief #2018040. Crescent Lake (H-240) Black Bass Survey (Survey #: 418011).

2.5 Aquatic Mesohabitat Study

2.5.1 General Description of Proposed Study

The Power Authority proposes to conduct an aquatic mesohabitat study at the Crescent and Vischer Ferry Projects. The study will be completed in a single field season. The purpose of the study is to identify and map aquatic habitats at the Projects including wetlands, riparian, and littoral vegetation communities, including submerged aquatic vegetation and open water habitats. The study will also identify and map areas of significant shoreline erosion. The study will be conducted using a combination of field observations and desktop evaluation.

2.5.2 Geographic Scope

The geographic scope of this study encompasses the FERC Project boundaries for the Crescent and Vischer Ferry Projects. More specifically, this study will examine aquatic habitats that occur within the Projects' boundaries, including wetlands, riparian and littoral vegetation communities, and other significant aquatic habitat types.

2.5.3 Study Goals and Objectives

The goal of the study is to identify and characterize the key aquatic habitat types found at the Projects, including wetlands, SAV, and riparian habitats. Specific goals of this study are to identify, describe, and map aquatic mesohabitat within the study area, and to identify areas of significant shoreline erosion. The study will also evaluate the potential effects, if any, of the Projects' operations on these habitats and will consider the differences in water level when the flashboards are both in place and removed.

2.5.4 Relevant Resource Management Goals and Public Interest Considerations

NYSDEC's mission is "to conserve, improve and protect New York's natural resources and environment and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being." NYSDEC's natural resource management goals within the Mohawk River Watershed are consistent with their mission while focusing on protecting and enhancing fish and wildlife habitat and improving public access. No essential fish habitat as defined by the National Marine Fisheries Service was identified in the Project area (National Oceanic and Atmospheric Administration, 2018).

2.5.5 Existing Information and Need for Additional Information

Existing information on wetlands in the lower Mohawk River in the vicinity of the Projects was gathered during PAD development. National Wetland Inventory (NWI) wetland maps for the two Projects are provided in Figures 4.6-1 through 4.6-5 in the PAD. Most of the aquatic habitat upstream and downstream of the Projects is comprised of open water lake (impoundment) habitat. The Crescent dam impounds an area of approximately 2,000 acres, and the impoundment extends upstream of the dam approximately 10 miles to the Vischer Ferry dam. The Vischer Ferry dam impounds an area of 1,050 acres and extends upstream 10.3 miles to the Lock E-8 dam. Downstream of the Crescent dam there is a short stretch of riverine habitat that continues to the impoundment created by Erie Boulevard's School Street Project. NWI data and digital orthophotography of the Project impoundments shows that there are some areas of vegetated wetlands within the Projects' boundaries, including some areas of aquatic beds. There are also aquatic bed, emergent and scrub-shrub wetlands along the margins of the impoundment and within the river's riparian zone, floodplain areas, and portions of the old canal system.

2.5.6 Project Nexus

The Crescent and Vischer Ferry impoundments encompass 2,000 acres and 1,050 acres of Project waters, respectively. The Projects' impoundments and tailwater areas support a variety of aquatic habitat types. A survey of wetlands and other aquatic mesohabitats within the Projects' boundaries will provide information on the type and quantity of habitat and associated vegetation and aquatic resources that have become established under the existing operation of the Projects, including the seasonal installation and removal of flashboards. The proposed study will provide up-to-date mapping of wetlands, riparian and littoral vegetation cover types, and other important aquatic habitat types located within the boundaries of the Projects, which will help inform resource assessments associated with the license application.

2.5.7 Methodology

Task 1. Background Research

Wetland, riparian, and littoral habitats within the Projects' boundaries are associated with the margin and near shore areas of the impoundments. NWI data and aerial imagery of the Projects suggest that vegetated wetlands within the boundaries consist of areas of aquatic beds in the impoundment, palustrine emergent (PEM) and palustrine scrub-shrub (PSS) wetlands along the edges of the impoundments and in adjacent floodplain areas. As a first step, the Power

Authority will review existing NWI, NYSDEC wetland mapping, and other readily available satellite imagery to identify general cover types for the waters within or immediately adjacent to the Projects' boundaries.

Task 2. Field Work

Habitat mapping will involve three phases of work. The first two phases will identify general wetland, littoral, and riparian cover types through aerial imagery interpretation and field verification. The third phase will be the production of an aquatic habitat/cover type map for each of the Projects. The field reconnaissance will be used to ground truth and verify aerial imagery throughout the Projects and, where necessary, to fill in gaps in the database for the habitat cover type map. Vegetation types and land use classifications will also be assigned for all lands and waters within the Projects' boundaries. Additional data collected during the field reconnaissance will describe the characteristics of each mapped aquatic habitat type including species composition, habitat structure, habitat quality, and land use. Information collected during desktop analysis and field surveys will include:

- plant species composition, including the dominant and more prominent associated species in each wetland and riparian habitat type;
- vegetation community structure data, including estimates of aerial cover of the dominant cover types, including SAV;
- rare, unique, and particularly high quality submerged or emergent wetland, littoral, or riparian habitat;
- occurrence of freshwater mussels and observed fish nesting activity; and
- occurrence of significant stands of invasive species.

The field reconnaissance surveys will be conducted by navigating around and through the Project by boat, by car or on foot. During the shoreline survey work, biologists will also attempt to observe and/or identify any RTE plant species that may be present but may not have been previously identified within the Projects' boundaries. Field crews will document plant RTE species observed and/or suitable habitats identified with a GPS unit. Significant habitats immediately adjacent to the Projects' shorelines (within 50 feet), will also be surveyed, quantified and identified via GPS.

Field crews will also note and record significant stands of invasive species, with special attention paid to the aerial extent of invasive European water chestnut (*Trapa natans)*. The

intent of the invasive species mapping is to document significant areas of invasives. Lesser areas containing only occasional invasive species will be characterized with a GPS center point and/or radius necessary to enclose the population. For areas where invasive species are ubiquitous or impractical to map, surveyors will characterize the invasive species population using estimates of aerial coverage and percent of species present. For areas where dense stands of invasive species have formed, infestations will be photo-documented and geo-referenced.

During field reconnaissance, impoundment shoreline and shallow water habitats will also be observed for the presence of freshwater mussels and other large or notable aquatic macroinvertebrates. Evidence of freshwater mussels including any observed relic shells or middens will be documented and marked with GPS coordinates. Observations will also be made of substrates in shallow and shoreline areas where substrates are readily observable either through aerial imagery or during field reconnaissance. Any notable areas of unique substrates such as ledge, gravel and cobble will be documented and located on the habitat maps with GPS coordinates. Areas of potential mussel habitat will be documented and mapped, even if no mussels are observed. Field crews will also look for evidence of fish nesting in shallow and marginal shoreline areas. Again, any areas of observed fish redds or other signs of fish nesting will be documented and located on the habitat maps with GPS coordinates.

During field reconnaissance surveys, observed areas of erosion will be documented and located with GPS, and representative photographs will be obtained.

Field reconnaissance surveys will be conducted during the summer when flashboards are installed and the impoundments are operating at their normal navigation season elevations and again in the fall following flashboard removal. Fall (flashboards down) surveys will focus on observing and documenting habitats found in the narrow littoral zone band between the boards up and boards down impoundment elevations.

Task 3. Data Analysis

Imagery data will be processed and incorporated into a geographic information system (GIS) platform. The GIS will be used to quantify and map aquatic and riparian habitats within the study area by geolocating boundaries, as defined by the field metrics. These data will be transformed into tabular, graphs, and spatial mapping data to quantify the approximate amount and distribution of each habitat type. Aerial imagery delineations of habitat types will be verified

through field reconnaissance and field verification data will be used to fill in gaps in the database for the habitat cover type map. Field observations of significant aquatic habitats, notable substrate types, significant stands of invasive species, and observations of freshwater mussels and fish nesting activities will all be added via GPS coordinates to the aquatic habitat maps. In addition, the report will include the general shoreline description and photographs of representative habitat types during both the summer (boards up) and fall (boards down) seasons. The report will include biological characteristics consisting of readily observable aquatic fauna, invasive aquatic plant species, fish spawning beds, observations of freshwater mussels, and areas of potential freshwater mussel habitat. The report will also describe the Projects' operations and impoundment elevations during the summer and fall field surveys. Data will be presented in concise tables, graphs, and maps, where appropriate.

Task 4. Study Report

The Power Authority will prepare a final report that details the results of the study including detailed aquatic habitat maps. The final report for the aquatic mesohabitat study will be provided in the Initial Study Report (ISR), which will be filed with FERC in February 2021.

2.5.8 Proposed Deliverables and Schedule

The Power Authority proposes to perform this study in 2020. Study reporting will be conducted in accordance with the Process Plan and Schedule (18 C.F.R. § 5.6(d)(1)), as provided in the PAD, and the FERC's SD1.

Task	Schedule
Task 1. Background Research	Spring and Summer 2020
Task 2. Field Work	Summer and Fall 2020
Task 3. Data Analysis	Fall 2020
Task 4. Final Study Report	February 2021 (as part of ISR)

2.5.9 Level of Effort and Cost

The estimated cost for the aquatic mesohabitat study is approximately $100,000.

2.5.10 References

United States Fish and Wildlife Service (USFWS). 2018. National Wetlands Inventory (NWI). Website: https://www.fws.gov/wetlands/index.html Accessed: October 26, 2018.

Wolman, M.G., 1954. A Method of Sampling Coarse River-Bed Materials. Trans. Am. Geophys. Union, 35: 951-956.

2.6 Bald Eagle Study

2.6.1 General Description of Proposed Study

The Power Authority is proposing a single-season bald eagle study, as requested by FERC. The purpose of the bald eagle study is to survey existing and potential bald eagle nesting, foraging, and roosting locations and to monitor seasonal use and bald eagle activity in these habitat areas.

2.6.2 Geographic Scope

The geographic scope of this study is the FERC Project boundaries for the Crescent and Vischer Ferry Projects.

2.6.3 Study Goals and Objectives

The goal of the study is to identify and map areas of existing and potential bald eagle nesting, roosting, and foraging habitats at the Crescent and Vischer Ferry Projects, and to monitor and record bald eagle activities in those areas.

2.6.4 Relevant Resource Management Goals and Public Interest Considerations

The bald eagle is a New York State-Threatened species and is known to occur within and in the vicinity of both Projects. The NYSDEC Division of Fish, Wildlife and Marine Resources, Bureau of Wildlife, published a *Conservation Plan for Bald Eagles in New York State*. The goal of the plan is to "ensure the perpetuation of a healthy bald eagle population, including its essential habitat and the ecosystems upon which it depends, in a cost-effective manner," (NYSDEC, 2016). Bald eagles are also protected by the federal Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (72 FR 37345-37372).

2.6.5 Existing Information and Need for Additional Information

There is significant information on the distribution of nesting and over-wintering bald eagles within New York State (NYSDEC 2016). Over the past two decades, NYSDEC has compiled data and information on eagle use of the Upper Hudson River and eastern Mohawk River. Based on available information, bald eagles utilize the eastern Mohawk River (in the vicinity of the Projects) during the breeding season and also sometimes for overwintering.

The Project areas are known to support nesting bald eagles as well. As recently as July 2019, an eBird participant recorded their observation of two adult bald eagles circling the Mohawk

River, and two immature Bald Eagles displaying territorial defense toward each other at the Town of Colonie Boat Launch (eBird, 2019). Further review of eBird records indicate that observations of bald eagles in the lower Mohawk River valley are relatively common.

The NYSDEC reports that the eastern-most section of the Mohawk River might also be considered part of the Upper Hudson survey area, as it empties into the Hudson about nine miles north of Albany. Cohoes Falls, located along the Mohawk River approximately one mile west of the Hudson, annually attracts a few eagles, likely due to the open water found around the falls; however, during the 2010 NYSDEC survey, only a single adult eagle was observed at that location (NYSDEC, 2019).

2.6.6 Project Nexus

The Crescent and Vischer Ferry Projects encompass 2,000 acres and 1,050 acres of Project waters, respectively. The Projects' impoundments and tailwater areas are known to provide foraging habitat for bald eagles. In addition, lands in the vicinity of the Projects may support seasonal nesting and roosting habitat for bald eagles. The proposed study will determine if there are existing or potential bald eagle habitat areas within the Project boundaries and will consider the effect of Project operations on eagle use of these habitats.

2.6.7 Methodology

Task 1. Consultation

The Power Authority will consult with NYSDEC to determine the availability of bald eagle nesting activity at the Projects, and obtain up-to-date information on the location of active and historic bald eagle nests within the Projects' boundaries.

Task 2. Background Research

As described above, over the past 30 years, significant research and survey efforts associated with bald eagles in the Upper Hudson River and eastern Mohawk River systems have been performed and well documented, and these activities continue today. The Power Authority will work with USFWS, NYSDEC, and other sources, as applicable, to obtain existing information associated with bald eagles in the lower Mohawk River system in the vicinity of the Projects.

Task 3. Field Work

The Power Authority will conduct surveys of the Projects to determine the location and use of nesting, roosting and foraging habitat. Surveys will be conducted in early spring and summer to best evaluate seasonal use of the Projects for nesting, roosting and foraging. Overwintering use will be documented based on birding observations reported through eBird and other local birding sites. Surveys will be conducted by boat, vehicle or on foot, as appropriate to the season and to gain access to areas of potential habitat. The location of bald eagle nests, nesting trees (historic or current), roost locations, and foraging areas will be mapped. The survey will also include routine checks of eBird and other on-line documentation of bald eagle listings and sightings in the Project vicinity. Such sightings will be combined with survey data to provide a comprehensive assessment of bald eagle use of the Crescent and Vischer Ferry Projects.

Task 4. Data Analysis

The Power Authority will analyze all collected data and create GIS-based maps showing the location of observed eagle nesting and roosting habitats. Observations of eagle nesting and roosting activity will be discussed in the report. Eagle use of Project waters for foraging, including information on time of year, weather, and flow conditions will be assessed.

Task 5. Study Report

The Power Authority intends to conduct the bald eagle study, including field surveys, in the early spring and summer of 2020. The final report for the bald eagle study will be provided in the Initial Study Report, which will be filed with FERC in February 2021.

2.6.8 Proposed Deliverables and Schedule

The Power Authority proposes to perform this study in 2020. Study reporting will be conducted in accordance with the Process Plan and Schedule (18 C.F.R. § 5.6(d)(1)), as provided in the PAD, and the FERC's SD1.

Task	Schedule
Task 1. Consultation	March - May 2020
Task 2. Background Research	Spring and Summer 2020
Task 3. Field Work	Spring and Summer 2020
Task 4. Data Analysis	Fall 2020
Task 5. Final Study Report	February 2021 (as part of ISR)

2.6.9 Level of Effort and Cost

The estimated cost for the bald eagle study as proposed is approximately $24,000.

2.6.10 References

American Bald Eagle Information for New York. 2019. Online [URL]: http://www.baldeagleinfo.com/eagle/directory/NY.html (Accessed: August 19, 2019).

eBird. 2019. Online [URL]: https://ebird.org/view/checklist/S53989382 (Accessed: August 19, 2019).

New York Hudson Online Bird News. 2019. http://birding.aba.org/mobiledigest/NY05. (Accessed: August 21, 2019).

Nye, P. 2010. New York State Bald Eagle Report: 2010. New York State Department of Environmental Conservation, Albany, NY. Online [URL]: http://www.dec.ny.gov/docs/wildlife_pdf/baea2010.pdf (Accessed: August 19, 2019).

NYSDEC. 2016. Conservation Plan for Bald Eagles in New York State. Division of Fish, Wildlife and Marine Resources: Bureau of Wildlife. March 2016.

NYSDEC. Undated. Bald Eagle Program, Bald Eagle Research. Online [URL]: http://www.dec.ny.gov/animals/9381.html. (Accessed: August 21, 2019).

2.7 Recreation Study

2.7.1 General Description of Proposed Study

The Power Authority proposes to conduct a single-season recreation study of the Crescent and Vischer Ferry Projects. The proposed study will inventory existing public recreation sites and provide information on recreation access, recreation use, and a consideration of effects of the Projects, if any, with respect to existing and future recreation use and capacity. The study will identify and describe formal and informal, non-commercial, public recreation sites, facilities and amenities that provide public access to the Projects, including the sites' relation to the Projects' boundaries. The study will also assess the condition of the public recreation sites and facilities within and adjacent to the Projects' boundaries, including any erosion that may exist due to recreational use. Finally, the study will utilize use counts and user surveys to determine the adequacy of the Project recreation sites and facilities and to evaluate if changes or upgrades to the sites are or will be needed to meet current or future recreation needs at the Projects.

2.7.2 Geographic Scope

The study area encompasses lands and waters within the Projects' boundaries as well as other commercial and non-commercial public recreation sites immediately adjacent to the Projects that provide public recreational access to Crescent and Vischer Ferry Project lands and waters.

2.7.3 Study Goals and Objectives

The goal of the study is to inventory both formal and informal, commercial and non-commercial recreation sites that provide public recreational access to the Projects, and to evaluate current use and future needs of the Projects' recreation sites through the conduct of use counts and user surveys at the Project recreation sites. The specific objectives of this study are to complete a recreation facility inventory and condition assessment, to evaluate recreation use at the Project recreation sites, and to conduct user surveys to help determine the adequacy of the existing Project recreation sites.

2.7.4 Relevant Resource Management Goals and Public Interest Considerations

Recreation has been identified as a Project purpose by the Commission. Identifying the effects of Project operations pertaining to recreation is relevant to the Commission's public interest determination in issuing new licenses for the continued operation of the Projects. In addition, the resource management goals of the agencies, such as NYSDEC and the New York State Office

of Parks, Recreation, and Historic Preservation (OPRHP), are to maintain public recreational opportunities at and access to the Projects.

2.7.5 Existing Information and Need for Additional Information

Existing information on public recreation sites (both Project and non-Project sites) and recreation use of those sites was gathered as part of the development of the PAD. In its study request, FERC noted that although the PAD provided a summary of recreation use based on its last three Form 80 (recreation report) filings, most data compiled for Form 80 filings are derived from informal surveys and estimates of use. FERC also stated that the PAD provided no project-specific information regarding visitor perceptions of recreation at the Projects. FERC concluded that a study that gathers information on visitor perceptions of the adequacy of public access and facilities, current use, and whether existing access facilities in the area are meeting recreation demand, in addition to the already proposed facility inventory, would inform future license conditions related to public access and recreation facilities. The proposed study will collect additional information with respect to current recreation use levels at the Project recreation sites and facilities; will obtain recreational users' perceptions regarding the adequacy of the existing Project recreation sites; and will inform a decision on whether existing Project recreation sites and facilities are meeting public recreation needs and demands.

2.7.6 Project Nexus

FERC regulations require that the license application include a statement of the existing recreation measures or facilities to be continued or maintained and the new measures or facilities proposed by the applicant for the purpose of creating, preserving, or enhancing recreational opportunities at the Projects and their vicinity, and for the purpose of ensuring public safety when using Project lands and waters. In addition, recreation is a recognized project purpose at FERC-licensed projects under section 10(a) of the Federal Power Act (FPA).

2.7.7 Methodology

Task 1. Background Research

The Power Authority will review existing information to consider Project recreation site locations and determine the appropriate survey routes and locations for trail camera placement to most effectively count site users. Existing and historic information on recreation use at the Project recreation sites will also be examined to determine its potential value for assessing recreation demand and site capacity at existing Project recreation sites.

Task 2. Field Work

The field work for this study will be conducted between the months of May 2020 and October 2020. Field data collection will involve a combination of inventory, condition assessment, use counts, and user surveys.

Recreation Facility Inventory

The Power Authority will update existing data on recreation resources adjacent to and within the Projects' boundaries through conduct of an inventory and recreation site assessment. For the site assessment, the Power Authority will utilize a standardized site inventory form (Attachment 1) to evaluate each formal and informal, commercial and non-commercial, public recreation site listed in the PAD (Tables 4.8-1, 4.8-2, 4.8-3 and 4.8-4). The inventory form will be used to document the facilities and amenities associated with each recreation site and determine the general condition of the site, facilities and amenities, including observations of erosion and impacts to vegetation caused by recreation use. The inventory will collect information on the owner and manager for each site; the number and types of facilities and amenities, including identifying Americans with Disabilities Act (ADA)-related amenities at formal recreation sites; signage at the site; the amount of available parking; observed recreation activities; and the general aesthetics of the site. Photos of the recreation sites will be taken and GPS datapoints will be recorded while in the field for each facility at the recreation site, which will be entered into a GIS format.

The inventory and condition assessment will be conducted at all commercial and non-commercial public recreation sites that provide recreational access to Project lands and waters, including privately-owned recreation sites within and abutting the Projects, such as commercial marinas. The inventory will not include private individual recreation facilities that are not available for public use. The inventory and condition assessment will be conducted during the mid to late summer, to allow a full assessment of the potential effects of vegetation growth, including invasive aquatic vegetation, on site and facility condition and function.

Project Recreation Site Use and User Survey

The Power Authority will conduct a recreation use and user survey at each of the Project recreation sites listed in Table 2-2. Project recreation site use will be evaluated with the use of trail cameras. User surveys will be conducted via voluntary survey boxes and online electronic

survey. The field work for this study will be conducted between the months of May 2020 through October 2020.

Table 2-2. Crescent and Vischer Ferry Project Recreation Sites

Crescent Project Recreation Site Name	**Recreation Amenities**
Tailrace Bank Fishing Area	Informal tailwater fishing area
Picnic Area	Small picnic area near powerhouse and tailwater
Vischer Ferry Project Recreation Site Name	**Recreation Amenities**
Project Forebay Scenic Overlook	Provides views of the impoundment and parking access to the shoreline for fishing and hiking
Tailrace Parking Facilities	Parking for fishing and hiking along the shoreline of the trailrace
Town of Niskayuna Boat Ramp (also known as Lock E-7 Boat Ramp)	Boat ramp and parking area that is integrated with the NYSCC Lock E-7 State Canal Park

Trail cameras will be employed to count recreation users and estimate recreation use at each of the Project recreation sites. Preliminary assessment of each of the recreation sites suggests that use at each site can be monitored effectively with trail cameras. Figures 2-3 through Figure 2-6 show the Power Authority's assessment of the planned location of each of the surveillance cameras. The exact locations and view field will be determined in the field at the time the cameras are installed. If, at the time of camera deployment it is determined that as a result of unforeseen circumstances a camera(s) cannot be located in a manner or in a location that would allow counts of site recreation users, the Power Authority will determine another appropriate way to obtain use information for that site, including the possible use of periodic spot counts, traffic counters and/or visitor sign-in sheets.

Figure 2-3. Crescent Project Picnic and Tailwater Fish Area Trail Camera Locations



Figure 2-4. Vischer Ferry Project Overlook Site Trail Camera Location

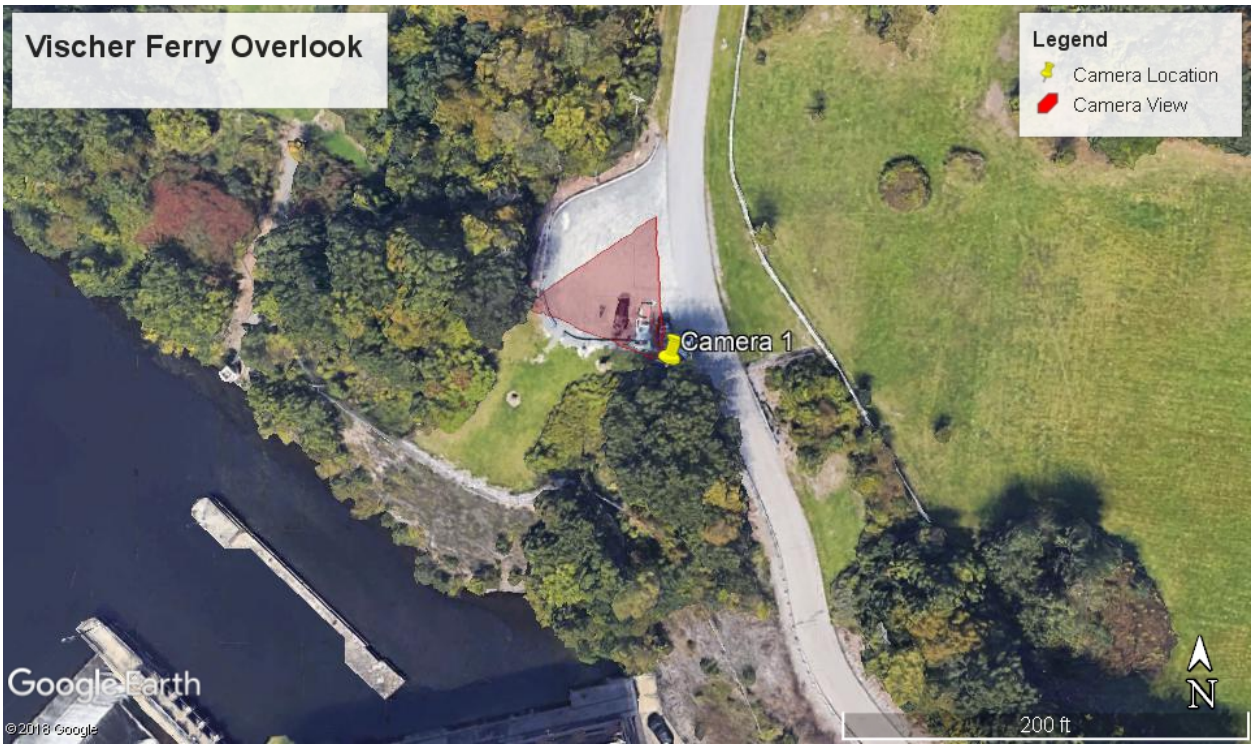


Figure 2-5. Vischer Ferry Tailwater Fishing Access Trail Camera Location



Figure 2-6. Vischer Ferry Niskayuna (Lock 7) Boat Launch Trail Camera Location



If used, spot counts will be conducted at each survey location on two weekdays and two weekend days a month and on one day on the following holiday weekends between May through October: Memorial Day, Independence Day (weekend closest to July 4th), Labor Day, and Columbus Day. The number of vehicles parked at each site and any observed recreation use will be recorded on data forms to determine the time-of-day use patterns at the sites. The number of vehicles parked will be factored into the recreation use estimates for the Project recreation sites.

A recreation user survey will be administered as a voluntary, self-administered, box survey and/or optional electronic online (internet access) survey access via cell phone and QR code. The proposed user survey is provided in Attachment 2. Among other things, the survey will ask recreationists to identify the recreational activities they are participating in at the Project recreation site that day, how often they visit the recreation site, and how they use the site in various seasons. This information will also be used to gain the opinion of the user with regard to the condition and adequacy of the Project recreation sites, facilities and amenities provided..

Task 3. Data Analysis

Inventory and condition assessment results will be compiled and maps of each of the Project recreation sites will be prepared showing the location of the Project boundary in relation to the site, facilities, and amenities. Trail camera use counts and voluntary user survey results will be compiled and analyzed. Trail camera counts will be analyzed to estimate the amount of use occurring at each of the Project recreation sites. To the extent possible, recreation use data will be summarized by month and activity type for each site surveyed. User survey results will be compiled and analyzed to evaluate user perceptions of the existing recreation sites and opportunities at the Projects. Future recreation demand at the Projects under current Project operations will be evaluated using trend data from state, regional, and national resources, as applicable.

Task 4. Study Report

The Power Authority will prepare a study report summarizing the results of the recreation facilities inventory and the recreation use and user survey. The report will include a description of each public recreation site inventoried, including both formal and informal Project and non-Project public recreation sites that provide access to the Projects. The report will include information on the available facilities and amenities, ownership and management, general

condition, and representative photos. Sketches and maps of the recreation sites will also be included. The report will also analyze user survey responses with respect to respondents' perceptions of the adequacy and condition of the Projects' recreation sites, including signage, parking, and access. Site inventory forms, user surveys, and trail camera counts will be included in an appendix to the report. The final report for the recreation study will be provided in the ISR, which will be filed with FERC in February 2021.

2.7.8 Proposed Deliverables and Schedule

The Power Authority proposes to perform this study in 2020. Study reporting will be conducted in accordance with the Process Plan and Schedule (18 C.F.R. § 5.6(d)(1)), as provided in the PAD, and the FERC's SD1.

Task	Schedule
Task 1. Background Research	March 2020 - May 2020
Task 2. Field Work	May 2020 - October 2020
Task 3. Data Analysis	November 2020 - December 2020
Task 4. Final Study Report	February 2021 (as part of ISR)

2.7.9 Level of Effort and Cost

The estimated cost of this recreation study as outlined in this plan is approximately $60,000.

2.7.10 References

Bowker et al. 2012. Outdoor Recreation Participation in the United States - Projections to 2060: A Technical Document Supporting the Forest Service 2010 RPA Assessment. Gen. Tech. Rep. SRS-160. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. Recreation Facility Inventory, Recreation Use and Needs Assessment, Section 11 and Reservoir Surface Area Assessment Study Plan.

Cordell et al. 1999. Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends. Champaign, IL: Sagamore Publishing.

Cordell, H. K. 2012. Outdoor recreation trends and futures: a technical document supporting the Forest Service 2010 RPA Assessment. Gen. Tech. Rep. SRS-150. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station.

Federal Energy Regulatory Commission (FERC). 1996. Recreation Development at Licensed Hydropower Projects. Washington, DC. March 1996.

FERC. 2014. Project Recreation Facilities Tables and As-Built Site Plan Drawing Guidance. Washington DC. July 2014.

FERC. 2017. Hydropower Primer: A Handbook of Hydropower Basics. Washington DC. February 2017.

U.S. Department of Agriculture Forest Service (USDA Forest Service). 2007 National Visitor Use Monitoring Program. USDA Forest Service. Washington D.C. July 2007. Web address: http://www.fs.fed.us/recreation/programs/nvum.

Attachment 1 - Site Inventory Form

CRESCENT AND VISCHER FERRY
PUBLIC RECREATION SITE INVENTORY FORM

Inspected by:_____Date: _____ Time: _____
Site Name/Code: _____ City/Town_____

_____

Address:_____ State:_____ Zip Code: _____
Site Owned by: _____ Operated/Maintained by: _____

Facility Type (Primary Purpose): Public ☐ **Commercial** (open to public) ☐ **Private** (non public) ☐

Developed Facilities: ☐ Boat Launch ☐ Picnic Area ☐ Angling Access
☐ Campground ☐ Swim Area ☐ Overlook/Roadside Pull-off
☐ Marina ☐ Other: _____

Undeveloped Facilities: ☐ Primitive Campsite ☐ Informal Boat Launch ☐ Informal Angling ☐ Other

Road Access: Condition:_____

☐ Paved access # entrances _____ # lanes _____ ☐ Circular entrance/exit ☐ Signage
☐ Unpaved access # entrances _____ # lanes _____ ☐ Circular entrance/exit ☐ Signage

Parking Lots: Condition:_____

Type	# Paved	# Gravel	Space Delineation
ADA Spaces	_____	_____	☐ Painted ☐ Curbs ☐ Signage
Regular Spaces	_____	_____	☐ Painted ☐ Curbs ☐ Signage
Vehicle & Trailer Spaces	_____	_____	☐ Painted ☐ Curbs ☐ Signage

Operations:

☐ Staffed ☐ Unstaffed ☐ Seasonal (From _____ To_____)
☐ Fee: (Site $_____; Parking $_____) ☐ Year Round

Operating Hours_____ Owner/Manager_____

Day Use Site Amenities (total # of all amenities per site; provide additional specifications on next page):

# Type	# Type	# Type
_____ Picnic Shelter	_____ Overlook/Vista	_____ Boat Launch Ramp
_____ Picnic Tables	_____ Hiking/Walking Trail	_____ Carry-in Boat Launch Area
_____ Trash Cans	_____ Fishing Trail/Shoreline	_____ Designated Swim Area
_____ Grills/Fire pits	_____ Fishing Pier/Platform	_____ Designated Campsite Area
_____ Restrooms - fixed	_____ Fishing Prep Area	_____ Safety Signage
_____ Restrooms - portable	_____ Information Kiosk	_____ Informational Signage

_____Other (specify)_____
_____

Boat Launch Facilities: Condition: _____

Craft Type: ☐ Motorized ☐ Carry In ☐ Boat Prep Area
Launch Type: ☐ Hard surface ☐ Gravel ☐ Informal (undeveloped)
☐ ADA Compliant ☐ Turn-around area _____ # of Lanes

Fishing Prep Area/Docks: Condition:
_____

☐ Prep Area ☐ Fishing Dimensions:_____ ☐ ADA Compliant
☐ Prep Area ☐ Fishing Dimensions:_____ ☐ ADA Compliant

Trails: Condition: _____

Type:_____ Length (ft):_____ Condition: _____ ☐ ADA Compliant
Type:_____ Length (ft):_____ Condition: _____ ☐ ADA Compliant
Type:_____ Length (ft):_____ Condition: _____ ☐ ADA Compliant

Interpretive/Site Information Condition: _____

Display Type: ☐ None ☐ Kiosk ☐ Other ___ No. of Displays

Information Type: ☐ Boating Safety ☐ Invasive Species ☐ Fishing Regulations ☐ Fish Type

☐ Regional Events ☐ Other (specify)_____

Sanitation Facilities: Condition:_____

	# Flush	(# ADA)	# Portable	(# ADA)
Unisex	_____	(_____)	_____	(_____)
Women	_____	(_____)	_____	(_____)
Men	_____	(_____)	_____	(_____)

Campground/Campsite: Condition: _____

	RV sites	Tent sites	Cabins/Cottages	Group sites
	Primitive sites			
Total # of sites	_____	_____	_____	_____
	_____			
ADA compliant	_____	_____	_____	_____
	_____			

Notes (including general condition, any restrictions, such as boating use, invasive species, erosion, etc.):

_____
_____
_____
_____
_____

Photos: No. _____ to _____

Site Sketch (and GPS coordinates for facilities and amenities)**:**

Attachment 2 – Recreation User Survey

CRESCENT AND VISCHER FERRY PROJECTS RECREATION USER SURVEY

1. Have you participated in this recreation survey before? If yes, thank you for your time. We are only interviewing each person once with this survey. If not, please continue with the survey.

2. What is your home (resident) zip code? _____

3. Which recreation site did you visit this trip? (check all that apply) On what date? _____

Crescent Picnic Area	☐	Crescent Tailwater Fishing Area	☐	Vischer Ferry Overlook	☐	Vischer Ferry Tailwater Fishing Area	☐	Niskayuna (Lock 7) Boat Launch Area	☐

4. How many were in your group at this recreation site, including yourself? _____

5. How did you/your group arrive at the recreation site? (check the one that best applies)
By automobile____ By boat ____ By bicycle ____ On foot ____ Other (fill in) _____

6. Have you ever visited this same or other Crescent and Vischer Ferry Project recreation sites before? If so, please fill in the approximate number of visits you made to each site in the past year.

Crescent Picnic Area	Crescent Tailwater Fishing Area	Vischer Ferry Overlook	Vischer Ferry Tailwater Fishing Area	Niskayuna (Lock 7) Boat Launch Area

7. Please indicate which of the following activities you have participated in at this site in the past year (including this trip). (Check all that apply in each season)

Activity	**This Trip**	**Spring (Apr 1– May 31)**	**Summer (Jun 1– Aug 31)**	**Fall (Sep 1- Oct 31)**	**Winter (Nov 1– Mar 31)**
Biking					
Birding					
Boating - power					
Boating – jet ski					
Canal Trail					
Canoeing/Kayaking					
Driving for Pleasure					

Activity	This Trip	Spring (Apr 1– May 31)	Summer (Jun 1– Aug 31)	Fall (Sep 1- Oct 31)	Winter (Nov 1– Mar 31)
Educational Program					
Fishing from a Boat					
Fishing from Shore					
Hiking					
Horseback Riding					
Nature Observation					
Paddle Boarding					
Photography					
Picnicking					
Running					
Scenery/Scenic View					
Sightseeing					
Sunbathing					
Swimming					
Walking					
Waterskiing					
Other:					

8. How crowded was this site today? (check one)

1 ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
Not Crowded	Slightly Crowded	Somewhat Crowded	Moderately Crowded	Extremely Crowded

9. Overall, please rate your satisfaction with the available recreation facilities at this site? (check one)

1 ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
Not Satisfied	Slightly Satisfied	Satisfied	More Than Satisfied	Extremely Satisfied

If less than "Satisfied" (rating 1 or 2) could you explain why?

_____

10. Please rate the following amenities at the recreation site you visited on this trip. (circle number)

	Poor		Fair		Excellent
Parking	1	2	3	4	5
River Access	1	2	3	4	5
Signs/Information	1	2	3	4	5
Trash Receptacles	1	2	3	4	5

Overall Site Condition 1 2 3 4 5

Please explain any poor (1) ratings.

_____

11. How would you rate the **value** of this recreation site as a public recreation opportunity on a scale of 1 to 5? (circle number)

(Low) **1**	**2**	**3**	**4**	**5** (High)

12. Would you return to this recreation site over the course of the next year? (circle one)
Yes **No**

13. What did you like most about your recreational experience today?
_____

14. What did you like least about your recreational experience today?
_____

15. About how many times a year do you visit this part Mohawk River for recreation?
_____

16. Do you have any additional comments regarding recreation opportunities in this part of the Mohawk River?

_____

_____

_____

_____

Thank you for your time and input.

3 DISCUSSION OF ADDITIONAL STUDY REQUESTS

In addition to the study plans proposed by the Power Authority in Section 2.0, several stakeholders requested other studies. In accordance with FERC's criteria for study requests, which were presented in Scoping Document 1 (SD1), the Power Authority has concluded that the proposed studies presented in Section 3.1 are unnecessary because: 1) there is (or will be as a result of proposed studies) sufficient existing information concerning the subject of the requested study; 2) there is no nexus between Project operations and effects on the resource requested to be studied; and/or 3) these requested studies would not inform the development of license requirements. A discussion of each request for which the Power Authority has not proposed a specific study is provided in Section 3.1 below.

Section 3.2 identifies two studies, an American Eel study and freshwater mussel survey, which may be considered for second-season studies, depending on the results of the Fish Community Study and Aquatic Mesohabitat Study. As part of the ISR, the Power Authority will consider whether either of these studies should be conducted in the second study season, as provided in section 5.15(c) of FERC's ILP regulations.

3.1 Studies Not Proposed

3.1.1 Tailrace Net Fishing Study

Riverkeeper requested a tailrace net fishing study of the Crescent and Vischer Ferry Projects. The requested study is intended to evaluate turbine entrainment and mortality rates at the Projects using tailrace netting techniques.

The Power Authority proposes to conduct an assessment of fish entrainment at the Projects, as described in Section 2.2 of this RSP. Its proposed desktop approach to evaluating entrainment and turbine survival/mortality is a standard, cost effective method that is routinely used throughout the U.S. to evaluate fish entrainment, impingement, and turbine mortality potential at hydropower projects. It is a recognized and scientifically based approach that has significant advantages to tailrace netting which is difficult, costly, impactful to the fish, and fraught with safety concerns for those conducting the study. Additionally, there are several indicators that fish mortality through the Crescent and Vischer Ferry Project turbines is low based on a turbine mortality study that was previously conducted, as discussed in Section 4.4 of the PAD.

Overall, the proposed desktop approach to evaluating the potential for entrainment/impingement and turbine mortality is the best approach. Therefore, because the Power Authority's proposed method is a recognized and generally accepted approach to evaluating entrainment and impingement potential and effects (see Criteria 6; 18 C.F.R. §5.9(b)), and because the level of effort and cost associated with doing the requested tailrace netting study as a means of evaluating turbine entrainment and mortality is significantly greater (see Criteria 7; 18 C.F.R. §5.9(b)), the Power Authority is not proposing a tailrace net fishing study.

3.1.2 Otolith Microchemistry of Blueback Herring Study

Riverkeeper requested that the Power Authority conduct a study of otolith microchemistry in blueback herring. The primary stated purpose of the requested study is to evaluate blueback herring via otolith microchemistry to determine if blueback herring are repeat spawners and if the Mohawk River is a source or sink population for the fish.

The Power Authority is proposing a blueback herring study, as described in Section 2.3 of this RSP. The proposed study will utilize appropriate methodologies and available information and data to fully examine downstream passage routes and whole station survival for outmigrating adult and juvenile BBH. Information collected from the proposed study will provide resource agencies with additional information on the various routes that outmigrating BBH use to pass through the Projects (including turbine passage), as well as the estimated survival/mortality rates associated with each route. An assessment of the proportion of fish utilizing each available passage route, along with an assessment of the survival/mortality rates associated with each route, will be combined in a model to evaluate whole station survival for both adult and juvenile BBH at both Projects. Additional questions about whether migrating adult blueback herring are repeat spawners or whether the Mohawk River itself is a source or sink population of the species are unrelated, and therefore have no nexus, to the Crescent and Vischer Ferry Projects and their continued operation. Because the issues raised in this study request have no nexus to the continued operation of the Crescent and Vischer Ferry Projects and would not inform the development of license requirements (see Criteria 5; 18 C.F.R. § 5.9(b)), the Power Authority is not proposing an otolith microchemistry study at the Projects.

3.1.3 Vischer Ferry Flooding Study

Several stakeholders provided comments related to flooding upstream of the Vischer Ferry Project dam and the effects, if any, of Vischer Ferry Project operations on localized flooding.

More specifically, some stakeholders requested that the Power Authority conduct a study to evaluate the role of the Vischer Ferry dam in upstream flooding and to consider an alternative dam configuration or operation to help reduce flooding potential. Other stakeholders state that the Vischer Ferry Project causes ice jams that result in flooding during the spring thaw. In its December 17, 2019 comments on the PSP, FERC staff also requested that the Power Authority conduct a study to evaluate any Project effects on flooding due to the formation of ice jams in the river reaches upstream of the Vischer Ferry dam (FERC 2019).

The Stockade District (a historic waterfront area) in Schenectady, New York has a long history of flooding. The Stockade District lies within the 100-year floodplain of the Mohawk River and has flooded repeatedly both before and after the Crescent and Vischer Ferry Project dams were built (Shumaker and Rock, 2018). Over the years, numerous studies were conducted by various entities, including the State of New York, NYSDEC, the USGS, and the Power Authority to examine the frequency and causes of the Stockade District flooding, including the role of ice jams and the potential effects of existing dams in such flooding. The Power Authority provided FERC with two of the more recent reports on this subject. The letter report dated April 17, 2018 prepared by Gomez and Sullivan found that operation of the Vischer Ferry dam has little effect on upstream flooding, and that reducing the dam crest and installing crest gates would have almost no effect on upstream water surface elevations in the Stockade District during 10-year and 100-year flood events (Gomez and Sullivan, 2017).

More comprehensive studies of the lower Mohawk River flooding determined that ice jams are more frequently the cause of flooding in the Stockade District than high river flows or the operation of the river's dams. For this reason, the USGS, in partnership with other agencies and researchers, conducted several studies to understand the nature and frequency of flood-causing ice jams and to develop modeling tools to predict the potential for ice jams and associated flooding on the lower Mohawk River. (USGS, 2019).

The Reimagine the Canals Task Force has also focused on flooding resiliency within the Project boundaries as a core element of its initiative. The Task Force engaged a consultant in 2019 to assess potential avenues for reducing summer flood risk within the Mohawk River and recommend interventions for further evaluation (see Bergmann, 2019 at http://www.canals.ny.gov/reimagine/Technical_Reports/Mohawk_Flood_Assessment.pdf).

It also convened an Ice Jam Mitigation Panel to review historical ice-jam-related flood events in the Mohawk River, identify changes in climate and river conditions driving future ice jam formation, and assess potential areas for mitigation. The ice jam panel produced a report for the Task Force and developed an ice jam model to better understand the causes of ice jams and impacts of possible solutions (see BuroHappold, 2019, 2019 at http://www.canals.ny.gov/reimagine/Technical_Reports/Mohawk_Ice_Jam_Study.pdf). Governor Cuomo has directed the Task Force to further assess and implement the findings presented in its Task Force Report released on January 6, 2020 (Appendix E), including those relating to flooding and ice jam mitigation.

NYSDEC has also made the issue of flooding and flood control strategies a significant component of its Mohawk River Basin Action Agenda and prepares regular reports and updates on cooperative initiatives being undertaken to better understand, predict and mitigate flooding on the lower Mohawk River (NYSDEC, 2018). In addition, in 2018, the U.S. Congress authorized $1.3 million in funds to assist the City of Schenectady with a study to evaluate options and develop flood mitigation plans for the Stockade District, and the Federal Emergency Management Agency (FEMA) has recently earmarked $7.5 M for implementation of Stockade District flood mitigation strategies (The Daily Gazette, 2019).

Thus, the issue of flooding upstream of Vischer Ferry dam, specifically ice jam flooding, continues to be studied in other venues. Because the Power Authority believes the existing information is sufficient to evaluate the fluvial flooding issue (see Criteria 4, 18 C.F.R. 5.9(b)) and other efforts specifically addressing ice jam flooding are underway, the Power Authority is not proposing a Vischer Ferry ice jam flooding study.

3.1.4 References

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Woidt, J. and J. Rock. 2019. Stockade Flood Mitigation Project; Hydrologic, Hydraulic, and Ice Jam Assessment. Powerpoint presentation given at public meeting. April 1, 2019.

3.1.5 Run of River Study

In its comments on the PSP, the USFWS recommends a Run-of-River Compliance study. The USFWS states that it is concerned that there will be inadequate information available to assess the impact of the Projects on notable downstream fluctuations at the USGS Cohoes gauge. The USFWS recommends this study utilize existing generation, headpond, lock operation, and gauge data; as well as an additional flow monitoring station downstream of the Crescent Project.

The Power Authority is not proposing a run-of-river study as described by the USFWS. First, the Power Authority questions the purpose of the study: to evaluate fluctuations in flow at the Cohoes gage. The Power Authority would note that the USGS Cohoes gage is located downstream of the School Street Project. Therefore, any fluctuations in flow observed at Cohoes are a direct result of the operation of the School Street Project rather than of the Crescent and Vischer Ferry Projects. More importantly, all of the information that USFWS suggests should be collected by the Power Authority as part of this study is already collected as part of the Power Authority's ongoing operation of the Projects, including generation, headpond and Project discharge (flow) data. This data will be provided in the license application in accordance with the Commission's regulations. Additionally, though the canal locks are not operated as part of the FERC-licensed Projects, lock operation data is available from the Canal Corporation. River flow data for USGS gages located at Cohoes Falls and elsewhere on the Mohawk River is available online.

3.2 Study Requests to be Considered in the ISR

3.2.1 American Eel Study

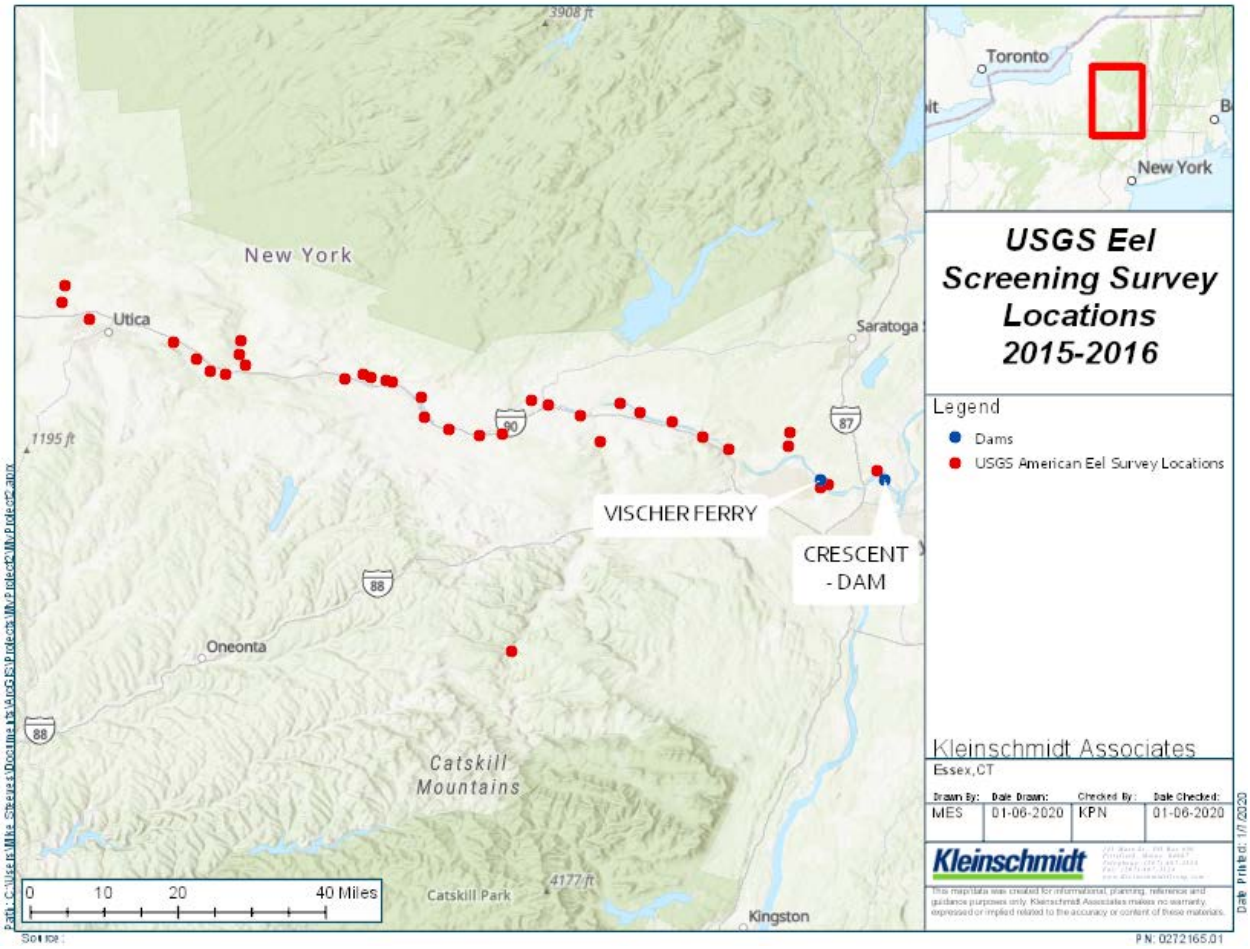
NYSDEC and other stakeholders have requested a study of American eel. According to NYSDEC, such a study is needed to assess the presence and relative abundance of American eel elvers in the Projects' area and assess the need for eel ladders to improve successful and safe upstream passage. Further, NYSDEC states that existing information is not sufficient because records of American eel presence in the Mohawk River come in the form of bycatch from other fish sampling efforts, usually black bass and other sport fish. NYSDEC also suggests that there have been limited to no concentrated efforts to sample American eel in the Mohawk River.

The Power Authority does not agree that existing information is insufficient to characterize the status of American eels in the lower Mohawk River in the vicinity of the Crescent and Vischer Ferry Projects. The Power Authority has proposed to conduct a fish community study using existing data that has been collected by NYSDEC, USGS and others in the lower Mohawk River. To date, NYSDEC has provided the Power Authority with a significant amount of fish survey data that has been collected over the past twenty years in the lower Mohawk River, including the survey data associated with many of the study reports and publications cited in Section 2.4 of this RSP. While in some cases the surveys conducted targeted game species such has black bass, the survey techniques used, particularly electrofishing ("e-fishing") (likely conducted near-shore and at night), would be expected to provide some evidence of eel presence and abundance in and near the Projects. As part of the proposed Fish Community Study, the Power Authority is planning to carefully review and analyze the existing fish data to examine the status of the fish community at the Projects, including the status of American eel.

The Power Authority has also determined that recent surveys were done that targeted American eel in the lower Mohawk River and its tributaries. In particular, according to the USGS, they surveyed for American eel at 20 tributary sites on the north side of the Mohawk in 2015, and 15 tributary sites on the south side of the Mohawk in 2016 (George, 2019). Survey locations are shown in Figure 3-1. Surveys were conducted using backpack electrofishing, and sampling time generally ranged from 600-1200 seconds depending on the quantity of accessible habitat. No American eel were captured or observed during any of these 35 surveys. Additionally, USGS is currently piloting the use of environmental DNA (eDNA) to detect American Eel in the Mohawk and its tributaries. According to the USGS they anticipate that this survey will be more useful for

determining the location and relative abundance of eels in the watershed than the previously conducted e-fishing efforts. The USGS anticipates that preliminary data from this project should be available around Fall of 2021 (George 2019), which would allow for its incorporation into the draft License Applications for the Crescent and Vischer Ferry Projects.

Figure 3-1. USGS American Eel Survey Locations in the Mohawk River Basin 2015-2016



Source: USGS 2019.

Finally, the Power Authority does not agree with NYSDEC's assertion that a study is needed to assess the presence and relative abundance of American eel elvers in the Projects' area and assess the need for eel ladders to improve successful and safe upstream passage. As discussed in the Pre-Application Document (PAD) and in the PSP, fish surveys done in the lower Mohawk River suggest that American eel are present in very small numbers at the Crescent and Vischer Ferry Projects. All of the additional fisheries reports and survey

information that the Power Authority has received from NYSDEC and USGS thus far suggest that American eel occur infrequently in the lower Mohawk River in the vicinity of the Projects. For example, NYSDEC conducted six nights of electrofishing in June 2018. The effort consisted of 27 electrofishing runs totaling 8.9 hours and covered much of the reservoir shoreline. The sampling focus was black bass and walleye but resulted in 27 fish species identified and 1,038 fish captured. This effort, however, yielded only one eel (Wells 2018).

A study of American eel at the School Street Project found eels both upstream and downstream of the Project dam, but in relatively small numbers (Niagara Mohawk 1994). In short, all the evidence examined thus far indicates that American eel are present in very small numbers in the lower Mohawk River despite the availability of passage through the canal and lock system and/or by scaling Cohoes Falls.

The Power Authority's proposed Fish Community Study will make a thorough examination of all of the existing fish data available for the lower Mohawk River in the vicinity of the Crescent and Vischer Ferry Projects and will provide an up-to-date assessment of the status and abundance of American eel at the Projects. In addition, eDNA surveys planned by the USGS will provide even more evidence of the abundance and distribution of eels. Together these assessments will provide sufficient information to evaluate the status of American eel at the Projects. However, should these studies find that eels occur more frequently than indicated in the current record, the Power Authority may propose an additional study or data collection in the ISR for the second study season to describe the frequency with which American eel occur at the Projects.

3.2.2 References

George, S.D. (USGS). 2019. Personal Communication - Email to R. Daly (NYPA) January 2, 2020.

Niagara Mohawk. 1994. School Street Project, FERC Project No. 2539-003. Response to Schedule B Additional Information Request No. 4. Fish Resources Baseline Study. September 2, 1992. Filed with FERC July 14, 1994.

USGS. 2015-2016. American eel in tributaries to the Mohawk River. The USGS, SUNY ESF, and DEC screening survey of tributaries for American eel.

Wells, S. 2018. Crescent Lake Black Bass Survey. New York State Department of Conservation. Technical Brief. #2018040. August 31, 2018.

3.2.3 Freshwater Mussel Survey

The USFWS and NYSDEC requested a freshwater mussel survey at the Projects. The intended purpose of the survey is to locate and identify freshwater mussels that may inhabit Project waters.

The Power Authority is proposing an Aquatic Mesohabitat Study that will include observations of any evidence of freshwater mussels. Such information, along with the aquatic habitat information and maps developed as part of this study, will additionally inform the need for further searches for freshwater mussels. Also, the Aquatic Mesohabitat Study will provide data that will allow the Power Authority to target searches for freshwater mussels in their preferred habitats. For this reason, the Power Authority is not proposing to conduct the requested freshwater mussel survey as a first season study. Rather, the Power Authority is proposing to use the results of the Aquatic Mesohabitat Study to better inform whether or not to propose in the ISR any mussel survey in the second study season.

4 ADDITIONAL INFORMATION REQUESTS

In its PSP comment letter dated December 17, 2019, FERC requested additional information as follows:

1) *Some existing information on the presence and relative abundance of American eel in the vicinity of the projects was compiled and presented in the PAD. However, this information was from non-targeted surveys that were focused on characterizing the general fish community composition in the Mohawk River. During the study plan process, it has become apparent there are additional existing data from targeted eel surveys that have been recently completed in the Mohawk River and would help inform staff's Study Plan Determination regarding the need for field surveys to determine the relative abundance of American eel in the vicinity of the projects, such as the studies requested by the U.S. Fish and Wildlife Service and New York DEC. Therefore, please provide, in the RSP, the following data reports that were contained in a memorandum distributed by NYPA at the PSP meeting that listed the various documents and reports it has requested from New York DEC:*

    - *USGS. 2015-2016. American eel in tributaries to the Mohawk River. The USGS, SUNY ESF, and DEC screening survey of tributaries for American eel.*

    - *USGS. 2015. American eel in USGS Newsletter describing a study being conducted "in cooperation with NYDEC" to determine if American eel are present in the Mohawk River.*

    Also, at the PSP meeting, Michael Hreben of Kleinschmidt Associates indicated that eel catch data may exist from adult eel collection efforts (years 2009-2010) at the downstream School Street Project (FERC No. 2539) that were conducted to support postlicensing studies of fish passage effectiveness at that project. However, the final reports associated with those efforts have not been filed with the Commission. Therefore, if eel catch data (size, relative abundance, etc.) are available from the School Street Project, please provide that data in the RSP, as well as any other existing information regarding the presence, abundance, or distribution of American eel in the vicinity of the Crescent and Vischer Ferry Projects.

NYPA requested from NYSDEC and USGS the two studies and supporting data identified by FERC in this AIR. In an email from Scott George of USGS dated 1/2/2020, the USGS explained that the two referenced studies are the same effort. USGS surveyed 20 tributary sites on the north side of the Mohawk in 2015, and 15 tributary sites on the south side of the Mohawk in 2016. Surveys were conducted using backpack electrofishing, and sampling time generally ranged from 600-1200 seconds depending on the quantity of accessible habitat. No eel were captured or observed during any of the 35 surveys. NYPA requested a summary of the exact locations sampled, a map of which is provided in Figure 3-1 of the RSP. Apparently USGS did not publish the results of this study in a study report.

USGS further reported that they are currently piloting the use of environmental DNA (eDNA) to detect American Eel in the Mohawk and its tributaries. USGS anticipates that this method and the results it produces will be more useful for determining the location and relative abundance of

eels in the watershed. Preliminary data from this project should be available around Fall of 2021.

Regarding American eel data collected at the School Street Project, NYPA is aware of a 1994 fish community study that surveyed both upstream and downstream of the dam. The final study report is included in Appendix C.

> *2) To inform staff's analysis of existing fish passage opportunities (for eels and blueback herring) afforded by the navigation locks associated with each project (E-6 at the Crescent Project and E-7 at the Vischer Ferry Project), please provide, for the past 10 years, to the extent such data are available, the monthly number of lockages at each project in each year. Also, please specify the hours of the day during which these locks operate.*

The lockage information requested for Locks E-6 and E-7 for the past 10 years is provided in Appendix D.

3) *In the RSP, please provide, for the entire duration of the 2012 study (September 8, 2012 through October 26, 2012), the same daily information that was presented in Table 2 (the daily proportion of flow along with the expected and observed proportion of juveniles migrating down the east (non-powerhouse) channel) for the 2008 study. These data are needed by staff to fully interpret the results of the 2012 study—especially the results from the mobile hydroacoustic surveys that were conducted on certain dates for which there is no daily information on the relative flow distribution between the two channels.*

NYPA has requested the data sought by FERC from the original study authors (Normandeau Associates). However, as that study is now several years old, it will take additional time to locate the original study datasets and/or locate project operations data for those 2012 study periods. Once the data is located or recreated, NYPA will provide it to FERC.

4) *Regarding the two separate flashboard openings, Please clarify whether: (1) both notches are open for the entire duration of the navigation season or (2) if the juvenile notch is initially closed (i.e., its flashboard is in place) until the end of the adult migration season, at which time the adult notch is closed (its flashboard is installed) and the juvenile notch is opened (by removing its flashboard)? If the latter, how much time generally elapses between the opening of the juvenile notch and closing of the adult notch (e.g., is this work done on the same day?) and on what dates does this switch generally occur?*

When the Vischer Ferry flashboards are initially installed in the spring (typically early April), the juvenile fish passage notch is closed (i.e., its flashboard is in place) and the adult fish notch is left open. The adult fish passage notch is left open until late summer (mid to late August). In mid to late August the adult passage notch is closed and the juvenile passage notch is opened. Typically, it takes a day or so to lower the Vischer Ferry pond and approximately 2 hours to open the juvenile passage (remove its flashboard) and close the adult passage, by installing its flashboard. The juvenile fish passage notch remains open until the project flashboards are removed for the winter in the late fall.

APPENDICES

APPENDIX A: PSP Comment Letters, Correspondence and Consultation

Crescent and Vischer Ferry Project Relicensing Consultation and Correspondence

Date of Document	From	To	Description of Correspondence
8/8/2019	John Garver	FERC (K. Bose)	Comments on the environmental review scoping document for the Vischer Ferry Hydroelectric Project and request for relicensing studies related to flooding and ice jams.
8/9/2019	James Duggan	FERC	Comment on flooding problems at the Vischer Ferry Hydroelectric Project.
10/22/2019	Assemblyman Phil Steck	FERC	Statement of disagreement with the current Vischer Ferry Dam proposal due to the lack of governmental studies related to ice jam flooding.
10/29/2019	Russel Wege	FERC (K. Bose)	Request that the relicensing studies of the Vischer Ferry Dam Hydroelectric Project include flooding issues. Provides a comprehensive flood control review.
11/6/2019	Russel Wege	FERC (J. Callihan)	Comments and concerns with the 1979 DEC and Gomez & Sullivan Consultants studies used for the Vischer Ferry Hydroelectric Project relicensing. Suggests a new study that employs a management tool and requests a flood study.
12/13/2019	NYSDEC (S. Wells)	NYPA (R. Daly and A.Weinstock)	Email providing NYPA with an overview and data of seven lower Mohawk River surveys.
12/15/2019	John Cococcia	FERC	Comment on a possible ice jam study relating to the relicensing of the Vischer Ferry Hydroelectric Project.
12/17/2017	FERC (J. Smith)	NYPA (R. Daly)	Staff comments and additional information requests (AIRs) on the proposed study plan (PSP) for the Crescent and Vischer Ferry Hydroelectric Projects. Comments related to water quality, fish entrainment, blueback herring migration, aquatic mesohabitat, and recreation studies. Request for ice jam flooding study.

Date of Document	From	To	Description of Correspondence
12/18/2019	Stockade Association of Schenectady (C. Delamarter)	FERC (K. Bose)	Requests that NYPA revise their study plan of Vischer Ferry Hydroelectric Project to include a study relating to flooding issues in the impoundment area.
12/20/2019	Gloria Kishton	FERC (K. Bose)	Comments on the Vischer Ferry Hydroelectric Project and request for flooding study.
12/20/2019	James Duggan	NYPA (K. Bose)	Request for a relicensing study involving flooding at the Vischer Ferry Hydroelectric Project. Includes an attachment suggesting weaknesses in the documentation NYPA has submitted
12/20/2019	NPS (D. Hay)	FERC (K. Bose)	Response to PSP and AIRs for the Crescent and Vischer Ferry Hydroelectric Projects, which specifically address the recreation study.
12/20/2019	NYSDEC (M. Higgins)	NYPA (M. Slade)	Comments and study requests on the PSP of the Crescent and Vischer Ferry Hydroelectric Projects. Comments are related to the water quality, fish entrainment, blueback herring migration, and aquatic mesohabitat studies. Study requests for an American Eel Study.
12/20/2019	Riverkeeper (J. Epstein)	FERC (K. Bose)	Comments on proposed studies for Crescent and Vischer Ferry Hydroelectric Projects. Comments are related to the water quality, fish, and potential ice jam studies.
12/20/2019	Assemblyman Phil Steck	FERC (K. Bose)	Re-emphasize request for a full analysis of the Crescent and Vischer Ferry dams' effects on water quality along the Mohawk River and request chlorophyll and nutrients be added to the list of parameters for the water quality study.

Date of Document	From	To	Description of Correspondence
12/22/2019	James Woidt	FERC	Claim of inaccuracies of licensing documents relative to ice jamming in the PSP for the Vischer Ferry Hydroelectric Project.
12/23/2019	USFWS (D. Stilwell)	NYPA (T. Groom)	Comments on proposed studies for the Crescent and Vischer Ferry Hydroelectric Projects. Comments related to fisheries, and water quality studies. Request of a run-of-river study.
1/6/2020	USGS (S. George)	NYPA (R. Daly)	Request of two American eel reports and raw data from NYPA, USGS's response with an overview of these reports, NYPA's request for exact locations and dates, and USGS's response providing NYPA with these data.
1/7/2020	Melissa Cherubino	FERC	Request that NYPA's study for the Vischer Ferry Hydroelectric Project include consideration of the presence of chlorophyll and nutrients out of concern for impact to drinking water

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John Garver, Schenectady, NY.
Kimberly D. Bose, Secretary, FERC
888 First St. NE
Washington, DC 20426

Dear Secretary Bose,

This is a comment on the environmental review scoping document (Docket Number P-4679), and this letter requests relicensing studies related to flooding and ice jams.

The permanent Vischer Ferry Dam (VFD, but herein “the Dam”) may exacerbate flooding in the immediate upstream Schenectady pool (Lock E7 to Lock E8 – herein “the Pool”). The Dam may affect flooding by: 1) trapping sediment that has impaired (filled) the effective channel over the last century; 2) facilitating the formation of thick sheet ice in the winter; 3) reducing surface velocity that favors ice jam formation. It is likely that there is a synergism between all three of these primary drivers (accumulated sediment, sheet ice development, low river velocity), which has resulted in chronic and damaging ice jams that are nearly annual in the area of the Rexford Knolls just up river from the Dam.

Ice jams are chronic in the Schenectady pool on the lower Mohawk River (Lederer and Garver, 2001; Garver and Cockburn, 2009; Marsellos and others, 2010; Garver, 2014; Garver and others, 2018, Garver, 2018; Garver 2019). Ice jams with back up flooding have been severe especially for the communities in Rexford, Alplaus, Glenville, Scotia, and the Stockade District of Schenectady. The latter is perhaps most problematic as it is the first historic district in NYS, and river-proximal structures there have had repeatedly been damaged. Ice jam flooding has been such an issue that the USGS has installed a one-of-a-kind ice jam monitoring system to aid emergency management. This system is unique, effective, but expensive. It was installed as a series of real-time pressure transducers (and cameras) between E7 (VFD) and E8 because this is one of the most jam-prone sections of river in NY State (Wall et al., 2013).

The lower part of the Mohawk River has a low gradient, and the permanent dam at Vischer’s Ferry (also Lock E7) impounds water for nearly 16 km (~10 miles) to Lock E8, and thus this is one site where thick sheet ice builds in the winter. The low gradient in this section (especially from Rexford to the Dam), compared to most sections of the Mohawk River up river from this area, contributes to jamming because river velocity slows.

The single most chronic jam point is in the Rexford Knolls, just up river from the Dam. We have shown that the Knolls are a chronic jam point, and a number of recent jams have occurred in this location. A major concern is that since dam construction, sediment has built up and accumulated, and these slugs of sediment may have reduced the channel width, and thus when ice floes move downstream the sediment forces lateral shortening and jamming.

Sediment has accumulated behind the dam since construction nearly a century ago, and that sediment has undoubtedly reduced the effective channel (full channel cross section bank to bank). An important issue is how sediment adjacent to the channel may block ice due to constriction (see Garver, 2019). We know that Irene and Lee were significant in transporting large volumes of bedload into the Pool, but we are unaware of any systematic published data that quantifies sediment accumulation in the Pool. It has been postulated that sediment is one of the major causes of channel constriction in low-flow mid winter ice jam events in the past few years (Garver, 2019). Thus we know that large volumes of sediment have accumulated in the Schenectady pool, and in almost any scenario this would favor more frequent floods (freewater and ice jam related). There are no data available on sediment thickness in the Pool.

Summary: The Dam may facilitate the growth of thick sheet ice, force velocity decrease of the River, and it has almost certainly resulted in sediment accumulation that has locally impaired channel width and depth. Studies are required to fully evaluate the roll that the Dam plays in driving ice-jam flooding and then numerical modeling is required to explore the possible ways that a new dam configuration or dam operation could alleviate ice jams. The role of sediment and channel impairment should also be conducted in parallel. Solutions that should be explored in model runs include: 1) dam removal; 2) significant pre-emptive lowering immediately prior to break up events to fracture and break ice cover; and 3) mechanical break up of ice up river from the Dam. Finally, sediment in the channel (in the entire Pool) needs to be measured and quantified so that the role that this sediment plays in channel shallowing and width reduction can to be evaluated in hydraulic models (where sediment can removed in model runs).

If nothing else, consideration should be given to implementing a funding solution for an expanded Ice Jam monitoring system, which incurs annual expenses related to maintenance and operation. Additional consideration should be given to development of an integrated ice jam warning system to alert the public of ongoing ice jam hazards.

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Garver, J.I., 2019. The 2019 mid-winter ice jam event..., NY. In MWS, v. 11, p. 12-17.

Garver, J.I., and Cockburn, J.M.H. 2009. A historical perspective of Ice Jams on the lower Mohawk River. In MWS, v. 1, p. 25-29.

Garver, J.I. et al., 2018. Photogrammetric models from UAS mapping and ice thickness estimated of the 2018 mid-winter Ice jam... NY, In: MWS, v. 10, p. 19-24.

Lederer, J.R., and Garver, J.I., 2001, Ice jams on the lower Mohawk River, NY.... GSA Abstracts with Programsv. 33, n. 1, p. 73.

Marsellos, A.E., et al., 2010, Mapping and Volumetric calculations...; MWS. v. 2, p. 23-27.

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Wall, G., et al., 2013, March. USGS Ice jam and flood monitoring: Mohawk, MWS, v. 5, p.83-85.

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VISCHER FERRY HYDROELECTRIC PROJECT (P-4679-049)

STUDY PROPOSED TO NYPA for FERC RE-LICENSING

NYPA proposes to study how to modify (mainly) Dam D of the fixed concrete Vischer Ferry Dam (VFD) complex as a means to curtail the Schenectady area's long-developed, valuable properties' post-VFD vulnerability to flooding. Affected are the Historic Stockade District, the Schenectady County Community College and broader-community commerce, resources and activity, also in Scotia and Glenville. The **Goal**: confirm the feasibility of preemptive controlled drawdown to **achieve a non-flooding "balance"** between runoff-volume arriving at Lock 8 and discharge past VFD, while avoiding/minimizing overflow (and its height backwatered upstream). The **Objective**: begin steps toward providing VFD with substantial below-crest hydraulic capability (and operation protocols) to allow partial drawdown of the permanent Pool's water-surface elevation.

During construction of the VFD, the Schenectady-area community **began** to suffer a new range of flooding, capped with record flood-heights in March 1913 and 1914, the latter valid today. Nature uncontrollably causes the water (hydrology); NYS built the unmanageably obstructing VFD, its (hydraulic) inadequacies proven too-frequently by free-flow floods (plus innumerable near-flood threats) in the Schenectady area. Individual and public damages to-date have **involved INESTIMABLE HUGE COSTS.** Smart thinking readily can foresee huge further penalties, if modifying VFD to 21st century flood-mitigating capabilities fails to occur.

Attention to-date has focused on the runoff's water-surface profile, relatively flat and draining ineffectively. The bottom at VFD (Goat Island) is**~30 feet lower** than the site of Lock 8. At both of these locales, bottom-slope was key to the combined pre-VFD natural drainage: lowered runoff-surface levels approaching Schenectady from upstream and then explicit drainage downstream to and past Goat Island. The occupying Pool-volume obscures bottom-influence for drainage. Its flat surface curtails gravity-pull, denying the velocity needed to drain the runoff.

The Pool's context is important. Pre-VFD, runoff directly followed **the riverbed's distinct overall slope** from Montgomery County to Albany County. FEMA studied the entire Schenectady County reach of the canalized Mohawk River for its Flood Insurance Study (FIS) in 2009. Its Table 6 reveals large variations in the data re the floodway's cross-sections and mean velocities for the free-flow "100-Year" runoff-volume. Mean flow-velocity per respective cross-section is particularly significant. Minus the few distinctly higher velocities (expected) at certain locations such as the movable dams, the velocity averaged along some reaches indicates the basic adequacy of runoff-drainage there. Compared to the runoff-volume draining from upstream to Lock 8, **drainage from the Scotia-Schenectady reach is inadequate.**

A listing of mean velocities follows; two are extremely slow. (For reference, ***WALKING* a mile in 20 minutes** = **4.4 fps**.) Along ~7.3 miles between the "Montgomery County Line" and near Lock 8, the average mean velocity is **~8.3 fps.** Along the next ~2.5 miles, the Scotia-Schenectady reach approaching Freemans Bridge, the average mean velocity is **~4.78 fps.** Markedly slower, this "runoff-plateau" contains the two **very slow** mean velocities: **2.9 fps** upstream from the overall SCCC campus, and **2.5 fps** closely flanking SCCC facilities. They

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signify the **ineffectual drainage there** that **endangers and/or damages** the campus of this valuable institution, as well as disrupting its programs. Mean velocity passing the Historic Stockade neighborhood is **5.9 fps, not adequate**. Along the WatersEdge Lighthouse complex between Freemans Bridge and Canadian-Pacific Railroad Bridge, mean velocity is **8.3 fps, fastest** in the ~5.6-miles Lock 8 - Rexford Bridge reach. Minus the unusually fast velocities at tightly clustered four cross-sections near the Rexford Bridge, the Pool's downstream reach along the next ~4.9 miles is **~6.4 fps, not adequate**. Nearest to VFD is the Pool's **third-least** mean velocity, **4.1 fps**, fostering the ~8.4' overflow-height **crossing VFD's ~1,990-feet crest**, its accompanying backwater - - all here **severely hindering drainage along the entire Pool.**

(For reference, a **"10-Year" runoff-volume** (~34% less than "100-Year") involves a **5'-plus high overflow.** Its backwater and the arriving runoff **enter the SCCC campus and pass the Historic Stockade at bank-height, NWS "Floodstage".)**

THIS MATTER DESERVES SERIOUS ADVOCACY FOR INSERTING A LARGE GATE-SYSTEM IN "DAM D" (CHANNEL-ALIGNED) TO ACTIVELY LOWER THE POOL'S SURFACE, THUS INCREASE RUNOFF-SLOPE AND VELOCITY AS FAR AS LOCK 8.

A **~500'-wide gate-system of substantial (10-12') depth would allow preemptive surface-managing action in response to now-available alerts.** This new capability would prevent or substantially reduce flood-disruption, damages and costs. A winter-long drawdown of several feet would act to **reduce the likelihood of flooding problems with ice-jamming.**

The needed searchingly open-minded, detailed investigation requires **more than "routine" computer outputs from river-based programs** to assess how to better-drain the runoff that now must sprawl **atop this reservoir-Pool**. The **less-than-riverine nature** of this condition clearly requires close attentiveness and probably some out-of-the-box adaptation.

At this time, proposing any specific study methodology etc and indicating cost, as well as the needed level of effort, exceed the specific background and applied skill of this proposer.

James E. Duggan
jeduggan18@yahoo.com

518.377.0556

528 Orlinda Avenue
Scotia, NY 12302

20191022-5139 FERC PDF (Unofficial) 10/22/2019 2:56:43 PM

THE ASSEMBLY
STATE OF NEW YORK
ALBANY

PHIL STECK
Member of Assembly, 110th District

CHAIR
Task Force on
People with Disabilities
COMMITTEES
Health
Insurance
Judiciary
Labor
Transportation

Statement of Assemblyman Phil Steck

I want to thank NYPA for meeting with me and giving me advance notice of how NYPA would be proceeding in the process for re-licensing the Vischer Ferry dam (VFD). This gave our office the opportunity to study the issue. We have initial familiarity with the issue through our office's attendance annually at the Mohawk River Symposium sponsored by Union College.

Unfortunately, based on our review, we cannot agree with the current proposal as to the studies that are required and urge NYPA to change course in one respect. We believe the effect of VFD in exacerbating the problem of ice jam flooding has not been studied by government.

To review, VFD is owned by New York Power Authority (NYPA) and the dam is used for Hydropower at the Vischer Ferry dam, and it is used for Navigation at Lock E7.

The initial license application was filed by NYPA to FERC on 31 May 2019, and the current license will expire on 5/31/2024. The initial application for the Vischer Ferry dam (#4679) is combined with the Crescent dam (#4678) because they are on the same river and the same license schedule.

NYPA released an initial scoping document in May (2019) that outlines the nature of the application, the fact that the two projects would be treated together, and the general aspects of the Mohawk River and the dams.

Comments and specific Study plans by outside organizations and individuals had to be submitted by 9 August 2019 to FEMA, and following this submission deadline NYPA pulled together not only its own intended studies, but also the study plans submitted.

Comments and study requests included issues and requests primarily related to:

a) Recreation
b) Fish passage
c) Water quality
d) Flooding and ice jams (see below).

There were five study requests for flooding (Steck, Garver, Woidt, Duggan, Wege). All five requests noted that a particularly important issue is ice jamming and the effect that the VDF may have on creating thick sheet ice, and preventing passage of ice floes. At issue is the role

ALBANY OFFICE: Room 702, Legislative Office Building, Albany, New York 12248 · 518-455-5931, FAX: 518-455-5840
DISTRICT OFFICE: 1609 Union Street, Schenectady, New York 12309 · 518-377-0902, FAX: 518-377-0458
EMAIL: steckp@nyassembly.gov

that the VFD has on ice jamming and the resulting flooding caused by ice jams, particularly in the Stockade area of Schenectady.

NYPA submitted its Study Plan on 23 September. This initial document will guide discussions and planning through the initial re-licensing process.

The NYPA Plan rejects all studies of flooding. This is incorrect. NYPA has failed to distinguished between ***freewater floods*** and ***ice jam floods***. NYPA is justified in its conclusion that freewater floods have been studied. On the other hand, ice jams floods are much more complicated and poorly studied. In explaining why floods and ice were NOT going to be part of the study plan, NYPA wrote (section 3.1.3)

"Several stakeholders provided comments related to flooding upstream of the Vischer Ferry dam and the effects, if any, of the Vischer Ferry Project operations on localized flooding. More specifically, some stakeholders requested that the Power Authority conduct a study to evaluate the role of Vischer Ferry dam in upstream flooding and to consider alternative dam configuration or operation to help reduce flooding potential.

The Stockade District (an historic waterfront area) of Schenectady, New York has a long history of flooding. The Stockade District lies within the 100 year floodplain of the Mohawk River and has been flooded repeatedly both before and after the Crescent and Vischer Ferry dams were built during construction of the original canal system (Shumaker and Rock, 2018). *Over the years, numerous studies have been conducted by various entities, including the State of New York, NYSDEC, the USGS, and the Power Authority to examine the frequency and causes of the Stockade District flooding, including the role of ice jams and the potential effects of existing dams in such flooding***. In a recent filing to FERC on August 9, 2019, the Power Authority provided FERC with two of the more recent reports on this subject. The letter report dated April 17, 2018 prepared by Gomez and Sullivan found that operation of the Vischer Ferry dam has little effect on upstream flooding, and that reducing the dam crest and installing crest gates would have almost no effect on upstream water surface elevations in the Stockade District during 10-year and 100-year flood events (Gomez and Sullivan, 2017).**

More comprehensive studies of the lower Mohawk River flooding have determined that ice jams are more frequently the cause of flooding in the Stockade District than high river flows or the operation of the river's dams. *For this reason, the USGS, in partnership with other agencies and researchers, has conducted several studies to understand the nature and frequency of flood causing ice jams and to develop modeling tools to predict the potential for ice jams and associated flooding on the lower Mohawk River. (USGS, 2019).*

NYSDEC has made the issue of flooding and flood control strategies a significant component of its Mohawk River Basin Action Agenda and prepares regular reports and updates on cooperative initiatives being undertaken to better understand, predict and mitigate flooding on the lower Mohawk River (NYSDEC, 2018). In addition, in 2018, the U.S. Congress authorized $1.3 M in funds to assist the City of Schenectady with a study to evaluate options and develop flood mitigation plans for the Stockade District, and the Federal Emergency Management Agency (FEMA) has recently earmarked $7.5 M for implementation of Stockade District flood mitigation strategies

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(The Daily Gazette, 2019).

In short, *the issue of flooding upstream of Vischer Ferry dam has been extensively studied and both ongoing and previous studies have repeatedly demonstrated that the existence and operation of the Vischer Ferry Project has little or no effect on upstream flooding of the Stockade District.* **Because the existing information is clearly sufficient to evaluate the flooding issue (see Criteria 4, 18 C.F.R. 5.9(b)), the Power Authority is not proposing a Vischer Ferry flooding study."**

Against this background, we have the following specific comments:

1) I am personally familiar with the efforts to mitigate the effects of flooding in the Stockade. The ongoing work in that area has nothing to do with ice jam flooding.

2) The issue is ice jamming and ice jam flooding. The issue is not freewater flooding. There have not been any specific studies that address the role of the VFD on ice formation and entrapment. NONE. The Gomez and Sullivan report only addresses free-water flooding.

3) The USGS has NOT studied ice jam flooding. The erroneous reference above is simply the USGS web page for the ice jam monitoring system. This is simply a web page that serves data on the warning system that measures changes in water levels at and above the VFD in the case of ice jams. The system is unique, and one-of-a-kind because the ice jam hazard is so serious in front of the VFD. The USGS ice jam monitoring systems assumes the existence of ice jam flooding. It does not address what is necessary to solve this problem.

4) There have been a number of studies that in fact do show that the sheet ice in front of the VDF, the build up of sediment, and the pinch point in the Knolls drives ice jams, that then flood the Stockade. This link is indisputable. See submitted letter to FERC by Garver (August 2019).

The historical issue of whether the Stockade floods or not is irrelevant. **The primary issue is: has the dam made flooding worse.** There is no substantial quantitative data on this issue. But the recent study by Shumaker Engineering showed that nearly all damaging historic floods in the Stockade are driven by ice jams. So understanding ice jams, and the relationship between ice jams and the VFD, is the key to understanding flooding in the Stockade.

Freewater models of flood levels (with or without dam) have been used to infer that the dam has no effect on the Stockade. They are using the wrong tool: we need to understand Ice Jam driven flooding.

Thank you.

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EMAIL: steckp@nyassembly.gov

20191104-0010 FERC PDF (Unofficial) 11/04/2019

ORIGINAL

31 Van Voast Lane

Glenville, NY, 12302

October 29, 2019

Kimberly D. Bose

Secretary, FERC

888 First Street, NE

Washington, DC 20426

Vischer Ferry Dam Project #4679-049

Dear Secretary Bose:

I ask that the re-licensing studies of the Vischer Ferry Dam (VFD) hydroelectric plant include flooding issues exasperated by this dam.

I am a retired licensed engineer formerly employed by the New York State Department of Environmental Conservation Flood Control Bureau (NYSDEC) for almost thirty years. I was involved in the planning, design, construction, operation and maintenance of many flood control projects constructed by the five Army Corps of Engineers (COE) districts serving New York State.

The VFD was substantially completed in1913 as a part of a ten year 500 mile canal construction project. As part of the state canal system, the Mohawk River was canalized from Utica to its confluence with the Hudson at Waterford. The river was dredged and movable dams constructed to produce the designed twelve foot depth. The exception was the construction of concrete gravity dams at Vischer Ferry and downstream at Crescent.

The VFD, with nearly a 2000 foot spillway constructed approximately thirty feet above bedrock, caused ice jam flooding that same year and the year after (1914 flood of record).

Since the VFD was constructed, the eleven mile reservoir pool flooded the Schenectady /Scotia area 23 times. Fourteen flooding events were ice jam events.

The flood prone Schenectady Stockade area is culturally unique dating back to the eighteenth century.

Over the course of twenty years I developed an understanding on what stops an ice run and creates ice blockage and backwater flooding. Briefly, a reduction in river slope, an ice covered pool, bridge piers, sharp bends in the stream channel and the confluences of high gradient tributaries trigger ice jamming. The Niskayuna Pool, formed by the VFD, triggers ice jamming by (1)thick sheet ice on the pool, (2)the sharp right bend in the river channel and (3)bridge piers.

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There are small gates in the north section of the VFD. However, the Niskayuna Pool is not drained during the winter months. IF there was a winter draw down of only five feet the historical ice jam flooding events would be reduced to three. Tremendous economic loss and great inconvenience and stress would have been eliminated. I urge that this issue be addressed in the study to re-license this hydro electric plant.

I urge one additional study concerning the VFD and the re-licensing of the hydroelectric plant. I am aware that several hydraulic studies have been made on the backwater effect from the VFD in the Schenectady/Scotia reach of the Niskayuna Pool that have determined only inches of flood water reduction would result even if the VFD was removed. I question the data impute into such studies as the friction factor is so different when the reservoir pool transforms from a placid reservoir into a flood wave. The narrow rock cut channel section downstream from the Rexford Bridge will have a much higher friction factor (having high velocities) than the wide silt lined channel in vicinity of the Western Gateway Bridge (having small velocities).

My main point is the re-licensing process offers an opportunity to define and adress a long standing problem using modern technology. Not available when the VFD was designed, the National Weather Service can now reliably forecast huge runoff events days before they occur. Local gauging stations can monitor the building flood wave and refine the arrival time of the flood wave. I believe IF there was a designed gated opening in the VFD that would pass a base flood flow (130,000 cfs), without overflowing the existing dam crest, and the Niskayuna Pool was drawn down prior to the arrival of the flood wave, significant flood level reductions in the Schenectady/Scotia area could be realized.

Madam Secretary, the area I am speaking about has billions in constructed development in the 500 year floodplain, including new hotels and a large manufacturing plant (General Electric). The Irene event of August, 2011, caused over a hundred million in damages.

I urge the study to re-license the VFD hydroelectric plant, include a comprehensive flood control review. The City of Schenectady, Stockade Association, Community College and Scotia/Glenville will appreciate flood relief benefits in future years.

Sincerely,

Russell Wege

Retired engineer

Copies to:

Senator Jim Tedisco

Senator George Amadore

Assemblyman Angelo Santabarber

Assemblyman Phillip Steck

Assemblywoman Mary Beth Walsh

Supervisor Christopher Koetzle

City of Schenectady, Kristin Divtto

Professor John Garver

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NON-DECISIONAL

20191129-0006 FERC PDF (Unofficial) 11/29/2019

31 Van Voast Lane

Glenville, NY 12302

November 6, 2019

Jody L. Callihan, PhD

Federal Energy Regulatory Commission

888 First Street, Suite 6H-03

Washington, DC 20426,

Reference: Vischer Ferry Dam, Hydroelectric Plant

Project #4679-049

Dear Jody,

It was good to meet you and have a brief chat at the recent scoping meeting concerning this project.

Some further thoughts may have importance in FERC's consideration of the flooding issue concerning the study plan for re-licensing this project.

The NYPA has referenced two studies, one a 1979 DEC study and a recent study by Gomez & Sullivan Consultants that conclude the Vischer Ferry Dam produces only negligible backwater flooding in the Schenectady/Scotia reach of the Niskayuna Pool.

Some background information may be helpful in understanding these two studies. First, I wrote the 1979 DEC report. I do not consider myself a technical hydrologic engineer. (My education and technical experiences was in petroleum engineering) A technician, Mike Milburt did the technical analysis of that 1979 study. Being responsible for that report, I recall Mike had a difficult time with friction factors in using the HEC-2 program that would recreate the recent flooding event.

I recall Mike used a very smooth friction factor, a figure that would NOT be used outside of lab conditions. Neither of us were happy using a number that would normally not be used to calculate river backwater conditions. However, that unrealistic number was used in that study as it duplicated the recent flooding event.

Years later, and hopefully a little wiser, I concluded that the Vischer Ferry Dam rendered that study in error. The error was, and remains, the spillway elevation of the dam (approximately 210 feet), sets the channel parameter, NOT the bottom of the river/pool bed. The Niskayuna reservoir/pool bottom is 10 to more than 20 feet below the spillway elevation. This results in moving water flowing over a static water

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column for the major length of every cross section through the permanent eleven mile pool. I must conclude that no channel bottom friction occurs. I believe this is where error occurs in using standard hydraulic backwater computations.

Jim Duggan and I have discussed this understanding with the NYPA consultants Gomez and Sullivan. They do not agree with my stated understanding, saying that turbulence in the pool column has been observed below spillway elevation. Their studies and others were based using the full cross section of this channel.

The effect of this turbulence on modeling flood flows is debatable. It certainly reduces the friction factors throughout the Niskayuna Pool during flooding events and allows one to question the validity of modeling rivers that are affected by a major dam obstruction.

Gomez and Sullivan Consultants produced five or six alternatives for managing water levels at the dam. Each alternative illustrates the negligible effect on water elevations in the Schenectady/Scotia area. One alternative involved a shallow cut in the dam.

I do not believe that study was sufficient in analyzing the impact of this dam on the high- value upstream properties in the Schenectady/Scotia area. I suggest a few additional runs that assums a gated weir cut in the spillway that would pass a base flood flow.

May I further suggest a new study employ a management tool. Assume a major storm event of 6 to 10 inches in the watershed with a predicted flood wave 24 hours in advance: and assume the new flood gates are opened, allowing the Niskayuna Pool to partly drain prior to the arrival of the flood wave. Such an ability to manage the pool elevation would produce higher velocities that would shorten the flooding time and may significantly reduce flood elevations.

Finally, the ability to draw down the Niskayuna reservoir pool during the winter months would yield significant flood elevation reductions from ice jams in this high-value area.

Therefore, I am convinced that flooding is a valid concern and should be included in the proposed studies for re-licensing the Vischer Ferry Dam hydroelectric plant.

Sincerely,

Russell Wege, retired engineer

copies to:

Jim Duggan

John Garver

From:	Wells, Scott M (DEC)
To:	Daly, Rob; Weinstock, Andrew
Subject:	[EXTERNAL]LMR surveys 1992-2008 on excel
Date:	Friday, December 13, 2019 2:49:27 PM
Attachments:	MR_surveys.1988-2019.pdf LMR.Surveys.1992-2008.xlsx

CAUTION — External Email
Suspicious? Click Report Phishing on Outlook toolbar. For **Mobile** forward to (abuse@nypa,gov)

OK gents – this week I have relearned how to extract fish survey data out of our SWDBD and compiled the 7 oldest surveys on the updated roster for the lower MR. All 7 of these surveys are now on one excel file, each getting their own spreadsheet. Luckily none of these day surveys had more and 1-2 sites so all fit into one page each. Note, I copied/pasted the CV text into a link to the far upper right for each survey = easily read by placing the mouse over the cell.

The newer surveys on the list are not that simple, thankfully I already have spreadsheets on the larger efforts. Hopefully these summaries will fit the needs of ALL stakeholders needing lower river survey data from us for years to come.

More raw data and reports coming next week.

Tgif,

><> smw

Scott Wells, CP-F *est.*
Aquatic Biologist 1
DEC R4 Stamford - Fisheries
607-652-7366
scott.wells@dec.ny.gov

Lower MOHAWK RIVER (H-240) - R4 FISH SURVEYS near NYPA hydro-plants (1992 to 2019)

SN	section	code	authority	dates	description	locations	format*	report	notes
419003	Lower	8	Wells	5/6 to 10/21	BBH Collections, outreach	Abv/blw W. Flight, braided channels	forms	no	
418011	Lower	2	Wells	6/18 to 27	6-night centrachid survey	All of Crescent Lake, Lock E6 pool	excel	**Tech**	agency report
418012	Lower	18	Wells	6/29 to 10/15	TSMP collections	Cohoes to Amsterdam, above Lock E7	forms	no	
417022	Lower	8	Wells	6/15 to 10/11	BBH collections, Quebec/ESF	Cohoes to Amsterdam	forms	no	not in excel yet
416011	Lower	99	Wells	5-24 to 10/19	BBH collections, SUNY ESF	Cohoes to Rotterdam (below VF Dam)	forms	no	not in excel yet
415034	Lower	8	Wells	8/26,27	Year 2 Seining effort w/OEI	Clifton Park to Root (upper Crescent Lake)	forms	no	Inverts report by OEI
415026	Lower	18	Wells	5/27 to 10/19	TSMP and outreach	Cohoes to Glenville (below VF Dam)	forms	no	not in excel yet
415010	Lower	8	Wells	5/26 to 6/2	Year 2 USGS/DEC study	Niskayuna to Minden, below VF Dam	**excel**	**yes**	*published article*
414005	Lower	8	Wells	5/27 to 6/2	Year 1 USGS/DEC study	Waterford to Minden, abv Crescent Dam	**excel**	**yes**	agency, AFS reports
414033	Lower	8	Wells	9-30 to 10/2	Year 1 Seining effort w/OEI	Waterford to Minden, abv Crescent Dam	forms	no	
413005	Lower	8	Wells	4/30 to 6/19	Year 2 of BBH study w/ ESF	Waterford to Minden, abv Crescent, blw VF	**excel**	no	
412007	Lower	99	Wells	5/23 to 6/26	Year 1 of BBH study w/ ESF	Clifton Park to Canajoharie, blw VF dam	**excel**	**abtract**	slides from 2013 AFS conf
408007	Lower	6	McBride	6/3	Fish Kill recon, dead n. pike	below Vischer Ferry Dam	**excel**	**abstract**	same text as CV
408002	Lower	28	Zielinski	5/20	Fish Health collection	below lock E7 and VF Dam	**excel**	**abstract**	very short summary
407005	Lower	28	Linhart	5/30, 6/6	Fish Health collection (VHS)	below Vischer Ferry Dam, county border	**excel**	no	
406004	Lower	18	McBride	6/1	TSMP Collection, bbh for USGS	below Vischer Ferry Dam	**excel**	**abstract**	very short summary
405001	Lower	18	McBride	5/12 to 13	TSMP Collection	below E7 and E9 lock and dams	**excel**	**abstract**	very short summary
498004	Lower	18	McBride	5/17	TSMP collection	Niskayuna, below VF dam	**excel**	no	
492004	Lower	18	McBride	5/15	TSMP Collection	Clifton Park; below VF dam	**excel**	no	

SWFDB - statewide fisheries database, not including CV or cover details, abstracts, or TB (technical briefs)
SN - survey #, 1 digit DEC region, 2 digit year, 3 digit SN
Survey codes - see back of CV or cover page form
Fish species codes - see back of IF or BF forms, also NYS spp. list on excel
BBH - blueback herring; SMB - smallmouth bass; T - tributary; VF - Vischer Ferry
TSMP - toxic substance monitoring program; annual collections for analysis at Hale Creek Lab
Lock E - Erie Canal, NYS Barge Canal, or NYS Canal System locks
Border between upper/lower Mohawk = DEC Regions 4/6 border at county line near St. Johnsville, NY
Yellow text highlighted - sites near NYPA hydro-power facilities (Vischer Ferry, Crescent Lake Dams)
Text in red font above = data not included in the SWFDB (yet)!

Some 111 MR surveys listed below
55 MR surveys in the lower basin
19 of those surveys with data near a NYPA hydro
9 of those surveys with a summary doc

*survey data now provided on MS excel

ver. 12-13-19, smw

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John Cococcia, Niskayuna, NY.
Hello

I was just reading an article about possible ice jam study as related to the relicensing of the Vischer Ferry Dam (P-4679).

I live between the Visher Ferry Dam (Lock 7) and the Cresent Dam (Lock 6) on the Mohawk River. I believe it is IMPERATIVE that any review of ice jams related to Lock 7 (P-4679) also include a review of ice jams related to Lock 6 (P-4678). Often times, the ice and debris that flows over Lock 7 contributes to jams at Lock 6 which impacts all of the property and home owners along that stretch of the river. Making any recommendations related to Lock 7 must consider the impact to Lock 6 and the stretch of river between the two.

Thank you for taking my comment.

Regards,
John

20191217-3096 FERC PDF (Unofficial) 12/17/2019

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
December 17, 2019

OFFICE OF ENERGY PROJECTS

Project No. 4678-052–New York
Crescent Hydroelectric Project

Project No. 4679-049–New York
Vischer Ferry Hydroelectric Project

New York Power Authority

VIA Electronic Mail

Mr. Robert Daly
Licensing Manager
New York Power Authority
Robert.Daly@NYPA.gov

Subject: Staff Comments on the Proposed Study Plan for the Crescent Hydroelectric Project and Vischer Ferry Hydroelectric Project

Dear Mr. Daly:

We have reviewed your proposed study plan for the Crescent Hydroelectric Project (Crescent Project) and Vischer Ferry Hydroelectric Project (Vischer Ferry Project), filed with the Federal Energy Regulatory Commission (Commission) on September 24, 2019. In addition to our verbal comments provided during the October 23, 2019, proposed study plan meeting, we are providing written comments pursuant to section 5.12 of the Commission's regulations. We anticipate that New York Power Authority (NYPA) will take our comments into consideration during development of the revised study plan, which must be filed with the Commission by January 21, 2020.

In the attached Schedule A, we provide comments on proposed studies and four additional information requests. In Schedule B, we request a new study on the potential effects of the Vischer Ferry Project on ice-jam flooding in the lower Mohawk River, in response to the concerns expressed over this issue at the study plan meeting by various stakeholders and in a letter filed by Assemblyman Phil Steck on October 22, 2019.

20191217-3096 FERC PDF (Unofficial) 12/17/2019

We appreciate the opportunity to comment on your proposed study plan for the Crescent and Vischer Ferry Projects. If you have any questions, please contact Jody Callihan at (202) 502-8278, or via email at jody.callihan@ferc.gov.

Sincerely,

John B. Smith, Chief
Mid-Atlantic Branch
Division of Hydropower Licensing

Attachments: Schedule A and Schedule B

20191217-3096 FERC PDF (Unofficial) 12/17/2019

SCHEDULE A

Comments on Proposed Study Plan (PSP)

Water Quality Study

1. In the PSP, you state the location of the water quality sampling sites within each project's impoundment and tailwaters will be based on consultation with New York State Department of Environmental Conservation (New York DEC) water quality staff. In the Revised Study Plan (RSP), please provide the results of this consultation, and include a map that shows the approximate locations of your proposed water quality sampling sites. Also, please indicate, in the RSP, the impoundment depth(s) at which you plan to deploy the data sondes that would be used to continuously monitor water temperature and dissolved oxygen (DO).

2. Water quality studies at hydropower projects commonly use 15-minute measurement intervals for continuously recording data sondes (i.e., water temperature and DO data are recorded every 15 minutes). Therefore, in the RSP, please explain why you propose to use a 30-minute rather than a 15-minute measurement interval for continuous measurements of water temperature and DO.

3. At the study plan meeting, there was a discussion of whether to collect water quality grab samples (surface waters) and impoundment depth profiles at weekly rather than monthly intervals (as proposed in the PSP). Therefore, in the RSP, please confirm your proposed sampling frequency (i.e., weekly or monthly) for water quality grab samples and impoundment depth profiles.

Fish Entrainment Study

4. You state that an Acoustic Doppler Current Profiler (ADCP) will be used to measure approach velocities in front of the projects' intakes during 'varying operational conditions.' In the RSP, please specify under what operation conditions (e.g., maximum hydraulic capacity of each project) these ADCP measurements would occur.

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5. You propose to estimate turbine survival via a blade strike model.[1] In the RSP, please indicate if you plan on providing separate estimates of turbine survival for each turbine type (Kaplan and Francis) present at the projects.[2]

Blueback Herring Migration Study

6. You propose to conduct a single-season hydroacoustic study by placing split-beam transducers[3] at navigation locks E-6 (at the Crescent Project) and E-7 (at the Vischer Ferry Project) to assess the timing, duration, and magnitude of the upstream migration of adult blueback herring through these navigation locks. However, it is unclear how the results from this study would inform potential license conditions or relate to the management goals for blueback herring in the Mohawk River. For instance, is the study meant to provide information on run timing for the purpose of informing decisions as to when the navigation locks should be operated to optimize upstream fish passage? It is also unclear how estimates of run sizes would provide new information for the project record because it is well known that a sizeable spawning run of blueback herring occurs in the Mohawk River as previous fishery surveys upstream of the projects have caught hundreds to thousands of adults in the spring and early summer spawning season (generally May and June).[4,5] Therefore, in the RSP, please specify how the results of your proposed study would inform potential license conditions, provide new information for the project record, and relate to the management goals for blueback herring in the Mohawk River.

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[1] Franke, G.F. and 9 others. Development of environmentally advanced hydropower turbine system design concepts. Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho. August 1997.

[2] Each project contains four turbines, two Kaplan units and two Francis units, each of which have the same specifications.

[3] Split-beam transducers send out acoustic signals into the water column and 'listen' for the for return signals. The characteristics of the return signals (amplitude, target strength, etc.) are used to estimate the number of fish in the vicinity of the transducers.

[4] http://www.asmfc.org/uploads/file/59c2ac1fRiverHerringStockAssessmentUpdateVolu meII_State-Specific_Aug2017.pdf

[5] Wells, S.M., Limburg, K.E., and C.D. Legard. 2013. Tracking blueback herring in the lower Mohawk River. AFS New York Chapter Meeting. February 2013.

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7. You propose to study only the upstream component of the blueback herring migration in the Mohawk River (as described above) given that a number of previous studies have already evaluated the effectiveness of the downstream passage (acoustic deterrent) systems present at the projects. Although several studies have evaluated the effectiveness of the existing acoustic deterrent systems—which use ultrasonic (high-frequency) sound to divert juvenile and post-spawning adult blueback herring away from the powerhouses and towards surface openings in the projects' flashboards, certain information gaps remain, particularly at the Crescent Project due its more complex channel arrangement (a split channel upstream of the dams) compared to Vischer Ferry (single channel). First, the effectiveness of the acoustic deterrent system for adults at the Crescent Project, which was initially evaluated during a 2009 telemetry study,[6] has not been re-evaluated since the direction of the sound field was changed in 2010.[7] Thus, the effectiveness of the current deployment configuration is largely unknown for adult blueback herring at the Crescent Project. Secondly, despite the re-alignment of the sound field at the Crescent Project, the acoustic deterrent system still appears to be only partially effective at diverting juveniles as the diversion rate[8] in a 2012 study (3 to 27 percent after re-alignment)[9] was similar to that (20 percent) from a 2008 study conducted

[6] Effect of an ultrasonic system on adult blueback herring at the Crescent Hydroelectric Project: data report. Filed on March 15, 2010. Accession No. 20100315-5011.

[7] The direction of the sound field was changed in 2010 to penetrate farther up the east (non-powerhouse) channel in an attempt to divert more juveniles away from the powerhouse at the Crescent Project.

[8] The 'diversion rate' is the additional proportion of fish estimated to migrate down the east (non-powerhouse) channel due to the presence of the acoustic deterrence system (i.e., the proportion in excess of that expected based on the natural flow allocation between the two, east and west, channels alone in the absence of the sound field). For example, if 85 percent of the flow was down the powerhouse (west) channel, and the remaining 15 percent was down the non-powerhouse (east) channel, and 35 percent of juvenile blueback herring were estimated to move down the east (non-powerhouse) channel when the sound field was on, then the 'diversion rate' would be 20 percent.

[9] Unlike the first (2008) juvenile study, the second (2012) juvenile study calculated diversion rates for *both* the peak migration period (based on fish movement patterns) and entire study period; the 2008 study only included the latter (entire study period). This is why a range is presented for the diversion rates from the 2012 study.

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prior to the re-alignment of the sound field.[10,11] Therefore, if you do not propose studies in the RSP to address these information gaps, please explain why you believe the existing information is sufficient to conclude that the current downstream passage system at the Crescent Project is effective for deterring both juvenile and adult blueback herring away from the project's turbines and passing safely downstream.

Aquatic Mesohabitat Study

8. As part of the Aquatic Mesohabitat Study, you propose to conduct field reconnaissance surveys along the projects' shorelines (littoral zones), in which you would note the occurrence of any freshwater mussels (and shell remains) or fish nests. However, you state that these field reconnaissance surveys would only be performed in areas that lack adequate (existing) aerial imagery data and would be used for the purpose of 'filling in' data gaps to create a comprehensive map of the various mesohabitats (wetlands, riparian, and littoral zones) present at the projects. Given these field surveys may cover a rather limited portion of the shoreline (depending on the quality and extent of existing aerial imagery data), it is unclear how the field component of this study would inform an analysis of potential project effects on freshwater mussels and fish spawning in the projects' impoundments. For instance, water levels in the project impoundments are drawn down 18 to 33 inches in the spring and fall for the purpose of installing and removing flashboards, which could cause desiccation of mussels and disrupt fish spawning activity. Therefore, in the RSP, please clarify how the study would inform potential project effects on mussels and fish spawning in the projects' impoundments.

Recreation Study

9. As part of the Recreation Study, you propose to use either trail cameras or spot counts to conduct use counts (page 41 of the PSP); and either a voluntary, self-administered box survey, or an intercept survey (page 42 of the PSP) to administer the recreation use survey. However, you do not describe the factors you will consider in deciding which method you will use, nor do you include a timeframe for making the decision. As discussed during the study plan meeting, please include in the RSP a description of the process you will use and any factors you will consider when making the determination on whether to use trail or spot counts, and self-administered or

[10] Dunning, D.J. and C.W.D. Gurshin. 2012. Downriver passage of juvenile blueback herring near an ultrasonic field in the Mohawk River. North American Journal of Fisheries Management 32:365-380.

[11] Gurshin, C.W.D., Balge, M.P., M.M. Taylor, and B.E. Lenz. Importance of ultrasonic field direction for guiding juvenile blueback herring past hydroelectric turbines. North American Journal of Fisheries Management 34:1242-1258.

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intercept surveys. In your description, please also include a schedule for when these determinations will be made.

10. As part of the Recreation Study, you propose to conduct an inventory and condition assessment "at all non-commercial, public recreation sites that provide recreational access to project lands and waters." You also state that "the inventory will not include privately-owned recreation sites within and abutting the projects." As discussed during the study plan meeting, while a condition assessment of these commercial facilities is not necessary, it would be helpful to have an inventory of all the commercial facilities that also provide access to the projects. Therefore, in the RSP, we recommend that you revise the Recreation Facility Inventory description under Task 2 of the Recreation Study (page 40 of the PSP) to include an identification and description of all commercial recreation sites within the study area that also provide access to the projects.

Additional Information Requests (AIRs)

1. Some existing information on the presence and relative abundance of American eel in the vicinity of the projects was compiled and presented in the PAD. However, this information was from non-targeted surveys that were focused on characterizing the general fish community composition in the Mohawk River. During the study plan process, it has become apparent there are additional existing data from targeted eel surveys that have been recently completed in the Mohawk River and would help inform staff's Study Plan Determination regarding the need for field surveys to determine the relative abundance of American eel in the vicinity of the projects, such as the studies requested by the U.S. Fish and Wildlife Service and New York DEC. Therefore, please provide, in the RSP, the following data reports that were contained in a memorandum distributed by NYPA at the PSP meeting that listed the various documents and reports it has requested from New York DEC:

- USGS. 2015-2016. American eel in tributaries to the Mohawk River. The USGS, SUNY ESF, and DEC screening survey of tributaries for American eel.

- USGS. 2015. American eel *in* USGS Newsletter describing a study being conducted "in cooperation with NYDEC" to determine if American eel are present in the Mohawk River.

Also, at the PSP meeting, Michael Hreben of Kleinschmidt Associates indicated that eel catch data may exist from adult eel collection efforts (years 2009-2010) at the downstream School Street Project (FERC No. 2539) that were conducted to support post-licensing studies of fish passage effectiveness at that project. However, the final reports

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associated with those efforts have not been filed with the Commission.[12] Therefore, if eel catch data (size, relative abundance, etc.) are available from the School Street Project, please provide that data in the RSP, as well as any other existing information regarding the presence, abundance, or distribution of American eel in the vicinity of the Crescent and Vischer Ferry Projects.

2. To inform staff's analysis of existing fish passage opportunities (for eels and blueback herring) afforded by the navigation locks associated with each project (E-6 at the Crescent Project and E-7 at the Vischery Ferry Project), please provide, for the past 10 years, to the extent such data are available, the monthly number of lockages at each project in each year. Also, please specify the hours of the day during which these locks operate.

3. As described above, hydroacoustic studies of juvenile blueback herring were conducted at the Crescent Project in 2008 and 2012. The manuscript reporting the results of the 2008 study included a table (Table 2) of the daily proportion of flow along with the expected and observed proportion of juveniles migrating down the east (non-powerhouse) channel. However, the report for the 2012 study does not contain such data on the daily proportion of flow and expected and observed number of juveniles moving down the east (non-powerhouse) channel. These data are needed by staff to fully interpret the results of the 2012 study—especially the results from the mobile hydroacoustic surveys that were conducted on certain dates for which there is no daily information on the relative flow distribution between the two channels.[13] Therefore, in the RSP, please provide, for the entire duration of the 2012 study (September 8, 2012 through October 26, 2012), the same daily information that was presented in Table 2 for the 2008 study.

4. At the Vischer Ferry Project, there are two separate 'notches' or flashboard openings (sections lacking flashboards) that provide downstream passage of blueback herring, one for juveniles and one for adults. Please clarify whether: (1) both notches are open for the entire duration of the navigation season or (2) if the juvenile notch is initially closed (i.e., its flashboard is in place) until the end of the adult migration season, at which time the adult notch is closed (its flashboard is installed) and the juvenile notch is opened (by removing its flashboard)? If the latter, how much time generally elapses between the

[12] See letter issued by the Commission on November 14, 2019. Accession No. 20191114-3026.

[13] To evaluate the effectiveness of the sound field in deterring blueback herring, these studies assume that, in the absence of a sound field, blueback herring migrate down each channel in direct proportion to the relative amount of flow down each channel (i.e., follow the bulk flow).

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opening of the juvenile notch and closing of the adult notch (e.g., is this work done on the same day?) and on what dates does this switch generally occur?

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SCHEDULE B

Additional Study Request

At the PSP meeting held on October 23, 2019, several stakeholders, including New York Assemblyman Phil Steck, commented that the Vischer Ferry Project exacerbates ice-jam flooding upstream of the project dam, including flooding in the Stockade Historic District. Comments concerning this issue were also filed with the Commission by several stakeholders. After reviewing the pre-application document (PAD), your comments on Scoping Document 1 that also provided supplemental information on flooding, and your proposed study plan, we have identified a gap between the information you provided and the information needed to assess project effects. As required in section 5.9 of the Commission's regulations, we have addressed the seven study request criteria for the study request that follows:

Ice-Jam Flooding Study

Criterion (1) – Describe the goals and objectives of each study proposal and the information to be obtained.

The goal of this study is to evaluate any project effects on flooding due to the formation of ice jams in the river reaches upstream of the Vischer Ferry Dam. The specific objectives of the study are as follows:

1. Characterize and understand ice-jam processes in the Mohawk River upstream of the project dam, including ice-jam formation, location of ice jams, and ice-jam-induced flooding.

2. Develop an ice-jam hydraulic model to evaluate the effects, if any, of the Vischer Ferry Project and its operation on ice-jam formation and flooding.

3. Identify structural and nonstructural options for the mitigation of ice-jam impacts if the project is shown to increase flood risk in any part of the study reach.

Criterion (2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

Not applicable.

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Criterion (3) – If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Sections 4(e) and 10(a) of the Federal Power Act require that the Commission give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values.

Comments provided by the stakeholders indicate that there may be some potential for the project to influence ice-jam flooding upstream of the dam. On August 9, 2019, NYPA filed copies of a flooding study by the New York State Department of Environmental Conservation in 1979, and a flooding study by Gomez and Sullivan for NYPA in 2018. The 1979 flooding study, that included modeling, evaluated the effect the Vischer Ferry Dam has, if any, on flooding conditions under various river flows and under existing and modified conditions at the dam. The study concluded that Vischer Ferry Dam has no significant effect on flooding in Schenectady, New York. Although the report briefly discusses ice-jam flooding, it did not include any analysis or modeling related to ice-jam related flooding. The 2018 flooding study included a modeling analysis to evaluate several Vischer Ferry Dam crest modification options (i.e., lowering crest) on flooding in Schenectady, New York. The modeling included evaluation of these options under a range of flow conditions, and concluded that installing a variable crest control apparatus at the dam and using the most extreme option (i.e., dam crest reduced by 6 feet) would result in minor changes in water surface elevation in the Stockade Historic District under the 10-year flood flow and no significant changes to the water surface elevation or the depth of flooding under the 100-year and 150 percent of 100-year floods.

Both prior modeling studies evaluated dam operation and/or modification options for open-water flooding conditions and did not include hydraulic modeling analysis of ice-jam-induced flooding. Therefore, an analysis of the extent, if any, that the project contributes to ice-jam flooding is needed to identify and balance potential mitigation measures with their costs. As such, the study is relevant to the Commission's public interest determination.

Criterion (4) – Describe existing information concerning the subject of the study proposal, and the need for additional information.

The Vischer Ferry Project impoundment extends 10.3 miles from the dam upstream to Lock E-8 in Schenectady, New York. Ice-jam flooding occurs in the low-lying areas along the Mohawk River, particularly in the vicinity of the Stockade Historic District in Schenectady (New York Department of Environmental Conservation, 2018). Ice-jam occurrences in the Stockade area, situated approximately 3 to 4 miles

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downstream of Lock E-8, have been discussed in the published literature (Garver, 2018; Garver, 2014; Garver and Cockburn, 2009). The United States Geological Survey also collects information on water levels and other ice-jam related information as part of the Mohawk River Ice Jam Monitoring Program in this reach of the Mohawk River (https://www.usgs.gov/centers/ny-water/science/mohawk-river-lock-8-near-schenectady-01354330?qt-science_center_objects=0#qt-science_center_objects).

However, there is no information in the PAD, or in any other documents, that evaluates the potential effects, if any, of the Vischer Ferry Project on ice-jam flooding in this portion of the river. Therefore, a study is needed to formally analyze and evaluate project effects, if any, on ice-jam-induced flooding.

Criterion (5) – Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

As the project impoundment extends upstream of the areas where ice-jam flooding occurs, water levels in the river along those areas could be affected by project operation. The results of the study would help identify and evaluate the potential effect, if any, of the Vischer Ferry Project on ice-jam-induced flooding and help identify potential measures for alleviating such flooding conditions.

Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

This study should characterize ice jams in the study area, including the frequency and extent/severity of historic ice events, ice-jam formation, location of ice jams, and ice-jam-induced flooding. The study must develop a hydraulic model that can simulate ice jams in the affected areas. The model can be developed using readily available and accepted programs, such as the U.S. Army Corps of Engineers' Hydrologic Engineering Center's River Analysis System (i.e., HEC-RAS). The study area should extend from the project dam to upstream areas where project operation could no longer influence water level in the river. The model should be calibrated for both open-water and ice-jam conditions, which would involve field data collection during actual events. Model simulations should include the analysis for a full range of hydrologic and ice-jam conditions. The study should include an evaluation of various potential structural and nonstructural options for mitigating ice-jam-induced flooding conditions in the upstream areas of the project dam, including changes in project operation leading up to an ice-jam event.

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Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The cost of the Ice-Jam Flooding Study is estimated to range from $125,000 - $150,000, including study plan development, field data collection, model development and simulation, mapping, and study report preparation.

References

New York Department of Environmental Conservation. March 2018. Progress Report, Mohawk River Basin Action Agenda, Environmental Sustainability and Flood Hazard Risk Reduction.

Garver, J. I. March 2018. Ice Jam Flooding on the Lower Mohawk River and the 2018 Mid-winter Ice Jam, Proceedings from the Mohawk Watershed Symposium, Union College, Schenectady, New York.

Garver, J. I. March 2014. Insight from Ice Jams on the Lower Mohawk River, New York, Proceedings of the 2014 Mohawk Watershed Symposium, Union College, Schenectady, New York.

Garver, J. I. and J.M.H. Cockburn. March 2009. A Historical Perspective of Ice Jams on the Lower Mohawk River, Proceedings of the 2009 Mohawk Watershed Symposium, Union College, Schenectady, New York.

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Carol Delamarter, Schenectady, NY.
Stockade Association of Schenectady
32 Washington Ave
Schenectady, NY 12305

December 19, 2019
Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Vischer Ferry Dam Project #4679-049

Dear Secretary Bose,

Dear Secretary Bose:

The Stockade Association of Schenectady requests that NYPA revise their Study Plan submitted to FERC on September 23, 2019. A revised study plan must specifically address flooding issues related to the effects of the operation of Vischer Ferry hydroelectric project on flooding issues in the impoundment area of the Vischer Ferry dam.

The Stockade Association, established in 1958 and incorporated in 1973, is a 501 (c) (3) charitable organization and was formed to preserve, protect and improve the Stockade Historic District in Schenectady. The Historic Stockade, on the south shore of the Mohawk River, was designated a National Register historic neighborhood in 1973 and New York State's first historic district in 1962.

In reading the FERC Scoping Documents it is our understanding that in order for FERC to complete the relicensing process for Vischer Ferry Hydroelectric plant, FERC must have the information needed to complete an environmental assessment. This environmental assessment requires that all issues including flooding (Section 4.2.2 of SD 2) are analyzed. To do this NYPA must provide data that allows for a thorough and balanced assessment of all impacts of the project on resources. The NYPA Study Plan, as submitted, asserts there is sufficient existing information to allow FERC to evaluate flooding issues in order to complete an Environment Assessment. (Section 3.1.3 related to Criteria 4, 18 CFR 5.9 (b). The Stockade Association asserts this statement is incorrect and more study is required.

In its Study plan submission letter to FERC, NYPA asserts further study is not needed as the several studies they cite in Section 3.1.3 are adequate.

The work done by Shumaker and Rock (2019) for Phase 1 of the City of Schenectady flood project was cited by NYPA. Shumaker consultants have stated their investigation was limited and did not include any review of VFD operations on flooding in the Stockade. Because of funding for their City of Schenectady work, consultants were not allowed to make recommendations except in Stockade neighborhood. In PAD comments, Shumaker consultant, James Woidt recommended that a study be conducted that quantifies the frequency and magnitude of ice jamming on the Mohawk

River upstream from VFD and quantifies the impact of VFD operations on upstream flooding.

Another study referred to was work by USGS. Again it appears USGS modeling tools referred to by NYPA are monitoring ice jams and their backwatering between Lock 7 and 8 but have not addressed how adequately modifying the design and operations of Vischer Ferry gateless dam could mitigate the formation of backwatering and ice jams.

The NYSDEC Mohawk River Basin agenda referred to by NYPA, includes initiatives to better understand flooding throughout the entire Mohawk River Basin. To date, the area of the lower Mohawk River in question has not been analyzed nor is it clear that any DEC consultant workplan includes any study of the impacts of the 100 year old gateless dam on this section of Mohawk River Basin. NYPA is relying on an as yet unpublished DEC Mohawk River Basin report as sufficient for FERC to complete their Environmental Assessment.

The Gomez and Sullivan findings are being challenged in the comments submitted by several stakeholders. The models and scenarios used in the Gomez and Sullivan study did not assess modifications to dam crest and gates that could significantly change backwatering and localized flooding. Such modifications in dam operations combined with updated technology to forecast high water events throughout the basin could prevent local flooding to properties in Schenectady especially Historic Stockade, Scotia and SUNY Schenectady County Community College.

Relevant public interest considerations in regard to the proposed study- As stated here and by others the area known as the Stockade was listed on the National Register of Historic Places in 1973. It became New York State’s first historic district in 1962 and includes 390 properties covering approximately 90 acres. Because of the location of the Stockade neighborhood on the Mohawk River, it has had historic and cultural significance for the City of Schenectady since it was first settled in 1661 as a water gateway to the west. FEMA has recently designated that 60-75 residential structures are located in a special flood hazard area. Proposals to mitigate periodic flooding of these properties require elevating or moving structures that have been an important part of the historic and cultural fabric of the Stockade community. This disruption of National Registered buildings and cohesive neighborhood setting located in the VFD impoundment area (approximately 8 miles upstream) has not included any assessment of impacts from VFD operations. Section 106 of National Historic Preservation Act of 1966 (NHPA) requires that FERC, as a federal agency taking a licensing action and completing environmental assessment, must have sufficient information to determine that the operation of VFD will have no significant impact on this NR setting. In their Study Plan, NYPA has not provided assurances that the information needed by FERC to issue a finding of no significant impact from Vischer Ferry Hydroelectric operations is currently available without further study. Property owners in the Historic Stockade neighborhood are being asked to make decisions and costly investments for the future of their historic homes. The 100 year old Hydroelectric dam operations downstream of Stockade should also be required to study and

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make modifications to operations at VFD if it is found to reduce the impact on future flooding in the Mohawk River Basin.

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gloria kishton, Schenectady, NY.
December 20, 2019
Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Vischer Ferry Dam Project #4679-049

Dear Secretary Bose,

Schenectady Heritage Foundation is a 501c3 non-profit organization founded in 1979 whose mission is to foster historic preservation in Schenectady County. To that end, we wish to comment on the Vischer Ferry Dam Project (#4679-049).

The Foundation is advocating that New York Power Authority be required to revise their Study Plan submitted to FERC on September 23, 2019. These revisions must specifically address how the operation of the Vischer Ferry hydroelectric project affects flooding issues in the impoundment area of the Vischer Ferry dam, especially in the Stockade Historic District, which is bordered by the Mohawk River.

Past studies cited by NYPA are inadequate and do not take into account new scientific information and technology that can help to analyze both ice jams and flooding in the area between Locks 7 and 8. This area includes the Stockade, a highly sensitive National Historic District, which was listed on the National Register of Historic Places in 1973, and became New York State’s first registered historic district in 1962. Architecture in this area spans several centuries and includes some of the Nation’s oldest examples of early Dutch housing. Every avenue of investigation and study should be thoroughly pursued in order to preserve this district, an important cultural resource.

Property owners, the City of Schenectady, and other government agencies are currently considering various flood mitigation measures to address the affects of flooding in the Stockade. These include “managed retreat” and elevating houses. At a time when such extreme measures and millions of dollars are potentially being spent, it is imperative that the best science and studies inform both the property owners and agencies that may be making decisions about such disruptive initiatives. We must be certain that everything possible has been done, vis-a-vis the Vischer Ferry Dam operations, to mitigate flooding, BEFORE other land-based measures are considered.

As part of a final Environmental Assessment, Section 106 of National Historic Preservation Act of 1966 (NHPA) requires that FERC, as a federal agency taking a licensing action, must have sufficient information to determine that the operation of VFD will have no significant impact on the Stockade, a National Historic District. In their Study Plan, NYPA has not provided assurances the information needed by FERC to issue a finding of no significant impact from Vischer Ferry Hydroelectric operations, is currently available without further study.

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Property owners in the Historic Stockade neighborhood are being asked to make decisions and costly investments for the future of their historic homes and to preserve the Stockade, a National cultural resource. The 100 year old Fischer Ferry Hydroelectric plant operations, downstream from the Stockade, should be required to study and make modifications to its operations if such modifications are found to reduce the impact on future flooding in the Mohawk River Basin.

Thank you for your consideration,
Gloria Kishton
Chair, Schenectady Heritage Foundation

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James E. Duggan
Consultant

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ORIGINAL

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20 December 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington DC 20426

Vischer Ferry Dam Project # 4679-048

Dear Secretary Bose,

After much examination, I request that FERC require NYPA to revise its Study Plan, submitted 23 September 2019, specifically to address comprehensively the hydraulic character and hydroelectric operation of the Vischer Ferry Dam regarding their pronounced effects toward flooding issues along its impounded reservoir-pool.

The NYPA Study Plan, as submitted, asserts that sufficient information exists to allow FERC to evaluate flooding issues in order to complete an Environment Assessment. My review of the referenced Gomez and Sullivan documentation (G and S) pertinent to the flooding issue requires that I assert strong dissent.

To this end, my attachment illustrates strategic weaknesses in the documentation NYPA has submitted.

In particular, the model studied was based on considering the top of flashboards as the "crest" elevation, and thus was token in its scale compared to reality of even the "10-Year" runoff-volume. Furthermore, reporting two of the seven options to the gate-system not penetrating the structural concrete crest and reporting two more to penetrate a maximum of only 1.75 feet (21 inches) distracts from reality, a useless portrayal. Then, in providing only related-scale surface-elevations, the failure to inform re mean velocities misses their huge importance as an inadequate-drainage cause of the runoff-flooding experienced so repeatedly.

Overall, the study-effort seemed also to (a) discount the non-riverine impounded nature of the permanent large underlying water-volume, and (b) be conditioned around concern for the two subject dams' "stability" ... if their height is reduced". This latter matter is basically one of engineering awareness, appropriate preparedness and careful execution.

By contrast to the G and S study, the long-available FEMA FIS, in profiling the un-modified dam and runoff-volumes overrunning its impounded water-volume, had

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provided much revealing information useful to developing pertinent, reasonable understandings. Coupled with real-time and earlier data from USGS gages spaced along the impoundment, the more-clearly defined dynamics within the pool are becoming much-better understood. Together, the FEMA and USGS information form a very valuable tool.

In conjunction with the excellent alert system in operation, a suitably modelled, designed/selected and installed gate-system can provide controlled preemptive drawdown affecting the entire impoundment to "balance" arriving runoff-volume with effective discharge past this dam with no (or very-limited) backwatering overflow. Modification should result in overflow occurring only with truly extreme runoff-volume.

For improved well-being of the affected community along the impoundment, FERC should condition re-licensing on three matters: comprehensive hydraulic study of this lengthy dam leading to unquestionable assessment of modification and related benefit regarding the flooding issue; assuming the distinct benefit of modification, a survey-report regarding pertinent candidate gate-systems, and the earliest possible committed basic budgeting and scheduling for actual modification and operational readiness.

The FERC review process and opportunity to participate at this early stage is gratifying. I hope my involvement can help lead to future betterment of community-life, minus the century-plus plague of the canalized-river flooding so readily.

Sincerely

James E. Duggan

Encl:

MINIMIZING LOCK 7 DAM'S ROLE IN FLOODING AT SCHENECTADY
"Gomez and Sullivan" Report to New York State Power Authority - Review

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MINIMIZING LOCK 7 DAM'S ROLE IN FLOODING AT SCHENECTADY

"Gomez and Sullivan" Report to New York Power Authority - Review

20 December 2019

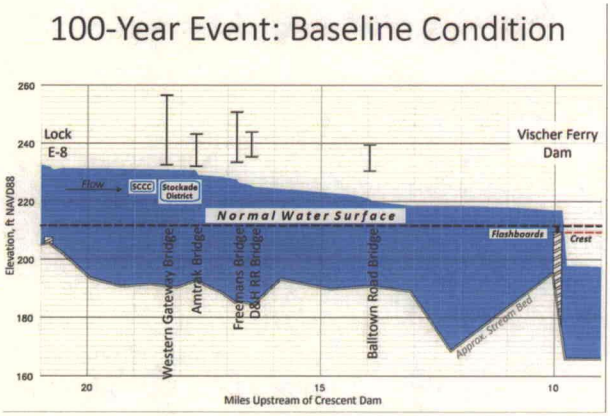
Abstract: The report of simulated crest-height reductions by modification with controlled gate-systems on two of the three dams for 100-Year runoff yielded no cost-justifying change to runoff-flooding in the targeted upstream-Schenectady reach of developed properties. Assessment of the options tested and key elements of the physical floodway provides reasoning for the result, plus basic recommendations to succeed.

The Gomez and Sullivan (G and S) report refers several times to "Balltown Road Bridge" (locally, aka the "Rexford Bridge") as a focal point regarding runoff-drainage.

> "These minimal reductions in water level *upstream of the Balltown Road Bridge* are due to the bridge acting as a significant flow control at high flow rates." (p. 8)
>
> "Option 7... ranged from approximately 2.41 feet at Vischer Ferry to *0.73 feet at Balltown Road*." (p. 9)
>
> *"Upstream of the Balltown Road Bridge,* including in the Stockade District, water levels are reduced by only a tenth of a foot or less for all options." (p. 10)

Balltown Road Bridge is a recognizable landmark, but what generates such mention?

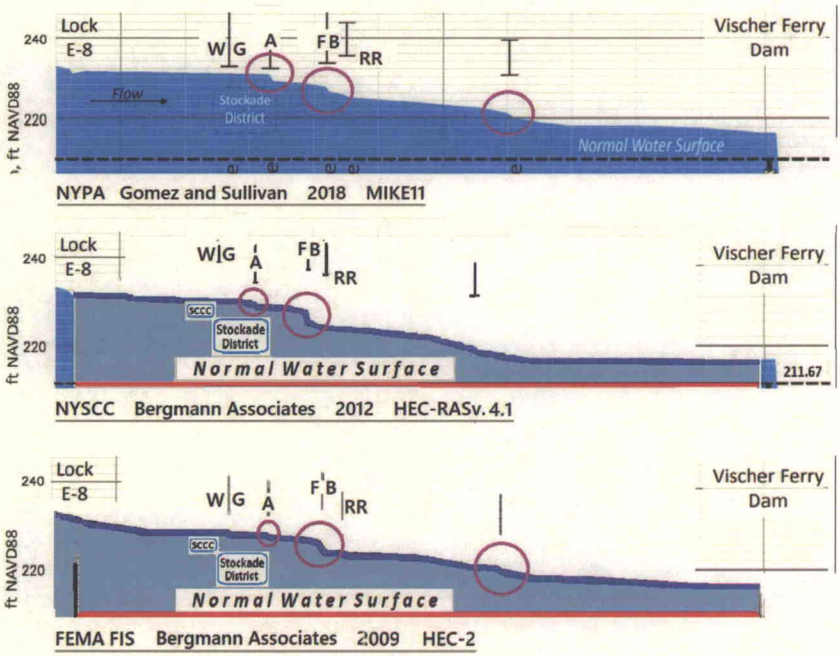
The G and S report excludes any water-surface profile. The firm presented slides of its study during a meeting with Lock 7 Dam-modification advocates, Russel Wege and James Duggan, at NYPA offices in Albany on 27 September 2018. Weeks later, Wege and Duggan received a hard-copy of the presentation. It included the following slide of a water-surface profile.



This profile lacks any distinct evidence that the "Balltown Road Bridge" reach seriously impedes runoff and might cause adverse results miles upstream, thus "...significant flow control...." (Following within this commentary are (a data and graphic examination of the subject riverbed reach excerpted from the FEMA FIS and (b) overflow-height backwatering from Lock 7 Dam and its effects far upstream in important reaches.

Other recent studies also define "...Bedrock control" at "Rexford".

The excerpted G and S "Baseline Condition" graphic (elongated slightly) indicates that the runoff-volume meets *flow control* near the *Amtrak Bridge* and the Freeman's Bridge. Control very near the latter impacts the immediate SCCC/Scotia/Schenectady reach by helping to form ***an*** *inadequately draining "runoff-plateau"*, a very real condition.



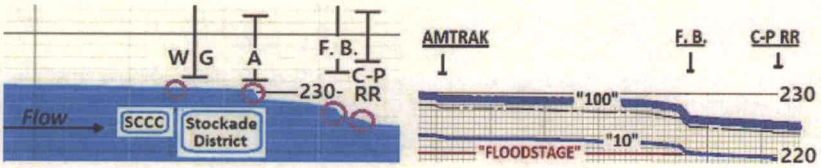
The "100-Year" runoff-volume's *overflow towers high* above the overall ~1,900-feet long Lock 7 Dam. This height then backwaters along the entire pool's normal volume.

The NYSCC *and FEMA FIS* profiles show *little restriction of runoff (a free-flow reality) at the Amtrak Bridge* , while also profiling the reach immediately upstream from Freeman's Bridge as *a key local control - - significant narrowing and a channel-side abrupt bend* (photo follows) that causes noticeable turbulence, even during an event of 70,000 cfs.

Lock 7 Dam's overflow-height backwater and is instrumental in sustaining the runoff-plateau by occupying the narrow reach between the two embracing bridges,

The narrowness is a positive characteristic in forming a more-coherent flow that could provide very effective drainage, reducing surface-height in the runoff-plateau. The *overflow-height backwater occupies cross-sectional space otherwise valuable to drain a substantial additional portion of the runoff-volume in the plateau.* The penalty is ongoing danger and repeated harms inflicted on the canalside Scotia/Schenectady area.

Excerpts (below) from the G and S "Baseline Condition" (left) and the FEMA FIS runoff-profile (right, less-compressed horizontally) illustrate the "runoff-plateau", *virtually non-draining* due to floodway breadth and consequent *extremely slow velocity* (both FEMA FIS-listed) atop the impounded underlying flat-surfaced pool-volume.



This Lock 7 Dam-exacerbated overall circumstance prevails far before a distinct draining gradient begins.

G and S Table 8: *Maximum Water Levels ... Scenario of the 100-Year Flood* (excerpted here) lists surface-levels for peak runoff that generally embrace this localized gradient that also involves a significant draining velocity.

Station	Location	Baseline Max WL (ft, NAVD 88)
16.5	D&H Railway Bridge - Upstream	225.34
16.8	Freeman's Bridge Road - Upstream	227.31
17.7	Amtrak Bridge	230.48

Within the 1.2-mile reach between the two railroad bridges, the G and S data states this indicated gradient totals 5.14 feet. The excerpted FEMA profile approximates this total.

The FEMA profile also re-distributes the gradient into only *small resistance at the Amtrak Bridge and pronounced resistance near Freeman's Bridge,* a recognized chokepoint.

After "release", runoff quickly achieves a very fast velocity, but along only a short reach to pass the C-P Railroad Bridge, Then, the average velocity is slower, but draining.

In this Google Earth photo, the angled Freemans Bridge Road is central, Waters Edge Lighthouse is upper- central and the Canadian-Pacific railroad bridge is upper-right.

It confirms two points that fit the FEMA and NYSCC depiction of slight backup: (a) the turn at the Schenectady-side ***is*** relatively abrupt, (b) the turn is complete slightly upstream from the bridge and (c) the riverbed/ floodway narrows immediately before the bridge, is pinched further near the banquet hall, and then widens slowly, downstream from the Canadian-Pacific Railroad bridge.

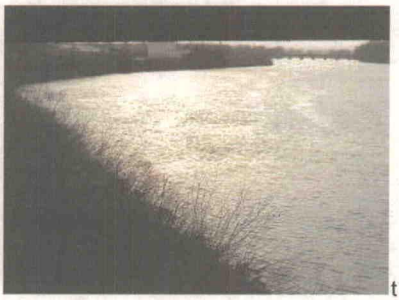
The bridge conceals pointed-prow aprons for two piers (below) at the quarter- points of the bridge.



the

This present two-piered Freemans Bridge replaced an overhead trussed bridge that had clear-spanned the river perpendicularly at the projecting abutment (right, above, approxi- mately the water's width downstream).





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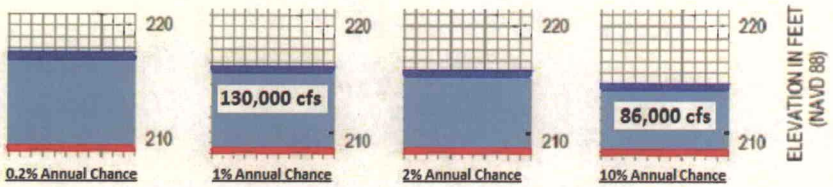
Characteristic of the reach extending *2.2 miles* upstream from Amtrak Bridge, and including Glenville, Stockade, Scotia and SCCC, the G and S water-level data identifies the presence of the *runoff-plateau, several miles long.*

Station	Location	Baseline Max WL (ft, NAVD 88)
17.7	Amtrak Bridge	230.48
18.1	Stockade Historic District	230.61
18.6	Western Gateway Bridge - Upstream	230.77
19.9	Isle of the Oneidas	231.07

This indicated total *slope of only 0.59 feet (~7.1 inches) is clearly inadequate for the drainage needed to avoid flooding.*

Further complicating this "local" inadequate-draining characteristic is the large-scale inadequate discharge at the three-story high Lock 7 Dam, miles downstream.

This overall 1,900-feet dam forces runoff to overflow, and far too slowly. The "100-Year" volume towers high, but note the (foundational) "10-Year" height - - *a concerning hydraulic "canary".* Any runoff exceeding 70,000 cfs has resulted in NWS "Floodstage".



PEAK RUNOFF-OVERFLOW HEIGHTS ACROSS CREST OF LOCK 7 DAM

Overflow-heights BACKWATER along the entire pool's flat-surfaced underlying volume exacerbates many situations tar upstream along the Niskayuna Pool.

Is not the Lock 7 Dam's HUGE "100-Year" overflow-height volume that backwaters pool-length a distinct, literally underlying problem (a) extending under Freeman's Bridge and past canalside Schenectady/Scotia/ SCCC - - and (b) supporting the runoff-plateau to flood very harmfully?

Now back to examining the reach under the Balltown Road (or Rexford) Bridge.

The elongated permanent *reservoir-pool's bottom-hugging volume prevents any significant bottom-influence toward a runoff-volume's surface profile.* As distinct volumes, the periodic arriving runoff-increase tops the in-place, flat-surfaced Niskayuna Pool, plus developing overflow-height backwater.

The FEMS FIS profiles the Balltown Road (Rexford) Bridge condition. For the tight cluster of four cross-sections J, K, L and M there, its Table 6 (pertinently excerpted below) lists revealing data. Topographically enforced narrowness bounds this very short (~255-feet) reach and promotes the ***distinctly fastest velocities*** of the "100- Year" runoff along the entire reservoir-pool, as listed below.

Fast velocities are *incongruous with any harmful retarding* of such a large volume-flow

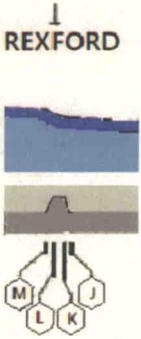
The FIS profiles of the riverbed and water-surface are excerpted (right, below) and the large volumetric throughput at this reach (cross-section x velocity = cubic feet per second) is boxed (left, below).

Such free-flow throughput is unmistakably very real.

	FLOODING SOURCE		FLOODWAY			1% or "100-Year" WATER SURFACE ELEVATION	
	CROSS-SECTION	DISTANCE*	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD)	INCREASE (FEET)
	MOHAWK RIVER						
158,741	Lock 7 Dam F	13,900	1,126	28,862	5.5	200.7	0.5
160,724	F	16,765	2,190	9,251	4.1	217.5	0.0
159,907	J	346,310	853	16,457	9.6	220.9	0.0
159,600	K	346,610	725	16,825	9.6	221.0	0.0
159,440	Rexford Bridge L	346,534	725	15,944	10.0	221.3	0.0
160,845	M	346,613	820	16,931	9.5	221.8	0.0

*Feet above Albany-Schenectady County boundary

+Floodway width determined from FIRM



Does the *slight bump* detectable on the riverbed at "Balltown Road Bridge/Rexford" pose, as the G and S report postulates, a backwatering threat so many miles far-upstream (FEMA shows "probably no")? These FEMA details, coupled with physical observations, conclude that *this small condition impacts very little and only locally.*

Its height,scaled from the FEMA profile as less than 2 feet, clearly does *not govern water-surface elevations many miles upstream.*

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G and S confirms that NYPA considers the top of flashboards as the **"crest" elevation.**

Modeling gates (that match the flashboard-height) to *replace a maximum depth of only 3.75 feet in the concrete crest - - at the scale of ~130,000 cfs* "100-Year"runoff-volume, is a *decidedly timid, hardly pertinent step.*

The following data, excerpted (and adapted) from the G and S Table 8, compares modeled surface-level results at key locations upstream with open 6-feet high gate-systems (inserted at *Dam D only* (Option 4), or at *Dams D and F* (Option 7).

Per the two Delta columns immediately adjacent to the Baseline water-surface elevations, each of *these two specific low-height options* would provide small reductions from the baseline runoff-surface elevations .

Dam F would contribute the reductions (feet) listed in the right column (Option 4 subtracted from Option 7).

***Table 8** (adapted excerpts): Maximum Water Levels ... Scenario of the 100-Year Flood*

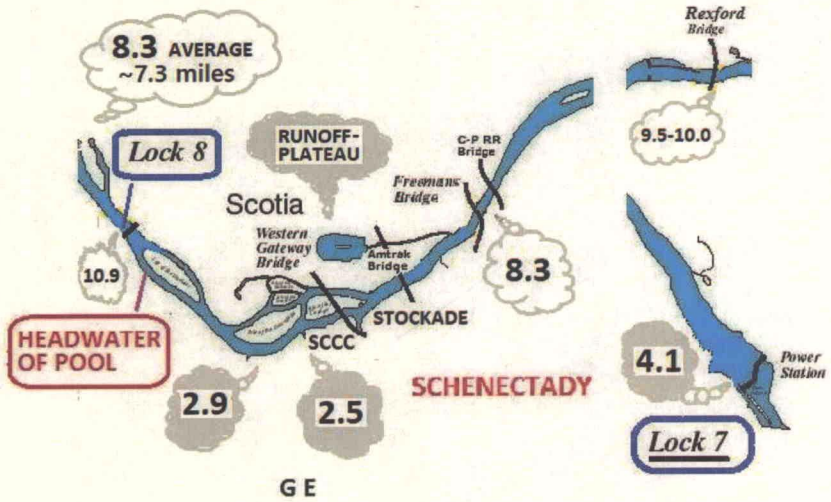
Station	Location	Baseline Max WL (ft, NAVD 88)	Option 4 - 6 ft Dam D Delta (ft)	Option 7 - 6 ft Dam D + F Delta (ft)	Option 7 - 6 ft Dam F Delta (ft)
9.7	Vischer Ferry Dam - Downstream	197.58	0.00	-0.01	-0.01
10.0	Vischer Ferry Dam - Upstream	216.77	-1.44	-2.08	-0.64
12.2	GE Global Research Center	218.33	-1.00	-1.43	-0.43
14.0	Balltown Road (Rt. 146) Bridge - Upstream	220.88	-0.60	-0.89	-0.29
16.5	D&H Railway Bridge - Upstream	225.34	-0.12	-0.16	-0.04
16.8	Freeman's Bridge Road - Upstream	227.31	-0.10	-0.14	-0.04
17.7	Amtrak Bridge	230.48	-0.09	-0.12	-0.03
18.1	Stockade Historic District	230.61	-0.09	-0.12	-0.03
18.6	Western Gateway Bridge - Upstream	230.77	-0.09	-0.12	-0.03
19.9	Isle of the Oneidas	231.07	-0.08	-0.11	-0.03

The respective Deltas (from the baseline) show that gates 6-feet high, inserted 3.75 feet into the concrete crest to match flashboard-height, would provide *negligible, cost-unjustifiable results - - less than 0.5 inch* upstream at SCCC/Scotia and Schenectady, where *reductions of many feet are needed.*

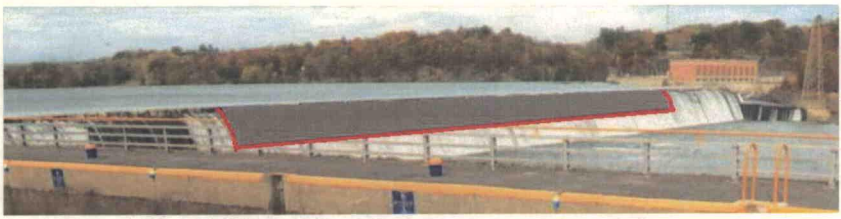
To be effective against the disruptive, damaging and more-frequent lesser volumes, and certainly a "100-Year' volume, ***the gate-system should replace no less than a 10-feet depth in the concrete crest across a large portion at Dam D alone.***

USGS gages have verified repeatedly the *cohesive behavior of water-surface levels along this entire impounded pool, in spite of concurrent major differences in velocity reach-by-reach.*

Following is an excerpted footprint of the Niskayuna Pool, intended to locate significant FEMA-listed mean velocities in feet per second (fps). The two extremely slow velocities between Lock 8 and the Stockade, then also far downstream at Lock 7, symbolize the inadequate drainage and overall discharge, thus the consequent flooding.



The objective of a gate-system modification is to develop maximum practical runoff-surface ***slope.*** Risk-management criteria focus on attaining adequate controlled preemptive capability for ***truly draining runoff-velocities*** *throughout the entire Niskayuna Pool.* This would resemble the effect of lifted dams upstream that allow the overall natural downstream-sloping riverbed there to govern runoff-drainage.



INSERT GATE-SYSTEM

Capability for preemptive release comparable to Lock 8 etc. upstream

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United States Department of the Interior

NATIONAL PARK SERVICE
NORTHEAST REGION
15 State Street
Boston, Massachusetts 02109-3572

IN REPLY REFER TO:

Comments on Proposed Study Plan and Responses to Aditional Information Requests
New York Power Authority

Crescent and Vischer Ferry Hydroelectric Projects, FERC P-4678, P-4679, Mohawk River, NY

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.R., Room 1A
Washington, DC 20426

December 20, 2019

Dear Secretary Bose:

The National Park Service (NPS) responds to the Proposed Study Plan (PSP) and Responses to Additional Information Requests (AIRs) for the Crescent and Vischer Ferry hydroelectric projects, located on the Mohawk River with powerhouses in the towns of Colonie and Clifton Park, New York. The PSP was prepared as part of an application for a new federal license. We offer the following comments based on the PSP, submitted by New York Power Authority (NYPA), the current licensee, on September 23, 2019, on information we obtained at the site visit on July 10, 2019, the joint agency meeting on July 11, at a study plan meeting organized by NYPA and attended by FERC staff on October 23, 2019, and FERC Staff Comments on the PSP of December 17, 2019.

2.7 Recreation Study

FERC's August 9, 2019 Requests for Additional Information and Study Requests specifies that that the Recreation Study should, at a minimum:

1. Inventory all formal and informal public and private recreational sites/facilities within and adjacent to each project's boundary [page 13, Criterion (6) item 1]
2. Administer a recreation use survey that addresses all recreation activity types known to occur or potentially occur at each project.
    - The survey instrument should include items to assess visitor perceptions of crowding, recreational conflict, conflicts between the public and adjacent property owner(s), adequacy and placement of signage, adequacy of recreation facilities and access to the projects, and effects of project operation and management on recreation and recreation opportunities at the projects (e.g., fluctuating reservoir levels).[page 14, Criterian 6, item 2, 3rd bullet]

By contrast, NYPA's proposed Recreation Study is limited to "non-commercial public recreation sites, facilities, and amenities" (PSP 2.7.1, .3, .7). While the emphasis on publically available facilities and activities is appropriate, it is overly restrictive given the nature of on-water and shore-side recreational activities within the boundaries of these two projects. Recreation is very different at Crescent and Vischer Ferry than at most hydro projects in northeast, which are located in comparatively remote areas. The New York State Department of Public Works constructed these facilities during the 1920s as adjuncts to Barge Canal development. Their waters are used for commercial tug and barge traffic, small cruise ships, tour boats and private watercraft ranging from stand-up paddleboards to large motor yachts.

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In addition to about a dozen formal and informal public access facilities within the project boundaries, there are at least five commercial marinas or boat clubs on the Crescent impoundment and four on the Vischer Ferry impoundment along with at least three boathouses and docks for university, school, and/or club rowing teams. While these commercial and club facilities are not public, they serve a large number of recreational users.

We do not propose the same level of Site Use and User Survey for marinas and clubs that NYPA proposes for project recreation sites, but they should be included in the Recreation Facility Inventory. The level of additional effort will be small. All docks and facilities on this section of the Mohawk River are required to have a Use and Occupancy Permit from the Canal Corporation. Additional information about marinas and boat clubs appears in the Canal Corporation's *Cruising Guide,*(2006), Richardson's *Hudson River & Adjacent Waterways Chartbook & Cruising Guide*, 3rd Ed.(2013), and the *New York State Canalway Water Trail Guidebook* (Waterford, NY: Erie Canalway National Heritage Corridor, 2019) pp 186-205.

Floating mats of invasive water chestnut in the Crescent and Vischer Ferry impoundments render some access points unusable by mid-summer each year. The Inventory and Study Report should recognize late season limitations to access at particular sites and address the impacts of non-native species on recreational use. The Recreation Management Plan should propose measures to manage water chestnut on project waters.

The NYS legislature authorized transfer of the Canal Corporation from Thruway Authority to NYPA in April 2016 and the change became effective January 1, 2017. The Canal Corporation is now listed as a subsidiary of the New York Power Authority so any action by Canal Corp is effectively an action by the licensee. Since NYPA took control of Canals the annual navigation season has been shortened by several weeks at either end. Further changes to navigation on the Mohawk are currently being discussed under a NYPA initiative called "Re-Imagine the Canals." Some plans submitted by BuroHaphold, NYPA's principal consultant on the Re-Imagine initiative, recommend full or partial closure of segments of the canal system. Those changes would eliminate through traffic for both commercial and pleasure vessels and would certainly have an impact on recreational use within the project boundaries.

While they were once separate entities within state government, operational changes by the Canal Corporation now have a direct effect on recreational use and access at FERC licensed projects operated by its parent. The Recreation User Survey and Study Report and the resulting management plan should address the effects.

The NPS appreciates the opportunity to comment on the PSP and looks forward to providing assistance to the applicant. Any comments or questions should be directed to the undersigned at Duncan_Hay@nps.gov or by phone at 617-223-5056.

Sincerely



Duncan E. Hay
Hydropower Licensing Specialist
National Park Service, DOI Region 1

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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Permits
625 Broadway, 4th Floor, Albany, New York 12233-1750
P: (518) 402-9167 | F: (518) 402-9168 | deppermitting@dec.ny.gov
www.dec.ny.gov

December 20, 2019

New York Power Authority (NYPA)
Attn: Mark E. Slade, Licensing Director
123 Main Street
White Plains, NY 10601

RE: Proposed Study Plan Comments and Study Requests
NYPA Projects
Crescent Hydroelectric Project (FERC No. 4678)
Vischer Ferry Hydroelectric Project (FERC No. 4679)
Town of Colonie, Albany County
Towns of Clifton Park and Halfmoon, Saratoga County
Town of Niskayuna, Schenectady County

Dear Mr. Slade:

The New York State Department of Environmental Conservation ("NYSDEC" or "Department") is submitting comments on the September 23, 2019 Proposed Study Plan and Response to Additional Information Request submitted by the New York Power Authority ("NYPA" or "Applicant") for relicensing the existing Crescent Hydroelectric Project (FERC No. 4678) and Vischer Ferry Hydroelectric Project (FERC No. 4679). The two projects, collectively referred to as the "NYPA Projects", are located on the Mohawk River with the Crescent Project located in Albany, Schenectady, and Saratoga Counties, New York and the Vischer Ferry Project located in Albany and Schenectady Counties, New York.

A Proposed Study Plan public meeting was held to discuss the NYPA projects on October 23, 2019 at the Hilton Garden Inn, Albany Airport, Albany, NY. In attendance at this meeting were representatives from the Federal Energy Regulatory Commission ("FERC"), NYPA, their consultant Kleinschmidt, USFWS, NYSDEC, Riverkeeper, other non-governmental agencies as well as interested members of the public. The purpose of the meeting was to present the proposed study plan, address questions, and accept comments and requests from those in attendance in preparation for official submissions of responses to the proposed study plan.

Comments on the Proposed Study Plan

The Proposed Study Plan is generally well-organized and addresses many of the several key issues for the NYPA Projects. NYSDEC offers the following comments and recommendations on the proposed studies:

I. Water Quality Study

NYPA proposes to conduct continual monitoring of Dissolved Oxygen (DO) and water temperature at 30-minute intervals. NYSDEC requests that these parameters be continually monitored at 15-minute intervals.

NYPA also proposes to conduct monthly water quality profile sampling, NYSDEC requests that NYPA conducts weekly water quality profile sampling. This could be accomplished at the same time the weekly spot checks and calibrations of the meters are conducted.

Following participation in an additional teleconference on December 17, 2019 with staff from NYSDEC, USFWS, NYPA and Kleinchmidt, NYSDEC would also like to request the addition of bypass monitoring sites. There should be two bypass monitoring sites at each of the NYPA Projects. Staff is requesting two because of the large size of the Mohawk River. At the Crescent project, one should be sited below Dam A and the other should be sited below Dam C. At the Vischer Ferry project, one should be sited below Dam D and the other should be sited below Dam F. NYSDEC would also like to request that the location of the tailwater monitoring site at both of the NYPA Projects be located not immediately at the outflow, but further downstream so that it may capture the outflows of all turbines under all possible operating scenarios.

II. Fish Entrainment Study

NYSDEC agrees with the proposed study but wishes to express the strong desire that the study includes both the Kaplan and the Francis turbines and both the Crescent and Vischer Ferry locations for analysis. While both locations are similar, there are different environmental variables that may impact which fish could be entrained. Likewise, Francis and Kaplan turbines do not operate within the same ranges and should be equally investigated.

III. Blueback Herring Migration Study

Based on a follow-up phone call held on November 7, 2019 including NYPA, Kleinschmidt, NYSDEC, USFWS and FERC, NYSDEC agrees that there is a large data pool already available for juvenile Blueback Herring and their interaction with the NYPA projects. NYSDEC currently has a greater interest and concern, at this time, in adult Blueback Herring and their interaction with the NYPA projects. As such, the currently proposed study and its goals to assess the timing, duration, and magnitude of the immigrating adults is acceptable; however, NYSDEC is also interested in assessing the timing, duration, magnitude of the emigrating adults as well as downstream mortality. The relationship between the NYPA projects and the adult Blueback Herring population, particularly during their outmigration, is incredibly important to assessing the impacts on the fishery.

NYSDEC requests that the monitoring commence just prior to the opening of the Canal System in April, when the canal will be in operation for use of the deployment of navigational buoys and other equipment for the canal season which fish may be take advantage of for migratory purposes. It is also requested that the monitoring continue into October, to assess the downstream migration. NYSDEC would also like to request that some adult Blueback Herring be collected and equipped with acoustic tags. These fish could be collected from just prior to or within the canal flight so that they can be captured moving past the first hydroacoustic array and again when they are emigrating from the Mohawk River. Tagging in the locks may prevent loss of tagged fish due to “fallback”, the moving of fish back downstream due to a stress event, but it may also present bonus data on how lockages affect migrating Blueback Herring and mortality from exposure to multiple lockages.

Understanding that the proposed study is already quite large and will be demanding of resources, NYSDEC suggests the creation of a fund that can be awarded in the form of a competitive grant to educational facilities to conduct an acceptable study(ies) in lieu of additional requests. This could relieve NYPA with some of the burden NYPA while also delivering

additional data to the resource agencies, which will further inform management of the Blueback Herring stock and how it may relate to the NYPA projects.

IV. Fish Community Study

NYSDEC agrees with the proposed study and has no further comments.

V. Aquatic Mesohabitat Study

NYSDEC agrees with the proposed study but would like to request that the study being conducted take into account the differences in water level when the flashboards are both in place and removed. This could be accomplished by making field observations during the summer field season and again in the fall after the flashboards have been removed and the impoundments have responded to the change in elevation.

VI. Bald Eagle Study

NYSDEC agrees with the proposed study and has no further comments.

VII. Recreation Study

NYSDEC agrees with the proposed study and had no further comments.

Study Requests

The New York State Department of Environmental Conservation requests that the Applicant conduct the following studies:

I. American Eel Study

American eel (*Anguilla rostrata*) has a wide range across the Eastern United States and New York State where it is native in 17 of the 18 watersheds in the state. Eel runs, in which young-of-year juvenile eels known as elvers migrate into freshwater habitat, have long occurred with elvers scaling waterfalls and the faces of dams to access more habitat further inland. Despite their robust nature, the American eel population has been steadily in decline and the construction of dams and the operation of hydropower projects are some of the contributing factors. American eels are not known to travel well through the canal lock system and may even show a preference for dam sites during their upstream migration in the spring. As the American eel has been documented in surveys to inhabit the Mohawk River Watershed, a study is needed to ascertain the presence and abundance of eels and the need to provide them a better mode of passage.

NYPA has proposed to conduct an American eel study following the results of the Fish Community Study, however NYSDEC strongly disagrees with hinging the conducting of the American Eel Study on a desktop analysis of previously conducted sampling and studies. The vast majority of the available material for review involves sampling methodologies that were developed for targeting specific species of fish, namely black bass and other sportfish. This presents the problem of a sampling bias and perhaps also gear bias. While American eel have been caught during some of these sampling efforts, it has been as limited bycatch. The behavior of the American eel is not comparable to the behavior of a Smallmouth Bass (*Micropterus salmoides*), for example, and their reaction to receiving an electric shock is more often to dig and burrow down into available substrate than to rise to the surface where scapers can net the fish for data collection. Moreover, the Mohawk River is a large and turbid river with great width

and depths, which makes the use of boat electrofishing for the purpose of sampling eel all the more difficult.

1. *Goals and Objectives*

   The goals and objectives of this study are to assess the presence and relative abundance of American eel elvers in the NYPA Projects area and assess the need for eel ladders to improve successful and safe upstream passage.

2. *Resource Management Goals*

   NYSDEC's mission is "to conserve, improve and protect New York's natural resources and environment and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being." The natural resource management goals within the Mohawk River Watershed will be consistent with the Department's mission while focusing on protecting and enhancing fish and wildlife habitat and improving public access.

   There is a pre-proposal currently available for public review and comment which will elevate the American eel from a species of conservation need to a species of special concern in New York State (https://www.dec.ny.gov/regulations/34113.html).

3. *Public Interest*

   The requestor is a state resource agency.

4. *Existing Information*

   Although caught in low numbers in the past couple of decades, fishery surveys have continued to collect mature American eels while sampling. There are also historical records of American eel caught in the Mohawk River and adjacent tributaries as referenced by Greeley (1935) in the Atlas of Inland Fishes of New York (Carlson et al. 2016)[1]: "…in waters above barriers eels are much less numerous, but sufficient numbers ascend the Mohawk…" and by Dittman et al. (2009c) that there had been commercial harvests of eel above Cohoes Falls in the Mohawk River during the colonial period.

   More recent records of American eel presence in the Mohawk River come in the form of bycatch from other fish sampling efforts, usually black bass and other sportfish, but also Blueback Herring. There have been limited to no concentrated efforts to sample American eel in the Mohawk River. They have been caught as far upstream as downstream of the Blenheim-Gilboa Dam on the Schoharie Creek (NYSDEC Survey #490009) and downstream of Newport Dam on the West Canada Creek (NYSDEC Survey #688202). They have also been caught in high numbers (100 individuals) above the NYS Dam (FERC No. 7481) in its impoundment and included all mature adults (NYSDEC Survey #490012). While often caught in small, limited amounts, American eel have been caught in the project area of the NYPA projects such as the tailwater of Vischer Ferry (NYSDEC Survey #413005).

[1] Carlson, D.M., R.A. Daniels, and J.J Wright. 2016. Atlas of Inland Fishes of New York. NYS Education Department and NYSDEC. Pg. 28-30.

According to the 2017 American Eel Stock Assessment Update by the Atlantic States Marine Fisheries Commission[2], there is evidence of a trend of neutral or declining abundance of eels and that the stock is depleted. This is a cause for concern as the eel is important for both its ecological and commercial value. The New York State freshwater stock of eels, from the elver through the yellow and to the silver eel life stage, are of great concern and as a result NYSDEC is considering the proposal of raising the species to the status of a species of concern in the state and begin to afford it some additional protection. Additionally, the American eel is on the IUCN red list of threatened species as endangered.[3]

There is an ongoing USGS study to evaluate the status of American eel populations in the Mohawk River basin, however it is not expected to be completed until March 2021 and no data is currently available.[4] This study will use American eel DNA to determine presence and abundance based on a model created using known eel populations in other Hudson River tributaries.

5. *Nexus to Projects Operations and Effects*

Both NYPA Projects have constructed dam structures which pose a migratory hurdle for the American eel in their upstream migration as elvers. While elvers may be able to ascend the dam face, they are also put at a higher risk of predation and will have to expend additional energy to do so. They may stage at the foot of the dam and then ascend by crawling up the face of the dam with slow and steady progress in order to surmount the dam and have access to upstream habitat.

6. *Methodology Consistent with Accepted Practice*

The sampling of eels should be conducted through the deployment of eel traps and eel mops to determine staging of upstream migration and relative abundance of elvers. The recommended study uses standard sampling techniques such as those used by Kleinschmidt in the relicensing of the Parr Hydroelectric Project (FERC Project 1894) [5], utilizing an eel ramp pass trap design as developed by Haro (2006). Consultation with NYSDEC and USFWS will help to refine the number, size, and placement of the eel traps and eel mops.

Traps and mops should be in place by the end of April to ensure that they will function well and be available to collect any early arriving immigrating elvers. Traps should be checked at regular intervals; once a week at numbers less than 50 and daily at more than 50 individuals. Collected eels should be enumerated and have their length and life stage recorded. All elvers should be released upstream and any mature eels released downstream of the associated NYPA project dam. Traps should be removed in October.

7. *Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort would involve one field crew. The study would last for one field season, two if abnormally high flows damage the sampling gear and disrupt the study. The actual cost is unknown and would depend upon the cost of sampling gear, number

[2] http://www.asmfc.org/species/american-eel
[3] https://www.iucnredlist.org/species/191108/121739077
[4] https://www.sciencebase.gov/catalog/item/5d70f37ee4b0c4f70cfcb202
[5] Kleinschmidt. 2016. American Eel Abundance Study Report: Parr Hydroelectric Project (FERC Project 1894). Kleinschmidt. Lexington, S.C.

of sampling locations, local labor costs, the ability to combine multiple studies (e.g., fisheries, mussels, and water quality) into one task, etc. The existing literature provided in the PAD (Section 4.4.2.3) is inadequate to fully address the NYPA projects impacts and the proposed Fish Community Study would not be truly representative of the American eel population in the Mohawk River. The Applicant has the flexibility to design the most cost-effective way to acquire the necessary data and may combine efforts with other study efforts but is encouraged to continue to consult with the resource agencies and FERC.

We appreciate the opportunity to comment. If you have any questions or would like to discuss further, please feel free to contact me at 518-402-9179 or michael.higgins@dec.ny.gov.

Sincerely,



Michael Higgins
Project Manager
Bureau of Energy Project Management

CC: Nicole Cain, NYSDEC, Bureau of Ecosystem Health
Chris VanMaaren, NYSDEC, Region 4
Mary Anne Bonilla, Office of General Counsel
Scott Wells, NYSDEC, Region 4
William Eakin, NYSDEC, Region 3
John Wiley, USFWS

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December 20, 2019

Via Electronic Filing

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First St. NE
Washington, DC 20426

Re: Comments of Riverkeeper, Inc. on NYPA's Proposed Studies for the Crescent Hydroelectric Project (P-4678-052) and Vischer Ferry Hydroelectric Project (P-4679-049)

Dear Secretary Bose,

Riverkeeper appreciates this opportunity to comment on the proposed environmental studies as part of the relicensing applications for the Crescent and Vischer Ferry Dams (FERC Nos. 4678 & 4679, respectively), located on the Mohawk River in Saratoga, Albany, and Schenectady Counties, New York.

A. Background on Crescent and Vischer Ferry Dams' Impacts

The Crescent and Vischer Ferry dams affect water flow and quality along approximately 20 miles of the Mohawk River from Schenectady to Cohoes, and are part of a canal system that has drastically altered hundreds of miles of the Mohawk River. These dams impede migration of herring and American eel, and can maim or kill fish passing through the turbines. The dams create lake-like pools of slow-moving or still water, which can concentrate pollutants, and threaten drinking water quality for as many as 250,000 people who rely on the river or its associated aquifer as a water source.

The Crescent and Vischer Ferry areas include multiple pollution sources, including wastewater treatment plant outfalls, urban areas that shed street water runoff directly into the river, and agricultural land that can contribute pollutants like sediment and fertilizers. The conjunction of these pollution sources and water uses makes it extremely important to understand the roles these two dams play, individually and cumulatively, in the ecosystem. By controlling the flow of

water, the operations of these dams have the potential to affect many physical and biological properties and processes in the Project Area.

In addition, changes in flow, temperature and precipitation due to climate change will have a significant impact on water quality and flooding risks. Climate change was not included in Scoping Document 1, Scoping Document 2, or the Proposed Study Plans. However, the issue was raised in public comment at the Study Plan meeting on October 23, 2019, and its relevance underscored by the "Halloween Storm" of October 30-31, 2019, which caused severe flooding and extensive damage throughout the Mohawk Valley, and prompted the National Weather Service to warn of a "potential dam failure condition" at the Trenton Falls Dam on West Canada Creek in its Flood Watch.[1]

Riverkeeper's comments and study requests seek to ensure that the relicensing process includes a thorough and comprehensive examination of impacts, to facilitate the Federal Energy Regulatory Commission's (FERC) development of license requirements that will lessen the harmful impacts of these dams on the Mohawk River and its life.

B. Comments on Proposed Water Quality Study

FERC's Scoping Document 2 (SD2), released on September 20, 2019, recognizes the importance of cumulative impacts from hydropower facilities and wastewater treatment facilities on drinking water supplies.[2] Riverkeeper appreciates that FERC has acknowledged additional information provided in our comments and comments from other parties. The importance of considering diverse and cumulative impacts is also reflected in the geographic scope of FERC's proposed environmental assessment. The geographic scope for cumulative impacts includes "the Mohawk River from the Vischer Ferry impoundment to its confluence with the Hudson River because this relatively short (15-mile) reach of the river contains five hydropower projects ***and numerous wastewater treatment facilities***, the operation of which may cumulatively affect water quality

[1] National Weather Service, *October 31-November 1, 2019 Record Flooding and High Winds*, https://www.weather.gov/aly/Halloween2019Storm; Glenn Coin, *Dam Failure Possible in Oneida County: Weather Service*, syracuse.com (November 1, 2019), https://www.syracuse.com/weather/2019/11/dam-failure-possible-in-oneida-county-weather-service.html.

[2] FERC, Scoping Document 2 for the Crescent Hydroelectric Project § 4.1.2, P-4678 and Vischer Ferry Hydroelectric Project, P-4679 (2019) (*hereinafter* Scoping Document 2).

and ***drinking water supplies in the identified area***."[3] NYPA must update its water quality study proposal to reflect the geographic and substantive scope of concerns identified by FERC in SD2.

The New York Power Authority's (NYPA) water quality study proposal is based on the false premise that "water quality immediately upstream and downstream of the dams and powerhouses has not been evaluated for many years."[4] Beginning in 2016, the New York State Department of Environmental Conservation (NYSDEC) and the United States Geological Survey (USGS) collected extensive water quality data and discharge measurements at 30 sites in the Mohawk River.[5] This sampling was a first step in the development of a TMDL for the river, and NYSDEC and USGS are currently engaged in the process of developing, testing and applying hydraulic and water-quality simulation models that cover the Project Area.[6] Not only is there a study of the water quality, but in fact these models have been built upon NYPA's own flood warning models.[7]

The most recent water quality assessments must be used as the basis of the Water Quality Study Plan. As stated in Riverkeeper's comments submitted August 9, 2019, NYSDEC's Waterbody Inventory/Priority Waterbodies List for the Mohawk River in the Project Area was last updated in 2010, and does not reflect more recent data. Nor does the proposed study plan reflect the most recent information. Data presented by NYSDEC and USGS at the 2017 Mohawk Symposium showed that "chlorophyll-a exceedance of guidance values does not appear to become an issue until … the area of Amsterdam – Cohoes."[8] The authors concluded that the "results may suggest a complex interaction between nutrient concentrations, altered flow regime due to the canal

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[3] Scoping Document 2, § 4.1.2. (Bold and italic type reflect revisions from Scoping Document 1, as noted by FERC in SD2).
[4] NYPA, Crescent Hydroelectric Project, FERC Project No. 4678, Vischer Ferry Hydroelectric Project, FERC Project No. 4679, Proposed Study Plan and Responses to Additional Information Requests § 2.1.5 (2019) (*hereinafter* Study Proposal).
[5] USGS, *Surface-water Quality in the Mohawk River Basin (Pilot RIBS/TMDL)*, https://www.usgs.gov/centers/ny-water/science/surface-water-quality-mohawk-river-basin-pilot-ribstmdl?qt-science_center_objects=0#qt-science_center_objects.
[6] USGS, *Mohawk River Basin Water Quality*, https://www.usgs.gov/centers/ny-water/science/mohawk-river-basin-water-quality?qt-science_center_objects=0#qt-science_center_objects
[7] Alexander J. Smith & Elizabeth Nystrom, *Enhanced Water Quality Monitoring in Support of Modeling Efforts in the Mohawk River Watershed* in Proceedings from the 2017 Mohawk Watershed Symposium, Union College, Schenectady NY (J.M.H. Cockburn & J.I. Garver eds., 2017).
[8] *Id.*

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system, and the build-up of suspended algae in downstream impoundments."[9] The impoundments referenced include those behind the Vischer Ferry and Crescent dams. We respectfully request that NYPA increase its coordination with NYSDEC, particularly the Mohawk River Basin Program and the Stream Monitoring and Assessment Section, when revising the Water Quality Study Plan, to ensure that the most recent water quality assessments are used as the basis of the plan.

In the Study Proposal, NYPA acknowledges that "certain water quality parameters, particularly [dissolved oxygen (DO)] and temperature, can be affected by the operation of hydropower projects," and that information about these parameters is "needed to confirm that the Project operations are not having adverse effects on river water quality, and that Project discharges meet applicable water quality standards for these parameters."[10] In comments submitted August 9, 2019, Riverkeeper requested a water quality study that would also include collection of chlorophyll and nutrient data, including sites located near drinking water intakes, and throughout the year to reflect a broad range of conditions and the year-round withdrawal of drinking water.[11]

In response to Riverkeeper's request, NYPA stated that chlorophyll and nutrients are "not related to Project operations."[12] This is incorrect because project operation impacts on chlorophyll--a measure of algal/cyanobacterial biomass--and nutrient concentrations within the project area are analogous to the impacts on DO and temperature.

The impoundment is defined as part of the project facility.[13] Temperature is related to hydropower operations because solar radiation heats the surface layer of the water, and this effect is more pronounced in slower-moving waters, such as impoundments formed by dams. Dissolved oxygen is closely related to photosynthesis and respiration. Near the water's surface, DO is produced through photosynthesis, largely by planktonic algae and cyanobacteria, whereas DO is consumed through respiration, largely by bacteria, at depth. The presence of nutrients, primarily nitrogen (N) and phosphorus (P), promote photosynthesis. When algae and

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[9] *Id.*
[10] NYPA, Study proposal, § 2.1.5.
[11] Riverkeeper, Comments of Riverkeeper, Inc. on the Scope of Environmental Review and Study Requests for the Crescent Hydroelectric Project (P-4678-052) and/or Vischer Ferry Hydroelectric Project (P-4679-049), § 5 (2019).
[12] NYPA, Study Proposal, Appendix B.
[13] NYPA, Crescent and Vischer Ferry Hydroelectric Projects Pre-Application Document FERC No. P-4678 & P-4679 § 3.3 (2019).

cyanobacteria die, they sink toward the river bottom, where DO is consumed during decomposition. The more biomass that is available at the bottom of the river, the more respiration may occur, and the more DO can be depleted. Due to these relationships, vertical (depth) profiles of DO and temperature provide some information about biological activity. Nutrients and chlorophyll a are interrelated components of the aquatic ecosystem. It is unreasonable to acknowledge the need to study the effects of hydropower operations on DO and temperature, and simultaneously claim that nutrients and chlorophyll "are not related to project operations."[14] The importance of studying chlorophyll and nutrients is validated by the existing water quality information and analysis by NYSDEC and USGS, and the ongoing use of surface water and hydraulically connected groundwater in the Project Area by approximately 250,000 people. Chlorophyll and nutrients are of greater concern for drinking water quality, whereas dissolved oxygen and temperature are more of concern to aquatic life. Both of these impacts are important.

The Mohawk River is known to be impaired under the Clean Water Act due to excess phosphorus. NYSDEC is developing a TMDL in order to reduce the risk of harmful algal blooms, disinfection byproduct formation and other water quality concerns that result from excessive nutrients. NYSDEC has also initiated a drinking water source protection program in the Mohawk River watershed and launched a study of disinfection byproduct formation potential.[15] NYPA should heed these concerns by including chlorophyll and nutrients as part of its water quality study to assess how hydropower operations influence water quality in this portion of the Mohawk River.

When revising the study plan, NYPA must gather all the relevant information, and should work closely with NYSDEC to design a water quality study that will comprehensively address known water quality issues in the project area.

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[14] NYPA, Study Proposal, Appendix B.

[15] Brian Nearing, State wants sewer system fixes to protect Mohawk, Albany Times Union, January 18, 2019, https://www.timesunion.com/business/article/State-wants-fixes-at-sewer-systems-Albany-13541579.php; Andrea Conine, Michaela Schnore, Zachary Smith, Gavin Lemly, Charles Stoll, and Alexander Smith, *Characterization of disinfection by-product formation potential in Mohawk River source waters to support TMDL implementation* in Proceedings from the 2019 Mohawk Watershed Symposium, Union College, Schenectady NY (J.M.H. Cockburn & J.I. Garver eds., 2019).

C. Comments on Proposed Fish Studies

The American eel is a native migratory species that has inhabited the Mohawk River and its watershed since the last glacial minimum. The presence of the Fall at Cohoes is not a sufficient barrier to prevent eels from entering the Mohawk River. Historical references denote the importance of the species to people who inhabited the Mohawk River Valley as represented by the Mohawk tribes, who maintained totemic eel clans as a fundamental kinship unit,[16] and by the hamlet of Alplaus, which receives its name from the Dutch word Al Plaats, or "Place of the Eels."[17] Furthermore, archaeological evidence cites the presence of eel weirs in the river from which Native Americans captured eels.[18] Therefore, it is reasonable to conclude that American eels have inhabited the Mohawk River for thousands of years and that eels were a commonly encountered migratory fish before the dams and other hydropower facilities contributed to their decline.

More recently, the presence of eels in the Mohawk River has been confirmed by NYSDEC, incidental to fish surveys designed to target other species over the past 30 years, and most recently in 2018, whereby the presence of a large, female silver eel was documented in the impoundment of the Project Area[19]. However, any out-migrating silver eels in the Project Area would have to negotiate the dams and the turbines of the Crescent and Vischer Ferry hydroelectric facilities before exiting the Mohawk River system. Eels in the Project Area are likely to be seriously impacted by the dams and may be delayed, entrained, or killed by the presence of the Vischer Ferry and Crescent Dams and other hydropower facilities, as has led to the decline of their species across its range.[20]

At the present, we do not have adequate information to understand eel density and distribution patterns in the Project Area. NYSDEC has acknowledged a lack of information pertaining to the density, distribution, and the factors driving the distribution of American eel in the Mohawk

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[16] C.M. Barbeau, Iroquoian Clans and Phratries, American Anthropologist New Series 19(3), 392-402 (1917).
[17] https://www.alplaus.org
[18] American Ancestry: Embracing lineages from the whole of the United States. 1888[-1898. Ed. by Frank Munsell
[19] USGS, *Status of American Eel Populations in the Mohawk River Basin*, https://www.usgs.gov/centers/ny-water/science/status-american-eel-populations-mohawk-river-basin?qt-science_center_objects=0#qt-science_center_objects. (*hereinafter* USGS American Eel Population Status)
[20] Atlantic States Marine Fisheries Commission, *2017 American Eel Stock Assessment Update* (2017) (*hereinafter* ASMFC 2017 Eel Assessment).

River.[21] What is known is that hydroelectric dams have been constructed in many rivers where eel populations were historically present, and it is recognized that these structures have contributed to habitat inaccessibility and the general decline of the species.[22] Accordingly, we find the proposed study plan for American eel insufficient in scope and scale, sampling design, and most importantly shows insufficient concern for the historical and current presence of this species, which has likely been seriously harmed by the production of electricity on the Mohawk River. The proposed study plan suggests that American eel rarely occur in the Mohawk River and in the vicinity of the Project Area. This statement is inaccurate. USGS states that "[t]he presence of eel in this basin has been confirmed only by a handful of [NYSDEC] fish surveys (aimed at sampling other species) over the past 30 years and that the density and distribution of American eels are largely unknown in this watershed."[23]

Accordingly, the NYSDEC's Mohawk River Basin Draft 2018-2022 Action Agenda clearly states that it is necessary to:

- "Investigate and gather baseline information to better understand the spatial distribution and condition of existing populations.
- Conduct watershed-wide surveys to determine the status of American eel in the Mohawk River and tributaries. Identify prime eel habitat and identify limiting factors for juvenile migration into the watershed.
- Implement a project similar to the "Hudson River Eel Project: Citizen Science Juvenile American Eel Survey" to document the movement of glass, yellow, and silver life stages of American eel within the Mohawk River and tributaries. Augment the proposed citizen science program with additional academic research of these life stages.
- Develop and implement comprehensive management actions that help grow, recover, or restore migratory fish populations that are struggling or on the edge of local extirpation."[24]

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[21] USGS American Eel Population Status.
[22] ASMFC 2017 Eel Assessment.
[23] USGS American Eel Population Status, https://www.usgs.gov/centers/ny-water/science/status-american-eel-populations-mohawk-river-basin?qt-science_center_objects=0#qt-science_center_objects
[24] NYSDEC, Mohawk River Basin Action Agenda: 2018-2022 (2018), https://www.dec.ny.gov/docs/water_pdf/mohawkactionag.pdf. (*hereinafter* Mohawk Basin Action Agenda)



In truth, there have been no specific studies aimed at determining the true density and abundance of American eels in the Mohawk River. To state that American eels rarely occur in the Mohawk River based on the results of surveys aimed at other species is an incorrect interpretation of the data and history. Absence can never be proven. All that can be established is a high probability that the target species are not present. But since we already know that American eels are in fact present in the Mohawk River, a true determination of density and distribution of the population is required to accurately assess how hydroelectric production actually impacts the fish and their populations. Towards this goal, calibrated methods, based upon detailed knowledge of gear efficiency and catchability are necessary to estimate abundance from catch per unit of sampling effort.

In order to determine the true density and abundance of American eel in the Mohawk River and especially in the Project Area, NYPA must conduct a rigorous scientific study utilizing proper sampling techniques, using effective gear from which quantification of effort can be measured. Moreover, for any study of fish populations, whether in the Mohawk River as a whole or in the Project Area, NYPA must include a robust sampling regime to determine both abundance and density. NYPA must also incorporate catchability into study designs, since it is critical when indexing abundance.[25] In addition, NYPA must account for any variability in catchability to avoid biased survey results, and ultimately arriving at an incorrect estimation. Finally, it must be clearly noted that NYPA's study must thoroughly evaluate sampling effort and gear selectivity to avoid inadequate designs leading to inaccurate results.[26]

American eels are a semelparous, catadromous species, which abstractly means that all mortality within their freshwater range occurs prior to spawning. American eels spawn once and subsequently die after an arduous return migration to the Sargasso Sea. Female eels may defer spawning for up to 20-30 years. According to the Atlantic States Marine Fisheries Commission's (ASMFC) 2017 American Eel Stock Assessment, the status of the American eel remains depleted, at historical lows in US waters.[27] The stock assessment continues to say that eels have precipitously declined or have been extirpated over portions of their historical freshwater habitats

[25] Assessing Reservoir Largemouth Bass Standardized Boat Electrofishing: Effect of Catchability on Density and Size Structure Indices. Stephen M. Tyszko, Matt A. Hangsleben, Richard D. Zweifel, Jeremy J. Pritt & Joseph D. Conroy North American Journal of Fisheries Management, Volume 37, 2017 - Issue 3
[26] A Review of Sampling Designs Commonly Used in Canadian Freshwater Habitats https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1240.pdf
[27] ASMFC 2017 Eel Assessment.

during the last 100 years mostly due to dams and turbine mortality, often in combination with over-harvest.[28] Therefore, in order to rebuild the stock, ASMFC's Interstate Fishery Management Plan has laid out goals and objectives that are designed to reduce mortality and increase conservation measures for the American eel across all life stages.[29]

Hydropower facilities will continue to negatively impact American eels if no protective measures are undertaken. Accordingly, we strongly recommend that FERC take strict action to promote safe upstream and downstream passage of American eel in the Mohawk River system. Currently, there are no protective screens on the Vischer Ferry and Crescent hydropower facilities to prevent entrainment. This is unfortunate because eels will often seek deep water escape through turbine intakes only to be injured or killed.[30] Hence, providing screens over the turbines and safe passage past the dams for eels and other migrating diadromous fish is absolutely necessary. To improve the mortality of American eels in particular, placement of screens over the turbine intakes, along with an appropriate adjusted flow velocity through the turbines to prevent impingement. FERC must also mandate state-of-the-art bypass facilities to benefit diadromous fish to avoid incurring more damage to these fishes. In addition, FERC must determine the appropriate species specific fishways and eel passages, as there are no universally applicable fish passage mechanisms. In their present condition, Vischer Ferry and Crescent Dams are currently out of alignment with the recommendations set forth by NYSDEC's Mohawk River Basin Action Agenda and the ASMFC's FMPs by impeding upstream passage by harming, killing, or delaying out-migrating eels. These dams do not enhance conservation of the American eel. Most importantly, since the presence of American eels has been confirmed in the Project Area, the installation of properly sized screens that protect yellow phase and silver phase life stages of American eels from being impinged or entrained and mangled by the turbines is the most effective way to comply with the Action Agenda and recommendations of the Atlantic States Marine Fisheries Commission to help restore and re-establish a species in decline.

The largest problem confronting migrating American eels in the Mohawk River is the presence of a series of dams, but most especially the hydroelectric facilities, including the Vischer Ferry

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[28] *Id.*

[29] Atlantic States Marine Fisheries Commission, *2017 Review of the ASMFC Fishery Management Plans for American Eel (Anguilla rostrata) 2016 Fishing Year,* http://www.asmfc.org/uploads/file/5ac2aafbAmericanEelFMPReview2017.pdf (2017).

[30] JW Carr & FG Whoriskey *Migration of Silver American Eels Past a Hydroelectric Dam and Through a Coastal Zone*. 15 Fisheries Mgmt. and Ecology, 393 (2008), https://doi.org/10.1111/j.1365-2400.2008.00627.x.

and the Crescent Dams. However, since American eels are confirmed to be present and a large, female silver eel has recently been captured in the Project Area impoundment, NYPA and FERC must follow the guidelines outlined in the NYSDEC's Mohawk River Basin Action Agenda, as well as the ASMFC protocol, which encourage the conservation of the species and the reduction of mortality.[31]

The best way to adhere to these guidelines is to conduct a robust sampling survey of American eels in the Project Area, facilitate the eels' safe movement in and out of the system, and protect eels that are present from being impinged and entrained into the turbines. In a study of hydroelectric dams by Carr and Whoriskey, demonstrated that 100 percent of entrained eels suffered mortality.[32] Accordingly, we strongly urge FERC to require NYPA to conduct all studies needed to implement appropriate fish passage devices that will re-establish American eels in their ancestral habitat and allow them to out-migrate safely.

D. Comments on Potential Ice Jam Studies

The issue of flooding due to ice jams was raised in multiple comments and at the October 23, 2019, study proposal meeting. Impacts on fish and water quality must be accounted for if operational changes to reduce ice jam flooding are considered in the future.

The Mohawk River has been extensively altered by navigational structures and hydropower generation facilities. Surface water in the Project Area and the hydraulically connected Great Flats Aquifer provide drinking water for approximately 250,000 people. A 2009 planning report for the Great Flats Aquifer states, "the water level in portions of the aquifer adjacent to the river is dependent on the river level, which varies between navigational and non-navigational seasons."[33]

If an ice jam study is conducted and operational changes are deemed necessary to mitigate ice jam flooding, protection of aquatic life and water quality must be prioritized. License requirements that may affect water level and flow must consider whether wastewater effluent

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[31] ASMFC 2017 Eel Assessment.

[32] JW Carr & FG Whoriskey *Migration of Silver American Eels Past a Hydroelectric Dam and Through a Coastal Zone*. 15 Fisheries Mgmt. and Ecology, 393 (2008), https://doi.org/10.1111/j.1365-2400.2008.00627.x.

[33] Thomas M. Johnson, *Responsible Planning For Future Ground Water Use From The Great Flats Aquifer: Two Case Studies: The Gep Energy Project And The Si Green Fuels Boiler Project* in Proceedings from the 2009 Mohawk Watershed Symposium, Union College, Schenectady NY (J.M.H. Cockburn & J.I. Garver eds., 2009).

discharge and water withdrawal volumes change seasonally, while keeping in mind that groundwater-surface water connections do change seasonally.[34]

E. Conclusion

Where the mere existence of hydropower facilities will necessarily cause significant environmental impacts, it is critically important to incorporate all feasible methods to mitigate these impacts to the maximum extent possible. There are still many major gaps in the information needed to determine effective mitigation techniques. Therefore, FERC must obtain a thorough understanding of how the Crescent and Vischer Ferry Dams affect water quality, fish and other aquatic wildlife, and ice-jam flooding through our recommended comprehensive studies in order to develop the most protective license requirements.

Riverkeeper appreciates the opportunity to comment. If you have any questions about these comments, please contact Jennifer Epstein at jepstein@riverkeeper.org or (914) 478-4501 x248.

Sincerely,



Jennifer Epstein

Water Quality Program Scientist

[34] *Id.*

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Phil Steck, Albany, NY.
PHIL STECK
Member of Assembly, 110th District

December 20, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First St. NE
Washington, DC 20426

RE: Docket # P-4678 and P-4679

Dear Secretary Bose:

On behalf of my constituents in the 110th Assembly District, I would like to thank FERC for its recent comments to NYPA regarding proposed studies on the potential effects of the Vischer Ferry Project on ice-jam flooding in the lower Mohawk River.

Additionally, as mentioned in our original submission, we would like to re-emphasize our request for a full analysis of the Crescent and Vischer Ferry dams effects on water quality along more than 20 miles of the Mohawk River. Specifically, I would like to request the addition of chlorophyll and nutrients to the list of parameters to be include in its water quality study. Water quality in these impoundments affects algal growth, which in turn can affect drinking water quality and/or treatment costs by increasing the risk of formation of disinfection byproducts or harmful algal blooms (HABs). More than 100,000 people in Colonie and Cohoes rely on the Mohawk River as a drinking water source, and more than 120,000 people in Niskayuna, Schenectady, Scotia, Glenville, Rotterdam and Ballston rely at least in part on aquifers under the influence of Mohawk River water.

Thank you for your kind consideration of this request.

Sincerely,

Phil Steck
110th Assembly District

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James Woidt, PE, Scarborough, ME.
I am the lead engineer responsible for producing the draft Hydrologic, Hydraulic, and Ice Jam Analysis Report (2019) for the City of Schenectady's (City) Mitigation Measures to Reduce Flood in the Historic Stockade (Stockade Mitigation Project). This report was prepared by Shumaker Consulting Engineering and Land Surveying, DPC (Shumaker) and the US Army Corps of Engineers' Cold Regions Research and Engineering Laboratory (CRREL). Please note that the following comments are mine as an individual and were not prepared at the request of my employer nor any of my employer's clients which at this time include the City of Schenectady, Schenectady County, New York State Department of Environmental Conservation (DEC), and New York Power Authority (NYPA), all of whom have an interest in the FERC relicensing studies.

I have reviewed portions of the licensing documents relative to ice jamming and have identified several inaccuracies in the Proposed Study Plan for Vischer Ferry Hydroelectric Project (FERC Project No. 4679) as follows:

1. On Page 47 of the Proposed Study Plan, Shumaker and CRREL's draft Hydrologic, Hydraulic, and Ice Jam Assessment (2019) was referenced. This document was shared in a draft format with three individuals for technical comment. Explicit directions were provided that this draft was not to be shared with any other individuals as the funding agency for the Stockade Mitigation Project has not yet completed their review of this deliverable and approved it for public dissemination. Therefore, sharing of this report beyond those three individuals and its reference in the Proposed Study Plan is a violation of the conditions under which the report was provided. In lieu of this report, NYPA may find beneficial information in the public reports and presentations provided on the Stockade Mitigation Project website: http://www.stockaderesilience.com/project-updates.

2. On Page 47, the Proposed Study Plan states "numerous studies have been conducted…to examine the frequency and causes of the Stockade District flooding, including the role of ice jams." This is an inaccurate statement. The Gomez and Sullivan (2018) letter report on Page 5 states "The hydraulic analysis assumes free-flowing conditions and does not assess impacts due to ice or debris". Therefore, Gomez and Sullivan (2018) did not evaluate ice jamming. The New York State Department of Environmental Conservation (1979) report's conclusion on ice jamming was based on a 40-year old discussion with a former member of CRREL; to characterize this as a "study" is misleading. Also, Mr. Joseph Rocks, CRREL's current subject matter expert on ice jamming, presented that such a determination is not possible without technical study.

3. In response to Addendum #26 authored by the Schenectady County Chamber of Commerce Flood Assessment Task Force that "Vischer Ferry is probably an asset to the region in terms of reducing ice jamming and flooding": Vischer Ferry may simultaneously be an asset to the region but a detriment to the local community. Both are relevant to Vischer Ferry.

Addicks and Barker Dams in Houston, Texas are well-publicized example of this (for fluvial “free-flow” flooding).

4. On Page 47, the Proposed Study Plan states that the USGS is studying the nature and frequency of flood-causing ice jams. It should be clarified that the USGS is studying the nature and frequency of flood-causing ice jams empirically. That is, they are collecting measurements of ice jams and deducing relationships from those observations. Therefore, the study applies only to the current configuration of the Mohawk River and Vischer Ferry. The USGS study does not attribute the cause of ice jam flooding to natural conditions, Vischer Ferry, or other potential features that may promote or discourage ice jamming.
5. On Page 47, it is stated that DEC is investigating the issue of flooding and flood control strategies on the Mohawk River. It should also be stated that NYPA is a partner in this effort and is providing direct technical support in the form of hydraulic modeling of alternatives. This is an apparent (to the public; but perhaps not real) conflict of interest that should be disclosed.

6. On Page 47 and 48, NYPA concludes that “the issue of flooding has been extensively studied and… studies have repeatedly demonstrated that the existence and operation of Vischer Ferry has little or no effect on upstream flooding in the Stockade District.” Per the above comments, this is an incorrect conclusion. No study has been performed to attribute the nature and frequency of ice jam-induced floods to Vischer Ferry, natural conditions, and/or other impediments.

Otherwise, I concur with NYPA’s conclusion that Vischer Ferry has a small impact on upstream fluvial (free-flow) flooding and that the upstream fluvial flood risk posed by Vischer Ferry has been adequately studied. However, I still recommend that an ice jam study be performed. I have previously provided technical comments as part of the scoping study to justify an ice jam study; I will not repeat those comments but recommend that they, as well as comments by Dr. John Garver, be re-reviewed by NYPA.

[Comment reduced due to character limitation]

I again recommend that an ice jam study be performed to quantify the impact of Vischer Ferry on upstream and downstream ice jamming. Specifically, I recommend that a physically based study be performed that integrates the physical processes that cause the formation and break-up of ice jams as well as the impoundment of water behind them. Such a study may include physical modeling or numerical modeling via HEC-RAS, MIKE11, and/or CRISSP 2D. Finally, the ice jam study should also evaluate whether a change in the operation of water levels impounded by Vischer Ferry Dam, such as lowering the impoundment level in advance of a warm-up or rainfall event that commonly causes ice jams, would reduce the risk of flood-causing ice jams.

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, New York 13045

December 23, 2019

Ms. Tara Groom
New York Power Authority
30 South Pearl St.
Albany, NY 12207

RE: Crescent and Vischer Ferry Hydroelectric Projects (FERC Nos. 4678 and 4679) Comments on Proposed Study Plan

Dear Ms. Groom:

The U.S. Fish and Wildlife Service (Service) has reviewed the September 23, 2019, Proposed Study Plan (PSP) filed by the Power Authority of the State of New York (NYPA) for the Crescent and Vischer Ferry Hydroelectric Projects (Projects) (FERC Nos. 4678 and 4679), located on the Mohawk River in Schenectady, Albany, and Saratoga Counties, New York. We have also reviewed the December 17, 2019, letter from the Federal Energy Regulatory Commission (Commission) staff providing their comments and additional information requests on the PSP (Staff Comments). The Service provided our Study Requests in our August 9, 2019, letter to the NYPA (Study Requests).

Fisheries Studies

In our Study Requests, the Service requested studies of the downstream migration and routing of blueback herring (*Alosa aestivalis*) (BBH) and American eel (*Anguilla rostrata*). For BBH, the Service requested a variety of radio telemetry, acoustic, and mortality studies to evaluate the movement and mortality of BBH as they move downstream past the Projects. For American eel, we requested field studies to evaluate the occurrence of American eels in the vicinity of the Projects' tailraces and in the impoundments. In the PSP, the NYPA proposed to study the upstream migration of BBH and conduct a literature review of American eel presence in the lower Mohawk River. The Service participated in the October 23, 2019, PSP meeting and a follow-up teleconference on November 7, 2019, regarding fisheries studies, with the NYPA, the New York State Department of Conservation (NYSDEC), and Commission staff. During these meetings, the Service, NYSDEC, and Commission staff provided preliminary comments regarding the studies proposed in the PSP for fisheries resources. These concerns were adequately captured in the Staff Comments provided to the NYPA, and we understand that the NYPA is revaluating their proposed studies for these resources for the Revised Study Plan (RSP)

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due to be filed with the Commission on January 21, 2020. We appreciate the NYPA's efforts to enhance their proposed studies for BBH and American eel at the Projects.

While we understand that there is existing information available for BBH in the lower Mohawk River and at the Projects, there are notable gaps in the available information for the river between the Projects, for the current configurations for fish protection measures, and between adults and juveniles for routing and survival between the Kaplan and Francis turbines present in the powerhouses. These gaps have been identified in our Study Requests and additionally in Commission Staff Comments. The Service encourages the use of the best available information; however, we strongly encourage the NYPA to propose an updated, holistic assessment for the downstream routing of BBH through the Projects. With a comprehensive study, the NYPA will be able to readily evaluate the proportion of BBH passing through the current flashboard notches, over the dams, through the locks, and through turbines at both Projects. Coupled with existing or any needed assessments of turbine mortality for both life stages, this would provide the information needed for our analysis of BBH passage at the Projects.

It is our understanding that the NYPA will be further evaluating additional information regarding American eel presence in the vicinity of the Projects. The Service is evaluating the need for upstream passage and downstream passage and protection for this species at the Projects. If the available information suggests that American eel are present below the Projects, the NYPA should consider proposing a study for upstream passage and protection as well as entrainment mortality studies for this species in the RSP.

Water Quality

In our Study Requests, the Service recommended standard water quality studies at the Projects that are conducted during most hydroelectric project relicensing. The NYPA has proposed to conduct these studies. We participated in an additional teleconference on December 17, 2019, with the NYPA and the NYSDEC to provide technical assistance regarding the proposed water quality studies. We recommended that the NYPA install at least two floating downstream water quality monitors below the Projects in order to ensure that outflows from each of the turbines are adequately measured under all operational scenarios during the study period. Additionally, we continue to recommend that chlorophyll-a be recorded during periodic monitoring as we have noted this parameter to be highly correlated to water quality in nutrient- rich systems such as the lower Mohawk River.

Run-of-River

The Service recommended a Run-of-River Compliance Study in our Study Request. The NYPA has not proposed this study in the PSP. The Service is concerned that there will be inadequate information available to assess the impact of the Projects on notable downstream fluctuations at the United States Geological Survey Cohoes Gauge. Operational activities related to ramping rates and the Projects' abilities to accommodate upstream flow variability can notably influence downstream Projects and flows. Primarily, this study would utilize existing generation, headpond, lock operation, and gauge data; however, one additional flow monitoring station

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would need to be installed and calibrated downstream of the Crescent Project. The Service continues to recommend this study and requests its inclusion in the RSP.

* * * * *

Thank you for the opportunity to provide study requests for the Projects. If you have any questions or desire additional information, please contact John Wiley at john_wiley@fws.gov or 607-753-9334.

Sincerely,

Acting for David A. Stilwell
Field Supervisor

cc: NYSDEC, Stamford, NY (C. VanMaaren, S. Wells)
NYSDEC, Albany, NY (N. Cain)
NYSDEC, New Paltz, NY (W. Eakin)
FERC e-file

From:	George, Scott D
To:	Daly, Rob
Cc:	VanMaaren, Chris C (DEC); Baldigo, Barry P; Wells, Scott M (DEC)
Subject:	RE: LMR fish data for NYPA
Date:	Monday, January 06, 2020 1:22:15 PM
Attachments:	Eelsites_2015-2016.xlsx

Hi Rob,

I've attached an excel file showing the stream name, date sampled, and coordinates for the downstream end of the sampled reach for all 35 sites where eel screening surveys were conducted.

In case it is of interest, I also wanted to mentioned that in 2019 our office did more intensive quantitative (three pass depletion) fish community surveys of 20 Mohawk River tributaries. The purpose (assess resident communities prior to round goby invasion) was not related to American Eel but I can tell you that no eel were observed or captured. All of that data will be put out as a USGS data release this spring.

Scott

From: Daly, Rob <Robert.Daly@nypa.gov>
Sent: Thursday, January 2, 2020 4:00 PM
To: George, Scott D <sgeorge@usgs.gov>
Cc: VanMaaren, Chris C (DEC) <chris.vanmaaren@dec.ny.gov>; Baldigo, Barry P <bbaldigo@usgs.gov>; Wells, Scott M (DEC) <scott.wells@dec.ny.gov>
Subject: [EXTERNAL] Re: LMR fish data for NYPA

Scott,

Thanks for the info, if you have the exact locations and dates that would be great, more info the better.

Appreciate your efforts.

Happy new year!!!

Robert A. Daly
Licensing Manager

New York Power Authority
123 Main Street
White Plains, NY 10601
(914) 681-6564 ofc l (716) 628-5894 cell lRob.daly@nypa.gov
www.nypa.gov

On Jan 2, 2020, at 2:52 PM, George, Scott D <sgeorge@usgs.gov> wrote:

Hi Rob,

Scott Wells asked me to provide information on the two bullets below. These two bullets reference the same project. In short, we surveyed 20 tributary sites on the north side of the Mohawk in 2015, and 15 tributary sites on the south side of the Mohawk in 2016. Surveys were conducted using backpack electrofishing, and sampling time generally ranged from 600-1200 seconds depending on the quantity of accessible habitat. Unfortunately, no eel were captured or observed during any of these 35 surveys. Let me know if you need a summary of the exact locations sampled. We are currently piloting the use of environmental DNA (eDNA) to detect American Eel in the Mohawk and its tributaries. I suspect this method and the results it produces will be more useful for determining the location and relative abundance of eels in the watershed. Preliminary data from this project should be available around Fall of 2021 in case that is of interest.

Scott

From: Daly, Rob <Robert.Daly@nypa.gov>
Sent: Friday, December 20, 2019 7:34 AM
To: Wells, Scott M (DEC) <scott.wells@dec.ny.gov>
Cc: Weinstock, Andrew <Andrew.Weinstock@nypa.gov>; Groom, Tara <Tara.Groom@nypa.gov>; Wendy Bley (Wendy.Bley@KleinschmidtGroup.com) <Wendy.Bley@KleinschmidtGroup.com>; Mike.Hreben@KleinschmidtGroup.com
Subject: CVF Fish Data

Scott,

I want to thank you for all the info you have gotten to us, its greatly appreciated and will be helpful going forward.

I'd like to know if you could look specifically for the two reports, and the supporting raw data, noted below:

- USGS, 2015-2016, American eel in tributaries to the Mohawk River. The USGS, SUNY ESF and DEC screening survey of tributaries for the American Eel.
- USGS, 2015, American eel in USGS Newsletter describing a study being conducted "in cooperation with NYDEC" to determine if American eel are present in the Mohawk River.

And in addition, see if any of the data for reports on the document list provided earlier

(attached so on a Friday you don't have to look for it) are available.

Hope you have a very good holiday!

Rob

Robert A. Daly
Licensing Manager

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Melissa A Cherubino, Glenville, NY.
We are concerned that the NYPAs study include consideration of the presence of chlorophyll and nutrients out of concern for impact to drinking water.

APPENDIX B: Summary and Response to PSP Comments

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
	COMMENTS ON PROPOSED STUDIES		
		WATER QUALITY	
1	FERC 12/17/2019	In the RSP, provide results on consultation between NYPA and NYSDEC regarding the location of the water quality sampling sites within each project's impoundment, and include a map showing these locations. Include the impoundment depth(s) at which you plan to deploy the data sondes that would be used to continuously monitor water temperature and dissolved oxygen (DO).	NYPA discussed potential monitor locations with NYSDEC and USFWS on a call 12/17/2019. The RSP has been revised to include a map of the proposed sampling locations. The RSP also includes information on planned depth of the data collection. See RSP, Section 2.1.7.
2	NYSDEC 12/20/2019	NYSDEC would like to request the addition of bypass monitoring sites. There should be two bypass monitoring sites at each of the NYPA Projects. Staff is requesting two because of the large size of the Mohawk River. At the Crescent project, one should be sited below Dam A and the other should be sited below Dam C. At the Vischer Ferry project, one should be sited below Dam D and the other should be sited below Dam F. NYSDEC would also like to request that the location of the tailwater monitoring site at both of the NYPA Projects be located not immediately at the outflow, but further downstream so that it may capture the outflows of all turbines under all possible operating scenarios.	NYPA is not proposing to collect data downstream of the dams at the Projects other than in a well-mixed location in the Project powerhouses' tailwater areas because during the navigation season, there is considerable water spilled at the dams through fish passage notches and through flashboard leakage, that there is no reason to expect that the tailwaters downstream of the dams would experience low DO conditions.
3	USFWS 12/23/2019	USFWS recommends that NYPA install at least two floating, downstream, water quality monitors below the Projects in order to ensure that outflows from each of the turbines are adequately measured under all operational scenarios during the study period. Additionally, USFWS recommends that chlorophyll-a be recorded during periodic monitoring as this parameter is highly correlated to water quality in nutrient- rich systems such as the lower Mohawk River.	NYPA has updated the RSP to include provisions for installing one floating downstream water quality monitor in the tailwater area of each of the Project powerhouses. The RSP has also been modified to include more detail on measures that will be undertaken to ensure the monitor location is in a well-mixed area that would capture DO and temperature conditions in the powerhouse discharge under all operational scenarios. NYPA is not proposing to collect chlorophyll-a data, as this WQ parameter is an indicator of nutrient

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
			enrichment and is unrelated to the operation of the hydropower projects.
4	FERC 12/17/2019	In the RSP, please explain why you propose to use a 30-minute rather than the commonly used 15-minute measurement interval for continuous measurements of water temperature and DO.	NYPA has proposed to take WQ measurements at 30-minute intervals for two reasons. First, because the Projects are operated as run-of-river, discharge does not fluctuate significantly from hour to hour. Thus, the 30-minute interval is sufficient to track WQ conditions in the tailwater areas. Second, using 30-minute intervals will significantly extend monitor battery life to ensure tracking between the bi-weekly intervals.
5	NYSDEC 12/20/2019	Conduct continual monitoring of dissolved oxygen and temperature at 15-minute intervals rather than 30-minute intervals.	See response 4.
6	FERC 12/17/2019	In the RSP, please confirm your proposed sampling frequency (i.e., weekly or monthly) for water quality grab samples and impoundment depth profiles.	The RSP has been modified to clarify that the sampling frequency for the water quality grab samples and depth profiles will be collected bi-weekly.
7	NYSDEC 12/20/2019	Conduct weekly water quality profile sampling rather than monthly.	See response 6.
8	Assemblyman Steck 12/20/2019	Re-emphasize request for a full analysis of the Crescent and Vischer Ferry dams effects on water quality along more than 20 miles of the Mohawk River, with the specific request of adding chlorophyll and nutrients to the water quality parameters due to their effect on algal blooms which have the effect of degrading drinking water and increasing treatment costs.	NYPA is not proposing to collect chlorophyll-a and/or nutrient data at the Projects, as nutrient enrichment and the resulting growth of algae, are unrelated to the operation of the hydropower projects. This is particularly true for the Crescent and Vischer Ferry Projects that are operated as run-of-river, such that inflow equals outflow on a daily basis and water is not stored and released.
9	Melissa Cherubino 1/7/2020	Request to add chlorophyll and nutrients to the water quality parameters out of concern for impact to drinking water.	See response 8.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
10	Riverkeeper 12/20/2019	Re-requesting to add chlorophyll and nutrient data to the list of water quality parameters at sites located near drinking water intakes, and throughout the year to reflect a broad range on conditions and the year-round withdrawal of drinking water. Since temperature and DO are being measured, so should chlorophyll and nutrients because their project operation impacts are analogous. Chlorophyll and nutrients are of greater concern for drinking water quality, whereas dissolved oxygen and temperature are more of concern to aquatic life. Both of these impacts are important. When revising the study plan, NYPA must gather all the relevant information, and should work closely with NYSDEC to design a water quality study that will comprehensively address known water quality issues in the project area.	See responses 3 and 8.
11	Riverkeeper 12/20/2019	Update its water quality study proposal to reflect the geographic and substantive scope of concerns identified by FERC in SD2. These scopes of concern include the 15-mile reach from the Vischer Ferry impoundment, which contains five hydropower projects and numerous wastewater treatment facilities.	See responses 3 and 8.
12	Riverkeeper 12/20/2019	Currently, the proposed study plan does not reflect the most recent water quality information. The most recent water quality assessments (performed by NYSDEC and USGS) must be used as the basis of the Water Quality Study Plan. We respectfully request that NYPA increase its coordination with NYSDEC, particularly the Mohawk River Basin Program and the Stream Monitoring and Assessment Section, when revising the Water Quality Study Plan, to ensure that the most recent water quality assessments are used as the basis of the plan.	The water quality study plan includes information that was available at the time the Pre-Application Document (PAD) was developed. Updated WQ information will be included, as appropriate, along with the results of NYPA's water quality monitoring in the study report which will be developed as part of the ISR.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
		FISH AND AQUATICS	
13	FERC 12/17/2019	**Fish Entrainment Study** In the RSP, please specify under what operation conditions (e.g., maximum hydraulic capacity of each project) the Acoustic Doppler Current Profiler (ADCP) would make measurements of approach velocities in front of the Projects' intakes.	The RSP has been modified to provide more detailed information about ADCP use to measure intake approach velocities at the Projects. See RSP, Section 2.2.7, Task 2.
14	NYSDEC 12/20/2019	NYSDEC agrees with the proposed study but wishes to express the strong desire that the study includes both the Kaplan and the Francis turbines and both the Crescent and Vischer Ferry locations for analysis. While both locations are similar, there are different environmental variables that may impact which fish could be entrained. Likewise, Francis and Kaplan turbines do not operate within the same ranges and should be equally investigated.	The RSP has been modified to clarify that the proposed entrainment study will utilize the Franke blade-strike equations to evaluate potential turbine mortality for both the Francis and Kaplan turbines.
15	FERC 12/17/2019	You propose to estimate turbine survival via a blade strike model. In the RSP, please indicate if you plan on providing separate estimates of turbine survival for each turbine type (Kaplan and Francis) present at the projects.	See response 14.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
16	FERC 12/17/2019	**Blueback Herring Migration Study** You propose to conduct a single-season hydroacoustic study by placing split-beam transducers at navigation locks E-6 (at the Crescent Project) and E-7 (at the Vischer Ferry Project) to assess the timing, duration, ~~and~~ magnitude of the upstream migration of adult blueback herring through these navigation locks. However, it is unclear how the results from this study would inform potential license conditions or relate to the management goals for blueback herring in the Mohawk River. For instance, is the study meant to provide information on run timing for the purpose of informing decisions as to when the navigation locks should be operated to optimize upstream fish passage? It is also unclear how estimates of run sizes would provide new information for the project record because it is well known that a sizeable spawning run of blueback herring occurs in the Mohawk River as previous fishery surveys upstream of the projects have caught hundreds to thousands of adults in the spring and early summer spawning season (generally May and June). Therefore, in the RSP, please specify how the results of your proposed study would inform potential license conditions, provide new information for the project record, and relate to the management goals for blueback herring in the Mohawk River.	Based on agency and stakeholder interest and comments, NYPA understands that its initially proposed study of upstream migrating adult blueback herring is not of primary interest or concern because there is an established run of blueback herring (BBH) in the lower Mohawk River and because upstream passage of BBH at both the Crescent and Vischer Ferry Projects is provided via the canal locks which are not part of the FERC- licensed projects and which are operated by the Canal Corporation for navigation purposes. Rather, the agencies have indicated that additional study of outmigrating adult and juvenile herring, the effectiveness of the acoustic deterrence system, and the effectiveness of the downstream passage facilities is needed to better inform potential measures to enhance BBH migration. However, as explained in the RSP, because the Crescent deterrent system will be undergoing repairs/maintenance in 2020, and because the Reimagine the Canal initiative may eventually result in changes to the Vischer Ferry Project that could affect fish passage, the Power Authority is not proposing a BBH field study for 2020. Rather, the RSP has been modified to refocus the proposed BBH study on using existing information and data to prepare a White Paper to evaluate downstream passage routes and whole station survival for BBH at the Crescent and Vischer Ferry Projects.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
17	FERC 12/17/2019	You propose to study only the upstream component of the blueback herringmigration in the Mohawk River (as described above) given that a number of previous studies have already evaluated the effectiveness of the downstream passage (acoustic deterrent) systems present at the projects. Although several studies have evaluated the effectiveness of the existing acoustic deterrent systems—which use ultrasonic (high frequency) sound to divert juvenile and post-spawning adult blueback herring away from the powerhouses and towards surface openings in the projects' flashboards, certain information gaps remain, particularly at the Crescent Project due its more complex channel arrangement (a split channel upstream of the dams) compared to Vischer Ferry (single channel). First, the effectiveness of the acoustic deterrent system for adults at the Crescent Project, which was initially evaluated during a 2009 telemetry study, has not been re-evaluated since the direction of the sound field was changed in 2010. Thus, the effectiveness of the current deployment configuration is largely unknown for adult blueback herring at the Crescent Project. Secondly, despite the re-alignment of the sound field at the Crescent Project, the acoustic deterrent system still appears to be only partially effective at diverting juveniles as the diversion rate in a 2012 study (3 to 27 percent after re-alignment) was similar to that (20 percent) from a 2008 study conducted prior to the re-alignment of the sound field. Therefore, if you do not propose studies in the RSP to address these information gaps, please explain why you believe the existing information is sufficient to conclude that the current downstream passage system at the Crescent Project is effective for deterring both juvenile and adult blueback herring away from the project's turbines and passing safely downstream.	See response 16.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
18	USFWS 12/23/2019	While we understand that there is existing information available for BBH in the lower Mohawk River and at the Projects, there are notable gaps in the available information for the river between the Projects, for the current configurations for fish protection measures, and between adults and juveniles for routing and survival between the Kaplan and Francis turbines present in the powerhouses. These gaps have been identified in our Study Requests and additionally in Commission Staff Comments.	See response 16.
19	USFWS 12/23/2019	We strongly encourage the NYPA to propose an updated, holistic assessment for thedownstream routing of BBH through the Projects. With a comprehensive study, the NYPA will be able to readily evaluate the proportion of BBH passing through the current flashboard notches, over the dams, through the locks, and through turbines at both Projects. Coupled with existing or any needed assessments of turbine mortality for both life stages, this would provide the information needed for our analysis of BBH passage at the Projects.	See response 16.
20	NYSDEC 12/20/2019	NYSDEC has a greater interest and concern in adult herring than juvenile herring and their interaction with the NYPA Project, and is also interested in assessing the timing, duration, magnitude of the emigrating adults as well as downstream mortality. The relationship between the NYPA projects and the adult Blueback Herring population, particularly during their outmigration, is incredibly important to assessing the impacts on the fishery. NYSDEC requests that the monitoring run from April to October due to migratory movements.	See response 16.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
21	NYSDEC 12/20/2019	NYSDEC would also like to request that some adult Blueback Herring be collected and equipped with acoustic tags. These fish could be collected from just prior to or within the canal flight so that they can be captured moving past the first hydroacoustic array and again when they are emigrating from the Mohawk River.	See response 16.
22	NYSDEC 12/20/2019	Understanding that the proposed study is already quite large and will be demanding of resources, NYSDEC suggests the creation of a fund that can be awarded in the form of a competitive grant to educational facilities to conduct an acceptable study(ies) in lieu of additional requests. This could relieve NYPA with some of the burden NYPA while also delivering additional data to the resource agencies, which will further inform management of the Blueback Herring stock and how it may relate to the NYPA projects.	NYPA has revised the proposed BBH study in the RSP to better address agency and stakeholders' concerns about outmigrating rather than inmigrating BBH. The Power Authority is now proposing to use existing information and data to prepare a White Paper that will include a comprehensive assessment of downstream passage routes and whole station survival for outmigrating BBH at the Projects.
23	Riverkeeper 12/20/2019	**American Eel** At the present, we do not have adequate information to understand eel density and distribution patterns in the Project Area. In order to determine the true density and abundance of American eel in the Mohawk River and especially in the Project Area, NYPA must conduct a rigorous scientific study utilizing proper sampling techniques, using effective gear from which quantification of effort can be measured. Moreover, for any study of fish populations, whether in the Mohawk River as a whole or in the Project Area, NYPA must include a robust sampling regime to determine both abundance and density. NYPA must also incorporate catchability into study designs, since it is critical when indexing abundance. In addition, NYPA must account for any variability in catchability to avoid biased survey results, and ultimately arriving at an incorrect estimation. Finally, it must be clearly noted that NYPA's study must thoroughly evaluate sampling	NYPA is proposing to conduct a Fish Community study which will be done as a desk-top evaluation using existing fisheries data that has been collected by NYSDEC and others over the past 10-20 years. NYPA requested and has received a significant amount of this fish data from NYSDEC and USGS for the lower Mohawk River in the vicinity of the projects. As part of the proposed fish community study, NYPA will be reviewing the data and will be evaluating the status of American eel and other management species and species of interest. NYPA proposes to use the Fish Community study results to better inform the need for any additional studies of American eel.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
		effort and gear selectivity to avoid inadequate designs leading to inaccurate results.	
24	USFWS 12/23/2019	It is our understanding that the NYP A will be further evaluating additional information regarding American eel presence in the vicinity of the Projects. The Service is evaluating the need for upstream passage and downstream passage and protection for this species at the Projects. If the available information suggests that American eel are present below the Projects, the NYPA should consider proposing a study for upstream passage and protection as well as entrainment mortality studies for this species in the RSP.	Regarding the status of American eel, NYPA is proposing to use the Fish Community study to evaluate the status of the species in the Projects' vicinity and to inform the need for additional study of American eel. Similarly, NYPA is planning to conduct a desktop entrainment study which will use the Franke blade strike models to evaluate the potential for turbine mortality of key fish species, including American eel. The results of these studies will be used to evaluate the potential Project impacts on migrating eel, and to inform the need for potential mitigation including possible eel passage measures.
25	Riverkeeper 12/20/2019	Since American eels are confirmed to be present and a large, female silver eel has recently been captured in the Project Area impoundment, NYPA and FERC must follow the guidelines outlined in the NYSDEC's Mohawk River Basin Action Agenda, as well as the ASMFC protocol, which encourage the conservation of the species and the reduction of mortality. The best way to adhere to these guidelines is to conduct a robust sampling survey of American eels in the Project Area, facilitate the eels' safe movement in and out of the system, and protect eels that are present from being impinged and entrained into the turbines.	See response 24.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
26	Riverkeeper 12/20/2019	Currently, there are no protective screens on the Vischer Ferry and Crescent hydropower facilities to prevent entrainment. We strongly recommend that FERC take strict action to promote safe upstream and downstream passage of American eel in the Mohawk River system. To improve the mortality of American eels in particular, placement of screens over the turbine intakes, along with an appropriate adjusted flow velocity through the turbines to prevent impingement. FERC must also mandate state-of-the-art bypass facilities to benefit diadromous fish to avoid incurring more damage to these fishes. In addition, FERC must determine the appropriate species specific fishways and eel passages, as there are no universally applicable fish passage mechanisms.	See response 24.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
27	FERC 12/17/2019	**Aquatic Mesohabitat Study** As part of the Aquatic Mesohabitat Study, you propose to conduct field reconnaissance surveys along the projects' shorelines (littoral zones), in which you would note the occurrence of any freshwater mussels (and shell remains) or fish nests. However, you state that these field reconnaissance surveys would only be performed in areas that lack adequate (existing) aerial imagery data and would be used for the purpose of 'filling in' data gaps to create a comprehensive map of the various mesohabitats (wetlands, riparian, and littoral zones) present at the projects. Given these field surveys may cover a rather limited portion of the shoreline (depending on the quality and extent of existing aerial imagery data), it is unclear how the field component of this study would inform an analysis of potential project effects on freshwater mussels and fish spawning in the projects' impoundments. For instance, water levels in the project impoundments are drawn down 18 to 33 inches in the spring and fall for the purpose of installing and removing flashboards, which could cause desiccation of mussels and disrupt fish spawning activity. Therefore, in the RSP, please clarify how the study would inform potential project effects on mussels and fish spawning in the projects' impoundments.	NYPA has revised the RSP to clarify that the reconnaissance surveys will be conducted throughout the Projects' impoundment and tailwater areas, not just in places where aerial imagery is not available. In short, the reconnaissance surveys will be used to confirm and "ground-truth" habitat information gained from the aerial imagery, and to provide additional observations on important habitat components including wildlife and aquatic resource usage. NYPA believes that the mesohabitat study proposed, which now includes both summer (boards up) and fall (boards down) field surveys, will provide sufficient information to adequately assess the potential effects of seasonal drawdowns associated with installation and removal of flashboards on aquatic habitats and their usage. The mesohabitat survey will also be used to identify potential and likely freshwater mussel habitats which could be the focus of freshwater mussel survey efforts during the second study season.
28	NYSDEC 12/20/2019	NYSDEC agrees with the proposed study but would like to request that the study being conducted take into account the differences in water level when the flashboards are both in place and removed. This could be accomplished by making field observations during the summer field season and again in the fall after the flashboards have been removed and the impoundments have responded to the change in elevation.	See response 27. NYPA believes that the proposed mesohabitat study will provide sufficient information to adequately assess the potential effects of seasonal drawdowns of 18-33 inches on habitats and their usage.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
		RECREATION	
29	FERC 12/17/2019	**Recreation Study** As discussed during the study plan meeting, please include in the RSP a description of the process you will use and any factors you will consider when making the determination on whether to use trail or spot counts, and voluntary, self-administered box survey or intercept surveys to administer the recreation use survey. In your description, please also include a schedule for when these determinations will be made.	The RSP has been modified to include a description of the process that will be used to determine whether trail cameras can be used to conduct use surveys at the Project recreation sites. This process was begun by NYPA staff making site-visits to the recreation sites to identify potential trail camera placement and documenting that on maps which are included in the RSP. A final determination on trail camera usage and placement will be made in April, prior to the initiation of the data collection season which begins Memorial Day weekend.
30	FERC 12/17/2019	As part of the Recreation Study, you propose to conduct an inventory and condition assessment "at all non-commercial, public recreation sites that provide recreational access to project lands and waters." You also state that "the inventory will not include privately-owned recreation sites within and abutting the projects." As discussed during the study plan meeting, while a condition assessment of these commercial facilities is not necessary, it would be helpful to have an inventory of all the commercial facilities that also provide access to the projects. Therefore, in the RSP, we recommend that you revise the Recreation Facility Inventory description under Task 2 of the Recreation Study (page 40 of the PSP) to include an identification and description of all commercial recreation sites within the study area that also provide access to the projects.	NYPA has revised the recreation study portion of the RSP to include an inventory of both commercial and non-commercial recreation sites that provide access to the Projects. NYPA is not proposing to inventory private individual recreation facilities such as private individual boat docks or piers.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
31	NPS 12/20/2019	We do not propose the same level of Site Use and User Survey for marinas and clubs that NYPA proposes for project recreation sites, but they should be included in the Recreation Facility Inventory. The level of additional effort will be small. All docks and facilities on this section of the Mohawk River are required to have a Use and Occupancy Permit from the Canal Corporation. Additional information about marinas and boat clubs appears in the Canal Corporation's Cruising Guide, (2006), Richardson's Hudson River & Adjacent Waterways Chartbook & Cruising Guide, 3rd Ed.(2013), and the New York State Canalway Water Trail Guidebook (Waterford, NY: Erie Canalway National Heritage Corridor, 2019) pp 186-205.	See response 30.
32	NPS 12/20/2019	Floating mats of invasive water chestnut in the Crescent and Vischer Ferry impoundments render some access points unusable by mid-summer each year. The Inventory and Study Report should recognize late season limitations to access at particular sites and address the impacts of non-native species on recreational use. The Recreation Management Plan should propose measures to manage water chestnut on project waters.	The RSP has been modified to clarify that the recreation site inventory and condition assessment will be conducted in the mid-late summer, which will ensure that the impact of non-native invasive species (such as water chestnut) on recreation site use can be evaluated and considered as part of the study.
33	NPS 12/20/2019	The Canal Corporation is now listed as a subsidiary of the New York Power Authority so any action by Canal Corp is effectively an action by the licensee. Since NYPA took control of Canals the annual navigation season has been shortened by several weeks at either end. Further changes to navigation on the Mohawk are currently being discussed under a NYPA initiative called "Re-Imagine the Canals." While they were once separate entities within state government, operational changes by the Canal Corporation now have a direct effect on recreational use and access at FERC licensed projects operated by its parent. The Recreation User Survey and Study Report and the	Although the Canal Corporation is technically a subsidiary of the New York Power Authority, the Canal Corporation operates as a separate entity whose mission and primary responsibility is to operate the canals for navigation and recreation. The canals and locks are not part of the FERC licensed Projects; any decisions regarding recreation and navigation management of the canals is outside the relicensing process.

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		resulting management plan should address the effects.	
	ADDITIONAL STUDY REQUESTS		
		American Eel Study	
34	NYSDEC 12/20/2019	The American eel has been documented in surveys to inhabit the Mohawk River Watershed, a study is needed to ascertain the presence and abundance of eels and the need to provide them a better mode of passage. NYPA has proposed to conduct an American eel study following the results of the Fish Community Study, however NYSDEC strongly disagrees with hinging the conducting of the American Eel Study on a desktop analysis of previously conducted sampling and studies due to said studies being focused on specific fish species other than American eel, thus creating a bias. The goals and objectives of this study are to assess the presence and relative abundance of American eel elvers in the NYPA Projects area and assess the need for eel ladders to improve successful and safe upstream passage.	The Power Authority is continuing to conduct a Fish Community Study, the results of which should provide reliable information about the presence, distribution and abundance of American eel in the Crescent and Vischer Ferry Project area.
35	NYSDEC 12/20/2019	**Criterion 2 - Resource Management Goals** The natural resource management goals within the Mohawk River Watershed will be consistent with the Department's mission while focusing on protecting and enhancing fish and wildlife habitat and improving public access. There is a pre-proposal currently available for public review and comment which will elevate the American eel from a species of conservation need to a species of special concern in New York State in (https://www.dec.ny.gov/regulations/34113.html).	See response 34.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
36	NYSDEC 12/20/2019	**Criterion 4 - Existing Information** Although caught in low numbers in the past couple of decades, fishery surveys have continued to collect mature American eels while sampling. There are also historical records of American eel caught in the Mohawk River and adjacent tributaries. More recent records of American eel presence in the Mohawk River come in the form of bycatch from other fish sampling efforts. There have been limited to no concentrated efforts to sample American eel in the Mohawk River. There is an ongoing USGS study to evaluate the status of American eel populations in the Mohawk River basin, however it is not expected to be completed until March 2021 and no data is currently available.	See response 34.
37	NYSDEC 12/20/2019	**Criterion 5 - Nexus to Project Operations and Effects** Both NYPA Projects have constructed dam structures which pose a migratory hurdle for the American eel in their upstream migration as elvers. While elvers may be able to ascend the dam face, they are also put at a higher risk of predation and will have to expend additional energy to do so. They may stage at the foot of the dam and then ascend by crawling up the face of the dam with slow and steady progress in order to surmount the dam and have access to upstream habitat.	See response 34.
38	NYSDEC 12/20/2019	**Criterion 6 - Methodology Consistent with Accepted Practice** The sampling of eels should be conducted through the deployment of eel traps and eel mops to determine staging of upstream migration and relative abundance of elvers, and standard sampling techniques should be used. Traps should be in place from April through October and sampled once a week at numbers less than 50 and daily at more than 50 individuals.	See response 34.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
39	NYSDEC 12/20/2019	**Criterion 7 - Level of Effort, Cost, and Why Alternative Studies Will Not Suffice** The level of effort would involve one field crew. The study would last for one field season, two if abnormally high flows damage the sampling gear and disrupt the study. The actual cost is unknown and would depend upon the cost of sampling gear, number of sampling locations, local labor costs, the ability to combine multiple studies (e.g., fisheries, mussels, and water quality) into one task, etc. The existing literature provided in the PAD (Section 4.4.2.3) is inadequate to fully address the NYPA projects impacts and the proposed Fish Community Study would not be truly representative of the American eel population in the Mohawk River. The Applicant has the flexibility to design the most cost-effective way to acquire the necessary data and may combine efforts with other study efforts but is encouraged to continue to consult with the resource agencies and FERC.	See response 34.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
		Ice Jam Flooding Study	
40	FERC 12/17/2019	After reviewing the pre-application document (PAD), your comments on Scoping Document 1 that also provided supplemental information on flooding, and your proposed study plan, we have identified a gap between the information you provided and the information needed to assess project effects. As required in section 5.9 of the Commission's regulations, we have addressed the seven study request criteria for the study request that follows. The goal of the study is to evaluate any project effects on flooding due to the formation of ice jams in the river reaches upstream of the Vischer Ferry Dam. The specific objectives of the study are as follows: 1. Characterize and understand ice-jam processes in the Mohawk River upstream of the project dam, including ice-jam formation, location of ice jams, and ice-jam-induced flooding. 2. Develop an ice-jam hydraulic model to evaluate the effects, if any, of the Vischer Ferry Project and its operation on ice-jam formation and flooding. 3. Identify structural and nonstructural options for the mitigation of ice-jam impacts.	NYPA is not proposing to conduct an ice jam study to evaluate the cause of ice jams on the lower Mohawk River as other efforts addressing seasonal flooding, including ice jam flooding, are already underway. The Reimagine the Canals Task Force was launched by Governor Andrew Cuomo in 2019 to pursue a comprehensive investigation of how the Erie Canal could be reimagined for the 21st century and published its findings in January 2020 in a Reimagine the Canals Task Force Report (Appendix E). The Task Force's work included potential ice jam mitigation within the Project boundaries as a key component of the overall initiative. The Task Force convened both a Mohawk Flood Assessment and Ice Jam Mitigation panels to review historical flooding and ice jam-related flood events in the Mohawk River, identify changes in climate and river conditions driving future ice jam formation, and assess potential areas for flooding mitigation. The Ice Jam and Flooding panels each produced a report for the Task Force. The Ice Jam panel developed an ice jam model to better understand the causes of ice jams and impacts of possible solutions. Governor Cuomo recently recommended that the Task Force take further action relating to its ice jam mitigation findings, including the development of an Ice Jam Monitoring and Early Warning System to better alert communities to potential flooding; and further assessments of potential river channel modifications, use of icebreakers/cutters, and possible retrofits to the Vischer Ferry Dam to mitigate ice jams and seasonal flooding on the Mohawk River. Links to

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
			the Ice Jam Mitigation Panel's and Mohawk Flood Assessment Panel's reports are provided in the RSP (Section 3.1.3).
41	FERC 12/17/2019	***Criterion (3) – If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.*** Both prior modeling studies evaluated dam operation and/or modification options for open-water flooding conditions and did not include hydraulic modeling analysis of ice-jam-induced flooding. Therefore, an analysis of the extent, if any, that the project contributes to ice-jam flooding is needed to identify and balance potential mitigation measures with their costs. As such, the study is relevant to the Commission's public interest determination.	See response 40.

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42	FERC 12/17/2019	***Criterion (4) – Describe existing information concerning the subject of the study proposal, and the need for additional information.*** Although Ice-jam occurrences in the Stockade area have been discussed in the published literature (Garver, 2018; Garver, 2014; Garver and Cockburn, 2009), there is no information in the PAD, or in any other documents, that evaluates the potential effects, if any, of the Vischer Ferry Project on ice-jam flooding in this portion of the river. Therefore, a study is needed to formally analyze and evaluate project effects, if any, on ice-jam-induced flooding.	See response 40.
43	FERC 12/17/2019	***Criterion (5) – Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.*** As the project impoundment extends upstream of the areas where ice-jam flooding occurs, water levels in the river along those areas could be affected by project operation. The results of the study would help identify and evaluate the potential effect, if any, of the Vischer Ferry Project on ice-jam-induced flooding and help identify potential measures for alleviating such flooding conditions.	See response 40.

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44	FERC 12/17/2019	***Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.*** This study should characterize ice jams in the study area, including the frequency and extent/severity of historic ice events, ice-jam formation, location of ice jams, and ice-jam-induced flooding. The study must develop a hydraulic model that can simulate ice jams in the affected areas. The study area should extend from the project dam to upstream areas where project operation could no longer influence water level in the river. The model should be calibrated for both open-water and ice-jam conditions, which would involve field data collection during actual events. Model simulations should include the analysis for a full range of hydrologic and ice-jam conditions. The study should include an evaluation of various potential structural and nonstructural options for mitigating ice-jam-induced flooding conditions in the upstream areas of the project dam, including changes in project operation leading up to an ice-jam event.	See response 40.
45	FERC 12/17/2019	***Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*** The cost of the Ice-Jam Flooding Study is estimated to range from $125,000 - $150,000, including study plan development, field data collection, model development and simulation, mapping, and study report preparation.	See response 40.

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46	Riverkeeper 12/20/2019	**Potential Ice Jam Studies** If an ice jam study is conducted and operational changes are deemed necessary to mitigate ice jam flooding, protection of aquatic life and water quality must be prioritized. License requirements that may affect water level and flow must consider whether wastewater effluent discharge and water withdrawal volumes change seasonally, while keeping in mind that groundwater-surface water connections do change seasonally.	See response 40.
47	Kishton (Schenectady Heritage Foundation) 12/20/2019	**Vischer Ferry Flooding** In the RSP, specifically address how the operation of the Vischer Ferry hydroelectric project affects flooding issues in the impoundment area of the Vischer Ferry dam, especially in the Stockade HistoricDistrict, which is bordered by the Mohawk River. Past studies cited by NYPA are inadequate and do not take into account new scientific information and technology that can help to analyze both ice jams and flooding in the area between Locks 7 and 8.	See response 40.
48	Duggan 12/20/2019	Request that FERC require NYPA to revise its Study Plan, specifically, to address comprehensively the hydraulic character and hydroelectric operation of the Vischer Ferry Dam regarding their pronounced effects toward flooding issues along its impounded reservoir-pool. There are weaknesses in the documentation NYPA has submitted, specifically being that the model studied was based on considering the top of flashboards as the "crest" elevation, and thus was token in its scale compared to reality of even the "10-Year" runoff-volume. The study-effort seemed also to (a) discount the non-riverine impounded nature of the permanent large underlying water-volume, and (b) be conditioned around concern for the two subject dams' stability" ... if their height is reduced. FERC should condition re-licensing on three matters: comprehensive hydraulic study of this lengthy dam	See response 40.

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		leading to unquestionable assessment of modification and related benefit regarding the flooding issue; assuming the distinct benefit of modification, a survey report regarding pertinent candidate gate-systems, and the earliest possible committed basic budgeting and scheduling for actual modification and operational readiness.	
49	Kishton (Schenectady Heritage Foundation) 12/20/2019	Provide sufficient information that determines the operation of the Project will have no significant impact on the Stockade, a National Historic District.	See response 40.
50	Kishton (Schenectady Heritage Foundation) 12/20/2019	Vischer Ferry Hydroelectric plant operations, downstream from the Stockade, should be required to study and make modifications to its operations if such modifications are found to reduce the impact on future flooding in the Mohawk River Basin.	See response 40.

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51	Wege 10/29/2019	Since the Vischer Ferry Dam was constructed, the 11 mile reservoir pool flooded the Schenectady/Scotia area 23 times. Fourteen flooding events were ice jam events. Over the course of twenty years I developed an understanding on what stops an ice run and creates ice blockage and backwater flooding. Briefly, a reduction in river slope, an ice covered pool, bridge piers, sharp bends in the stream channel and the confluences of high gradient tributaries trigger ice jamming. The Niskayuna Pool, formed by the Vischer Ferry dam triggers ice jamming by (1) thick sheet ice on the pool, (2) the sharp right bend in the river channel and (3) bridge piers. There are small gates in the north section of the VFD. However, the Niskayuna Pool is not drained during the winter months. If there was a winter drawdown of only 5 feet the historical ice jam events would be reduced to three. I urge this issue be addressed in the relicensing and I urge one additional study. I am aware that several hydraulic studies have been made on the backwater effect from the VFD in the Schenectady/Scotia reach of the Niskayuna Pool that have determined only inches of flood water reduction would result even if the VFD was removed. I question the data input into such studies as the friction factor is so different when the reservoir pool transforms from a placid reservoir into a flood wave. The narrow rock cut channel section downstream from the Rexford Bridge will have a much higher friction factor (having higher velocities) than the wide silt lined channel in the vicinity of the Western Gateway Bridge (having small velocities). Relicensing offers an opportunity to define and address a long standing problem using modern technology. I urge the study to relicense the Vischer Ferry project include a comprehensive flood control review.	See response 40.

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52	Wege 11/6/2019	Gomez and Sullivan consultants conducted flooding studies that examined five or six alternatives for managing water levels at the [Vischer Ferry] dam. Each alternative illustrates the negligible effect on water elevations in the Schenectady/Scotia area. One alternative involved a shallow cut in the dam. I do not believe that study was sufficient in analyzing the impact of this dam on the high-value upstream properties in the Schenectady/Scotia area. I suggest a few additional runs that assumes a gated weir cut in the spillway that would pass a base flood flow. I further suggest a new study employ a management tool. Assume a major storm of 6 to 10 inches in the watershed with a predicted flood wave 24 hours in advance; and assume the new flood gates are opened, allowing the Niskayuna Pool to partly drain prior to the arrival of the flood wave. Such an ability to manage the pool elevation would produce higher velocities that would shorten the flooding time and may significantly reduce flood elevations. The ability to draw down the Niskayuna reservoir pool during the winter months would yield significant flood elevation reductions from ice jams. I am convinced that flooding is a valid concern and should be included in the proposed studies for relicensing Vischer Ferry.	See response 40.

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53	Woidt 12/22/2019	I have reviewed portion of the relicensing documents relative to ice jamming and have identified several inaccuracies in the Proposed Study Plan for the Vischer Ferry Project. (1) On page 47 of the PSP Shumaker and CRREL's draft Hydrologic, Hydraulic and Ice Jam Assessment (2019) was referenced. This document was shared in draft form and was not to be shared with others as it is still under review by the funding agency. NYPA may find beneficial information in the public reports and presentation provided on the Stockade Mitigation Project Website: http://www.stockaderesilience.com/project-updates. (2) On page 47, the PSP states "numerous studies have been conducted to examine the frequency and causes of the Stockade District flooding, including the role of ice jams". This is an inaccurate statement. The Gomez and Sullivan (2018) report states "The hydraulic analysis assumes free-flowing conditions and does not assess impacts due to ice or debris". The NYSDEC (1979) report's conclusion on ice jamming was based on 40-year old discussion .... to characterize this as a "study" is misleading. Also, Mr Rocks, CRREL's current subject matter expert on ice jamming presented that such a determination is not possible without technical study. (3) In response to Addendum #26 authored by the Schenectady County Chamber of Commerce Flood Assessment Task Force that "Vischer Ferry is probably an asset to the region in terms of reducing ice jamming and flooding": Vischer Ferry may simultaneously be an asset to the region but a detriment to the local community. Both are relevant to Vischer Ferry. (4) On page 47, the PSP states the USGS is studying the nature and frequency of flood-causing ice jams. It should be clarified that the USGS is studying the nature and frequency of flood-causing ice jams empirically. (5) On page 47 the PSP states the DEC	See response 40.

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		is investigation the issue of flooding and flood control strategies on the Mohawk River. It should also be stated that NYPA is a partner in this effort and is providing direct technical support in the form of hydraulic modeling of alternatives. (6) On pages 47-48, NYPA concludes that the issue of flooding has been extensively studied and ...studies have repeatedly demonstrated that the existence and operation of Vischer Ferry has little or no effect on upstream flooding in the Stockade District. This is an inaccurate conclusion. No study has been performed to attribute the nature and frequency of ice jam-induced floods to Vischer Ferry, natural conditions, or other impediments. Otherwise I concur that VFD has a small impact on upstream fluvial (free-flow) flooding and that the upstream fluvial flood risk posed by VFD has been adequately studies. I still recommend that an ice jam study be performed to quantify the impact of VFD on upstream and downstream ice jamming. Specifically, I recommend that a physically based study be performed that integrates the physical processes that cause the formation and break-up of ice jams as well as the impoundment of water behind them. Such a study may include physical modeling of numerical modeling. The ice jam study should also evaluate whether a change in the operation of water levels impoundment by VFD would reduce the risk of flood-causing jams.	

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54	Delamarter (Stockade Association of Schenectady) 12/18/2019	The Stockade Association of Schenectady requests that NYPA revise their study plan to address flooding issues related to the effects of the operation of the Vischer Ferry Project on flooding issues in the impoundment area of the VFD. The work done by Shumaker and Rock (2019) for Phase 1 of the Schenectady flood project was cited by NYPA. However, the Shumaker consultants have stated their investigation was limited and did not include any review of VFD operation on flooding in the Stockade. Another study referenced was work by USGS. USGS is monitoring ice jams and their backwatering between Lock 7 and 8 but have not addressed how modifying design or operation of VFD could mitigate the formation of backwatering and ice jams. The NYSDEC study referenced in the PSP includes initiatives to understand flooding through the Mohawk River Basin. To date, the area of the lower Mohawk River in question has not been analyzed, nor is it clear that any DEC workplan includes study of the impacts of the gateless VFD on the section on the Mohawk River. The Gomez and Sullivan study did no assess modification to dam crest and gates that could significantly change backwatering and localized flooding. Such modifications in dam operations combined with updated technology to forecast high water events throughout the basin could prevent local flooding.	See response 40.
55	Delamarter (Stockade Association of Schenectady) 12/18/2019	The Stockade district of Schenectady was listed on the National Register (NR) of Historic Places in 1973. Section 106 of the National Historic Preservation Act requires that FERC must have sufficient information to determine that the VFD will have no significant impact on the NR setting. In the PSP NYPA has not provided assurances that the information needed by FERC to issue a finding of no significant impact from Vischer	See response 40.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
		Ferry Project operations is currently available without further study.	
56	Cococcia 12/15/2019	I live between the Vischer Ferry Dam (VFD) (Lock 7) and the Crescent Dam (Lock 6) on the Mohawk River. I believe it is imperative that any review of ice jams related to Lock 7 also include a review of ice jams related to Lock 6. Often times, the ice and debris that flows over Lock 7 contributes to jams at Lock 6 which impacts all of the property and homeowners along that stretch of the river. Making recommendations related to Lock 7 must consider the impact to Lock 6 and the stretch of river between the two.	See response 40.
57	Assemblyman Steck 10/22/2019	The PSP provided explanation as to why floods and ice jams were not going to be part of the study plan. NYPA has failed to distinguish between freewater floods and ice jam floods. I am personally familiar with the efforts to mitigate the effects of flooding in the Stockade. the ongoing work in that area has nothing to do with ice jam flooding. The issue is ice jamming and ice jam flooding. There have been no specific studies that addresses the roll of the VFD on ice formation and entrapment. There have been a number of studies that in fact do show that the sheet ice in front of VFD, the buildup of sediment, and the pinch point in the Knolls drives ice jams that then flood the Stockade. This link is indisputable. Freewater models of flood levels (with or without dam) have been used to infer that the dam has no effect on the Stockade. They are using the wrong tool: we need to understand ice jam driven flooding.	See response 40.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
58	Garver 8/8/2019	The Vischer Ferry Dam may exacerbate flooding in the immediate upstream Schenectady pool by 1) trapping sediment that has impaired (filled) the effective channel over the last century; 2) facilitating the formation of thick sheet ice in the winter; 3) reducing surface velocity that favors ice jam formation, which has resulted in chronic and damaging ice jams that are nearly annual in the area of the Rexford Knolls just up river from the dam. Ice jam flooding has been severe for the communities in Rexford, Allplaus, Glenville, Scotia, and the Stockade District of Schenectady. Studies are required to fully evaluate the roll that the dam plays in driving ice jam flooding and numerical modeling is required to explore the possible ways that a new dam configuration or dam operation could alleviate ice jams.	See response 40.
59	Duggan 8/9/2019	NYPA [should] study how to modify Dam D of the Vischer Ferry Dam as a means to curtail flooding in the Schenectady area. The goal would be to confirm the feasibility of preemptive controlled drawdown to achieve a non-flooding “balance” between runoff-volume arriving at Lock 8 and discharge past VFD, while avoiding/minimizing overflow. The objective is to begin steps toward providing VFD with substantial below-crest hydraulic capability (and operations protocols) to allow partial drawdown of the permanent pool’s water surface elevation. This matter deserves serious advocacy for inserting a large gate-system in Dam D to actively lower the pool’s surface, thus increase runoff-slope and velocity as far as Lock 8.	See response 40.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
		Run - of - River Compliance Study	
60	USFWS 12/23/2019	The Service recommended a Run-of-River Compliance Study in our Study Request. The NYPA has not proposed this study in the PSP. The Service is concerned that there will be inadequate information available to assess the impact of the Projects on notable downstream fluctuations at the United States Geological Survey Cohoes Gauge. Operational activities related to ramping rates and the Projects' abilities to accommodate upstream flow variability can notably influence downstream Projects and flows. Primarily, this study would utilize existing generation, headpond, lock operation, and gauge data; however, one additional flow monitoring station would need to be installed and calibrated downstream of the Crescent Project. The Service continues to recommend this study and requests its inclusion in the RSP.	The Power Authority is not proposing a run-of-river study as described by the USFWS. First, the Power Authority questions the purpose of the study; to evaluate fluctuations in flow at the Cohoes gage. The Power Authority would note that the USGS Cohoes gage is located downstream of the School Street Project. Therefore, any fluctuations in flow observed at Cohoes are a direct result of the operation of the School Street Project rather than of the Crescent and Vischer Ferry Projects. More importantly, all of the information that USFWS suggests should be collected by the Power Authority as part of this study is already collected as part of the Power Authority's ongoing operation of the Projects, including generation, headpond and Project discharge (flow) data. This data will be provided in the FERC license application in accordance with the Commission's regulations. Additionally, though the canal locks are not operated as part of the FERC-licensed Projects, lock operation data is available from the Canal Corporation and could be provided to FERC at any time. River flow data for USGS gages located at Cohoes Falls and elsewhere on the Mohawk River is available online.
	ADDITIONAL INFORMATON REQUESTS		
1	FERC 12/17/2019	**American Eel** Some compiled information in the PAD on the presence and relative abundance of American eel was from surveys focused on characterizing the general fish community in the Mohawk River, and additional data from more recent targeted eel surveys are available. These surveys would help inform staff's Study Plan Determination regarding the need for field	NYPA requested from NYSDEC and USGS the two studies and supporting data identified by FERC in this AIR. In an email from Scott George of USGS dated 1/3/2020, the USGS explained that the two referenced studies are the same effort. USGS surveyed 20 tributary sites on the north side of the Mohawk in 2015, and 15 tributary sites on the south side of the Mohawk in

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
		surveys to determine the relative abundance of American eel in the vicinity of the projects, such as the studies requested by the U.S. Fish and Wildlife Service and New York DEC. Please provide the following data reports in the RSP: (1) USGS. 2015-2016. American eel in tributaries to the Mohawk River. The USGS, SUNY ESF, and DEC screening survey of tributaries for American eel. (2) USGS. 2015. American eel in USGS Newsletter describing a study being conducted "in cooperation with NYSDEC" to determine if American eel are present in the Mohawk River." In addition, final reports (indicated by KA) that may contain the eel catch data from adult eel collection efforts (years 2009-2010) at the downstream School Street Project (FERC No. 2539) has not been filed with the Commission. Therefore, if eel catch data (size, relative abundance, etc.) are available from the School Street Project, please provide that data in the RSP, as well as any other existing information regarding the presence, abundance, or distribution of American eel in the vicinity of the Crescent and Vischer Ferry Projects.	2016. Surveys were conducted using backpack electrofishing, and sampling time generally ranged from 600-1200 seconds depending on the quantity of accessible habitat. No eel were captured or observed during any of the 35 surveys. Apparently USGS did not publish the results of this study in a study report. USGS further reported that they are currently piloting the use of environmental DNA (eDNA) to detect American Eel in the Mohawk and its tributaries. USGS anticipates that this method and the results it produces will be more useful for determining the location and relative abundance of eels in the watershed. Preliminary data from this project should be available around Fall of 2021. Regarding American eel data collected at the School Street Project, NYPA is aware of a 1994 fish community study that surveyed both upstream and downstream of the dam. The final study report is included in Appendix C.
2	FERC 12/17/2019	**Lock Operations in Relation to Fish Passage** To inform staff's analysis of existing fish passage opportunities (for eels and blueback herring) afforded by the navigation locks associated with each project (E-6 at the Crescent Project and E-7 at the Vischer Ferry Project), please provide, for the past 10 years, to the extent such data are available, the monthly number of lockages at each project in each year. Also, please specify the hours of the day during which these locks operate.	Lockage information requested by FERC is provided in Appendix D of the RSP filing.

No.	Agency/Stakeholder	Comments, Additional Study Requests, and AIRs	NYPA Response
3	FERC 12/17/2019	**Hydroacoustic Studies of Juvenile Blueback Herring** In the RSP, please provide, for the entire duration of the 2012 study (September 8, 2012 through October 26, 2012), the same daily information that was presented in Table 2 (the daily proportion of flow along with the expected and observed proportion of juveniles migrating down the east (non-powerhouse) channel) for the 2008 study. These data are needed by staff to fully interpret the results of the 2012 study—especially the results from the mobile hydroacoustic surveys that were conducted on certain dates for which there is no daily information on the relative flow distribution between the two channels	NYPA has requested the data sought by FERC from the original study authors (Normandeau Associates). However, as that study is now several years old, it will take time to locate the original study datasets and/or locate project operations data for those 2012 study periods. Once the data is located or recreated, NYPA will provide it to FERC.
4	FERC 12/17/2019	**Blueback Herring Downstream Passage at the Vischer Ferry Project** Regarding the two separate flashboard openings, Please clarify whether: (1) both notches are open for the entire duration of the navigation season or (2) if the juvenile notch is initially closed (i.e., its flashboard is in place) until the end of the adult migration season, at which time the adult notch is closed (its flashboard is installed) and the juvenile notch is opened (by removing its flashboard)? If the latter, how much time generally elapses between the opening of the juvenile notch and closing of the adult notch (e.g., is this work done on the same day?) and on what dates does this switch generally occur?	The Vischer Ferry flashboard opening information requested by FERC is provided in the response to AIR's section of the RSP. As explained therein, when the Vischer Ferry flashboards are initially installed in the spring (typically early April), the juvenile fish passage notch is closed (i.e., its flashboard is in place) and the adult fish notch is open. The adult fish passage notch is open until late summer (mid to late August). In mid to late August the adult passage notch is closed and the juvenile passage notch is opened. Typically, it takes a day or so to lower the Vischer Ferry pond and approximately 2 hours to open the juvenile passage (remove its flashboard) and close the adult passage, by installing its flashboard. The juvenile fish passage notch remains open until the project flashboards are removed for the winter in the late fall.

APPENDIX C: Response to FERC AIR: Lockage Information for Locks E-6 and E-7 for the Period 2010-2019

Crescent Project – Lock E-6 – Number of Lockages by Month, and Hours of Lock Operation for the Period 2010-2019

	April	May	June	July	August	September	October	November	December	
Year	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	Hour Range
2010	3	217	227	261	203	202	111	25	0	May 1 to May 26, 7:00 AM to 5:00 PM, May 27 to September 8, 7:00 AM to 10:00 PM, September 9 to November 15, 7:00 AM to 5:00 PM.
2011	1	103	241	279	210	12	14	17	14	May 26 to September 7, 7:00 AM to 10:00 PM.
2012	18	178	218	223	222	201	128	32	2	April 28 at 10:00 AM, May 1 to May 23 7:00 AM to 5:00 PM, May 24 to September 5, 7:00 AM to 10:00 PM, September 6 to September 28, 7:00 AM to 7:00 PM, September 29 to November 15, 7:00 AM to 5:00 PM.
2013	6	164	78	173	212	130	80	34	0	May 23 to September 11, 7:00 AM to 10:00 PM.
2014	3	124	184	224	167	172	115	16	1	May 23 to September 10, 8:00 AM to 6:00 PM.
2015	7	139	175	191	172	181	110	42	10	May 8 to June 3, 7:00 AM to 5:00 PM, June 4 to September 9, 8:00 AM to 6:00 PM, September 10 to November 18, 7:00 AM to 5:00 PM.
2016	5	148	196	215	152	169	103	43	0	Operated on demand up to 10:00 PM from Thursday through Monday from May 19 to September 13.
2017	1	97	198	172	183	164	77	5	0	Operated on demand up to 10:00 PM from Thursday through Monday from May 19 to September 13.
2018	2	63	128	140	105	109	50	6	0	Operated on demand up to 10:00 PM from Thursday through Monday from May 18 to September 12.
2019	0	53	226	221	182	170	90	0	0	Operated on demand up to 10:00 PM from Thursday through Monday from May 17 to September 11.

Vischer Ferry Project – Lock E-7 - Number of Lockages by Month, and Hours of Lock Operation for the Period 2010-2019

	April	May	June	July	August	September	October	November	December	
Year	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	# of Lockages	Hour Range
2010	12	317	381	500	403	351	151	34	0	May 1 to May 26, 7:00 AM to 5:00 PM, May 27 to September 8, 7:00 AM to 10:00 PM, September 9 to November 15, 7:00 AM to 5:00 PM.
2011	0	137	355	460	316	10	9	25	7	May 26 to September 7, 7:00 AM to 10:00 PM.
2012	10	203	352	372	320	290	142	18	0	April 28 at 10:00 AM, May 1 to May 23 7:00 AM to 5:00 PM, May 24 to September 5, 7:00 AM to 10:00 PM, September 6 to September 28, 7:00 AM to 7:00 PM, September 29 to November 15, 7:00 AM to 5:00 PM.
2013	1	180	132	282	337	203	111	37	0	May 1 to May 22, 7:00 AM to 5:00 PM, May 23 to September 11: 8:00 AM to 6:00 PM, September 12 to November 15: 7:00 AM to 5:00 PM.
2014	0	151	306	352	316	264	128	30	0	May 23 to June 3, 8:00 AM to 6:00 PM, September 10. Opened on request from 7:00 AM to 10:00 PM daily. During this time period due to heavy rainfall across upstate New York 90 percent of the locks were open.
2015	5	156	267	356	317	270	137	42	14	May 8 to June 3, 7:00 AM to 5:00 PM, June 4 to September 9, from 8:00 AM to 10:00 PM, from September 10 to November 18, 7:00 AM to 5:00 PM with on demand from 7:00AM to 10:00 PM from June 4 to September 9.
2016	8	183	306	404	284	270	126	43	2	May 1 to May 25, 7:00 AM to 5:00 PM, May 26 to September 7, from 8:00 AM to 6:00 PM, from September 8 to November 20, 7:00 AM to 5:00 PM with on demand from 7:00AM to 10:00 PM from May 26 to September 7.
2017	1	135	297	307	317	276	108	25	3	May 19 to October 11, 7:00 AM to 5:00 PM.
2018	0	166	390	406	339	286	120	12	2	May 18 to September 12 7:00 AM to 5:00 PM extended hours until 10:00 PM May 18 to September 12.
2019	4	128	357	464	394	330	148	14	0	May 17 to October 16, 7:00 AM to 5:00 PM, with on-demand operation until 10:00 PM to September 11

APPENDIX D: Response to FERC AIR: School Street Fisheries Study

FEDERAL ENERGY REGULATORY COMMISSION

SCHOOL STREET PROJECT

FERC PROJECT NO. 2539-003

RESPONSE TO

SCHEDULE B

ADDITIONAL INFORMATION REQUEST NO. 4

FISH RESOURCES BASELINE STUDY

DATED: SEPTEMBER 2, 1992

JULY 1994

NIAGARA MOHAWK

NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

July 14, 1994

Hon. Lois D. Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, DC 20426

SUBJECT: SCHOOL STREET PROJECT
FERC Project No. 2539-003 NY
Response to FERC September 2, 1992
Additional Information Request No. 4

Dear Secretary Cashell:

Enclosed is one (1) original and eight (8) copies of Niagara Mohawk Power Corporation's (Niagara Mohawk) Response to FERC's September 2, 1992 Additional Information Request No. 4 (Fish Baseline Study) for the School Street Project (FERC No. 2539). The enclosed submittal completes information requested by the Commission in its September 2, 1992 letter. The remainder of the AIR responses were submitted to the Commission by letter dated December 6, 1993. Quarterly Progress Reports were submitted to the Commission on March 29, 1993, June 29, 1993, September 29, 1993, December 27, 1993, March 30, 1994 and June 29, 1994.

The enclosed submittal consists of Niagara Mohawk's response to AIR No. 4 which summarizes the results of the 1993/94 fish sampling and makes comparison to the previous 1988 study that was referenced by the Commission in its September 2, 1992 letter. Appended to Niagara Mohawk's response is the final draft of the fisheries baseline report prepared by Kleinschmidt Associates which addresses each issue raised in the Commission's September 2, 1992 AIR as modified by the Commission's August 10, 1993 letter accepting the study plan.

Agency comments on the draft fish baseline report are contained within Appendix A of the referenced fish baseline report. The enclosed fisheries baseline report has been revised to incorporate pertinent agency comments. Responses to other comments raised by the U.S. Fish & Wildlife Service's June 28, 1994 letter are addressed in Kleinschmidt Associate's letter dated July 13, 1994 (see Appendix A of the Fish Baseline Report). Comments on the draft report were received from the New York Department of Environmental Conservation (NYSDEC) on July 11, 1994. Due to publication schedules, we were unable to include Niagara Mohawk's responses to the NYSDEC comments within this filing. Niagara Mohawk will provide the Commission with the response to the NYSDEC's July 11, 1994 letter within thirty (30) days of this filing.

JLS\SS-L194A.4JS

If you should have any questions regarding the enclosed, please contact Mr. David P. Falcinelli at (315) 428-5569.

Very truly yours,

David P Falcinelli

for Jerry L. Sabattis
Hydro Licensing Coordinator
Hydro Licensing & Regulatory Compliance

JLS:jas

Enclosures

cc: Attached Service List Project #2539
D. P. Falcinelli
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SERVICE LIST

PROJECT: School Street Hydroelectric Project, FERC #2539

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Date: July 14, 1999 David P. Falcinelli

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FEDERAL ENERGY REGULATORY COMMISSION

SCHOOL STREET PROJECT

FERC PROJECT NO. 2539-003

RESPONSE TO

SCHEDULE B

ADDITIONAL INFORMATION REQUEST NO. 4

FISH RESOURCES BASELINE STUDY

DATED: SEPTEMBER 2, 1992

JULY 1994

NIAGARA MOHAWK

SCHOOL STREET PROJECT
FERC PROJECT NO. 2539-003

NIAGARA MOHAWK POWER CORPORATION'S RESPONSE TO FERC ADDITIONAL INFORMATION REQUEST ITEM NO. 4

FISH BASELINE STUDY

The FERC Additional Information Request schedule B, Item 4, states:

"In Exhibit E.3 (pages E.3-20 through E.3-23) of your application you provide information about existing fish habitat in the School Street Project impoundment and bypass reach from a 1988 fisheries survey conducted by Ichthyological Associates, Inc. (IA). Exhibit E.3 also provides fisheries data obtained through a series of sampling efforts conducted by NYSDEC in the vicinity of the School Street Project (upstream at Crescent Lake, School Street Impoundment, and downstream at the mouth of Mohawk river). However, you do not provide similar fisheries data downstream of the School Street dam (beyond the bypass reach) resulting from sampling of the river within the project area. In order for staff to evaluate the impacts of your project operations on the fisheries of the Mohawk River, we need the following additional information on the species of fish in the project area which inhabit the Mohawk River downstream of the School Street project powerhouse.

We need fish population statistics for the Mohawk River downstream of the powerhouse (sampling at the location where the bypass reach discharge and the powerhouse discharge would be combined) in the form of:

(a) percent abundance, standing stock, and size frequency distributions;
(b) sampling locations for the data; and
(c) brief summary of the sampling methods used in these fisheries investigations including the number of sampling events, duration, time of year, time of day, and sampling equipment.

If the information requested above is available from the NYSDEC and FWS, you may provide such information. If no information is available through the agencies, you must conduct a fisheries survey in this section for the Mohawk River. Therefore, if the requested fisheries information is not available through the agencies, you must, after consultation with the NYSDEC and the FWS, develop a study plan and conduct a study to describe the fisheries downstream of your proposed project in the Mohawk River. Along with the information requested above, the plan and study results must also include the following:

(d) Description of the methods used in the study;

(e) Documentation of consultation with NYSDEC and FWS prior to initiating the study, including specific descriptions of how all the agency comments and recommendations were accommodated by the plan (you must allow the agencies a minimum of 30 days to provide you with comments regarding the development of the study plan). You have 12 months to complete the studies (from the time the final study plans have been filed with the Commission) and to file the results of the studies with the Commission."

RESPONSE TO FERC ADDITIONAL INFORMATION REQUEST ITEM NO.4
FISH BASELINE STUDY

The 1988 fisheries survey referenced by the above Additional Information Request (AIR) was performed to collect information on the existing fish species and population data within the School Street Project impoundment and bypass reach waters. Results of the 1988 study referenced by the FERC AIR are presented in the December, 1991 license application.

In response to the September 2, 1992 FERC AIR, Niagara Mohawk Power Corporation (Niagara Mohawk) proposed a study plan on April 16, 1993 which was approved by FERC on August 10, 1993. In implementing the approved study plan, Niagara Mohawk conducted a separate study to collect fisheries information for the tailwater area. The results of the 1993/94 study are appended to this document. Documentation of agency consultation in scoping of the requested study and review of the draft report is presented in Appendix A of the 1993/94 report. A summary of each report and its general conclusions is presented herein to assist the Commission in its evaluation of the existing operation of the School Street Project relative to the existing fishery resource of the Mohawk River.

- 1988 Study

The 1988 survey was conducted during the summer months of July and August. The July survey focused on fish abundance in the project impoundment, while the August survey focused on fish abundance in the project bypass reach.

The July 1988 survey of the School Street Project impoundment collected a total of 3,832 fish, representing 21 species; by boat electrofishing, trap net, gill net, seine net, and minnow trap. Out of the total 3,832 fish, 82.5% (3161 fish) of the fish collected were blueback herring. The remaining 17.5% (671 fish) were of various species, which included: yellow perch (most common panfish collected), rock bass, white sucker, and

pumpkinseed sunfish, smallmouth bass (most common gamefish collected), largemouth bass, and walleye. The numerical dominance of small blueback herring (18 to 55 mm) indicated the presence of recently hatched blueback herring young-of-year (YOY).

The August 1988 fisheries survey of the School Street Project bypass reach collected a total of 52 fish, representing 12 species. The catch was dominated by white sucker, smallmouth bass, and yellow perch. These three species accounted for 65% of the total catch, with 25%, 23.1%, and 19.2%, respectively. Two blueback herring (lifestage not specified) were collected during the August 1988 study in the bypass area. The only other game species collected aside from the smallmouth bass were walleye. Other commonly collected panfish species included: brown bullhead, yellow bullhead, and rock bass.

- 1993/94 Study

In response to the September 2, 1992 FERC AIR, an additional, more intensive survey was conducted, and seasonal fish distribution samples were obtained at the School Street Project during the spring, summer, and fall of 1993/1994; which encompassed six samples over a period of 12 months. From June, 1993 to June, 1994, sampling efforts were conducted on: June 14-17, 1993; August 16-18, 1993; September 20-23; October 12-14; November 8-9, 1993; May 17-18 (impoundment and tailwater only), and May 31-June 1, 1994 (bypass reach only). As specified by the Commission's AIR No. 4, the tailwater portion of the School Street Project was sampled during each of these months for requested fish population statistics. The project impoundment and bypass reach were also sampled to develop information comparative to that collected by Ichthyological Associates in a concurrent timeframe with the requested tailrace sampling.

As a result of the seasonal sampling efforts, it was observed that temperature, dissolved oxygen (D.O), and pH varied seasonally in all areas of the project site; falling within the range of ambient Mohawk River water quality parameters. The range of ambient water quality parameters found in the project was within reported tolerance

limits for all the observed fish species, including the warm summer months. This indicates a potential for year-round presence of all fish species observed (not including any anadromous species).

The species composition found within the project can be generally described as a warmwater community typical of the ecoregion of central and eastern New York. The fish species observed in the project waters which were native to the Mohawk River include gamefish, non-gamefish, anadromous, and catadromous fish species. Stray species including the tiger muskellunge, rainbow trout, striped bass, and freshwater drum were also collected. Tiger muskellunge (an artificial hybrid) and rainbow trout are probably escapees from stocking elsewhere. Native fish species and the tiger muskellunge were observed living within the project waters during each of the three seasons sampling was conducted: spring, summer, and fall.

Recruitment by natural reproduction was evident in the School Street Project waters, as would be expected due to its location, which is bracketed from contiguous reaches of the Mohawk River. Yellow perch were observed spawning during mid-May, 1994. Centrachid species were observed spawning in project waters in June, 1993, and preparing to spawn in late May/early June, 1994. YOY (young of year) of these species groups were particularly abundant in samples gathered in the months following spawning. No fall spawning species were detected in the project waters and, it follows, no fall spawning was evident within project waters.

Observed species richness and fish population data indicates that the impoundment has the highest species richness and fish abundance of the three project areas surveyed. It was followed by the bypass reach. The tailwater had the lowest species richness and fish abundance. The tailwater is predominantly rapids with ledge substrate and relatively high instream velocities under most river flows. Generally, there is a lack of velocity shelters (cover) and suitable habitat for the observed fish species within the tailwater of the project. The reason for the low species diversity and population in the tailwater, it can be reasoned, is due to the paucity of velocity shelters and suitable aquatic habitat.

Similar to the 1988 survey, the only anadromous species observed during the 1993/94 sampling period was the blueback herring. The blueback herring's upmigration is unaffected by the School Street Project due to the Waterford Flight of the New York State Barge Canal, which bypasses the entire project area and allows passage to the upstream reaches of the Mohawk River. Data from the sampling efforts indicated that spent blueback herring were present within the project during mid-June, and YOY were consistently detected from late summer to mid-fall. The data indicate that adult blueback herring upmigrate past, spawn above, and the subsequent YOY live in and leave, project waters. The only catadromous fish found in the project was the American eel, which was observed in all segments of the study area from June to October.

The data collected over the period of the June, 1993 to June, 1994 indicates that the School Street Project can support, and is suitable for, the recruitment of indigenous, and some non-indigenous species of fish. The data collected also indicates the project can support the catadromous fish and anadromous fish species in the Mohawk River. Furthermore, it was observed that no fall spawning species were evident in the project waters, and subsequently, no fall spawning is occurring within the project area.

The summer (July and August) 1988 fisheries study bears similarities to the results of the summer (August) 1993 fisheries survey despite some differences in sampling methods and effort levels. Both the 1988 and August, 1993 surveys found 22 species of fish present in the project area, with 18 matching species. Of particular interest, both studies found that the blueback herring and the smallmouth bass were among the most commonly collected species in the impoundment during the similar period of sampling. A length/frequency comparison of collected smallmouth bass also found that the 1988 impoundment survey and the August, 1993 impoundment survey had similar size distributions for smallmouth bass in both survey periods. Due to less intensive data collected during the 1988 survey, concerning the bypass reach, a length/frequency

comparison of collected smallmouth bass could not be made with the August, 1993 survey data. Despite differences in sampling effort, and total fish collected, the two studies nonetheless recorded the following similar trends: number of species, 12 (August, 1988) and 14 (August, 1993), with eight species (75%) the same among both studies. Rock bass and smallmouth bass were among the most abundant species in both cases. In both studies, blueback herring were also sampled.

The similarities in number and type of species found in two independent surveys conducted five years apart, suggests that the fish resources found within the School Street Project's impoundment and bypass reach appear to have remained relatively consistent between 1988 and 1993. Further, the length/frequency comparison of smallmouth bass collected in the project impoundment also suggests a similar size and age distribution among years, and the high abundance of blueback herring in the project impoundment remained consistent among both survey periods, with the majority of the specimens collected being YOY fish. Consequently, the data collected during both of the survey efforts suggests that a constant, and stable, fish assemblage exists within the project impoundment.

The project tailwater area consists predominantly of rapids with ledge substrate and relatively high velocities under most river flows. Generally, there is a lack of velocity shelters and suitable habitat for the observed fish species within the tailwater of the project. The reason for the low species diversity and population in the tailwater, it can be reasoned, is due to the paucity of velocity shelters and suitable aquatic habitat.

- Conclusions

As indicated by the observed data, the School Street Project provides habitat for warmwater fish of the Mohawk River within the project's waters. Indigenous fish species are all able to live within the project waters during the spring, summer, and fall. Yellow perch and the centrachid species present in the project waters were observed to be naturally recruiting. Thus, the School Street Project provides conditions suitable for natural recruitment of indigenous species and their respective life cycles.

In addition, upmigrating blueback herring are known to bypass the project waters and successfully spawn upstream. Subsequently, blueback herring YOY were abundant within the project waters during the late summer through the mid-fall (October), and vacated project waters in the fall, as indicated by their absence during November sampling. Accordingly, the project supports suitable habitat and water quality parameters.

In reviewing the enclosed document and agency comments on the draft report the reviewer should keep the original focus of the Commission request in mind (*i.e.*, the need for fisheries data for the tailwater portion of the School Street Project). As discussed in the study plan, Niagara Mohawk proposed to also collect fisheries baseline information in the impoundment and bypass during 1993/94 to provide a context for assessing the results of this study relative to the results of the previous 1988 fisheries baseline study of the impoundment and bypass reach. As noted above, the two studies show similar results for the impoundment and bypass reach. The fact that there were few fish collected in the project tailwater during the same collection period appears to be a function of the existing high velocity/poor cover conditions of the downstream river channel, and is not likely a result of project operations or some perceived problem with the method of data collection/analysis.

SCHOOL STREET PROJECT
FERC PROJECT NO. 2539

NIAGARA MOHAWK
POWER CORPORATION'S
RESPONSE TO

FERC ADDITIONAL INFORMATION REQUEST ITEM NO. 4 FISHERIES BASELINE STUDY

JULY 1994

Prepared by
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Consulting Engineers
Pittsfield, Maine

SCHOOL STREET PROJECT
FERC PROJECT NO. 2539

NIAGARA MOHAWK POWER CORPORATION'S
RESPONSE TO

FERC ADDITIONAL INFORMATION REQUEST ITEM NO. 4
FISHERIES BASELINE STUDY

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SCHOOL STREET PROJECT
FERC PROJECT NO. 2539

NIAGARA MOHAWK POWER CORPORATION'S
RESPONSE TO

FERC ADDITIONAL INFORMATION REQUEST ITEM NO. 4
FISHERIES BASELINE STUDY

1.0 INTRODUCTION

Niagara Mohawk Power Corporation (Niagara Mohawk) owns and operates the School Street Project (FERC. No. 2539). The project consists of one hydroelectric development on the Mohawk River in the city of Cohoes, towns of Colonie and Waterford, Albany and Saratoga counties, New York. The project is located approximately two miles from the confluence of the Mohawk River with the Hudson River. On December 20, 1991, Niagara Mohawk submitted a relicense application for the project to the Federal Energy Regulatory Commission (FERC).

Niagara Mohawk had conducted sampling in the School Street project bypass reach and impoundment in 1988 (Niagara Mohawk Power Corp., 1991). However, no sampling data was available for the "tailrace" (tailwater) riverine area located downstream from the project powerhouse. By letter dated September 2, 1992, the FERC concluded that additional information regarding the fisheries resources of the project area were required. An Additional Information Request (AIR item 4) was issued by the FERC requesting Niagara Mohawk to further describe the fisheries resource immediately downstream of the powerhouse (at the location where the bypass reach discharge and the powerhouse discharge would be combined). FERC requested that Niagara Mohawk conduct a study "to describe the fisheries downstream of your proposed project in the Mohawk River." FERC required that the study follow a study plan which documented the methods to be used, as well as agency consultation in designing the study.

2.0 STUDY PLAN

As per the AIR, a draft study plan was submitted to the U.S. Fish and Wildlife Service (USFWS) and the New York State Department of Environmental Conservation (NYSDEC) on April 16, 1993 for review and comment (see Appendix A for copies of correspondence). Included in the study plan was proposed study methodology, study details, and a report schedule.

Although FERC had only requested sampling below the bypass reach, Niagara Mohawk believed it was prudent to concurrently re-sample previously studied project areas, so that all biological data would be from a comparable time frame. Therefore, the study plan stated that fish sampling would occur at three study areas: the impoundment upstream of the School Street dam, the bypass reach, and the approximately 3,000 ft reach downstream to the New York State Dam impoundment (tailwater below the School Street powerhouse).

By letter dated August 10, 1993 the FERC issued a letter approving the study plan and extending the time frame in which to conduct the study until July 15, 1994 (see Appendix A). In response to agency comments on the draft study plan, the FERC also requested that seasonal sampling occur:

> "(to) provide an indication of seasonal utilization. A spring sampling period is necessary since this may be the primary spawning period for species that potentially inhabit the project area, such as smallmouth bass and walleye. Summer sampling will provide an indication of which species survive under adverse conditions of low flow and high temperature and are therefore likely present year round. Fall sampling is important to determine any potential fall spawning runs and whether flow or temperature limitations are reduced."

The following report describes the fishery baseline study that Niagara Mohawk undertook at the School Street Project in response to the approved study plan.

3.0 DESCRIPTION OF THE PROJECT

The School Street Project consists of one hydroelectric development located in eastern New York State, on the Mohawk River two miles upstream from its confluence with the Hudson River and eight miles north of the city of Albany (see Figure 1). The development consists of a dam measuring 1,280 feet long and 16 feet high, a power canal approximately 4,400 feet long by 150 wide and 14 feet deep, a powerhouse containing five turbine-generators and a tailrace (see Figure 1, and Photoplate 1). The project has historically operated in a store and release mode using up to 3 ft of storage. In its license application, Niagara Mohawk proposed to install a sixth turbine-generator unit to reduce impoundment fluctuations from three feet to one foot and provide a minimum flow of 60 cfs in the project bypass (Niagara Mohawk, December, 1991 license application).

The relatively shallow 100-acre impoundment can be described as slow-flowing riverine habitat. The only significant source of inflow is provided by the Crescent Dam Project (FERC No. 4678) located on the northwest edge of the impoundment. The northern shoreline of the impoundment consists of near vertical bedrock bluffs with private residences located further inland along a portion of the shoreline. The southern shoreline is steeply-sloped and has a narrow fringe of upland scrub shrub and tree species. Dominant cover and substrate types on the north and south shorelines consist of dense submerged aquatic vegetation, mud, shale ledge, and shale fragments. A portion of the impoundment shoreline, located between the Crescent powerhouse and the northern section of the Crescent Dam consists primarily of boulder (large and small) substrate.

Cohoes Falls (approximately 60 ft. high) divides the 4,500 ft bypass reach into two study areas, the upper and lower. Aquatic habitat present in the upper bypass reach under existing leakage conditions consists of a small riffle side channel interconnecting deep, clear pools. Substrate is shale ledge. The northern shoreline is bordered by near vertical cliffs, while the southern shoreline is steeply-sloped and wooded. The power canal for the project parallels the bypass for its entire length.

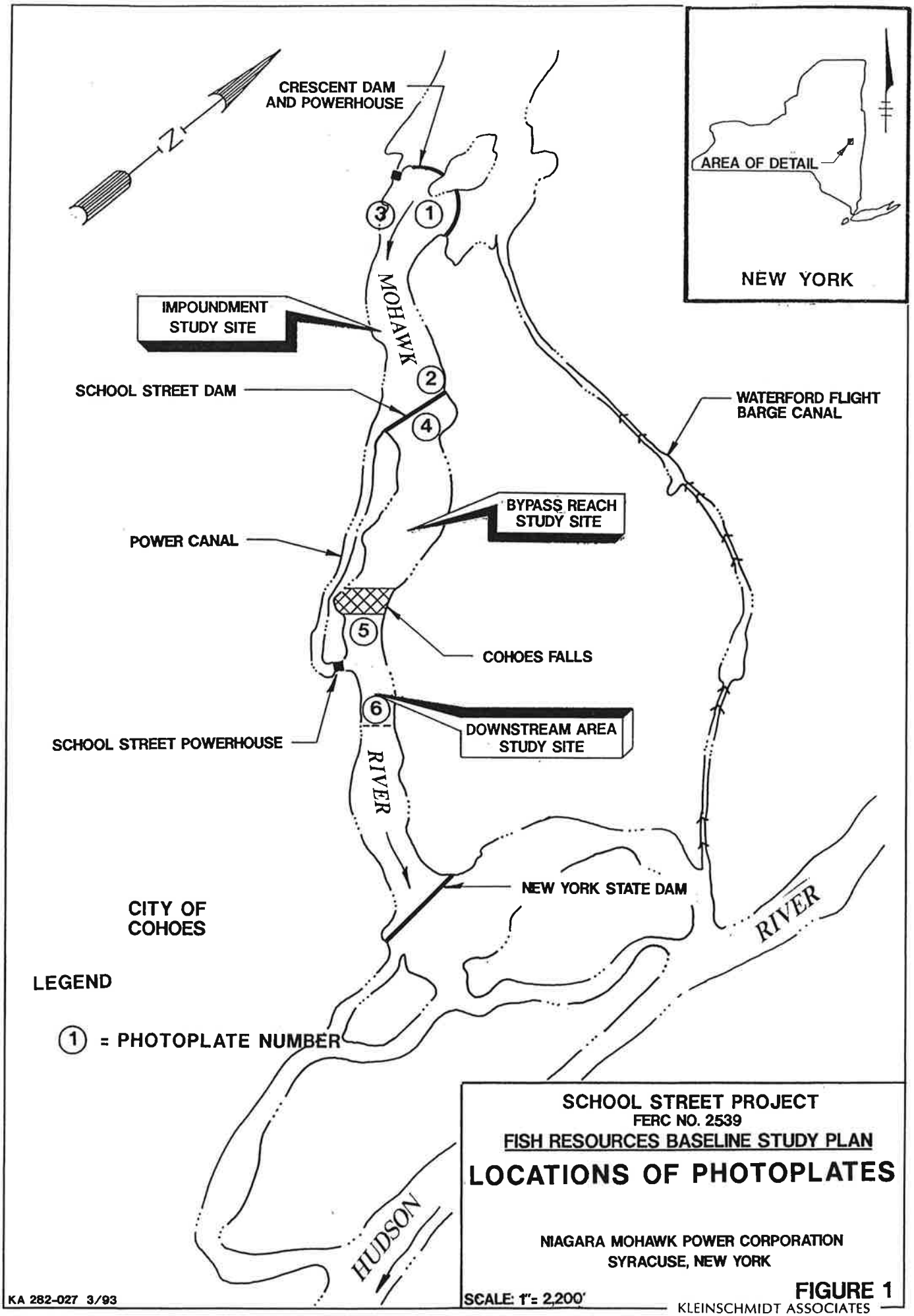
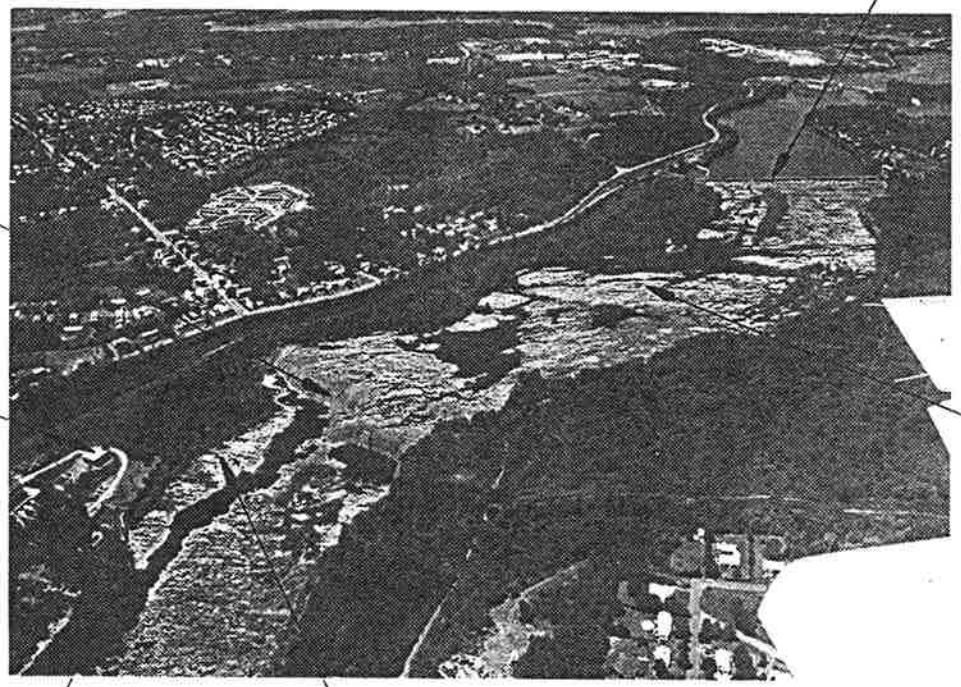


FIGURE 1

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SCHOOL STREET PROJECT

FERC PROJECT No. 2539-003



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CONSULTING ENGINEERS

The lower bypass can be characterized as a fairly deep (2-8 ft.), backwatered pool, with depth and wetted area influenced by flow from the powerhouse. A more detailed analysis of bypass reach habitat is presented in Ichthyological Associates' "Instream Flow and Routing Study of the Mohawk River in the Vicinity of the School Street Project" (Connors, *et al.*, 1990).

The tailwater habitat, which extends from the powerhouse tailrace to the New York State Dam impoundment can be characterized as relatively fast flowing, shallow, riverine habitat with riffle and rapids. Substrate consists primarily of shale bedrock and contains very limited object cover. An area consisting of small and large boulder is present where the Mohawk River discharge flows into the New York Dam impoundment. Except for this relatively small area, the tailwater is generally void of significant velocity shelters or other quality cover types.

4.0 STUDY METHODOLOGY

Seasonal fish distribution samples were obtained at the School Street Project during spring, summer and fall in response to the FERC AIR item No. 4, to determine relative fish abundance, size frequency distribution, seasonal utilization and distribution of fish species present within the School Street Project.

Six different months of sampling visits were performed from June, 1993 to May, 1994. All efforts were conducted in a similar, standardized procedure when possible. Data was gathered from three study areas: the upstream impoundment, bypass reach, and tailwater below the powerhouse. Sampling stations and gear types were selected based on habitat characteristics observed during the first site reconnaissance and were, to the extent possible, resampled on each subsequent trip unless prevented by extenuating field conditions (*e.g.* spillage flows). Shoreline electrofishing in the impoundment encompassed the entire impoundment perimeter, but was divided into discrete segments, based on habitat types (see letter dated June 30, 1993 in Appendix A). Habitat type and quality were qualitatively classified for each sampling station. Recorded information relating to aquatic habitat included substrate type, shoreline types, and cover type/quality. At least one sampling station was established in each observed habitat type.

Data for each sample station generally included location, depth, gear type, number of fish per species, fish length (total length to nearest mm), date and begin/end time of each sample, prevailing weather and water quality, including temperature (Celsius), dissolved oxygen (mg/l), pH and (for electrofishing samples) conductivity. Most fish were returned to the river following sample processing, however, any fish species not readily identifiable were preserved and later identified, using fisheries keys (Smith, 1985; Scott and Crossman, 1973).

Water quality data was gathered *in situ* at fish sampling depth, generally at the beginning and end of each fish collection (Table 1). D.O. and water temperature were gathered using a calibrated YSI model 51B D.O. meter. Conductivity data was recorded

during electrofishing sampling to qualify the effectiveness of the electrofishing gear. Ambient pH was obtained from a standard HACH kit and phenol red, bromothymol blue titration chemistry.

Fish collection gear types used during sampling included gill nets, hoop nets, beach seining, backpack electrofishing and boat electrofishing. Below is a description of each gear type, followed by a detailed description of field methods for each study area.

Gear Types

Horizontal gill nets, approximately 125 feet long and 4 feet wide with graduated 25 ft experimental mesh panels ranging from 0.5 inches up to 2.5 inches bar length (0.5 in. increments) were set and anchored to the bottom of sampling stations in water depths ranging from 1 to 4 meters.

Hoop nets had 3-foot diameter rings with two throats to prevent fish escape. The nets were approximately 10 feet long with 0.25-inch delta mesh size and had two attached wings (approximately 16 feet long and 3 feet wide). Each net/wing combination was set to divert shoreline-oriented fish into the net mouth.

Beach seining consisted of two biologists entrapping fish in shallow water with a seine approximately 50 feet long with 0.25-inch mesh. Due to limited areas in the School Street project where seining could actually occur and a ledge substrate that frequently snagged the net, this gear type was not effective in collecting fish and was abandoned during the June sample, and not attempted during subsequent sampling efforts.

Backpack electrofishing was conducted using a Smith-Root backpack electrofishing unit (Model 12). Voltage and pulse rate were generally set on 300 volts and 60 pps, respectively, but were varied based on observed effectiveness. The crew consisted of one person equipped with the electrofishing unit shocking fish and two netters. Beach seines were used as block nets in the channel area of the upper bypass reach.

Boat electrofishing was conducted using a DC electrofishing unit mounted on an 18 foot Jon Boat. Sampling voltage and frequency was typically 300 volts and 60 pps, respectively. The crew consisted of a boat operator and two netters located at the bow of the boat. Both day-time and nocturnal boat electrofishing were conducted at the School Street Project.

Study Areas

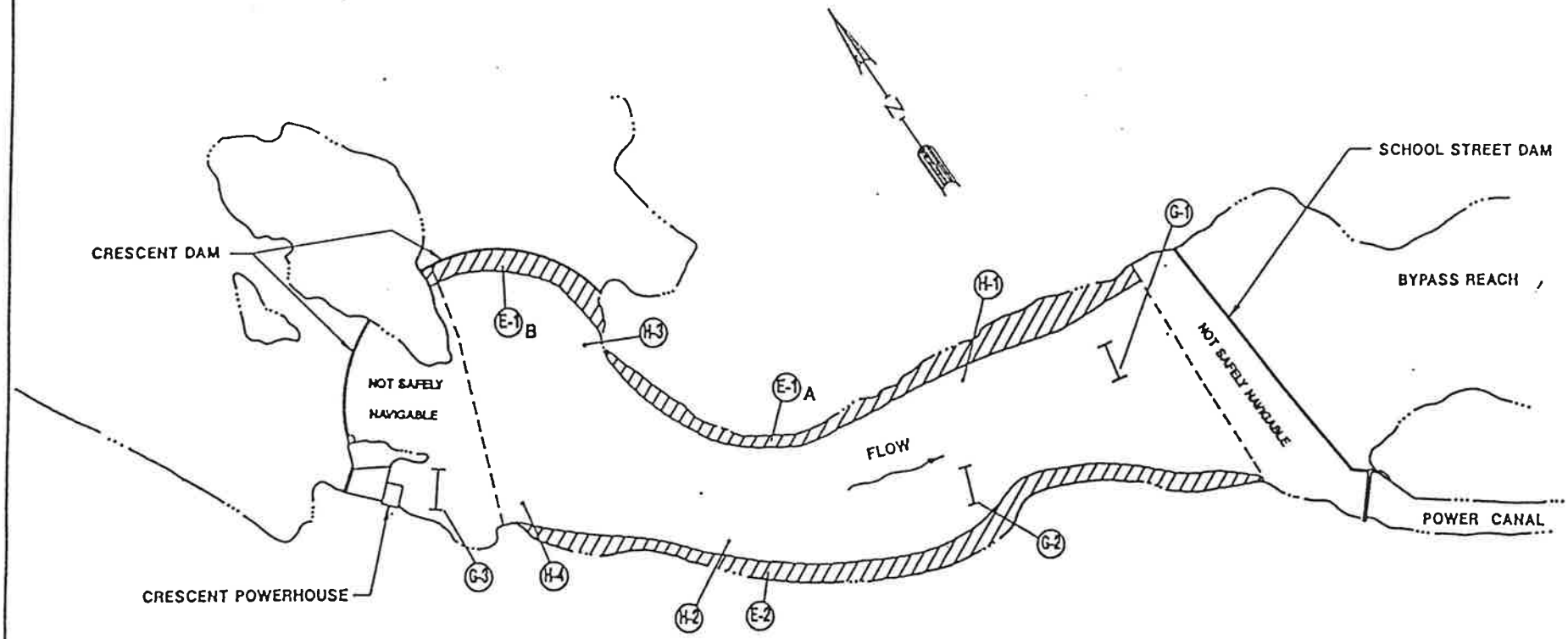
Impoundment

Data was collected from the impoundment using three different gear types to minimize potential sampling bias: anchored horizontal gill nets, hoop nets and night-time boat electrofishing. Figure 2 shows the location of all impoundment sampling stations.

Horizontal gill nets were set from a boat and anchored to the bottom of the impoundment in three locations. Approximate sampling depth was 3 - 5 meters. At least one, and sometimes two, consecutive overnight net sets were generally obtained per sampling trip. Each net was retrieved and all fish were removed and processed at the end of each overnight set.

Hoop net sampling was conducted along both the north and south shorelines of the impoundment. Four hoop nets with attached wings were set from a boat and anchored to the bottom of the impoundment. Approximate sampling depth was 2 - 3 meters. Sampling typically consisted of one or two consecutive overnight efforts per sample trip. All fish were harvested and processed at the end of each overnight set.

Night-time boat electrofishing was conducted along the entire boatable impoundment perimeter. The shoreline was divided into three sampling areas: the north and south shorelines of the impoundment and the base of Crescent Dam. Depths ranged from less than 1 meter to 3 meters. Each area's sample duration varied from



LEGEND

H-3 = HOOP NET

E-A = ELECTROFISHING

G-2 = GILL NET

SCHOOL STREET IMPOUNDMENT

500 0 500

SCALE IN FEET

SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

IMPOUNDMENT SAMPLING LOCATIONS

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

FIGURE 2

K.A. 262-027 3/93

Kleinschmidt Associates
Consulting Engineers
Pittsfield, Maine

0.58 to 1.50 hours, and was sufficiently short to facilitate the rapid processing and release of the catch. All netted fish were placed in holding buckets with ambient water and subsequently taken to a shore-side processing location.

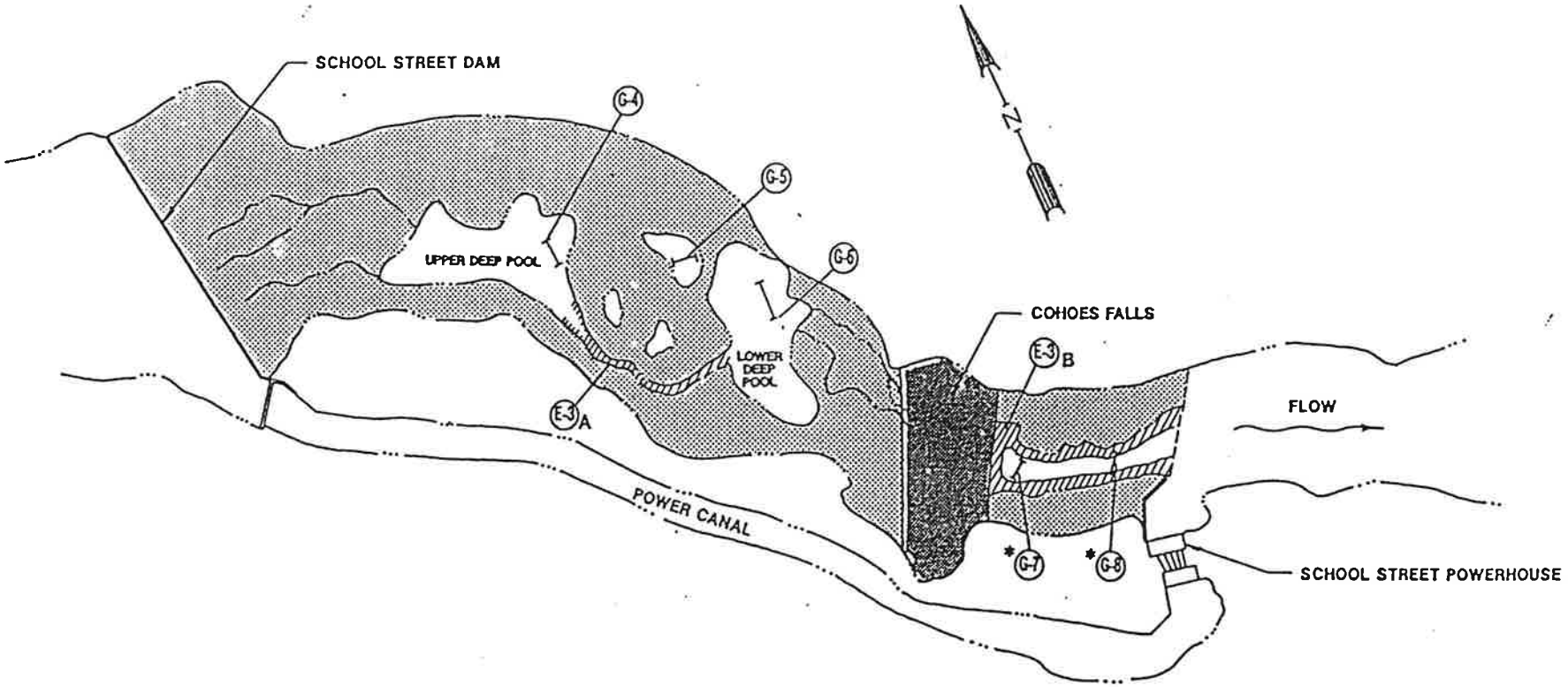
During the November sampling effort, high flows prevented net sets. On this occasion, the only sampling method utilized was boat electrofishing.

Bypass Reach

Data was collected from the bypass reach using two different gear types to account for different habitat areas: anchored horizontal gill nets (deep rocky pools), and electrofishing (shallow ledge/riffle channel, and lower bypass) (see Figure 3 for sampling locations).

Sampling occurred during leakage conditions both for safety reasons, maximum access, and to portray fish resources under existing conditions. A Smith-Root Model 12 electrofishing unit was used to sample wadable portions of the upper bypass reach while day-time boat electrofishing was employed in the lower bypassed reach below Cohoes Falls.

One horizontal gill net per pool was anchored at mid-depth to bottom and used to transect each deep pool in the upper bypass reach. Each net was secured to woody vegetation along the pool edges and/or submerged anchors. Nets were retrieved and all fish were processed at the end of each overnight set. On one occasion, the October sample, the bypass reach was not accessible at the end of the first overnight set due to the potential for spill in the bypass reach (Niagara Mohawk operators would not permit access into the bypass due to safety concerns) and thus the nets fished for two days prior to retrieval. During November, spillage prevented access to the bypass reach.



LEGEND

G-5 ⊢⊣ = GILL NET

E-3 = ELECTROFISHING

= EXPOSED BEDROCK

BYPASS REACH

* STATIONS G-7 AND G-8 WERE UTILIZED ONLY DURING THE JUNE '93' EFFORT

500 0 500

SCALE IN FEET

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Pittsfield, Maine

SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

BYPASS REACH SAMPLING LOCATIONS

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

FIGURE 3

Backpack electrofishing was conducted in the small side channel and along the margins of deep pools in the upper bypass reach. Two teams, each with a backpack electrofishing unit, sampled simultaneously. Blocking nets were set to prevent escapement. All collected fish were placed in buckets containing ambient river water and processed.

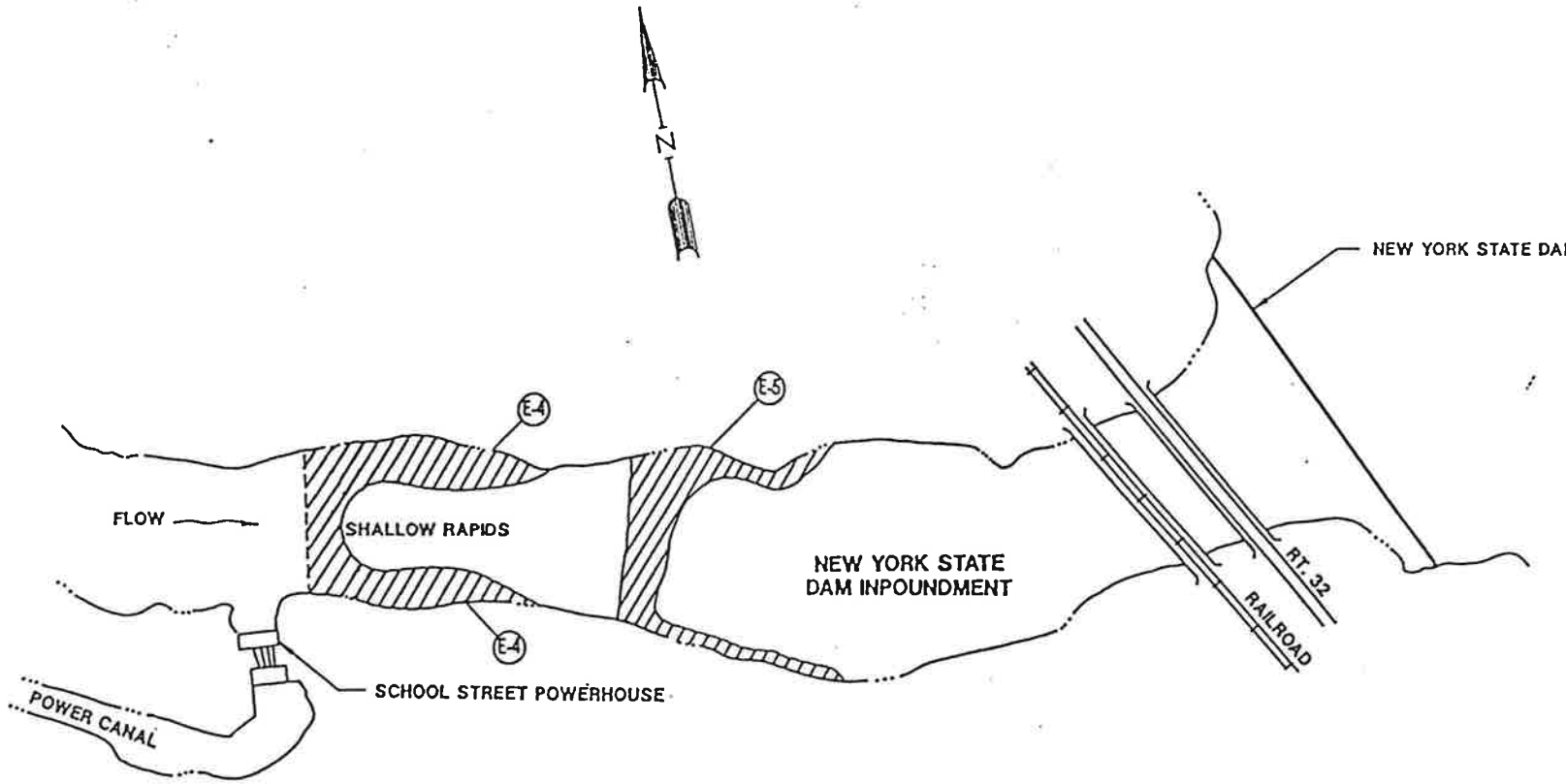
Day-time boat electrofishing was conducted as a single sampling effort per visit in the lower bypass reach below Cohoes Falls. Night-time boat electrofishing was not feasible for safety reasons and would not have been temporally consistent with other bypass electrofishing. During the June sample, access limitations necessitated substitution of gill net and backpack electrofishing (along the stream margins) because the electrofishing boat could not ascend the rapids safely. During subsequent sampling efforts, electrofishing boat access was feasible.

During the November sampling effort high flows precluded access to the upper bypass reach. The lower bypass reach was sampled via boat electrofishing as per usual.

Tailwater

Data was collected from the area below the powerhouse using day-time boat electrofishing (see Figure 4 for sampling station locations). Night-time boat electrofishing was not conducted due to safety concerns pertaining to boat navigation in rapids immediately below the tailrace.

Day-time boat electrofishing was conducted as a single sample effort per visit. The areas sampled included all navigable portions of the river between the powerhouse and the New York State Dam impoundment. Specifically, areas sampled included the margins along the tailwater, the riffle/rapid area located where the tailwater discharge flows into the New York State Dam impoundment and along the upstream-most shores of the New York State Dam impoundment. Sampling depths ranged from less than 1



LEGEND

E-5 = ELECTROFISHING

500 0 500

SCALE IN FEET

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SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

DOWNSTREAM SAMPLING LOCATIONS

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

FIGURE 4

meter up to 3 meters. As with the lower bypass reach during the June sampling event, the upper tailwater was not entirely accessible by the electrofishing boat and therefore necessitated substitution of backpack electrofishing along wadable parts of the river margins.

Nets were not utilized as a sampling gear in the tailwater due to the relatively high velocities, turbulence, and shallows throughout this reach.

5.0 RESULTS

A total of six samples were obtained in three seasons as follows: late spring, summer, early fall (two samples), and late fall and early spring (see Appendix C for complete fish sampling data). Table 1 summarizes water quality data obtained during sampling. Table 2 summarizes all fish collected between June and November 1993. Tables 3, 4, and 5 summarize relative abundance for each sampling event, by project area (impoundment, bypass reach and tailwater area, collectively). Table 6 presents length frequency data, by project area for each collection event. Individual station sampling information is listed in Appendix C. Other tables describe catch per unit effort and habitat characteristics within the project. Figures 5 and 6 describe population characteristics of the smallmouth bass, broken down by project area and monthly season. Figures 7-9 summarize composite species composition by project area.

5.1 Early Spring Sample

Early spring sampling was conducted in May, 1994, once high spring run-off subsided. Due to spillage flows in the bypass reach, two sampling trips were required to obtain data from the impoundment and tailwater (May 17 and 18), and the bypass reach (May 31 - June 1). A total of 843 fish of 22 species were sampled (Table 2).

5.1.1 Impoundment

Physical Data

Water temperature ranged from 12.9 to 14.0°C, with most temperatures ranging from 13.0 to 13.2 (Table 1a). D.O. ranged from 9.3 to 11.9 mg/l, with most readings in the 9.6-9.9 mg/l range. River pH was consistently 7.5 - 7.6.

Biological Data

A total of 542 fish of 18 species were collected (Table 3); spottail shiner, smallmouth bass, and yellow perch collectively dominated the catches, accounting for 78% of all fish collected. Length frequency data for smallmouth bass, a commonly caught species of management interest, is presented in Table 6, Figure 6; and other species are included in Appendix C. Bass ranging from 250-450 mm (adults), and 100-175 mm (yearlings and juvenile) are present. Fry and YOY were not observed or collected. A single rainbow trout (224 mm) was captured in the impoundment. This individual fish was marked by a right ventral finclip, suggesting that it is an escapee from stocking elsewhere.

Most yellow perch were in ripe spawning condition. Table 11 summarizes the gender and spawning condition of adult yellow perch sampled at various electrofishing, gill net and hoopnet stations. Lengths and weights are provided in Appendix C. A total of 11 female and 89 male mature yellow perch were sampled. Only three females, and no males were spent, suggesting that spawning was just beginning. One female specimen's spawning condition was uncertain.

5.1.2 Bypass Reach

The bypass reach received spillage during the mid-May period, thereby making the upper bypass reach inaccessible for field crew safety and limiting in collection efficiency for field gear. However, other project areas could be sampled, including the lower bypass reach (Station E-3B, below Cohoes Falls), which was safely accessible from the downstream impoundment via boat. Sampling of the upper bypass reach was delayed until May 31, 1994, at which time it was feasible to gather data with gill nets and backpack electrofishing. Fish were also opportunistically

captured through experimental angling in the deep pools (Stations A-1 and A-2, which are located in the pools associated with G-4 and G-6, respectively).

Physical Data

The lower bypass station was sampled May 17, 1994. Ambient temperature at the time was 13.0°C, D.O. was 9.2 mg/l, and pH was 7.9. The remainder of the bypass reach stations were accessed for sampling May 31 and June 1, at which time water temperature ranged from 21.0 to 24.0°C in the deep pools, most likely as a result of solar warming. The shallow side channel temperature was 24.8. D.O. ranged from 8.0 to 8.8 mg/l in the deep pools, and was 9.2 mg/l in the side channel (Station E-3a). pH ranged from 7.7 to 8.2 through out the reach.

Biological Data

92 fish of 11 species were collectively captured in all samples from this study area (Table 4). The lower bypass reach sample from May 17 consisted of 34 fish of six species, with common carp, yellow perch and smallmouth bass each contributing 26.5% of the catch. Smallmouth bass ranged in size from 324 to 495 mm TL. Yellow perch ranged from 120 to 292 mm TL. Other species collected were white sucker, pumpkinseed and rock bass.

The catch in the upper bypass samples was dominated by logperch darter (50 - 70 mm), which were found in the riffles of the side channel (station E-3a). Juvenile smallmouth bass (91 - 117 mm) were captured in the side channel, while larger specimens (84 - 257 mm) were collected by angling in the deep pools. Other species collected included rock bass, white sucker, tessellated darter, and bluegill sunfish. Shoal areas of pools were inspected for evidence of nest building. Rock bass were observed

guarding two nests in 1.5-2.0 ft of water in the shoal areas of the shallow pools, however, widespread nesting activities among centrarchids was not observed. Zebra mussels were found colonizing most of the ledge areas of the bypass reach, and were observably more abundant than during 1993.

5.1.3 Tailwater

Physical Data

The tailwater stations were sampled on May 17, 1994, using boat electrofishing. Water temperature at both stations (E-4 and E-5) was 13.0°C; D.O. ranged from 7.8 to 9.7 mg/l; pH was either 7.6 or 7.8.

Biological Data

A total of 209 fish of 10 species were collected (Table 5); spottail shiner, smallmouth bass, and white sucker collectively dominated the catches, accounting for 95% of all fish collected. Spottail shiner (n=132) comprised 63% of the total catch. Length frequency data for smallmouth bass (the most commonly caught game species) is presented in Table 6 and Figure 6. All but one smallmouth bass ranged from 225 to 475 mm TL, with most fish ranging from 300-400 mm.

Only one early spring-spawner (yellow perch) was captured in this part of the study area.

5.2 Late Spring Sample

The late spring sample was conducted during June 14-17, 1993 at the School Street Project. This sampling effort resulted in the collection of 20 species and a total of 452 individual fish. Table 2 includes a breakdown of the total number of fish sampled according to species. Smallmouth bass and bluegill

sunfish were the most abundant species sampled, comprising 23% and 22%, respectively, of the total catch. Water temperature was in the range reported for bass and sunfish spawning. Field observations confirmed that many of the centrarchidae species collected were running and ripe. In addition, numerous nests of the size and location typical for many of the centrarchidae were observed along the littoral zone of the School Street impoundment.

5.2.1 Impoundment

Physical Data

Water quality data collected at the School Street impoundment during the June sample included temperature, dissolved oxygen (D.O.) and conductivity (Table 1). Due to a malfunction, pH data from this was not available. Temperature data, gathered at sampling depth, ranged from 20.0°C to 22.0°C with 20.8°C being the average. D.O. also collected at sampling depth in the impoundment, ranged from 6.4 to 9.2 mg/l. Both temperature and D.O. remained relatively consistent during sampling throughout the impoundment.

Biological Data

A total of 305 fish representing 16 species were collected using the aforementioned methods in the impoundment during June (Table 3). The most abundant species sampled, in declining order of abundance, were bluegill sunfish, yellow perch, spottail shiner, smallmouth bass, blueback herring and golden shiner. These six species collectively accounted for 81% of the total catch. Bluegill sunfish and yellow perch comprised 33% and 13%, respectively, of the total catch in the impoundment. A number of dead or dying adult blueback herring were observed floating throughout the impoundment. Most were stiff, partly decomposed and/or diseased and appeared to be exhibiting post-spawning mortality.

Game species collected in the impoundment include seven largemouth bass, 32 smallmouth bass and one walleye.

Length-frequency data, summarized for the more frequently encountered species (Table 6), shows that all blueback herring collected ranged between 201-275 mm. Bluegill sunfish lengths ranged between 51-200 mm, with 94% being 100 mm or larger. Smallmouth bass lengths were widely distributed, with lengths ranging between 76-300 mm. Of the 39 yellow perch collected, 20 (51.2%) were between 201 and 250 mm size classes.

5.2.2 Bypass reach

Physical Data

Water quality data collected at the bypass reach during the June sample included temperature, D.O., and conductivity (Table 1). Recorded temperatures ranged from 20.0°C to 28.5°C most ambient temperatures ranged from 20.0 - 22.0°C; the 28.5°C temperature occurred as an isolated instance in the shallow margins of one deep pool area above Cohoes Falls (Station E-3). Dissolved oxygen content of the bypass water ranged from 6.0 to 9.2 mg/l.

Biological Data

A total of 62 fish consisting of nine species were collected in the bypass reach (Table 4). The most abundant species collected, in declining order of abundance, were blueback herring, smallmouth bass, and rock bass. These species collectively accounted for 75% of the total catch. Blueback herring and smallmouth bass comprised 39% and 24%, respectively, of the total fish collected in the bypass reach.

Northern pike (the head of one specimen was recovered in a gill net, apparently due to predation) and smallmouth bass were the only large game fish collected during June. Smallmouth bass ranged in length between 76-450 mm (Table 6). Six common carp were collected by gill nets in the deep pool below Cohoes Falls in the lower bypass reach study area.

5.2.3 Tailwater

Physical Data

Water quality data collected at the tailwater during the June sample include temperature, D.O., and conductivity (Table 1). Temperatures collected in the tailwater ranged from 21.0°C to 25.0°C with 23.0°C being the average of all temperatures collected. The D.O. content of the water in the tailwater ranged from 7.8 to 8.6, with a single excursion to 11.8 mg/l. The shallow riffle area immediately above the New York State Dam impoundment (Station E-4) recorded the high D.O. of 11.8, and may reflect aeration due to turbulence.

Biological Data

A total of 85 fish representing eight species were collected during June (Table 5). The most abundant species and the only gamefish species collected, smallmouth bass, comprised 67% of the total catch. Lengths for smallmouth bass collected in the tailwater ranged between 101-425 mm (Table 6). Rock bass, a pan fish, comprised 11.7% of the catch. Other species collected, listed in decreasing abundance, include common carp, blueback herring and spottail shiner.

5.3 Summer Sample

The summer sample was conducted during August 16-18, 1993. A total of 416 fish, representing 22 species were collected at the School Street Project during the August sample (Table 2). Smallmouth bass were by far the most abundant species collected, comprising 52.2% of the total catch. Young-of-year (YOY) and juvenile age classes of many of the species detected in June were captured during the August effort. Due to a malfunction, pH data from these collections was not available.

5.3.1 Impoundment

Physical Data

Water quality data collected at the School Street impoundment during the August sample include temperature, D.O. and conductivity (Table 1). Temperatures in the impoundment ranged from 23.5°C to 24.5°C. D.O. in the impoundment, ranged from 6.0 to 9.9 mg/l.

Biological Data

19 species were collected with a total of 243 individual fish in the impoundment during the August sample (Table 3). Smallmouth bass and blueback herring were the most abundant species collected, comprising 41.5% and 12%, respectively, of the total catch. Many juvenile blueback herring (too many to net entirely), were observed in the impoundment during electrofishing. Other species collected, in declining order of abundance, include largemouth bass, bluegill sunfish, and common carp.

Large gamefish collected in the impoundment during the summer sample included smallmouth bass, largemouth bass, walleye and tiger musky. Recorded lengths for the two walleye collected by gill netting in the impoundment were 428 and 643 mm.

Length-frequency data for other species collected in the impoundment (Table 6) indicate that 93% of the blueback herring collected were in the 50 and 75 mm size classes. The remainder were adult-sized fish. Smallmouth bass lengths ranged between 51-424 mm, with 72% of the 101 individuals collected being in the 100 and 125 mm size classes. Similarly, of the 19 largemouth bass collected in the impoundment, 10 were in the 100 mm size class and six were recorded in the 125 mm size class. Recorded lengths for bluegill sunfish ranged between 26 - 225 mm with 66% being 175-225 mm.

5.3.2 Bypass reach

Physical Data

Water quality data collected in the bypass reach during August include temperature, D.O., and conductivity (Table 1). Recorded temperatures ranged from 24.0°C to 27.0°C. Most temperature readings were close to 24°C, however, the absolute highest temperature recorded on one occasion from a deep pool (Station G-4) of the upper bypass reach was approximately 2°C higher than ambient temperatures found elsewhere in the project waters. D.O. in the bypass ranged from 6.0 to 9.0 mg/l.

Biological Data

A total of 112 fish from 13 species were collected in the bypass reach (Table 4). Smallmouth bass, with lengths ranging between 51 to 125

mm (Table 6), were by far the most abundant species collected, comprising 78.5% of the total catch. Other species collected include rock bass, yellow bullhead, bluegill, and largemouth bass.

5.3.3 Tailwater

Physical Data

Water quality data collected at the School Street tailwater during the August sample include temperature, D.O., and conductivity (Table 1). For the two tailwater samples, recorded water temperatures ranged from 24.0 and 25.0°C, while D.O. measurements were between 6.0 and 8.3 mg/l.

Biological Data

A total of 61 fish representing 5 species were collected by boat electrofishing in the tailwater during the August sample (Table 5). The most abundant species collected was smallmouth bass, which comprised 50% of the total catch. Total lengths for the smallmouth bass ranged between 51 to 275 mm (Table 6). The remainder of the fish species collected, in declining order of abundance, include blueback herring, eel, rock bass and white sucker.

5.4 Fall Sampling

The fall samples were conducted during September 20-22, 1993, October 12-14, 1993 and November 8-9, 1993 at the School Street Project. A total of 3,586 fish, of 32 species were collected.

5.4.1 September Sample

The September 20-22, 1993 sample was conducted as the first of three fall sampling efforts scheduled to occur at approximately monthly intervals. A total catch consisting of 1,283 fish from 28 species was collected at the School Street Project during the September sample. Approximately, 73% of the total catch was comprised of bluegill sunfish (33%), smallmouth bass (30.3%), and largemouth bass (9.7%). Young-of-year centrarchids were particularly abundant.

5.4.1.1 Impoundment

Physical Data

Water quality data collected in the impoundment included temperature, D.O., pH and conductivity (Table 1). Temperatures collected in the impoundment ranged from 17.5°C to 19.8°C, with an average temperature of 18.0°C. D.O. ranged from 5.0 to 7.2 mg/l, with 6.4 mg/l being the average. The impoundment was slightly alkaline, with pH ranging from 7.4 to 7.8.

Biological Data

A total of 924 fish representing 27 species were collected in the impoundment during the September sample (Table 3). Bluegill sunfish and largemouth bass were the most abundant species collected, comprising 45% and 13.4%, respectively, of the total catch. Total lengths for bluegill and largemouth bass ranged between 26-225 mm and 76-400 mm, respectively (Table 6). 95% other bluegill were 75 mm or smaller in size; 98% of the largemouth bass were 175 mm or less in length. Other species

collected include smallmouth bass, yellow perch, black crappie, spottail and golden shiner. Of the 86 smallmouth bass collected, 45% were in the 125 mm size class.

Other large game fish species collected include tiger muskellunge, walleye and northern pike. A single freshwater drum was collected.

5.4.1.2 Bypass reach

Physical Data

Water quality data collected at the bypass reach during September include temperature, D.O., pH and conductivity (Table 1). Temperatures ranged from 16.2°C to 19.8°C, with an average of 17.7°C. D.O. recordings ranged from 7.4 to 12.5 mg/l with values of 8.2-9.6 being most typical. The small side channel recorded the high D.O. reading of 12.5 mg/l. The bypass reach had an average aquatic pH of 7.9.

Biological Data

A total of 264 fish from 8 species were collected in the bypass reach during the September sample (Table 4). Smallmouth bass, the most abundant species collected, comprised 87% of the total catch. Length-frequency data (Table 6) indicate that smallmouth bass collected in the bypass ranged between 51-275 mm, with 51% of these being in the 100 mm size class.

Other relatively abundant species collected include rock bass, blueback herring and bluegill sunfish.

5.4.1.3 Tailwater

Physical Data

Water quality data collected in the tailwater include temperature, D.O., pH and conductivity (Table 1). Temperature and D.O. in the tailwater were very consistent, ranging from 18.8°C to 19.0°C, and 5.9 mg/l to 6.7 mg/l, respectively. Average pH was 7.4.

Biological Data

A total of 95 fish representing 9 species were collected in the tailwater area during September (Table 5). The most abundant species collected was smallmouth bass, which comprised 77.8% of the total catch. Recorded lengths for smallmouth bass ranged between 51-250 mm (Table 6) with the majority of individuals 150 mm or less in length. Other species collected, in decreasing order of abundance, include blueback herring, white sucker, black crappie and eel.

5.4.2 October Sample

The second fall sample was obtained during October 12-14, 1993. A total catch of 1,154 fish, of 24 species, was collected (Table 2). Bluegill sunfish, smallmouth bass, and largemouth bass were the most abundant species collected, comprising 38.5%, 20.2% and 12.1%, respectively, of the total catch.

5.4.2.1 Impoundment

Physical Data

Water quality data gathered at the impoundment include temperature, D.O., pH and conductivity (Table 2). Temperature in the impoundment ranged from 10.7°C to 14.0°C; D.O. content ranged from 8.3 to 10.6 mg/l. The impoundment was slightly alkaline, with a pH range of 7.6-8.1.

Biological Data

A total of 966 fish, of 24 species were collected in the impoundment during the October sample (Table 3). Bluegill sunfish were the most abundant species collected, comprising 45.8% of the total catch. Total lengths for the bluegill ranged between 26-225 mm (Table 6) with most fish ranging in length from 50 to 75 mm.

Other fish species collected in large numbers were largemouth bass (139 fish) and smallmouth bass (112 fish). Length-frequency data (Table 6) indicates that 95% of the largemouth bass and 89% of the smallmouth bass collected ranged between 76-175 mm in total length.

Other large game fish collected in the impoundment during October, include walleye, striped bass and tiger muskellunge. The single striped bass (502 mm) was collected in a gill net.

5.4.2.2 Bypass reach

Physical Data

Water quality data collected during October include temperature, D.O., pH, and conductivity (Table 1). Temperatures were widely distributed, with a range of 9.0°C to 12.8°C. One temperature recording of 6.0 (Station G-6) is suspect, outlier and may be an artifact or error. The relatively fast flowing side channels maintained a slightly lower temperature (9.0°C), than the pools (10.0-12.0°C). D.O. ranged from 9.2 to 11.5 mg/l, with an average of 9.5 mg/l. The bypass was also slightly alkaline with a pH range from 7.7 to 8.1.

Biological Data

A total of 129 fish, of 9 species were collected in the bypass during the October sample (Table 4). Smallmouth bass comprised 74% of the total catch. Lengths for the smallmouth bass ranged between 51-175 mm (Table 6). Other species collected, in decreasing order of abundance, include blueback herring, rock bass, tessellated darter, yellow bullhead, bluegill sunfish, yellow perch, eel and pumpkinseed sunfish.

5.4.2.3 Tailwater

Physical Data

Water quality data collected during October, include temperature, D.O., pH and conductivity (Table 1). Temperature ranged from 13.0 - 13.3°C. D.O. ranged from 9.5 to 10.8 mg/l. The tailwater pH ranged from 7.5-7.9.

Biological Data

A total of 59 fish representing nine species were collected in the tailwater area during the October sample (Table 5). Smallmouth bass (58%) and blueback herring (5%) collectively accounted for 63% of the total catch. 88% of the smallmouth bass were less than the 150 mm (Table 6). Lengths for blueback herring ranged between 26-100 mm. Other species collected included spottail shiner, eel, white sucker, tesselated darter, yellow perch, shorthead redhorse and pumpkinseed sunfish.

5.4.3 November Sample

The November 8-9, 1993 sample was the last of three fall samples. A total catch of 1,149 fish from 22 species was collected at the School Street Project during the November sample. Spottail shiner and golden shiner collectively accounted for 50.8% of the total catch. Bluegill sunfish and largemouth bass comprised 18.5% and 9.7%, respectively, of the total catch (Table 2). Sampling was curtailed due to an increase in river flow which lead to sufficient spillage to interrupt sampling, produce inconsistent sampling conditions in the bypass reach, and render most parts of the project area unsafe for access. Boat electrofishing of the project was the only sampling completed.

5.4.3.1 Impoundment

Physical Data

Water quality data collected in the impoundment during the November sampling effort included temperature, D.O., pH and

conductivity (Table 1). Average temperature and D.O. was 5.4°C and 12.4 mg/l, respectively with little variation among readings. The average pH in the impoundment was 7.8.

Biological Data

A total of 1,120 fish representing 21 species was collected during the November sampling event (Table 3), by relying on night-time boat electrofishing, which is the technique which historical yields the majority of the fish sampled from the impoundment. Golden shiner and spottail shiner collectively accounted for 51.9% of the total catch in the impoundment and increased in overall abundance from previous samples. Other species collected, in declining order of abundance, included bluegill sunfish, largemouth bass, smallmouth bass, yellow perch, rock bass and others. Bluegill sunfish length frequency (Table 6), indicates that the majority of the bluegill were of the size classes 50 and 75 mm. Largemouth bass ranged in length between 51-375 mm, with 79% of the 111 collected being placed in the 125 and 150 mm size classes. Of the 45 smallmouth bass collected, 82% were of the 100 and 125 mm size classes.

5.4.3.2 Bypass reach

Spillage resulted in unsafe conditions in the upper bypass reach, however, a single sample was gathered in the lower bypass reach (Station E-3B) (below Cohoes Falls) by using an electrofishing boat.

Physical Data

Water quality data collected during November included temperature, D.O., pH and conductivity (Table 1). Temperature and D.O. was recorded as 5.0°C and 13.6 mg/l, respectively. The pH was recorded as 7.8.

Biological Data

A total of 13 fish, of 4 species were collected (Table 4) including, 7 bluegill sunfish, 4 smallmouth bass, 1 walleye and 1 yellow perch. All of the bluegill were of the 50 and 75 mm size classes (Table 6). Smallmouth bass lengths ranged between 101 - 350 mm.

5.4.3.3 Tailwater

Physical Data

Water quality data included temperature, D.O., pH and conductivity (Table 1). Temperature recorded was 6.0°C and 6.2°C. D.O. content of the tailwater ranged from 12.2 to 13.6 mg/l. The pH of the tailwater was 7.6.

Biological Data

A total of 16 fish, representing six species, were collected (Table 5). The catch consisted of eastern silvery minnow (5), smallmouth bass (4), spottail shiner (3), common carp (2), white sucker (1) and brook silversides (1). All smallmouth bass collected were in the size class of 125 mm.

6.0 DISCUSSION

By letter dated September 2, 1992 the FERC concluded that additional fisheries data for the School Street Project were required to assess the impacts of project operation on the fishery resource. Specifically, additional information (AIR item 4) was needed to further describe the fisheries resources of the Mohawk River downstream of the School Street powerhouse (*i.e.* the tailwater), because sampling during the 1988 survey Culp and Homa, 1989) had not included this area. The FERC AIR specified an interest in the following topics related to fish distribution: species abundance, seasonal utilization, spring spawning, species abundance during low flow and high temperatures, and potential fall spawning runs.

Six samples were obtained at the School Street Project from June, 1993 to May, 1994. The results of the May 1994 sample are not included in this report due to time constraints imposed by data analysis and agency review, and will be provided via addendum. The 1993 late spring through late fall samples are discussed in the following sections.

6.1 Species Composition and Abundance

The School Street Project supports an abundant and diverse warm and coolwater fish assemblage, as indicated by this study and the 1988 fisheries survey (Culp and Homa, 1989). Abundant populations of panfish and gamefish species including small and largemouth bass are present within the School Street Project. Centrarchid species are not stocked in the Mohawk River and thus recruitment is by natural reproduction.

The NYSDEC has identified smallmouth bass, walleye, tiger muskellunge, and blueback herring as the species of primary concern from a management perspective (NMPC School Street 1991 license application; McBride, 1987).

Electrofishing was the most efficient gear type used during the study collecting 81% of the total catch. A total catch consisting of 4,454 fish representing 35 species was collected in this study. Bluegill sunfish, smallmouth bass, and largemouth bass were the most abundant species collected, comprising 26.9%, 22.4% and 9.0%, respectively, of the total catch. Large gamefish species collected during sampling included smallmouth bass, largemouth bass, tiger muskellunge, northern pike, walleye, and striped bass. Sampling also indicated that a forage base of minnow species exists in the School Street project which benefits resident predatory fish species.

Smallmouth bass was the most widely distributed species. Smallmouth bass were consistently among the most dominant species in the impoundment, bypass reach and tailwater of the School Street Project. Abundance of smallmouth bass collected in all samples within the project included 376 in the impoundment, 431 in the bypass reach and 190 in the tailwater. Catch per unit effort (CPUE) summarized for smallmouth bass (Table 7 and Figure 5) for the impoundment, bypass reach and tailwater indicates that the density of smallmouth bass increased in each of the three study areas from June though September. Length frequency data (Table 6 and Figure 6) for smallmouth bass show that the number of sub-adult smallmouth bass also increased from June through September in the impoundment, bypass reach and tailwater. This, combined with observed nests, and gravid fish in June, 1993 strongly indicates recruitment of young-of-year (YOY), and the occurrence of successful spawning of smallmouth bass in project waters.

Species not reported to exist within the School Street Project by previous studies yet collected during 1993/1994 sampling included longear sunfish and freshwater drum. Although literature indicates that longear sunfish is listed as a threatened species in New York, the species is found to exist in the eastern Lake Erie drainage basin (NYSDEC, 1993) and is abundant in neighboring states. Northeastern New York is near the eastern range of distribution for this species

Scott and Crossman, 1973). A single specimen of freshwater drum was collected in the impoundment; though not common in the Mohawk watershed, this species has been reported to exist both in the Hudson River drainage and the Great Lakes (Smith, 1993).

- *Impoundment*

Total numbers of fish collected during 1993 and CPUE estimates (Table 7) among the three study areas indicate that fish species diversity and abundance was generally greatest in the impoundment area (3,558 fish of 33 species; Table 3 and Figure 7). The catch in the impoundment was dominated by bluegill sunfish, largemouth bass, smallmouth bass, and yellow perch, which collectively accounted for 60.7% of the total catch. These species are typical of lentic warmwater environments, and are often associated with aquatic habitat (Table 8, photoplates) within the type of impoundment. The impoundment also possesses suitable seasonal water quality parameters described for these fish species (Scott and Crossman, 1973; Smith, 1985, Coble, 1975; Coutant, 1975, Heidinger, 1975).

- *Bypass reach*

A total of 580 fish representing 17 species were collected in the bypass reach (Table 4 and Figure 8). The catch was dominated by smallmouth bass (74%) and rock bass (5.9%). Habitat present in the bypass, (Table 8) consisting of deep, rocky pools, favors the adults of these species (Scott and Crossman, 1975; Smith, 1985; Coble; 1975; Mayhew, 1982). Juvenile and YOY smallmouth for bass were consistently collected in the small side channel in the bypass reach (Station E-3A), including the summer. Macro- and micro habitat conditions appear to provide suitable aquatic habitat for this species (Edwards, et al. 1983). A seasonal influx of adult blueback herring was detected in the bypass in June; YOY were present in summer, and more abundant in the fall (September and October), likely a result of spillage over the School Street dam.

Temperatures, dissolved oxygen and pH remained within parameters suitable for the species found at School Street under the existing conditions.

- *Tailwater*

A total catch of 316 fish of 14 species was collected (Table 5 and Figure 9) in the tailwaters. Smallmouth bass were the most abundant species in the tailwater, comprising 60.1% of the total catch. Catch per unit effort (Table 7) for this species (13.1-52.5/hour except November) suggests that smallmouth bass densities in the tailwater are in a range roughly similar to estimates from other segments of the lower Mohawk River. When one considers that a significant portion of this segment is composed of poor cover rapids with unsuitable object cover (Bain, et al., 1982). McBride (1993) reported smallmouth bass CPUE estimates for the lower Mohawk River as ranging from 28.5 to 71.3/hour.

Overall, CPUE and species richness indices indicate that fish density and diversity is lower in the tailwater than other parts of the School Street Project (Table 7). This could be attributed to the lack of suitable aquatic habitat available in the tailwater area (Table 8). The upper tailwater area is predominantly rapids with ledge substrate with relatively high velocities under most river flows. The lack of object cover tends to reduce suitability of habitat for most of these fish species due to the paucity of velocity shelters. The smallmouth bass, for example is a habitat generalist which occurs in both lentic and lotic habitat (Coble, 1975; Edwards, et al., 1983). In lotic habitat, it prefers low to moderate gradient streams with numerous velocity shelters. However, the School Street tailwater area is moderate to high gradients with ledge riffles and rapids; velocity shelters are nearly non-existent. The resulting shallow, high velocity flows are not suitable to species such as smallmouth bass, rock bass, walleye, and blueback herring (Scott and Crossman, 1973; Smith, 1985; Coble, 1975; Mayberry, 1982; Edwards, et al., 1983; Bain, 1982; Leonard, et al., 1986).

Temperature and D.O. data gathered from the tailwater area indicate that water quality is suitable during all seasons sampled.

6.2 Seasonal Utilization

Sampling was conducted seasonally to provide information on seasonal utilization or movement of the fish species present in the School Street Project. Early spring is typically a spawning period for percid species such as walleye and yellow perch, which generally initiate spawning when temperatures reach 6-10°C (Scott and Crossman, 1973; Smith, 1985; Collette, et al. 1977). Esocids, such as northern pike, also typically spawn in early spring, immediately following ice-out (Scott and Crossman, 1973; Smith, 1985). Centrarchids, including largemouth and smallmouth bass, sunfish and crappie species spawn in late spring at water temperatures ranging from 18.2 - 24.5°C (Scott and Crossman, 1973; Smith, 1985).

6.2.1 Early Spring

Per the FERC's August 10, 1993 approval letter, the study included sampling the abundance and distribution of fish in early spring, to document the use of project waters for early spring spawning, within the constraints of logistics and field personnel safety. Early spring spawning fish native to the Mohawk River of particular interest include percids (walleye, yellow perch) and esocids (northern pike, muskellunge). Walleye and pike species typically spawn between ice-out and water temperature rising to approximately 10°C. Walleye typically aggregate in spawning areas prior to spawning, and spawn between 6 and 10°C; yellow perch may spawn at slightly higher temperatures (Collette, et al. 1977; Inskip, 1982). The onset of these conditions typically occurs in the lower Mohawk River in early April.

Informal discussions held with NYSDEC diminished expectations of encountering significant walleye aggregations in the study area, due to (a) limited suitable habitat in the subject river segment (McBride, personal communication), isolation of the project area from other river segments containing walleye staging areas, and (c) expected limitations to sampling, due to high flows which create strong surface velocities, extreme spillage over the dam and Cohoes Falls, and turbulent tailwater hydraulics, resulting in unsafe and/or unworkable field conditions. The NYSDEC subsequently formally noted that sampling for walleye was generally important and should be attempted provided conditions are safe and feasible, but if necessary, as an alternative, sampling outside the walleye period was acceptable, with emphasis on the bypass reach (NYSDEC letter, March 30, 1994).

Commencing in early April, river conditions were closely monitored to assess the feasibility of field conditions. Average daily discharge data was obtained by interrogating the USGS Cohoes, NY gage, located immediately downstream from the study area. Temperature and spillage data was concurrently obtained and recorded daily by on-site personnel. These data are summarized in Appendix B.

Temperature ranged from 3 to 6°C from April 6 through 23, with one brief initial excursion to 7° on April 5. Temperature climbed from 8 to 11.5°C between April 26 and May 9. Provisional USGS gage data for the period April 17 through May 3 showed flows to range from 6,200 up to 49,200 cfs, with a mean for the period being 18,564 cfs. During this period, spillage ranged from about 1 to 3.3 ft. above the crest of the School Street Dam, with mean spillage being 1.9 ft. Appendix B also contains photographs illustrating hydraulic conditions in the project bypass reach at 1.7 ft spillage (April 21, 1994). These conditions result in extremely high-velocity and turbulent flow conditions in the bypass,

resulting in low efficiency for fish sampling gear, and certain injury of death for any field personnel who could be drowned or swept over Cohoes Falls.

As a result of these conditions and consistent with recommendations made by the FERC (letter dated August 10, 1993), sampling was not possible during the month of April; sampling commenced in May, once high spring flows subsided. Sampling in the impoundment and tailwater was conducted May 17-18; however, spillage (approximately 6 inches over crest) precluded sampling in the bypass reach at that time. Sampling in the bypass reach was completed May 31-June 1.

Observed water temperature during the mid-May survey generally ranged from 13 - 14 °C. Based on these water temperatures, sampling in May likely occurred after the walleye spawning period. Ripe, pre-spawning walleye were captured on April 27, 1994 in the Hudson River approximately 30 miles from School Street, at an ambient water temperature of 7.0-7.5 °C (KA, provisional data), which is in agreement with spawning temperatures reported by Collette, et al. (1977), Smith (1985) and other general references on walleye (McMahon, et al., 1984).

Yellow perch, another early spring spawning percid, is reported to move onto spawning grounds at water temperatures from 7-14 °C (Collette, et al., 1977; Kreiger, et al., 1982). Gravid, ripe yellow perch were detected in project waters under thermal conditions consistent with the literature. It is therefore reasonable to conclude that yellow perch utilize the project area for spawning purposes.

Ambient river temperature in mid-May was somewhat cooler than the range reported for spawning of centrarchid species inhabiting the study area. No nesting activities were observed at that time. However, length frequency data for the May 1994 sampling indicates that the stock of

locally abundant centrarchid species (bluegill, largemouth bass and smallmouth bass) was generally dominated by juvenile and adult-sized specimens similar to those found during the June 1993 survey.

Sampling conducted during late May 1994 in the bypass reach detected only limited nesting activities underway for rock bass, suggesting that late spring spawning activities were just commencing. By contrast, during the mid-June, 1993 survey, ample evidence of centrarchid nesting was observed (see Section 5.2). Rock bass either collected or observed during May, 1994 ranged from juvenile to adult. Most smallmouth bass detected during the bypass reach phase of the survey appeared to be of a size corresponding to yearling/juvenile life stages.

6.2.2 Late Spring

There was evidence of spawning activity for centrarchid species during June. Many individuals of centrarchid species were observed to be running and ripe during June. Numerous nests were observed in the littoral zone of the impoundment during nocturnal electrofishing. Water temperatures recorded at sampling locations at the time were within the range reported for spawning for many of the Centrarchid species known to be present in the School Street Project (Scott and Crossman, 1973; Smith, 1985).

Subsequent baseline fish samples taken at the School Street Project suggest that spawning was successful. Length-frequency data (Table 6) indicate a shift from larger, adult bass and sunfish in June, to abundant YOY sized fish of the same species in summer and fall samples, from all sampling areas of the School Street Project.

Adult blueback herring, lengths ranging between 225-300 mm, were observed either alive, or dead or dying throughout the School Street Project area. Many were stiff, partly decomposed and/or diseased. Since the spawning mortality of adult clupeids (herring and/or alewives) is high, the mortality was most likely a result of post-spawning condition. Anadromous adult blueback herring migrate into the Mohawk River via the Hudson River, and Waterford Flight canal system from the Atlantic Ocean in late spring. They spawn in tributaries and below dams in the Mohawk River at temperatures of 20-24°C (Scott and Crossman, 1973; Pardue, 1983), which coincides with temperatures recorded during the late spring sample (Table 1). Blueback herring occur as an incidental species in the Mohawk River due to the construction of the Waterford Flight, which enabled the species to access the Mohawk River upstream of Cohoes Falls. The Waterford Flight is the only upstream migration route (McBride, 1987), and results in all upmigrating herring bypassing the School Street Project (Figure 1). Blueback herring migrate up the Mohawk River as far as Marcy, (N.Y.), approximately 111 miles upstream from the Hudson River (McBride, 1987). Therefore, it is likely the majority of spawning takes place upstream of the School Street Project. Spent adults may either migrate or drift back down river, and some transiently pass through the School Street Project. Other spent fish die after spawning and decompose as they wash downstream. It was apparent that some of these fish washed into the School Street Project.

6.2.3 Summer

The sample conducted August 16-18, 1993 was to "provide an indication of which species survive under adverse conditions of low flow and high temperatures and are therefore likely present year round" as per the August 10, 1993 FERC letter. July and August are typically the months when the parameters of temperature, dissolved oxygen and flow

may approach conditions stressful to aquatic organisms. Sampling in August occurred under hot and humid conditions, with air temperatures approaching the high 80's and low 90's (Fahrenheit). No spill was recorded in the bypass reach. Ambient river temperatures for the lower Mohawk River typically range from 22.3° to 27°C (NMPC School Street license application).

Ambient water temperatures ranged from 23.5°C (in the impoundment) to a maximum of 27°C (in the bypass). Typical water temperatures for this sampling period was 24°C, D.O. ranged from 6.0 to 9.0 mg/l. These ranges were consistent with temperatures and D.O. recorded for the lower Mohawk River and School Street Project during August in other years by previous water quality inventories (SYNCD, 1935; NYSDOH, 1952; USGS, 1977-1979; Culp and Homa, 1989).

For purposes of this report, "adverse (thermal) conditions" are considered to be those that are reported as the upper lethal limit for species of interest (Table 9).

The upper lethal temperatures for smallmouth bass, largemouth bass, walleye and sunfish species have been reported to be 35.0, 36.4, 31.6 and 34.7°C, respectively (Scott and Crossman, 1973; Bell, 1990; Thorpe, 1977). The minimum level for dissolved oxygen (D.O.) has been reported by Bell (1990) to be 5.0 mg/l. Physical data gathered in the impoundment, bypass reach and tailwater (Table 1) indicates that temperatures and D.O. were well within these tolerances (Table 9; Bell, 1990) of these species, several of which are coolwater organisms.

Smallmouth bass, considered a cool-water species in New York state, were found to be distributed throughout all habitats within the three sampling areas of the School Street project during August. As an indicator of sensitivity to warm seasonal extremes, this suggests that

summer conditions (high temperature, low D.O. and low flow) do not necessarily have an "adverse" effect on the fishery resources at the School Street project. Other resident species would therefore also be expected to be present year round.

Other species of game management interest that were consistently present in the School Street Project during spring, summer and fall sampling included smallmouth bass, largemouth bass, bluegill sunfish, rock bass, pumpkinseed and walleye. Tiger muskellunge were collected in all but the June sample.

Juvenile YOY smallmouth bass (lengths ranging between 75-126 mm) (Table 10), were collected in all sampling areas in August (Table 6). As previously mentioned, this would suggest that the School Street Project area provides rearing habitat for bass produced in the project area.

YOY blueback herring (Table 10) were also present in all project areas during the summer. These are primarily recruited from upstream production areas, and transiently occupy the project waters by passing through the Crescent Project (FERC No. 4678) powerhouse or dam during the late summer, early fall outmigration following hatching and growth. These YOY contribute to part of a forage base for larger predators residing with the School Street Project (McBride, 1987). Juvenile blueback herring outmigrate to the ocean prior to the end of the first growing season after hatching (Scott and Crossman, 1973; Pardue, 1983). They would therefore be expected to occupy the School Street Project from August until early November.

6.2.4 Fall Sampling

Three fall samples were gathered at monthly intervals (September to November, 1993). The sampling was conducted to "determine any fall

spawning runs and whether flow or temperature limitations are reduced" as requested by the FERC's August 10, 1993 letter to NMPC.

No flow or temperature limitations were detected during the three fall sampling events and the cooler temperature and D.O. concentrations recorded (Table 1) were well within the tolerances (Table 9) of the fish species of interest present in the School Street Project area (Bell, 1990; 1975). Temperature declined and D.O. rose during the fall relative to summer conditions. None of these seasonally varying parameters ever fell to an adverse range for the species common to the river.

Sampling did not detect any fish species present within the School Street Project area that spawn during the fall months, nor are any significant fall spawning runs reported for the Mohawk River in general. "Runs" of fish (*i.e.* directed movements of fish for spawning purposes), do not occur at School Street, primarily due to it's location, which is bracketed from contiguous reaches of the Mohawk by the Crescent Dam (upstream), the Cohoes Falls, and the New York State Dam (downstream). The project is characterized by populations of non-migratory warm and coolwater fish species common to the Mohawk River, and is transiently occupied by outmigrating blueback herring during late summer through at least mid-fall. Herring were no longer abundant in the project by November.

Fall length-frequency data (Table 6) maintained the trend of a significant shift from adult largemouth bass, smallmouth bass, bluegill sunfish and rock bass (in the spring) to primarily YOY/juvenile fish

(Table 10). This is consistent with observations in natural populations, and suggests that recruitment by natural reproduction is occurring within the School Street Project.

6.3 Summary and Conclusions of Study

The School Street Project study area was sampled seasonally for one year to document seasonal changes in the abundance and distribution of fish species. Six fish sampling surveys occurred between mid June 1993 and early June 1994 in the tailwater area below the project, but also in the project impoundment and bypass reach. Conventional sampling methods such as electrofishing, gill netting and hoop netting were employed as the primary means to gather fish.

The project waters are generally surrounded by a vertical-walled shale cliff embankment, and consist of a relatively shallow, riverine impoundment with a silt/sand bottom and rooted aquatic vegetation, a bypass reach consisting of several large, deep pools interconnected by a side channel. The bypass reach is dominated by striated, horizontal ledge substrate, divided into two sections by a 60 ft-high waterfall. A short tailwater area consisting of ledge rapids with high instream velocities and limited velocity refuges (which limits habitat quality) extends downstream into another impoundment a short distance below the School Street Project.

Project waters experience only limited sport fishing. Observed public angling use of project waters was limited to occasional shoreline use at a single, small, informal pathway access point in the upstream extremity of the impoundment, in the immediate vicinity of the tailrace of the Crescent Project. All other project waters are surrounded by steep cliffs and extremely hazardous land and water approaches, which has limited shoreline recreationists (primarily juveniles) to occasional use below the project area.

The water quality parameters of temperature, dissolved oxygen and pH vary seasonally as expected, and appear to fall within a range which is ambient to the Mohawk River in general, and for which the observed species are reported to tolerate, including the warm summer months. The zebra mussel, an exotic filter-feeding mollusk, has colonized all areas of the project, but especially the bypass reach, where it anchors to wetted areas of the ledge substrate. These mussels have become visibly more abundant in project waters over the course of the twelve months of this study.

The following general observations about seasonal use and fish resource composition can be made:

Project waters are not stocked. The species composition found within the project can generally be described as being composed of a warmwater community typical of the ecoregion containing central New York, including other segments of the Mohawk River. Dominant native game species include smallmouth bass, largemouth bass, walleye, and northern pike. Common panfish species include yellow perch, rock bass, bluegill and pumpkinseed sunfish. Common non-game species include spottail shiner, common carp, and white sucker. Tiger muskellunge (escapees from stocking elsewhere), which is an artificial hybrid species, were also captured, as was a single fin-clipped rainbow trout which is believed to be an escapee from tributary stocking elsewhere.

Because the Mohawk River is tributary to the tidal Hudson River, and interconnected to Lake Ontario via a canal network, bioregionally-stray species may occur occasionally as incidental distributional artifacts. Small numbers of several species in this category were detected, including freshwater drum (Lake Ontario), striped bass (Hudson River), and longear sunfish (Lake Ontario drainage). Each of these species were detected in low numbers, as one-time occurrences.

Discussions with NYSDEC suggest that the longear sunfish identity may be questionable, in part due to geography, and in part because pumpkinseed and redbreast sunfish (two locally common species) may produce a hybrid which strongly resembles the longear sunfish (D. Bouten, NYSDEC, personal communication, Smith; 1985).

Yellow perch spawning was evident in the project during May, 1994. Centrarchid species were observed spawning in project waters in June 1993, and preparing to spawn again in late May/early June 1994. YOY members of these species groups were particularly abundant in samples gathered in the months following spawning. No fall spawning was evident, nor were any fish species which spawn in the fall detected.

Blueback herring was the only anadromous species present in the project. Spent adults (dead and alive) were found drifting downstream throughout the entire lower Mohawk River, including the project, during mid-June, 1993. Most of the dead spent adults found in the study area were intact, but stiff, discolored and fungused, suggesting prior post-spawning mortality. Due to the location of the School Street Project, upmigrating blueback herring do not migrate through project waters, as the migration route for this species involves the Waterford Flight canal, which bypasses the entire project area. Spawning for this species generally occurs well upstream from the project. Adult herring were not abundant in surveys subsequent to June. YOY herring were consistently detected in the project area during the late summer through mid-fall period. No herring of any lifestage were present during November, 1993.

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TABLES

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH BASELINE STUDY
ENVIRONMENTAL DATA

School Street Environmental Data
Table 1

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
166	H-1	14.33	21.5	20.0	7.2	7.8					06/15/93
166	H-2	14.67	21.2	20.0	8.0	7.8					06/15/93
166	H-3	MISSING DATA									06/15/93
166	H-4	MISSING DATA									06/15/93
166	G-1	15.17	21.0	20.0	6.4	7.8					06/15/93
166	G-2	15.00	21.0	20.0	8.0	7.8					06/15/93
166	G-3	MISSING DATA									06/15/93
166	G-4	12.83	26.0	22.5	6.0	7.2					06/15/93
166	G-5	15.83		22.0		7.0					06/15/93
166	G-6	MISSING DATA									06/15/93
167	H-1	27.03	20.0	21.0	7.8	8.8					06/16/93
167	H-2	26.82	20.0	21.0	7.8	8.8					06/16/93
167	H-3			21.0		9.0					06/16/93
167	H-4			21.0		8.6					06/16/93
167	G-1	26.67	20.0	21.0	7.8	8.6					06/16/93
167	G-2	26.25	20.0	21.0	7.8	8.6					06/16/93
167	G-3			21.0		9.2					06/16/93
167	G-4	26.00	22.5	22.0	7.2	9.2					06/16/93
167	G-5		22.0		7.0		MISSING DATA				06/16/93
167	G-6	23.25	22.5	22.0	7.6	7.4					06/16/93
168	G-7	15.50		20.0		7.8					06/17/93
168	G-8	16.75		21.5		7.6					06/17/93
167	E-1	0.58	21.5	21.5	8.0	8.0			278		06/16/93
167	E-2	0.67	22.0		7.8						06/16/93
165	E-3	2.17	28.5	26.2	8.2	6.0			311	311	06/14/93
167	E-4	4.00	24.0	25.0	8.6	11.8					06/16/93
168	E-5	0.58	22.0	21.0	8.0	7.8			270	270	06/17/93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Table 1 (Con't.)

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
228	E-1A	1.10	24.5	24.5	8.4	7.7					8-16-93
228	E-2	1.50	24.5	24.5	8.4	7.7					8-16-93
229	G-1	15.50	24.0	24.0	6.1	6.1					8-17-93
229	G-2	16.16	24.5	24.0	8.1	6.9					8-17-93
229	G-3	16.83	24.5	24.0	9.9	8.3					8-17-93
229	G-4	17.33	27.0	24.0	7.2	6.0					8-17-93
229	G-5	17.50	26.0	24.0	6.6	7.1					8-17-93
229	G-6	17.67	26.0	24.0	7.2	7.8					8-17-93
229	H-1	19.37	24.0	24.1	7.0	6.7					8-17-93
229	H-2	18.75	24.5	24.1	7.0	6.8					8-17-93
229	H-3	17.92	24.5	23.5	8.2	6.8					8-17-93
229	H-4	17.66	24.5	24.0	7.9	7.4					8-17-93
229	E-1B	0.85	24.0	24.0	9.6	9.0			301	278	8-17-93
229	E-3B	0.63	24.0	24.5	8.4	7.9			298	289	8-17-93
229	E-4	0.75	24.5	24.0	8.2	8.3			287	290	8-17-93
229	E-5	0.82	24.0	25.0	7.2	6.0			306	302	8-17-93
230	G-1	23.58	24.0	24.0	6.1	6.1					8-18-93
230	G-2	23.58	24.0	24.0	6.9	6.0					8-18-93
230	G-3	24.00	24.0	24.0	8.3	6.9					8-18-93
230	G-4	23.50	24.0	24.0	6.0	7.8					8-18-93
230	G-5	23.66	24.0	24.0	7.1	9.0					8-18-93
230	G-6	24.16	24.0	24.0	7.8	7.4					8-18-93
230	H-1	23.66	24.1	23.8	6.7	6.0					8-18-93
230	H-2	23.66	24.1	24.0	6.8	6.0					8-18-93
230	H-3	23.66	23.5	24.0	6.8	6.3					8-18-93
230	H-4	23.75	24.0	24.0	7.4	6.9					8-18-93
230	E-3A	2.00	24.0	24.0	8.0	8.0					8-18-93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Table 1 (Con't.)

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
263	E-1A	1.00	19.0	19.0	7.2	6.4	7.6	7.6	270	272	9-20-93
263	E-1B	0.83	19.0	19.0	6.8	7.0	7.4	7.6	273	273	9-20-93
263	E-2	0.92	19.5	19.0	6.6	6.3	7.6	7.6	275	274	9-20-93
263	E-3a	1.16	19.5	19.5	12.5	12.5	8.0	8.0	280	280	9-20-93
264	H-1	22.00	19.4	17.8	6.2	5.8	7.8	7.8			9-21-93
264	H-2	21.75	19.5	18.5	5.0	6.2	7.5				9-21-93
264	H-3	21.75	19.8	18.5	5.9	6.6	7.6				9-21-93
264	H-4	21.83	19.8	18.5	6.0	7.0	7.6				9-21-93
264	G-1	23.58	19.2	18.0	5.6	6.1	7.8				9-21-93
264	G-2	23.58	19.2	18.5	5.8	6.0	7.5				9-21-93
264	G-3	21.75	19.2	18.5	6.2	7.0	7.6				9-21-93
264	E-3B	0.75	18.0	18.5	9.2	8.2	8.0	8.0	254	269	9-21-93
264	E-4	0.75	19.0	19.0	5.9	5.9	7.2	7.2	273	272	9-21-93
264	E-5	0.66	18.8	18.9	6.7	5.9	7.6	7.6	271	270	9-21-93
264	G-4	18.75	19.8	17.0	10.2	8.2	8.0	7.6			9-21-93
264	G-5	19.77	17.5	17.0	7.4	8.2	8.0	8.0			9-21-93
264	G-6	20.30	19.0	17.0	9.6	9.1	8.0	7.8			9-21-93
265	H-1	22.92	17.8	17.5	5.8	5.9	7.4				9-22-93
265	H-2	23.17	18.5	17.5	6.2	6.6	7.4				9-22-93
265	H-3	23.00	18.5	18.0	6.6	7.0	7.4				9-22-93
265	H-4	22.92	18.5	18.0	7.0	6.8	7.4				9-22-93
265	G-1	22.16	18.0	18.0	6.1	6.5	7.4				9-22-93
265	G-2	21.08	18.5	17.8	6.0	6.6	7.4				9-22-93
265	G-3	22.92	18.5	18.0	7.0	6.8	7.4				9-22-93
265	G-4	21.92	17.0	17.0	8.2	9.0	8.0	7.8			9-22-93
265	G-5	21.50	17.0	16.2	8.2	8.6	8.0	7.7			9-22-93
265	G-6	21.56	17.0	17.2	9.1	8.6	7.8	7.8			9-22-93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Table 1 (Con't.)

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
285	E-1A	0.91	13.0	13.0	9.7	9.8	7.7	7.7	213	217	10/12/93
285	E-1B	0.75	13.0	13.2	10.6	10.4	8.0	7.8	217	217	10/12/93
285	E-2	0.75	13.0	13.0	10.0	10.0	7.5	8.1	216	217	10/12/93
287	E-3A	1.17	9.0	9.0	11.4	11.4			304	304	10/14/93
285	E-3B	0.83	12.7	12.8	9.6	9.5	8.1	7.8	217	217	10/12/93
285	E-4	0.42	13.3	13.2	9.5	10.8	7.9	7.5	215	218	10/12/93
285	E-5	0.45	13.2	13.0	10.8	10.6	7.5	7.9	218	217	10/12/93
286	G-1	24.17	13.7	13.0	9.7	9.5	7.8	7.8			10/13/93
287	G-1	21.42	13.0	12.0	9.5	8.5	7.8	7.6			10/14/93
286	G-2	24.75	10.7	13.0	9.5	9.4	7.8	7.8			10/13/93
287	G-2	21.08	13.0	12.0	9.4	8.5	7.8	7.6			10/14/93
286	G-3	23.59	14.0	13.0	9.4	9.4	7.6	7.6			10/13/93
287	G-3	21.33	13.0	12.1	9.4	8.8	7.6	7.6			10/14/93
287	G-4	43.00	12.0	10.0	9.2	11.2	7.8	7.8			10/14/93
287	G-5	43.17	12.2	10.0	9.2	11.4	8.1	8.1			10/14/93
287	G-6	43.25	12.0	6.0	10.2	11.5	7.7	7.7			10/14/93
286	H-1	24.17	13.5	12.5	8.3	10.6	7.8	7.8			10/13/93
287	H-1	21.59	12.5	12.0	8.3	8.7	7.8	7.6			10/14/93
286	H-2	24.92	14.0	13.0	9.5	9.2	7.8	7.8			10/13/93
287	H-2	21.08	13.0	12.0	9.2	8.8	7.8	7.6			10/14/93
286	H-3	25.08	14.0	13.0	9.8	9.5	7.6	7.6			10/13/93
287	H-3	21.42	13.0	12.1	9.5	9.2	7.6	7.6			10/14/93
286	H-4	24.17	14.0	13.0	9.6	9.2	7.6	7.6			10/13/93
287	H-4	21.33	13.0	12.0	9.2	8.4	7.6	7.6			10/14/93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Table 1 (Con't.)

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
313	E-3B	0.65	5.0	5.0	13.6	13.6	7.8	7.8	285	286	11/09/93
313	E-4	0.50	6.0	6.0	13.6	13.6	7.6	7.6	278	285	11/09/93
313	E-5	0.50	6.0	6.2	13.6	12.2	7.6	7.6	293	277	11/09/93
312	E-2	0.92	5.0	5.2	13.0	12.2	7.8	8.0	298	286	11/08/93
312	E-1A	0.75	5.0	6.0	12.6	11.6	7.6	7.6	304	304	11/08/93
312	E-1B	0.75	5.0	6.0	12.6	12.4	7.7	7.8	279	304	11/08/93

Table 1 (Continued)

SCHOOL STREET ENVIRONMENTAL DATA
MAY 1994
1993-94 FISHERIES BASELINE STUDY
NIAGARA MOHAWK POWER CORPORATION

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
137	G-1	23.08	13.0	13.2	9.3	9.9	7.50	7.60			05/17/94
138	G-1	22.63	13.2	12.9	9.9	9.9	7.60	7.60			05/18/94
137	G-2	22.92	13.0	13.2	9.6	9.8	7.60	7.60			05/17/94
138	G-2	22.67	13.2	12.9	9.8	9.8	7.60	7.60			05/18/94
137	G-3	23.00	13.0	13.2	9.6	9.8	7.60	7.50			05/17/94
138	G-3	23.00	13.2	12.9	9.8	9.5	7.50	7.50			05/18/94
137	H-1	23.25	13.0	13.1	9.7	10.1	7.60	7.60			05/17/94
138	H-1	23.00	13.1	12.9	10.1	9.9	7.60	7.60			05/18/94
137	H-2	22.83	13.0	13.1	9.7	9.8	7.60	7.60			05/17/94
138	H-2	23.17	13.1	12.9	9.8	9.6	7.60	7.60			05/18/94
137	H-3	23.17	13.0	13.2	9.6	10.1	7.60	7.50			05/17/94
138	H-3	22.75	13.2	12.9	10.1	11.9	7.50	7.50			05/18/94
137	H-4	23.00	13.0	13.2	9.6	9.8	7.60	7.50			05/17/94
138	H-4	22.92	13.2	12.9	9.8	9.5	7.50	7.50			05/18/94
136	E-1A	0.33	13.5	13.5	10.1	10.1	7.60	7.60	229.0	229.0	05/16/94
136	E-1B	0.33	13.5	13.5	10.0	10.0	7.60	7.60	210.0	210.0	05/16/94
136	E-2	0.58	14.0	14.0	9.9	9.9	7.60	7.60	207.0	207.0	05/16/94
137	E-3B	0.40	13.0	13.0	9.2	9.2	7.90	7.90	230.0	230.0	05/17/94
137	E-4	0.33	13.0	13.0	9.2	9.2	7.80	7.80	220.0	220.0	05/17/94
137	E-5	0.42	13.0	13.0	9.7	7.8	7.60	7.60	238.0	238.0	05/17/94
152	A-1	1.08	22.7	22.7	8.0	8.0	8.20	8.20			06/01/94
152	A-2	0.50	22.5	22.5	8.8	8.8	8.20	8.20			06/01/94
152	G-4	18.00	23.0	21.0	8.3	8.4	7.80	8.20			06/01/94
152	G-5	17.99	24.0	21.0	8.6	8.6	7.80	7.70			06/01/94
152	G-6	17.92	22.0	21.0	8.7	8.5	8.00	8.20			06/01/94
152	E-3A	1.06	24.8	24.8	9.2	9.2	8.00	8.00	208.0	208.0	06/01/94

Niagara Mohawk Power Corporation
School Street Hydroelectric Project (FERC No. 2539)
1993-94 Fish Baseline Study

Table 2

SPECIES SAMPLED AND TOTALS FOR EACH MONTH

	Total Sampled Per Month						
Species	Jun-93	Aug-93	Sep-93	Oct-93	Nov-93	May-94	Total
Bluegill	100	20	423	444	212	2	1201
Smallmouth Bass	105	217	389	233	53	146	1143
Spottail Shiner	38	7	37	20	439	358	899
Largemouth Bass	7	21	124	139	111	6	408
Yellow Perch	40	6	57	64	40	136	343
Golden Shiner	13	8	34	53	145	8	261
Rock Bass	30	22	37	46	35	57	227
Blueback Herring	58	53	23	35	0	2	171
Black Crappie	5	0	47	35	30	1	118
Common Carp	20	19	22	3	18	34	116
White Sucker	9	7	5	8	14	29	72
Pumpkinseed	5	1	19	16	6	21	68
Brook Silversides	0	0	18	17	13	0	48
Logperch	1	8	1	4	1	22	37
American Eel	6	13	7	6	0	0	32
Tessellated Darter	0	1	2	8	8	6	25
Brown Bullhead	7	1	2	2	5	0	17
Yellow Bullhead	0	3	3	4	6	0	16
Gizzard Shad	0	2	7	4	1	0	14
Shorthead Redhorse	0	2	0	8	0	4	14
Tiger Muskellunge	0	1	4	1	3	2	11
Walleye	1	2	2	2	2	1	10
White Crappie	0	0	8	0	0	1	9
Fallfish	0	0	6	0	0	0	6
Eastern Silvery Minnow	0	0	0	0	5	0	5
Bluntnose Minnow	1	0	2	0	0	1	4
Longear Sunfish *	4	0	0	0	0	0	4
Cyprinidae spp.	0	0	0	0	0	3	3
Spotfin Shiner	0	0	1	1	1	0	3
Mirror Carp	0	1	1	0	0	0	2
Northern Pike	1	0	1	0	0	0	2
Banded Killifish	0	0	0	0	1	0	1
Blacknose Dace	1	0	0	0	0	0	1
Common Shiner	0	1	0	0	0	0	1
Creek Chub	0	0	0	0	0	1	1
Freshwater Drum	0	0	1	0	0	0	1
Rainbow Trout	0	0	0	0	0	1	1
Striped Bass	0	0	0	1	0	0	1
Trout-Perch	0	0	0	0	0	1	1
Total	452	416	1283	1154	1149	843	5297

* or possible hybrid (see text)

Niagara Mohawk Power Corporation
School Street Hydroelectric Project (FERC No. 2539)
1993-94 Fish Baseline Study

Table 3

6 MONTH TOTALS FOR IMPOUNDMENT

Species	Jun-93	Aug-93	Sep-93	Oct-93	Nov-93	May-94	Total
Bluegill	100	18	417	442	205	2	1184
Spottail Shiner	35	7	36	11	436	224	749
Smallmouth Bass	32	101	86	112	45	72	448
Largemouth Bass	7	19	124	139	111	4	404
Yellow Perch	39	5	56	61	39	126	326
Golden Shiner	13	7	34	53	145	7	259
Rock Bass	12	16	23	37	35	43	166
Black Crappie	5	0	45	35	30	1	116
Common Carp	8	18	19	3	16	22	86
Blueback Herring	29	29	8	11	0	0	77
Pumpkinseed	5	0	18	14	6	20	63
Brook Silversides	0	0	18	17	12	0	47
White Sucker	7	4	0	5	13	7	36
Brown Bullhead	7	1	2	2	5	2	19
Gizzard Shad	0	2	7	4	1	0	14
Logperch	0	8	1	4	1	0	14
Shorthead Redhorse	0	2	0	6	0	4	12
Tessellated Darter	0	0	1	2	8	0	11
Tiger Muskellunge	0	1	4	1	3	2	11
Walleye	1	2	2	2	1	1	9
White Crappie	0	0	8	0	0	1	9
Yellow Bullhead	0	0	1	1	6	0	8
Fallfish	0	0	6	0	0	0	6
American Eel	0	1	2	2	0	0	5
Longear Sunfish*	4	0	0	0	0	0	4
Bluntnose Minnow	1	0	2	0	0	0	3
Cyprinidae	0	0	0	0	0	3	3
Spotfin Shiner	0	0	1	1	1	0	3
Mirror Carp	0	1	1	0	0	0	2
Banded Killifish	0	0	0	0	1	0	1
Common Shiner	0	1	0	0	0	0	1
Freshwater Drum	0	0	1	0	0	0	1
Northern Pike	0	0	1	0	0	0	1
Rainbow Trout	0	0	0	0	0	1	1
Striped Bass	0	0	0	1	0	0	1
Total	305	243	924	966	1120	542	4100

* or possible hybrid (see text)

Niagara Mohawk Power Corporation
School Street Hydroelectric Project (FERC No. 2539)
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Table 4

6 MONTH TOTALS FOR BYPASS

Species	Jun-93	Aug-93	Sep-93	Oct-93	Nov-93	May-94	Total
Smallmouth Bass	15	88	229	95	4	23	454
Blueback Herring	24	2	7	13	0	0	46
Rock Bass	8	4	13	9	0	12	46
Logperch	1	0	0	0	0	22	23
Common Carp	6	1	3	0	0	10	20
Bluegill	0	2	6	2	7	0	17
American Eel	5	4	3	1	0	0	13
Yellow Perch	0	1	0	2	1	9	13
Tessellated Darter	0	1	0	3	0	5	9
White Sucker	1	2	0	0	0	6	9
Yellow Bullhead	0	3	2	3	0	0	8
Pumpkinseed	0	1	1	1	0	1	4
Golden Shiner	0	1	0	0	0	1	2
Largemouth Bass	0	2	0	0	0	0	2
Spottail Shiner	0	0	0	0	0	2	2
Blacknose Dace	1	0	0	0	0	0	1
Creek Chub	0	0	0	0	0	1	1
Northern Pike	1	0	0	0	0	0	1
Walleye	0	0	0	0	1	0	1
Total	62	112	264	129	13	92	672

Niagara Mohawk Power Corporation
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Table 5

6 MONTH TOTAL FOR TAILWATERS

Species	Jun-93	Aug-93	Sep-93	Oct-93	Nov-93	May-94	Total
Smallmouth Bass	58	28	74	26	4	51	241
Spottail Shiner	3	0	1	9	3	132	148
Blueback Herring	5	22	8	11	0	0	46
White Sucker	1	1	5	3	1	16	27
American Eel	1	8	2	3	0	0	14
Rock Bass	10	2	1	0	0	0	13
Common Carp	6	0	0	0	2	2	10
Eastern Silvery Minnow	0	0	0	0	5	0	5
Tessellated Darter	0	0	1	3	0	1	5
Yellow Perch	1	0	1	1	0	0	3
Black Crappie	0	0	2	0	0	0	2
Largemouth Bass	0	0	0	0	0	2	2
Rock Bass	0	0	0	0	0	2	2
Shorthead Redhorse	0	0	0	2	0	0	2
Blunt Nosed Minnow	0	0	0	0	0	1	1
Brook Silversides	0	0	0	0	1	0	1
Pumpkinseed	0	0	0	1	0	0	1
Trout-Perch	0	0	0	0	0	1	1
Yellow Perch	0	0	0	0	0	1	1
Total	85	61	95	59	16	209	525

Niagara Mohawk Power Corporation
School Street Hydroelectric Project (FERC No. 2539)
1993-94 Fish Baseline Study

Table 6
JUNE LENGTH-FREQUENCY DATA

	BYPASS REACH			IMPOUNDMENT						TAILWATERS				
LENGTH (mm)	Smallmouth Bass	Blueback Herring	Rock Bass	Smallmouth Bass	Bluegill	Largemouth Bass	Blueback Herring	Rock Bass	Yellow Perch	Smallmouth Bass	Blueback Herring	Rock Bass	Yellow Perch	Total
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	2	0	0	2	0	0	0	0	0	4
100	1	0	0	3	2	0	0	2	0	0	0	0	0	8
125	2	0	1	3	14	0	0	0	0	2	0	0	0	22
150	0	0	2	0	29	0	0	3	2	1	0	0	0	37
175	4	0	2	9	39	0	0	3	9	0	0	0	0	66
200	4	0	2	2	14	1	0	0	5	16	0	2	0	46
225	1	0	1	5	0	0	5	2	12	12	0	5	0	43
250	1	11	0	7	0	0	12	0	8	7	1	3	1	51
275	1	13	0	2	0	1	12	0	1	11	4	0	0	45
300	0	0	0	1	0	3	0	0	2	2	0	0	0	8
325	0	0	0	0	0	1	0	0	0	0	0	0	0	1
350	0	0	0	0	0	0	0	0	0	2	0	0	0	2
375	0	0	0	0	0	0	0	0	0	2	0	0	0	2
400	0	0	0	0	0	1	0	0	0	1	0	0	0	2
425	0	0	0	0	0	0	0	0	0	2	0	0	0	2
450	1	0	0	0	0	0	0	0	0	0	0	0	0	1
475	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
525	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	15	24	8	32	100	7	29	12	39	58	5	10	1	340

Niagara Mohawk Power Corporation
School Street Hydroelectric Project (FERC No. 2539)
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Table 6 (Continued)
AUGUST LENGTH-FREQUENCY DATA

	BYPASS REACH						IMPOUNDMENT						TAILWATERS			
LENGTH (mm)	Smallmouth Bass	Bluegill	Largemouth Bass	Blueback Herring	Rock Bass	Yellow Perch	Smallmouth Bass	Bluegill	Largemouth Bass	Blueback Herring	Rock Bass	Yellow Perch	Smallmouth Bass	Bluegill	Rock Bass	Total
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	3	0	12	0	0	0	0	0	15
75	36	0	0	1	4	0	5	3	0	15	5	0	2	4	0	75
100	49	0	0	1	0	0	49	0	10	0	0	3	19	0	0	131
125	3	0	0	0	0	0	24	0	6	0	1	0	5	0	0	39
150	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
175	0	2	0	0	0	0	0	3	0	0	1	0	0	0	0	6
200	0	0	0	0	0	0	3	6	1	0	2	0	0	0	1	13
225	0	0	2	0	0	0	10	3	0	0	1	1	0	0	0	17
250	0	0	0	0	0	1	2	0	0	1	5	0	0	0	1	10
275	0	0	0	0	0	0	4	0	0	1	1	1	1	0	0	8
300	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
325	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
350	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
375	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
400	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
425	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
525	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	88	2	2	2	4	1	101	18	19	29	16	5	28	4	2	321

Niagara Mohawk Power Corporation
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Table 6 (Continued)
SEPTEMBER LENGTH-FREQUENCY DATA

	BYPASS REACH				IMPOUNDMENT						TAILWATERS				
LENGTH (mm)	Smallmouth Bass	Bluegill	Blueback Herring	Rock Bass	Smallmouth Bass	Bluegill	Largemouth Bass	Blueback Herring	Rock Bass	Yellow Perch	Smallmouth Bass	Blueback Herring	Rock Bass	Yellow Perch	Total
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	4	0	0	0	24	0	1	0	0	0	0	0	0	29
75	3	2	7	10	1	219	0	4	6	0	1	5	1	0	259
100	117	0	0	2	18	10	5	2	13	17	12	3	0	0	199
125	84	0	0	0	39	1	65	0	0	34	43	0	0	1	267
150	19	0	0	1	16	0	39	0	1	1	15	0	0	0	92
175	3	0	0	0	0	1	13	0	0	0	2	0	0	0	19
200	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
225	2	0	0	0	2	1	0	0	0	0	0	0	0	0	5
250	0	0	0	0	2	0	0	0	1	3	1	0	0	0	7
275	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
300	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
325	0	0	0	0	3	0	0	0	0	1	0	0	0	0	4
350	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
400	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
425	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
525	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	229	6	7	13	86	256	124	8	23	56	74	8	1	1	892

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Table 6 (Continued)
OCTOBER LENGTH-FREQUENCY DATA

	BYPASS REACH					IMPOUNDMENT						TAILWATERS			
LENGTH (mm)	Smallmouth Bass	Bluegill	Blueback Herring	Rock Bass	Yellow Perch	Smallmouth Bass	Bluegill	Largemouth Bass	Blueback Herring	Rock Bass	Yellow Perch	Smallmouth Bass	Blueback Herring	Yellow Perch	Total
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	63	0	0	0	0	0	1	0	64
75	3	2	8	7	0	0	243	0	7	10	0	0	7	0	287
100	37	0	5	2	1	16	0	11	4	20	5	5	3	0	109
125	44	0	0	0	1	58	0	54	0	0	42	15	0	1	215
150	8	0	0	0	0	24	1	44	0	2	8	3	0	0	90
175	3	0	0	0	0	2	2	23	0	0	0	0	0	0	30
200	0	0	0	0	0	1	0	2	0	0	0	0	0	0	3
225	0	0	0	0	0	0	2	0	0	2	2	0	0	0	6
250	0	0	0	0	0	3	0	0	0	2	2	0	0	0	7
275	0	0	0	0	0	2	0	0	0	1	1	0	0	0	4
300	0	0	0	0	0	3	0	1	0	0	0	1	0	0	5
325	0	0	0	0	0	1	0	0	0	0	1	2	0	0	4
350	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
375	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
400	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
425	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
525	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	95	2	13	9	2	112	311	139	11	37	61	26	11	1	830

Niagara Mohawk Power Corporation
School Street Hydroelectric Project (FERC No. 2539)
1993-94 Fish Baseline Study

Table 6 (Continued)
NOVEMBER LENGTH-FREQUENCY DATA

	BYPASS REACH			IMPOUNDMENT					TAILWATERS	
LENGTH (mm)	Smallmouth Bass	Bluegill	Yellow Perch	Smallmouth Bass	Bluegill	Largemouth Bass	Rock Bass	Yellow Perch	Smallmouth Bass	Total
25	0	0	0	0	0	0	0	0	0	0
50	0	3	0	0	67	0	0	0	0	70
75	0	4	0	0	96	1	5	0	0	106
100	0	0	0	15	7	6	27	0	0	55
125	2	0	1	22	0	59	1	25	4	114
150	1	0	0	7	0	29	0	7	0	44
175	0	0	0	1	0	11	0	1	0	13
200	0	0	0	0	1	1	1	0	0	3
225	0	0	0	0	0	0	1	0	0	1
250	0	0	0	0	0	0	0	3	0	3
275	0	0	0	0	0	0	0	1	0	1
300	0	0	0	0	0	0	0	0	0	0
325	0	0	0	0	0	0	0	2	0	2
350	1	0	0	0	0	3	0	0	0	4
375	0	0	0	0	0	1	0	0	0	1
400	0	0	0	0	0	0	0	0	0	0
425	0	0	0	0	0	0	0	0	0	0
450	0	0	0	0	0	0	0	0	0	0
475	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0
525	0	0	0	0	0	0	0	0	0	0
TOTAL	4	7	1	45	171	111	35	39	4	417

NIAGRA MOWHAWK POWER CORPORATION
SCHOOL STREET HYDROELECTRIC PROJECT (FERC No. 2539)
1993-94 FISH BASELINE STUDY

Table 6 (Continued)
MAY 1994 LENGTH-FREQUENCY DATA

	BYPASS REACH		IMPOUNDMENT				TAILWATER			
LENGTH (mm)	Smallmouth Bass	Yellow Perch	Bluegill	Largemouth Bass	Smallmouth Bass	Yellow Perch	Largemouth Bass	Smallmouth Bass	Yellow Perch	TOTAL
25	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
75	0	0	1	0	0	0	0	0	0	1
100	3	0	0	0	2	4	0	0	1	10
125	4	2	0	0	15	45	0	8	0	74
150	0	1	0	0	12	27	0	0	0	40
175	0	0	1	0	1	3	0	0	0	5
200	2	0	0	0	0	4	0	0	0	6
225	3	0	0	0	0	16	0	1	0	20
250	1	3	0	0	1	11	0	1	0	17
275	1	2	0	0	6	10	0	2	0	21
300	0	1	0	0	10	4	0	5	0	20
325	1	0	0	0	10	2	1	7	0	21
350	0	0	0	0	2	0	0	9	0	11
375	2	0	0	0	5	0	1	7	0	15
400	0	0	0	1	3	0	0	4	0	8
425	3	0	0	2	3	0	0	2	0	10
450	1	0	0	0	2	0	0	3	0	6
475	1	0	0	1	0	0	0	2	0	4
500	1	0	0	0	0	0	0	0	0	1
525	0	0	0	0	0	0	0	0	0	0
550	0	0	0	0	0	0	0	0	0	0
575	0	0	0	0	0	0	0	0	0	0
600	0	0	0	0	0	0	0	0	0	0
TOTAL	23	9	2	4	72	126	2	51	1	290

TABLE 7
SCHOOL STREET PROJECT
ELECTROFISHING CATCH PER UNIT EFFORT ESTIMATES (CPUE)

		Impoundment	Bypass	Tailwater
June	All Fish	219.2/hr	10.1/hr	18.6/hr
	Smallmouth Bass	25.6/hr	5.1/hr	13.1/hr
August	All Fish	60.6/hr	41.1/hr	39.5/hr
	Smallmouth Bass	24.1/hr	33.5/hr	17.8/hr
September	All Fish	184.7/hr	136.6/hr	67.4/hr
	Smallmouth Bass	27.3/hr	118.8/hr	52.5/hr
October	All Fish	267.2/hr	64.0/hr	67.8/hr
	Smallmouth Bass	46.9/hr	48.0/hr	26.4/hr
November	All Fish	463.6/hr	20.0/hr	16.0/hr
	Smallmouth Bass	18.6/hr	6.2/hr	4.0/hr

* CPUE = n fish/sampling time

TABLE 8
SCHOOL STREET PROJECT
HABITAT CLASSIFICATIONS OF SAMPLING STATIONS

Station	Habitat Type	Substrate	Shoreline	Cover	Overall Cover Quality
Impoundment					
H-1	pool	mud/sand	steep bank	aqua. veg	Fair
H-2	pool	mud/sand	steep bank	aqua.veg/ ledge	Good
H-3	pool	mud	steep bank	aqua. veg.	Poor
H-4	pool	mud	shallow bank	aqua. veg.	Fair
G-1	pool	mud/sand	steep bank	Ledge	Fair
G-2	pool	mud/sand	steep bank	ledge/ aqua.veg.	Poor
G-3	pool	mud	shallow bank	N/A	Poor
E-1(a/b)	pool	mud/sand/gravel/ cobble/boulder	steep bank	rock/boulder/ logs	Good
E-2	pool	gravel	shallow bank	aqua. veg.	Good
Bypass					
G-4	pool	ledge	ledge	rock/boulder/ ledge	Good
G-5	pool	ledge	brush	undercut bank/ledge	Fair
G-6	pool	ledge	ledge	rock/boulder/ ledge	Fair
G-7	pool	ledge	steep bank	ledge	Fair
G-8	pool	ledge	shallow bank	ledge	None
E-3a	riffle	ledge	ledge	ledge/ aqua.veg.	Fair
E-3b	run/pool	ledge	steep bank	ledge/boulder/ undercut bank	Fair
Tailwater					
E-4	rapids	ledge	steep bank/ brush	aqua.veg./ ledge	Poor
E-5	run	sand/silt/ledge		aqua.veg/ ledge	Fair

TABLE 9

TEMPERATURE/DO SURVIVAL CRITERIA FOR SELECTED FISH SPECIES COMMON TO THE MOHAWK RIVER, NEW YORK, AT THE SCHOOL STREET PROJECT

SPECIES	LOWER LETHAL TEMP	UPPER LETHAL TEMP
Walleye	**	31.6 C
Smallmouth Bass	10.1 C*	35.2 C
Largemouth Bass	5.0 C	36.4 C
White Crappie	**	19.0 C
Bluegill Sunfish	2.2 C	34.7 C
Yellow Perch	1.1 C	29.7 C
Common Carp	3.4 C*	37.0 C

Note: The generally accepted minimum level for dissolved oxygen (DO) is given as 5 mg/l (Bell, 1990).

Literature Cited:

Bell, 1990.

Thorpe, 1977.

Scott and Crossman, 1973.

* Not lethal/induces inactivity.

** Values not available.

Niagara Mohawk Power Corporation
School Street Hydroelectric Project (FERC No. 2539)
1993-94 Fish Baseline Study

Table 10

Age/Length Frequency (mm) of Selected Fish Species Common to the Mohawk River, New York, at the School Street Project

AGE CLASS	SPECIES BLUEGILL	LARGEMOUTH BASS	ROCK BASS	SMALLMOUTH BASS	YELLOW PERCH	BLUEBACK HERRING
0+	43	51	38	38*	36*	30-70
1+	79	102	81	140*	77*	80-150
2+	109	203	109	178*	168	N/A
3+	137	254	132	211*	196	N/A
4+	168	305	157	246*	216	N/A

All measurements total length unless noted
* Fork Length

Literature Cited:

Thorpe, 1977; Scott and Crossman, 1973.

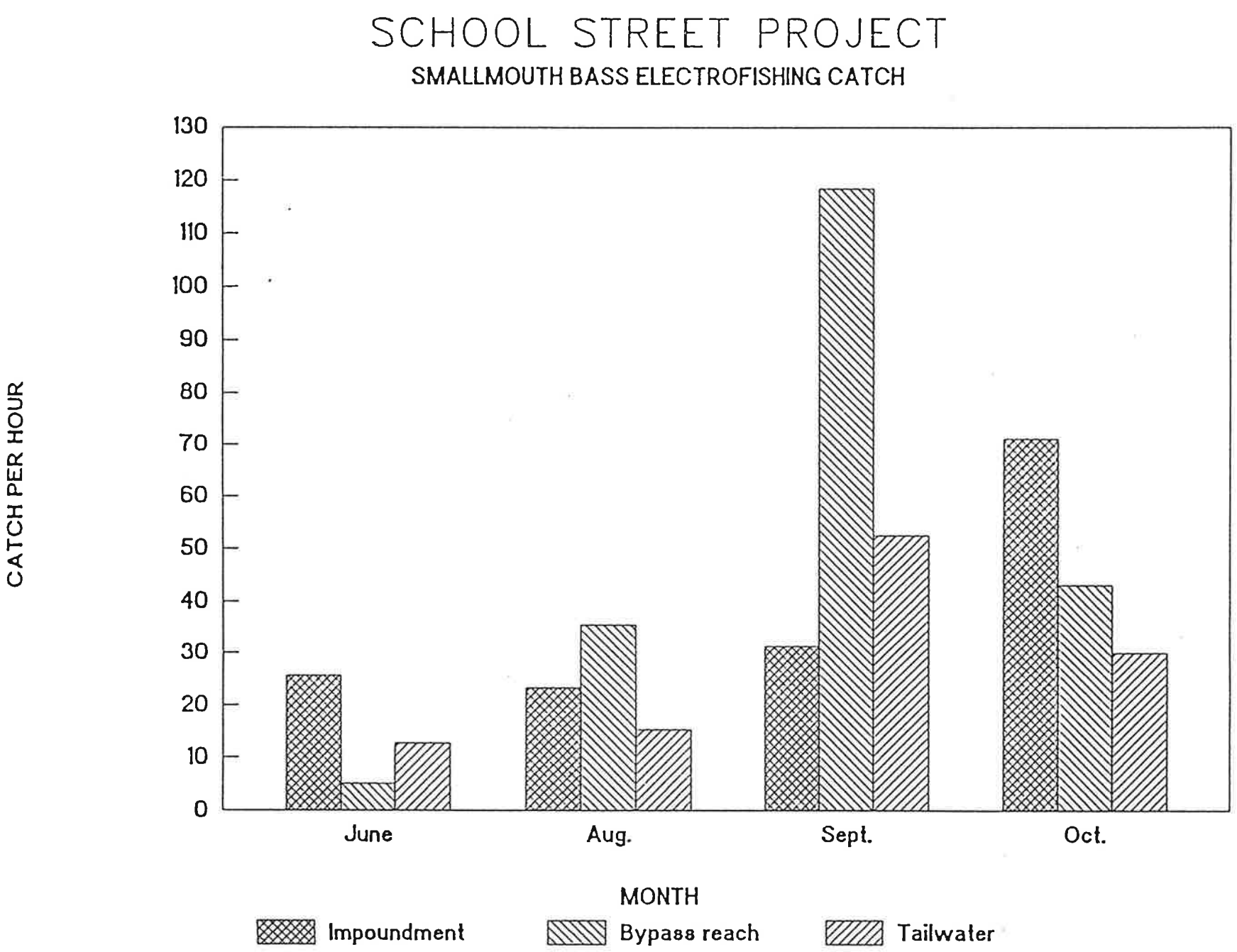
Table 11. Niagara Mohawk Power Corporation
School Street Project - May 1994
Fishery Baseline Study
Spawning Condition of Yellow Perch

Date	Station	Tot. No. Perch	No. Ripe Males	No. Spent Males	No. Ripe Females	No. Spent Females
5/16/94	E-1A	14	14	0	0	0
5/16/94	E-1B	36	33	0	3	0
5/17/94	H-3	2	2	0	0	0
5/17/94	H-4	2	2	0	0	0
5/17/94	E-3B	9	4	0	3	2
5/18/94	G-1	1	1	0	0	0
5/18/94	H-3*	36	33	0	1	1

* 1 Female, condition unknown

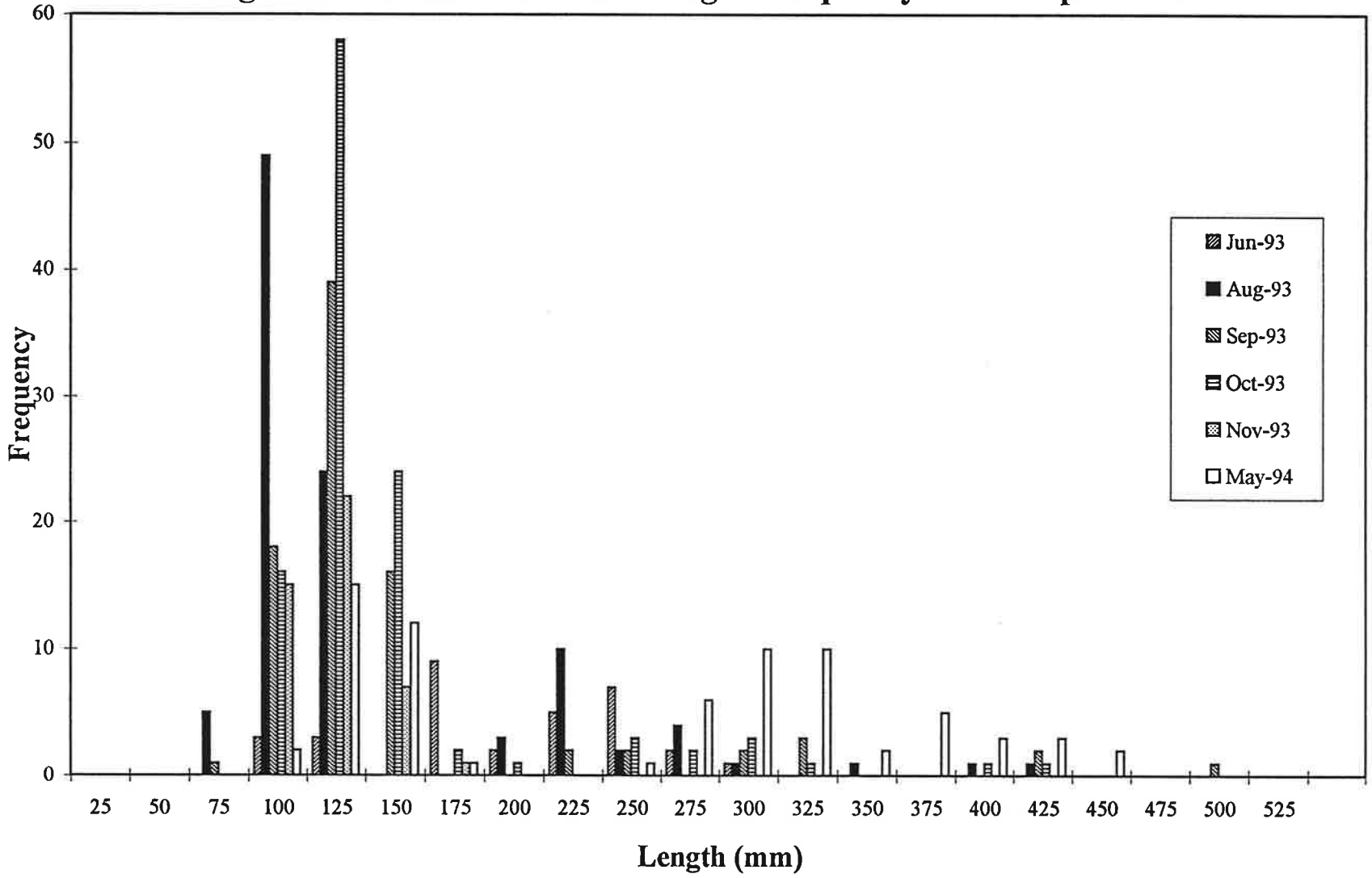
FIGURES

FIGURE 5


SCHOOL STREET PROJECT
SMALLMOUTH BASS ELECTROFISHING CATCH
CATCH PER HOUR
130
120
110
100
90
80
70
60
50
40
30
20
10
0
June
Aug.
Sept.
Oct.
MONTH
Impoundment
Bypass reach
Tailwater

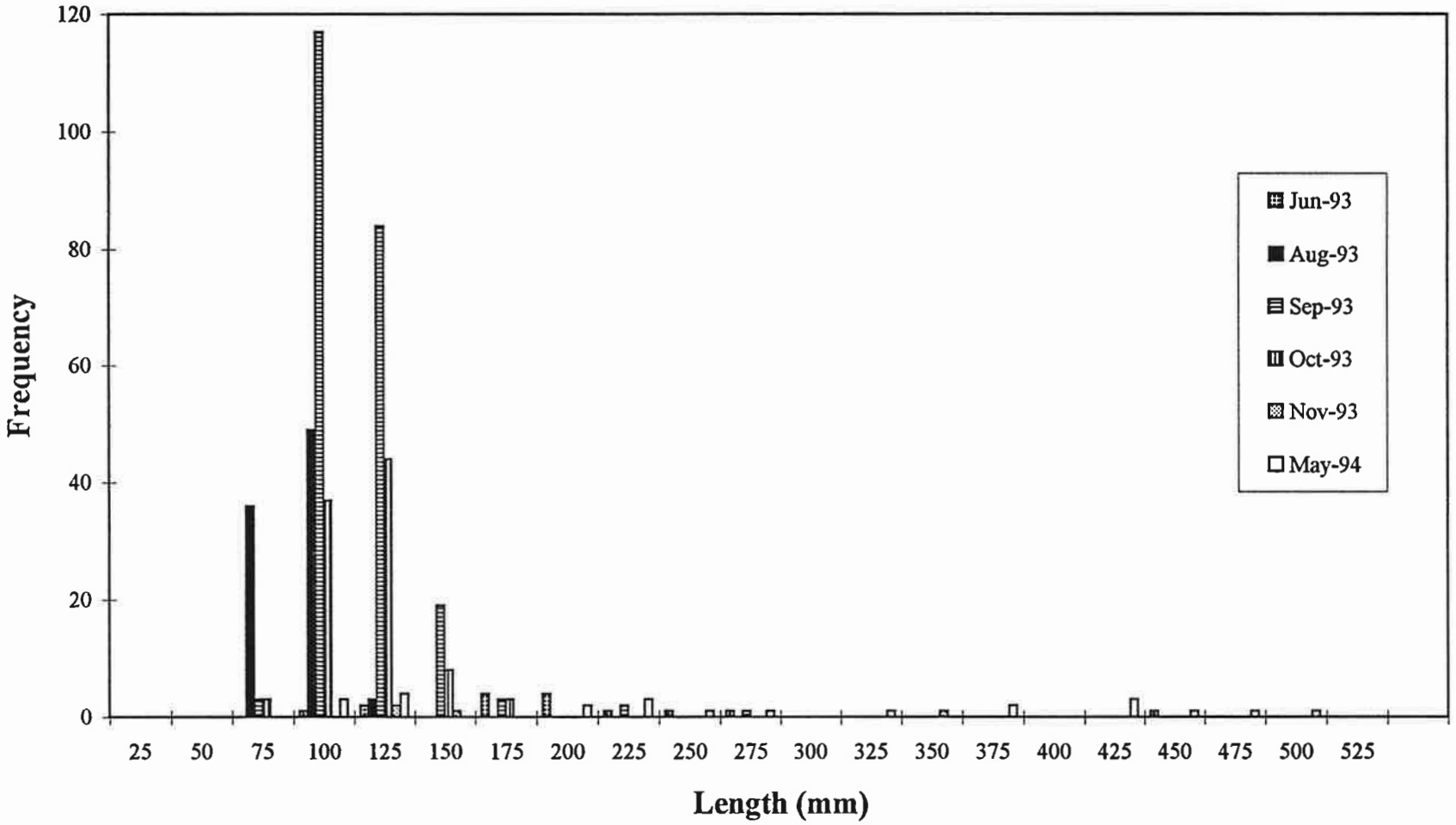
School Street Fish Sampling 1993-94

Figure 6a - Smallmouth Bass Length-Frequency in the Impoundment



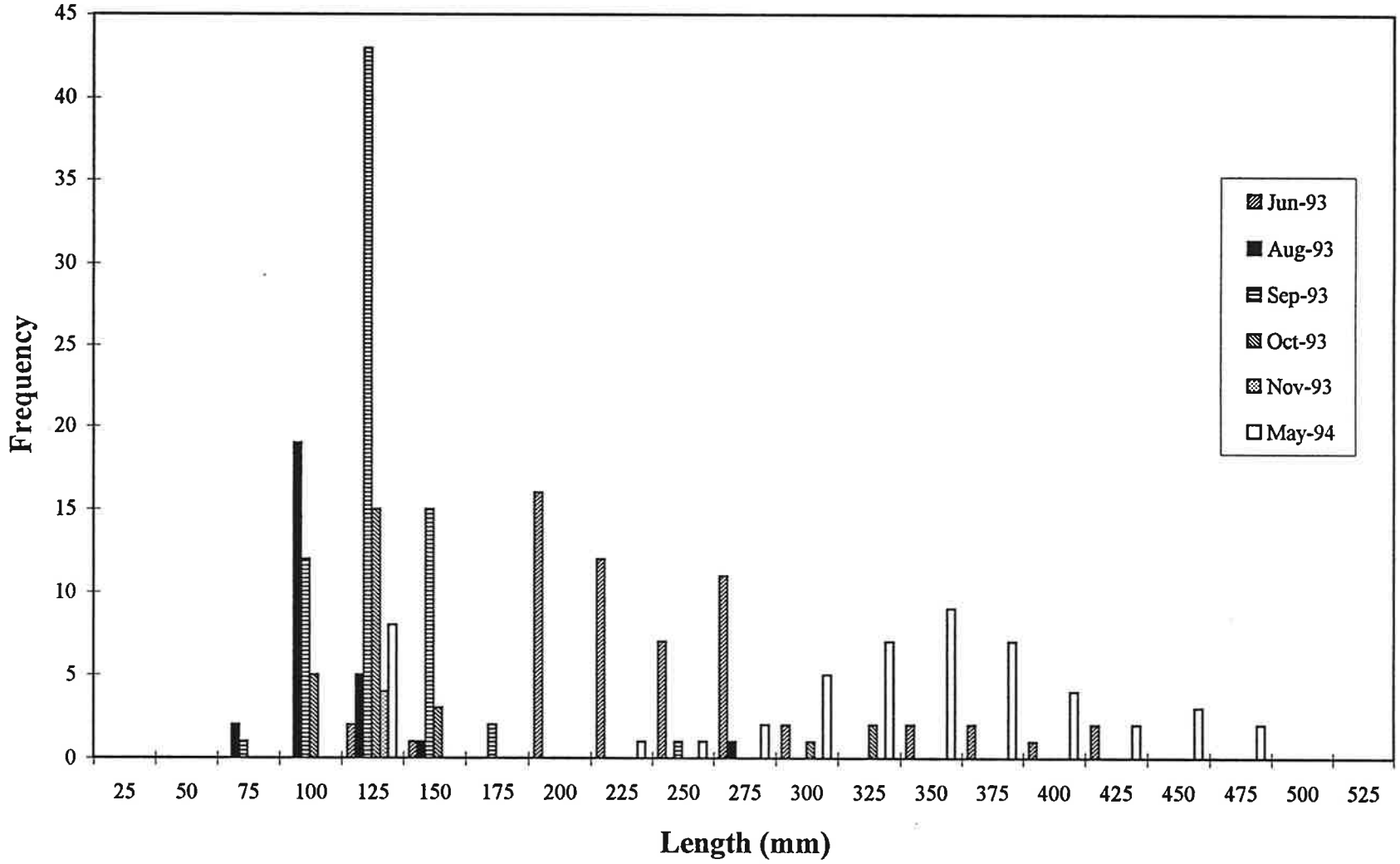
SSGRAPHS Chart 4-6/15/94-jla

School Street Fish Sampling 1993-94
Figure 6b - Smallmouth Bass Length-Frequency in the Bypass Reach



SSGRAPHS Chart 2-6/15/94-jla

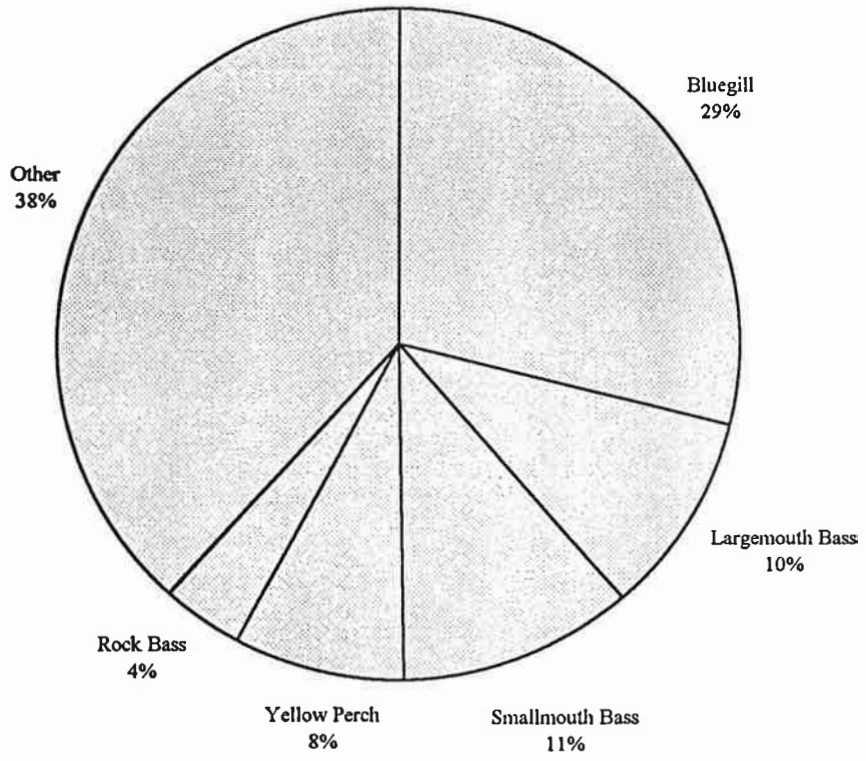
School Street Fish Sampling 1993-94
Figure 6c - Smallmouth Bass Length-Frequency in the Tailwaters



SSGRAPHS Chart 5-6/15/94-jla

Figure 7

School Street Fish Sampling - 1993-94
Species Composition of the Impoundment
(all samples combined)

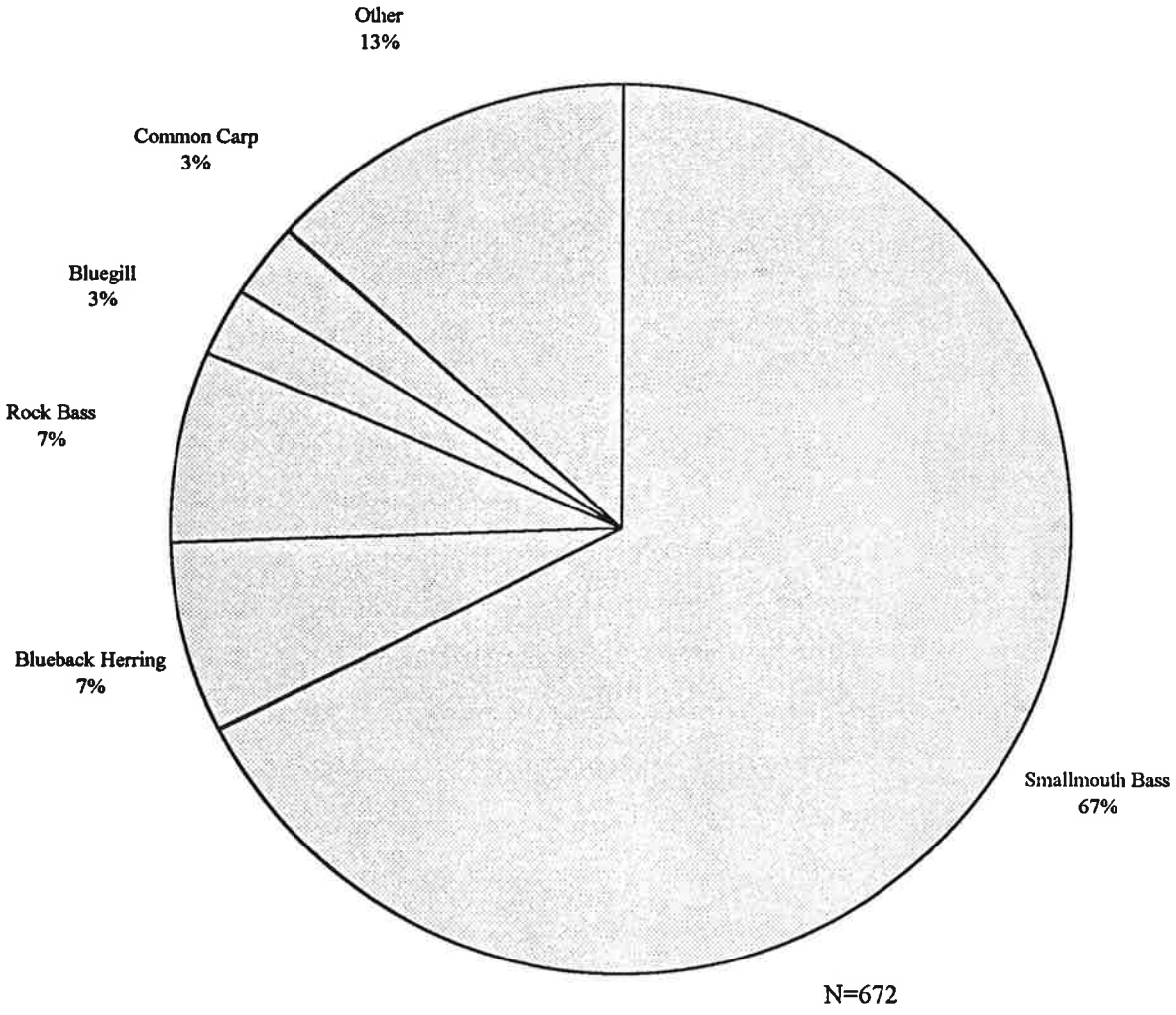


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*-SSTOTALS Chart 4-6/15/94-jla

Figure 8

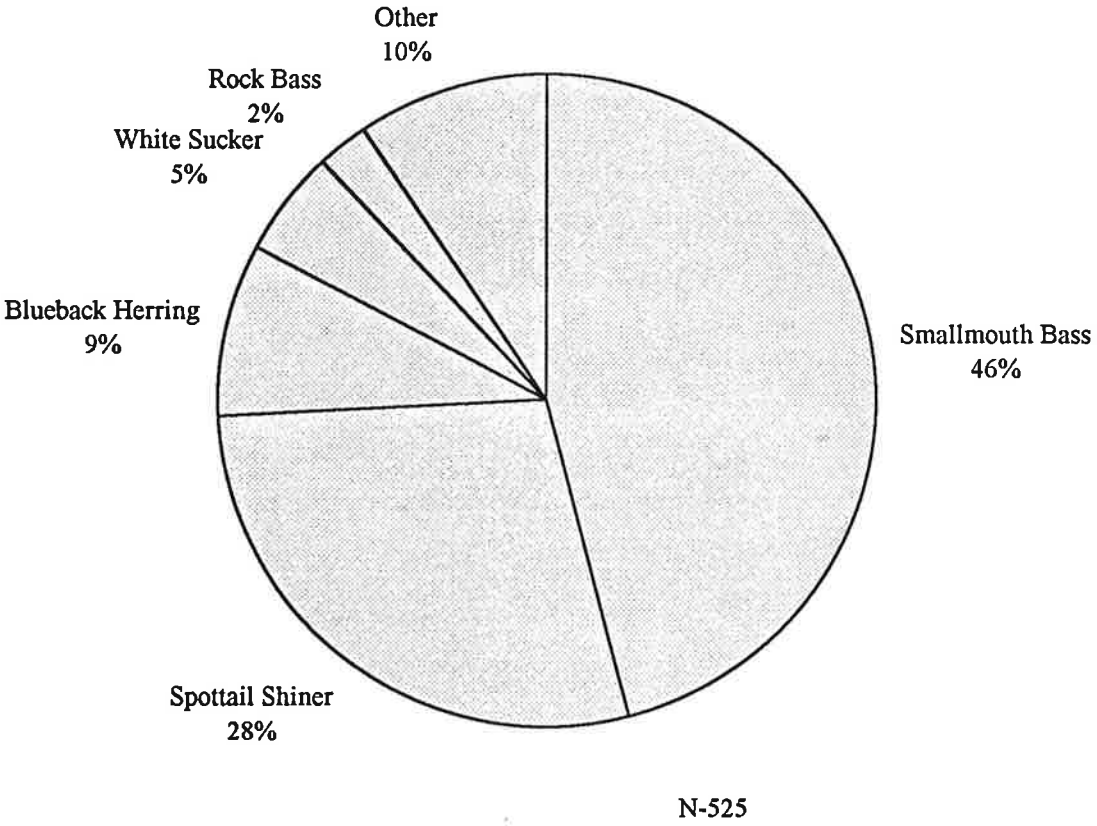
School Street Fish Sampling - 1993-94
Species Composition of the Bypass Reach



*-SSTOTALS Chart 3-6/15/94-jla

Figure 9

School Street Sampling - 1993-94
Species Composition of the Tailwaters



SSTOTALS Chart 5-6/15/94-jla

APPENDIX A

AGENCY CORRESPONDENCE

Kleinschmidt
KA
Associates
Consulting Engineers
75 Main Street P.O. Box 576
Pittsfield, Maine 04967
207-487-3328
207-487-3211

April 16, 1993

Mr. Edward Miller
NY Dept. of Environmental Conservation
50 Wolf Road
Albany, NY 12233

Mr. Leonard Corin
U.S. Fish & Wildlife Service
3817 Luker Road
Cortland, NY 13045

Ms. Lois Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, NE
Washington, DC 20426

School Street Project (FERC No. 2539)
Draft Baseline Fishery Study Plans
Niagara Mohawk Power Corporation

Dear Sir/Madam:

On behalf of Niagara Mohawk Power Corporation, we are providing for your review and comment the enclosed draft baseline fishery study plans for the referenced project.

In order to complete the proposed study on schedule, and in conformity with the FERC request for Additional Information, we request that you provide your comments by May 18, 1993.

If you have any questions concerning these plans, please contact Brandon Kulik of this office or me.

Sincerely,

KLEINSCHMIDT ASSOCIATES

John H. Slagle
Project Manager

JHS:gls
Encl.
cc: D.P. Falcinelli
G.L. Schoonmaker
G.L. Liimatainen

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, New York 13045

TAKE PRIDE IN AMERICA

CONFIRMATION COPY
Faxed 05/20/93

May 20, 1993

Mr. Brandon Kulik
Kleinschmidt Associates
75 Main Street
P.O. Box 576
Pittsfield, ME 04967

Dear Mr. Kulik:

The U.S. Fish and Wildlife Service (Service) has reviewed the draft Fish Resources Baseline Study Plan (Plan) for the School Street Project, FERC No. 2539. Although the Federal Energy Regulatory Commission requested that Niagara Mohawk Power Corporation (Niagara) provide further information regarding the fishery resources located downstream of the project powerhouse, the Plan proposes to "concurrently re-sample previously studied project areas, so that all biological data is from a comparable time frame." The Service agrees with this approach and offers the following comments on the Plan.

The Plan proposes to use "standard fisheries techniques" including at least three gear types: horizontal gill nets, trap nets, seines, and electrofishing equipment (backpack and boat-mounted). Instead of using gill nets, which may kill or injure the fish, electrofishing should be used at all sample sites. The Service notes that the impoundment size (100 surface acres) should not preclude fishing nearly the entire impoundment.

The Service understands that the New York State Department of Environmental Conservation's (NYSDEC) protocol for in-reservoir sampling requires electrofishing for several 15-minute periods collecting all species encountered. The remainder of the impoundment is then sampled concentrating on collecting gamefish species. Considering the size of the School Street impoundment, it would be appropriate to undertake two or three 15-minute samples collecting all species during one night followed by completely electrofishing the reservoir for only gamefish species on the following night.

The Service believes that it would be useful to utilize trap nets or hoop nets to collect percids (i.e. walleye and yellow perch). These species may not be well represented with the near-shore electrofishing techniques. The use of the trap nets, hoop nets, or fyke nets should be used during periods when the reservoir is not being electrofished. These nets should be checked every 6 to 8 hours and should be fished for a 24-hour period.

The Service recommends that the species, total lengths, and weights be recorded for all fish collected. Other field notes, such as indications of spawning condition (i.e. ripe, spent, male, female, adult, immature), should be indicated where appropriate. If large schools of young-of-year fish are encountered, such as blueback herring, subsampling should be considered.

In addition to the final summary sheets, copies of all field notes and data sheets should be provided directly to the Service for review. The Service and the NYSDEC should be notified at least one week, preferably two weeks, prior to the projected sampling date. This would allow us to respond to potential public inquiries related to the sampling activities. If any sampling difficulties are encountered, Niagara should immediately notify the Service and the NYSDEC.

The Service appreciates the opportunity to provide these comments. Should you have further questions, please contact Dave Bryson of my staff at (607) 753-9334.

Sincerely,

Leonard P. Corin
Field Supervisor

cc: Niagara Mohawk Power Corporation, Syracuse, NY (J. Sabattis)
NYSDEC, Albany, NY (W. Sarbello, T. Post, E. Miller)
NYSDEC, Stamford, NY (N. McBride)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
. Cortland, New York 13045

May 21, 1993

Mr. Jerry L. Sabattis
Hydro Licensing Coordinator
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, NY 13202

Dear Mr. Sabattis:

The U.S. Fish and Wildlife Service (Service) has reviewed Niagara Mohawk Power Corporation's (Niagara) "Proposed Enhancement Plan For Downstream Fish Passage" (Plan) for the School Street Project, FERC No. 2539. The Plan would analyze the potential routes of passage and then develop an enhancement plan. The Service does not concur with the planned approach and is ready to provide preliminary recommendations for fish passage facilities.

Much of the Service's efforts related to fish passage on the Mohawk River have focused on the blueback herring, however, we are also concerned with the passage of other riverine fish species. In reviewing the proposed Plan, we note that fish entering the School Street reservoir will not have access to the Waterford Flight. Thus, downstream passage cannot be accommodated by this route. Passage through the existing and proposed turbines will result in fish mortalities; providing a safe alternative passage route is desired. The Service's goal for fish passage on the Mohawk River is 100% passage survival. The safest fish passage route would bypass the project turbines and place fish in the Mohawk River downstream of Cohoes Falls.

The Department of the Interior (Department) will likely prescribe fishways for this project under Section 18 of the Federal Power Act. At this time the Service recommends that a full depth angled guiding device leading to a bypass facility be designed for the project. This guiding device should be in the form of bar racks or louvers. The bypass facility should be designed to have a surface and bottom level entry; the two entrances should converge into a single sluiceway. Preliminary recommendations for attraction flows should be in the range of 2 to 3% of the project's total hydraulic capacity. A portion of this attraction flow may be recycled into the project forebay via pumps, although an adequate fish conveyance flow must be provided.

The Service believes that the provision of downstream fish passage facilities must be incorporated into any relicense which may be issued for the project. The Service remains willing to assist Niagara in designing the recommended fish passage facilities. The Service appreciates the opportunity to provide these comments. Should you have further questions, please contact Dave Bryson of my staff at (607) 753-9334.

Sincerely,

Leonard P. Corin
Field Supervisor

cc: Kleinschmidt Associates, Pittsfield, ME (B. Kulik)
NYSDEC, Albany, NY (E. Radle, W. Sarbello, M. Woythal, T. Post, D. Sheppard, P. Hulbert, E. Miller)
NYSDEC, Stamford, NY (N. McBride)
NYSDEC, Utica, NY (J. Hasse)
NMFS, Milford, CT (M. Ludwig, C. Collins)
USDOI, Newton Corner, MA (B. Rizzo)
USFWS, Hadley, MA (A. Hoar)

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

May 28, 1993

Mr. John H. Slagle
Project Manager
Kleinschmidt Associates Consulting Engineers
75 Main Street
P.O. Box 576
Pittsfield, Maine 04967

RE: FERC 2539 - School Street Project
Draft Baseline Fishery Study Plans

Dear Mr. Slagle:

The New York State Department of Environmental Conservation (DEC) has reviewed your April 16, 1993 submittal describing the baseline fishery plans for the School Street Hydroelectric Project. The study will be undertaken to satisfy the requirements of the Federal Energy Regulatory Commission's (FERC) September 2, 1992 Additional Information Request (AIR) item 4 which requested the Niagara Mohawk Power Corporation (NMPC) to describe the fisheries downstream of the powerhouse. While not required as part of the Air requirements, you will also survey the 2,400 foot long bypass reach and the impoundment to supplement the data gathered in the 1988 fisheries survey. Our comments follow:

-- A scientific collectors permit is required before sampling can begin. Please contact the Special License office at 50 Wolf Road, Albany to obtain the required permit. Their phone number is (516)751-1596.

-- The School Street station is currently operated as a storage-and-release pulsing facility which operates in tandem with the New York Power Authorities (NYPA) Crescent and Vischer Ferry Stations immediately upstream. During the non-generation phase, little or no water is passed to the downstream river. Further, little water is passed to the bypass during much of the year. Therefore, the study proposed will only indicate what species (and sizes) are attempting to use the river sections under the current mode of operation, not

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what might occur under an "improved" mode of operation (such as minimum base flows, bypass flows, and more restrictive limitations on impoundment fluctuations). The project impoundment currently fluctuates, such fluctuations impact on numbers, sizes, and species of fish present. The study will only indicate the current conditions, not what may be achieved through more stable operating conditions.

-- Generally, electrofishing is the most efficient gear for sampling centrarchids. Fish taken by electrofishing more closely reflects the species and size composition of the fish community than samples obtained from other types of sampling gear. All other standard fish sampling gear have one or both of the following problems: they are ineffective in capturing centrarchids and/or the variability is very high.

Trap net catch variability is among the highest of standard sampling gears and is not suitable for determining abundance when used for typical lake surveys. Trap nets are also highly size selective and the size of centrarchid captured varies which mesh size. Trap nets are effective for determining species composition. Trap nets in the riverine reaches are not effective in assessing game fish abundance. For example, smallmouth bass are very abundant in the Mohawk River as evidenced by an average electrofishing catch rate of 71 fish/h; however, trap net catch rates averaged 0.3 to 2.4 fish/net in the 12 pools sampled. Trap netting is recommended to help determine species composition.

Gill net catch variability is also very high and unsuitable for determining abundance when used for typical lake surveys. It may be impossible to sample small populations (this includes the vast majority of inland lakes in NY) intensively enough to detect change with gill nets. Gill nets are highly size selective and the size of fish captured varies with mesh size. The use of experimental gill nets with a range of mesh sizes will not fully compensate for gill net selectively. Gill nets also cause high mortality. Gill nets are not recommended

Boat and backpack electrofishing should be the preferred method of sampling the impoundment and stream reaches.

Electrofishing should be done at night (0.5 h before sunset to 0.5 h after sunrise) as fish are generally more vulnerable to capture during these time periods. DEC's standard electrofishing procedures for ponded waters is recommended and is as follows: four 15 min fish collections where all fish are collected and one lap of the entire impoundment or stream where game fish only are collected.

-- Fish collections and length-frequency distribution should be reported separately by gear type. The data should be compared with information from previous surveys.

-- Relying on one sample per habitat type is questionable. Species presence and lengths could vary even within similar habitats. Sampling of several different areas that appear to have similar habitat characteristics is recommended. Sampling of several similar areas will more accurately portray the species and length frequency distributions present, and minimize variability. Sampling must be done within each different habitat type.

-- Your proposed sampling frequency is not adequate. Spring sampling is needed during the high flow period when spillage to the bypass occurs. This is also the primary spawning period for most species that we believe inhabit the project area. The summer-low flow period when little or no flow outside of leakage is available to the bypass, should also be sampled. Species that survive the summer under the current adverse conditions will probably be present year-round. Fall should be sampled to determine if: 1) any fall spawning runs are occurring, 2) flows increase to a level where species may be better able to tolerate conditions (if there is spillage) and, 3) temperature limitations are reduced. The variability associated with sampling only once in each period would not determine seasonal fish utilization. Seasonal utilization will help predict the potential for year round usage if an when minimum bypass flows and base flows are provided.

So that potential seasonal differences can be determined sampling should be conducted every other week during March, April, May, June, September, October, and November. Many species, such as centrarchids, are most vulnerable to capture during their spawning season. Therefore, frequent sampling

that will ensure capture of species and determine the seasonal use of the bypass and downstream river is recommended. This sampling schedule should provide a relatively complete sample of the species and size distribution present.

The bypassed and downstream river reaches need to be sampled once a month during July and August in order to determine the aquatic community that is attempting to use these areas under current impacted conditions.

I may be reached at (518)457-2224 if you have any questions.

Sincerely,

Edward R. Miller

Edward R. Miller
Environmental Analyst 2
Project Management Section
Division of Regulatory Affairs

ERM:lk
cc: L. Cashell (FERC)
B. Bell (FERC)
M. Robinson (FERC)
A. Sidoti (FERC-NY)
L. Corin (USFWS)
J. Sabaltis (NMPC)
File

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, New York 13045

June 16, 1993

Mr. Dean L. Shumway, Director
Division of Project Review
Office of Hydropower Licensing
Federal Energy Regulatory Commission
810 First Street, N.E.
Washington, DC 20426

Dear Mr. Shumway:

The Federal Energy Regulatory Commission's (FERC), September 2, 1992, letter to Niagara Mohawk Power Corporation (Niagara) identified several additional information requests (AIR's) regarding the application to relicense the School Street Project No. 2539. The AIR at item 4. requested additional information regarding fishery population statistics. A plan was to be developed in consultation with the New York State Department of Environmental Conservation and the U.S. Fish and Wildlife Service. The AIR specified that,

> "(e) Documentation of consultation with NYSDEC and FWS prior to initiating the study, including specific descriptions of how all agency comments and recommendations were accommodated by the plan [emphasis added]."

On Monday, June 14, 1993, a telephone call from Niagara's consultant informed the Service that the consultant was in the field on that day and was beginning the study. The Service was also informed that all of the agencies' comments and recommendations were not incorporated in the plan. Since we had not received a final plan of study, Niagara's consultant was advised not to proceed with the study.

My staff attempted to contact the East Branch of the Division of Project Review to inform them of the situation. We were advised that most of the supervisors were not in the office, but a message would be left to return the Service's call. We have not received any return calls. We feel that this is a serious situation requiring your prompt attention. If you have further questions, please contact Dave Bryson of my staff at (607) 753-9334.

Sincerely,

Leonard P. Corin
Field Supervisor

cc: Service List

Kleinschmidt
KA
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June 21, 1993

Secretary Lois D. Cashell
Federal Energy Regulatory Commission
825 North Capital Street, NE
Washington, DC 20426

Fish Resources Baseline Study Plan
School Street Project (FERC No. 2539)

Dear Secretary Cashell:

On behalf of Niagara Mohawk Power Corporation, we are transmitting to you an original and eight copies of the United States Fish and Wildlife Service (USFWS) letter of May 20, 1993 and the New York State Department of Environmental Conservation (NYSDEC) letter of May 28, 1993 providing comments on the draft Fish Resources Baseline Study Plan. The draft study plan was submitted to the USFWS, NYSDEC and the FERC on April 16, 1993 for review and comment as required by the Commission's Additional Information Request dated September 2, 1992. The comments of the USFWS and NYSDEC have been reviewed by Niagara Mohawk Power Corporation (NMPC) and NMPC's comments are provided below.

The higher than normal spring flows on the Mohawk River have subsided and NMPC is proceeding with the late spring sampling as proposed in the draft study plan. The sampling effort will be adjusted from that presented in the draft study plan to incorporate specific agency comments as discussed below. We are requesting clarification from the FERC on the required sampling frequency (see discussion below). Unless we hear otherwise from the FERC, we plan on proceeding with summer sampling as described in the study plan.

The following is a discussion of agency comments by topic and NMPC's response.

1. Study Area

Based upon a review of agency comments, NMPC assumes that all parties are in agreement regarding the study area. The NYSDEC made no specific comments regarding NMPC's proposal to expand the FERC defined study area to include the impoundment and bypass areas. The USFWS provided the following comment:

> Although the Federal Energy Regulatory Commission requested that Niagara Mohawk Power Corporation (Niagara) provide further information regarding the fishery resources located downstream of the project powerhouse, the Plan proposes to "concurrently re-sample previously studied project areas, so that all biological data is from a comparable time frame." The Service agrees with this approach . . .

As discussed in the draft study plan, NMPC will undertake baseline fishery work in the project impoundment, the project bypass and downstream of the project powerhouse.

2. Collectors Permit

The NYSDEC stated that a *"scientific collectors permit is required before sampling can begin."*

An appropriate scientific collectors permit has been obtained from the NYSDEC. A copy of the permit is attached.

3. Study Techniques

The draft study plan proposed to use standard fisheries techniques and at least three gear types including gill nets, trap nets, seines and electrofishing. The USFWS and the NYSDEC stated that electrofishing should be used as the primary sampling gear type, with limited use of seines and trap nets to provide supplemental data. The USFWS stated that gill netting should not be used as it may kill or injure the fish. The NYSDEC's basis for the need to use electrofishing instead of other gear types, including gill netting, follows:

> *Generally, electrofishing is the most efficient gear for sampling centrarchids. Fish taken by electrofishing more closely reflects the species and size composition of the fish community than samples obtained from other types of sampling gear. All other standard fish sampling gear have one or both of the following problems: they are ineffective in capturing centrarchids and/or the variability is very high.*
>
> *Trap net catch variability is among the highest of standard sampling gears and is not suitable for determining abundance when used for typical lake surveys. Trap nets are also highly size selective and the size of centrarchid captured varies with mesh size . . . Trap netting is recommended to help determine species composition.*

> *Gill net catch variability is also very high and unsuitable for determining abundance when used for typical lake surveys. It may be impossible to sample small populations (this includes the vast majority of inland lakes in NY) intensively enough to detect change with gill nets. Gill nets are highly size selective and the size of fish captured varies with mesh size . . . Gill nets are not recommended.*
>
> *Boat and backpack electrofishing should be the preferred method of sampling the impoundment and stream reaches.*
>
> *Electrofishing should be done at night (0.5 h before sunset to 0.5 after sunrise) as fish are generally more vulnerable to capture during these time periods. DEC's standard electrofishing procedures for ponded waters is recommended and is as follows: four 15 min fish collections where all fish are collected and one lap of the entire impoundment or stream where game fish only are collected.*

First and foremost, it is important to note that the comments provided by NYSDEC directly relate only to centrarchids. These species are expected to be included in the sampling but, by no means, constitute the entire fish community to be sampled. In addition, the NYSDEC has for years relied on data gathered using all of the above procedures, including gill netting. While they criticize gill and trap netting for high variability and size biases, these practices constitute standard NYSDEC data collection protocol. A description can be found in the *Fish Sampling Manual: Guidelines for the Collection, Analyses, and Interpretation of Fisheries Data by Units of the New York State Department of Environmental Conservation, Division of Fish and Wildlife,*(Manual) 1989. Justification for the use of both gill and trap nets is explained in the Manual. Trap nets are considered to be second only to electrofishing as the method of choice for sampling centrarchids, and can be especially helpful in special purpose sampling. Gill nets are described (NYSDEC Bureau of Fisheries, 1989) as being:

> useful for determining abundance of some species, *i.e.* yellow perch, and are often set to sample fish communities and it is expected that they will be used for sampling fish communities by DEC. The data can be useful in determining species composition and provides a means of sampling deep water where many other gears are not effective.

The Manual, which was used *verbatim* (but out of context) for a large part of NYSDEC's comments to the proposed study plan, clearly supports the use of gill and trap nets as recommended methods for fish *community* sampling.

NMPC is aware that all fish sampling techniques, including electrofishing, have biases resulting from inherent gear efficiencies. Although not included in the NYSDEC's letter, electrofishing itself has several sampling biases based on the depth of the water being sampled and the temperature and conductivity at the time of the sampling. If one

of the four sampling procedures outlined in the study plan was employed exclusively, data collected would certainly reflect these biases. Therefore, as discussed in the draft study plan, NMPC proposes to conduct the baseline fish studies using a combination of these methods in order to reduce the biases of any individual technique. The results of the electrofishing effort will be compared with that of the gill and trap netting efforts and reported in the final report to the FERC.

Based on site specific constraints which could affect the safety of the field collection staff, NMPC will conduct electrofishing during evening and night-time hours whenever possible. Due to safety concerns associated with working in the bypass area and the area immediately downstream of the powerhouse in darkness, NMPC proposes to conduct electrofishing in these areas only during early morning or daylight hours.

4. Data Collection

The NYSDEC stated that fish collections and length-frequency distribution should be reported separately by gear type and that the data should be compared with information from previous surveys. The USFWS recommended that the total length, weight, spawning condition and species identification data for all the fish collected during the sampling effort be recorded onto field data sheets. The USFWS did recommend that if large schools of young-of-year fish are encountered, such as blue back herring, that subsampling be considered. The USFWS requested copies of all field notes, data sheets and final summary sheets.

While not specifically stated in the draft study plan, NMPC agrees that all fish collections should be reported separately by gear type. NMPC has included a draft copy of the field data sheet that will be used. In accordance with standard sampling techniques, it includes a space for the field crew to indicate the collection method being used.

With the exception of a very general comparison of species composition, comparison of data from the 1993 field sampling effort with previous surveys is not appropriate. This study may not necessarily share similar sampling techniques with the previous studies. As discussed by the NYSDEC comment above, the use of each sampling technique introduces biases into the data collection effort. In addition, undocumented environmental variables (*e.g.*, high flows during the emergence of fry or something as minor as a change in the fishing regulations) other than operation of the project, may have occurred between the sampling efforts which influences species composition, the age structure, size frequency and abundance of the resident fishery population. If comparisons were made between new and old samples and disparate numbers were to appear, there would be no way of conclusively attributing the cause of the differences. While NMPC believes that it is not appropriate to compare this sampling effort with previous events, there is nothing stopping the NYSDEC from attempting to compare the study results once it receives the study report.

Niagara Mohawk agrees with the USFWS's recommendation regarding subsampling and will incorporate the USFWS's suggestion into the study plan. As recommended by the USFWS, the species length, weight and spawning condition will be recorded onto field data sheets. Copies of the field data sheets will be provided to the USFWS and the NYSDEC upon completion of the study and reporting of the results to the FERC.

5. Sampling

The NYSDEC stated that reliance upon one sample per habitat type is questionable in that species presence and lengths could vary even within similar habitats. They recommended that sampling of several different areas that appear to have similar habitat characteristics be performed.

Depending on field conditions encountered during each sampling event such as availability of access, river flow and water levels, NMPC will attempt to sample more than one similar habitat type in order to portray species length and variability.

6. Sampling Frequency

The USFWS had no comments on the proposed sampling frequency. The NYSDEC stated that the sampling frequency reported in the draft study plan was inadequate. The NYSDEC stated that the variability associated with sampling only once in each period would not determine seasonal fish utilization. The NYSDEC believes that seasonal utilization is needed to predict the potential for year round usage and the base flows that need to be provided. The NYSDEC stated that many species, such as centrarchids, are most vulnerable to capture during their spawning season and that frequent sampling would ensure capture of the species and assist in determining the seasonal use of the bypass and downstream river. To accomplish this the NYSDEC recommended that sampling occur every other week during March, April, May, June, September, October, and November and once per month during July and August.

As discussed in the draft of the study plan, NMPC is proposing to sample the entire study area for approximately three day intervals, once in the late Spring, Summer, and Fall. The School Street Project consists of a very small (100 acre) impoundment that reacts very quickly to changes in flow, a 1,200 foot long overflow spillway dam that leads to a rocky, steep-sided bypass reach that is approximately 2,400 feet long with a 65 foot high bluff located approximately midway that becomes a waterfall under spillage conditions. Access to the upper section of the bypass area is gained by suspending a ladder off the canal intake structure. Access to the lower bypass area is accomplished near the powerhouse. Under spillage conditions the School Street bypass and downstream area become a hazardous, turbulent water filled channel. Under similar spillage conditions, the impoundment level would rise above the spillway crest creating hazardous boating conditions for the impoundment sampling effort.

Examination of the flow duration curves for the School Street Project demonstrate that early Spring sampling is unsafe. The maximum hydraulic capacity of the School Street generating units is 5,910 cfs. During 60% of March, 84% of April, and 40% of May, flows at the site exceed turbine capacity, requiring spillage into the bypass. Daily and weekly flow information show high flows occasionally reaching 61,940 cfs to 112,060 cfs. The resulting spillage increases the flows within the bypass reach study area to a dangerous level. Sampling crews cannot work safely during these periods of exceedence, so NMPC proposes no sampling until such flows have subsided.

In addition, the FERC in its AIR requests information regarding the impact to the fisheries caused by project operation. Fish that pass over the spillway during these high spring flows are not effected by project operation as these flows are beyond the hydraulic capacity of the project generating units.

The NYSDEC also requests additional sampling in July and August to "determine the aquatic community that is attempting to use these areas." NMPC is not aware of any significant changes in operations or in the life cycle of the local fish populations during these months that would require more than one sampling event. It is NMPC's opinion that one sampling event during the summer will present an adequate view of this season's operations and fisheries activity.

The sampling schedule contained within the draft study plan will provide an accurate portrait of the baseline fish community that has developed under existing operating conditions.

7. Alternative Project Operations

The NYSDEC notes that the proposed study will only

> "indicate what species (and sizes) are attempting to use the river sections under the current mode of operation, not what might occur under an "improved" mode of operation... The study will indicate the current conditions, not what may be achieved through more stable operating conditions."

The FERC's AIR requires that NMPC "evaluate the impacts of project operations on the fisheries of the Mohawk River downstream of the School Street Project powerhouse". The draft study plan that was submitted to the agencies was designed to respond to the question posed by Federal Energy Regulatory Commission. FERC requested the baseline study in order to define the existing fishery being influenced by the current mode of operation. FERC did not request alternative operations studies, but simply asks what fish exist in the Mohawk River given current conditions. Each seasonal study is estimated to be three days in length. Altering flow conditions for such a short period would in no way provide adequate information regarding hypothetical enhancement conditions. Years would be required to detect fish population changes in response to new flows. Such studies may not be conclusive due to the large number of

variables influencing riverine fish populations. FERC is interested in the impact of the project on the existing representative fish community. For this reason the study proposes to collect fish at existing flows only.

In its draft study plan, NMPC proposed to expand the study area for the School Street Project to include sampling in the bypass and impoundment areas concurrently. The Fish Resources Baseline Study Plan outlines sampling frequencies which will provide a complete picture of the species and size distribution present. The schedule in the draft study plan originally had the period mid May to mid June picked for the late spring sampling event. The USFWS comments were received on May 20, 1993 and the NYSDEC comments were received on June 3, 1993. After receipt of the agency comments, it was discussed whether to proceed with the study as planned or whether to do nothing and wait for FERC approval of the study plan. NMPC decided that it would attempt to show good faith and commence with the study effort considering that the only real area of dispute was with the NYSDEC's request for increased sampling frequency which could be decided at a later date. In order for the late spring data to be collected, crews were mobilized during the week of June 14, 1993. Unfortunately with the quick response, NMPC's consultant was only able to alert the agencies of the scheduled event concurrently with deployment of the field crew. Every effort will be taken to give the NYSDEC and the USFWS as much advance notice as possible prior to the summer and fall sampling events.

We are hereby requesting clarification from the FERC on the required sampling frequency. An expeditious review of this document would be appreciated so that the study goals for this summer field season can be accomplished.

If you have any questions, please call.

Sincerely,

KLEINSCHMIDT ASSOCIATES

Gary Liimatainen

Gary L. Liimatainen
Project Manager

GLL:gls
cc: Len Corin, USFWS
Ed Miller, NYSDEC
Jerry Sabattis
Dave Falcinelli
Andrew Sims
Brandon Kulik

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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D C 20428

Project No. 2539-003 - New York
School Street Project
Niagara Mohawk Power Corporation

JUN 29 1993

Mr. Jerry L. Sabattis
300 Erie Boulevard West
Syracuse, NY 13202

Dear Mr. Sabattis:

We were advised by the U.S. Fish and Wildlife Service's (FWS) June 16, 1993 letter (copy enclosed) that you have commenced field studies to satisfy the fishery information requests in the additional information request number 4 for the School Street Project, No. 2539 dated September 2, 1992. The FWS has not received a copy of the final study plan. The plan to be developed to satisfy the requirements of AIR No. 4 specified that: (e) Documentation of Consultation with DEC and the FWS prior to initiating the study, including specific descriptions of how all agency comments and recommendations were accommodated by the plan.

You are requested to provide an explanation of the steps you have taken to consult with the New York State Department of Environmental Conservation (DEC) and FWS in the development of the study plan. If you have not consulted with these agencies, explain why you have not. If you have not consulted with these agencies describe your steps and schedule for doing so. You should discontinue any studies you have started until you have submitted a copy of your final study plan to FWS, DEC and for our review and approval.

You have 30 days from the date of this letter to file the above requested information. Should you have any questions pertaining to the above, please call John Novak at (202) 219-2828.

Sincerely,

Dean L. Shumway
Director, Division of
Project Review

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DEPARTMENT

JUL 06 1993

NIAGARA MOHAWK POWER CORP.

Enclosure

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June 30, 1993

Mr. David Bryson
U.S. Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

School Street Project (FERC No. 2539)
Fish Resource Study

Dear Mr. Bryson:

Niagara Mohawk Power Corporation (Niagara Mohawk) is engaging in a study of the distribution and abundance of fish species at the School Street Project on the Mohawk River, pursuant to the FERC Additional Information Request (AIR) of September 2, 1992.

The field effort is based both on a study plan submitted for your comment on April 16, 1993, and pertinent comments received from both the USFWS and the New York Department of Environmental Conservation (NYSDEC). Comments pertaining to this study were provided by your office in a letter dated May 20, 1993. In that letter, the USFWS specified that "Niagara" notify the "Service" and NYSDEC if any sampling difficulties are encountered.

As you are aware, the first sampling effort was completed during the week of June 14, 1993. In accordance with your request, we wish to advise you of sampling problems which were encountered, and minor modifications to the field effort which were made to address these unforeseen field conditions.

1.0 BOAT ELECTROFISHING IN THE TAILWATER AREA OF THE PROJECT

Under the prevailing field conditions, a shallow, boulder/ledge rapids restricts navigation of a conventional electrofishing boat from the only available launch site (in Cohoes) upstream to the immediate vicinity of the tailrace. As an alternative, the suitably navigable portions of these rapids were sampled using boat electrofishing, and wadable shoal areas were also sampled with a combination of backpack electrofishing used in conjunction with a block net.

We are investigating the feasibility and availability of use of a modified sampling boat which may surmount the navigation problem in the future, and therefore permit more flexibility in electrofishing. We will update you on the feasibility of this alternative

method once the details are known. However, due to the hazards of navigation in rapids, any future electrofishing in this reach must be conducted during daylight hours for purposes of field crew safety, and to avoid damage to watercraft.

2.0 BYPASS REACH SAMPLING

As stated on page 6 of the draft study plan, it was assumed that backpack shocking, beach seining and trap nets would be used to sample fish. Our site experience was that backpack shocking was an effective technique in the lotic segment of the bypass reach, but that there is only a limited amount of wadable lotic habitat. Beach seining was not effective due to the rocky, snag-filled nature of the substrate found throughout wadable portions of the bypass reach, and was abandoned after several unsuccessful attempts. Several deep, unwadable pools located both above and below the Cohoes Falls were not amenable to sampling using any of the techniques originally proposed for the bypass reach; however, these areas were successfully sampled using 125-ft experimental-mesh panel gill nets, which were stretched across the pools, and anchored to opposing shorelines. This proved to be an effective sampling technique.

3.0 IMPOUNDMENT SAMPLING

The impoundment was sampled as proposed, with all boat electrofishing occurring at night, as requested by NYSDEC and USFWS. However, a limited upstream portion of the impoundment immediately adjacent to the Crescent Dam could not be safely navigated at night, due to the existence of rocky shoals and turbulence.

Although we attempted the NYSDEC's "protocol" for sampling (*i.e.* one complete lap around the impoundment, etc. except the small un-navigable zones noted above), all parties should be aware that this protocol is intended to be limited to *centrarchid population sampling* only, and may not necessarily be directly applicable to this study; for example different protocols are recommended by NYSDEC for esocid, percid and general fish community sampling (NYSDEC Bureau of Fisheries, 1989).

Another drawback of using the referenced protocol is that spatial distribution differences for species among varied habitat types in the impoundment cannot be well documented if all habitat types are homogenized into one sample. Our recommendation is that it may be more informative to sub-divide the impoundment shoreline into several sampling stations, based on discrete differences in habitat. Our opinion is that this would result in approximately three more-or-less contiguous separate sampling stations, which could be accommodated without any significant increase in field logistics.

Please let us know if you think this is an appropriate scope modification. If the USFWS and NYSDEC do not advise us differently, we will assume that the practice of following the so-called "protocols" for impoundment electrofishing is what each agency prefers.

If you have any questions or wish to further discuss these issues, please call.

Sincerely,

KLEINSCHMIDT ASSOCIATES

Gary Liimatainen
for Brandon H. Kulik
Fisheries Biologist

BHK:gls
cc: D. Shumway
E. Miller
D. Falcinelli
G. Schoonmaker
G. Liimatainen

TELEPHONE DISCUSSION NOTES

DATE:	July 30, 1993	PROJECT:	School Street and Hoosic Fish Baseline Studies
TIME:	11:30 a.m.	TALKED WITH:	Norm McBride
PLACED:	X RECEIVED:	FROM:	NYSDEC
BY:	Brandon H. Kulik		

I called Norm McBride at the recommendations of Dave Bryson and Tim Post, regarding fish collecting techniques at the School Street (FERC No. 2539) and Hoosic (FERC No. 2616) Projects. He is the regional fisheries biologist for the New York State Department of Environmental Conservation (NYSDEC). According to Messrs. Bryson and Post, Norm McBride knows the sites thoroughly and authored many of the NYSDEC written comments regarding fish resources at the referenced projects.

School Street

I described the access difficulties involved with sampling the tailwater area. Mr. McBride had never sampled that location, but indicated his belief that a small jonboat (14 ft) with a lightweight motor and small electrofishing unit might be dragged upstream through the shallow rapids located between the School Street tailrace and the New York State Dam impoundment.

He agreed, however, that electrofishing would not be effective in the channel immediately below Cohoes Falls. I described the netting technique we used there; he felt that netting was probably the best alternative, given the site limitations, but feels that electrofishing would generate a more balanced picture of the size and abundance of bass in that river segment. He also seemed comfortable with the boat shocking effort we conducted in the lower riffle and the upper part of the New York State Dam impoundment.

DISTRIBUTION: Tim Post, Norm McBride, Mark Woythal, Dave Bryson, Steve Patch, Bob Bell, Dave Falcinelli, Scott Shupe, Gary Schoonmaker, Gary Liimatainen, Jon Christensen, William Hearn, Tina Jones

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We discussed my concerns about strict adherence to the NYSDEC "guidelines" for impoundment electrofishing (four (4) 15-minute samples, plus one lap around the entire impoundment). 15-minute samples can be lumped. He agreed that the alternative approach of breaking up the shoreline into a series of contiguous, linear habitat sampling stations was an acceptable alternative, and that this alternative would probably provide more information regarding fish distribution within the impoundment. (NOTE: Dave Bryson had earlier agreed to the proposal, when discussed at the School Street site on July 13, 1993).

Norm also stated that there was a robust smallmouth bass fishery throughout the Mohawk River, with excellent capture rates by anglers. He has recently completed a tagging study of Mohawk River smallmouth bass, which shows that 80% of the bass do not migrate, 14% migrate downstream, and 4% migrate upstream slightly. He agreed to send me a copy when he returns from vacation in two weeks.

Hoosic Project

I expressed concern about sampling the deep, unwadable pocket plunge pools in the upper bypass reach. Norm agreed that the plunge pools were unwadable, and not amenable to electrofishing or net sampling. He suggests qualitative observation, such as by snorkeling or some other techniques. Backpack shocking, seining and trap netting may be acceptable in the riffle and pool segments of the middle and lower bypass reach.

Norm recommends boat electrofishing in the lowermost extreme of the bypass reach, as well as contiguous segments of the tailrace and downstream reach. He does not recommend venturing far downstream from the project, as there are difficult to navigate shoals and ledge areas.

Electric Lake may be trailer-accessed from private property adjacent to the west end of the railroad causeway, with landowner permission, assuming the culvert and outlet riffle is unnavigable from the main impoundment. Mr. McBride previously sampled both Electric Lake and the main impoundment with three gill net sets each and both lakes for 1.5 hours of electrofishing ("unacceptably low electrofishing effort by today's standards" - NM) , and will copy us on his related report.

We also discussed the upcoming study task involving the origin of fish in the Schaghticoke bypass. I asked Mr. McBride if he knew what specific concern was driving this request. He did not know what issue specifically triggered this FERC request, nor the context of it; he "was surprised to read it". He feels the most common taggable residents and recruits to this reach would be rock bass smallmouth bass, walleye and white sucker (spring spawning), and blueback herring.

Mr. McBride felt that our study proposal for floy tagging was flawed, because:

1. Floy tags might alter fish behavior, growth or survival

2. There probably aren't the targeted 500 fish per species available (at least in the impoundment and bypass) available to tag.

I clarified that the 500-fish target was a maximum, not a minimum objective, and that it might actually be achievable below the powerhouse, depending on the effort applied downstream, and after two series of fish marking efforts (*i.e.* summer and fall). This is significant, since most spring spawning recruits would probably originate in either the reach itself, or come up from downstream reaches.

He agreed that the overall study design was acceptable, but that we should consider fin-clipping or fin hole punching as an alternative to tagging. I told him my concerns with clipping or punching were:

1. regrowth of fin prior to study conclusion
2. inability to distinguish time and exact location that a recaptured fish was originally captured and marked

We did not resolve this issue, but I said we would take his recommendations under consideration, and noted that FERC was reviewing both the NYSDEC comments and ours, presumably to approve a final plan.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

Project No. 2539-003-NY
School Street Hydroelectric Project
Niagara Mohawk Power Corporation

AUG 10 1993

Mr. Jerry Sabattis
Licensing Coordinator
Hydro Licensing & Regulatory Compliance
300 Erie Boulevard West
Syracuse, New York 13202

Dear Mr. Sabattis:

We have reviewed the letters of June 21 and July 2, 1993, requesting review of your proposed study plan to evaluate fisheries communities of the Mohawk River, prepared by Kleinschmidt Associates on behalf of the Niagara Mohawk Power Corporation (Niagara Mohawk). The proposed supplemental fisheries study plan is adequate except for the issue of seasonal sampling frequency.

The major area of disagreement between Niagara Mohawk, the New York Department of Environmental Conservation (NYSDEC) and the U. S. Fish and Wildlife Service (USFWS) appears to be with the sampling frequency requirements.

NYSDEC and USFWS interpret the original AIR No. 4 to require an evaluation of fisheries on a seasonal basis. Therefore, the resource agencies state that the frequency of sampling is not adequate to satisfy the AIR. You have recommended sampling the fishery communities in the project area over three-day intervals during late spring, summer and fall, while the resource agencies have requested biweekly sampling from March through November.

Seasonal sampling of fishes in the area or fish passage is not evident from previous studies. Your proposed sampling frequency would not provide sufficient additional information related to seasonal fisheries or fish movement.

The proposed supplemental fisheries study adequately responds to AIR No. 4 except for the issue of seasonal sampling frequency. We concur with NYSDEC and the USFWS that seasonal sampling is necessary. Specifically, seasonal sampling will provide an indication of seasonal utilization. A spring sampling period is necessary since this may be the primary spawning period

for species that potentially inhabit the project area, such as smallmouth bass and walleye. Summer sampling will provide an indication of which species survive under adverse conditions of low flow and high temperature and are therefore likely present year round. Fall sampling is important to determine any potential fall spawning runs and whether flow or temperature limitations are reduced.

We understand that for scheduling reasons, you have gone forward with the study plan as submitted and will await guidance from the Commission as to the required level of effort (i.e., sampling frequency). The current study plan will satisfy the summer sampling requirements. Additional sampling in the fall (October, 1993) and the spring (April/May 1994) are required to adequately address the issue of fish movement within the project area. We recognize your concerns with respect to potentially hazardous conditions during early spring flows. However, spring sampling is necessary to determine potential runs of spring spawning species. In this regard, the spring sampling may be contingent on river flows to avoid safety concerns, which you should coordinate with the participating resource agencies.

Accordingly, you must conduct additional sampling at the School Street Project following the protocol identified in the June 21, 1993 letter on the Fish Resources Baseline Study in response to AIR No. 4. Particularly, you must consult with the resource agencies to identify adequate dates and extend the studies to include monthly sampling throughout the fall, 1993, and April and May 1994. Study results must be filed with the Commission by July 15, 1994.

You must file agency comments on your study results. You must allow a minimum of 30 days for the agency to respond before filing the information. If the agencies do not reply, you should provide the Commission with dated copies of the letters of request.

In conjunction with this requested information, you must file three-month progress reports with the Secretary of the Commission. The reports should include identification of any conferences or meetings, copies of any important correspondence, letters of consultation and studies or study conclusions, and a schedule for completing any remaining work. The first report will be due on October 1, 1993.

We are aware that you propose to file a fish protection plan for the School Street Project before the end of 1993. Should you elect to file fish protection plans for the School Street Project that adequately protect upstream and downstream passage of fishes, additional fish baseline study sampling may not be needed. Should such a fish passage plan be filed with the Commission, you may request relief from the remainder of the sampling associated with AIR No. 4.

Within 5 days of receipt, provide a copy of this letter to all agencies you will consult in response to this letter. Then, when you file the requested information with the Commission, you must file a complete copy of the information to each agency consulted under Section 16.8 of the regulations and the service list entities. You are advised to contact Mr. John Novak on (202) 219-2828 with any questions.

Sincerely,

Edward J. Fowlkes

for Dean L. Shumway
Director
Division of Project Review

cc: Ronald Pisani
365 S. Main Avenue
Albany, NY 12209

William Corrigan
601 Beacon Street
Glenville, NY 12302

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Kleinschmidt
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Associates
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75 Main Street P.O. Box 576
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207-487-3328
207-487-3211

August 23, 1993

Mr. Ed Miller
NYS Dept. of Environmental Conservation
50 Wolf Road
Albany, NY 12233

School Street Project (FERC No. 2539)
Fish Resource Baseline Study Plan

Dear Mr. Miller:

By letter dated August 10, 1993, the Federal Energy Regulatory Commission (FERC) approved Niagara Mohawk Power Corporation's (Niagara Mohawk) Fish Resource Baseline Study Plan for the School Street Hydroelectric Project (see Niagara Mohawk's transmittal to you, dated August 18, 1993). In their letter, FERC stated that the proposed study adequately responds to Additional Information Request (AIR) No. 4 except for the issue of seasonal sampling frequency.

FERC has requested that Niagara Mohawk consult with both the New York State Department of Environmental Conservation and the U.S. Fish and Wildlife Service to identify adequate dates that would extend the studies to include monthly sampling throughout the fall of 1993 and in April and May of 1994. In order to address FERC's request regarding the fall sampling, Niagara Mohawk is proposing to sample during the weeks of September 20th, October 11th, and November 8th, 1993. Niagara Mohawk would like to defer consultation regarding the spring sampling until a later date. We would appreciate receiving a response to the proposed fall sampling schedule as soon as possible. Please call if you have any questions.

Sincerely,

KLEINSCHMIDT ASSOCIATES

Gary L. Liimatainen
Project Manager

GLL:gls
cc: Robert Bell
Dave Falcinelli
Gary Schoonmaker
Brandon Kulik

Kleinschmidt
KA
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Consulting Engineers
75 Main Street P.O.Box 576
Pittsfield, Maine 04967
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207-487-3211

March 24, 1994

Mr. David Bryson
U.S. Fish & Wildlife Service
3817 Luker Road
Cortland, NY 13045

Mr. Edward Miller
NY Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233

School Street Project (FERC No. 2539)
Niagara Mohawk Power Corporation
Fish Resources Baseline Study Status Report

Dear Gentlemen:

On December 21, 1991, Niagara Mohawk Power Corporation (Niagara Mohawk) submitted an application for new license to the Federal Energy Regulatory Commission (FERC) for the School Street Project (FERC No. 2539). The Commission responded by letter dated September 2, 1992 requesting additional information on the School Street Project fisheries community with particular focus on the tailrace area below the bypass reach. In compliance with AIR No. 4, Niagara Mohawk consulted with the U.S. Fish and Wildlife Service and the New York State Department of Environmental Conservation and filed with the Commission, a Fish Resources Baseline Study Plan dated June 21, 1993. With some increase in sampling frequency, FERC approved this plan by letter dated August 10, 1993.

Work Completed to Date

In the above-referenced approval letter, FERC required Niagara Mohawk to collect data which would indicate the seasonal utilization patterns of the resident fish species in the project impoundment, bypass reach, and tailwater areas. Based upon the FERC approval letter, a seasonal sampling approach was established to provide data to allow assessment of the impact of project operation on the existing fish community. In addition to the collection of general fish abundance data, sampling during each season portrays certain biological cycles. Smallmouth bass and other centrarchids were collected and observed to be nesting and/or were gravid during the June, 1993 collection,

indicating that our sample corresponded with the late spring centrarchid spawning period. Centrarchid spawning is typically initiated when ambient water temperature reaches 17°C, when nesting begins (Smith, 1985). The summer sampling was timed to give an indication of fish abundance under conditions of low flow and high temperatures, well after spawning. This sample was obtained in August, 1993, under the referenced conditions. Fall sampling was scheduled to occur at the end of the growing season, and under conditions of falling water temperature. Fall samples collected during September, October, and November, 1993 spanned the outmigration period for juvenile blueback herring, and also detected young-of-year fish present in the project area. Sampling was not requested for the winter season, nor would it have been feasible.

The only remaining seasonal period to be assessed is early spring. The significance of the early spring sample is discussed in detail below. With the exception of this sample, the completion of which is contingent on safety and river flows, Niagara Mohawk has collected the requested data on seasonal fish distribution in the School Street Project area.

Early Spring Sample

A spring sample was requested by the Commission " . . . since this may be the primary spawning period for species that potentially inhabit the project area, such as smallmouth bass and walleye." As discussed above, spawning smallmouth bass were documented during the June, 1993 sampling. Walleye and other early spring spawners (*e.g.* yellow perch) move into their spawning grounds and may commence spawning activity following the thaw, when water temperatures are in the range of 2° - 7°C (Smith, 1985).

From discussions with the regional NYSDEC fisheries office, we have concluded that any walleye potentially in the vicinity of the project area would typically be expected to spawn during the first half of April (Norm McBride, personal communication). Most of the School Street Project area is typically inaccessible for sampling at that time, due to heavy flows and spillage at the dam and Cohoes Falls, which create unsafe conditions. Based upon our review of the flow duration curves, spillage occurs approximately 85% of the time during April.

Mr. McBride has questioned the value of attempting to sample for walleye spawning in the project area. He noted that spawning walleye abundance in the project area would probably be limited due to a) the small amount of suitable spawning substrate (*i.e.*, rubble and cobble) present in the area below the Crescent dam and the area below the School Street Project tailrace, and b) the isolation of these sites from areas where spawning walleyes would congregate in any abundance in the Mohawk River.

As an alternative, NYSDEC has suggested that Niagara Mohawk sample fish abundance immediately following the cessation of spillage at the School Street Project as early in the spring as possible, with the sampling to include the bypass reach (Tim Post, personal communication). Based on the flow duration curve for the month of April,

spillage at the project would be expected to continue until very close to the end of the month on any but a dry water year. If the spring of 1994 proves to be exceptionally wet, spillage may not terminate until late spring. In this case, a sample following the end of spillage would potentially result in the collection of a late spring sample providing no information on early spring spawners, and would be redundant relative to that gathered in late spring 1993.

Niagara Mohawk is proposing to sample during the early April period to coincide with any walleye spawning activity and to collect data on other early spring spawners (*e.g.*, yellow perch), provided that site conditions are safe for the field crew. If spillage (*i.e.*, unsafe sampling conditions) persists during the early April period, Niagara Mohawk is proposing to collect data as soon after the spillage event as possible to document effects of the post run-off period provided the water temperature is within the 2 - 16°C range typically associated with early spring spawning. If water temperatures are above 16°C, the sample would be redundant of the late spring 1993 sample, and Niagara Mohawk would not perform a sample, but would proceed to submit a report on fish sampling consistent with the FERC filing date requirements.

We would appreciate your response to this proposal, as soon as possible, so that decisions pertaining to early spring sampling can be made prior to the onset of field season. To expedite consultation, we suggest an informal (verbal) response prior to April 1, to be followed by a formal response as soon after that as possible. Absent any response, Niagara Mohawk will proceed as described above.

If you have any questions or comments, please contact me.

Sincerely,

KLEINSCHMIDT ASSOCIATES

Brandon Kulik

Brandon H. Kulik
Senior Fisheries Biologist

BHK:gls
cc: Bob Bell
Tim Post
Dave Falcinelli
Gary Schoonmaker
Gary Liimatainen
Jeff Murphy

New York State Department of Environmental Conservation
Division of Regulatory Affairs - Room 514
50 Wolf Road, Albany, New York 12233-1750
Telephone: (518) 457-2224

Langdon Marsh
Acting Commissioner

March 30, 1994

Mr. Brandon H. Kulik
Kleinschmidt Associates
75 Main Street
PO Box 576
Pittsfield, Maine 04967

RE: FERC-2539 - School Street Hydroelectric Project
Fish Resources Baseline Study Status Report

Dear Mr. Kulik:

We have reviewed your March 24, 1994 letter regarding the Fish Resources Baseline Study Status Report and offer the following:

-- Page 2, last paragraph... Tim Post indicated that sampling during the walleye spawning period was needed. Walleye spawing activities are expected to occur during April. If river flows permit safe access to the river, then sampling should be done. Sampling outside the walleye spawning period could be limited to the bypass reach; and

-- Your proposed sampling protocol appears appropriate.

I may be reached at (518)457-2224 if you have any questions.

Sincerely,

Edward R Miller

Edward R. Miller
Environmental Analyst II
Project Management Section
Division of Regulatory Affairs

ERM:lk
cc: L. Cashell (FERC)
M. Robinson (FERC)
A. Sidoti (FERC-NY)
D. Stilwell (USFWS)

cc: G. Limabarman
J. Murphy

FACSIMILE
TRANSMITTAL

U.S. FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, New York 13045

PHONE: (607) 753-9334 FAX: (607) 753-9699

To: Brandon Kulik (KA); Tim Post (NYSDEC)

From: Dave Bryson, FERC Coordinator

Date: May 27, 1994

Pages: 1

Subject: May 27, 1994, FAX regarding School Street Project Sampling Provisional Field Schedule.

I received and reviewed the above-mentioned FAX and have the following comments.

1) Dates are not definitive - I assume "TUES:" is May 31, 1994 and "WEDS:" is June 1, 1994. Please let me know if this is incorrect.

2) The FAX states "F.Y.I. ASSUMES NO SPILLAGE IN BYPASS REACH" I note that spillage into the bypassed reach is a frequent occurrence. The Service has previously commented and reiterates that fish sampling should occur during the existing conditions - which includes periods when spillage occurs. We recognize that, depending on the amount of water spilling, the consultants may need to utilize special safety equipment. It is not unreasonable for cables and safety lines to be used during sampling. In fact, use of this type of equipment is recommended. The Service does not concur that sampling should be postponed if spillage into the bypassed reach occurs during the planned sampling event.

KLEINSCHMIDT ASSOCIATES
Consulting Engineers

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

June 3, 1994

Mr. Timothy J. Post
N.Y. State Department of Environmental Conservation
50 Wolf Road, Room 530
Albany, New York 12233-1010

Mr. David Bryson
U.S. Fish and Wildlife Service
3817 Luker Road
Cortland, NY 13045

School Street Project (FERC No. 2539)
Draft Fisheries Baseline Study Report

Dear Gentlemen:

Enclosed for your review and comment is a report summarizing the seasonal abundance and distribution of fish in the Mohawk River within and immediately downstream of the School Street Project. This study was conducted in response to the FERC Additional Information Request dated September 2, 1992.

Fish sampling extended from spring (June) 1993 through spring (May) 1994 in order to portray seasonal changes in fish species utilization of the project impoundment, bypass reach, and tailwater area downstream from the Project. High discharge conditions of early spring delayed 1994 sampling from April until May.

At this writing, the data and analyses from this spring are still being processed; however, we have developed most of the text, and most of the data into the enclosed draft report in order to provide you with the opportunity for a timely review prior to the FERC filing deadline of July 15, 1994. We are presently preparing supplemental text, tables etc. to present our spring 1994 data and conclusions, and will forward this material to you as soon as possible.

SOUTHEAST OFFICE • 101 Trade Zone Drive • Suite 22A • West Columbia, SC 29170 • Phone: 803-822-3177 • Fax: 803-822-3183
NEW YORK FIELD OFFICE • 306 South Salina Street • Syracuse, New York 13202 • 315-479-8803

In order to formally incorporate your comments into the FERC filing, we request that we receive written comments by July 6, 1994. Please contact either Gary Liimatainen or me with any technical questions or comments pertaining to the draft report.

Sincerely,

KLEINSCHMIDT ASSOCIATES

Brandon H. Kulik
Senior Fisheries Biologist

BHK:gls
Encl.
cc: E. Miller
D. Falcinelli
J. Sabattis
G. Schoonmaker
G. Liimatainen

282-027-95-03
040-282.wp/282-00R

KLEINSCHMIDT ASSOCIATES
Consulting Engineers

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

June 21, 1994

Mr. Timothy Post
N.Y. State Department of Environmental Conservation
50 Wolf Road, Room 530
Albany, New York 12233-1010

Mr. David Bryson
U.S. Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

School Street Project (FERC No. 2539)
Draft Fisheries Baseline Study Report Supplement

Dear Gentlemen:

On June 3, 1994, Kleinschmidt Associates submitted to your office a draft preliminary report on fish abundance, based on fish sampling during 1993 at the School Street Project. As noted in the transmittal letter, that report was issued to facilitate your initial review of site data in advance of the FERC filing deadline, and as a result, did not include data and conclusions based on spring 1994 survey, which was undergoing processing and analysis at that time.

The additional data and text have now been prepared. Revised tables, figures and pertinent text sections are included, and should be substituted and/or inserted as indicated by their numbering sequence.

In order to formally incorporate your comments into the FERC filing, we request receipt of written comments by July 6, 1994.

Sincerely,

KLEINSCHMIDT ASSOCIATES
Brandon H Kulik

Brandon H. Kulik
Senior Fisheries Biologist

BHK:gls
Encl.
cc: E. Miller
N. McBride
D. Falcinelli
G. Schoonmaker
G. Liimatainen

282-027-95-03/053-282.wp/282-00r

SOUTHEAST OFFICE • 101 Trade Zone Drive • Suite 22A • West Columbia, SC 29170 • Phone: 803-822-3177 • Fax: 803-822-3183
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, New York 13045

June 28, 1994

Mr. Brandon H. Kulik
Senior Fisheries Biologist
Kleinschmidt Associates
75 Main Street
P.O. Box 576
Pittsfield, ME 04967

Dear Mr. Kulik:

This letter is written in response to Kleinschmidt Associates' (KA) request for the U.S. Fish and Wildlife Service (Service) to "review and comment" on the Draft Fisheries Baseline Study Report for the School Street Project, FERC No. 2539. The materials we received on June 7, 1994, indicated that KA is preparing supplemental text, tables, etc., to present spring 1994 data and conclusions, and will forward this material to the Service as soon as possible. KA states that to meet the Federal Energy Regulatory Commission's (FERC) filing deadline of July 15, 1994, the Service's written comments should be received by KA no later that July 6, 1994.

The Service considers the materials provided to be inconsistent with the plan and schedule required by the FERC. To explain, KA's June 21, 1993, letter to the FERC stated that, "Copies of the field data sheets will be provided to the USFWS and the NYSDEC [New York State Department of Environmental Conservation] upon completion of the study and report of the results to the FERC." The Service has not received copies of the original field notes and data sheets. In order to fully evaluate the report, its presentations, and conclusions, KA should immediately forward this information to the Service. Furthermore, the FERC's letter of August 10, 1993, instructed Niagara Mohawk Power Corporation (NMPC) to "allow a minimum of 30 days for the agencies to respond before filing the information." The materials we recently received do not adhere to this FERC directive.

Since we consider the information provided to be preliminary, the Service will need to be provided with all of the study results before final comments and recommendations can be completed. Never-the-less, to initiate the necessary interactive response to the information presented, the Service has provided some initial comments below.

Preliminary Comments

Study Plan - page 2. The document states that, "As per the AIR [additional information request] a draft plan was submitted to the [agencies] on April 16, 1993...." Although the AIR was issued on September 2, 1992, the Service was not provided a study proposal until nearly 8 months later. This delayed the licensing process.

Description of the Project - page 3. The document states that, NMPC "...proposed to install a sixth turbine-generator unit to reduce impoundment fluctuations from three feet to one foot and provide a minimum flow of 60 cfs to the project bypass...." This proposal was substantially different than the draft application, wherein a small minimum flow unit was proposed. The sixth large generating unit was not mentioned.

page 3. The text suggests that Cohoes Falls is approximately 60 feet high; however, some estimates consider the falls to be 80 feet tall.

page 5. The photograph of the School Street Project is unclear.

page 6. The document describes the lower bypassed reach as a back-watered pool. Please explain how this determination of back watering was made. Indicate when and where water velocities were measured and/or flow vectors evaluated.

The Service notes that leakage from the canal also enters the river below the falls and upstream of the project tailrace.

The text suggests that, "... the tailwater is generally void of significant velocity shelters or other quality cover types." This statement lacks supporting quantified data. In many situations, sufficient depth may be considered cover, which in turn, is a critical component of habitat. It appears that the center section of the downstream riffle was not sampled or evaluated under all field conditions. Please provide depth and velocity measurements, cross-sectional drawings, and/or other mapping data which assess the available habitat of this area.

Study Methodology - page 7. The text states that seasonal samples were obtained to "determine relative fish abundance, size frequency distribution, seasonal utilization and distribution of fish species present within the School Street Project." However, the FERC requested populational statistics including "standing stock", "percent abundance", and "size frequency distributions".

The document states that sampling stations were resampled on subsequent trips "unless prevented by extenuating field conditions (e.g. spillage flows)." Spillage never-the-less represents an existing condition. Cables could have been used to sample areas of the bypassed reach during spill flow events. This is a common practice when sampling areas of high gradient or high water velocities.

A brief description of the data collected is given; however, species, length, weight, and spawning condition were also to be recorded onto the field sheets.[1] Please provide the Service with copies of all field notes as required by the approved study plan.

page 8. The document states that, "Due to limited areas in the School Street project where seining could occur and a ledge substrate that frequently snagged the net, this gear type was not effective in collecting fish and was abandoned during the June sample, and

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[1] See letter from KA to the FERC dated June 21, 1993.

not attempted during subsequent sampling efforts." This action represents a major deviation from the approved study plan.

Figure 2. Impoundment Sampling Locations - page 10. There is an illegible comment at the bottom of the figure. In addition, we note that the "Not Safely Navigable" area depicted downstream of the Crescent Dam could have been electrofished, especially during non-spill conditions. This area represents unique riffle-type habitat which may be utilized as a walleye spawning site.

page 11. Although the text states that high flows prevented nets from being set in the reservoir during November, please indicate whether net sampling occurred during October.

The document suggests that, "Sampling occurred during leakage conditions both for safety reasons, maximum access, and to portray fish resources under existing conditions [emphasis added]." We note that spillage is an existing condition.

Figure 3 - page 12. Portions of the figure are illegible. Please provide a clear copy.

page 13. The statement that, "Night-time boat electrofishing was not feasible for safety reasons and would not have been temporally consistent [emphasis added] with other bypass electrofishing." We note that was not consistent with the study since night-time sampling was required.

Figure 4 - page 14. Note: the large, center section of the shallow rapids downstream of the project tailrace was not sampled.

Biological Data - **Page 18.** The text states that, "A number of dead or dying adult blueback herring were observed floating throughout the impoundment." These observations may reflect the effects from turbine entrainment at the upstream Crescent and Vischer Ferry hydroelectric projects.

page 19. Although dissolved oxygen (DO) concentration ranges are given, it is not clear whether these data reflect only day-time samples. DO values are typically the lowest prior to dawn since respiration of green plants has taken place overnight. Please explain whether night-time or pre-dawn measurements were taken. Also, please identify the flow rates occurring within the reach sampled.

Biological Data - **page 21.** Species abundance percentages may not be accurate. To explain, 12% is likely an underestimate of the percent abundance for blueback herring.

6.0 Discussion. Until the Service receives copies of the actual field notes, we cannot comment fully on this section.

Tailwater - page 35. Classifying the tailwater as "poor cover rapids" may be inappropriate since substantive portions of the first downstream riffle were unsampled. In fact, the deeper, un-wadeable portions in the center of the rapids were not sampled by

back-pack electrofishing gear. Since a large portion of the riffle was not sampled, the classification of "poor cover" may be inappropriate.

The indication that catch per unit effort (CPUE) in the tailwater is low, may reflect the sampling techniques used and the skill of the samplers. Thus, comparisons of CPUE may not yield a clear assessment of the fish abundance and diversity. Sampling a large riffle with backpack electrofishing equipment may not be a very effective sampling technique.

Table 7 Gear collection efficiencies may be reflected here. Please provide field notes so the Service can evaluate further.

Table 8 Habitat classifications should be displayed on a map.

Table 9 We disagree that 5 mg/l is the "generally accepted minimum level for dissolved oxygen." The Environmental Protection Agency has stated that "moderate production impairment" of the early life history stages of warmwater fish occurs at 5.0 mg/l; DO levels of 6.5 mg/l and above may reflect the "no production impairment" level.[2]

The lower lethal temperatures indicated do not hold true in New York State. For example, largemouth bass probably would not over-winter in New York if water temperatures 5 degrees Celsius or lower were lethal.

Table 10 Please identify whether ages of fish were determined from actual field samples. Note: within the Mohawk River system, juvenile blueback herring in the 80-150 mm length range may be age 0+.

Figures 6a,b, & c. The demarkation of monthly increments did not copy clearly. Please provide legible copies.

Figures 8 & 9 Please explain whether these figures reflect the summation of all samples.

Appendix C Fish Sampling Data. Please provide copies of actual field notes and observations. Information on fish weights is missing.

Appendix D FERC-approved Study Plan Note: this plan was modified by the FERC's letter of August 10, 1993.

Appendix E Copies of the photos are unclear. Please provide clear copies of these photos.

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[2] See Environmental Protection Agency. 1986. Ambient water quality criteria for dissolved oxygen. EPA 440/5-86-003, Washington, D.C.

The Service appreciates the opportunity to provide these preliminary comments. We look forward to receiving the additional information as required and requested. Should you have further questions, please contact Dave Bryson at (607) 753-9334.

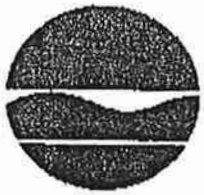
Sincerely,

David A. Stilwell

David A. Stilwell
Acting Field Supervisor

cc: NMPC, Syracuse, NY (T. Fair, T. Barren, J. Sabattis)
NYSDEC, Albany, NY (T. Post, W. Sarbello, P. Hulbert, E. Miller)
NYSDEC, Stamford, NY (N. McBride)
NYSDEC, Utica, NY (J. Hasse)
NMFS, Milford, CT (C. Collins, M. Ludwig, A. Blott)
USFWS, Hadley, MA (K. Orvis, A. Hoar)
DOI, Newton Corner, MA (B. Rizzo)

New York State Department of Environmental Conservation
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Langdon Marsh
Commissioner

July 11, 1994

Mr. Brandon H. Kulik
Kleinschmidt Associates
75 Main Street
P.O. Box 576
Pittsfield, ME 04967

Re: FERC-2539 - School Street
Hydroelectric Project - Draft
Fisheries Baseline Study Report
and Supplement

Dear Mr. Kulik:

We have reviewed the above referenced documents dated June 3, 1994 and June 21, 1994 and offer the following comments.

-- Boat and backpack electrofishing collections are not comparable. The report combines the data and treats the catch per unit effort (CPUE) between the two gear types as the same. The data for the gear types should be reported separately. Sampling a large river body such as Mohawk River with backpack shocking gear is not effective, especially in areas of greater depth. While backpack shocking may be the only technique available and will provide useful information, the CPUE's cannot be combined or compared.

-- Day and night electrofishing data were also combined. Night electrofishing usually has much higher catch rates. This data should also be reported separately.

-- CPUE is most relevant if information is provided to show the time sampled. The length of the sampling period, type of habitats sampled, depths sampled, etc. Discussion on how various techniques, times, habitats resulted in higher/lower catches should also be included.

-- The report combines the data for the bypassed reach. There are two distinct bypass reaches; an upper bypassed reach (above Cohoes Falls), and a lower bypass reach (below the falls and accessible from State Dam impoundment) which is backwatered during generation periods at School Street. These two areas are quite different in their characteristics. The data for these two sections of bypass, therefore, should be separated.

-- The Figures and Tables generally lump the fish collection data for each study site. We would find that information more useful if the data were presented separately by gear type.

-- Table 9 is not accurate. For example, largemouth bass would not overwinter in New York if water temperatures of 5 degrees centigrade (5°c) or less were lethal. White crappie are abundant in the Crescent impoundment immediately upstream of the study area, and water temperatures commonly exceed the reported upper lethal temperature of 19 degrees C.

-- Sample size should be stated in Table 10.

-- The area below Crescent Dam was considered "not safely navigable". This should be explained. During non spillage periods it should have been readily sampleable since it is frequently fished by boat fisherman.

-- The report indicates that the adult blueback herring (BBH) observed dead were <u>all</u> "spawning mortality". There is another obvious source of mortality which you should mention. Their death may have been due to mortality associated with passage through the upstream hydroelectric projects (Crescent, Vishers Ferry, and School Street). During a recent site visit to the lower Mohawk River, DEC staff observed numerous dead adult herring. Of the ones that could be examined, over half had injuries which appeared to be consistent with blade strikes. The report should acknowledge this fact.

-- Temperature and dissolved oxygen (DO) data is described as being collected at the time and place of sampling. While this is informative, it is no way in indicative of what the most extreme levels will be. Temperatures should be taken in late afternoon on hot sunny days, and DO should be measured just before dawn if one wishes to identify extremes.

-- Sampling was not performed in areas of expected walleye spawning during periods when walleye spawning is/was anticipated.

-- The discussion for the November sample mentions night sampling; the other sampling periods do not identify when the sampling was done. Please clarify whether the sampling was consistent between periods.

-- Page 41 states that no fish that are known to exhibit "runs" are present in the impoundment. This is not accurate. Blueback herring (BBH) are present seasonally in the impoundment. Walleye are also present and make runs. Other species also make seasonal movements that might be considered runs, such as perch and crappies.

-- The discussion of temperature data says that the upper temperature was 27 degrees C. Elsewhere in the report it states that a temperature of 28.5 was recorded. The upper range should be corrected to reflect the 28.5° recording.

-- During the August sample, BBH were so abundant in the impoundment that there were too many to net entirely, yet they represented only 12% of the total catch. We must assume that this is due to a conscious effort to avoid collecting BBH.

Thank you for the opportunity for review. I may be reached at (518) 457-2224 if you have any questions.

Sincerely,

Edward R. Miller
Environmental Analyst 2
Project Management Section
Division of Regulatory Affairs

ERM/md
cc: L. Cashell (FERC)
M. Robinson (FERC)
A. Sidoti (FERC-NY)
D. Stilwell (USFWS)

bcc: J. Cianci
T. Post
N. McBride
File (2)

KULI2539.ERM

KLEINSCHMIDT ASSOCIATES
Consulting Engineers

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

July 13, 1994

Mr. David Stilwell
U.S. Fish and Wildlife Service
3817 Luker Road
Cortland, NY 13045

Niagara Mohawk Power Corporation
School Street Project (FERC No. 2539)
Draft Fisheries Baseline Study Report

Dear Mr. Stilwell:

We are in receipt of your letter of June 28, 1994, commenting on the above-referenced draft report. To facilitate both your review and the July 15, 1994 FERC filing deadline, the majority of the draft report was forwarded to you on June 7; supplemental report material (based on delayed field samples obtained in late May/early June 1994) was analyzed and sent to your office on June 21, 1994. This approach was adopted as an alternative to delaying distribution of the entire draft report until data from the spring 1994 samples were processed and included in the report.

The following comments address pertinent issues raised in your letter. In general, it appears that many of the comments contained within the USFWS's letter are a result of a misunderstanding of the fisheries field techniques utilized by KA, and/or an oversight of information provided in the reports and in the record. For clarity, these comments are addressed in the same topic order and format as contained in your letter.

Opening Comment - The USFWS is incorrect that the draft report is "inconsistent with the plan and schedule required by the FERC". As your letter notes, the June 21, 1993 letter to the FERC states that "Copies of the field data sheets will be provided to the USFWS and the NYSDEC upon completion of the study *and report of the results to the FERC*" (emphasis added). By letter dated August 10, 1993, the FERC approved the study plan, including the referenced June 21, 1993 field data sheet protocol. NMPC still plans to adhere to the stated schedule, with field data sheets forthcoming following the July 15, 1994 FERC submittal.

Study Plan - page 2. We are not aware of a FERC deadline contained within the September 2, 1992 Additional Information Request (AIR) which has been delayed by the date by which the draft study plan was distributed. Instead, the date of the submittal of

the AIR response was delayed due to the expanded study effort resulting from agency comments on the draft study plan. Between the issuance of the AIR and development and distribution of the draft study plan (*i.e.*, the fall/winter of 1992), Niagara Mohawk was seeking clarification from the FERC regarding specific study parameters.

Further, the USFWS did not raise this concern during study plan development. We also note that as the study progressed, technical correspondence from KA to the USFWS specifically soliciting agency input regarding study details, which could have potentially affected the schedule and scope of the field practices (June 30, 1993), went unanswered by the USFWS.

Description of the Project - page 3. The proposed sixth generating unit for the site was referenced in the draft application submitted for agency review.

page 3. Depending on where observations are made, and what is defined as the crest and toe, Cohoes Falls may be described as *approximately* 60 to 80 feet high.

page 5. The referenced photograph is an aerial photo, included in the draft report for the benefit of report reviewers totally unfamiliar with the study area. A color photocopy will be provided the final report.

page 6. The backwatering of the lower bypass pool was readily observed both from the shoreline and from within the sampling area during each site visit, as well as under a range of operating and river conditions at other times, and is plainly evident in photos 5 and 6 (Appendix E). The hydraulic control appears to be located at the crest of the rapids below the project. Water velocities and flow vectors referenced in the USFWS letter were not obtained, as Niagara Mohawk did not propose and the FERC did not require the collection of this type of data, or any quantitative habitat analyses. During development of the study plan, the USFWS did not recommend collection of such data as part of this study.

You will recall that initially, access to this area by conventional boat sampling gear was not possible (see June 30, 1993 letter). Wadable shoal areas of the tailwater area were investigated as a means of qualitatively describing the nearshore habitat of that segment; the center section of the downstream riffle/rapids zone was navigated by a boat powered by a special jet-pump motor, which permitted access through the rapids. These rapids feature turbulence, standing waves, high velocities and were directly observed to afford limited velocity shelter for fish or sampling gear. This type of stream channel does not facilitate safe or reliable fish capture (Hubert, 1983, Hayes, 1983). Further, most researchers recommend concentrating electrofishing along shoreline areas when sampling riverine habitat (Reynolds, 1983, Meador, et al., 1993).

A careful review of the report text (page 13) will indicate that "all navigable portions of the river between the powerhouse and the New York State Dam impoundment" were sampled. No depth and velocity measurements, cross-sectional drawings and/or mapping data of this area were obtained, as they were not proposed in the study plan or required by the FERC, or previously requested by the USFWS during scoping of the study.

Study Methodology - page 7. Data describing "Percent abundance" of the fish resources and "size frequency distributions" of relatively abundant species are included in the results section of the report, and are presented in tabular and graphic form (Tables 2 through 6, Figures 5 through 7). Standing stock is the concentration of the population for a given area for a given point in time, and can be calculated a number of different ways (Everhart, *et al.*, 1975). Stock size data, defined by means of catch per unit effort (CPUE) (Malvestuto, 1983) was calculated and presented for smallmouth bass (Table 7), as this was the most abundant and widely-distributed game species located within all three segments of the study area, and a species of particular harvest/management interest to the NYSDEC (McBride, 1987, 1993). Sufficient data is presented in the draft report (Table 1, Appendix C) for reviewers to compute CPUE estimates for any other species of interest.

The USFWS suggests that cables can somehow be used to sample areas of the bypassed reach during spill flow events. As discussed in section 6.2.1 of the draft report, spillage events result in extremely high-velocity and turbulent flow conditions in the bypass, particularly the segment located upstream of the Cohoes Falls. Even if the field gear could be designed to be anchored in place, sampling under such spillage conditions would be extremely hazardous, and field gear efficiency would be drastically reduced (Johnson and Nielsen, 1983). Reynolds (1983) recommends avoiding electrofishing during high water, and states that for safety, effectiveness and consistency, sampling should occur during normal or low water stages.

Weights of spawning fish gathered subsequent to FERC's approval of the study plan were recorded onto data sheets, and will be circulated to USFWS as discussed above.

page 8. The USFWS is incorrect that abandonment of beach seining is a "major deviation" from the approved plan. Hayes (1983) states that habitat features may limit effectiveness of some gear types, and that boulders, rock outcrops, etc. may obstruct passage of gear along the bottom. This is consistent with our site experience. On June 30, 1993, KA wrote to Mr. Bryson of the USFWS specifically to advise him that based on site experience, "beach seining was not effective due to the rocky, snag-filled nature of the substrate found throughout wadable portions of the bypass reach, and was abandoned after several unsuccessful attempts", and specifically solicited his input. Mr. Bryson did not choose to respond.

Figure 2. Impoundment Sampling Locations - page 10. The referenced illegible "comment" is a note to publication personnel to shift the page when copying so that the image was centered.

The area at the toe of Crescent Dam noted as not safely navigable consisted of algae-covered ledge outcrops which were extremely shallow under no-spill conditions, and thus not boatable, or extremely turbulent with an undertoe surface flow during spillage conditions.

Page 11. Section 5.4.2 (pages 26-28 of the draft report), Table 1, and Appendix C provides details documenting that net sampling was conducted during October, 1993.

Page 13. The upper part of the bypass reach (*i.e.* upstream of Cohoes Falls) was sampled by means of backpack electrofishing during daylight because backpack shocking requires wading, and if conducted at night would have to be restricted to shallow, low, flat areas (Reynolds, 1983), which are rare in the upper bypass reach. To be diurnally consistent with collections made in the upper bypass reach, the lower sections of the bypass reach (which was a backwatered pool too deep to wade) were therefore also shocked during daylight, as was the tailwater area. As noted above, the tailwater area is an area with turbulent rips and standing waves, and requires daylight visibility to safely navigate. The impoundment, which is a discrete, navigable project area, was boat-mounted electrofished at night, as per agency request. These field procedures were discussed in correspondence from KA to the USFWS on June 30, 1993, which the USFWS chose not to respond to.

Figure 4 - page 14. As stated above, and in the text of the report, the large, center section of the rapids was not sampled because it was not possible to hold either a sampling vessel or nets in position in the high velocity, turbulent standing waves, and the absence of cover suggested that few fish would likely hold in that portion of the sampling area. Instead, the lower-velocity shoal areas were sampled.

Biological Data - page 18. The USFWS statement regarding blueback herring is taken out of context. The remainder of the paragraph goes on to explain that "most herring were stiff, partly decomposed and/or diseased and appeared to exhibit post-spawning mortality". These are not characteristics exhibited by fish experiencing entrainment mortality. The Crescent and Vischer Ferry projects are located immediately upstream from School Street, in fact, the Crescent tailrace is backwatered by the School Street impoundment. Had these fish been subjected to entrainment mortality at Crescent, they would have appeared to be freshly killed and exhibited blade strikes, descaling, hemorrhaging, or severing (Bell, 1973, Stone and Webster, 1992) as typical physical damage. These types of damage were not observed. Furthermore, herring in this condition were reported as being observed "throughout the entire lower Mohawk River" (draft report Section 6.3), which included observations made well outside and upstream from the study area throughout June, 1993, ranging from the Waterford Flight to Amsterdam, New York. Further, McBride (1987) in discussing the blueback herring run on the Mohawk River, notes that spawning mortality for this species is high, and that "the carcasses of dead spawners serve as an abundant food source for benthic invertebrates including crayfish." These observations do not support the USFWS turbine mortality hypothesis.

page 19. Dissolved oxygen (D.O.) was measured at the beginning and end of each sample (section 4.0, page 8 of the draft report) in order to describe sampling conditions. Since both nocturnal and daylight sampling were performed, D.O. data was gathered under both sets of conditions. Data regarding flow rates occurring during sampling were not specified by either the FERC or the USFWS during study scoping, and were therefore not collected. However, the USGS maintains a gage to measure Mohawk River discharge immediately downstream from the project (Cohoes, NY, gage no. 01357500), and can provide you with that data.

Biological data - page 21. The reported percentage is based on the sample *obtained*. All field gear has efficiency limitations; according to Reynolds (1983), Simpson (1978) found that dense concentrations of fish may result in group fright response to sampling activity, thus reducing sampling efficiency. Juvenile herring in fact are a schooling species, and respond accordingly. For this reason, the text notes that additional juvenile herring were observed but not captured in the impoundment. The significance of the referenced sample is that juvenile blueback herring are among the most dominant fish species in the impoundment during August.

6.0 Discussion. The issue of field notes has been addressed above.

Tailwater - page 35. The statement made by the USFWS is incorrect. The *entire* downstream "riffle" *was* investigated by wading the shoals and by jet-pump boat, as noted in the report and re-stated above. As previously noted, investigation by direct inspection facilitated our ability to evaluate the habitat, and also make decisions as to where in this stream segment to concentrate fish sampling. The USFWS correctly noted that unwadable areas were not sampled by back-pack electrofishing. As stated in the report text, these areas were sampled by boat-mounted electrofishing.

The USFWS incorrectly references catch-per-unit-effort (CPUE) in the context of "fish abundance and diversity". CPUE is not an index of species diversity; most fisheries techniques recommend the use of CPUE as an index of fish density (Malvestuto, 1983). Shannon-Wiener, species richness, and other indices are generally used to compute diversity (Cody and Diamond, 1975, Goodman, 1975).

The depaupurate habitat is a likely explanation for the lower end of the reported CPUE range. The literature is replete with references indicating that poor-cover rapids such as those found in the tailwater are not ideal smallmouth bass habitat (Bain, et al., 1982, Todd and Rabeni, 1989, Edwards, et al., 1983, Leonard, et al, 1986). The sampling techniques used were consistent with those recommended by Reynolds (1983), Ohio EPA (1987), and Meador (1993). The samplers consisted of a three- or four-person crew. Two of the crew have over 15 years experience with this type of electrofishing, in rivers ranging from small brooks to as large as the Susquehanna and Ohio rivers, ranging from Maine to Kentucky; a third member has been electrofishing for approximately ten years throughout the northeast. It is not likely that the skills of the samplers were limiting.

The USFWS incorrectly notes that the "large riffle (was sampled) with backpack electrofishing equipment". As stated in the text, with one exception (an occasion when boat access was unfeasible), unwadable rapid/riffle areas were sampled by boat-mounted electrofishing.

Table 7. A review of the existing data (Table 1, Appendix C) reveals that the vast majority of all fish, and virtually all smallmouth bass were gathered by electrofishing. As noted previously, electrofishing was to be the preferred method, expected to generate the highest gear collection efficiency (NYSDEC letter, May 28, 1993). Therefore gear collection efficiencies are not likely to be a significant factor.

Table 8. Habitat mapping was neither required by the FERC, nor requested by the USFWS during scoping of the study. Detailed habitat mapping of project areas is already contained in other reports (*e.g.*, IFIM) associated with the School Street Project relicensing.

Table 9. Dissolved oxygen (D.O.) levels lower than 5.0 mg/l were not detected at the project; occurrence of D.O. levels lower than 6.5 mg/l were scattered and infrequent; most D.O. readings ranged well above 6.5 mg/l (Table 1). In any case, all readings exceeded the minimum standards defined in the state water quality standards for this segment of the Mohawk River.

Table 10. As stated in the footnote to table 10, the length at age information was obtained from literature. Direct aging of fish sampled at School Street was neither proposed in the study plan, required by the FERC, nor requested by the USFWS during scoping.

Figures 6a,b & c. The demarkation of monthly increments were modified and sent to your office on June 21, 1994.

Figures 8 & 9. The referenced figures reflect the summation of all samples, as captioned on the revised figures sent to your office on June 21, 1994.

Appendix C. This Appendix will be amended to include fish weights.

Appendix D. FERC's letter accepting the study plan has been added to the appendix.

Appendix E. Color photo plates will accompany the final report.

We trust these responses clarify the comments raised in the USFWS's June 28, 1994 letter.

Sincerely,

KLEINSCHMIDT ASSOCIATES

Brandon H. Kulik
Senior Fisheries Biologist

BHK:gls
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J. Sabattis
D. Falcinelli
G. Schoonmaker
G. Liimatainen
J. Murphy

APPENDIX B

FLOW DATA INDICATING SPRING SPILLAGE INTO BYPASS REACH AND PHOTOPLATE

SCHOOL STREET TEMPERATURE DATA

DATE	TIME	TEMPERATURE	SPILL (feet over crest)
4-05-94	1400	7°C	+1.9
4-06-94	1400	5°C	+1.9
4-08-94	1400	3°C	+2.7
4-07-94	1400	3°C	
4-09-94	1400	4°C	+2.2
4-11-94	1400	4°C	+2.3
4-12-94	1400	4°C	+2.0
4-14-94	1400	4°C	+3.35
4-15-94	1400	4°C	+2.5
4-18-94	1400	6°C	+2.5
4-20-94	1400	6°C	+1.9
4-21-94	1400	6°C	+1.7
4-22-94	1400	5°C	+1.2
4-23-94	1400	6°C	+1.1
4-26-94	1400	8°C	+1.4
4-27-94	1400	10°C	+1.2
5-06-94	1400	11°C	+1.0
5-09-94	1400	11.5°C	+0.9

- As reported by NMPC Operators

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - NEW YORK/NEW ENGLAND 04/26/94

STATION NUMBER 01357500 MOHAWK RIVER AT COHOES NY STREAM SOURCE AGENCY USGS
LATITUDE 424707 LONGITUDE 0734229 DRAINAGE AREA 3450.00 DATUM 49.13 STATE 36 COUNTY 001
PROVISIONAL DATA from HANDAR SUBJECT TO REVISION

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	995	3740	12600	3350	6340	5040	17900	10,100	---	---	---	---
2	1720	4730	9620	3490	4920	4460	21100	15,200	---	---	---	---
3	1630	4390	9800	3250	4550	4290	21800	11,300	---	---	---	---
4	2420	4280	9680	3090	3810	4250	28900	7570	---	---	---	---
5	2220	5170	11400	2770	3610	3780	26600	6550	---	---	---	---
6	3370	10800	16200	2400	3440	4080	25900	---	---	---	---	---
7	2250	9510	12700	2620	3370	4110	36400	---	---	---	---	---
8	1860	6820	9340	2620	3300	3760	37700	---	---	---	---	---
9	1670	4470	7710	2610	3240	4550	27700	---	---	---	---	---
10	1710	4280	6470	2360	2700	6130	25000	---	---	---	---	---
11	1250	3820	7300	2310	2700	7750	27900	---	---	---	---	---
12	2110	4200	10300	2340	2560	11600	27300	---	---	---	---	---
13	1270	3650	8270	2760	2540	9380	28700	---	---	---	---	---
14	2560	3610	6610	3110	2810	8420	47600	---	---	---	---	---
15	2140	4090	5810	2850	2630	8260	39100	---	---	---	---	---
16	1430	4740	5740	2530	2410	8800	36300	---	---	---	---	---
17	1760	3560	5870	1670	2530	9520	49200	---	---	---	---	---
18	4250	13100	5250	2050	2240	9010	34100	---	---	---	---	---
19	4250	10300	3810	1990	2480	8090	28500	---				
20	3160	7080	3920	2030	2700	7300	25000	---				
21	2470	4490	4730	2030	3210	6710	21700	---				
22	---	5440	6980	2030	7190	7170	17300	---				
23	---	4330	7720	2030	11900	11200	14000	---				
24	2630	5020	5880	2030	11100	16500	11700	---				
25	2630	3950	4200	2030	8710	22000	10600	---				
26	2790	3330	3490	2230	7210	20800	6200	---				
27	1950	3380	2660	2450	6040	20300	14,700	---				
28	2450	8990	2110	2120	5330	20900	10,400	---				
29	2360	17700	2580	2480	---	23000	14100	---				
30	2250	13800	2470	3400	---	19700	11,600	---				
31	2760	---	2800	4590	---	17200	---	---				
TOTAL	---	186770	214020	79620	125570	318060	---	---	---	---	---	---
MEAN	---	6226	6904	2568	4485	10260	---	---	---	---	---	---
MAX	---	17700	16200	4590	11900	23000	---	---	---	---	---	---
MIN	---	3330	2110	1670	2240	3760	---	---	---	---	---	---

PROVISIONAL DRAFT
Subject to Revision
DO NOT QUOTE OR RELEASE
Pending Approval by Director,
U.S. Geological Survey

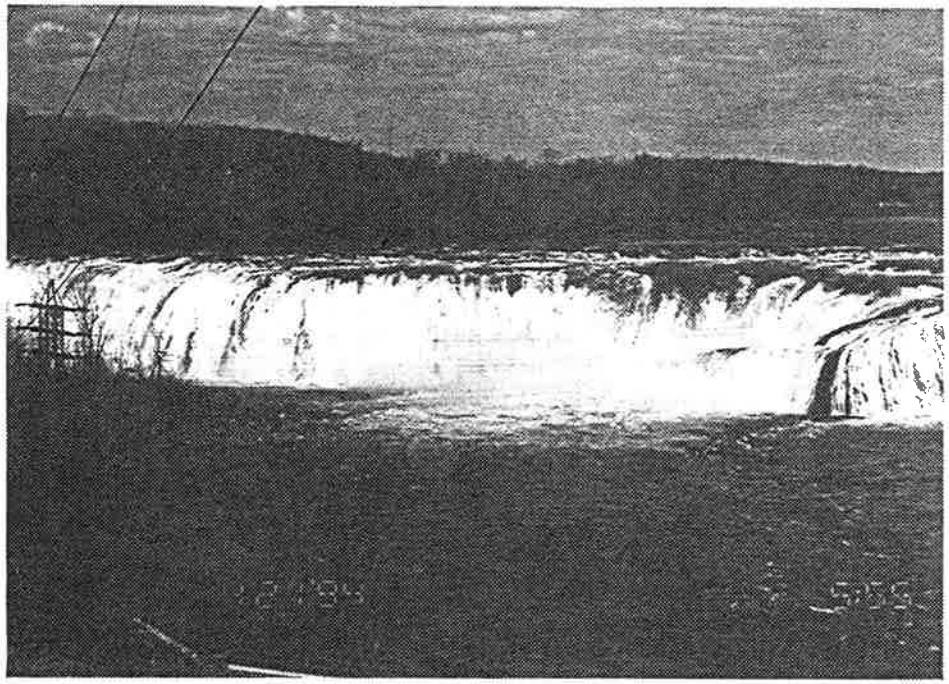
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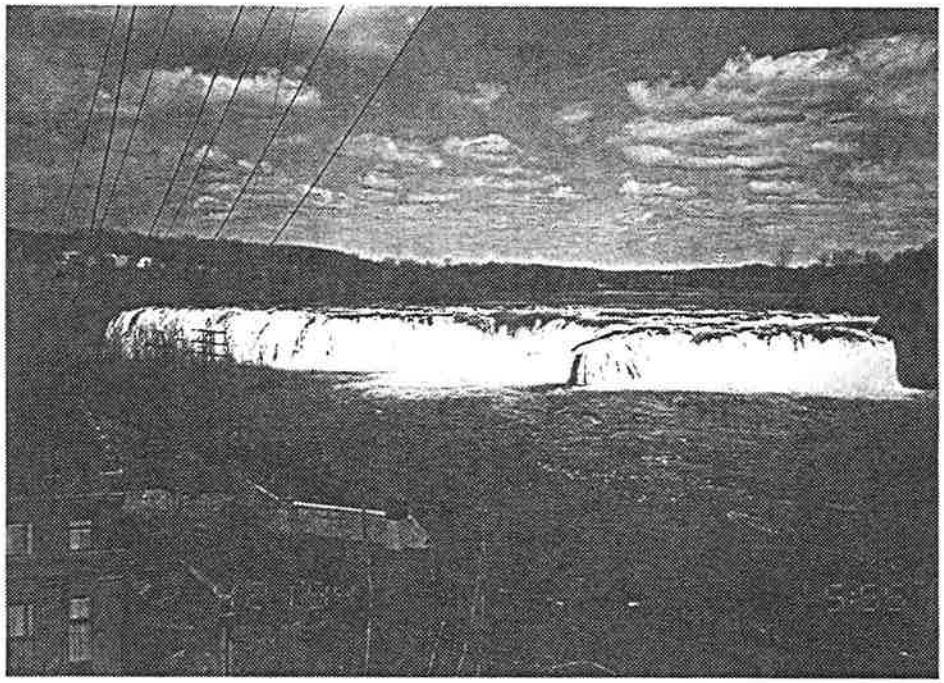
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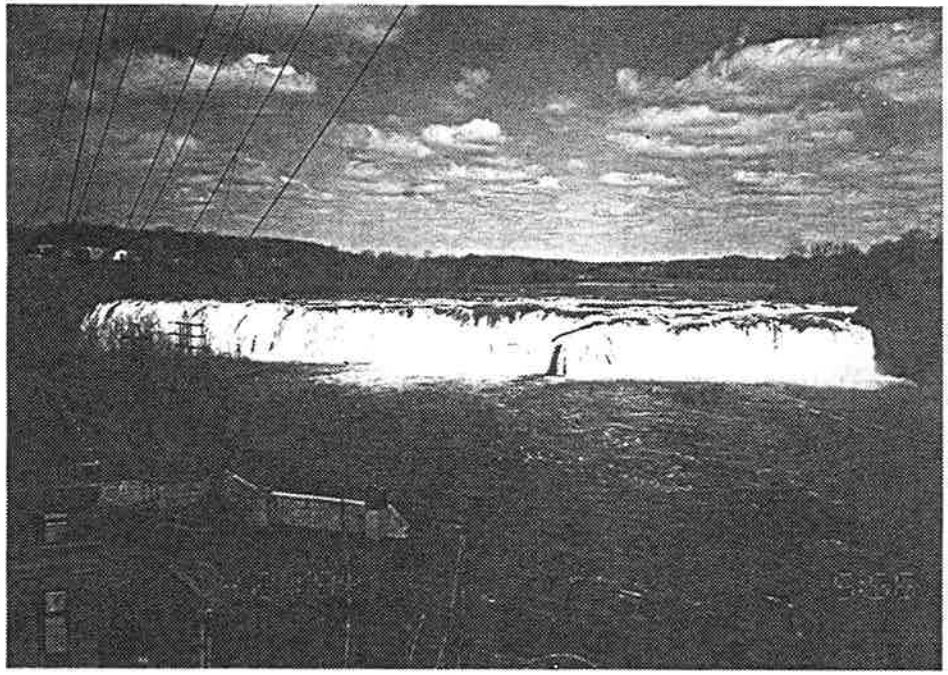
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Jeff Coffin	L. Wagner
Dept./Agency	Phone #
Fax # 207-487-3124	Fax # 518-472-2805

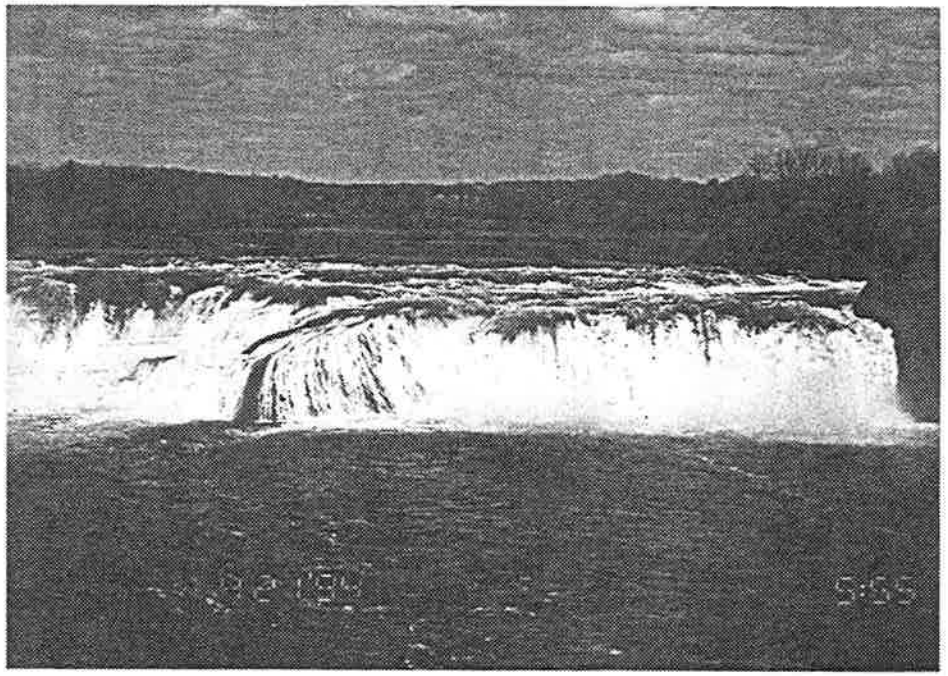
NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

PHOTOPLATES SHOWING SPILLAGE INTO BYPASS REACH (APRIL 21, 1994)





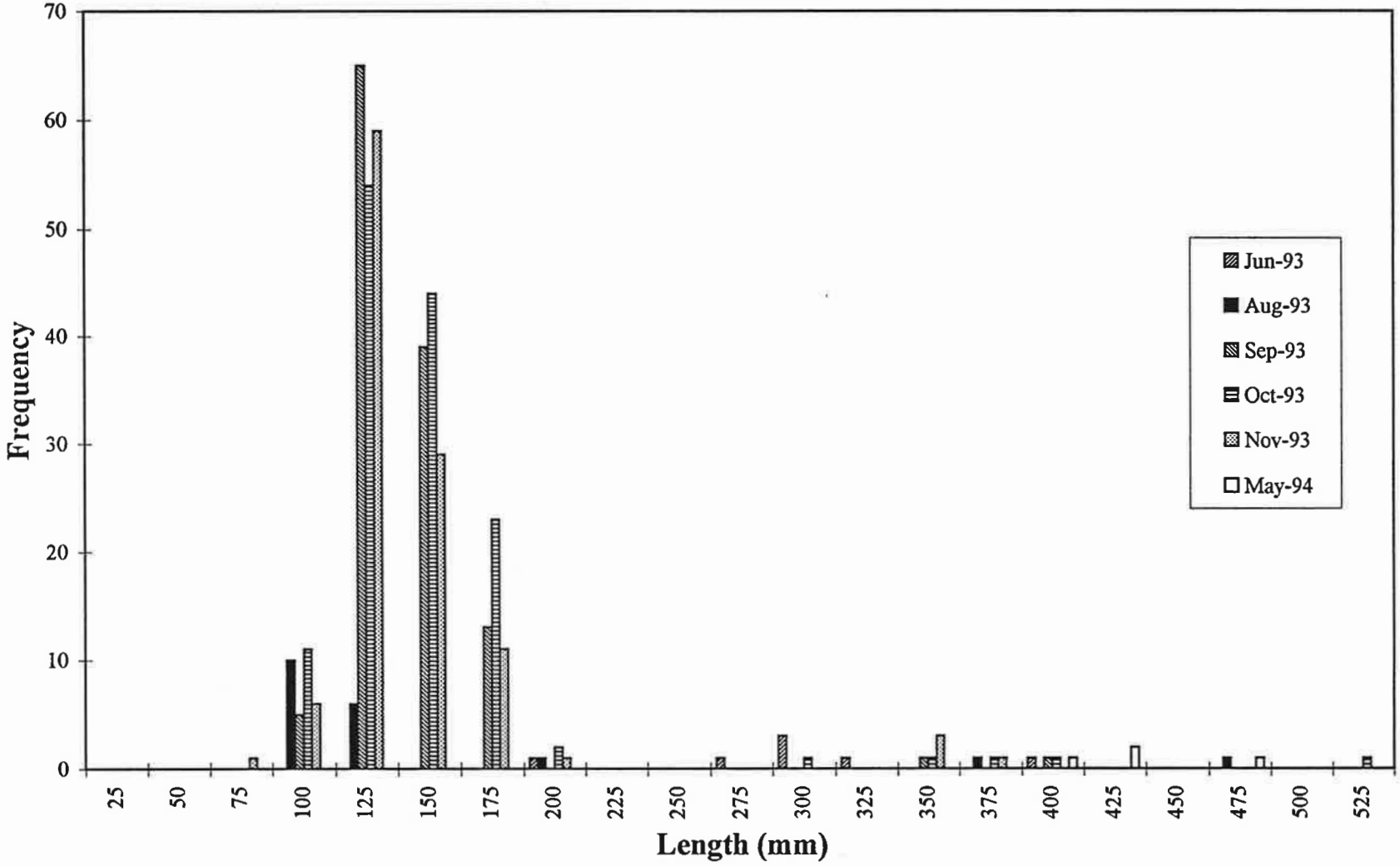




APPENDIX C

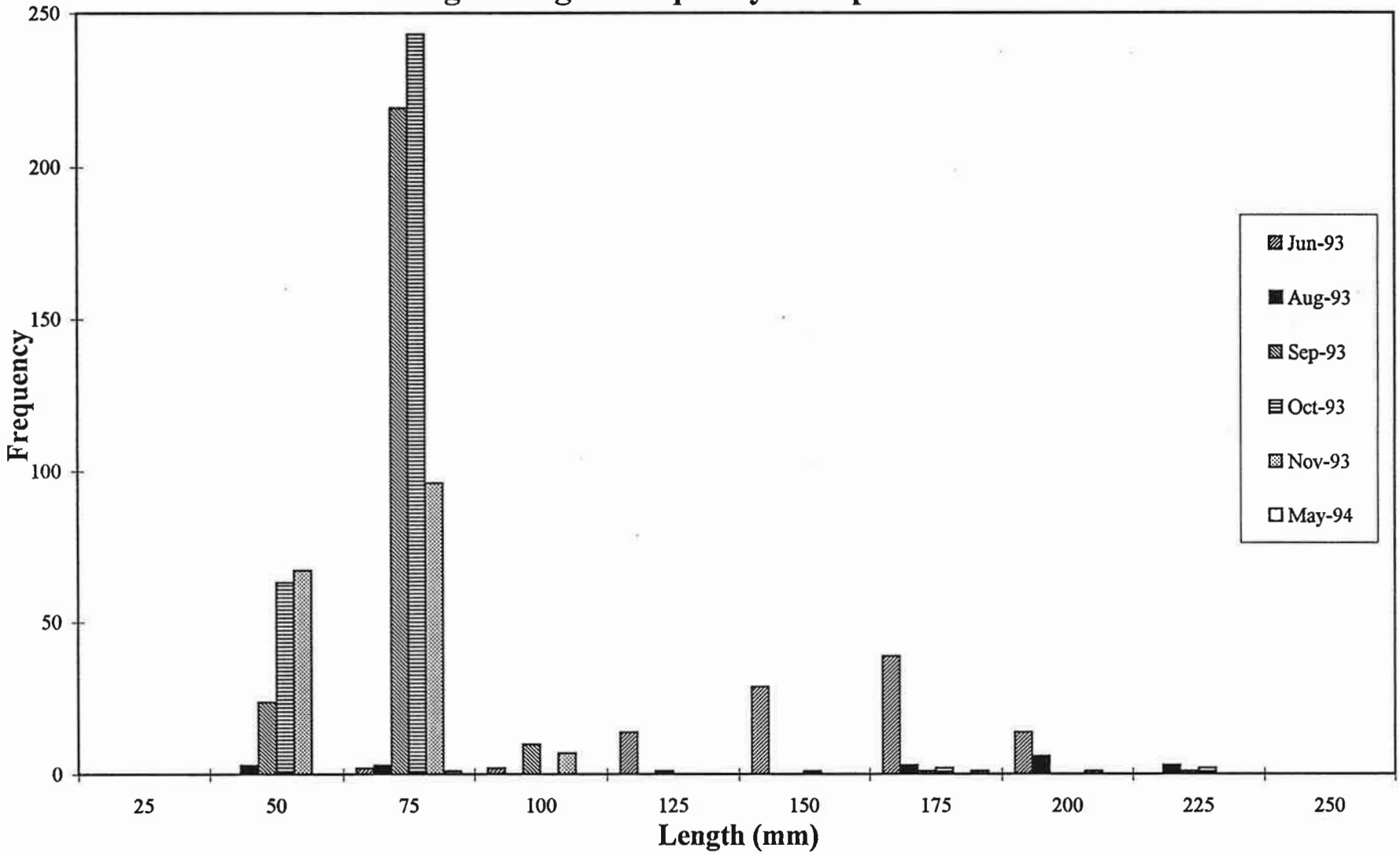
FISH SAMPLING DATA

School Street Fish Sampling 1993-94
Largemouth Bass Length-Frequency in the Impoundment



*-SSGRAPHS Chart 6-6/15/94-jla

School Street Fish Sampling 1993-94
Bluegill Length-Frequency in Impoundment



*-6/15/94-jla

KA Field Studies
Fish Abbreviations
06-02-94

Common Name	Abbreviation	Code
Herring (Clupeidae)	CLU	100
Blue Back Herring	BLH	110
Gizzard Shad	GZS	120
Threadfin Shad	TFS	130
Minnows (Cyprinidae)	CYP	200
Mirror Carp	MCP	205
Common Carp	CCP	210
Golden Shiner	GSH	220
Spottail Shiner	SSH	230
Whitefin Shiner	WFS	231
Coastal Shiner	CLS	232
Creek Chub	CCB	240
Bluehead Chub	BHC	241
Eastern Silvery Minnow	SMW	250
Bluntnosed Minnow	BMW	260
Fallfish	FLF	270
Common Shiner	CSH	280
Black Nose Dace	BND	290
Spotfin Shiner	SFS	291
Long Nosed Dace	LND	292
Cutlips Minnow	CLM	293
Emerald Shiner	EMS	294
Sandbar Shiner	SBS	295
Suckers (Catostomidae)	CAT	300
White Sucker	WHS	310
Shorthead Redhorse	SRH	320
Golden Redhorse	GRH	321
Silver Redhorse	SVR	322
Northern Hog Sucker	NHS	330
Long Nosed Sucker	LNS	340
Quillback Carpsucker	QBC	350
Creek Chubsucker	CCS	360
Striped Jumprock	SJR	370
Sunfishes (Centrarchidae)	CEN	400
Bluegill	BLG	410
Smallmouth Bass	SMB	420
Largemouth Bass	LMB	430
Redeye Bass	REB	435
Spotted Bass	SPB	436
White Crappie	WCR	440
Black Crappie	BCR	450
Pumpkinseed	PKS	460
Longear Sunfish	LES	470
Redear Sunfish	RES	475

Rock Bass	RKB	480
Warmouth	WRM	485
Redbreast Sunfish	RBS	490
Perches (Percidae)	PER	500
Yellow Perch	YLP	510
Log Perch	LGP	520
Walleye	WLY	530
Tessellated Darter	TDD	540
Blackbanded Darter	BBD	545
Piedmont Darter	PMD	550
Bullhead Catfish (Ictaluridae)	ICT	600
Black Bullhead	BLB	605
Yellow Bullhead	YBH	610
Brown Bullhead	BBH	620
Snail (Green) Bullhead	SBH	625
Flat Bullhead	FBH	627
Channel Catfish	CCF	630
White Catfish	WCF	640
Margined Madtom	MMT	650
Stonecat	STC	660
Temperate Basses (Moronidae)	MOR	700
White Perch	WHP	710
Striped Bass	STB	720
Pikes (Esocidae)	ESO	800
Northern Pike	NPK	810
Muskellunge	MSK	820
Chain Pickerel	CPK	830
Tiger Muskie	TGM	840
EEL	EEL	900
Drums (Sciaenidae)	SCI	904
Freshwater Drum	FWD	905
Silversides (Atherinidae)	ATH	909
Brook Silversides	NBS	910
Trouts (Salmonidae)	SAL	1100
Rainbow Trout	RBT	1110
Brown Trout	BRT	1120
Brook Trout	BKT	1130
Landlocked Salmon	LLS	1140
Killifish (Cyprinodontidae)	CPR	1200
Banded Killifish	BKF	1210
Trout-Perches (Percopsidae)	PEC	1300
Trout-Perch	TRP	1310

SCHOOL STREET FISHERIES BASELINE DATA
JUNE 1993 SAMPLE

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH BASELINE STUDY
ENVIRONMENTAL DATA

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
166	H-1	14.33	21.5	20.0	7.2	7.8					06/15/93
166	H-2	14.67	21.2	20.0	8.0	7.8					06/15/93
166	H-3	MISSING DATA									06/15/93
166	H-4	MISSING DATA									06/15/93
166	G-1	15.17	21.0	20.0	6.4	7.8					06/15/93
166	G-2	15.00	21.0	20.0	8.0	7.8					06/15/93
166	G-3	MISSING DATA									06/15/93
166	G-4	12.83	26.0	22.5	6.0	7.2					06/15/93
166	G-5	15.83		22.0		7.0					06/15/93
166	G-6	MISSING DATA									06/15/93
167	H-1	27.03	20.0	21.0	7.8	8.8					06/16/93
167	H-2	26.82	20.0	21.0	7.8	8.8					06/16/93
167	H-3			21.0		9.0					06/16/93
167	H-4			21.0		8.6					06/16/93
167	G-1	26.67	20.0	21.0	7.8	8.6					06/16/93
167	G-2	26.25	20.0	21.0	7.8	8.6					06/16/93
167	G-3			21.0		9.2					06/16/93
167	G-4	26.00	22.5	22.0	7.2	9.2					06/16/93
167	G-5		22.0		7.0		MISSING DATA				06/16/93
167	G-6	23.25	22.5	22.0	7.6	7.4					06/16/93
168	G-7	15.50		20.0		7.8					06/17/93
168	G-8	16.75		21.5		7.6					06/17/93
167	E-1	0.58	21.5	21.5	8.0	8.0			278		06/16/93
167	E-2	0.67	22.0		7.8						06/16/93
165	E-3	2.17	28.5	26.2	8.2	6.0			311	311	06/14/93
167	E-4	4.00	24.0	25.0	8.6	11.8					06/16/93
168	E-5	0.58	22.0	21.0	8.0	7.8			270	270	06/17/93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE DISPOSITION	SAMPLE AREA	ADD. FISH
165	H-1	NO FISH CAUGHT					I	
165	H-2	220	GSH	7.13	181	2	I	
165	H-3	MISSING DATA					I	
165	H-4	MISSING DATA					I	
165	G-1	110	BLH	10.38	264	1	I	
165	G-1	110	BLH	10.00	254	1	I	
165	G-1	110	BLH	10.13	257	1	I	
165	G-1	110	BLH	10.00	254	1	I	
165	G-1	110	BLH	9.88	251	1	I	
165	G-1	110	BLH	8.75	222	1	I	
165	G-1	110	BLH	9.25	235	1	I	
165	G-2	110	BLH	9.75	248	1	I	
165	G-3	MISSING DATA					I	
165	G-4	480	RKB	7.13	181	1	B	
165	G-4	420	SMB	4.25	108	1	B	
165	G-4	310	WHS	12.50	318	1	B	
165	G-4	810	NPK			1	B	
165	G-5	480	RKB	5.50	140	1	B	
165	G-6	MISSING DATA					B	
165	E-3	420	SMB	7.25	184	1	B	
165	E-3	900	EEL	9.50	241	1	B	
165	E-3	900	EEL	9.75	248	1	B	
165	E-3	900	EEL	10.75	273	1	B	
165	E-3	420	SMB	10.00	254	1	B	
165	E-3	420	SMB	7.25	184	1	B	
165	E-3	420	SMB	6.50	165	1	B	
165	E-3	420	SMB	7.25	184	1	B	
165	E-3	420	SMB	6.50	165	1	B	
165	E-3	420	SMB	7.13	181	1	B	
165	E-3	420	SMB	6.88	175	1	B	
165	E-3	420	SMB	6.63	168	1	B	
165	E-3	480	RKB	6.13	156	1	B	
165	E-3	520	LGP	4.13	105	1	B	
165	E-3	900	EEL	20.00	508	1	B	
165	E-3	290	BND	1.88	48	1	B	
165	E-3	900	EEL	24.00	610	1	B	
165	E-3	480	RKB	8.50	216	1	B	
165	E-3	480	RKB	7.13	181	1	B	
165	E-3	420	SMB	3.88	98	1	B	
165	E-3	480	RKB	6.50	165	1	B	
165	E-3	420	SMB	4.13	105	1	B	
167	H-1	410	BLG	6.00	152	1	I	
167	H-1	410	BLG	6.25	159	1	I	
167	H-2	230	SSH	2.13	54	1	I	
167	H-2	410	BLG	6.00	152	1	I	
167	H-2	410	BLG	7.25	184	1	I	
167	H-3	NO FISH CAUGHT					I	
167	H-4	NO FISH CAUGHT					I	
167	G-1	310	WHS	19.00	483	1	I	
167	G-1	110	BLH	9.25	235	1	I	
167	G-1	110	BLH	9.25	235	1	I	
167	G-1	110	BLH	8.13	206	1	I	
167	G-2	310	WHS	20.13	511	1	I	
167	G-2	210	CCP	17.50	445	1	I	
167	G-2	110	BLH	10.25	260	1	I	
167	G-2	110	BLH	9.75	248	1	I	
167	G-2	110	BLH	10.38	264	1	I	
167	G-3	110	BLH	9.25	235	1	I	
167	G-3	110	BLH	9.50	241	1	I	
167	G-3	110	BLH	9.75	248	1	I	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE DISPOSITION	SAMPLE AREA	ADD. FISH
167	G-3	110	BLH	10.00	254	1	I	
167	G-3	110	BLH	9.50	241	1	I	
167	G-3	110	BLH	9.50	241	1	I	
167	G-3	110	BLH	9.63	244	1	I	
167	G-3	110	BLH	8.25	210	1	I	
166	G-4	420	SMB	8.63	219	1	B	
166	G-4	420	SMB	9.50	241	1	B	
166	G-4	480	RKB	4.38	111	1	B	
166	G-5	MISSING DATA					B	
166	G-6	480	RKB	5.25	133	1	B	
167	G-7	210	CCP	15.50	394	1	B	
167	G-8	420	SMB	17.00	432	1	B	
167	G-8	210	CCP	16.63	422	1	B	
167	G-8	210	CCP	20.50	521	1	B	
167	G-8	210	CCP	16.25	413	1	B	
167	G-8	210	CCP	19.38	492	1	B	
167	G-8	210	CCP	17.50	445	1	B	
167	G-8	110	BLH	10.25	260	1	B	
167	G-8	110	BLH	9.25	235	1	B	
167	G-8	110	BLH	9.38	238	1	B	
167	G-8	110	BLH	10.13	257	1	B	
167	G-8	110	BLH	10.50	267	1	B	
167	G-8	110	BLH	10.38	264	1	B	
167	G-8	110	BLH	10.13	257	1	B	
167	G-8	110	BLH	9.63	244	1	B	
167	G-8	110	BLH	9.50	241	1	B	
167	G-8	110	BLH	9.50	241	1	B	
167	G-8	110	BLH	10.25	260	1	B	
167	G-8	110	BLH	9.50	241	1	B	
167	G-8	110	BLH	10.00	254	1	B	
167	G-8	110	BLH	9.75	248	1	B	
167	G-8	110	BLH	10.63	270	1	B	
167	G-8	110	BLH	9.75	248	1	B	
167	G-8	110	BLH	10.38	264	1	B	
167	G-8	110	BLH	10.25	260	1	B	
167	G-8	110	BLH	10.25	260	1	B	
167	G-8	110	BLH	9.50	241	1	B	
167	G-8	110	BLH	10.25	260	1	B	
167	G-8	110	BLH	9.63	244	1	B	
167	G-8	110	BLH	9.75	248	1	B	
167	G-8	110	BLH	10.00	254	1	B	
167	E-1	420	SMB	6.63	168	1	I	
167	E-1	420	SMB	8.88	225	1	I	
167	E-1	110	BLH	10.00	254	1	I	
167	E-1	510	YLP	8.00	203	1	I	
167	E-1	510	YLP	8.25	210	1	I	
167	E-1	410	BLG	5.00	127	1	I	
167	E-1	410	BLG	6.25	159	1	I	
167	E-1	410	BLG	4.75	121	1	I	
167	E-1	220	GSH	5.63	143	1	I	
167	E-1	220	GSH	8.13	206	1	I	
167	E-1	410	BLG	5.75	146	1	I	
167	E-1	510	YLP	6.00	152	1	I	
167	E-1	230	SSH	3.50	89	1	I	
167	E-1	410	BLG	5.75	146	1	I	
167	E-1	410	BLG	6.50	165	1	I	
167	E-1	450	BCR	5.75	146	1	I	
167	E-1	410	BLG	6.50	165	1	I	
167	E-1	510	YLP	6.00	152	1	I	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. IND.
167	E-1	510	YLP	9.50	241	I	1	
167	E-1	410	BLG	6.63	168	I	1	
167	E-1	510	YLP	10.25	260	I	1	
167	E-1	410	BLG	7.00	178	I	1	
167	E-1	420	SMB	7.25	184	I	1	
167	E-1	510	YLP	7.00	178	I	1	
167	E-1	410	BLG	5.88	149	I	1	
167	E-1	410	BLG	6.13	156	I	1	
167	E-1	470	LES	6.88	175	I	1	
167	E-1	410	BLG	5.00	127	I	1	
167	E-1	410	BLG	6.75	171	I	1	
167	E-1	510	YLP	8.13	206	I	1	
167	E-1	510	YLP	8.50	216	I	1	
167	E-1	510	YLP	8.38	213	I	1	
167	E-1	410	BLG	6.50	165	I	1	
167	E-1	410	BLG	7.13	181	I	1	
167	E-1	470	LES	6.88	175	I	1	
167	E-1	410	BLG	6.00	152	I	1	
167	E-1	410	BLG	5.75	146	I	1	
167	E-1	410	BLG	6.25	159	I	1	
167	E-1	510	YLP	8.38	213	I	1	
167	E-1	410	BLG	2.50	64	I	1	
167	E-1	410	BLG	6.88	175	I	1	
167	E-1	410	BLG	7.50	191	I	1	
167	E-1	410	BLG	6.75	171	I	1	
167	E-1	410	BLG	5.50	140	I	1	
167	E-1	410	BLG	5.00	127	I	1	
167	E-1	460	PKS	5.50	140	I	1	
167	E-1	510	YLP	11.13	283	I	1	
167	E-1	510	YLP	7.25	184	I	1	
167	E-1	420	SMB	3.38	86	I	1	
167	E-1	410	BLG	5.75	146	I	1	
167	E-1	410	BLG	6.25	159	I	1	
167	E-1	410	BLG	5.38	137	I	1	
167	E-1	410	BLG	5.38	137	I	1	
167	E-1	450	BCR	5.88	149	I	1	
167	E-1	110	BLH	10.63	270	I	1	
167	E-1	410	BLG	4.25	108	I	1	
167	E-1	480	RKB	2.50	64	I	1	
167	E-1	420	SMB	6.50	165	I	1	
167	E-1	420	SMB	4.13	105	I	1	
167	E-1	420	SMB	4.75	121	I	1	
167	E-1	420	SMB	4.38	111	I	1	
167	E-1	420	SMB	3.88	98	I	1	
167	E-1	510	YLP	6.50	165	I	1	
167	E-1	510	YLP	6.88	175	I	1	
167	E-1	510	YLP	8.38	213	I	1	
167	E-1	510	YLP	7.63	194	I	1	
167	E-1	410	BLG	4.38	111	I	1	
167	E-1	410	BLG	5.25	133	I	1	
167	E-1	470	LES	6.25	159	I	1	
167	E-1	230	SSH	4.00	102	I	1	
167	E-1	410	BLG	6.75	171	I	1	
167	E-1	410	BLG	7.38	187	I	1	
167	E-1	410	BLG	5.00	127	I	1	
167	E-1	480	RKB	8.13	206	I	1	
167	E-1	230	SSH	3.88	98	I	1	
167	E-1	410	BLG	5.50	140	I	1	
167	E-1	410	BLG	5.63	143	I	1	
167	E-1	510	YLP	9.00	229	I	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. IND.
167	E-1	510	YLP	6.75	171	I	1	
167	E-1	420	SMB	6.13	156	I	1	
167	E-1	410	BLG	5.38	137	I	1	
167	E-1	410	BLG	5.75	146	I	1	
167	E-1	410	BLG	6.25	159	I	1	
167	E-1	420	SMB	9.75	248	I	1	
167	E-1	410	BLG	4.50	114	I	1	
167	E-1	420	SMB	6.00	152	I	1	
167	E-1	510	YLP	7.13	181	I	1	
167	E-1	230	SSH	4.00	102	I	1	
167	E-1	480	RKB	8.00	203	I	1	
167	E-1	420	SMB	7.88	200	I	1	
167	E-1	410	BLG	6.75	171	I	1	
167	E-1	430	LMB	7.38	187	I	1	
167	E-1	420	SMB	7.13	181	I	1	
167	E-1	220	GSH	6.25	159	I	1	
167	E-1	220	GSH	2.75	70	I	1	
167	E-1	430	LMB	12.50	318	I	1	
167	E-1	510	YLP	8.25	210	I	1	
167	E-1	450	BCR	5.00	127	I	1	
167	E-1	430	LMB	11.13	283	I	1	
167	E-1	410	BLG	3.25	83	I	1	
167	E-1	230	SSH	2.63	67	I	1	
167	E-1	230	SSH	3.75	95	I	1	
167	E-1	230	SSH	3.75	95	I	1	
167	E-1	230	SSH	2.75	70	I	1	
167	E-1	430	LMB	11.75	298	I	1	
167	E-1	420	SMB	8.50	216	I	1	
167	E-1	510	YLP	6.13	156	I	1	
167	E-1	410	BLG	6.25	159	I	1	
167	E-1	410	BLG	3.00	76	I	1	
167	E-1	420	SMB	6.50	165	I	1	
167	E-1	430	LMB	15.38	391	I	1	
167	E-1	410	BLG	5.00	127	I	1	
167	E-1	260	BMW	3.00	76	I	1	
167	E-1	410	BLG	6.75	171	I	1	
167	E-1	410	BLG	4.63	117	I	1	
167	E-1	410	BLG	4.25	108	I	1	
167	E-1	410	BLG	6.63	168	I	1	
167	E-1	460	PKS	5.88	149	I	1	
167	E-1	460	PKS	4.75	121	I	1	
167	E-1	480	RKB	2.75	70	I	1	
167	E-1	110	BLH	8.75	222	I	1	
167	E-1	410	BLG	5.50	140	I	1	
167	E-1	410	BLG	4.63	117	I	1	
167	E-1	430	LMB	10.13	257	I	1	
167	E-1	510	YLP	8.25	210	I	1	
167	E-1	510	YLP	7.00	178	I	1	
167	E-1	410	BLG	2.50	64	I	1	
167	E-1	480	RKB	3.13	79	I	1	
167	E-1	420	SMB	6.25	159	I	1	
167	E-1	410	BLG	6.25	159	I	1	
167	E-1	510	YLP	5.00	127	I	1	
167	E-1	510	YLP	6.00	152	I	1	
167	E-1	230	SSH	3.75	95	I	1	
167	E-1	230	SSH	3.63	92	I	1	
167	E-1	480	RKB	3.00	76	I	1	
167	E-1	420	SMB	3.50	89	I	1	
167	E-1	110	BLH	8.13	206	I	1	
167	E-1	510	YLP	9.75	248	I	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. IND.
167	E-1	510	YLP	9.25	235	I		1
167	E-1	420	SMB	6.13	156	I		1
167	E-1	410	BLG	5.00	127	I		1
167	E-1	410	BLG	6.25	159	I		1
167	E-1	410	BLG	5.13	130	I		1
167	E-1	480	RKB	6.50	165	I		1
167	E-1	410	BLG	5.25	133	I		1
167	E-1	410	BLG	4.50	114	I		1
167	E-1	480	RKB	5.00	127	I		1
167	E-1	220	GSH	3.25	83	I		1
167	E-1	220	GSH	3.63	92	I		1
167	E-1	220	GSH	3.13	79	I		1
167	E-1	410	BLG	4.63	117	I		1
167	E-1	420	SMB	8.75	222	I		1
167	E-1	420	SMB	8.88	225	I		1
167	E-1	480	RKB	6.00	152	I		1
167	E-1	480	RKB	6.00	152	I		1
167	E-1	480	RKB	5.75	146	I		1
167	E-1	530	WLY	23.00	584	I		1
167	E-1	310	WHS	17.25	438	I		1
167	E-1	310	WHS	15.13	384	I		1
167	E-1	310	WHS	17.13	435	I		1
167	E-1	310	WHS	19.88	505	I		1
167	E-1	310	WHS	15.75	400	I		1
167	E-1	620	BBH	13.00	330	I		1
167	E-1	620	BBH	14.25	362	I		1
167	E-1	620	BBH	13.50	343	I		1
167	E-1	210	CCP	23.50	597	I		1
167	E-1	210	CCP	26.25	667	I		1
167	E-1	210	CCP	29.50	749	I		1
167	E-1	230	SSH	3.50	89	I		2
167	E-1	230	SSH	2.75	70	I		2
167	E-1	230	SSH	2.75	70	I		2
167	E-1	230	SSH	2.88	73	I		2
167	E-1	230	SSH	2.75	70	I		2
167	E-1	230	SSH	3.00	76	I		2
167	E-1	230	SSH	3.50	89	I		2
167	E-1	230	SSH	3.63	92	I		2
167	E-1	230	SSH	2.75	70	I		2
167	E-1	230	SSH	3.13	79	I		2
167	E-1	230	SSH	3.63	92	I		2
167	E-1	230	SSH	2.88	73	I		2
167	E-1	230	SSH	2.75	70	I		2
167	E-1	230	SSH	3.00	76	I		2
167	E-1	230	SSH	3.13	79	I		2
167	E-1	230	SSH	4.38	111	I		2
167	E-1	230	SSH	3.88	98	I		2
167	E-1	230	SSH	4.00	102	I		2
167	E-1	230	SSH	3.75	95	I		2
167	E-1	230	SSH	3.50	89	I		2
167	E-1	230	SSH	3.75	95	I		2
167	E-1	230	SSH	3.00	76	I		2
167	E-1	230	SSH	3.63	92	I		2
167	E-1	230	SSH	3.00	76	I		2
167	E-1	220	GSH	2.63	67	I		2
167	E-1	220	GSH	2.38	60	I		2
167	E-2	420	SMB	11.25	286	I		1
167	E-2	420	SMB	9.25	235	I		1
167	E-2	510	YLP	9.00	229	I		1
167	E-2	420	SMB	6.50	165	I		1

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. IND.
167	E-2	510	YLP	7.88	200	I	1	
167	E-2	420	SMB	9.75	248	I	1	
167	E-2	410	BLG	6.00	152	I	1	
167	E-2	510	YLP	5.25	133	I	1	
167	E-2	510	YLP	6.13	156	I	1	
167	E-2	420	SMB	9.75	248	I	1	
167	E-2	510	YLP	9.00	229	I	1	
167	E-2	410	BLG	7.38	187	I	1	
167	E-2	410	BLG	6.88	175	I	1	
167	E-2	420	SMB	9.13	232	I	1	
167	E-2	420	SMB	8.13	206	I	1	
167	E-2	220	GSH	6.00	152	I	1	
167	E-2	410	BLG	6.25	159	I	1	
167	E-2	410	BLG	5.63	143	I	1	
167	E-2	220	GSH	3.25	83	I	1	
167	E-2	410	BLG	6.75	171	I	1	
167	E-2	420	SMB	6.63	168	I	1	
167	E-2	410	BLG	6.88	175	I	1	
167	E-2	220	GSH	3.50	89	I	1	
167	E-2	420	SMB	8.63	219	I	1	
167	E-2	620	BBH	12.00	305	I	1	
167	E-2	410	BLG	7.13	181	I	1	
167	E-2	430	LMB	11.63	295	I	1	
167	E-2	410	BLG	6.50	165	I	1	
167	E-2	620	BBH	12.00	305	I	1	
167	E-2	420	SMB	10.25	260	I	1	
167	E-2	410	BLG	6.75	171	I	1	
167	E-2	460	PKS	5.00	127	I	1	
167	E-2	410	BLG	6.63	168	I	1	
167	E-2	410	BLG	5.38	137	I	1	
167	E-2	410	BLG	5.38	137	I	1	
167	E-2	410	BLG	4.75	121	I	1	
167	E-2	410	BLG	6.25	159	I	1	
167	E-2	450	BCR	6.25	159	I	1	
167	E-2	450	BCR	5.63	143	I	1	
167	E-2	110	BLH	10.50	267	I	1	
167	E-2	410	BLG	7.75	197	I	1	
167	E-2	410	BLG	4.50	114	I	1	
167	E-2	110	BLH	9.50	241	I	1	
167	E-2	410	BLG	5.25	133	I	1	
167	E-2	510	YLP	6.50	165	I	1	
167	E-2	410	BLG	4.63	117	I	1	
167	E-2	410	BLG	5.13	130	I	1	
167	E-2	410	BLG	5.50	140	I	1	
167	E-2	410	BLG	6.75	171	I	1	
167	E-2	410	BLG	6.13	156	I	1	
167	E-2	410	BLG	7.00	178	I	1	
167	E-2	410	BLG	6.50	165	I	1	
167	E-2	410	BLG	7.25	184	I	1	
167	E-2	410	BLG	7.75	197	I	1	
167	E-2	410	BLG	6.63	168	I	1	
167	E-2	510	YLP	8.00	203	I	1	
167	E-2	620	BBH	16.00	406	I	1	
167	E-2	420	SMB	10.13	257	I	1	
167	E-2	510	YLP	8.13	206	I	1	
167	E-2	410	BLG	7.25	184	I	1	
167	E-2	460	PKS	5.00	127	I	1	
167	E-2	470	LES	6.13	156	I	1	
167	E-2	410	BLG	7.00	178	I	1	
167	E-2	410	BLG	5.25	133	I	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. IND.
167	E-2	410	BLG	6.00	152	I	1	
167	E-2	410	BLG	7.13	181	I	1	
167	E-2	410	BLG	4.63	117	I	1	
167	E-2	510	YLP	11.50	292	I	1	
167	E-2	510	YLP	9.50	241	I	1	
167	E-2	410	BLG	6.00	152	I	1	
167	E-2	410	BLG	4.50	114	I	1	
167	E-2	510	YLP	9.00	229	I	1	
167	E-2	110	BLH	10.75	273	I	1	
167	E-2	480	RKB	5.68	144	I	1	
167	E-2	410	BLG	6.88	175	I	1	
167	E-2	210	CCP	29.50	749	I	1	
167	E-2	210	CCP	24.50	622	I	1	
167	E-2	210	CCP	24.25	616	I	1	
167	E-2	210	CCP	22.00	559	I	1	
167	E-2	620	BBH	12.50	318	I	1	
167	E-4	420	SMB	9.88	251	T	1	
167	E-4	420	SMB	11.50	292	T	1	
167	E-4	420	SMB	9.38	238	T	1	
167	E-4	420	SMB	15.88	403	T	1	
167	E-4	420	SMB	7.68	195	T	1	
167	E-4	480	RKB	7.00	178	T	1	
167	E-4	230	SSH	2.38	60	T	1	
167	E-4	230	SSH	2.50	64	T	1	
167	E-4	230	SSH	2.25	57	T	1	
167	E-4	510	YLP	9.00	229	T	1	
168	E-5	420	SMB	13.50	343	T	1	
168	E-5	420	SMB	15.25	387	T	1	
168	E-5	420	SMB	16.25	413	T	1	
168	E-5	420	SMB	14.00	356	T	1	
168	E-5	420	SMB	14.00	356	T	1	
168	E-5	420	SMB	10.00	254	T	1	
168	E-5	420	SMB	7.88	200	T	1	
168	E-5	420	SMB	8.25	210	T	1	
168	E-5	420	SMB	10.38	264	T	1	
168	E-5	420	SMB	13.50	343	T	1	
168	E-5	420	SMB	11.75	298	T	1	
168	E-5	420	SMB	10.25	260	T	1	
168	E-5	420	SMB	7.38	187	T	1	
168	E-5	420	SMB	7.25	184	T	1	
168	E-5	420	SMB	7.00	178	T	1	
168	E-5	420	SMB	9.63	244	T	1	
168	E-5	420	SMB	10.25	260	T	1	
168	E-5	420	SMB	8.75	222	T	1	
168	E-5	420	SMB	8.50	216	T	1	
168	E-5	420	SMB	8.88	225	T	1	
168	E-5	420	SMB	10.63	270	T	1	
168	E-5	420	SMB	7.25	184	T	1	
168	E-5	420	SMB	10.13	257	T	1	
168	E-5	420	SMB	8.00	203	T	1	
168	E-5	420	SMB	9.88	251	T	1	
168	E-5	420	SMB	10.00	254	T	1	
168	E-5	420	SMB	10.25	260	T	1	
168	E-5	420	SMB	9.75	248	T	1	
168	E-5	420	SMB	8.88	225	T	1	
168	E-5	420	SMB	8.00	203	T	1	
168	E-5	420	SMB	8.88	225	T	1	
168	E-5	420	SMB	7.13	181	T	1	
168	E-5	420	SMB	8.50	216	T	1	
168	E-5	420	SMB	7.75	197	T	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. IND.
168	E-5	420	SMB	7.75	197	T	1	
168	E-5	420	SMB	7.00	178	T	1	
168	E-5	420	SMB	5.75	146	T	1	
168	E-5	420	SMB	8.13	206	T	1	
168	E-5	420	SMB	9.38	238	T	1	
168	E-5	420	SMB	10.00	254	T	1	
168	E-5	420	SMB	7.50	191	T	1	
168	E-5	420	SMB	8.00	203	T	1	
168	E-5	420	SMB	8.25	210	T	1	
168	E-5	420	SMB	7.50	191	T	1	
168	E-5	420	SMB	7.75	197	T	1	
168	E-5	420	SMB	7.88	200	T	1	
168	E-5	420	SMB	7.50	191	T	1	
168	E-5	420	SMB	7.25	184	T	1	
168	E-5	420	SMB	4.50	114	T	1	
168	E-5	480	RKB	8.50	216	T	1	
168	E-5	480	RKB	7.75	197	T	1	
168	E-5	480	RKB	8.75	222	T	1	
168	E-5	420	SMB	7.25	184	T	1	
168	E-5	480	RKB	9.25	235	T	1	
168	E-5	480	RKB	9.00	229	T	1	
168	E-5	480	RKB	8.00	203	T	1	
168	E-5	480	RKB	8.00	203	T	1	
168	E-5	310	WHS	12.50	318	T	1	
168	E-5	420	SMB	4.13	105	T	1	
168	E-5	110	BLH	9.63	244	T	1	
168	E-5	110	BLH	10.25	260	T	1	
168	E-5	110	BLH	10.00	254	T	1	
168	E-5	110	BLH	10.13	257	T	1	
168	E-5	210	CCP	23.25	591	T	1	
168	E-5	210	CCP	20.00	508	T	1	
168	E-5	210	CCP	22.38	568	T	1	
168	E-5	210	CCP	19.50	495	T	1	
168	E-5	210	CCP	17.88	454	T	1	
168	E-5	210	CCP	22.25	565	T	1	
168	E-5	480	RKB	9.50	241	T	1	
168	E-5	480	RKB	8.00	203	T	1	
168	E-5	420	SMB	8.50	216	T	1	
168	E-5	420	SMB	7.75	197	T	1	
168	E-5	110	BLH	10.00	254	T	1	
168	E-5	900	EEL	24.00	610	T	1	

SCHOOL STREET FISHERIES BASELINE DATA
AUGUST 1993 SAMPLE

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
228	E-1A	1.10	24.5	24.5	8.4	7.7					8-16-93
228	E-2	1.50	24.5	24.5	8.4	7.7					8-16-93
229	G-1	15.50	24.0	24.0	6.1	6.1					8-17-93
229	G-2	16.16	24.5	24.0	8.1	6.9					8-17-93
229	G-3	16.83	24.5	24.0	9.9	8.3					8-17-93
229	G-4	17.33	27.0	24.0	7.2	6.0					8-17-93
229	G-5	17.50	26.0	24.0	6.6	7.1					8-17-93
229	G-6	17.67	26.0	24.0	7.2	7.8					8-17-93
✓229	H-1	19.37	24.0	24.1	7.0	6.7					8-17-93
✓229	H-2	18.75	24.5	24.1	7.0	6.8					8-17-93
✓229	H-3	17.92	24.5	23.5	8.2	6.8					8-17-93
✓229	H-4	17.66	24.5	24.0	7.9	7.4					8-17-93
229	E-1B	0.85	24.0	24.0	9.6	9.0			301	278	8-17-93
229	E-3B	0.63	24.0	24.5	8.4	7.9			298	289	8-17-93
229	E-4	0.75	24.5	24.0	8.2	8.3			287	290	8-17-93
229	E-5	0.82	24.0	25.0	7.2	6.0			306	302	8-17-93
230	G-1	23.58	24.0	24.0	6.1	6.1					8-18-93
230	G-2	23.58	24.0	24.0	6.9	6.0					8-18-93
230	G-3	24.00	24.0	24.0	8.3	6.9					8-18-93
230	G-4	23.50	24.0	24.0	6.0	7.8					8-18-93
230	G-5	23.66	24.0	24.0	7.1	9.0					8-18-93
230	G-6	24.16	24.0	24.0	7.8	7.4					8-18-93
✓230	H-1	23.66	24.1	23.8	6.7	6.0					8-18-93
✓230	H-2	23.66	24.1	24.0	6.8	6.0					8-18-93
✓230	H-3	23.66	23.5	24.0	6.8	6.3					8-18-93
✓230	H-4	23.75	24.0	24.0	7.4	6.9					8-18-93
230	E-3A	2.00	24.0	24.0	8.0	8.0					8-18-93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

PROJECT CODE	JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
********									
95-03	228	E-1A	210	CCP	30.91	785	I	1	
95-03	228	E-1A	210	CCP	20.94	532	I	1	
95-03	228	E-1A	420	SMB	11.77	299	I	1	
95-03	228	E-1A	420	SMB	4.02	102	I	1	
95-03	228	E-1A	420	SMB	4.92	125	I	1	
95-03	228	E-1A	420	SMB	2.68	68	I	1	
95-03	228	E-1A	420	SMB	3.58	91	I	1	
95-03	228	E-1A	420	SMB	4.41	112	I	1	
95-03	228	E-1A	420	SMB	4.09	104	I	1	
95-03	228	E-1A	420	SMB	3.35	85	I	1	
95-03	228	E-1A	420	SMB	3.94	100	I	1	
95-03	228	E-1A	420	SMB	3.94	100	I	1	
95-03	228	E-1A	420	SMB	3.62	92	I	1	
95-03	228	E-1A	420	SMB	3.74	95	I	1	
95-03	228	E-1A	420	SMB	4.41	112	I	1	
95-03	228	E-1A	110	BLH	2.20	56	I	1	
95-03	228	E-1A	110	BLH	1.89	48	I	1	
95-03	228	E-1A	110	BLH	1.65	42	I	1	
95-03	228	E-1A	110	BLH	1.69	43	I	1	
95-03	228	E-1A	110	BLH	1.65	42	I	1	
95-03	228	E-1A	110	BLH	1.73	44	I	1	
95-03	228	E-1A	110	BLH	1.85	47	I	1	
95-03	228	E-1A	110	BLH	1.89	48	I	1	
95-03	228	E-1A	110	BLH	2.20	56	I	1	
95-03	228	E-1A	110	BLH	2.13	54	I	1	
95-03	228	E-1A	110	BLH	1.73	44	I	1	
95-03	228	E-1A	110	BLH	2.44	62	I	1	
95-03	228	E-1A	220	GSH	2.80	71	I	1	
95-03	228	E-1A	220	GSH	2.87	73	I	1	
95-03	228	E-1A	220	GSH	3.15	80	I	1	
95-03	228	E-1A	220	GSH	2.91	74	I	1	
95-03	228	E-1A	410	BLG	6.97	177	I	1	
95-03	223	E-1A	410	BLG	8.58	218	I	1	
95-03	228	E-1A	410	BLG	7.95	202	I	1	
95-03	228	E-1A	410	BLG	2.76	70	I	1	
95-03	228	E-1A	430	LMB	4.41	112	I	1	
95-03	228	E-1A	430	LMB	3.94	100	I	1	
95-03	228	E-1A	480	RKB	10.28	261	I	1	
95-03	228	E-1A	620	BBH	14.57	370	I	1	
95-03	228	E-1A	510	YLP	8.66	220	I	1	
95-03	228	E-2	210	CCP	28.35	720	I	1	
95-03	228	E-2	210	CCP	25.98	660	I	1	
95-03	228	E-2	480	RKB	9.84	250	I	1	

95-03	228	E-2	210	CCP	31.89	810	I	1
95-03	228	E-2	210	CCP	24.41	620	I	1
95-03	228	E-2	430	LMB	18.11	460	I	1
95-03	228	E-2	420	SMB	8.66	220	I	1
95-03	228	E-2	420	SMB	7.09	180	I	1
95-03	228	E-2	210	CCP	27.95	710	I	1
95-03	228	E-2	210	CCP	22.64	575	I	1
95-03	228	E-2	220	GSH	1.57	40	I	1
95-03	228	E-2	420	SMB	10.43	265	I	1
95-03	228	E-2	480	RKB	8.98	228	I	1
95-03	228	E-2	420	SMB	8.98	228	I	1
95-03	228	E-2	410	BLG	8.46	215	I	1
95-03	228	E-2	480	RKB	8.62	219	I	1
95-03	228	E-2	480	RKB	7.09	180	I	1
95-03	228	E-2	210	CCP	27.56	700	I	1
95-03	228	E-2	210	CCP	25.98	660	I	1
95-03	228	E-2	210	CCP	24.41	620	I	1
95-03	228	E-2	410	BLG	6.69	170	I	1
95-03	228	E-2	410	BLG	7.68	195	I	1
95-03	228	E-2	430	LMB	14.69	373	I	1
95-03	228	E-2	410	BLG	6.89	175	I	1
95-03	228	E-2	430	LMB	4.37	111	I	1
95-03	228	E-2	480	RKB	9.57	243	I	1
95-03	228	E-2	410	BLG	7.28	185	I	1
95-03	228	E-2	430	LMB	3.86	98	I	1
95-03	228	E-2	430	LMB	4.37	111	I	1
95-03	228	E-2	410	BLG	6.38	162	I	1
95-03	228	E-2	430	LMB	4.33	110	I	1
95-03	228	E-2	430	LMB	7.28	185	I	1
95-03	228	E-2	410	BLG	2.95	75	I	1
95-03	228	E-2	420	SMB	3.74	95	I	1
95-03	228	E-2	420	SMB	3.54	90	I	1
95-03	228	E-2	420	SMB	3.74	95	I	1
95-03	228	E-2	420	SMB	3.54	90	I	1
95-03	228	E-2	420	SMB	3.43	87	I	1
95-03	228	E-2	430	LMB	4.02	102	I	1
95-03	228	E-2	420	SMB	3.94	100	I	1
95-03	228	E-2	430	SMB	3.90	99	I	1
95-03	228	E-2	520	LGP	3.15	80	I	2
95-03	228	E-2	510	YLP	3.39	86	I	1
95-03	228	E-2	430	LMB	3.58	91	I	1
95-03	228	E-2	520	LGP	4.13	105	I	2
95-03	228	E-2	520	LGP	4.61	117	I	1
95-03	228	E-2	420	SMB	3.62	92	I	1
95-03	228	E-2	420	SMB	3.62	92	I	1
95-03	228	E-2	420	SMB	3.74	95	I	1
95-03	228	E-2	420	SMB	3.94	100	I	1
95-03	228	E-2	420	SMB	3.23	82	I	1
95-03	228	E-2	430	LMB	4.02	102	I	1
95-03	228	E-2	420	SMB	4.13	105	I	1

95-03	228	E-2	110	BLH	1.57	40	I	1
95-03	228	E-2	420	SMB	3.66	93	I	1
95-03	228	E-2	230	SSH	2.56	65	I	1
95-03	228	E-2	420	SMB	3.94	100	I	1
95-03	228	E-2	420	SMB	4.72	120	I	1
95-03	228	E-2	420	SMB	4.53	115	I	1
95-03	228	E-2	420	SMB	4.53	115	I	1
95-03	228	E-2	420	SMB	3.07	78	I	1
95-03	228	E-2	510	YLP	3.39	86	I	1
95-03	228	E-2	420	SMB	3.54	90	I	1
95-03	228	E-2	420	SMB	3.66	93	I	1
95-03	228	E-2	520	LGP	2.95	75	I	1
95-03	228	E-2	230	SSH	2.76	70	I	1
95-03	228	E-2	420	SMB	3.66	93	I	1
95-03	228	E-2	420	SMB	3.11	79	I	1
95-03	228	E-2	420	SMB	3.58	91	I	1
95-03	228	E-2	420	SMB	3.62	92	I	1
95-03	228	E-2	420	SMB	4.33	110	I	1
95-03	228	E-2	420	SMB	4.37	111	I	1
95-03	228	E-2	420	SMB	4.02	102	I	1
95-03	228	E-2	410	BLG	2.60	66	I	1
95-03	228	E-2	420	SMB	4.02	102	I	1
95-03	228	E-2	230	SSH	2.40	61	I	1
95-03	228	E-2	420	SMB	3.35	85	I	1
95-03	228	E-2	220	GSH	2.91	74	I	1
95-03	228	E-2	420	SMB	4.37	111	I	1
95-03	228	E-2	230	SSH	2.76	70	I	1
95-03	228	E-2	410	BLG	1.18	30	I	1
95-03	228	E-2	520	LGP	2.95	75	I	1
95-03	228	E-2	420	SMB	3.82	97	I	1
95-03	228	E-2	280	CSH	2.60	66	I	1
95-03	228	E-2	310	WHS	16.14	410	I	2
95-03	228	E-2	420	SMB	4.21	107	I	1
95-03	228	E-2	520	LGP	4.13	105	I	1
95-03	228	E-2	510	YLP	3.46	88	I	1
95-03	228	E-2	420	SMB	3.74	95	I	1
95-03	228	E-2	420	SMB	3.66	93	I	1
95-03	228	E-2	110	BLH	2.28	58	I	1
95-03	228	E-2	220	GSH	2.64	67	I	1
95-03	228	E-2	520	LGP	2.87	73	I	1
95-03	229	G-2	110	BLH	10.43	265	I	1
95-03	229	G-2	110	BLH	9.09	231	I	1
95-03	229	G-2	420	SMB	7.40	188	I	1
95-03	229	G-2	420	SMB	3.46	88	I	1
95-03	229	G-3	210	CCP	19.29	490	I	1
95-03	229	G-3	210	CCP	18.98	482	I	1
95-03	229	G-3	210	CCP	22.13	562	I	1
95-03	229	G-4	430	LMB	8.74	222	B	1
95-03	229	G-4	430	LMB	7.99	203	B	1

95-03	229	G-5					B	
95-03	229	G-6	310	WHS	17.24	438	B	1
95-03	229	H-1	410	BLG	7.48	190	I	1
95-03	229	H-1	420	SMB	3.62	92	I	1
95-03	229	H-1	420	SMB	4.33	110	I	1
95-03	229	H-2					I	
95-03	229	H-3	420	SMB	4.13	105	I	1
95-03	229	H-4	420	SMB	4.02	102	I	1
95-03	229	H-4	420	SMB	4.06	103	I	1
95-03	229	E-1B	210	CCP	28.15	715	I	1
95-03	229	E-1B	210	CCP	24.02	610	I	1
95-03	229	E-1B	210	CCP	19.92	506	I	1
95-03	229	E-1B	210	CCP	26.10	663	I	1
95-03	229	E-1B	205	MCP	19.69	500	I	1
95-03	229	E-1B	420	SMB	3.46	88	I	1
95-03	229	E-1B	420	SMB	15.16	385	I	1
95-03	229	E-1B	420	SMB	10.24	260	I	1
95-03	229	E-1B	420	SMB	4.17	106	I	1
95-03	229	E-1B	420	SMB	15.94	405	I	1
95-03	229	E-1B	420	SMB	10.47	266	I	1
95-03	229	E-1B	420	SMB	4.02	102	I	1
95-03	229	E-1B	420	SMB	3.66	93	I	1
95-03	229	E-1B	420	SMB	4.06	103	I	1
95-03	229	E-1B	420	SMB	3.35	85	I	1
95-03	229	E-1B	420	SMB	3.31	84	I	1
95-03	229	E-1B	420	SMB	12.83	326	I	1
95-03	229	E-1B	420	SMB	8.90	226	I	1
95-03	229	E-1B	420	SMB	8.66	220	I	1
95-03	229	E-1B	420	SMB	8.86	225	I	1
95-03	229	E-1B	420	SMB	3.74	95	I	1
95-03	229	E-1B	420	SMB	4.92	125	I	1
95-03	229	E-1B	420	SMB	3.74	95	I	1
95-03	229	E-1B	420	SMB	3.74	95	I	1
95-03	229	E-1B	420	SMB	3.19	81	I	1
95-03	229	E-1B	420	SMB	2.87	73	I	1
95-03	229	E-1B	420	SMB	2.87	73	I	1
95-03	229	E-1B	420	SMB	3.39	86	I	1
95-03	229	E-1B	420	SMB	3.27	83	I	1
95-03	229	E-1B	420	SMB	3.43	87	I	1
95-03	229	E-1B	420	SMB	4.02	102	I	1
95-03	229	E-1B	420	SMB	2.91	74	I	1
95-03	229	E-1B	420	SMB	3.94	100	I	1
95-03	229	E-1B	420	SMB	3.23	82	I	1
95-03	229	E-1B	420	SMB	3.62	92	I	1
95-03	229	E-1B	420	SMB	3.94	100	I	1
95-03	229	E-1B	410	BLG	7.56	192	I	1
95-03	229	E-1B	410	BLG	7.01	178	I	1
95-03	229	E-1B	410	BLG	1.93	49	I	1
95-03	229	E-1B	410	BLG	1.26	32	I	1
95-03	229	E-1B	420	SMB	2.48	63	I	1

95-03	229	E-1B	480	RKB	9.45	240	I	1
95-03	229	E-1B	480	RKB	2.40	61	I	1
95-03	229	E-1B	480	RKB	9.84	250	I	1
95-03	229	E-1B	480	RKB	2.40	61	I	1
95-03	229	E-1B	480	RKB	4.88	124	I	1
95-03	229	E-1B	480	RKB	2.13	54	I	1
95-03	229	E-1B	480	RKB	2.64	67	I	1
95-03	229	E-1B	480	RKB	7.17	182	I	1
95-03	229	E-1B	480	RKB	2.56	65	I	1
95-03	229	E-1B	120	GZS	3.54	90	I	1
95-03	229	E-1B	110	BLH	1.85	47	I	1
95-03	229	E-1B	110	BLH	2.20	56	I	1
95-03	229	E-1B	110	BLH	2.68	68	I	1
95-03	229	E-1B	110	BLH	1.97	50	I	1
95-03	229	E-1B	110	BLH	2.36	60	I	1
95-03	229	E-1B	110	BLH	2.36	60	I	1
95-03	229	E-1B	110	BLH	2.05	52	I	1
95-03	229	E-1B	110	BLH	2.05	52	I	1
95-03	229	E-1B	110	BLH	2.28	58	I	1
95-03	229	E-1B	110	BLH	2.20	56	I	1
95-03	229	E-1B	110	BLH	1.73	44	I	1
95-03	229	E-1B	110	BLH	2.05	52	I	1
95-03	229	E-1B	110	BLH	2.13	54	I	1
95-03	229	E-1B	430	LMB	3.94	100	I	1
95-03	229	E-1B	430	LMB	3.62	92	I	1
95-03	229	E-1B	430	LMB	3.62	92	I	1
95-03	229	E-1B	430	LMB	3.39	86	I	1
95-03	229	E-1B	430	LMB	3.66	93	I	1
95-03	229	E-1B	430	LMB	3.35	85	I	1
95-03	229	E-1B	430	LMB	3.94	100	I	1
95-03	229	E-1B	900	EEL	12.99	330	I	1
95-03	229	E-1B	230	SSH	2.48	63	I	1
95-03	229	E-1B	230	SSH	1.57	40	I	1
95-03	229	E-1B	230	SSH	1.77	45	I	1
95-03	229	E-1B	520	LGP	4.61	117	I	1
95-03	229	E-3B	110	BLH	2.52	64	B	1
95-03	229	E-3B	110	BLH	3.50	89	B	1
95-03	229	E-3B	900	EEL	22.05	560	B	1
95-03	229	E-3B	610	YBH	8.66	220	B	1
95-03	229	E-3B	410	BLG	6.50	165	B	1
95-03	229	E-3B	410	BLG	6.14	156	B	1
95-03	229	E-3B	900	EEL	23.43	595	B	1
95-03	229	E-3B	900	EEL	14.17	360	B	1
95-03	229	E-3B	900	EEL	20.47	520	B	1
95-03	229	E-3B	220	GSH	3.90	99	B	1
95-03	229	E-3B	480	RKB	2.13	54	B	1
95-03	229	E-3B	460	PKS	7.68	195	B	1
95-03	229	E-3B	510	YLP	9.84	250	B	1
95-03	229	E-3B	210	CCP	3.46	88	B	1
95-03	229	E-3B	420	SMB	3.74	95	B	1

95-03	229	E-3B	420	SMB	3.27	83	B	1
95-03	229	E-3B	420	SMB	3.27	83	B	1
95-03	229	E-3B	420	SMB	2.76	70	B	1
95-03	229	E-3B	420	SMB	3.27	83	B	1
95-03	229	E-3B	420	SMB	3.19	81	B	1
95-03	229	E-3B	420	SMB	4.41	112	B	1
95-03	229	E-3B	420	SMB	3.03	77	B	1
95-03	229	E-3B	420	SMB	3.74	95	B	1
95-03	229	E-3B	420	SMB	3.31	84	B	1
95-03	229	E-3B	420	SMB	3.03	77	B	1
95-03	229	E-3B	420	SMB	3.11	79	B	1
95-03	229	E-3B	420	SMB	3.35	85	B	1
95-03	229	E-3B	420	SMB	2.60	66	B	1
95-03	229	E-3B	420	SMB	2.99	76	B	1
95-03	229	E-3B	420	SMB	3.46	88	B	1
95-03	229	E-3B	420	SMB	3.27	83	B	1
95-03	229	E-3B	420	SMB	3.03	77	B	1
95-03	229	E-3B	420	SMB	3.58	91	B	1
95-03	229	E-3B	420	SMB	2.95	75	B	1
95-03	229	E-3B	420	SMB	3.07	78	B	1
95-03	229	E-3B	420	SMB	3.07	78	B	1
95-03	229	E-3B	420	SMB	3.58	91	B	1
95-03	229	E-3B	420	SMB	3.15	80	B	1
95-03	229	E-3B	420	SMB	4.17	106	B	1
95-03	229	E-3B	420	SMB	4.02	102	B	1
95-03	229	E-3B	420	SMB	3.70	94	B	1
95-03	229	E-3B	420	SMB	3.62	92	B	1
95-03	229	E-3B	420	SMB	2.91	74	B	1
95-03	229	E-3B	420	SMB	2.91	74	B	1
95-03	229	E-3B	420	SMB	3.15	80	B	1
95-03	229	E-3B	420	SMB	3.46	88	B	1
95-03	229	E-3B	420	SMB	2.76	70	B	1
95-03	229	E-4	900	EEL	22.44	570	T	1
95-03	229	E-4	900	EEL	13.78	350	T	1
95-03	229	E-4	310	WHS	4.02	102	T	1
95-03	229	E-4	420	SMB	5.91	150	T	1
95-03	229	E-4	420	SMB	3.78	96	T	1
95-03	229	E-4	420	SMB	3.78	96	T	1
95-03	229	E-4	420	SMB	4.41	112	T	1
95-03	229	E-4	420	SMB	4.33	110	T	1
95-03	229	E-4	420	SMB	3.94	100	T	1
95-03	229	E-4	420	SMB	3.70	94	T	1
95-03	229	E-4	420	SMB	3.74	95	T	1
95-03	229	E-4	420	SMB	3.15	80	T	1
95-03	229	E-4	420	SMB	3.74	95	T	1
95-03	229	E-4	420	SMB	3.46	88	T	1
95-03	229	E-4	900	EEL	14.17	360	T	1
95-03	229	E-5	900	EEL	32.28	820	T	1
95-03	229	E-5	900	EEL	23.62	600	T	1
95-03	229	E-5	900	EEL	28.35	720	T	1

229	E-5	900	EEL	20.08	510	1	T	
229	E-5	900	EEL	20.28	515	1	T	
229	E-5	480	RKB	9.25	235	1	T	
229	E-5	480	RKB	7.76	197	1	T	
229	E-5	110	BLH	2.09	53	1	T	
229	E-5	110	BLH	2.36	60	1	T	
229	E-5	110	BLH	2.05	52	1	T	
229	E-5	110	BLH	2.20	56	1	T	
229	E-5	420	SMB	10.47	266	1	T	
229	E-5	420	SMB	4.33	110	1	T	
229	E-5	420	SMB	3.15	80	1	T	
229	E-5	420	SMB	3.43	87	1	T	
229	E-5	420	SMB	3.94	100	1	T	
229	E-5	420	SMB	4.13	105	1	T	
229	E-5	420	SMB	2.56	65	1	T	
229	E-5	420	SMB	4.61	117	1	T	
229	E-5	420	SMB	2.68	68	1	T	
229	E-5	420	SMB	3.58	91	1	T	
229	E-5	420	SMB	2.99	76	1	T	
229	E-5	420	SMB	3.54	90	1	T	
229	E-5	420	SMB	3.35	85	1	T	
229	E-5	420	SMB	3.39	86	1	T	
229	E-5	420	SMB	3.19	81	1	T	
229	E-5	420	SMB	3.27	83	1	T	
229	E-5	420	SMB	2.99	76	1	T	
229	E-5	110	BLH			1	T	18
230	G-1	310	WHS	18.66	474	1	I	
230	G-1	310	WHS	18.74	476	1	I	
230	G-1	510	YLP	10.00	254	1	I	
230	G-1	200	CYP	4.37	111	1	I	
230	G-1	420	SMB	8.27	210	1	I	
230	G-1	420	SMB	8.74	222	1	I	
230	G-1	840	TGM	31.02	788	1	I	
230	G-2	420	SMB	7.32	186	1	I	
230	G-3	530	WLY	25.31	643	1	I	
230	G-3	530	WLY	16.85	428	1	I	
230	G-3	320	SRH	20.35	517	1	I	
230	G-3	320	SRH	21.06	535	1	I	
230	G-3	310	WHS	17.76	451	1	I	
230	G-3	120	GZS	3.62	92	1	I	
230	G-4	310	WHS	14.25	362	1	B	
230	G-5						B	
230	G-6						B	
230	H-1						I	
230	H-2						I	
230	H-3	420	SMB	8.86	225	1	I	
230	H-3	480	RKB	6.77	172	1	I	
230	H-4	420	SMB	3.62	92	1	I	
230	E-3A	420	SMB	2.52	64	1	B	

95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	2.64	67	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	2.91	74	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	2.64	67	B	1
95-03	230	E-3A	420	SMB	2.64	67	B	1
95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	2.13	54	B	1
95-03	230	E-3A	420	SMB	2.64	67	B	1
95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	2.91	74	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	2.91	74	B	1
95-03	230	E-3A	420	SMB	3.78	96	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	3.78	96	B	1
95-03	230	E-3A	420	SMB	2.91	74	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	2.91	74	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	3.54	90	B	1
95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	3.27	83	B	1
95-03	230	E-3A	420	SMB	2.52	64	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	2.76	70	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1

95-03	230	E-3A	420	SMB	3.54	90	B	1
95-03	230	E-3A	420	SMB	3.54	90	B	1
95-03	230	E-3A	420	SMB	3.03	77	B	1
95-03	230	E-3A	420	SMB	2.91	74	B	1
95-03	230	E-3A	480	RKB	2.01	51	B	1
95-03	230	E-3A	480	RKB	2.28	58	B	1
95-03	230	E-3A	480	RKB	2.28	58	B	1
95-03	230	E-3A	610	YBH	2.52	64	B	1
95-03	230	E-3A	610	YBH	2.28	58	B	1
95-03	230	E-3A	540	TDD	2.76	70	B	1
95-03	229	G-1	420	SMB	8.86	225	I	1
95-03	229	G-1	420	SMB	10.47	266	I	1
95-03	229	G-1	420	SMB	8.07	205	I	1
95-03	229	G-1	420	SMB	8.78	223	I	1
95-03	229	G-1	420	SMB	8.70	221	I	1

SCHOOL STREET FISHERIES BASELINE DATA
SEPTEMBER 1993 SAMPLE

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
263	E-1A	1.00	19.0	19.0	7.2	6.4	7.6	7.6	270	272	9-20-93
263	E-1B	0.83	19.0	19.0	6.8	7.0	7.6	7.6	273	273	9-20-93
263	E-2	0.92	19.5	19.0	6.6	6.3	7.6	7.6	275	274	9-20-93
263	E-3a	1.16	19.5	19.5	12.5	12.5	8.0	8.0	280	280	9-20-93
264	H-1	22.00	19.4	17.8	6.2	5.8	7.8	7.8			9-21-93
264	H-2	21.75	19.5	18.5	5.0	6.2	7.5				9-21-93
264	H-3	21.75	19.8	18.5	5.9	6.6	7.6				9-21-93
264	H-4	21.83	19.8	18.5	6.0	7.0	7.6				9-21-93
264	G-1	23.58	19.2	18.0	5.6	6.1	7.8				9-21-93
264	G-2	23.58	19.2	18.5	5.8	6.0	7.5				9-21-93
264	G-3	21.75	19.2	18.5	6.2	7.0	7.6				9-21-93
264	E-3B	0.75	18.0	18.5	9.2	8.2	8.0	8.0	254	269	9-21-93
264	E-4	0.75	19.0	19.0	5.9	5.9	7.2	7.2	273	272	9-21-93
264	E-5	0.66	18.8	18.9	6.7	5.9	7.6	7.6	271	270	9-21-93
264	G-4	18.75	19.8	17.0	10.2	8.2	8.0	7.6			9-21-93
264	G-5	19.77	17.5	17.0	7.4	8.2	8.0	8.0			9-21-93
264	G-6	20.30	19.0	17.0	9.6	9.1	8.0	7.8			9-21-93
265	H-1	22.92	17.8	17.5	5.8	5.9	7.4				9-22-93
265	H-2	23.17	18.5	17.5	6.2	6.6	7.4				9-22-93
265	H-3	23.00	18.5	18.0	6.6	7.0	7.4				9-22-93
265	H-4	22.92	18.5	18.0	7.0	6.8	7.4				9-22-93
265	G-1	22.16	18.0	18.0	6.1	6.5	7.4				9-22-93
265	G-2	21.08	18.5	17.8	6.0	6.6	7.4				9-22-93
265	G-3	22.92	18.5	18.0	7.0	6.8	7.4				9-22-93
265	G-4	21.92	17.0	17.0	8.2	9.0	8.0	7.8			9-22-93
265	G-5	21.50	17.0	16.2	8.2	8.6	8.0	7.7			9-22-93
265	G-6	21.56	17.0	17.2	9.1	8.6	7.8	7.8			9-22-93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

PROJECT CODE	JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
95-03	263	E-1A	210	CCP	23.82	605	I	1	
95-03	263	E-1A	205	MCP	23.82	605	I	1	
95-03	263	E-1A	210	CCP	27.56	700	I	1	
95-03	263	E-1A	210	CCP	17.72	450	I	1	
95-03	263	E-1A	210	CCP	23.70	602	I	1	
95-03	263	E-1A	210	CCP	19.02	483	I	1	
95-03	263	E-1A	210	CCP	24.49	622	I	1	
95-03	263	E-1A	210	CCP	28.15	715	I	1	
95-03	263	E-1A	210	CCP	33.58	853	I	1	
95-03	263	E-1A	210	CCP	25.04	636	I	1	
95-03	263	E-1A	210	CCP	23.35	593	I	1	
95-03	263	E-1A	210	CCP	27.17	690	I	1	
95-03	263	E-1A	210	CCP	28.43	722	I	1	
95-03	263	E-1A	210	CCP	20.79	528	I	1	
95-03	263	E-1A	210	CCP	27.95	710	I	1	
95-03	263	E-1A	430	LMB	15.28	388	I	1	
95-03	263	E-1A	430	LMB	5.71	145	I	1	
95-03	263	E-1A	430	LMB	6.69	170	I	1	
95-03	263	E-1A	430	LMB	6.73	171	I	1	
95-03	263	E-1A	430	LMB	5.12	130	I	1	
95-03	263	E-1A	430	LMB	4.45	113	I	1	
95-03	263	E-1A	430	LMB	4.25	108	I	1	
95-03	263	E-1A	430	LMB	6.02	153	I	1	
95-03	263	E-1A	430	LMB	5.79	147	I	1	
95-03	263	E-1A	430	LMB	4.45	113	I	1	
95-03	263	E-1A	430	LMB	5.20	132	I	1	
95-03	263	E-1A	430	LMB	5.04	128	I	1	
95-03	263	E-1A	430	LMB	4.96	126	I	1	
95-03	263	E-1A	430	LMB	6.42	163	I	1	
95-03	263	E-1A	430	LMB	6.22	158	I	1	
95-03	263	E-1A	430	LMB	4.53	115	I	1	
95-03	263	E-1A	430	LMB	5.39	137	I	1	
95-03	263	E-1A	430	LMB	4.25	108	I	2	
95-03	263	E-1A	430	LMB	4.76	121	I	1	
95-03	263	E-1A	430	LMB	5.35	136	I	1	
95-03	263	E-1A	430	LMB	4.37	111	I	1	
95-03	263	E-1A	430	LMB	6.30	160	I	1	
95-03	263	E-1A	430	LMB	5.83	148	I	1	
95-03	263	E-1A	430	LMB	4.37	111	I	1	
95-03	263	E-1A	430	LMB	4.25	108	I	1	
95-03	263	E-1A	430	LMB	5.28	134	I	1	
95-03	263	E-1A	430	LMB	4.65	118	I	1	
95-03	263	E-1A	430	LMB	5.00	127	I	1	

95-03	263	E-1A	430	LMB	5.20	132	I	1
95-03	263	E-1A	420	SMB	9.61	244	I	1
95-03	263	E-1A	420	SMB	5.43	138	I	1
95-03	263	E-1A	420	SMB	5.39	137	I	1
95-03	263	E-1A	420	SMB	5.75	146	I	2
95-03	263	E-1A	420	SMB	5.20	132	I	1
95-03	263	E-1A	420	SMB	4.65	118	I	1
95-03	263	E-1A	420	SMB	4.92	125	I	1
95-03	263	E-1A	420	SMB	4.45	113	I	1
95-03	263	E-1A	420	SMB	5.31	135	I	1
95-03	263	E-1A	420	SMB	4.96	126	I	1
95-03	263	E-1A	420	SMB	5.04	128	I	1
95-03	263	E-1A	430	LMB	6.06	154	I	1
95-03	263	E-1A	430	LMB	5.79	147	I	1
95-03	263	E-1A	430	LMB	5.79	147	I	1
95-03	263	E-1A	430	LMB	4.53	115	I	1
95-03	263	E-1A	430	LMB	4.80	122	I	1
95-03	263	E-1A	430	LMB	3.31	84	I	1
95-03	263	E-1A	430	LMB	6.69	170	I	1
95-03	263	E-1A	430	LMB	4.76	121	I	1
95-03	263	E-1A	430	LMB	5.51	140	I	1
95-03	263	E-1A	430	LMB	4.65	118	I	1
95-03	263	E-1A	430	LMB	3.94	100	I	1
95-03	263	E-1A	430	LMB	4.57	116	I	1
95-03	263	E-1A	430	LMB	4.61	117	I	1
95-03	263	E-1A	430	LMB	5.51	140	I	1
95-03	263	E-1A	430	LMB	5.24	133	I	1
95-03	263	E-1A	430	LMB	5.51	140	I	1
95-03	263	E-1A	430	LMB	4.41	112	I	1
95-03	263	E-1A	430	LMB	5.43	138	I	1
95-03	263	E-1A	430	LMB	5.67	144	I	1
95-03	263	E-1A	430	LMB	4.33	110	I	1
95-03	263	E-1A	430	LMB	4.53	115	I	1
95-03	263	E-1A	430	LMB	4.25	108	I	1
95-03	263	E-1A	430	LMB	4.09	104	I	1
95-03	263	E-1A	430	LMB	4.33	110	I	1
95-03	263	E-1A	430	LMB	4.02	102	I	1
95-03	263	E-1A	430	LMB	4.37	111	I	1
95-03	263	E-1A	430	LMB	4.53	115	I	1
95-03	263	E-1A	430	LMB	5.12	130	I	1
95-03	263	E-1A	430	LMB	4.53	115	I	1
95-03	263	E-1A	430	LMB	4.53	115	I	1
95-03	263	E-1A	430	LMB	4.96	126	I	1
95-03	263	E-1A	430	LMB	4.61	117	I	1
95-03	263	E-1A	430	LMB	5.04	128	I	1
95-03	263	E-1A	430	LMB	4.37	111	I	1
95-03	263	E-1A	430	LMB	4.61	117	I	1
95-03	263	E-1A	430	LMB	5.35	136	I	1
95-03	263	E-1A	430	LMB	5.91	150	I	1
95-03	263	E-1A	420	SMB	4.25	108	I	1

95-03	263	E-1A	420	SMB	4.37	111	I	1
95-03	263	E-1A	420	SMB	4.80	122	I	1
95-03	263	E-1A	420	SMB	4.88	124	I	1
95-03	263	E-1A	420	SMB	4.84	123	I	1
95-03	263	E-1A	420	SMB	4.57	116	I	1
95-03	263	E-1A	420	SMB	4.57	116	I	1
95-03	263	E-1A	420	SMB	4.45	113	I	1
95-03	263	E-1A	420	SMB	3.74	95	I	1
95-03	263	E-1A	420	SMB	3.90	99	I	1
95-03	263	E-1A	420	SMB	4.06	103	I	1
95-03	263	E-1A	420	SMB	4.57	116	I	1
95-03	263	E-1A	420	SMB	3.54	90	I	1
95-03	263	E-1A	420	SMB	4.80	122	I	1
95-03	263	E-1A	420	SMB	3.46	88	I	1
95-03	263	E-1A	450	BCR	5.91	150	I	1
95-03	263	E-1A	450	BCR	5.55	141	I	1
95-03	263	E-1A	450	BCR	7.99	203	I	1
95-03	263	E-1A	450	BCR	3.58	91	I	2
95-03	263	E-1A	450	BCR	3.70	94	I	1
95-03	263	E-1A	450	BCR	3.58	91	I	1
95-03	263	E-1A	450	BCR	3.90	99	I	1
95-03	263	E-1A	450	BCR	3.78	96	I	1
95-03	263	E-1A	440	WCR	3.62	92	I	2
95-03	263	E-1A	480	RKB	3.31	84	I	2
95-03	263	E-1A	620	BBH	15.39	391	I	1
95-03	263	E-1A	420	SMB	4.80	122	I	1
95-03	263	E-1A	430	LMB	5.94	151	I	1
95-03	263	E-1A	510	YLP	3.90	99	I	2
95-03	263	E-1A	510	YLP	4.17	106	I	1
95-03	263	E-1A	510	YLP	3.46	88	I	1
95-03	263	E-1A	510	YLP	3.74	95	I	1
95-03	263	E-1A	510	YLP	4.45	113	I	1
95-03	263	E-1A	480	RKB	2.80	71	I	1
95-03	263	E-1A	440	WCR	3.31	84	I	1
95-03	263	E-1A	450	BCR	4.17	106	I	1
95-03	263	E-1A	450	BCR	3.54	90	I	1
95-03	263	E-1A	410	BLG	2.48	63	I	2
95-03	263	E-1A	410	BLG	2.09	53	I	1
95-03	263	E-1A	410	BLG	2.01	51	I	1
95-03	263	E-1A	410	BLG	1.69	43	I	1
95-03	263	E-1A	410	BLG	8.27	210	I	1
95-03	263	E-1A	410	BLG	3.03	77	I	1
95-03	263	E-1A	420	SMB	4.65	118	I	1
95-03	263	E-1A	420	SMB	3.03	77	I	1
95-03	263	E-1A	420	SMB	4.53	115	I	1
95-03	263	E-1A	480	RKB	2.80	71	I	1
95-03	263	E-1A	450	BCR	3.15	80	I	1
95-03	263	E-1A	450	BCR	3.62	92	I	1
95-03	263	E-1A	450	BCR	3.82	97	I	1
95-03	263	E-1A	510	YLP	4.49	114	I	1

95-03	263	E-1A	510	YLP	4.06	103	I	1
95-03	263	E-1A	510	YLP	4.21	107	I	1
95-03	263	E-1A	510	YLP	4.37	111	I	1
95-03	263	E-1A	510	YLP	4.37	111	I	1
95-03	263	E-1A	510	YLP	3.74	95	I	1
95-03	263	E-1A	510	YLP	4.49	114	I	1
95-03	263	E-1A	510	YLP	4.21	107	I	1
95-03	263	E-1A	510	YLP	4.72	120	I	1
95-03	263	E-1A	510	YLP	4.09	104	I	1
95-03	263	E-1A	410	BGL	2.13	54	I	1
95-03	263	E-1A	410	BGL	1.54	39	I	1
95-03	263	E-1A	410	BGL	1.61	41	I	1
95-03	263	E-1A	410	BGL	2.17	55	I	1
95-03	263	E-1A	410	BGL	2.09	53	I	1
95-03	263	E-1A	410	BGL	1.65	42	I	1
95-03	263	E-1A	120	GZS	4.06	103	I	2
95-03	263	E-1A	120	GZS	3.98	101	I	1
95-03	263	E-1A	110	BLH	2.99	76	I	1
95-03	263	E-1A	110	BLH	2.60	66	I	1
95-03	263	E-1A	110	BLH	2.99	76	I	1
95-03	263	E-1A	110	BLH	2.13	54	I	1
95-03	263	E-1A	110	BLH	2.60	66	I	1
95-03	263	E-1A	230	SSH	3.74	95	I	2
95-03	263	E-1A	230	SSH	3.58	91	I	2
95-03	263	E-1A	230	SSH	2.99	76	I	2
95-03	263	E-1A	230	SSH	4.02	102	I	2
95-03	263	E-1A	230	SSH	3.35	85	I	2
95-03	263	E-1A	230	SSH	3.39	86	I	2
95-03	263	E-1A	230	SSH	3.50	89	I	2
95-03	263	E-1A	230	SSH	3.50	89	I	2
95-03	263	E-1A	230	SSH	3.43	87	I	2
95-03	263	E-1A	230	SSH	3.43	87	I	2
95-03	263	E-1A	230	SSH	2.83	72	I	2
95-03	263	E-1A	230	SSH	3.90	99	I	2
95-03	263	E-1A	230	SSH	3.31	84	I	2
95-03	263	E-1A	230	SSH	3.15	80	I	2
95-03	263	E-1A	230	SSH	3.58	91	I	2
95-03	263	E-1A	230	SSH	3.54	90	I	2
95-03	263	E-1A	260	BMW	2.64	67	I	2
95-03	263	E-1A	910	NBS	2.40	61	I	2
95-03	263	E-1A	910	NBS	2.80	71	I	2
95-03	263	E-1A	910	NBS	2.83	72	I	2
95-03	263	E-1A	910	NBS	2.17	55	I	2
95-03	263	E-1A	620	BBH	2.64	67	I	2
95-03	263	E-1A	510	YLP	3.82	97	I	1
95-03	263	E-1A	430	LMB	4.80	122	I	1
95-03	263	E-1A	460	PKS	5.51	140	I	2
95-03	263	E-1A	480	RKB	2.76	70	I	1
95-03	263	E-1A	410	BLG	2.13	54	I	1
95-03	263	E-1B	210	CCP	25.71	653	I	1

95-03	263	E-1B	420	SMB	11.54	293	I	1
95-03	263	E-1B	460	PKS	6.02	153	I	1
95-03	263	E-1B	430	LMB	5.59	142	I	1
95-03	263	E-1B	430	LMB	4.92	125	I	1
95-03	263	E-1B	430	LMB	5.39	137	I	1
95-03	263	E-1B	430	LMB	4.53	115	I	1
95-03	263	E-1B	430	LMB	5.71	145	I	1
95-03	263	E-1B	420	SMB	4.76	121	I	1
95-03	263	E-1B	430	LMB	4.88	124	I	1
95-03	263	E-1B	420	SMB	4.37	111	I	1
95-03	263	E-1B	420	SMB	4.65	118	I	1
95-03	263	E-1B	420	SMB	5.04	128	I	1
95-03	263	E-1B	420	SMB	3.74	95	I	1
95-03	263	E-1B	420	SMB	3.86	98	I	1
95-03	263	E-1B	430	LMB	4.33	110	I	1
95-03	263	E-1B	480	RKB	3.66	93	I	1
95-03	263	E-1B	120	GZS	4.41	112	I	1
95-03	263	E-1B	120	GZS	4.72	120	I	1
95-03	263	E-1B	220	GSH	4.49	114	I	1
95-03	263	E-1B	410	BLG	2.52	64	I	1
95-03	263	E-1B	420	SMB	4.37	111	I	1
95-03	263	E-1B	110	BLH	1.42	36	I	1
95-03	263	E-1B	910	NBS	2.48	63	I	1
95-03	263	E-1B	910	NBS	2.68	68	I	1
95-03	263	E-1B	910	NBS	2.56	65	I	1
95-03	263	E-1B	910	NBS	2.83	72	I	1
95-03	263	E-1B	910	NBS	2.13	54	I	1
95-03	263	E-1B	910	NBS	2.80	71	I	1
95-03	263	E-1B	910	NBS	2.56	65	I	1
95-03	263	E-1B	910	NBS	2.60	66	I	1
95-03	263	E-1B	910	NBS	2.68	68	I	1
95-03	263	E-1B	910	NBS	2.48	63	I	1
95-03	263	E-1B	910	NBS	2.83	72	I	1
95-03	263	E-1B	910	NBS	2.56	65	I	1
95-03	263	E-1B	220	GSH	3.31	84	I	1
95-03	263	E-1B	410	BLG	2.36	60	I	1
95-03	263	E-1B	910	NBS	2.44	62	I	1
95-03	263	E-1B	420	SMB	4.37	111	I	1
95-03	263	E-1B	900	EEL	15.75	400	I	1
95-03	263	E-1B	230	SSH	2.05	52	I	1
95-03	263	E-2	210	CCP	23.82	605	I	1
95-03	263	E-2	210	CCP	25.83	656	I	1
95-03	263	E-2	210	CCP	27.32	694	I	1
95-03	263	E-2	210	CCP	29.69	754	I	1
95-03	263	E-2	810	NPK	24.57	624	I	1
95-03	263	E-2	840	TGM	25.83	656	I	1
95-03	263	E-2	430	LMB	13.19	335	I	1
95-03	263	E-2	410	BLG	2.44	62	I	1
95-03	263	E-2	410	BLG	2.44	62	I	1
95-03	263	E-2	410	BLG	2.52	64	I	1

95-03	263	E-2	410	BLG	2.24	57	I	1
95-03	263	E-2	410	BLG	1.46	37	I	1
95-03	263	E-2	410	BLG	1.85	47	I	1
95-03	263	E-2	291	SFS	2.91	74	I	1
95-03	263	E-2	410	BLG	2.48	63	I	1
95-03	263	E-2	910	NBS	2.87	73	I	1
95-03	263	E-2	220	GSH	3.62	92	I	1
95-03	263	E-2	220	GSH	3.58	91	I	1
95-03	263	E-2	410	BLG	2.48	63	I	1
95-03	263	E-2	410	BLG	2.40	61	I	1
95-03	263	E-2	410	BLG	2.83	72	I	1
95-03	263	E-2	410	BLG	2.24	57	I	1
95-03	263	E-2	410	BLG	2.17	55	I	1
95-03	263	E-2	410	BLG	1.61	41	I	1
95-03	263	E-2	410	BLG	2.36	60	I	1
95-03	263	E-2	430	LBM	4.61	117	I	1
95-03	263	E-2	230	SSH	3.03	77	I	1
95-03	263	E-2	410	BLG	2.17	55	I	1
95-03	263	E-2	430	LMB	4.21	107	I	1
95-03	263	E-2	410	BLG	3.03	77	I	1
95-03	263	E-2	410	BLG	2.20	56	I	1
95-03	263	E-2	420	SMB	3.66	93	I	1
95-03	263	E-2	430	LMB	4.09	104	I	1
95-03	263	E-2	410	BLG	2.17	55	I	1
95-03	263	E-2	440	WCR	3.50	89	I	1
95-03	263	E-2	230	SSH	2.95	75	I	1
95-03	263	E-2	410	BLG	1.97	50	I	1
95-03	263	E-2	420	SMB	3.94	100	I	1
95-03	263	E-2	410	BLG	2.72	69	I	1
95-03	263	E-2	450	BCR	2.91	74	I	1
95-03	263	E-2	410	BLG	1.69	43	I	1
95-03	263	E-2	440	WCR	3.50	89	I	1
95-03	263	E-2	420	SMB	4.76	121	I	1
95-03	263	E-2	480	RKB	3.43	87	I	1
95-03	263	E-2	430	LMB	4.29	109	I	1
95-03	263	E-2	410	BLG	2.72	69	I	1
95-03	263	E-2	450	BCR	3.43	87	I	1
95-03	263	E-2	480	RKB	3.27	83	I	1
95-03	263	E-2	410	BLG	2.87	73	I	1
95-03	263	E-2	410	BLG	2.56	65	I	1
95-03	263	E-2	410	BLG	2.13	54	I	1
95-03	263	E-2	410	BLG	2.44	62	I	1
95-03	263	E-2	270	FLF	3.66	93	I	1
95-03	263	E-2	430	LMB	5.00	127	I	1
95-03	263	E-2	430	LMB	4.76	121	I	1
95-03	263	E-2	450	BCR	3.35	85	I	1
95-03	263	E-2	480	RKB	3.27	83	I	1
95-03	263	E-2	430	LMB	4.33	110	I	1
95-03	263	E-2	410	BLG	2.76	70	I	1
95-03	263	E-2	410	BLG	2.36	60	I	1

95-03	263	E-2	431	LMB	4.13	105	I	1
95-03	263	E-2	410	BLG	2.48	63	I	1
95-03	263	E-2	410	BLG	2.36	60	I	1
95-03	263	E-2	450	BCR	3.54	90	I	1
95-03	263	E-2	230	SSH	3.03	77	I	1
95-03	263	E-2	260	BMW	2.64	67	I	1
95-03	263	E-2	220	GSH	4.29	109	I	1
95-03	263	E-2	220	GSH	3.66	93	I	1
95-03	263	E-2	220	GSH	3.82	97	I	1
95-03	263	E-2	220	GSH	3.66	93	I	1
95-03	263	E-2	220	GSH	3.23	82	I	1
95-03	263	E-2	220	GSH	3.62	92	I	1
95-03	263	E-2	220	GSH	3.54	90	I	1
95-03	263	E-2	220	GSH	3.35	85	I	1
95-03	263	E-2	220	GSH	3.43	87	I	1
95-03	263	E-2	220	GSH	3.50	89	I	1
95-03	263	E-2	220	GSH	3.94	100	I	1
95-03	263	E-2	220	GSH	3.11	79	I	1
95-03	263	E-2	220	GSH	2.48	63	I	1
95-03	263	E-2	450	BCR	3.50	89	I	1
95-03	263	E-2	420	SMB	4.92	125	I	1
95-03	263	E-2	430	LMB	3.35	85	I	1
95-03	263	E-2	430	LMB	3.94	100	I	1
95-03	263	E-2	410	BLG	2.95	75	I	1
95-03	263	E-2	220	GSH	3.94	100	I	1
95-03	263	E-2	420	SMB	3.62	92	I	1
95-03	263	E-2	220	GSH	3.74	95	I	1
95-03	263	E-2	220	GSH	3.74	95	I	1
95-03	263	E-2	480	RKB	3.43	87	I	1
95-03	263	E-2	410	BLG	2.60	66	I	1
95-03	263	E-2	450	BCR	3.07	78	I	1
95-03	263	E-2	410	BLG	2.24	57	I	1
95-03	263	E-2	420	SMB	4.02	102	I	1
95-03	263	E-2	230	SSH	3.27	83	I	1
95-03	263	E-2	450	BCR	3.23	82	I	1
95-03	263	E-2	480	RKB	2.95	75	I	1
95-03	263	E-2	430	LMB	4.02	102	I	1
95-03	263	E-2	410	BLG	2.72	69	I	1
95-03	263	E-2	220	GSH	3.35	85	I	1
95-03	263	E-2	410	BLG	2.09	53	I	1
95-03	263	E-2	220	GSH	2.09	53	I	1
95-03	263	E-2	430	LMB	3.98	101	I	1
95-03	263	E-2	410	BLG	1.85	47	I	1
95-03	263	E-2	420	SMB	5.59	142	I	1
95-03	263	E-2	430	LMB	4.92	125	I	1
95-03	263	E-2	420	SMB	4.49	114	I	1
95-03	263	E-2	450	BCR	3.94	100	I	1
95-03	263	E-2	270	FLF	2.99	76	I	1
95-03	263	E-2	450	BCR	9.13	232	I	1
95-03	263	E-2	420	SMB	5.08	129	I	1

95-03	263	E-2	420	SMB	4.33	110	I	1
95-03	263	E-2	230	SSH	3.19	81	I	1
95-03	263	E-2	420	SMB	4.92	125	I	1
95-03	263	E-2	450	BCR	4.02	102	I	1
95-03	263	E-2	410	BLG	1.97	50	I	1
95-03	263	E-2	410	BLG	2.32	59	I	1
95-03	263	E-2	110	BLH	2.64	67	I	1
95-03	263	E-2	230	SSH	2.99	76	I	1
95-03	263	E-2	430	LMB	5.94	151	I	1
95-03	263	E-2	410	BLG	4.61	117	I	1
95-03	263	E-2	220	GSH	3.23	82	I	1
95-03	263	E-2	230	SSH	2.80	71	I	1
95-03	263	E-2	410	BLG	2.95	75	I	1
95-03	263	E-2	410	BLG	2.64	67	I	1
95-03	263	E-2	410	BLG	2.48	63	I	1
95-03	263	E-2	410	BLG	2.24	57	I	1
95-03	263	E-2	410	BLG	2.28	58	I	1
95-03	263	E-2	410	BLG	2.28	58	I	1
95-03	263	E-2	430	LMB	6.34	161	I	1
95-03	263	E-2	420	SMB	5.20	132	I	1
95-03	263	E-2	510	YLP	4.88	124	I	1
95-03	263	E-2	120	GZS	4.29	109	I	1
95-03	263	E-2	230	SSH	2.95	75	I	1
95-03	263	E-2	230	SSH	2.95	75	I	1
95-03	263	E-2	410	BLG	1.57	40	I	1
95-03	263	E-2	410	BLG	2.20	56	I	1
95-03	263	E-2	430	LMB	4.96	126	I	1
95-03	263	E-2	410	BLG	2.36	60	I	1
95-03	263	E-2	230	SSH	4.21	107	I	1
95-03	263	E-2	410	BLG	2.60	66	I	1
95-03	263	E-2	510	YLP	3.98	101	I	1
95-03	263	E-2	410	BLG	2.09	53	I	1
95-03	263	E-2	420	SMB	4.21	107	I	1
95-03	263	E-2	430	LMB	4.33	110	I	1
95-03	263	E-2	430	LMB	4.45	113	I	1
95-03	263	E-2	430	LMB	4.57	116	I	1
95-03	263	E-2	480	RKB	3.15	80	I	1
95-03	263	E-2	480	RKB	3.31	84	I	1
95-03	263	E-2	410	BGL	2.24	57	I	1
95-03	263	E-2	410	BGL	2.44	62	I	1
95-03	263	E-2	410	BGL	2.36	60	I	1
95-03	263	E-2	410	BGL	1.97	50	I	1
95-03	263	E-2	220	GSH	3.70	94	I	1
95-03	263	E-2	510	YLP	4.49	114	I	1
95-03	263	E-2	230	SSH	3.03	77	I	1
95-03	263	E-2	230	SSH	2.80	71	I	1
95-03	263	E-2	430	LMB	4.61	117	I	1
95-03	263	E-2	420	SMB	5.12	130	I	1
95-03	263	E-2	430	LMB	5.35	136	I	1
95-03	263	E-2	120	GZS	4.80	122	I	1

95-03	263	E-2	220	GSH	4.41	112	I	1
95-03	263	E-2	410	BLG	2.80	71	I	1
95-03	263	E-2	410	BLG	2.36	60	I	1
95-03	263	E-2	410	BLG	2.52	64	I	1
95-03	263	E-2	410	BLG	2.52	64	I	1
95-03	263	E-2	410	BLG	2.64	67	I	1
95-03	263	E-2	900	EEL	32.36	822	I	1
95-03	263	E-2	510	YLP	4.17	106	I	1
95-03	263	E-2	420	SMB	4.80	122	I	1
95-03	263	E-2	410	BLG	3.03	77	I	1
95-03	263	E-2	410	BLG	2.09	53	I	1
95-03	263	E-2	410	BLG	2.20	56	I	1
95-03	263	E-2	410	BLG	1.97	50	I	1
95-03	263	E-2	420	SMB	2.95	75	I	1
95-03	263	E-2	230	SSH	2.76	70	I	1
95-03	263	E-2	270	FLF	2.56	65	I	1
95-03	263	E-2	430	LMB	6.06	154	I	1
95-03	263	E-2	430	LMB	4.53	115	I	1
95-03	263	E-2	480	RKB	3.23	82	I	1
95-03	263	E-2	420	SMB	3.46	88	I	1
95-03	263	E-2	610	YBH	3.90	99	I	1
95-03	263	E-2	430	LMB	5.71	145	I	1
95-03	263	E-2	430	LMB	4.09	104	I	1
95-03	263	E-2	420	SMB	3.66	93	I	1
95-03	263	E-2	480	RKB	2.95	75	I	1
95-03	263	E-2	420	SMB	4.13	105	I	1
95-03	263	E-2	220	GSH	3.66	93	I	1
95-03	263	E-2	480	RKB	3.27	83	I	1
95-03	263	E-2	420	SMB	3.82	97	I	1
95-03	263	E-2	420	SMB	4.61	117	I	1
95-03	263	E-2	120	GZS	3.82	97	I	1
95-03	263	E-2	270	FLF	2.91	74	I	1
95-03	263	E-2	430	LMB	5.24	133	I	1
95-03	263	E-2	430	LMB	4.21	107	I	1
95-03	263	E-2	430	LMB	4.45	113	I	1
95-03	263	E-2	220	GSH	5.39	137	I	1
95-03	263	E-2	450	BCR	3.27	83	I	1
95-03	263	E-2	450	BCR	3.03	77	I	1
95-03	263	E-2	410	BLG	3.11	79	I	1
95-03	263	E-2	410	BLG	2.44	62	I	1
95-03	263	E-2	410	BLG	2.48	63	I	1
95-03	263	E-2	410	BLG	2.52	64	I	1
95-03	263	E-2	410	BLG	1.81	46	I	1
95-03	263	E-2	410	BLG	2.01	51	I	1
95-03	263	E-2	410	BLG	2.32	59	I	1
95-03	263	E-2	230	SSH	3.23	82	I	1
95-03	263	E-2	220	GSH	2.83	72	I	1
95-03	263	E-2	220	GSH	3.27	83	I	1
95-03	263	E-2	410	BLG	1.77	45	I	1
95-03	263	E-2	410	BLG	6.34	161	I	1

95-03	263	E-2	420	SMB	5.16	131	I	1
95-03	263	E-2	430	LMB	5.24	133	I	1
95-03	263	E-2	430	LMB	4.61	117	I	1
95-03	263	E-2	230	SSH	3.03	77	I	1
95-03	263	E-2	230	SSH	2.83	72	I	1
95-03	263	E-2	410	BLG	2.80	71	I	1
95-03	263	E-2	410	BLG	2.20	56	I	1
95-03	263	E-2	410	BLG	2.40	61	I	1
95-03	263	E-2	410	BLG	2.56	65	I	1
95-03	263	E-2	430	LMB	6.65	169	I	1
95-03	263	E-2	420	SMB	3.78	96	I	1
95-03	263	E-2	430	LMB	4.17	106	I	1
95-03	263	E-2	410	BLG	2.20	56	I	1
95-03	263	E-2	270	FLF	2.91	74	I	1
95-03	263	E-2	410	BLG	2.72	69	I	1
95-03	263	E-2	230	SSH	3.39	86	I	1
95-03	263	E-2	420	SMB	5.39	137	I	1
95-03	263	E-2	420	SMB	4.76	121	I	1
95-03	263	E-2	410	BLG	3.62	92	I	1
95-03	263	E-2	410	BLG	2.60	66	I	1
95-03	263	E-2	410	BLG	2.20	56	I	1
95-03	263	E-2	410	BLG	2.48	63	I	1
95-03	263	E-2	410	BLG	2.52	64	I	1
95-03	263	E-2	410	BLG	2.44	62	I	1
95-03	263	E-2	410	BLG	2.64	67	I	1
95-03	263	E-2	410	BLG	1.93	49	I	1
95-03	263	E-2	410	BLG	1.85	47	I	1
95-03	263	E-2	410	BLG	1.93	49	I	1
95-03	263	E-2	220	GSH	3.62	92	I	1
95-03	263	E-2	220	GSH	3.43	87	I	1
95-03	263	E-2	230	SSH	2.60	66	I	1
95-03	263	E-2	430	LMB	5.91	150	I	1
95-03	263	E-2	430	LMB	4.41	112	I	1
95-03	263	E-2	410	BLG	2.56	65	I	1
95-03	263	E-2	410	BLG	2.32	59	I	1
95-03	263	E-2	430	LMB	5.59	142	I	1
95-03	263	E-2	430	LMB	4.29	109	I	1
95-03	263	E-2	480	RKB	3.58	91	I	1
95-03	263	E-2	410	BLG	2.64	67	I	1
95-03	263	E-2	410	BLG	2.20	56	I	1
95-03	263	E-2	410	BLG	2.64	67	I	1
95-03	263	E-2	510	YLP	3.94	100	I	1
95-03	263	E-2	410	BLG	1.81	46	I	1
95-03	263	E-2	270	FLF	2.64	67	I	1
95-03	263	E-2	410	BLG	2.24	57	I	1
95-03	263	E-2	410	BLG	2.36	60	I	1
95-03	263	E-2	410	BLG	2.64	67	I	1
95-03	263	E-2	420	SMB	4.88	124	I	1
95-03	263	E-2	430	LMB	4.69	119	I	1
95-03	263	E-2	420	SMB	4.02	102	I	1

95-03	263	E-2	420	SMB	3.58	91	I	1
95-03	263	E-2	420	SMB	3.82	97	I	1
95-03	263	E-2	420	SMB	3.19	81	I	1
95-03	263	E-2	520	LGB	4.13	105	I	1
95-03	263	E-2	430	LMB	4.21	107	I	1
95-03	263	E-2	420	SMB	5.16	131	I	1
95-03	263	E-2	480	RKB	3.19	81	I	1
95-03	263	E-2	510	YLP	4.61	117	I	1
95-03	263	E-2	420	SMB	4.17	106	I	1
95-03	263	E-2	420	SMB	3.94	100	I	1
95-03	263	E-2	420	SMB	4.33	110	I	1
95-03	263	E-2	510	YLP	3.74	95	I	1
95-03	263	E-2	420	SMB	4.72	120	I	1
95-03	263	E-2	420	SMB	5.12	130	I	1
95-03	263	E-2	410	BLG	2.24	57	I	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.66	93	B	1
95-03	263	E-3	420	SMB	3.43	87	B	1
95-03	263	E-3	420	SMB	3.66	93	B	1
95-03	263	E-3	420	SMB	3.78	96	B	1
95-03	263	E-3	420	SMB	3.15	80	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.03	77	B	1
95-03	263	E-3	420	SMB	3.66	93	B	1
95-03	263	E-3	420	SMB	3.15	80	B	1
95-03	263	E-3	420	SMB	3.43	87	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.78	96	B	1
95-03	263	E-3	420	SMB	3.78	96	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	2.64	67	B	2
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.03	77	B	1
95-03	263	E-3	420	SMB	3.15	80	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.90	99	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.03	77	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.43	87	B	1
95-03	263	E-3	420	SMB	3.66	93	B	1
95-03	263	E-3	420	SMB	3.78	96	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	4.17	106	B	1

95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.43	87	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.27	83	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.90	99	B	1
95-03	263	E-3	420	SMB	3.66	93	B	1
95-03	263	E-3	420	SMB	3.03	77	B	1
95-03	263	E-3	420	SMB	3.54	90	B	1
95-03	263	E-3	420	SMB	3.03	77	B	1
95-03	263	E-3	420	SMB	3.15	80	B	1
95-03	263	E-3	420	SMB	10.08	256	B	1
95-03	263	E-3	420	SMB	8.31	211	B	1
95-03	263	E-3	420	SMB	7.95	202	B	1
95-03	263	E-3	610	YBH	3.27	83	B	2
95-03	263	E-3	610	YBH	3.03	77	B	1
95-03	263	E-3	480	RKB	2.40	61	B	2
95-03	263	E-3	480	RKB	2.76	70	B	1
95-03	263	E-3	480	RKB	2.52	64	B	1
95-03	263	E-3	480	RKB	2.28	58	B	1
95-03	263	E-3	480	RKB	2.52	64	B	1
95-03	263	E-3	480	RKB	2.01	51	B	1
95-03	263	E-3	480	RKB	2.52	64	B	1
95-03	263	E-3	110	BLH	2.76	70	B	2
95-03	263	E-3	110	BLH	2.76	70	B	1
95-03	263	E-3	110	BLH	2.76	70	B	1
95-03	263	E-3	110	BLH	2.28	58	B	1
95-03	263	E-3	110	BLH	2.28	58	B	1
95-03	263	E-3	110	BLH	2.28	58	B	1
95-03	263	E-3	110	BLH	2.52	64	B	1
95-03	263	E-3	410	BLG	1.50	38	B	1
95-03	263	E-3	410	BLG	1.77	45	B	1
95-03	263	E-3	410	BLG	1.50	38	B	1
95-03	263	E-3	410	BLG	1.50	38	B	2
95-03	263	E-3	540	TDD			B	2
95-03	263	E-3	540	TDD			B	2
95-03	264	H-1	410	BLG	2.05	52	I	1
95-03	264	H-1	410	BLG	2.80	71	I	1
95-03	264	H-1	410	BLG	2.64	67	I	1
95-03	264	H-1	410	BLG	2.80	71	I	1
95-03	264	H-1	410	BLG	2.20	56	I	1
95-03	264	H-1	410	BLG	2.87	73	I	1
95-03	264	H-1	410	BLG	2.28	58	I	1
95-03	264	H-1	410	BLG	1.73	44	I	1
95-03	264	H-1	420	SMB	4.88	124	I	1
95-03	264	H-2	440	WCR	7.32	186	I	1

95-03	264	H-2	480	RKB	7.09	180	I	1
95-03	264	H-2	480	RKB	5.75	146	I	1
95-03	264	H-3					I	
95-03	264	H-4	410	BLG	2.60	66	I	1
95-03	264	H-4	410	BLG	2.48	63	I	1
95-03	264	H-4	440	WCR	9.49	241	I	1
95-03	264	H-4	410	BLG	2.44	62	I	1
95-03	264	G-1	510	YLP	4.80	122	I	1
95-03	264	G-2	510	YLP	12.40	315	I	1
95-03	264	G-2	420	SMB	12.28	312	I	1
95-03	264	G-2	420	SMB	8.66	220	I	1
95-03	264	G-2	420	SMB	7.95	202	I	1
95-03	264	G-2	840	TGM	27.76	705	I	1
95-03	264	G-2	530	WLY	21.81	554	I	1
95-03	264	G-2	530	WLY	18.31	465	I	1
95-03	264	G-3	420	SMB	16.18	411	I	1
95-03	264	G-3	420	SMB	18.90	480	I	1
95-03	264	G-3	840	TMG	28.15	715	I	1
95-03	264	G-3	420	SMB	11.89	302	I	1
95-03	264	G-3	420	SMB	11.65	296	I	1
95-03	264	E-3B	420	SMB	4.45	113	B	1
95-03	264	E-3B	420	SMB	4.13	105	B	1
95-03	264	E-3B	420	SMB	4.02	102	B	1
95-03	264	E-3B	420	SMB	4.29	109	B	1
95-03	264	E-3B	420	SMB	4.17	106	B	1
95-03	264	E-3B	420	SMB	5.98	152	B	1
95-03	264	E-3B	420	SMB	4.37	111	B	1
95-03	264	E-3B	420	SMB	5.20	132	B	1
95-03	264	E-3B	420	SMB	4.02	102	B	1
95-03	264	E-3B	420	SMB	4.02	102	B	1
95-03	264	E-3B	420	SMB	5.12	130	B	1
95-03	264	E-3B	420	SMB	4.80	122	B	1
95-03	264	E-3B	420	SMB	5.12	130	B	1
95-03	264	E-3B	420	SMB	5.04	128	B	1
95-03	264	E-3B	420	SMB	4.84	123	B	1
95-03	264	E-3B	420	SMB	4.37	111	B	1
95-03	264	E-3B	420	SMB	4.13	105	B	1
95-03	264	E-3B	420	SMB	3.35	85	B	1
95-03	264	E-3B	420	SMB	5.16	131	B	1
95-03	264	E-3B	420	SMB	3.31	84	B	1
95-03	264	E-3B	420	SMB	3.74	95	B	1
95-03	264	E-3B	420	SMB	3.74	95	B	1
95-03	264	E-3B	420	SMB	5.43	138	B	1
95-03	264	E-3B	420	SMB	5.00	127	B	1
95-03	264	E-3B	420	SMB	4.92	125	B	1
95-03	264	E-3B	420	SMB	3.70	94	B	1
95-03	264	E-3B	420	SMB	3.78	96	B	1
95-03	264	E-3B	420	SMB	3.62	92	B	1
95-03	264	E-3B	420	SMB	3.66	93	B	1
95-03	264	E-3B	420	SMB	4.88	124	B	1

95-03	264	E-3B	420	SMB	4.53	115	B	1
95-03	264	E-3B	420	SMB	4.33	110	B	1
95-03	264	E-3B	420	SMB	5.79	147	B	1
95-03	264	E-3B	420	SMB	4.53	115	B	1
95-03	264	E-3B	420	SMB	4.88	124	B	1
95-03	264	E-3B	420	SMB	4.41	112	B	1
95-03	264	E-3B	420	SMB	4.06	103	B	1
95-03	264	E-3B	420	SMB	3.98	101	B	1
95-03	264	E-3B	420	SMB	4.76	121	B	1
95-03	264	E-3B	420	SMB	4.65	118	B	1
95-03	264	E-3B	420	SMB	4.69	119	B	1
95-03	264	E-3B	420	SMB	3.82	97	B	1
95-03	264	E-3B	420	SMB	4.80	122	B	1
95-03	264	E-3B	420	SMB	4.02	102	B	1
95-03	264	E-3B	420	SMB	3.70	94	B	1
95-03	264	E-3B	420	SMB	4.13	105	B	1
95-03	264	E-3B	420	SMB	3.54	90	B	1
95-03	264	E-3B	420	SMB	4.53	115	B	1
95-03	264	E-3B	420	SMB	4.96	126	B	1
95-03	264	E-3B	420	SMB	4.72	120	B	1
95-03	264	E-3B	420	SMB	5.43	138	B	1
95-03	264	E-3B	420	SMB	4.80	122	B	1
95-03	264	E-3B	420	SMB	4.57	116	B	1
95-03	264	E-3B	420	SMB	4.53	115	B	1
95-03	264	E-3B	420	SMB	4.49	114	B	1
95-03	264	E-3B	420	SMB	4.25	108	B	1
95-03	264	E-3B	420	SMB	4.41	112	B	1
95-03	264	E-3B	420	SMB	4.17	106	B	1
95-03	264	E-3B	420	SMB	4.17	106	B	1
95-03	264	E-3B	420	SMB	3.66	93	B	1
95-03	264	E-3B	420	SMB	4.09	104	B	1
95-03	264	E-3B	420	SMB	3.43	87	B	1
95-03	264	E-3B	420	SMB	3.86	98	B	1
95-03	264	E-3B	420	SMB	4.92	125	B	1
95-03	264	E-3B	420	SMB	5.94	151	B	1
95-03	264	E-3B	420	SMB	4.57	116	B	1
95-03	264	E-3B	420	SMB	3.66	93	B	1
95-03	264	E-3B	420	SMB	4.92	125	B	1
95-03	264	E-3B	420	SMB	3.54	90	B	1
95-03	264	E-3B	420	SMB	4.76	121	B	1
95-03	264	E-3B	420	SMB	3.94	100	B	1
95-03	264	E-3B	420	SMB	4.96	126	B	1
95-03	264	E-3B	420	SMB	3.82	97	B	1
95-03	264	E-3B	420	SMB	4.49	114	B	1
95-03	264	E-3B	420	SMB	4.45	113	B	1
95-03	264	E-3B	420	SMB	5.12	130	B	1
95-03	264	E-3B	420	SMB	3.66	93	B	1
95-03	264	E-3B	420	SMB	4.25	108	B	1
95-03	264	E-3B	420	SMB	4.61	117	B	1
95-03	264	E-3B	420	SMB	3.39	86	B	1

95-03	264	E-38	420	SMB	4.53	115	B	1
95-03	264	E-38	420	SMB	3.78	96	B	1
95-03	264	E-38	420	SMB	3.46	88	B	1
95-03	264	E-38	420	SMB	3.98	101	B	1
95-03	264	E-38	420	SMB	4.45	113	B	1
95-03	264	E-38	420	SMB	4.06	103	B	1
95-03	264	E-38	420	SMB	3.54	90	B	1
95-03	264	E-38	420	SMB	4.09	104	B	1
95-03	264	E-38	420	SMB	4.13	105	B	1
95-03	264	E-38	420	SMB	5.24	133	B	1
95-03	264	E-38	420	SMB	3.54	90	B	1
95-03	264	E-38	420	SMB	3.46	88	B	1
95-03	264	E-38	420	SMB	3.66	93	B	1
95-03	264	E-38	420	SMB	3.78	96	B	1
95-03	264	E-38	420	SMB	4.37	111	B	1
95-03	264	E-38	420	SMB	3.94	100	B	1
95-03	264	E-38	420	SMB	4.21	107	B	1
95-03	264	E-38	420	SMB	4.84	123	B	1
95-03	264	E-38	420	SMB	4.41	112	B	1
95-03	264	E-38	420	SMB	4.45	113	B	1
95-03	264	E-38	420	SMB	4.21	107	B	1
95-03	264	E-38	420	SMB	4.06	103	B	1
95-03	264	E-38	420	SMB	3.23	82	B	1
95-03	264	E-38	420	SMB	5.94	151	B	1
95-03	264	E-38	420	SMB	4.80	122	B	1
95-03	264	E-38	420	SMB	5.00	127	B	1
95-03	264	E-38	420	SMB	4.92	125	B	1
95-03	264	E-38	420	SMB	4.13	105	B	1
95-03	264	E-38	420	SMB	5.12	130	B	1
95-03	264	E-38	420	SMB	3.94	100	B	1
95-03	264	E-38	420	SMB	3.74	95	B	1
95-03	264	E-38	420	SMB	5.12	130	B	1
95-03	264	E-38	420	SMB	3.78	96	B	1
95-03	264	E-38	420	SMB	3.46	88	B	1
95-03	264	E-38	420	SMB	4.13	105	B	1
95-03	264	E-38	420	SMB	4.25	108	B	1
95-03	264	E-38	420	SMB	4.72	120	B	1
95-03	264	E-38	420	SMB	3.35	85	B	1
95-03	264	E-38	420	SMB	3.31	84	B	1
95-03	264	E-38	420	SMB	3.58	91	B	1
95-03	264	E-38	420	SMB	3.46	88	B	1
95-03	264	E-38	420	SMB	4.69	119	B	1
95-03	264	E-38	420	SMB	3.50	89	B	1
95-03	264	E-38	420	SMB	4.57	116	B	1
95-03	264	E-38	420	SMB	4.65	118	B	1
95-03	264	E-38	420	SMB	5.08	129	B	1
95-03	264	E-38	420	SMB	3.62	92	B	1
95-03	264	E-38	420	SMB	4.80	122	B	1
95-03	264	E-38	420	SMB	4.45	113	B	1
95-03	264	E-38	420	SMB	4.13	105	B	1

95-03	264	E-38	420	SMB	3.54	90	B	1
95-03	264	E-38	420	SMB	4.41	112	B	1
95-03	264	E-38	420	SMB	3.74	95	B	1
95-03	264	E-38	420	SMB	3.82	97	B	1
95-03	264	E-38	420	SMB	3.43	87	B	1
95-03	264	E-38	420	SMB	3.78	96	B	1
95-03	264	E-38	420	SMB	3.70	94	B	1
95-03	264	E-38	420	SMB	4.76	121	B	1
95-03	264	E-38	420	SMB	3.70	94	B	1
95-03	264	E-38	420	SMB	4.33	110	B	1
95-03	264	E-38	420	SMB	4.21	107	B	1
95-03	264	E-38	420	SMB	3.94	100	B	1
95-03	264	E-38	420	SMB	3.98	101	B	1
95-03	264	E-38	420	SMB	3.90	99	B	1
95-03	264	E-38	420	SMB	3.11	79	B	1
95-03	264	E-38	420	SMB	2.80	71	B	1
95-03	264	E-38	420	SMB	3.43	87	B	1
95-03	264	E-38	420	SMB	3.31	84	B	1
95-03	264	E-38	420	SMB	5.16	131	B	1
95-03	264	E-38	420	SMB	3.98	101	B	1
95-03	264	E-38	420	SMB	3.54	90	B	1
95-03	264	E-38	420	SMB	3.94	100	B	1
95-03	264	E-38	420	SMB	4.09	104	B	1
95-03	264	E-38	420	SMB	3.54	90	B	1
95-03	264	E-38	420	SMB	3.78	96	B	1
95-03	264	E-38	420	SMB	4.06	103	B	1
95-03	264	E-38	420	SMB	4.49	114	B	1
95-03	264	E-38	420	SMB	3.70	94	B	1
95-03	264	E-38	420	SMB	3.43	87	B	1
95-03	264	E-38	420	SMB	3.50	89	B	1
95-03	264	E-38	420	SMB	3.58	91	B	1
95-03	264	E-38	420	SMB	3.58	91	B	1
95-03	264	E-38	420	SMB	3.39	86	B	1
95-03	264	E-38	420	SMB	3.19	81	B	1
95-03	264	E-38	420	SMB	3.62	92	B	1
95-03	264	E-38	420	SMB	4.17	106	B	1
95-03	264	E-38	420	SMB	3.70	94	B	1
95-03	264	E-38	420	SMB	3.94	100	B	1
95-03	264	E-38	420	SMB	3.82	97	B	1
95-03	264	E-38	420	SMB	4.21	107	B	1
95-03	264	E-38	420	SMB	3.31	84	B	1
95-03	264	E-38	410	BLG	2.52	64	B	1
95-03	264	E-38	480	RKB	2.64	67	B	1
95-03	264	E-38	210	CCP	2.83	72	B	1
95-03	264	E-38	480	RKB	2.60	66	B	1
95-03	264	E-38	410	BLG	2.17	55	B	1
95-03	264	E-38	480	RKB	5.35	136	B	1
95-03	264	E-38	420	SMB	3.94	100	B	1
95-03	264	E-38	900	EEL	11.81	300	B	1
95-03	264	E-38	480	RKB	3.46	88	B	1

95-03	264	E-38	420	SMB	2.68	68	B	1
95-03	264	E-38	420	SMB	4.96	126	B	1
95-03	264	E-38	900	EEL	9.45	240	B	1
95-03	264	E-38	900	EEL	16.14	410	B	1
95-03	264	E-38	480	RKB	2.95	75	B	1
95-03	264	E-38	420	SMB	3.39	86	B	1
95-03	264	E-38	460	PKS	2.80	71	B	1
95-03	264	E-4	420	SMB	9.84	250	T	1
95-03	264	E-4	420	SMB	4.76	121	T	1
95-03	264	E-4	420	SMB	5.04	128	T	1
95-03	264	E-4	420	SMB	4.57	116	T	1
95-03	264	E-4	420	SMB	6.30	160	T	1
95-03	264	E-4	420	SMB	5.28	134	T	1
95-03	264	E-4	420	SMB	4.76	121	T	1
95-03	264	E-4	420	SMB	4.84	123	T	1
95-03	264	E-4	420	SMB	5.20	132	T	1
95-03	264	E-4	420	SMB	3.86	98	T	1
95-03	264	E-4	420	SMB	3.98	101	T	1
95-03	264	E-4	420	SMB	4.37	111	T	1
95-03	264	E-4	420	SMB	5.04	128	T	1
95-03	264	E-4	420	SMB	4.57	116	T	1
95-03	264	E-4	420	SMB	3.39	86	T	1
95-03	264	E-4	420	SMB	3.90	99	T	1
95-03	264	E-4	420	SMB	3.74	95	T	1
95-03	264	E-4	420	SMB	3.94	100	T	1
95-03	264	E-4	420	SMB	4.92	125	T	1
95-03	264	E-4	420	SMB	4.76	121	T	1
95-03	264	E-4	420	SMB	2.01	51	T	1
95-03	264	E-4	420	SMB	3.74	95	T	1
95-03	264	E-4	420	SMB	4.41	112	T	1
95-03	264	E-4	420	SMB	3.78	96	T	1
95-03	264	E-4	420	SMB	5.47	139	T	1
95-03	264	E-4	420	SMB	6.38	162	T	1
95-03	264	E-4	420	SMB	4.92	125	T	1
95-03	264	E-4	420	SMB	3.70	94	T	1
95-03	264	E-4	420	SMB	4.06	103	T	1
95-03	264	E-4	420	SMB	4.02	102	T	1
95-03	264	E-4	420	SMB	4.96	126	T	1
95-03	264	E-4	420	SMB	5.67	144	T	1
95-03	264	E-4	420	SMB	4.69	119	T	1
95-03	264	E-4	420	SMB	5.16	131	T	1
95-03	264	E-4	420	SMB	4.80	122	T	1
95-03	264	E-4	420	SMB	4.13	105	T	1
95-03	264	E-4	420	SMB	4.41	112	T	1
95-03	264	E-4	450	BCR	8.31	211	T	1
95-03	264	E-4	310	WHS	4.96	126	T	1
95-03	264	E-4	310	WHS	4.69	119	T	1
95-03	264	E-4	420	SMB	4.29	109	T	1
95-03	264	E-4	110	BLH	3.19	81	T	1
95-03	264	E-4	480	RKB	2.87	73	T	1

95-03	264	E-4	450	BCR	4.02	102	T	1
95-03	264	E-4	420	SMB	3.94	100	T	1
95-03	264	E-4	510	YLP	4.33	110	T	1
95-03	264	E-4	110	BLH	2.91	74	T	1
95-03	264	E-4	310	WHS	3.94	100	T	1
95-03	264	E-4	420	SMB	3.58	91	T	1
95-03	264	E-4	420	SMB	4.88	124	T	1
95-03	264	E-4	310	WHS	4.13	105	T	1
95-03	264	E-5	420	SMB	5.91	150	T	1
95-03	264	E-5	420	SMB	4.61	117	T	1
95-03	264	E-5	420	SMB	4.13	105	T	1
95-03	264	E-5	420	SMB	3.62	92	T	1
95-03	264	E-5	420	SMB	4.25	108	T	1
95-03	264	E-5	420	SMB	5.00	127	T	1
95-03	264	E-5	420	SMB	4.80	122	T	1
95-03	264	E-5	420	SMB	4.29	109	T	1
95-03	264	E-5	420	SMB	4.92	125	T	1
95-03	264	E-5	420	SMB	4.80	122	T	1
95-03	264	E-5	420	SMB	4.92	125	T	1
95-03	264	E-5	420	SMB	4.76	121	T	1
95-03	264	E-5	420	SMB	5.12	130	T	1
95-03	264	E-5	420	SMB	4.02	102	T	1
95-03	264	E-5	420	SMB	5.16	131	T	1
95-03	264	E-5	420	SMB	4.65	118	T	1
95-03	264	E-5	420	SMB	5.91	150	T	1
95-03	264	E-5	420	SMB	4.41	112	T	1
95-03	264	E-5	420	SMB	4.57	116	T	1
95-03	264	E-5	420	SMB	4.49	114	T	1
95-03	264	E-5	420	SMB	4.72	120	T	1
95-03	264	E-5	420	SMB	4.84	123	T	1
95-03	264	E-5	420	SMB	4.33	110	T	1
95-03	264	E-5	420	SMB	3.78	96	T	1
95-03	264	E-5	420	SMB	4.13	105	T	1
95-03	264	E-5	420	SMB	4.57	116	T	1
95-03	264	E-5	420	SMB	5.43	138	T	1
95-03	264	E-5	420	SMB	4.41	112	T	1
95-03	264	E-5	420	SMB	4.25	108	T	1
95-03	264	E-5	420	SMB	4.61	117	T	1
95-03	264	E-5	420	SMB	4.29	109	T	1
95-03	264	E-5	110	BLH	2.76	70	T	1
95-03	264	E-5	110	BLH	2.64	67	T	1
95-03	264	E-5	110	BLH	3.11	79	T	1
95-03	264	E-5	110	BLH	2.99	76	T	1
95-03	264	E-5	110	BLH	2.64	67	T	1
95-03	264	E-5	110	BLH	2.95	75	T	1
95-03	264	E-5	230	SSH	2.95	75	T	1
95-03	264	E-5	310	WSH	5.67	144	T	1
95-03	264	E-5	540	TDD	2.52	64	T	1
95-03	264	E-5	900	EEL	14.96	380	T	1
95-03	264	E-5	900	EEL	16.93	430	T	1

95-03	264	E-5	420	SMB	5.51	140	T	1
95-03	264	E-5	420	SMB	4.29	109	T	1
95-03	264	G-4	420	SMB	3.39	86	B	1
95-03	264	G-5	210	CCP	9.50	241	B	1
95-03	264	G-5	210	CCP	9.00	229	B	1
95-03	264	G-6					B	
95-03	265	H-1	430	LMB	4.33	110	I	1
95-03	265	H-1	430	LMB	4.45	113	I	1
95-03	265	H-1	430	LMB	3.78	96	I	1
95-03	265	H-1	410	BLG	2.48	63	I	1
95-03	265	H-1	410	BLG	2.80	71	I	1
95-03	265	H-1	410	BLG	2.56	65	I	1
95-03	265	H-1	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	3.86	98	I	1
95-03	265	H-2	410	BLG	2.83	72	I	1
95-03	265	H-2	410	BLG	2.56	65	I	1
95-03	265	H-2	410	BLG	2.52	64	I	1
95-03	265	H-2	410	BLG	2.13	54	I	1
95-03	265	H-2	410	BLG	2.13	54	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.87	73	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.20	56	I	1
95-03	265	H-2	410	BLG	2.76	70	I	1
95-03	265	H-2	410	BLG	3.11	79	I	1
95-03	265	H-2	410	BLG	3.23	82	I	1
95-03	265	H-2	410	BLG	2.52	64	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.13	54	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	2.20	56	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.56	65	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	2.32	59	I	1
95-03	265	H-2	410	BLG	2.48	63	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.13	54	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	2.48	63	I	1
95-03	265	H-2	410	BLG	2.17	55	I	1
95-03	265	H-2	410	BLG	2.09	53	I	1
95-03	265	H-2	410	BLG	2.24	57	I	1
95-03	265	H-2	410	BLG	2.60	66	I	1
95-03	265	H-2	410	BLG	2.64	67	I	1
95-03	265	H-2	410	BLG	2.05	52	I	1
95-03	265	H-2	410	BLG	2.48	63	I	1

95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	2.20	56	I	1
95-03	265	H-2	410	BLG	2.60	66	I	1
95-03	265	H-2	410	BLG	2.17	55	I	1
95-03	265	H-2	410	BLG	2.09	53	I	1
95-03	265	H-2	410	BLG	2.13	54	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.76	70	I	1
95-03	265	H-2	410	BLG	2.52	64	I	1
95-03	265	H-2	410	BLG	2.80	71	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	2.60	66	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.48	63	I	1
95-03	265	H-2	410	BLG	2.83	72	I	1
95-03	265	H-2	410	BLG	2.17	55	I	1
95-03	265	H-2	410	BLG	2.68	68	I	1
95-03	265	H-2	410	BLG	2.60	66	I	1
95-03	265	H-2	410	BLG	3.19	81	I	1
95-03	265	H-2	410	BLG	2.48	63	I	1
95-03	265	H-2	410	BLG	2.48	63	I	1
95-03	265	H-2	410	BLG	2.68	68	I	1
95-03	265	H-2	410	BLG	2.72	69	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	1.89	48	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.52	64	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.24	57	I	1
95-03	265	H-2	410	BLG	2.60	66	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	1.97	50	I	1
95-03	265	H-2	410	BLG	2.60	66	I	1
95-03	265	H-2	410	BLG	2.52	64	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.01	51	I	1
95-03	265	H-2	410	BLG	2.48	63	I	1
95-03	265	H-2	410	BLG	2.44	62	I	1
95-03	265	H-2	410	BLG	2.40	61	I	1
95-03	265	H-2	410	BLG	2.52	64	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1
95-03	265	H-2	410	BLG	2.87	73	I	1
95-03	265	H-2	410	BLG	2.28	58	I	1
95-03	265	H-2	410	BLG	2.09	53	I	1
95-03	265	H-2	410	BLG	2.64	67	I	1
95-03	265	H-2	410	BLG	2.05	52	I	1
95-03	265	H-2	410	BLG	2.36	60	I	1

95-03	265	H-2	410	BLG	2.64	67	I	1	
95-03	265	H-2	410	BLG	2.56	65	I	1	
95-03	265	H-2	410	BLG	2.44	62	I	1	
95-03	265	H-2	410	BLG	2.09	53	I	1	
95-03	265	H-2	410	BLG	2.01	51	I	1	
95-03	265	H-2	410	BLG	2.56	65	I	1	
95-03	265	H-2	410	BLG	2.44	62	I	1	
95-03	265	H-2	410	BLG	2.20	56	I	1	
95-03	265	H-2	410	BLG	2.60	66	I	1	
95-03	265	H-2	410	BLG	2.68	68	I	1	
95-03	265	H-2	410	BLG	2.52	64	I	1	
95-03	265	H-2	410	BLG	2.80	71	I	1	
95-03	265	H-2	410	BLG	2.60	66	I	1	
95-03	265	H-2	410	BLG	2.68	68	I	1	
95-03	265	H-2	410	BLG			I	1	161
95-03	265	H-2	450	BCR	2.83	72	I	1	
95-03	265	H-2	450	BCR	3.66	93	I	1	
95-03	265	H-2	450	BCR	2.99	76	I	1	
95-03	265	H-2	450	BCR	3.58	91	I	1	
95-03	265	H-2	450	BCR	3.54	90	I	1	
95-03	265	H-2	450	BCR	3.11	79	I	1	
95-03	265	H-2	450	BCR	3.86	98	I	1	
95-03	265	H-2	450	BCR	3.27	83	I	1	
95-03	265	H-2	450	BCR	3.78	96	I	1	
95-03	265	H-2	450	BCR	2.87	73	I	1	
95-03	265	H-2	450	BCR	3.66	93	I	1	
95-03	265	H-2	450	BCR	3.94	100	I	1	
95-03	265	H-2	450	BCR	3.58	91	I	1	
95-03	265	H-2	450	BCR	3.62	92	I	1	
95-03	265	H-2	450	BCR	3.62	92	I	1	
95-03	265	H-2	450	BCR	3.43	87	I	1	
95-03	265	H-2	450	BCR	3.19	81	I	1	
95-03	265	H-2	450	BCR	3.31	84	I	1	
95-03	265	H-2	440	WCR	2.80	71	I	1	
95-03	265	H-2	440	WCR	3.35	85	I	1	
95-03	265	H-2	480	RKB	8.94	227	I	1	
95-03	265	H-2	480	RKB	7.20	183	I	1	
95-03	265	H-2	510	YLP	4.29	109	I	1	
95-03	265	H-2	510	YLP	4.41	112	I	1	
95-03	265	H-2	510	YLP	4.21	107	I	1	
95-03	265	H-2	510	YLP	4.53	115	I	1	
95-03	265	H-2	510	YLP	4.17	106	I	1	
95-03	265	H-2	510	YLP	4.02	102	I	1	
95-03	265	H-2	510	YLP	3.82	97	I	1	
95-03	265	H-2	510	YLP	4.49	114	I	1	
95-03	265	H-2	510	YLP	3.74	95	I	1	
95-03	265	H-2	510	YLP	3.74	95	I	1	
95-03	265	H-2	510	YLP	3.98	101	I	1	
95-03	265	H-2	510	YLP	3.82	97	I	1	
95-03	265	H-2	510	YLP	3.86	98	I	1	

95-03	265	H-2	510	YLP	4.21	107	I	1
95-03	265	H-2	510	YLP	4.33	110	I	1
95-03	265	H-2	510	YLP	4.25	108	I	1
95-03	265	H-2	510	YLP	5.24	133	I	1
95-03	265	H-2	510	YLP	3.70	94	I	1
95-03	265	H-2	510	YLP	3.78	96	I	1
95-03	265	H-2	510	YLP	4.09	104	I	1
95-03	265	H-2	510	YLP	4.57	116	I	1
95-03	265	H-2	510	YLP	4.06	103	I	1
95-03	265	H-2	510	YLP	3.70	94	I	1
95-03	265	H-2	510	YLP	4.09	104	I	1
95-03	265	H-2	510	YLP	3.74	95	I	1
95-03	265	H-2	510	YLP	4.41	112	I	1
95-03	265	H-2	430	LMB	4.33	110	I	1
95-03	265	H-2	430	LMB	5.59	142	I	1
95-03	265	H-2	430	LMB	4.76	121	I	1
95-03	265	H-2	460	PKS	3.11	79	I	1
95-03	265	H-2	460	PKS	2.95	75	I	1
95-03	265	H-2	460	PKS	3.43	87	I	1
95-03	265	H-2	460	PKS	2.87	73	I	1
95-03	265	H-2	460	PKS	2.99	76	I	1
95-03	265	H-2	460	PKS	2.64	67	I	1
95-03	265	H-2	460	PKS	3.03	77	I	1
95-03	265	H-2	460	PKS	2.56	65	I	1
95-03	265	H-2	460	PKS	2.83	72	I	1
95-03	265	H-2	460	PKS	3.07	78	I	1
95-03	265	H-2	460	PKS	2.36	60	I	1
95-03	265	H-2	460	PKS	2.44	62	I	1
95-03	265	H-2	460	PKS	2.60	66	I	1
95-03	265	H-2	460	PKS	3.66	93	I	1
95-03	265	H-2	460	PKS	2.40	61	I	1
95-03	265	H-2	510	YLP	4.02	102	I	1
95-03	265	H-2	510	YLP	3.94	100	I	1
95-03	265	H-3	410	BLG	2.36	60	I	1
95-03	265	H-3	410	BLG	2.17	55	I	1
95-03	265	H-3	410	BLG	2.20	56	I	1
95-03	265	H-3	410	BLG	2.17	55	I	1
95-03	265	H-3	410	BLG	2.17	55	I	1
95-03	265	H-3	410	BLG	2.64	67	I	1
95-03	265	H-3	410	BLG	2.52	64	I	1
95-03	265	H-3	410	BLG	2.76	70	I	1
95-03	265	H-3	410	BLG	2.76	70	I	1
95-03	265	H-3	410	BLG	2.24	57	I	1
95-03	265	H-3	410	BLG	2.48	63	I	1
95-03	265	H-3	410	BLG	2.01	51	I	1
95-03	265	H-3	410	BLG	2.68	68	I	1
95-03	265	H-3	410	BLG	2.48	63	I	1
95-03	265	H-3	410	BLG	2.60	66	I	1
95-03	265	H-3	410	BLG	2.13	54	I	1
95-03	265	H-3	410	BLG	2.64	67	I	1

95-03	265	H-3	410	BLG	2.44	62	I	1
95-03	265	H-3	410	BLG	2.76	70	I	1
95-03	265	H-3	410	BLG	2.13	54	I	1
95-03	265	H-3	410	BLG	2.76	70	I	1
95-03	265	H-3	410	BLG	2.56	65	I	1
95-03	265	H-3	410	BLG	2.99	76	I	1
95-03	265	H-3	410	BLG	2.24	57	I	1
95-03	265	H-3	410	BLG	1.81	46	I	1
95-03	265	H-3	410	BLG	2.24	57	I	1
95-03	265	H-3	410	BLG	2.52	64	I	1
95-03	265	H-3	410	BLG	2.80	71	I	1
95-03	265	H-3	430	LMB	4.96	126	I	1
95-03	265	H-3	430	LMB	4.02	102	I	1
95-03	265	H-3	430	LMB	5.12	130	I	1
95-03	265	H-3	480	RKB	2.99	76	I	1
95-03	265	H-3	480	RKB	2.68	68	I	1
95-03	265	H-3	450	BCR	3.70	94	I	1
95-03	265	H-3	460	PKS	2.80	71	I	1
95-03	265	H-3	230	SSH	2.32	59	I	1
95-03	265	H-3	540	TTD	2.36	60	I	1
95-03	265	H-4					I	
95-03	265	G-1	430	LMB	4.33	110	I	1
95-03	265	G-1	220	GSH	4.33	110	I	1
95-03	265	G-1	220	GSH	7.76	197	I	1
95-03	265	G-1	220	GSH	6.89	175	I	1
95-03	265	G-1	450	BCR	3.50	89	I	1
95-03	265	G-1	840	TGM	27.95	710	I	1
95-03	265	G-2	510	YLP	9.45	240	I	1
95-03	265	G-2	510	YLP	9.21	234	I	1
95-03	265	G-2	510	YLP	8.98	228	I	1
95-03	265	G-2	420	SMB	12.60	320	I	1
95-03	265	G-2	420	SMB	9.45	240	I	1
95-03	265	G-2	110	BLH	10.00	254	I	1
95-03	265	G-2	905	FWD	10.79	274	I	2
95-03	265	G-3	420	SMB	16.54	420	I	1
95-03	265	G-4					B	
95-03	265	G-5	420	SMB			B	1
95-03	265	G-6	420	SMB	4.02	102	B	1
95-03	265	G-6	480	RKB	3.54	90	B	1

SCHOOL STREET FISHERIES BASELINE DATA
OCTOBER 1993 SAMPLE

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
285	E-1A	0.91	13.0	13.0	9.7	9.8	7.7	7.7	213	217	10/12/93
285	E-1B	0.75	13.0	13.2	10.6	10.4	8.0	7.8	217	217	10/12/93
285	E-2	0.75	13.0	13.0	10.0	10.0	7.5	8.1	216	217	10/12/93
287	E-3A	1.17	9.0	9.0	11.4	11.4			304	304	10/14/93
285	E-3B	0.83	12.7	12.8	9.6	9.5	8.1	7.8	217	217	10/12/93
285	E-4	0.42	13.3	13.2	9.5	10.8	7.9	7.5	215	218	10/12/93
285	E-5	0.45	13.2	13.0	10.8	10.6	7.5	7.9	218	217	10/12/93
286	G-1	24.17	13.7	13.0	9.7	9.5	7.8	7.8			10/13/93
287	G-1	21.42	13.0	12.0	9.5	8.5	7.8	7.6			10/14/93
286	G-2	24.75	10.7	13.0	9.5	9.4	7.8	7.8			10/13/93
287	G-2	21.08	13.0	12.0	9.4	8.5	7.8	7.6			10/14/93
286	G-3	23.59	14.0	13.0	9.4	9.4	7.6	7.6			10/13/93
287	G-3	21.33	13.0	12.1	9.4	8.8	7.6	7.6			10/14/93
287	G-4	43.00	12.0	10.0	9.2	11.2	7.8	7.8			10/14/93
287	G-5	43.17	12.2	10.0	9.2	11.4	8.1	8.1			10/14/93
287	G-6	43.25	12.0	6.0	10.2	11.5	7.7	7.7			10/14/93
286	H-1	24.17	13.5	12.5	8.3	10.6	7.8	7.8			10/13/93
287	H-1	21.59	12.5	12.0	8.3	8.7	7.8	7.6			10/14/93
286	H-2	24.92	14.0	13.0	9.5	9.2	7.8	7.8			10/13/93
287	H-2	21.08	13.0	12.0	9.2	8.8	7.8	7.6			10/14/93
286	H-3	25.08	14.0	13.0	9.8	9.5	7.6	7.6			10/13/93
287	H-3	21.42	13.0	12.1	9.5	9.2	7.6	7.6			10/14/93
286	H-4	24.17	14.0	13.0	9.6	9.2	7.6	7.6			10/13/93
287	H-4	21.33	13.0	12.0	9.2	8.4	7.6	7.6			10/14/93

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
285	E-1A	430	LMB	20.16	512	I		1
285	E-1A	430	LMB	14.96	380	I		1
285	E-1A	430	LMB	6.06	154	I		1
285	E-1A	430	LMB	5.51	140	I		1
285	E-1A	430	LMB	6.77	172	I		1
285	E-1A	430	LMB	5.83	148	I		1
285	E-1A	430	LMB	4.65	118	I		1
285	E-1A	430	LMB	4.21	107	I		1
285	E-1A	430	LMB	5.31	135	I		1
285	E-1A	430	LMB	5.00	127	I		1
285	E-1A	430	LMB	4.21	107	I		1
285	E-1A	430	LMB	5.83	148	I		1
285	E-1A	430	LMB	4.80	122	I		1
285	E-1A	430	LMB	4.37	111	I		1
285	E-1A	430	LMB	4.33	110	I		1
285	E-1A	430	LMB	5.00	127	I		1
285	E-1A	430	LMB	5.35	136	I		1
285	E-1A	510	YLP	9.49	241	I		1
285	E-1A	510	YLP	8.66	220	I		1
285	E-1A	510	YLP	3.94	100	I		1
285	E-1A	510	YLP	4.76	121	I		1
285	E-1A	510	YLP	4.41	112	I		1
285	E-1A	510	YLP	5.16	131	I		1
285	E-1A	510	YLP	4.53	115	I		1
285	E-1A	510	YLP	3.86	98	I		1
285	E-1A	510	YLP	3.94	100	I		1
285	E-1A	510	YLP	4.61	117	I		1
285	E-1A	510	YLP	4.29	109	I		1
285	E-1A	510	YLP	4.53	115	I		1
285	E-1A	510	YLP	4.41	112	I		1
285	E-1A	510	YLP	10.47	266	I		1
285	E-1A	510	YLP	9.17	233	I		1
285	E-1A	510	YLP	4.33	110	I		1
285	E-1A	510	YLP	4.80	122	I		1
285	E-1A	510	YLP	4.61	117	I		1
285	E-1A	510	YLP	4.65	118	I		1
285	E-1A	510	YLP	3.94	100	I		1
285	E-1A	480	RKB	10.08	256	I		1
285	E-1A	510	YLP	5.35	136	I		1
285	E-1A	410	BLG	8.43	214	I		1
285	E-1A	510	YLP	4.57	116	I		1
285	E-1A	510	YLP	4.53	115	I		1
285	E-1A	510	YLP	5.24	133	I		1
285	E-1A	420	SMB	11.14	283	I		1
285	E-1A	420	SMB	5.55	141	I		1
285	E-1A	420	SMB	5.75	146	I		1
285	E-1A	420	SMB	10.31	262	I		1
285	E-1A	420	SMB	5.31	135	I		1
285	E-1A	420	SMB	4.21	107	I		1
285	E-1A	430	LMB	3.86	98	I		1
285	E-1A	430	LMB	5.55	141	I		1
285	E-1A	430	LMB	5.24	133	I		1
285	E-1A	430	LMB	6.18	157	I		1
285	E-1A	430	LMB	4.17	106	I		1
285	E-1A	430	LMB	4.61	117	I		1
285	E-1A	430	LMB	4.49	114	I		1
285	E-1A	430	LMB	4.92	125	I		1
285	E-1A	430	LMB	4.57	116	I		1
285	E-1A	430	LMB	5.47	139	I		1

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285	E-1A	430	LMB	5.12	130	I		1
285	E-1A	430	LMB	4.45	113	I		1
285	E-1A	420	SMB			I		1
285	E-1A	420	SMB	4.13	105	I		1
285	E-1A	420	SMB	5.20	132	I		1
285	E-1A	420	SMB	4.25	108	I		1
285	E-1A	420	SMB	4.29	109	I		1
285	E-1A	420	SMB	5.20	132	I		1
285	E-1A	420	SMB	4.29	109	I		1
285	E-1A	420	SMB	5.24	133	I		1
285	E-1A	420	SMB	4.57	116	I		1
285	E-1A	420	SMB	4.61	117	I		1
285	E-1A	420	SMB	4.21	107	I		1
285	E-1A	420	SMB	4.06	103	I		1
285	E-1A	420	SMB	4.21	107	I		1
285	E-1A	420	SMB	4.37	111	I		1
285	E-1A	420	SMB	4.88	124	I		1
285	E-1A	420	SMB	4.53	115	I		1
285	E-1A	420	SMB	4.41	112	I		1
285	E-1A	420	SMB	4.61	117	I		1
285	E-1A	420	SMB	5.31	135	I		1
285	E-1A	420	SMB	4.25	108	I		1
285	E-1A	420	SMB	4.69	119	I		1
285	E-1A	420	SMB	4.41	112	I		1
285	E-1A	420	SMB	3.35	85	I		1
285	E-1A	420	SMB	3.94	100	I		1
285	E-1A	420	SMB	4.57	116	I		1
285	E-1A	420	SMB	5.16	131	I		1
285	E-1A	420	SMB	4.72	120	I		1
285	E-1A	420	SMB	4.80	122	I		1
285	E-1A	510	YLP	4.13	105	I		1
285	E-1A	510	YLP	4.06	103	I		1
285	E-1A	510	YLP	4.45	113	I		1
285	E-1A	510	YLP	4.17	106	I		1
285	E-1A	510	YLP	4.76	121	I		1
285	E-1A	510	YLP	4.84	123	I		1
285	E-1A	510	YLP	4.45	113	I		1
285	E-1A	510	YLP	4.49	114	I		1
285	E-1A	420	SMB	4.80	122	I		1
285	E-1A	420	SMB	5.28	134	I		1
285	E-1A	620	BBH	11.54	293	I		1
285	E-1A	430	LMB	3.98	101	I		1
285	E-1A	430	LMB	4.21	107	I		1
285	E-1A	450	BCR	4.96	126	I		1
285	E-1A	450	BCR	3.90	99	I		1
285	E-1A	450	BCR	3.78	96	I		1
285	E-1A	450	BCR	3.78	96	I		1
285	E-1A	120	GZS	5.91	150	I		1
285	E-1A	480	RKB	2.87	73	I		1
285	E-1A	410	BLG	2.68	68	I		1
285	E-1A	220	GSH	3.94	100	I		1
285	E-1A	460	PKS	2.95	75	I		1
285	E-1A	420	SMB	3.98	101	I		1
285	E-1A	450	BCR	3.70	94	I		1
285	E-1A	220	GSH	4.06	103	I		1
285	E-1A	220	GSH	4.02	102	I		1
285	E-1A	510	YLP	4.29	109	I		1
285	E-1A	410	BLG	2.13	54	I		1
285	E-1A	410	BLG	2.13	54	I		1

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285	E-1A	220	GSH	3.78	96	I		1
285	E-1A	410	BLG	2.09	53	I		1
285	E-1A	220	GSH	3.19	81	I		1
285	E-1A	220	GSH	4.80	122	I		1
285	E-1A	450	BCR	3.62	92	I		1
285	E-1A	510	YLP	4.76	121	I		1
285	E-1A	450	BCR	4.53	115	I		1
285	E-1A	410	BLG	2.87	73	I		1
285	E-1A	410	BLG	1.97	50	I		1
285	E-1A	480	RKB	8.03	204	I		1
285	E-1A	510	YLP	4.21	107	I		1
285	E-1A	450	BCR	3.86	98	I		1
285	E-1A	410	BLG	2.76	70	I		1
285	E-1A	450	BCR	3.90	99	I		1
285	E-1A	450	BCR	3.78	96	I		1
285	E-1A	420	SMB	4.21	107	I		1
285	E-1A	220	GSH	4.25	108	I		1
285	E-1A	410	BLG	1.61	41	I		1
285	E-1A	410	BLG	2.09	53	I		1
285	E-1A	480	RKB	3.15	80	I		1
285	E-1A	610	YBH	2.80	71	I		1
285	E-1A	480	RKB	3.31	84	I		1
285	E-1A	460	PKS	2.36	60	I		1
285	E-1A	410	BLG	2.68	68	I		1
285	E-1A	480	RKB	3.82	97	I		1
285	E-1A	220	GSH	4.06	103	I		1
285	E-1A	320	SRH	1.61	41	I		1
285	E-1A	310	WHS	20.35	517	I		1
285	E-1A	410	BLG	6.38	162	I		1
285	E-1A	420	SMB	6.18	157	I		1
285	E-1A	420	SMB	5.67	144	I		1
285	E-1A	450	BCR	3.78	96	I		1
285	E-1A	480	RKB	3.27	83	I		1
285	E-1A	220	GSH	4.21	107	I		1
285	E-1A	910	NBS	1.85	47	I		1
285	E-1A	410	BLG	1.73	44	I		1
285	E-1A	220	GSH	3.86	98	I		1
285	E-1A	540	TDD	1.85	47	I		1
285	E-1B	530	WLY	21.06	535	I		1
285	E-1B	420	SMB	15.47	393	I		1
285	E-1B	420	SMB	15.98	406	I		1
285	E-1B	420	SMB	12.60	320	I		1
285	E-1B	320	SRH	18.03	458	I		1
285	E-1B	510	YLP	11.89	302	I		1
285	E-1B	320	SRH	14.25	362	I		1
285	E-1B	310	WHS	18.31	465	I		1
285	E-1B	420	SMB	4.41	112	I		1
285	E-1B	420	SMB	5.59	142	I		1
285	E-1B	420	SMB	4.92	125	I		1
285	E-1B	420	SMB	3.94	100	I		1
285	E-1B	420	SMB	4.49	114	I		1
285	E-1B	420	SMB	3.94	100	I		1
285	E-1B	420	SMB	4.37	111	I		1
285	E-1B	420	SMB	3.70	94	I		1
285	E-1B	420	SMB	4.25	108	I		1
285	E-1B	420	SMB	4.29	109	I		1
285	E-1B	420	SMB	4.21	107	I		1
285	E-1B	420	SMB	3.23	82	I		1
285	E-1B	420	SMB	3.66	93	I		1

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285	E-1B	420	SMB	4.80	122	I		1
285	E-1B	420	SMB	5.35	136	I		1
285	E-1B	420	SMB	4.29	109	I		1
285	E-1B	420	SMB	4.65	118	I		1
285	E-1B	420	SMB	4.37	111	I		1
285	E-1B	420	SMB	4.57	116	I		1
285	E-1B	420	SMB	4.02	102	I		1
285	E-1B	420	SMB	3.35	85	I		1
285	E-1B	420	SMB	4.37	111	I		1
285	E-1B	420	SMB	3.11	79	I		1
285	E-1B	430	LMB	4.72	120	I		1
285	E-1B	430	LMB	4.57	116	I		1
285	E-1B	430	LMB	3.58	91	I		1
285	E-1B	430	LMB	3.74	95	I		1
285	E-1B	430	LMB	5.24	133	I		1
285	E-1B	430	LMB	5.98	152	I		1
285	E-1B	430	LMB	5.28	134	I		1
285	E-1B	420	SMB	4.17	106	I		1
285	E-1B	420	SMB	4.65	118	I		1
285	E-1B	420	SMB	3.66	93	I		1
285	E-1B	420	SMB	4.02	102	I		1
285	E-1B	420	SMB	4.33	110	I		1
285	E-1B	420	SMB	3.66	93	I		1
285	E-1B	420	SMB	4.09	104	I		1
285	E-1B	430	LMB	4.37	111	I		1
285	E-1B	480	RKB	7.95	202	I		1
285	E-1B	460	PKS	8.11	206	I		1
285	E-1B	410	BLG	2.05	52	I		1
285	E-1B	410	BLG	2.20	56	I		1
285	E-1B	410	BLG	2.32	59	I		1
285	E-1B	410	BLG	2.17	55	I		1
285	E-1B	480	RKB	2.72	69	I		1
285	E-1B	480	RKB	3.15	80	I		1
285	E-1B	480	RKB	3.15	80	I		1
285	E-1B	480	RKB	2.91	74	I		1
285	E-1B	450	BCR	4.09	104	I		1
285	E-1B	291	SFS	3.31	84	I		1
285	E-1B	910	NBS	2.91	74	I		1
285	E-1B	910	NBS	2.60	66	I		1
285	E-1B	910	NBS	2.44	62	I		1
285	E-1B	910	NBS	2.80	71	I		1
285	E-1B	910	NBS	2.52	64	I		1
285	E-1B	910	NBS	2.56	65	I		1
285	E-1B	910	NBS	2.17	55	I		1
285	E-1B	910	NBS	2.48	63	I		1
285	E-1B	910	NBS	2.24	57	I		1
285	E-1B	910	NBS	2.60	66	I		1
285	E-1B	910	NBS	2.56	65	I		1
285	E-1B	480	RKB	2.64	67	I		1
285	E-1B	230	SSH	3.50	89	I		1
285	E-1B	230	SSH	3.35	85	I		1
285	E-1B	230	SSH	2.64	67	I		1
285	E-1B	230	SSH	2.83	72	I		1
285	E-1B	120	GZS	5.55	141	I		1
285	E-1B	120	GZS	5.00	127	I		1
285	E-1B	910	NBS	2.76	70	I		1
285	E-1B	510	YLP	4.37	111	I		1
285	E-1B	900	EEL	18.11	460	I		1
285	E-1B	420	SMB	4.29	109	I		1

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285	E-1B	420	SMB	5.16	131	I	1	
285	E-1B	420	SMB	4.25	108	I	1	
285	E-1B	420	SMB	5.00	127	I	1	
285	E-1B	420	SMB	4.13	105	I	1	
285	E-1B	420	SMB	5.20	132	I	1	
285	E-1B	420	SMB	3.70	94	I	1	
285	E-1B	420	SMB	3.11	79	I	1	
285	E-1B	430	LMB	4.53	115	I	1	
285	E-1B	510	YLP	4.72	120	I	1	
285	E-1B	480	RKB	3.11	79	I	1	
285	E-1B	480	RKB	3.23	82	I	1	
285	E-1B	480	RKB	2.83	72	I	1	
285	E-1B	480	RKB	3.54	90	I	1	
285	E-1B	480	RKB	3.23	82	I	1	
285	E-1B	480	RKB	3.15	80	I	1	
285	E-1B	480	RKB	3.58	91	I	1	
285	E-1B	480	RKB	2.83	72	I	1	
285	E-1B	410	BLG	2.01	51	I	1	
285	E-1B	410	BLG	1.81	46	I	1	
285	E-1B	450	BCR	4.33	110	I	1	
285	E-1B	910	NBS	2.60	66	I	1	
285	E-1B	910	NBS	2.95	75	I	1	
285	E-1B	910	NBS	2.40	61	I	1	
285	E-1B	120	GZS	4.37	111	I	1	
285	E-1B	230	SSH	3.07	78	I	1	
285	E-1B	230	SSH	3.54	90	I	1	
285	E-1B	210	CCP	23.31	592	I	1	
285	E-1B	210	CCP	27.95	710	I	1	
285	E-1B	320	SRH	20.63	524	I	1	
285	E-1B	310	WHS	18.31	465	I	1	
285	E-1B	900	EEL	43.31	1100	I	1	
285	E-2	410	BLG			I	1	30
285	E-2	410	BLG	2.52	64	I	1	
285	E-2	410	BLG	2.24	57	I	1	
285	E-2	410	BLG	2.17	55	I	1	
285	E-2	410	BLG	2.17	55	I	1	
285	E-2	410	BLG	1.81	46	I	1	
285	E-2	410	BLG	2.68	68	I	1	
285	E-2	410	BLG	2.05	52	I	1	
285	E-2	410	BLG	2.87	73	I	1	
285	E-2	410	BLG	1.81	46	I	1	
285	E-2	410	BLG	2.28	58	I	1	
285	E-2	410	BLG	2.40	61	I	1	
285	E-2	410	BLG	2.76	70	I	1	
285	E-2	410	BLG	2.40	61	I	1	
285	E-2	410	BLG	2.48	63	I	1	
285	E-2	410	BLG	2.60	66	I	1	
285	E-2	410	BLG	2.80	71	I	1	
285	E-2	410	BLG	2.56	65	I	1	
285	E-2	410	BLG	2.01	51	I	1	
285	E-2	410	BLG	1.65	42	I	1	
285	E-2	430	LMB	5.16	131	I	1	
285	E-2	430	LMB	5.35	136	I	1	
285	E-2	420	SMB	9.57	243	I	1	
285	E-2	420	SMB	11.06	281	I	1	
285	E-2	420	SMB	10.94	278	I	1	
285	E-2	420	SMB	9.25	235	I	1	
285	E-2	420	SMB	7.60	193	I	1	
285	E-2	420	SMB	10.39	264	I	1	

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285	E-2	420	SMB	9.72	247	I		1
285	E-2	420	SMB	5.51	140	I		1
285	E-2	420	SMB	5.63	143	I		1
285	E-2	420	SMB	4.29	109	I		1
285	E-2	420	SMB	4.25	108	I		1
285	E-2	420	SMB	4.49	114	I		1
285	E-2	420	SMB	5.00	127	I		1
285	E-2	420	SMB	4.33	110	I		1
285	E-2	420	SMB	5.12	130	I		1
285	E-2	420	SMB	4.41	112	I		1
285	E-2	420	SMB	4.76	121	I		1
285	E-2	420	SMB	5.59	142	I		1
285	E-2	420	SMB	5.28	134	I		1
285	E-2	420	SMB	4.88	124	I		1
285	E-2	420	SMB	4.92	125	I		1
285	E-2	420	SMB	5.24	133	I		1
285	E-2	420	SMB	4.57	116	I		1
285	E-2	420	SMB	4.45	113	I		1
285	E-2	420	SMB	4.88	124	I		1
285	E-2	420	SMB	5.35	136	I		1
285	E-2	420	SMB	5.94	151	I		1
285	E-2	420	SMB	5.04	128	I		1
285	E-2	430	LMB	4.88	124	I		1
285	E-2	430	LMB	3.62	92	I		1
285	E-2	430	LMB	4.29	109	I		1
285	E-2	430	LMB	4.65	118	I		1
285	E-2	430	LMB	4.49	114	I		1
285	E-2	430	LMB	4.45	113	I		1
285	E-2	430	LMB	5.35	136	I		1
285	E-2	430	LMB	5.20	132	I		1
285	E-2	420	SMB	4.57	116	I		1
285	E-2	480	RKB	9.41	239	I		1
285	E-2	480	RKB	3.70	94	I		1
285	E-2	480	RKB	3.54	90	I		1
285	E-2	430	LMB	5.24	133	I		1
285	E-2	430	LMB	4.41	112	I		1
285	E-2	430	LMB	3.70	94	I		1
285	E-2	430	LMB	5.51	140	I		1
285	E-2	430	LMB	5.63	143	I		1
285	E-2	430	LMB	4.45	113	I		1
285	E-2	430	LMB	4.76	121	I		1
285	E-2	430	LMB	4.29	109	I		1
285	E-2	430	LMB	3.66	93	I		1
285	E-2	430	LMB	4.84	123	I		1
285	E-2	430	LMB	4.33	110	I		1
285	E-2	430	LMB	4.80	122	I		1
285	E-2	430	LMB	4.96	126	I		1
285	E-2	430	LMB	6.69	170	I		1
285	E-2	430	LMB	5.20	132	I		1
285	E-2	430	LMB	5.00	127	I		1
285	E-2	430	LMB	6.93	176	I		1
285	E-2	430	LMB	3.98	101	I		1
285	E-2	430	LMB	4.06	103	I		1
285	E-2	430	LMB	6.77	172	I		1
285	E-2	430	LMB	5.00	127	I		1
285	E-2	430	LMB	5.63	143	I		1
285	E-2	430	LMB	6.30	160	I		1
285	E-2	430	LMB	4.76	121	I		1
285	E-2	430	LMB	4.57	116	I		1

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JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
285	E-2	430	LMB	6.38	162	I		1
285	E-2	430	LMB	5.20	132	I		1
285	E-2	430	LMB	5.75	146	I		1
285	E-2	430	LMB	5.12	130	I		1
285	E-2	430	LMB	5.20	132	I		1
285	E-2	430	LMB	5.94	151	I		1
285	E-2	430	LMB	4.41	112	I		1
285	E-2	430	LMB	6.02	153	I		1
285	E-2	430	LMB	4.72	120	I		1
285	E-2	430	LMB	4.33	110	I		1
285	E-2	430	LMB	4.41	112	I		1
285	E-2	430	LMB	5.79	147	I		1
285	E-2	430	LMB	3.94	100	I		1
285	E-2	430	LMB	4.53	115	I		1
285	E-2	430	LMB	4.61	117	I		1
285	E-2	430	LMB	5.51	140	I		1
285	E-2	430	LMB	4.45	113	I		1
285	E-2	430	LMB	14.25	362	I		1
285	E-2	430	LMB	13.78	350	I		1
285	E-2	430	LMB	6.57	167	I		1
285	E-2	430	LMB	4.41	112	I		1
285	E-2	430	LMB	4.37	111	I		1
285	E-2	430	LMB	3.70	94	I		1
285	E-2	430	LMB	11.50	292	I		1
285	E-2	430	LMB	5.63	143	I		1
285	E-2	430	LMB	7.32	186	I		1
285	E-2	430	LMB	6.06	154	I		1
285	E-2	430	LMB	5.51	140	I		1
285	E-2	430	LMB	4.80	122	I		1
285	E-2	430	LMB	6.30	160	I		1
285	E-2	430	LMB	4.69	119	I		1
285	E-2	430	LMB	5.16	131	I		1
285	E-2	430	LMB	4.41	112	I		1
285	E-2	430	LMB	4.88	124	I		1
285	E-2	430	LMB	5.12	130	I		1
285	E-2	430	LMB	5.98	152	I		1
285	E-2	430	LMB	4.92	125	I		1
285	E-2	430	LMB	6.02	153	I		1
285	E-2	430	LMB	4.92	125	I		1
285	E-2	430	LMB	5.20	132	I		1
285	E-2	430	LMB	4.76	121	I		1
285	E-2	430	LMB	5.98	152	I		1
285	E-2	430	LMB	5.51	140	I		1
285	E-2	430	LMB	5.94	151	I		1
285	E-2	430	LMB	6.02	153	I		1
285	E-2	430	LMB	4.41	112	I		1
285	E-2	430	LMB	6.85	174	I		1
285	E-2	430	LMB	5.75	146	I		1
285	E-2	430	LMB	5.67	144	I		1
285	E-2	430	LMB	5.87	149	I		1
285	E-2	430	LMB	4.92	125	I		1
285	E-2	430	LMB	6.30	160	I		1
285	E-2	430	LMB	6.77	172	I		1
285	E-2	430	LMB	6.42	163	I		1
285	E-2	430	LMB	5.28	134	I		1
285	E-2	430	LMB	5.16	131	I		1
285	E-2	430	LMB	4.69	119	I		1
285	E-2	430	LMB	6.30	160	I		1
285	E-2	430	LMB	5.24	133	I		1

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285	E-2	480	RKB	5.43	138	I		1
285	E-2	480	RKB	5.55	141	I		1
285	E-2	480	RKB	3.70	94	I		1
285	E-2	480	RKB	2.76	70	I		1
285	E-2	480	RKB	2.48	63	I		1
285	E-2	480	RKB	3.54	90	I		1
285	E-2	480	RKB	3.11	79	I		1
285	E-2	480	RKB	2.68	68	I		1
285	E-2	410	BLG	2.48	63	I		1
285	E-2	410	BLG	2.36	60	I		1
285	E-2	410	BLG	2.05	52	I		1
285	E-2	410	BLG	1.73	44	I		1
285	E-2	410	BLG	2.09	53	I		1
285	E-2	410	BLG	1.97	50	I		1
285	E-2	410	BLG	2.05	52	I		1
285	E-2	410	BLG	2.17	55	I		1
285	E-2	410	BLG	2.36	60	I		1
285	E-2	410	BLG	2.52	64	I		1
285	E-2	410	BLG	2.52	64	I		1
285	E-2	410	BLG	2.01	51	I		1
285	E-2	410	BLG	2.20	56	I		1
285	E-2	410	BLG	2.36	60	I		1
285	E-2	410	BLG	2.48	63	I		1
285	E-2	410	BLG	2.20	56	I		1
285	E-2	410	BLG	2.17	55	I		1
285	E-2	410	BLG	2.36	60	I		1
285	E-2	410	BLG	1.89	48	I		1
285	E-2	410	BLG	2.36	60	I		1
285	E-2	410	BLG	2.56	65	I		1
285	E-2	410	BLG	2.20	56	I		1
285	E-2	410	BLG	1.69	43	I		1
285	E-2	410	BLG	2.32	59	I		1
285	E-2	410	BLG	2.01	51	I		1
285	E-2	410	BLG	2.48	63	I		1
285	E-2	410	BLG	2.09	53	I		1
285	E-2	410	BLG	1.50	38	I		1
285	E-2	410	BLG	2.20	56	I		1
285	E-2	410	BLG	2.64	67	I		1
285	E-2	410	BLG	2.52	64	I		1
285	E-2	410	BLG	1.97	50	I		1
285	E-2	410	BLG	2.28	58	I		1
285	E-2	410	BLG	2.13	54	I		1
285	E-2	410	BLG	2.28	58	I		1
285	E-2	410	BLG	2.05	52	I		1
285	E-2	410	BLG	2.40	61	I		1
285	E-2	410	BLG	2.40	61	I		1
285	E-2	410	BLG	2.40	61	I		1
285	E-2	410	BLG	1.97	50	I		1
285	E-2	410	BLG	2.24	57	I		1
285	E-2	410	BLG	2.60	66	I		1
285	E-2	410	BLG	2.20	56	I		1
285	E-2	410	BLG	2.76	70	I		1
285	E-2	410	BLG	2.60	66	I		1
285	E-2	410	BLG	2.91	74	I		1
285	E-2	410	BLG	1.97	50	I		1
285	E-2	410	BLG	2.36	60	I		1
285	E-2	410	BLG	2.60	66	I		1
285	E-2	410	BLG	2.36	60	I		1
285	E-2	410	BLG	2.05	52	I		1

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285	E-2	410	BLG	2.09	53	I		1
285	E-2	410	BLG	2.17	55	I		1
285	E-2	460	PKS	7.48	190	I		1
285	E-2	460	PKS	5.39	137	I		1
285	E-2	460	PKS	5.12	130	I		1
285	E-2	480	RKB	3.35	85	I		1
285	E-2	480	RKB	3.07	78	I		1
285	E-2	480	RKB	2.56	65	I		1
285	E-2	430	LMB	4.53	115	I		1
285	E-2	430	LMB	5.31	135	I		1
285	E-2	450	BCR	4.65	118	I		1
285	E-2	450	BCR	3.23	82	I		1
285	E-2	450	BCR	3.35	85	I		1
285	E-2	450	BCR	2.76	70	I		1
285	E-2	450	BCR	3.94	100	I		1
285	E-2	450	BCR	3.86	98	I		1
285	E-2	450	BCR	3.39	86	I		1
285	E-2	450	BCR	3.35	85	I		1
285	E-2	450	BCR	4.02	102	I		1
285	E-2	450	BCR	3.74	95	I		1
285	E-2	450	BCR	3.74	95	I		1
285	E-2	410	BLG	1.97	50	I		1
285	E-2	410	BLG	2.05	52	I		1
285	E-2	410	BLG	1.81	46	I		1
285	E-2	410	BLG	1.26	32	I		1
285	E-2	410	BLG	2.01	51	I		1
285	E-2	410	BLG	2.48	63	I		1
285	E-2	410	BLG	1.65	42	I		1
285	E-2	410	BLG	1.85	47	I		1
285	E-2	410	BLG	2.09	53	I		1
285	E-2	410	BLG	1.57	40	I		1
285	E-2	410	BLG	2.17	55	I		1
285	E-2	410	BLG	1.50	38	I		1
285	E-2	410	BLG	1.97	50	I		1
285	E-2	410	BLG	2.24	57	I		1
285	E-2	410	BLG	1.85	47	I		1
285	E-2	410	BLG	2.76	70	I		1
285	E-2	410	BLG	1.81	46	I		1
285	E-2	410	BLG	2.48	63	I		1
285	E-2	450	BCR	4.02	102	I		1
285	E-2	450	BCR	3.58	91	I		1
285	E-2	450	BCR	3.70	94	I		1
285	E-2	450	BCR	3.86	98	I		1
285	E-2	460	PKS	3.54	90	I		1
285	E-2	460	PKS	3.31	84	I		1
285	E-2	460	PKS	2.95	75	I		1
285	E-2	460	PKS	2.80	71	I		1
285	E-2	460	PKS	3.23	82	I		1
285	E-2	460	PKS	2.80	71	I		1
285	E-2	460	PKS	3.39	86	I		1
285	E-2	420	SMB	3.70	94	I		1
285	E-2	420	SMB	3.90	99	I		1
285	E-2	420	SMB	3.94	100	I		1
285	E-2	430	LMB	3.78	96	I		1
285	E-2	430	LMB	3.86	98	I		1
285	E-2	430	LMB	3.78	96	I		1
285	E-2	480	RKB	3.74	95	I		1
285	E-2	450	BCR	3.27	83	I		1
285	E-2	450	BCR	3.35	85	I		1

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285	E-2	450	BCR	2.80	71	I		1
285	E-2	840	TGM	10.00	254	I		1
285	E-2	510	YLP	3.98	101	I		1
285	E-2	510	YLP	4.57	116	I		1
285	E-2	510	YLP	4.41	112	I		1
285	E-2	510	YLP	4.65	118	I		1
285	E-2	510	YLP	4.72	120	I		1
285	E-2	510	YLP	4.57	116	I		1
285	E-2	510	YLP	4.45	113	I		1
285	E-2	510	YLP	8.86	225	I		1
285	E-2	510	YLP	4.33	110	I		1
285	E-2	510	YLP	4.41	112	I		1
285	E-2	510	YLP	5.20	132	I		1
285	E-2	510	YLP	4.76	121	I		1
285	E-2	510	YLP	5.71	145	I		1
285	E-2	510	YLP	4.76	121	I		1
285	E-2	510	YLP	5.12	130	I		1
285	E-2	510	YLP	5.24	133	I		1
285	E-2	510	YLP	4.49	114	I		1
285	E-2	510	YLP	4.76	121	I		1
285	E-2	510	YLP	4.53	115	I		1
285	E-2	510	YLP	4.41	112	I		1
285	E-2	510	YLP	4.69	119	I		1
285	E-2	510	YLP	3.94	100	I		1
285	E-2	220	GSH	6.57	167	I		1
285	E-2	220	GSH	7.95	202	I		1
285	E-2	220	GSH	7.72	196	I		1
285	E-2	220	GSH	7.60	193	I		1
285	E-2	220	GSH	6.06	154	I		1
285	E-2	220	GSH	6.14	156	I		1
285	E-2	220	GSH	3.35	85	I		1
285	E-2	220	GSH	4.49	114	I		1
285	E-2	220	GSH	6.65	169	I		1
285	E-2	220	GSH	4.33	110	I		1
285	E-2	220	GSH	4.09	104	I		1
285	E-2	220	GSH	4.06	103	I		1
285	E-2	220	GSH	3.39	86	I		1
285	E-2	220	GSH	3.46	88	I		1
285	E-2	220	GSH	3.54	90	I		1
285	E-2	510	YLP	4.96	126	I		1
285	E-2	220	GSH	3.86	98	I		1
285	E-2	220	GSH	3.94	100	I		1
285	E-2	220	GSH	4.17	106	I		1
285	E-2	220	GSH	4.37	111	I		1
285	E-2	220	GSH	3.98	101	I		1
285	E-2	220	GSH	3.78	96	I		1
285	E-2	220	GSH	3.66	93	I		1
285	E-2	220	GSH	3.23	82	I		1
285	E-2	220	GSH	3.39	86	I		1
285	E-2	220	GSH	3.70	94	I		1
285	E-2	220	GSH	4.65	118	I		1
285	E-2	220	GSH	4.21	107	I		1
285	E-2	220	GSH	3.94	100	I		1
285	E-2	220	GSH	3.74	95	I		1
285	E-2	220	GSH	4.25	108	I		1
285	E-2	220	GSH	4.41	112	I		1
285	E-2	220	GSH	3.58	91	I		1
285	E-2	220	GSH	3.35	85	I		1
285	E-2	220	GSH	3.54	90	I		1

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285	E-2	220	GSH	3.23	82	I		1
285	E-2	220	GSH	3.90	99	I		1
285	E-2	220	GSH	4.02	102	I		1
285	E-2	220	GSH	3.70	94	I		1
285	E-2	220	GSH	3.54	90	I		1
285	E-2	220	GSH	3.31	84	I		1
285	E-2	220	GSH	3.70	94	I		1
285	E-2	220	GSH	3.54	90	I		1
285	E-2	220	GSH	4.25	108	I		1
285	E-2	310	WHS	5.63	143	I		1
285	E-2	520	LGP	4.92	125	I		1
285	E-2	520	LGP	4.65	118	I		1
285	E-2	520	LGP	4.33	110	I		1
285	E-2	520	LGP	4.53	115	I		1
285	E-2	230	SSH	2.95	75	I		1
285	E-2	230	SSH	3.78	96	I		1
285	E-2	230	SSH	2.28	58	I		1
285	E-2	230	SSH	4.29	109	I		1
285	E-2	230	SSH	3.82	97	I		1
285	E-2	910	NBS	4.17	106	I		1
285	E-2	110	BLH	2.76	70	I		1
285	E-2	110	BLH	2.87	73	I		1
285	E-2	620	BBH	11.30	287	I		1
285	E-2	210	CCP	26.06	662	I		1
287	E-3A	540	TDD	2.20	56	B		1
287	E-3A	540	TDD	2.60	66	B		1
287	E-3A	540	TDD	2.28	58	B		1
287	E-3A	420	SMB	2.80	71	B		1
287	E-3A	420	SMB	3.66	93	B		1
287	E-3A	420	SMB	3.23	82	B		1
287	E-3A	420	SMB	3.70	94	B		1
287	E-3A	420	SMB	4.02	102	B		1
287	E-3A	420	SMB	3.74	95	B		1
287	E-3A	420	SMB	3.82	97	B		1
287	E-3A	420	SMB	3.23	82	B		1
287	E-3A	420	SMB	3.15	80	B		1
287	E-3A	420	SMB	3.35	85	B		1
287	E-3A	420	SMB	3.19	81	B		1
287	E-3A	420	SMB	3.23	82	B		1
287	E-3A	420	SMB	3.70	94	B		1
287	E-3A	420	SMB	3.15	80	B		1
287	E-3A	420	SMB	3.70	94	B		1
287	E-3A	420	SMB	3.07	78	B		1
287	E-3A	420	SMB	3.23	82	B		1
287	E-3A	420	SMB	2.40	61	B		1
287	E-3A	480	RKB	2.60	66	B		1
285	E-3B	420	SMB	4.76	121	B		1
285	E-3B	420	SMB	4.72	120	B		1
285	E-3B	420	SMB	4.96	126	B		1
285	E-3B	420	SMB	4.96	126	B		1
285	E-3B	420	SMB	3.35	85	B		1
285	E-3B	420	SMB	3.94	100	B		1
285	E-3B	420	SMB	4.33	110	B		1
285	E-3B	420	SMB	4.49	114	B		1
285	E-3B	420	SMB	4.76	121	B		1
285	E-3B	420	SMB	4.02	102	B		1
285	E-3B	420	SMB	4.65	118	B		1
285	E-3B	420	SMB	4.88	124	B		1
285	E-3B	420	SMB	2.48	63	B		1

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285	E-3B	420	SMB	3.70	94	B		1
285	E-3B	420	SMB	3.35	85	B		1
285	E-3B	420	SMB	3.54	90	B		1
285	E-3B	420	SMB	5.12	130	B		1
285	E-3B	420	SMB	6.42	163	B		1
285	E-3B	420	SMB	3.54	90	B		1
285	E-3B	420	SMB	5.98	152	B		1
285	E-3B	420	SMB	3.19	81	B		1
285	E-3B	420	SMB	4.37	111	B		1
285	E-3B	420	SMB	4.80	122	B		1
285	E-3B	420	SMB	5.35	136	B		1
285	E-3B	420	SMB	3.98	101	B		1
285	E-3B	420	SMB	3.54	90	B		1
285	E-3B	420	SMB	4.25	108	B		1
285	E-3B	420	SMB	3.62	92	B		1
285	E-3B	420	SMB	4.09	104	B		1
285	E-3B	420	SMB	4.09	104	B		1
285	E-3B	420	SMB	4.76	121	B		1
285	E-3B	420	SMB	4.33	110	B		1
285	E-3B	420	SMB	3.82	97	B		1
285	E-3B	420	SMB	3.94	100	B		1
285	E-3B	420	SMB	4.65	118	B		1
285	E-3B	420	SMB	3.50	89	B		1
285	E-3B	420	SMB	4.02	102	B		1
285	E-3B	420	SMB	3.86	98	B		1
285	E-3B	420	SMB	2.99	76	B		1
285	E-3B	420	SMB	4.33	110	B		1
285	E-3B	420	SMB	4.41	112	B		1
285	E-3B	420	SMB	3.43	87	B		1
285	E-3B	420	SMB	3.62	92	B		1
285	E-3B	420	SMB	3.54	90	B		1
285	E-3B	420	SMB	5.28	134	B		1
285	E-3B	420	SMB	5.59	142	B		1
285	E-3B	420	SMB	4.76	121	B		1
285	E-3B	420	SMB	4.84	123	B		1
285	E-3B	420	SMB	4.17	106	B		1
285	E-3B	420	SMB	4.61	117	B		1
285	E-3B	420	SMB	4.37	111	B		1
285	E-3B	420	SMB	4.92	125	B		1
285	E-3B	420	SMB	4.92	125	B		1
285	E-3B	420	SMB	4.61	117	B		1
285	E-3B	420	SMB	4.25	108	B		1
285	E-3B	420	SMB	4.41	112	B		1
285	E-3B	420	SMB	5.12	130	B		1
285	E-3B	420	SMB	5.98	152	B		1
285	E-3B	420	SMB	4.88	124	B		1
285	E-3B	420	SMB	3.94	100	B		1
285	E-3B	420	SMB	4.25	108	B		1
285	E-3B	420	SMB	4.72	120	B		1
285	E-3B	420	SMB	4.29	109	B		1
285	E-3B	420	SMB	4.96	126	B		1
285	E-3B	420	SMB	4.49	114	B		1
285	E-3B	420	SMB	4.53	115	B		1
285	E-3B	420	SMB	4.02	102	B		1
285	E-3B	420	SMB	4.33	110	B		1
285	E-3B	420	SMB	4.41	112	B		1
285	E-3B	420	SMB	3.66	93	B		1
285	E-3B	420	SMB	4.76	121	B		1
285	E-3B	420	SMB	4.72	120	B		1

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285	E-3B	420	SMB	4.84	123	B		1
285	E-3B	420	SMB	4.65	118	B		1
285	E-3B	420	SMB	3.15	80	B		1
285	E-3B	420	SMB	3.15	80	B		1
285	E-3B	420	SMB	3.23	82	B		1
285	E-3B	480	RKB	3.46	88	B		1
285	E-3B	480	RKB	2.87	73	B		1
285	E-3B	480	RKB	2.36	60	B		1
285	E-3B	480	RKB	2.40	61	B		1
285	E-3B	480	RKB	3.11	79	B		1
285	E-3B	480	RKB	2.76	70	B		1
285	E-3B	480	RKB	2.91	74	B		1
285	E-3B	480	RKB	2.68	68	B		1
285	E-3B	410	BLG	2.20	56	B		1
285	E-3B	410	BLG	2.01	51	B		1
285	E-3B	460	PKS	3.07	78	B		1
285	E-3B	610	YBH	3.39	86	B		1
285	E-3B	610	YBH	2.80	71	B		1
285	E-3B	610	YBH	11.81	300	B		1
285	E-3B	510	YLP	3.94	100	B		1
285	E-3B	110	BLH	2.87	73	B		1
285	E-3B	110	BLH	2.95	75	B		1
285	E-3B	110	BLH	3.03	77	B		1
285	E-3B	110	BLH	2.44	62	B		1
285	E-3B	110	BLH	3.35	85	B		1
285	E-3B	110	BLH	2.76	70	B		1
285	E-3B	110	BLH	2.64	67	B		1
285	E-3B	110	BLH	2.64	67	B		1
285	E-3B	110	BLH	3.39	86	B		1
285	E-3B	110	BLH	3.07	78	B		1
285	E-3B	110	BLH	2.68	68	B		1
285	E-3B	110	BLH	2.80	71	B		1
285	E-3B	110	BLH	3.15	80	B		1
285	E-3B	900	EEL	21.65	550	B		1
285	E-4	420	SMB	11.34	288	T		1
285	E-4	320	SRH	19.69	500	T		1
285	E-4	320	SRH	22.28	566	T		1
285	E-4	420	SMB	4.37	111	T		1
285	E-4	310	WHS	4.69	119	T		1
285	E-4	420	SMB	3.62	92	T		1
285	E-4	900	EEL	31.50	800	T		1
285	E-5	420	SMB	12.09	307	T		1
285	E-5	420	SMB	5.51	140	T		1
285	E-5	420	SMB	4.17	106	T		1
285	E-5	420	SMB	4.17	106	T		1
285	E-5	420	SMB	4.53	115	T		1
285	E-5	420	SMB	4.49	114	T		1
285	E-5	420	SMB	4.88	124	T		1
285	E-5	420	SMB	4.65	118	T		1
285	E-5	420	SMB	12.44	316	T		1
285	E-5	420	SMB	4.65	118	T		1
285	E-5	420	SMB	4.96	126	T		1
285	E-5	420	SMB	3.66	93	T		1
285	E-5	420	SMB	4.76	121	T		1
285	E-5	420	SMB	4.76	121	T		1
285	E-5	420	SMB	5.39	137	T		1
285	E-5	420	SMB	4.25	108	T		1
285	E-5	420	SMB	3.94	100	T		1
285	E-5	420	SMB	4.06	103	T		1

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285	E-5	420	SMB	3.86	98	T		1
285	E-5	420	SMB	3.58	91	T		1
285	E-5	420	SMB	4.33	110	T		1
285	E-5	420	SMB	4.57	116	T		1
285	E-5	420	SMB	4.41	112	T		1
285	E-5	110	BLH	3.23	82	T		1
285	E-5	110	BLH	3.11	79	T		1
285	E-5	110	BLH	2.52	64	T		1
285	E-5	110	BLH	2.64	67	T		1
285	E-5	110	BLH	2.76	70	T		1
285	E-5	110	BLH	2.60	66	T		1
285	E-5	110	BLH	2.52	64	T		1
285	E-5	110	BLH	2.20	56	T		1
235	E-5	110	BLH	1.89	48	T		1
285	E-5	110	BLH	3.19	81	T		1
285	E-5	110	BLH	2.36	60	T		1
285	E-5	310	WHS	5.91	150	T		1
285	E-5	310	WHS	3.98	101	T		1
285	E-5	510	YLP	4.49	114	T		1
285	E-5	540	TDD	2.36	60	T		1
285	E-5	540	TDD	2.83	72	T		1
285	E-5	540	TDD	3.46	88	T		1
285	E-5	230	SSH	3.35	85	T		1
285	E-5	230	SSH	3.54	90	T		1
285	E-5	230	SSH	3.23	82	T		1
285	E-5	230	SSH	3.23	82	T		1
285	E-5	230	SSH	3.31	84	T		1
285	E-5	230	SSH	3.27	83	T		1
285	E-5	230	SSH	3.15	80	T		1
285	E-5	230	SSH	2.99	76	T		1
285	E-5	230	SSH	2.80	71	T		1
285	E-5	460	PKS	7.32	186	T		1
285	E-5	900	EEL	19.29	490	T		1
285	E-5	900	EEL	27.56	700	T		1
286	G-1	320	SRH	21.06	535	I		1
287	G-1					I		
286	G-2	530	WLY	24.02	610	I		1
287	G-2	720	STB	19.76	502	I		1
287	G-2	310	WHS	17.68	449	I		1
287	G-2	320	SRH	15.94	405	I		1
286	G-3					I		
287	G-3					I		
287	G-4	510	YLP	4.53	115	B		1
287	G-5					B		
287	G-6					B		
286	H-1	410	BLG	5.94	151	I		1
286	H-1	410	BLG	5.31	135	I		1
286	H-1	410	BLG	1.65	42	I		1
286	H-1	410	BLG	2.01	51	I		1
286	H-1	410	BLG	2.48	63	I		1
286	H-1	410	BLG	2.32	59	I		1
286	H-1	410	BLG	2.52	64	I		1
286	H-1	410	BLG	1.57	40	I		1
286	H-1	410	BLG	1.97	50	I		1
286	H-1	410	BLG	2.28	58	I		1
286	H-1	410	BLG	2.13	54	I		1
286	H-1	410	BLG	2.32	59	I		1
286	H-1	410	BLG	2.44	62	I		1
286	H-1	410	BLG	2.36	60	I		1

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286	H-1	410	BLG	2.05	52	I		1
287	H-1	540	TDD	2.36	60	I		1
287	H-1	110	BLH	3.07	78	I		1
286	H-2	480	RKB	9.13	232	I		1
286	H-2	450	BCR	3.94	100	I		1
286	H-2	410	BLG	2.13	54	I		1
286	H-2	410	BLG	2.48	63	I		1
286	H-2	410	BLG	1.93	49	I		1
286	H-2	410	BLG	2.40	61	I		1
286	H-2	410	BLG	2.83	72	I		1
286	H-2	410	BLG	2.17	55	I		1
286	H-2	410	BLG	2.48	63	I		1
286	H-2	410	BLG	2.36	60	I		1
286	H-2	410	BLG	2.28	58	I		1
286	H-2	410	BLG	2.52	64	I		1
286	H-2	410	BLG	2.24	57	I		1
286	H-2	410	BLG	2.09	53	I		1
286	H-2	410	BLG	2.13	54	I		1
286	H-2	410	BLG	2.28	58	I		1
286	H-2	410	BLG	2.91	74	I		1
286	H-2	410	BLG	2.20	56	I		1
286	H-2	410	BLG	1.93	49	I		1
286	H-2	410	BLG	2.05	52	I		1
286	H-2	410	BLG	2.24	57	I		1
286	H-2	410	BLG	2.09	53	I		1
286	H-2	410	BLG	2.60	66	I		1
286	H-2	410	BLG	2.72	69	I		1
286	H-2	410	BLG	2.28	58	I		1
286	H-2	410	BLG	2.09	53	I		1
286	H-2	410	BLG	2.24	57	I		1
286	H-2	410	BLG	2.09	53	I		1
286	H-2	410	BLG	2.32	59	I		1
286	H-2	410	BLG	2.64	67	I		1
286	H-2	410	BLG	2.56	65	I		1
286	H-2	410	BLG	2.44	62	I		1
286	H-2	410	BLG	2.13	54	I		1
286	H-2	410	BLG	2.44	62	I		1
286	H-2	410	BLG	2.17	55	I		1
286	H-2	410	BLG	2.01	51	I		1
286	H-2	410	BLG	1.97	50	I		1
286	H-2	410	BLG	2.28	58	I		1
286	H-2	410	BLG	2.24	57	I		1
286	H-2	410	BLG	2.01	51	I		1
286	H-2	410	BLG	2.09	53	I		1
286	H-2	410	BLG	1.89	48	I		1
286	H-2	410	BLG	2.60	66	I		1
286	H-2	410	BLG	2.28	58	I		1
286	H-2	410	BLG	1.85	47	I		1
286	H-2	410	BLG	2.20	56	I		1
286	H-2	410	BLG	1.93	49	I		1
286	H-2	410	BLG	2.40	61	I		1
286	H-2	410	BLG	1.54	39	I		1
286	H-2	410	BLG	1.65	42	I		1
286	H-2	410	BLG	2.01	51	I		1
286	H-2	410	BLG	2.09	53	I		1
286	H-2	410	BLG	2.20	56	I		1
286	H-2	410	BLG	2.01	51	I		1
286	H-2	410	BLG	2.48	63	I		1
286	H-2	410	BLG	1.97	50	I		1

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286	H-2	410	BLG	2.28	58	I	1	
286	H-2	410	BLG	2.60	66	I	1	
286	H-2	410	BLG	2.13	54	I	1	
286	H-2	410	BLG	1.69	43	I	1	
286	H-2	410	BLG	2.09	53	I	1	
286	H-2	410	BLG	2.20	56	I	1	
286	H-2	410	BLG	2.44	62	I	1	
286	H-2	410	BLG	2.01	51	I	1	
286	H-2	410	BLG	2.01	51	I	1	
286	H-2	410	BLG	2.05	52	I	1	
286	H-2	410	BLG	1.73	44	I	1	
286	H-2	410	BLG	1.50	38	I	1	
286	H-2	410	BLG	1.61	41	I	1	
286	H-2	410	BLG	1.46	37	I	1	
287	H-2					I		
286	H-3					I		
287	H-3	410	BLG	8.43	214	I	1	
287	H-3	410	BLG	2.17	55	I	1	
287	H-3	410	BLG	2.05	52	I	1	
287	H-3	410	BLG	1.54	39	I	1	
287	H-3	410	BLG	1.85	47	I	1	
287	H-3	450	BCR	4.02	102	I	1	
287	H-3	450	BCR	3.39	86	I	1	
286	H-4	410	BLG			I	1	101
286	H-4	410	BLG	2.60	66	I	1	
286	H-4	410	BLG	2.17	55	I	1	
286	H-4	410	BLG	2.52	64	I	1	
286	H-4	410	BLG	2.13	54	I	1	
286	H-4	410	BLG	2.17	55	I	1	
286	H-4	410	BLG	2.44	62	I	1	
286	H-4	410	BLG	2.60	66	I	1	
286	H-4	410	BLG	2.36	60	I	1	
286	H-4	410	BLG	2.13	54	I	1	
286	H-4	410	BLG	1.97	50	I	1	
286	H-4	410	BLG	2.24	57	I	1	
286	H-4	410	BLG	2.40	61	I	1	
286	H-4	410	BLG	2.40	61	I	1	
286	H-4	410	BLG	2.44	62	I	1	
286	H-4	410	BLG	2.28	58	I	1	
286	H-4	410	BLG	1.61	41	I	1	
286	H-4	410	BLG	1.65	42	I	1	
286	H-4	410	BLG	2.24	57	I	1	
286	H-4	410	BLG	1.93	49	I	1	
286	H-4	410	BLG	2.48	63	I	1	
286	H-4	410	BLG	2.40	61	I	1	
286	H-4	410	BLG	2.13	54	I	1	
286	H-4	410	BLG	2.17	55	I	1	
286	H-4	410	BLG	2.32	59	I	1	
286	H-4	410	BLG	2.48	63	I	1	
286	H-4	410	BLG	2.52	64	I	1	
286	H-4	410	BLG	1.93	49	I	1	
286	H-4	410	BLG	2.76	70	I	1	
286	H-4	410	BLG	2.20	56	I	1	
286	H-4	410	BLG	2.95	75	I	1	
286	H-4	410	BLG	1.97	50	I	1	
286	H-4	410	BLG	2.17	55	I	1	
286	H-4	410	BLG	2.52	64	I	1	
286	H-4	410	BLG	1.97	50	I	1	
286	H-4	410	BLG	2.13	54	I	1	

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286	H-4	410	BLG	2.24	57	I		1
286	H-4	410	BLG	1.97	50	I		1
286	H-4	410	BLG	2.44	62	I		1
286	H-4	410	BLG	2.20	56	I		1
286	H-4	410	BLG	2.44	62	I		1
286	H-4	410	BLG	2.13	54	I		1
286	H-4	410	BLG	2.13	54	I		1
286	H-4	410	BLG	2.36	60	I		1
286	H-4	410	BLG	1.77	45	I		1
286	H-4	410	BLG	2.01	51	I		1
286	H-4	410	BLG	2.13	54	I		1
286	H-4	410	BLG	2.44	62	I		1
286	H-4	410	BLG	2.01	51	I		1
286	H-4	410	BLG	2.32	59	I		1
286	H-4	410	BLG	2.76	70	I		1
286	H-4	410	BLG	2.32	59	I		1
286	H-4	410	BLG	2.68	68	I		1
286	H-4	410	BLG	2.44	62	I		1
286	H-4	410	BLG	2.28	58	I		1
286	H-4	410	BLG	2.24	57	I		1
286	H-4	410	BLG	2.05	52	I		1
286	H-4	410	BLG	2.28	58	I		1
286	H-4	410	BLG	2.36	60	I		1
286	H-4	410	BLG	2.24	57	I		1
286	H-4	410	BLG	2.36	60	I		1
286	H-4	410	BLG	1.93	49	I		1
286	H-4	410	BLG	2.36	60	I		1
286	H-4	410	BLG	2.44	62	I		1
286	H-4	410	BLG	2.68	68	I		1
286	H-4	410	BLG	2.64	67	I		1
286	H-4	410	BLG	1.61	41	I		1
286	H-4	410	BLG	1.89	48	I		1
286	H-4	410	BLG	2.44	62	I		1
286	H-4	410	BLG	2.17	55	I		1
286	H-4	410	BLG	1.97	50	I		1
286	H-4	410	BLG	2.20	56	I		1
286	H-4	410	BLG	1.89	48	I		1
286	H-4	410	BLG	2.68	68	I		1
286	H-4	410	BLG	2.20	56	I		1
286	H-4	410	BLG	2.24	57	I		1
286	H-4	410	BLG	1.89	48	I		1
286	H-4	410	BLG	1.57	40	I		1
286	H-4	410	BLG	2.17	55	I		1
286	H-4	410	BLG	2.48	63	I		1
286	H-4	410	BLG	2.52	64	I		1
286	H-4	410	BLG	2.68	68	I		1
286	H-4	410	BLG	2.13	54	I		1
286	H-4	410	BLG	2.05	52	I		1
286	H-4	410	BLG	2.44	62	I		1
286	H-4	410	BLG	1.89	48	I		1
286	H-4	410	BLG	2.01	51	I		1
286	H-4	410	BLG	1.89	48	I		1
286	H-4	410	BLG	1.93	49	I		1
286	H-4	410	BLG	2.40	61	I		1
286	H-4	410	BLG	2.24	57	I		1
286	H-4	410	BLG	2.05	52	I		1
286	H-4	410	BLG	2.09	53	I		1
286	H-4	410	BLG	2.20	56	I		1
286	H-4	410	BLG	2.24	57	I		1

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286	H-4	410	BLG	2.76	70	I	1	
286	H-4	410	BLG	2.32	59	I	1	
286	H-4	410	BLG	2.76	70	I	1	
286	H-4	410	BLG	2.28	58	I	1	
286	H-4	410	BLG	2.80	71	I	1	
286	H-4	410	BLG	2.48	63	I	1	
286	H-4	410	BLG	2.13	54	I	1	
286	H-4	410	BLG	2.24	57	I	1	
286	H-4	410	BLG	2.05	52	I	1	
286	H-4	450	BCR	3.54	90	I	1	
286	H-4	460	PKS	3.07	78	I	1	
287	H-4	410	BLG	2.28	58	I	1	
287	H-4	410	BLG	2.32	59	I	1	
287	H-4	410	BLG	2.44	62	I	1	
287	H-4	410	BLG	2.64	67	I	1	
287	H-4	410	BLG	2.48	63	I	1	
287	H-4	410	BLG	2.36	60	I	1	
287	H-4	410	BLG	2.32	59	I	1	
287	H-4	410	BLG	2.64	67	I	1	
287	H-4	410	BLG	2.28	58	I	1	
287	H-4	410	BLG	2.36	60	I	1	
287	H-4	410	BLG	2.13	54	I	1	
287	H-4	110	BLH	3.19	81	I	1	
287	H-4	110	BLH	3.07	78	I	1	
287	H-4	110	BLH	2.64	67	I	1	
287	H-4	110	BLH	2.80	71	I	1	
287	H-4	110	BLH	3.03	77	I	1	
287	H-4	110	BLH	2.87	73	I	1	
287	H-4	110	BLH	2.52	64	I	1	
287	H-4	110	BLH	2.87	73	I	1	

SCHOOL STREET FISHERIES BASELINE DATA
NOVEMBER 1993 SAMPLE

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
ENVIRONMENTAL DATA

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
313	E-3B	0.65	5.0	5.0	13.6	13.6	7.8	7.8	285	286	11/09/93
313	E-4	0.50	6.0	6.0	13.6	13.6	7.6	7.6	278	285	11/09/93
313	E-5	0.50	6.0	6.2	13.6	12.2	7.6	7.6	293	277	11/09/93
312	E-2	0.92	5.0	5.2	13.0	12.2	7.8	8.0	298	286	11/08/93
312	E-1A	0.75	5.0	6.0	12.6	11.6	7.6	7.6	304	304	11/08/93
312	E-1B	0.75	5.0	6.0	12.6	12.4	7.7	7.8	279	304	11/08/93

NIAGARA MOHAWK POWER CORPORATION REVISED 4-7-94
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
313	E-3B	530	WLY	19.55	516	B	1	
313	E-3B	420	SMB	12.80	338	B	1	
313	E-3B	420	SMB	4.55	120	B	1	
313	E-3B	420	SMB	4.73	125	B	1	
313	E-3B	420	SMB	4.89	129	B	1	
313	E-3B	510	YLP	4.36	115	B	1	
313	E-3B	410	BLG	1.70	45	B	1	
313	E-3B	410	BLG	1.67	44	B	1	
313	E-3B	410	BLG	2.39	63	B	1	
313	E-3B	410	BLG	2.20	58	B	1	
313	E-3B	410	BLG	2.16	57	B	1	
313	E-3B	410	BLG	2.31	61	B	1	
313	E-3B	410	BLG	1.59	42	B	1	
313	E-4					T		
313	E-5	210	CCP	8.75	231	T	1	
313	E-5	210	CCP	8.03	212	T	1	
313	E-5	420	SMB	4.17	110	T	1	
313	E-5	420	SMB	4.51	119	T	1	
313	E-5	420	SMB	3.83	101	T	1	
313	E-5	420	SMB	3.83	101	T	1	
313	E-5	910	NBS	2.05	54	T	1	
313	E-5	310	WHS	5.34	141	T	1	
313	E-5	230	SSH	3.67	97	T	1	
313	E-5	230	SSH	3.11	82	T	1	
313	E-5	230	SSH	3.22	85	T	1	
313	E-5	250	SMW	1.89	50	T	2	
313	E-5	250	SMW	1.93	51	T	2	
313	E-5	250	SMW	1.97	52	T	2	
313	E-5	250	SMW	2.35	62	T	2	
313	E-5	250	SMW	1.86	49	T	2	
312	E-2	220	GSH			I	1	7
312	E-2	410	BLG			I	1	34
312	E-2	230	SSH			I	1	57
312	E-2	430	LMB	12.35	326	I	1	
312	E-2	430	LMB	6.17	163	I	1	
312	E-2	430	LMB	6.52	172	I	1	
312	E-2	430	LMB	5.49	145	I	1	
312	E-2	430	LMB	5.68	150	I	1	
312	E-2	430	LMB	6.17	163	I	1	
312	E-2	430	LMB	3.83	101	I	1	
312	E-2	430	LMB	5.53	146	I	1	
312	E-2	430	LMB	5.19	137	I	1	
312	E-2	430	LMB	6.10	161	I	1	
312	E-2	430	LMB	2.80	74	I	1	
312	E-2	430	LMB	4.02	106	I	1	
312	E-2	430	LMB	5.72	151	I	1	
312	E-2	430	LMB	5.00	132	I	1	
312	E-2	430	LMB	3.98	105	I	1	
312	E-2	430	LMB	4.58	121	I	1	
312	E-2	430	LMB	4.28	113	I	1	
312	E-2	430	LMB	6.36	168	I	1	
312	E-2	430	LMB	4.13	109	I	1	
312	E-2	430	LMB	3.79	100	I	1	
312	E-2	430	LMB	3.52	93	I	1	
312	E-2	430	LMB	4.32	114	I	1	
312	E-2	430	LMB	4.62	122	I	1	
312	E-2	430	LMB	3.98	105	I	1	
312	E-2	430	LMB	5.38	142	I	1	
312	E-2	430	LMB	4.20	111	I	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	430	LMB	3.86	102	I	1	
312	E-2	430	LMB	4.13	109	I	1	
312	E-2	430	LMB	4.20	111	I	1	
312	E-2	430	LMB	4.24	112	I	1	
312	E-2	430	LMB	5.38	142	I	1	
312	E-2	430	LMB	4.36	115	I	1	
312	E-2	430	LMB	4.58	121	I	1	
312	E-2	430	LMB	5.53	146	I	1	
312	E-2	430	LMB	4.89	129	I	1	
312	E-2	430	LMB	5.27	139	I	1	
312	E-2	430	LMB	5.53	146	I	1	
312	E-2	430	LMB	5.19	137	I	1	
312	E-2	430	LMB	5.00	132	I	1	
312	E-2	430	LMB	5.45	144	I	1	
312	E-2	430	LMB	4.09	108	I	1	
312	E-2	430	LMB	3.98	105	I	1	
312	E-2	430	LMB	4.24	112	I	1	
312	E-2	430	LMB	3.71	98	I	1	
312	E-2	430	LMB	12.69	335	I	1	
312	E-2	430	LMB	3.98	105	I	1	
312	E-2	430	LMB	4.02	106	I	1	
312	E-2	430	LMB	4.36	115	I	1	
312	E-2	430	LMB	4.47	118	I	1	
312	E-2	430	LMB	4.13	109	I	1	
312	E-2	430	LMB	5.87	155	I	1	
312	E-2	430	LMB	4.89	129	I	1	
312	E-2	430	LMB	4.09	108	I	1	
312	E-2	430	LMB	4.77	126	I	1	
312	E-2	430	LMB	4.05	107	I	1	
312	E-2	430	LMB	5.23	138	I	1	
312	E-2	430	LMB	4.32	114	I	1	
312	E-2	430	LMB	3.98	105	I	1	
312	E-2	430	LMB	4.47	118	I	1	
312	E-2	430	LMB	5.45	144	I	1	
312	E-2	430	LMB	5.23	138	I	1	
312	E-2	430	LMB	3.94	104	I	1	
312	E-2	430	LMB	5.30	140	I	1	
312	E-2	430	LMB	5.27	139	I	1	
312	E-2	430	LMB	4.77	126	I	1	
312	E-2	430	LMB	3.52	93	I	1	
312	E-2	430	LMB	4.47	118	I	1	
312	E-2	430	LMB	4.05	107	I	1	
312	E-2	430	LMB	4.39	116	I	1	
312	E-2	430	LMB	5.91	156	I	1	
312	E-2	430	LMB	6.52	172	I	1	
312	E-2	430	LMB	4.24	112	I	1	
312	E-2	430	LMB	4.20	111	I	1	
312	E-2	430	LMB	4.20	111	I	1	
312	E-2	430	LMB	4.70	124	I	1	
312	E-2	430	LMB	5.91	156	I	1	
312	E-2	430	LMB	5.23	138	I	1	
312	E-2	430	LMB	4.36	115	I	1	
312	E-2	430	LMB	4.43	117	I	1	
312	E-2	430	LMB	4.17	110	I	1	
312	E-2	430	LMB	6.86	181	I	1	
312	E-2	430	LMB	4.05	107	I	1	
312	E-2	430	LMB	4.73	125	I	1	
312	E-2	430	LMB	4.36	115	I	1	
312	E-2	430	LMB	3.67	97	I	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	430	LMB	5.23	138	I		1
312	E-2	430	LMB	4.09	108	I		1
312	E-2	430	LMB	5.83	154	I		1
312	E-2	430	LMB	4.85	128	I		1
312	E-2	420	SMB	4.58	121	I		1
312	E-2	840	TGM	10.68	282	I		1
312	E-2	840	TGM	10.11	267	I		1
312	E-2	430	LMB	4.28	113	I		1
312	E-2	220	GSH	3.71	98	I		1
312	E-2	220	GSH	3.79	100	I		1
312	E-2	220	GSH	3.64	96	I		1
312	E-2	220	GSH	4.02	106	I		1
312	E-2	220	GSH	3.86	102	I		1
312	E-2	220	GSH	3.45	91	I		1
312	E-2	220	GSH	6.82	180	I		1
312	E-2	220	GSH	6.52	172	I		1
312	E-2	220	GSH	3.52	93	I		1
312	E-2	220	GSH	5.72	151	I		1
312	E-2	220	GSH	6.74	178	I		1
312	E-2	220	GSH	6.89	182	I		1
312	E-2	220	GSH	3.52	93	I		1
312	E-2	220	GSH	3.18	84	I		1
312	E-2	220	GSH	5.49	145	I		1
312	E-2	220	GSH	3.60	95	I		1
312	E-2	220	GSH	3.71	98	I		1
312	E-2	220	GSH	3.14	83	I		1
312	E-2	220	GSH	3.83	101	I		1
312	E-2	220	GSH	3.52	93	I		1
312	E-2	220	GSH	3.03	80	I		1
312	E-2	220	GSH	3.07	81	I		1
312	E-2	220	GSH	3.07	81	I		1
312	E-2	220	GSH	3.56	94	I		1
312	E-2	220	GSH	3.22	85	I		1
312	E-2	220	GSH	3.79	100	I		1
312	E-2	220	GSH	2.95	78	I		1
312	E-2	220	GSH	2.84	75	I		1
312	E-2	220	GSH	3.18	84	I		1
312	E-2	220	GSH	3.60	95	I		1
312	E-2	220	GSH	3.86	102	I		1
312	E-2	220	GSH	3.60	95	I		1
312	E-2	220	GSH	3.41	90	I		1
312	E-2	220	GSH	5.83	154	I		1
312	E-2	220	GSH	3.18	84	I		1
312	E-2	220	GSH	3.48	92	I		1
312	E-2	220	GSH	3.33	88	I		1
312	E-2	220	GSH	3.45	91	I		1
312	E-2	220	GSH	3.60	95	I		1
312	E-2	220	GSH	4.09	108	I		1
312	E-2	220	GSH	4.02	106	I		1
312	E-2	220	GSH	2.92	77	I		1
312	E-2	220	GSH	3.98	105	I		1
312	E-2	220	GSH	4.02	106	I		1
312	E-2	220	GSH	3.94	104	I		1
312	E-2	220	GSH	3.41	90	I		1
312	E-2	220	GSH	3.41	90	I		1
312	E-2	220	GSH	6.97	184	I		1
312	E-2	220	GSH	3.79	100	I		1
312	E-2	220	GSH	3.45	91	I		1
312	E-2	220	GSH	3.60	95	I		1

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	220	GSH	3.18	84	I	1	
312	E-2	510	YLP	9.47	250	I	1	
312	E-2	510	YLP	4.70	124	I	1	
312	E-2	510	YLP	9.58	253	I	1	
312	E-2	510	YLP	9.17	242	I	1	
312	E-2	510	YLP	4.58	121	I	1	
312	E-2	510	YLP	6.36	168	I	1	
312	E-2	510	YLP	4.55	120	I	1	
312	E-2	510	YLP	11.52	304	I	1	
312	E-2	510	YLP	5.27	139	I	1	
312	E-2	510	YLP	4.55	120	I	1	
312	E-2	220	GSH	4.13	109	I	1	
312	E-2	220	GSH	3.33	88	I	1	
312	E-2	220	GSH	3.67	97	I	1	
312	E-2	220	GSH	3.41	90	I	1	
312	E-2	220	GSH	4.02	106	I	1	
312	E-2	220	GSH	3.86	102	I	1	
312	E-2	220	GSH	2.69	71	I	1	
312	E-2	220	GSH	3.52	93	I	1	
312	E-2	220	GSH	2.80	74	I	1	
312	E-2	220	GSH	3.86	102	I	1	
312	E-2	220	GSH	3.37	89	I	1	
312	E-2	220	GSH	3.86	102	I	1	
312	E-2	220	GSH	3.41	90	I	1	
312	E-2	220	GSH	4.05	107	I	1	
312	E-2	220	GSH	3.26	86	I	1	
312	E-2	220	GSH	4.13	109	I	1	
312	E-2	220	GSH	3.67	97	I	1	
312	E-2	220	GSH	3.86	102	I	1	
312	E-2	220	GSH	3.14	83	I	1	
312	E-2	220	GSH	3.90	103	I	1	
312	E-2	220	GSH	3.22	85	I	1	
312	E-2	220	GSH	3.64	96	I	1	
312	E-2	220	GSH	3.18	84	I	1	
312	E-2	220	GSH	3.18	84	I	1	
312	E-2	220	GSH	3.60	95	I	1	
312	E-2	220	GSH	3.37	89	I	1	
312	E-2	220	GSH	4.39	116	I	1	
312	E-2	220	GSH	3.48	92	I	1	
312	E-2	220	GSH	3.41	90	I	1	
312	E-2	220	GSH	3.45	91	I	1	
312	E-2	220	GSH	4.28	113	I	1	
312	E-2	220	GSH	2.99	79	I	1	
312	E-2	220	GSH	3.52	93	I	1	
312	E-2	220	GSH	3.45	91	I	1	
312	E-2	220	GSH	3.60	95	I	1	
312	E-2	220	GSH	3.60	95	I	1	
312	E-2	220	GSH	4.02	106	I	1	
312	E-2	220	GSH	3.41	90	I	1	
312	E-2	220	GSH	3.03	80	I	1	
312	E-2	410	BLG	2.12	56	I	1	
312	E-2	410	BLG	1.63	43	I	1	
312	E-2	410	BLG	2.27	60	I	1	
312	E-2	410	BLG	2.20	58	I	1	
312	E-2	410	BLG	1.82	48	I	1	
312	E-2	410	BLG	2.35	62	I	1	
312	E-2	410	BLG	1.29	34	I	1	
312	E-2	410	BLG	1.93	51	I	1	
312	E-2	410	BLG	1.74	46	I	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	410	BLG	1.33	35	I		1
312	E-2	410	BLG	2.08	55	I		1
312	E-2	410	BLG	1.63	43	I		1
312	E-2	410	BLG	1.93	51	I		1
312	E-2	410	BLG	1.97	52	I		1
312	E-2	410	BLG	2.20	58	I		1
312	E-2	410	BLG	2.46	65	I		1
312	E-2	410	BLG	2.05	54	I		1
312	E-2	410	BLG	2.27	60	I		1
312	E-2	410	BLG	1.78	47	I		1
312	E-2	410	BLG	1.82	48	I		1
312	E-2	410	BLG	1.89	50	I		1
312	E-2	410	BLG	2.08	55	I		1
312	E-2	410	BLG	2.12	56	I		1
312	E-2	410	BLG	2.12	56	I		1
312	E-2	410	BLG	1.97	52	I		1
312	E-2	410	BLG	1.93	51	I		1
312	E-2	410	BLG	2.01	53	I		1
312	E-2	410	BLG	2.12	56	I		1
312	E-2	410	BLG	2.46	65	I		1
312	E-2	410	BLG	2.31	61	I		1
312	E-2	410	BLG	1.55	41	I		1
312	E-2	410	BLG	2.31	61	I		1
312	E-2	410	BLG	1.97	52	I		1
312	E-2	220	GSH	3.83	101	I		1
312	E-2	420	SMB	3.64	96	I		1
312	E-2	220	GSH	3.56	94	I		1
312	E-2	410	BLG	1.93	51	I		1
312	E-2	410	BLG	2.73	72	I		1
312	E-2	410	BLG	2.46	65	I		1
312	E-2	410	BLG	1.89	50	I		1
312	E-2	410	BLG	2.31	61	I		1
312	E-2	410	BLG	1.44	38	I		1
312	E-2	410	BLG	2.50	66	I		1
312	E-2	410	BLG	2.35	62	I		1
312	E-2	410	BLG	2.05	54	I		1
312	E-2	410	BLG	2.39	63	I		1
312	E-2	410	BLG	2.20	58	I		1
312	E-2	410	BLG	2.27	60	I		1
312	E-2	410	BLG	1.86	49	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	2.35	62	I		1
312	E-2	410	BLG	2.27	60	I		1
312	E-2	410	BLG	2.23	59	I		1
312	E-2	410	BLG	1.89	50	I		1
312	E-2	410	BLG	1.33	35	I		1
312	E-2	410	BLG	2.61	69	I		1
312	E-2	410	BLG	2.42	64	I		1
312	E-2	410	BLG	1.67	44	I		1
312	E-2	410	BLG	2.46	65	I		1
312	E-2	410	BLG	1.93	51	I		1
312	E-2	410	BLG	1.70	45	I		1
312	E-2	410	BLG	2.42	64	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	1.93	51	I		1
312	E-2	410	BLG	2.61	69	I		1
312	E-2	410	BLG	2.42	64	I		1
312	E-2	410	BLG	2.58	68	I		1
312	E-2	410	BLG	2.54	67	I		1

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JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	410	BLG	1.89	50	I		1
312	E-2	410	BLG	1.70	45	I		1
312	E-2	410	BLG	2.08	55	I		1
312	E-2	410	BLG	2.12	56	I		1
312	E-2	410	BLG	2.50	66	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	1.59	42	I		1
312	E-2	220	GSH	3.45	91	I		1
312	E-2	410	BLG	2.31	61	I		1
312	E-2	410	BLG	1.97	52	I		1
312	E-2	410	BLG	2.08	55	I		1
312	E-2	410	BLG	2.12	56	I		1
312	E-2	410	BLG	1.82	48	I		1
312	E-2	410	BLG	2.35	62	I		1
312	E-2	410	BLG	3.22	85	I		1
312	E-2	410	BLG	2.42	64	I		1
312	E-2	410	BLG	2.69	71	I		1
312	E-2	410	BLG	1.52	40	I		1
312	E-2	410	BLG	1.63	43	I		1
312	E-2	410	BLG	1.97	52	I		1
312	E-2	410	BLG	1.63	43	I		1
312	E-2	410	BLG	2.39	63	I		1
312	E-2	410	BLG	3.03	80	I		1
312	E-2	410	BLG	1.36	36	I		1
312	E-2	410	BLG	1.82	48	I		1
312	E-2	410	BLG	2.35	62	I		1
312	E-2	410	BLG	2.50	66	I		1
312	E-2	410	BLG	2.95	78	I		1
312	E-2	410	BLG	2.27	60	I		1
312	E-2	410	BLG	1.36	36	I		1
312	E-2	410	BLG	2.27	60	I		1
312	E-2	480	RKB	3.18	84	I		1
312	E-2	480	RKB	2.54	67	I		1
312	E-2	480	RKB	3.33	88	I		1
312	E-2	480	RKB	3.48	92	I		1
312	E-2	480	RKB	3.14	83	I		1
312	E-2	480	RKB	3.33	88	I		1
312	E-2	480	RKB	6.93	183	I		1
312	E-2	480	RKB	2.80	74	I		1
312	E-2	480	RKB	3.30	87	I		1
312	E-2	480	RKB	3.11	82	I		1
312	E-2	480	RKB	3.11	82	I		1
312	E-2	480	RKB	3.22	85	I		1
312	E-2	480	RKB	3.26	86	I		1
312	E-2	480	RKB	2.95	78	I		1
312	E-2	220	GSH	3.33	88	I		1
312	E-2	220	GSH	4.24	112	I		1
312	E-2	220	GSH	5.49	145	I		1
312	E-2	220	GSH	2.95	78	I		1
312	E-2	220	GSH	6.44	170	I		1
312	E-2	480	RKB	3.03	80	I		1
312	E-2	480	RKB	3.07	81	I		1
312	E-2	410	BLG	2.20	58	I		1
312	E-2	410	BLG	3.14	83	I		1
312	E-2	410	BLG	3.22	85	I		1
312	E-2	410	BLG	3.14	83	I		1
312	E-2	410	BLG	2.95	78	I		1
312	E-2	510	YLP	5.11	135	I		1

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312	E-2	480	RKB	3.22	85	I		1
312	E-2	480	RKB	3.41	90	I		1
312	E-2	480	RKB	3.45	91	I		1
312	E-2	480	RKB	2.35	62	I		1
312	E-2	480	RKB	3.48	92	I		1
312	E-2	480	RKB	3.64	96	I		1
312	E-2	480	RKB	2.88	76	I		1
312	E-2	510	YLP	4.70	124	I		1
312	E-2	510	YLP	4.58	121	I		1
312	E-2	420	SMB	3.11	82	I		1
312	E-2	450	BCR	2.77	73	I		1
312	E-2	450	BCR	3.60	95	I		1
312	E-2	450	BCR	3.37	89	I		1
312	E-2	450	BCR	3.67	97	I		1
312	E-2	450	BCR	3.86	102	I		1
312	E-2	450	BCR	3.45	91	I		1
312	E-2	450	BCR	3.60	95	I		1
312	E-2	450	BCR	2.50	66	I		1
312	E-2	450	BCR	3.48	92	I		1
312	E-2	450	BCR	2.77	73	I		1
312	E-2	450	BCR	3.60	95	I		1
312	E-2	450	BCR	3.60	95	I		1
312	E-2	310	WHS	16.67	440	I		1
312	E-2	310	WHS	5.87	155	I		1
312	E-2	220	GSH	3.48	92	I		1
312	E-2	220	GSH	3.41	90	I		1
312	E-2	220	GSH	2.77	73	I		1
312	E-2	220	GSH	6.29	166	I		1
312	E-2	220	GSH	3.52	93	I		1
312	E-2	410	BLG	1.17	31	I		1
312	E-2	410	BLG	1.82	48	I		1
312	E-2	410	BLG	2.31	61	I		1
312	E-2	410	BLG	1.97	52	I		1
312	E-2	410	BLG	2.08	55	I		1
312	E-2	450	BCR	3.45	91	I		1
312	E-2	450	BCR	3.48	92	I		1
312	E-2	450	BCR	2.69	71	I		1
312	E-2	450	BCR	2.84	75	I		1
312	E-2	450	BCR	2.54	67	I		1
312	E-2	450	BCR	3.79	100	I		1
312	E-2	450	BCR	3.83	101	I		1
312	E-2	450	BCR	3.60	95	I		1
312	E-2	450	BCR	3.83	101	I		1
312	E-2	450	BCR	2.69	71	I		1
312	E-2	450	BCR	3.37	89	I		1
312	E-2	450	BCR	3.41	90	I		1
312	E-2	450	BCR	3.83	101	I		1
312	E-2	450	BCR	3.83	101	I		1
312	E-2	230	SSH	3.86	102	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	460	PKS	5.30	140	I		1
312	E-2	460	PKS	5.38	142	I		1
312	E-2	460	PKS	4.92	130	I		1
312	E-2	460	PKS	5.45	144	I		1
312	E-2	230	SSH	4.13	109	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.88	76	I		1

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312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	3.26	86	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	4.02	106	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	3.86	102	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	2.95	78	I		1
312	E-2	230	SSH	3.45	91	I		1
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	2.27	60	I		1
312	E-2	230	SSH	2.92	77	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.84	75	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	3.90	103	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	2.92	77	I		1
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	2.69	71	I		1
312	E-2	230	SSH	2.84	75	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.69	71	I		1
312	E-2	230	SSH	2.69	71	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.37	89	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	2.35	62	I		1
312	E-2	230	SSH	2.92	77	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	2.84	75	I		1

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312	E-2	230	SSH	2.84	75	I	1	
312	E-2	230	SSH	2.92	77	I	1	
312	E-2	230	SSH	2.80	74	I	1	
312	E-2	230	SSH	2.69	71	I	1	
312	E-2	230	SSH	2.99	79	I	1	
312	E-2	230	SSH	3.11	82	I	1	
312	E-2	230	SSH	3.07	81	I	1	
312	E-2	230	SSH	3.11	82	I	1	
312	E-2	230	SSH	2.99	79	I	1	
312	E-2	230	SSH	3.03	80	I	1	
312	E-2	230	SSH	2.65	70	I	1	
312	E-2	230	SSH	3.07	81	I	1	
312	E-2	230	SSH	3.52	93	I	1	
312	E-2	230	SSH	3.11	82	I	1	
312	E-2	230	SSH	3.07	81	I	1	
312	E-2	230	SSH	3.14	83	I	1	
312	E-2	230	SSH	2.99	79	I	1	
312	E-2	230	SSH	3.14	83	I	1	
312	E-2	230	SSH	2.95	78	I	1	
312	E-2	230	SSH	2.95	78	I	1	
312	E-2	230	SSH	2.84	75	I	1	
312	E-2	230	SSH	3.18	84	I	1	
312	E-2	230	SSH	2.99	79	I	1	
312	E-2	230	SSH	3.30	87	I	1	
312	E-2	230	SSH	3.07	81	I	1	
312	E-2	230	SSH	2.77	73	I	1	
312	E-2	230	SSH	2.99	79	I	1	
312	E-2	230	SSH	3.11	82	I	1	
312	E-2	230	SSH	3.14	83	I	1	
312	E-2	230	SSH	2.65	70	I	1	
312	E-2	230	SSH	3.22	85	I	1	
312	E-2	230	SSH	2.80	74	I	1	
312	E-2	230	SSH	3.11	82	I	1	
312	E-2	230	SSH	3.26	86	I	1	
312	E-2	230	SSH	3.11	82	I	1	
312	E-2	230	SSH	3.18	84	I	1	
312	E-2	230	SSH	2.88	76	I	1	
312	E-2	230	SSH	3.07	81	I	1	
312	E-2	230	SSH	3.33	88	I	1	
312	E-2	230	SSH	3.26	86	I	1	
312	E-2	230	SSH	3.03	80	I	1	
312	E-2	230	SSH	2.92	77	I	1	
312	E-2	310	WHS	5.91	156	I	1	
312	E-2	310	WHS	6.33	167	I	1	
312	E-2	540	TDD	2.92	77	I	1	
312	E-2	540	TDD	2.27	60	I	1	
312	E-2	540	TDD	2.54	67	I	1	
312	E-2	540	TDD	1.93	51	I	1	
312	E-2	420	SMB	3.03	80	I	1	
312	E-2	210	CCP			I		16
312	E-2	230	SSH			I		152
312	E-2	480	RKB	8.48	224	I	1	
312	E-2	480	RKB	3.07	81	I	1	
312	E-2	480	RKB	3.03	80	I	1	
312	E-2	480	RKB	3.86	102	I	1	
312	E-2	510	YLP	4.09	108	I	1	
312	E-2	510	YLP	5.08	134	I	1	
312	E-2	510	YLP	4.55	120	I	1	
312	E-2	510	YLP	4.13	109	I	1	

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312	E-2	510	YLP	4.89	129	I		1
312	E-2	510	YLP	4.17	110	I		1
312	E-2	510	YLP	4.47	118	I		1
312	E-2	510	YLP	4.36	115	I		1
312	E-2	510	YLP	4.02	106	I		1
312	E-2	510	YLP	4.32	114	I		1
312	E-2	510	YLP	4.36	115	I		1
312	E-2	510	YLP	4.24	112	I		1
312	E-2	510	YLP	3.98	105	I		1
312	E-2	480	RKB	3.14	83	I		1
312	E-2	510	YLP	3.98	105	I		1
312	E-2	510	YLP	4.62	122	I		1
312	E-2	510	YLP	4.36	115	I		1
312	E-2	410	BLG	2.31	61	I		1
312	E-2	410	BLG	1.70	45	I		1
312	E-2	410	BLG	1.14	30	I		1
312	E-2	410	BLG	1.97	52	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	2.20	58	I		1
312	E-2	410	BLG	2.08	55	I		1
312	E-2	410	BLG	2.20	58	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	1.67	44	I		1
312	E-2	410	BLG	1.78	47	I		1
312	E-2	410	BLG	2.31	61	I		1
312	E-2	410	BLG	2.35	62	I		1
312	E-2	410	BLG	1.82	48	I		1
312	E-2	410	BLG	2.01	53	I		1
312	E-2	410	BLG	1.93	51	I		1
312	E-2	410	BLG	2.01	53	I		1
312	E-2	410	BLG	2.39	63	I		1
312	E-2	410	BLG	1.02	27	I		1
312	E-2	410	BLG	1.55	41	I		1
312	E-2	410	BLG	2.01	53	I		1
312	E-2	410	BLG	1.82	48	I		1
312	E-2	410	BLG	2.01	53	I		1
312	E-2	410	BLG	2.08	55	I		1
312	E-2	410	BLG	1.44	38	I		1
312	E-2	410	BLG	2.46	65	I		1
312	E-2	410	BLG	2.23	59	I		1
312	E-2	410	BLG	2.35	62	I		1
312	E-2	410	BLG	1.55	41	I		1
312	E-2	410	BLG	1.86	49	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	450	BCR	3.67	97	I		1
312	E-2	840	TGM	10.30	272	I		1
312	E-2	310	WHS	5.80	153	I		1
312	E-2	310	WHS	5.08	134	I		1
312	E-2	310	WHS	5.76	152	I		1
312	E-2	310	WHS	5.34	141	I		1
312	E-2	450	BCR	3.94	104	I		1
312	E-2	310	WHS	17.84	471	I		1
312	E-2	120	GZS	5.11	135	I		1
312	E-2	410	BLG	6.93	183	I		1
312	E-2	310	WHS	17.73	468	I		1
312	E-2	310	WHS	14.47	382	I		1
312	E-2	510	YLP	12.16	321	I		1
312	E-2	510	YLP	8.94	236	I		1

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312	E-2	420	SMB	6.21	164	I		1
312	E-2	430	LMB	4.32	114	I		1
312	E-2	430	LMB	3.22	85	I		1
312	E-2	430	LMB	4.77	126	I		1
312	E-2	430	LMB	5.61	148	I		1
312	E-2	430	LMB	4.36	115	I		1
312	E-2	420	SMB	4.77	126	I		1
312	E-2	430	LMB	4.51	119	I		1
312	E-2	430	LMB	4.32	114	I		1
312	E-2	430	LMB	4.20	111	I		1
312	E-2	430	LMB	4.24	112	I		1
312	E-2	430	LMB	4.05	107	I		1
312	E-2	430	LMB	4.13	109	I		1
312	E-2	430	LMB	4.85	128	I		1
312	E-2	430	LMB	4.62	122	I		1
312	E-2	430	LMB	4.13	109	I		1
312	E-2	450	BCR	3.48	92	I		1
312	E-2	620	BBH	3.86	102	I		1
312	E-2	620	BBH	4.47	118	I		1
312	E-2	620	BBH	3.56	94	I		1
312	E-2	610	YBH	1.59	42	I		1
312	E-2	540	TDD	2.69	71	I		1
312	E-2	230	SSH	2.69	71	I		1
312	E-2	230	SSH	3.41	90	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	2.50	66	I		1
312	E-2	230	SSH	3.52	93	I		1
312	E-2	230	SSH	2.95	78	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	3.33	88	I		1
312	E-2	430	LMB	4.39	116	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	2.95	78	I		1
312	E-2	230	SSH	2.92	77	I		1
312	E-2	230	SSH	3.83	101	I		1
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	3.26	86	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	2.92	77	I		1
312	E-2	230	SSH	3.45	91	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	3.33	88	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	3.71	98	I		1
312	E-2	230	SSH	2.88	76	I		1
312	E-2	230	SSH	2.69	71	I		1
312	E-2	230	SSH	3.07	81	I		1

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.37	89	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	3.60	95	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	2.84	75	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	2.92	77	I		1
312	E-2	230	SSH	2.69	71	I		1
312	E-2	230	SSH	4.20	111	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	2.95	78	I		1
312	E-2	230	SSH	2.61	69	I		1
312	E-2	230	SSH	2.88	76	I		1
312	E-2	230	SSH	3.26	86	I		1
312	E-2	230	SSH	3.56	94	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	2.84	75	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	4.39	116	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	4.17	110	I		1
312	E-2	230	SSH	4.47	118	I		1
312	E-2	230	SSH	3.33	88	I		1
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	3.94	104	I		1
312	E-2	230	SSH	2.88	76	I		1
312	E-2	230	SSH	2.65	70	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	2.80	74	I		1
312	E-2	230	SSH	3.45	91	I		1
312	E-2	230	SSH	4.24	112	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	3.11	82	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	2.88	76	I		1
312	E-2	230	SSH	2.61	69	I		1
312	E-2	230	SSH	3.03	80	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	2.88	76	I		1
312	E-2	230	SSH	2.84	75	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	2.69	71	I		1
312	E-2	230	SSH	3.22	85	I		1

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	230	SSH	2.99	79	I		1
312	E-2	230	SSH	3.37	89	I		1
312	E-2	230	SSH	2.95	78	I		1
312	E-2	230	SSH	4.32	114	I		1
312	E-2	230	SSH	2.61	69	I		1
312	E-2	230	SSH	2.39	63	I		1
312	E-2	230	SSH	3.33	88	I		1
312	E-2	230	SSH	2.58	68	I		1
312	E-2	230	SSH	3.94	104	I		1
312	E-2	230	SSH	3.07	81	I		1
312	E-2	230	SSH	2.77	73	I		1
312	E-2	230	SSH	3.18	84	I		1
312	E-2	230	SSH	2.73	72	I		1
312	E-2	230	SSH	3.14	83	I		1
312	E-2	230	SSH	3.94	104	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	3.22	85	I		1
312	E-2	230	SSH	4.05	107	I		1
312	E-2	230	SSH	2.95	78	I		1
312	E-2	230	SSH	2.88	76	I		1
312	E-2	220	GSH	3.83	101	I		1
312	E-2	220	GSH	3.79	100	I		1
312	E-2	220	GSH	4.36	115	I		1
312	E-2	220	GSH	3.86	102	I		1
312	E-2	220	GSH	3.52	93	I		1
312	E-2	410	BLG	0.98	26	I		1
312	E-2	410	BLG	1.82	48	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	1.89	50	I		1
312	E-2	410	BLG	1.70	45	I		1
312	E-2	410	BLG	2.05	54	I		1
312	E-2	410	BLG	1.74	46	I		1
312	E-2	410	BLG	1.67	44	I		1
312	E-2	910	NBS	2.84	75	I		1
312	E-2	910	NBS	2.92	77	I		1
312	E-2	220	GSH	3.48	92	I		1
312	E-2	220	GSH	3.71	98	I		1
312	E-2	220	GSH	4.32	114	I		1
312	E-2	220	GSH	3.14	83	I		1
312	E-2	220	GSH	4.73	125	I		1
312	E-2	220	GSH	4.13	109	I		1
312	E-2	220	GSH	3.56	94	I		1
312	E-2	220	GSH	3.52	93	I		1
312	E-2	220	GSH	3.33	88	I		1
312	E-2	220	GSH	3.94	104	I		1
312	E-2	220	GSH	3.64	96	I		1
312	E-2	220	GSH	2.69	71	I		1
312	E-2	220	GSH	3.71	98	I		1
312	E-2	220	GSH	3.45	91	I		1
312	E-2	220	GSH	3.52	93	I		1
312	E-2	220	GSH	3.83	101	I		1
312	E-2	220	GSH	3.48	92	I		1
312	E-2	220	GSH	4.13	109	I		1
312	E-2	220	GSH	3.41	90	I		1
312	E-2	220	GSH	3.60	95	I		1
312	E-2	220	GSH	3.03	80	I		1
312	E-2	220	GSH	3.18	84	I		1
312	E-2	220	GSH	3.86	102	I		1
312	E-2	220	GSH	3.11	82	I		1

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-2	220	GSH	3.22	85	I	1	
312	E-2	220	GSH	3.22	85	I	1	
312	E-2	220	GSH	3.52	93	I	1	
312	E-2	220	GSH	3.60	95	I	1	
312	E-2	220	GSH	3.48	92	I	1	
312	E-2	410	BLG	1.78	47	I	1	
312	E-2	410	BLG	2.31	61	I	1	
312	E-2	410	BLG	1.52	40	I	1	
312	E-2	410	BLG	1.74	46	I	1	
312	E-2	410	BLG	1.86	49	I	1	
312	E-2	410	BLG	1.97	52	I	1	
312	E-2	410	BLG	2.23	59	I	1	
312	E-2	410	BLG	1.44	38	I	1	
312	E-2	410	BLG	1.21	32	I	1	
312	E-2	410	BLG	1.78	47	I	1	
312	E-2	410	BLG	1.86	49	I	1	
312	E-2	540	TDD	2.77	73	I	1	
312	E-2	910	NBS	2.65	70	I	1	
312	E-2	910	NBS	3.11	82	I	1	
312	E-2	620	BBH	4.05	107	I	1	
312	E-2	620	BBH	3.45	91	I	1	
312	E-1B	420	SMB	4.36	115	I	1	
312	E-1B	420	SMB	4.32	114	I	1	
312	E-1B	420	SMB	3.94	104	I	1	
312	E-1B	420	SMB	4.02	106	I	1	
312	E-1B	420	SMB	3.75	99	I	1	
312	E-1B	420	SMB	4.17	110	I	1	
312	E-1B	420	SMB	4.39	116	I	1	
312	E-1B	420	SMB	3.98	105	I	1	
312	E-1B	420	SMB	3.94	104	I	1	
312	E-1B	420	SMB	3.75	99	I	1	
312	E-1B	420	SMB	4.51	119	I	1	
312	E-1B	420	SMB	3.45	91	I	1	
312	E-1B	420	SMB	5.30	140	I	1	
312	E-1B	420	SMB	4.77	126	I	1	
312	E-1B	420	SMB	4.32	114	I	1	
312	E-1B	420	SMB	3.64	96	I	1	
312	E-1B	420	SMB	3.86	102	I	1	
312	E-1B	420	SMB	3.71	98	I	1	
312	E-1B	420	SMB	3.94	104	I	1	
312	E-1B	420	SMB	4.02	106	I	1	
312	E-1B	420	SMB	4.77	126	I	1	
312	E-1B	420	SMB	3.22	85	I	1	
312	E-1B	420	SMB	3.67	97	I	1	
312	E-1B	420	SMB	3.83	101	I	1	
312	E-1B	420	SMB	3.30	87	I	1	
312	E-1B	420	SMB	3.71	98	I	1	
312	E-1B	310	WHS	16.63	439	I	1	
312	E-1B	480	RKB	3.03	80	I	1	
312	E-1B	480	RKB	2.80	74	I	1	
312	E-1B	310	WHS	17.35	458	I	1	
312	E-1B	480	RKB	2.84	75	I	1	
312	E-1B	480	RKB	3.07	81	I	1	
312	E-1B	480	RKB	3.22	85	I	1	
312	E-1B	510	YLP	4.39	116	I	1	
312	E-1B	450	BCR	4.13	109	I	1	
312	E-1B	610	YBH	4.13	109	I	1	
312	E-1B	510	YLP	4.92	130	I	1	
312	E-1B	410	BLG	2.65	70	I	1	

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-1B	410	BLG	2.23	59	I		1
312	E-1B	910	NBS	2.80	74	I		1
312	E-1B	410	BLG	2.12	56	I		1
312	E-1B	610	YBH	4.70	124	I		1
312	E-1B	410	BLG	2.42	64	I		1
312	E-1B	410	BLG	2.27	60	I		1
312	E-1B	410	BLG	1.59	42	I		1
312	E-1B	410	BLG	1.89	50	I		1
312	E-1B	410	BLG	1.97	52	I		1
312	E-1B	410	BLG	2.31	61	I		1
312	E-1B	540	TDD	2.80	74	I		1
312	E-1B	410	BLG	1.86	49	I		1
312	E-1B	520	LGP	3.30	87	I		1
312	E-1B	910	NBS	2.69	71	I		1
312	E-1B	410	BLG	1.89	50	I		1
312	E-1B	910	NBS	2.27	60	I		1
312	E-1B	910	NBS	1.93	51	I		1
312	E-1B	910	NBS	2.84	75	I		1
312	E-1B	430	LMB	5.30	140	I		1
312	E-1B	430	LMB	4.55	120	I		1
312	E-1B	530	WLY	19.28	509	I		1
312	E-1B	430	LMB	14.13	373	I		1
312	E-1B	430	LMB	12.99	343	I		1
312	E-1B	420	SMB	3.79	100	I		1
312	E-1B	230	SSH	2.65	70	I		1
312	E-1B	460	PKS	2.69	71	I		1
312	E-1B	420	SMB	4.73	125	I		1
312	E-1B	420	SMB	4.24	112	I		1
312	E-1B	420	SMB	4.73	125	I		1
312	E-1B	420	SMB	5.15	136	I		1
312	E-1B	420	SMB	4.51	119	I		1
312	E-1B	420	SMB	3.48	92	I		1
312	E-1B	420	SMB	4.55	120	I		1
312	E-1B	420	SMB	4.96	131	I		1
312	E-1B	420	SMB	4.62	122	I		1
312	E-1B	420	SMB	3.71	98	I		1
312	E-1B	420	SMB	3.98	105	I		1
312	E-1B	420	SMB	5.15	136	I		1
312	E-1B	540	TDD	1.86	49	I		1
312	E-1B	430	LMB	3.83	101	I		1
312	E-1B	430	LMB	4.47	118	I		1
312	E-1B	510	YLP	4.66	123	I		1
312	E-1B	510	YLP	4.81	127	I		1
312	E-1B	510	YLP	4.17	110	I		1
312	E-1B	510	YLP	4.77	126	I		1
312	E-1B	510	YLP	4.32	114	I		1
312	E-1B	510	YLP	4.17	110	I		1
312	E-1B	480	RKB	2.88	76	I		1
312	E-1B	480	RKB	3.67	97	I		1
312	E-1B	460	PKS	3.03	80	I		1
312	E-1B	610	YBH	3.83	101	I		1
312	E-1B	610	YBH	2.88	76	I		1
312	E-1B	1210	BKF	2.50	66	I		1
312	E-1B	910	NBS	1.74	46	I		1
312	E-1B	910	NBS	2.27	60	I		1
312	E-1B	230	SSH	2.84	75	I		1
312	E-1B	230	SSH	2.65	70	I		1
312	E-1B	230	SSH	2.84	75	I		1
312	E-1B	410	BLG	2.05	54	I		1

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET FISH SAMPLING STUDY
BIOLOGICAL DATA

JULIAN END DATE	STATION I.D.	SPECIES Code	SPECIES Name	LENGTH (in)	LENGTH (mm)	SAMPLE AREA	SAMPLE DISPOSITION	ADD. INDV.
312	E-1B	610	YBH	2.08	55	I	1	
312	E-1B	410	BLG	2.08	55	I	1	
312	E-1B	910	NBS	2.73	72	I	1	
312	E-1B	291	SSH	3.30	87	I	1	

SCHOOL STREET FISHERIES BASELINE DATA
MAY 1994 SAMPLE

SCHOOL STREET ENVIRONMENTAL DATA
MAY 1994
FISHERIES BASELINE STUDY
NIAGRA MOWHAWK POWER COMPANY

Julian End Date	Station I.D.	Sample Duration (hours)	Begin Temp. (C)	End Temp. (C)	Begin D.O. (mg/l)	End D.O. (mg/l)	Begin pH	End pH	Begin Conduct. (umhos)	End Conduct. (umhos)	Calendar End Date
137	G-1	23.08	13.0	13.2	9.3	9.9	7.50	7.60			05/17/94
138	G-1	22.63	13.2	12.9	9.9	9.9	7.60	7.60			05/18/94
137	G-2	22.92	13.0	13.2	9.6	9.8	7.60	7.60			05/17/94
138	G-2	22.67	13.2	12.9	9.8	9.8	7.60	7.60			05/18/94
137	G-3	23.00	13.0	13.2	9.6	9.8	7.60	7.50			05/17/94
138	G-3	23.00	13.2	12.9	9.8	9.5	7.50	7.50			05/18/94
137	H-1	23.25	13.0	13.1	9.7	10.1	7.60	7.60			05/17/94
138	H-1	23.00	13.1	12.9	10.1	9.9	7.60	7.60			05/18/94
137	H-2	22.83	13.0	13.1	9.7	9.8	7.60	7.60			05/17/94
138	H-2	23.17	13.1	12.9	9.8	9.6	7.60	7.60			05/18/94
137	H-3	23.17	13.0	13.2	9.6	10.1	7.60	7.50			05/17/94
138	H-3	22.75	13.2	12.9	10.1	11.9	7.50	7.50			05/18/94
137	H-4	23.00	13.0	13.2	9.6	9.8	7.60	7.50			05/17/94
138	H-4	22.92	13.2	12.9	9.8	9.5	7.50	7.50			05/18/94
136	E-1A	0.33	13.5	13.5	10.1	10.1	7.60	7.60	229.0	229.0	05/16/94
136	E-1B	0.33	13.5	13.5	10.0	10.0	7.60	7.60	210.0	210.0	05/16/94
136	E-2	0.58	14.0	14.0	9.9	9.9	7.60	7.60	207.0	207.0	05/16/94
137	E-3B	0.40	13.0	13.0	9.2	9.2	7.90	7.90	230.0	230.0	05/17/94
137	E-4	0.33	13.0	13.0	9.2	9.2	7.80	7.80	220.0	220.0	05/17/94
137	E-5	0.42	13.0	13.0	9.7	7.8	7.60	7.60	238.0	238.0	05/17/94
152	A-1	1.08	22.7	22.7	8.0	8.0	8.20	8.20			06/01/94
152	A-2	0.50	22.5	22.5	8.8	8.8	8.20	8.20			06/01/94
152	G-4	18.00	23.0	21.0	8.3	8.4	7.80	8.20			06/01/94
152	G-5	17.99	24.0	21.0	8.6	8.6	7.80	7.70			06/01/94
152	G-6	17.92	22.0	21.0	8.7	8.5	8.00	8.20			06/01/94
152	E-3A	1.06	24.8	24.8	9.2	9.2	8.00	8.00	208.0	208.0	06/01/94

SCHOOL STREET MAY 1994
FISH BASELINE STUDY
NIAGRA MOWHAWK POWER COMPANY

JULIAN END DATE	STATION I.D.	SPECIES CODE	SPECIES NAME	LENGTH (IN.)	LENGTH (mm)	SAMPLE DISPOSITION	SAMPLE AREA	SEX M=MALE F=FEM	COND. R=RIPE S=SPENT	WEIGHT (kg)
136	E-2	200	CYP	3.66	93	2	I			
136	E-2	200	CYP	2.87	73	2	I			
136	E-2	200	CYP	2.87	73	2	I			
136	E-1A	210	CCP			1	I			
136	E-1A	210	CCP			1	I			
136	E-1A	210	CCP			1	I			
136	E-1A	210	CCP			1	I			
136	E-1A	210	CCP			1	I			
136	E-1A	210	CCP			1	I			
136	E-1A	210	CCP			1	I			
136	E-1A	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-1B	210	CCP			1	I			
136	E-2	210	CCP			1	I			
136	E-2	210	CCP			1	I			
136	E-2	210	CCP			1	I			
136	E-1A	220	GSH	7.52	191	1	I			
136	E-1A	220	GSH	7.72	196	1	I			
136	E-1A	220	GSH	6.81	173	1	I			
136	E-1A	220	GSH	7.44	189	1	I			
136	E-1A	220	GSH	3.27	83	1	I			
136	E-1A	220	GSH	8.07	205	1	I			
136	E-1B	220	GSH	7.80	198	1	I			
136	E-1A	230	SSH	3.82	97	1	I			
136	E-1A	230	SSH	3.27	83	1	I			
136	E-1A	230	SSH	4.41	112	1	I			
136	E-1A	230	SSH	3.90	99	1	I			
136	E-1A	230	SSH	4.06	103	1	I			
136	E-1A	230	SSH	4.80	122	1	I			
136	E-1A	230	SSH	3.15	80	1	I			
136	E-1A	230	SSH	2.76	70	1	I			
136	E-1A	230	SSH	4.37	111	1	I			
136	E-1A	230	SSH	3.15	80	1	I			
136	E-1A	230	SSH	2.87	73	1	I			
136	E-1A	230	SSH	3.54	90	1	I			
136	E-1A	230	SSH	2.99	76	1	I			
136	E-1A	230	SSH	3.23	82	1	I			
136	E-1A	230	SSH	2.64	67	1	I			
136	E-1A	230	SSH	3.94	100	1	I			
136	E-1A	230	SSH	3.15	80	1	I			
136	E-1A	230	SSH	3.19	81	1	I			
136	E-1A	230	SSH	2.99	76	1	I			
136	E-1A	230	SSH	3.31	84	1	I			
136	E-1A	230	SSH	4.02	102	1	I			
136	E-1A	230	SSH	2.68	68	1	I			
136	E-1A	230	SSH	3.35	85	1	I			
136	E-1A	230	SSH	3.66	93	1	I			
136	E-1A	230	SSH	3.35	85	1	I			
136	E-1A	230	SSH	2.87	73	1	I			
136	E-1A	230	SSH	3.23	82	1	I			
136	E-1A	230	SSH	2.52	64	1	I			
136	E-1A	230	SSH	2.83	72	1	I			
136	E-1A	230	SSH	4.17	106	1	I			
136	E-1A	230	SSH	3.27	83	1	I			
136	E-1A	230	SSH	2.76	70	1	I			
136	E-1A	230	SSH	3.23	82	1	I			
136	E-1A	230	SSH	2.95	75	1	I			
136	E-1A	230	SSH	2.99	76	1	I			

136	E-1A	230	SSH	2.95	75	1	I
136	E-1A	230	SSH	4.29	109	1	I
136	E-1A	230	SSH	4.21	107	1	I
136	E-1A	230	SSH	4.41	112	1	I
136	E-1A	230	SSH	3.27	83	1	I
136	E-1A	230	SSH	3.23	82	1	I
136	E-1A	230	SSH	4.41	112	1	I
136	E-1A	230	SSH	2.20	56	1	I
136	E-1A	230	SSH	3.15	80	1	I
136	E-1A	230	SSH	3.27	83	1	I
136	E-1A	230	SSH	3.39	86	1	I
136	E-1A	230	SSH	2.91	74	1	I
136	E-1A	230	SSH	2.87	73	1	I
136	E-1A	230	SSH	3.94	100	1	I
136	E-1A	230	SSH	2.95	75	1	I
136	E-1A	230	SSH	3.23	82	1	I
136	E-1A	230	SSH	2.99	76	1	I
136	E-1A	230	SSH	3.78	96	1	I
136	E-1A	230	SSH	3.39	86	1	I
136	E-1A	230	SSH	2.91	74	1	I
136	E-1A	230	SSH	4.17	106	1	I
136	E-1A	230	SSH	3.35	85	1	I
136	E-1A	230	SSH	3.07	78	1	I
136	E-1A	230	SSH	3.07	78	1	I
136	E-1A	230	SSH	2.44	62	1	I
136	E-1A	230	SSH	3.35	85	1	I
136	E-1A	230	SSH	3.27	83	1	I
136	E-1A	230	SSH	3.03	77	1	I
136	E-1A	230	SSH	3.50	89	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	3.15	80	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	3.62	92	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	3.39	86	1	I
136	E-1A	230	SSH	3.39	86	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	3.15	80	1	I
136	E-1A	230	SSH	3.39	86	1	I
136	E-1A	230	SSH	4.53	115	1	I
136	E-1A	230	SSH	2.99	76	1	I
136	E-1A	230	SSH	3.07	78	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	2.60	66	1	I
136	E-1A	230	SSH	2.91	74	1	I
136	E-1A	230	SSH	3.35	85	1	I
136	E-1A	230	SSH	3.50	89	1	I
136	E-1A	230	SSH	3.31	84	1	I
136	E-1A	230	SSH	2.48	63	1	I
136	E-1A	230	SSH	3.35	85	1	I
136	E-1A	230	SSH	3.54	90	1	I
136	E-1A	230	SSH	2.83	72	1	I
136	E-1A	230	SSH	2.56	65	1	I
136	E-1A	230	SSH	3.03	77	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	3.23	82	1	I
136	E-1A	230	SSH	4.37	111	1	I
136	E-1A	230	SSH	4.06	103	1	I
136	E-1A	230	SSH	3.35	85	1	I
136	E-1A	230	SSH	3.50	89	1	I
136	E-1A	230	SSH	3.15	80	1	I
136	E-1A	230	SSH	3.27	83	1	I
136	E-1A	230	SSH	3.35	85	1	I
136	E-1A	230	SSH	3.27	83	1	I
136	E-1A	230	SSH	2.76	70	1	I
136	E-1A	230	SSH	3.07	78	1	I
136	E-1A	230	SSH	3.27	83	1	I
136	E-1A	230	SSH	3.07	78	1	I
136	E-1A	230	SSH	3.46	88	1	I
136	E-1A	230	SSH	3.03	77	1	I
136	E-1A	230	SSH	3.07	78	1	I
136	E-1B	230	SSH	2.80	71	1	I

136	E-1B	230	SSH	2.99	76	1	I
136	E-1B	230	SSH	3.03	77	1	I
136	E-1B	230	SSH	2.48	63	1	I
136	E-1B	230	SSH	2.91	74	1	I
136	E-1B	230	SSH	2.83	72	1	I
136	E-1B	230	SSH	3.27	83	1	I
136	E-1B	230	SSH	4.02	102	1	I
136	E-1B	230	SSH	3.90	99	1	I
136	E-1B	230	SSH	3.27	83	1	I
136	E-1B	230	SSH	3.35	85	1	I
136	E-1B	230	SSH	3.03	77	1	I
136	E-1B	230	SSH	2.68	68	1	I
136	E-1B	230	SSH	2.80	71	1	I
136	E-1B	230	SSH	3.15	80	1	I
136	E-1B	230	SSH	2.80	71	1	I
136	E-1B	230	SSH	2.99	76	1	I
136	E-1B	230	SSH	3.19	81	1	I
136	E-1B	230	SSH	3.50	89	1	I
136	E-1B	230	SSH	4.37	111	1	I
136	E-1B	230	SSH	4.45	113	1	I
136	E-1B	230	SSH	3.78	96	1	I
136	E-1B	230	SSH	3.27	83	1	I
136	E-1B	230	SSH	3.19	81	1	I
136	E-1B	230	SSH	4.21	107	1	I
136	E-1B	230	SSH	3.35	85	1	I
136	E-1B	230	SSH	3.35	85	1	I
136	E-1B	230	SSH	3.03	77	1	I
136	E-1B	230	SSH	2.99	76	1	I
136	E-1B	230	SSH	2.99	76	1	I
136	E-1B	230	SSH	3.66	93	1	I
136	E-1B	230	SSH	3.66	93	1	I
136	E-1B	230	SSH	3.07	78	1	I
136	E-1B	230	SSH	3.27	83	1	I
136	E-1B	230	SSH	3.31	84	1	I
136	E-1B	230	SSH	2.99	76	1	I
136	E-1B	230	SSH	3.15	80	1	I
136	E-1B	230	SSH	3.15	80	1	I
136	E-1B	230	SSH	3.35	85	1	I
136	E-1B	230	SSH	4.41	112	1	I
136	E-1B	230	SSH	3.86	98	1	I
136	E-1B	230	SSH	2.36	60	1	I
136	E-1B	230	SSH	3.03	77	1	I
136	E-1B	230	SSH	2.83	72	1	I
136	E-1B	230	SSH	3.03	77	1	I
136	E-1B	230	SSH	2.99	76	1	I
136	E-1B	230	SSH	3.15	80	1	I
136	E-1B	230	SSH	3.27	83	1	I
136	E-1B	230	SSH	2.76	70	1	I
136	E-2	230	SSH	2.99	76	1	I
136	E-2	230	SSH	2.60	66	1	I
136	E-2	230	SSH	2.56	65	1	I
136	E-2	230	SSH	2.76	70	1	I
136	E-2	230	SSH	2.64	67	1	I
136	E-2	230	SSH	2.95	75	1	I
136	E-2	230	SSH	3.54	90	1	I
136	E-2	230	SSH	3.15	80	1	I
136	E-2	230	SSH	2.87	73	1	I
136	E-2	230	SSH	2.83	72	1	I
136	E-2	230	SSH	2.44	62	1	I
136	E-2	230	SSH	2.56	65	1	I
136	E-2	230	SSH	2.56	65	1	I
136	E-2	230	SSH	3.35	85	1	I
136	E-2	230	SSH	3.07	78	1	I
136	E-2	230	SSH	3.19	81	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.76	70	1	I
136	E-2	230	SSH	2.76	70	1	I
136	E-2	230	SSH	3.03	77	1	I
136	E-2	230	SSH	2.44	62	1	I
136	E-2	230	SSH	2.80	71	1	I
136	E-2	230	SSH	2.20	56	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.44	62	1	I

136	E-2	230	SSH	2.64	67	1	I
136	E-2	230	SSH	3.15	80	1	I
136	E-2	230	SSH	2.68	68	1	I
136	E-2	230	SSH	2.20	56	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.72	69	1	I
136	E-2	230	SSH	2.09	53	1	I
136	E-2	230	SSH	2.05	52	1	I
136	E-2	230	SSH	2.68	68	1	I
136	E-2	230	SSH	2.56	65	1	I
136	E-2	230	SSH	2.76	70	1	I
136	E-2	230	SSH	2.83	72	1	I
136	E-2	230	SSH	3.27	83	1	I
136	E-2	230	SSH	2.95	75	1	I
136	E-2	230	SSH	2.56	65	1	I
136	E-2	230	SSH	3.07	78	1	I
136	E-2	230	SSH	2.76	70	1	I
136	E-2	230	SSH	2.91	74	1	I
136	E-2	230	SSH	2.64	67	1	I
136	E-2	230	SSH	2.56	65	1	I
136	E-2	230	SSH	4.33	110	1	I
136	E-2	230	SSH	4.33	110	1	I
136	E-2	230	SSH	3.15	80	1	I
136	E-2	230	SSH	3.35	85	1	I
136	E-2	230	SSH	2.76	70	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.24	57	1	I
136	E-2	230	SSH	2.48	63	1	I
136	E-2	230	SSH	3.15	80	1	I
136	E-2	230	SSH	2.95	75	1	I
136	E-2	230	SSH	2.40	61	1	I
136	E-2	230	SSH	2.64	67	1	I
136	E-2	230	SSH	3.03	77	1	I
136	E-2	230	SSH	2.56	65	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.64	67	1	I
136	E-2	230	SSH	2.44	62	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.95	75	1	I
136	E-2	230	SSH	2.36	60	1	I
136	E-2	230	SSH	2.24	57	1	I
136	E-1A	310	WHS	11.26	286	1	I
136	E-1A	310	WHS	15.51	394	1	I
136	E-1A	310	WHS	19.49	495	1	I
136	E-1A	310	WHS	4.76	121	1	I
136	E-1A	310	WHS	4.61	117	1	I
136	E-2	310	WHS	16.02	407	1	I
136	E-1A	320	SRH	15.04	382	1	I
136	E-1A	410	BLG	6.85	174	1	I
136	E-2	410	BLG	2.28	58	1	I
136	E-1A	420	SMB	13.98	355	1	I
136	E-1A	420	SMB	12.17	309	1	I
136	E-1A	420	SMB	12.48	317	1	I
136	E-1A	420	SMB	12.17	309	1	I
136	E-1A	420	SMB	11.42	290	1	I
136	E-1A	420	SMB	5.98	152	1	I
136	E-1A	420	SMB	4.37	111	1	I
136	E-1A	420	SMB	4.25	108	1	I
136	E-1A	420	SMB	5.08	129	1	I
136	E-1A	420	SMB	4.84	123	1	I
136	E-1A	420	SMB	5.20	132	1	I
136	E-1A	420	SMB	5.12	130	1	I
136	E-1A	420	SMB	4.41	112	1	I
136	E-1A	420	SMB	4.45	113	1	I
136	E-1B	420	SMB	13.15	334	1	I
136	E-1B	420	SMB	15.75	400	1	I
136	E-1B	420	SMB	17.72	450	1	I
136	E-1B	420	SMB	16.54	420	1	I
136	E-1B	420	SMB	14.72	374	1	I
136	E-1B	420	SMB	15.79	401	1	I
136	E-1B	420	SMB	11.89	302	1	I
136	E-1B	420	SMB	12.56	319	1	I

136	E-1B	420	SMB	10.87	276	1	I
136	E-1B	420	SMB	12.48	317	1	I
136	E-1B	420	SMB	12.05	306	1	I
136	E-1B	420	SMB	11.14	283	1	I
136	E-1B	420	SMB	12.24	311	1	I
136	E-1B	420	SMB	15.20	386	1	I
136	E-1B	420	SMB	16.22	412	1	I
136	E-1B	420	SMB	12.68	322	1	I
136	E-1B	420	SMB	15.75	400	1	I
136	E-1B	420	SMB	11.06	281	1	I
136	E-1B	420	SMB	11.02	280	1	I
136	E-1B	420	SMB	11.77	299	1	I
136	E-1B	420	SMB	4.17	106	1	I
136	E-1B	420	SMB	17.56	446	1	I
136	E-1B	420	SMB	13.31	338	1	I
136	E-1B	420	SMB	14.65	372	1	I
136	E-1B	420	SMB	13.94	354	1	I
136	E-1B	420	SMB	10.98	279	1	I
136	E-1B	420	SMB	10.98	279	1	I
136	E-1B	420	SMB	11.02	280	1	I
136	E-1B	420	SMB	4.96	126	1	I
136	E-1B	420	SMB	4.57	116	1	I
136	E-1B	420	SMB	4.57	116	1	I
136	E-1B	420	SMB	5.63	143	1	I
136	E-1B	420	SMB	4.96	126	1	I
136	E-1B	420	SMB	3.62	92	1	I
136	E-2	420	SMB	14.69	373	1	I
136	E-2	420	SMB	10.83	275	1	I
136	E-2	420	SMB	11.30	287	1	I
136	E-2	420	SMB	9.61	244	1	I
136	E-2	420	SMB	10.20	259	1	I
136	E-2	420	SMB	10.28	261	1	I
136	E-2	420	SMB	12.28	312	1	I
136	E-2	420	SMB	10.04	255	1	I
136	E-2	420	SMB	10.12	257	1	I
136	E-2	420	SMB	10.08	256	1	I
136	E-2	420	SMB	4.84	123	1	I
136	E-2	420	SMB	5.20	132	1	I
136	E-2	420	SMB	4.29	109	1	I
136	E-2	420	SMB	4.80	122	1	I
136	E-2	420	SMB	5.04	128	1	I
136	E-2	420	SMB	5.12	130	1	I
136	E-2	420	SMB	4.61	117	1	I
136	E-2	420	SMB	4.53	115	1	I
136	E-2	420	SMB	5.31	135	1	I
136	E-2	420	SMB	5.20	132	1	I
136	E-2	420	SMB	3.23	82	1	I
136	E-2	420	SMB	4.65	118	1	I
136	E-2	420	SMB	4.02	102	1	I
136	E-2	430	LMB	14.92	379	1	I
136	E-2	430	LMB	18.31	465	1	I
136	E-2	430	LMB	15.98	406	1	I
136	E-2	430	LMB	16.02	407	1	I
136	E-1B	450	BCR	8.39	213	1	I
136	E-2	460	PKS	2.28	58	1	I
136	E-2	460	PKS	2.09	53	1	I
136	E-2	460	PKS	2.20	56	1	I
136	E-2	460	PKS	2.56	65	1	I
136	E-2	460	PKS	2.09	53	1	I
136	E-2	460	PKS	4.33	110	1	I
136	E-2	460	PKS	2.09	53	1	I
136	E-2	460	PKS	1.97	50	1	I
136	E-2	460	PKS	2.36	60	1	I
136	E-2	460	PKS	2.09	53	1	I
136	E-2	460	PKS	2.48	63	1	I
136	E-1A	480	RKB	8.50	216	1	I
136	E-1A	480	RKB	9.72	247	1	I
136	E-1A	480	RKB	7.09	180	1	I
136	E-1A	480	RKB	7.95	202	1	I
136	E-1A	480	RKB	7.87	200	1	I
136	E-1A	480	RKB	5.31	135	1	I
136	E-1A	480	RKB	7.87	200	1	I
136	E-1A	480	RKB	7.48	190	1	I

136	E-1A	480	RKB	7.20	183	1	I		
136	E-1A	480	RKB	7.80	198	1	I		
136	E-1A	480	RKB	7.68	195	1	I		
136	E-1A	480	RKB	7.76	197	1	I		
136	E-1A	480	RKB	8.78	223	1	I		
136	E-1A	480	RKB	8.03	204	1	I		
136	E-1A	480	RKB	9.29	236	1	I		
136	E-1A	480	RKB	7.20	183	1	I		
136	E-1A	480	RKB	7.60	193	1	I		
136	E-1A	480	RKB	3.94	100	1	I		
136	E-1A	480	RKB	7.20	183	1	I		
136	E-1A	480	RKB	7.28	185	1	I		
136	E-1A	480	RKB	3.90	99	1	I		
136	E-1A	480	RKB	3.78	96	1	I		
136	E-1A	480	RKB	3.70	94	1	I		
136	E-1A	480	RKB	3.66	93	1	I		
136	E-1A	480	RKB	3.46	88	1	I		
136	E-1A	480	RKB	3.58	91	1	I		
136	E-1B	480	RKB	9.29	236	1	I		
136	E-1B	480	RKB	7.95	202	1	I		
136	E-1B	480	RKB	8.62	219	1	I		
136	E-1B	480	RKB	8.70	221	1	I		
136	E-1B	480	RKB	7.56	192	1	I		
136	E-1B	480	RKB	8.74	222	1	I		
136	E-1B	480	RKB	7.44	189	1	I		
136	E-1B	480	RKB	3.39	86	1	I		
136	E-1B	480	RKB	8.50	216	1	I		
136	E-1B	480	RKB	7.01	178	1	I		
136	E-1B	480	RKB	7.28	185	1	I		
136	E-1B	480	RKB	8.78	223	1	I		
136	E-1B	480	RKB	8.31	211	1	I		
136	E-2	480	RKB	3.74	95	1	I		
136	E-1A	510	YLP	12.40	315	1	I		
136	E-1A	510	YLP	4.29	109	1	I		
136	E-1A	510	YLP	5.31	135	1	I		
136	E-1A	510	YLP	5.04	128	1	I	M	R
136	E-1A	510	YLP	4.02	102	1	I		
136	E-1A	510	YLP	3.70	94	1	I	M	R
136	E-1A	510	YLP	4.76	121	1	I		
136	E-1A	510	YLP	4.84	123	1	I		
136	E-1A	510	YLP	4.41	112	1	I	M	R
136	E-1A	510	YLP	4.92	125	1	I	M	R
136	E-1A	510	YLP	4.17	106	1	I	M	R
136	E-1A	510	YLP	4.84	123	1	I		
136	E-1A	510	YLP	5.31	135	1	I		
136	E-1A	510	YLP	5.24	133	1	I		
136	E-1A	510	YLP	4.53	115	1	I	M	R
136	E-1A	510	YLP	4.61	117	1	I	M	R
136	E-1A	510	YLP	4.80	122	1	I	M	R
136	E-1A	510	YLP	4.37	111	1	I	M	R
136	E-1A	510	YLP	4.80	122	1	I		
136	E-1A	510	YLP	4.92	125	1	I		
136	E-1A	510	YLP	4.80	122	1	I		
136	E-1A	510	YLP	4.72	120	1	I		
136	E-1A	510	YLP	4.92	125	1	I		
136	E-1A	510	YLP	4.72	120	1	I		
136	E-1A	510	YLP	4.09	104	1	I	M	R
136	E-1A	510	YLP	4.49	114	1	I	M	R
136	E-1A	510	YLP	6.42	163	1	I	M	R
136	E-1A	510	YLP	5.24	133	1	I		
136	E-1A	510	YLP	4.45	113	1	I	M	R
136	E-1A	510	YLP	3.31	84	1	I	M	R
136	E-1B	510	YLP	10.47	266	1	I	M	R
136	E-1B	510	YLP	9.80	249	1	I	F	R
136	E-1B	510	YLP	9.61	244	1	I	M	R
136	E-1B	510	YLP	9.45	240	1	I	M	R
136	E-1B	510	YLP	8.31	211	1	I	M	R
136	E-1B	510	YLP	12.01	305	1	I	F	R
136	E-1B	510	YLP	9.61	244	1	I	M	R
136	E-1B	510	YLP	8.23	209	1	I	M	R
136	E-1B	510	YLP	10.98	279	1	I	UNKNOWN	
136	E-1B	510	YLP	8.35	212	1	I	M	R
136	E-1B	510	YLP	8.35	212	1	I	M	R

136	E-1B	510	YLP	10.63	270	1	I	M	R
136	E-1B	510	YLP	8.35	212	1	I	F	R
136	E-1B	510	YLP	7.95	202	1	I	M	R
136	E-1B	510	YLP	9.02	229	1	I	M	R
136	E-1B	510	YLP	5.98	152	1	I	M	R
136	E-1B	510	YLP	2.99	76	1	I	M	R
136	E-1B	510	YLP	8.90	226	1	I	M	R
136	E-1B	510	YLP	10.12	257	1	I	M	R
136	E-1B	510	YLP	8.66	220	1	I	M	R
136	E-1B	510	YLP	11.57	294	1	I	M	R
136	E-1B	510	YLP	8.35	212	1	I	M	R
136	E-1B	510	YLP	4.96	126	1	I	M	R
136	E-1B	510	YLP	10.24	260	1	I	M	R
136	E-1B	510	YLP	4.17	106	1	I	M	R
136	E-1B	510	YLP	4.76	121	1	I	M	R
136	E-1B	510	YLP	5.12	130	1	I	M	R
136	E-1B	510	YLP	5.28	134	1	I	M	R
136	E-1B	510	YLP	4.41	112	1	I	M	R
136	E-1B	510	YLP	5.75	146	1	I	M	R
136	E-1B	510	YLP	4.25	108	1	I		
136	E-1B	510	YLP	4.57	116	1	I	M	R
136	E-1B	510	YLP	7.01	178	1	I	M	R
136	E-1B	510	YLP	5.35	136	1	I	M	R
136	E-1B	510	YLP	5.00	127	1	I	M	R
136	E-1B	510	YLP	5.12	130	1	I	M	R
136	E-1B	510	YLP	5.28	134	1	I	M	R
136	E-1B	510	YLP	4.61	117	1	I	M	R
136	E-1B	510	YLP	4.45	113	1	I		
136	E-2	510	YLP	5.31	135	1	I		
136	E-2	510	YLP	5.12	130	1	I		
136	E-2	510	YLP	4.41	112	1	I		
136	E-2	510	YLP	5.28	134	1	I		
136	E-2	510	YLP	5.20	132	1	I		
136	E-2	510	YLP	4.84	123	1	I		
136	E-2	510	YLP	5.08	129	1	I		
136	E-2	510	YLP	4.69	119	1	I		
136	E-2	510	YLP	4.76	121	1	I		
136	E-2	510	YLP	4.69	119	1	I		
136	E-2	510	YLP	4.72	120	1	I		
136	E-2	510	YLP	3.66	93	1	I		
136	E-2	510	YLP	5.16	131	1	I		
136	E-2	510	YLP	4.84	123	1	I		
136	E-2	510	YLP	5.04	128	1	I		
136	E-1A	530	WLY	10.04	255	1	I		
136	E-1B	620	BBH	13.46	342	1	I		
136	E-2	840	TGM	40.43	1027	1	I		
136	E-1A	1110	RBT	8.82	224	1	I		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-3B	210	CCP			1	B		
137	E-4	210	CCP			1	T		
137	E-4	210	CCP			1	T		
137	E-4	230	SSH	2.68	68	1	T		
137	E-4	230	SSH	3.19	81	1	T		
137	E-4	230	SSH	4.13	105	1	T		
137	E-4	230	SSH	3.90	99	1	T		
137	E-4	230	SSH	2.99	76	1	T		
137	E-4	230	SSH	3.31	84	1	T		
137	E-4	230	SSH	2.95	75	1	T		
137	E-4	230	SSH	3.11	79	1	T		
137	E-4	230	SSH	3.11	79	1	T		
137	E-4	230	SSH	3.46	88	1	T		
137	E-4	230	SSH	3.23	82	1	T		
137	E-4	230	SSH	3.78	96	1	T		
137	E-4	230	SSH	2.76	70	1	T		
137	E-4	230	SSH	3.35	85	1	T		

137	E-4	230	SSH	3.03	77	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	3.98	101	1	T
137	E-4	230	SSH	3.39	86	1	T
137	E-4	230	SSH	3.43	87	1	T
137	E-4	230	SSH	3.15	80	1	T
137	E-4	230	SSH	3.35	85	1	T
137	E-4	230	SSH	2.72	69	1	T
137	E-4	230	SSH	2.99	76	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	2.68	68	1	T
137	E-4	230	SSH	3.19	81	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	3.39	86	1	T
137	E-4	230	SSH	3.15	80	1	T
137	E-4	230	SSH	2.60	66	1	T
137	E-4	230	SSH	2.52	64	1	T
137	E-4	230	SSH	3.35	85	1	T
137	E-4	230	SSH	3.11	79	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	3.19	81	1	T
137	E-4	230	SSH	3.19	81	1	T
137	E-4	230	SSH	4.06	103	1	T
137	E-4	230	SSH	4.61	117	1	T
137	E-4	230	SSH	3.43	87	1	T
137	E-4	230	SSH	3.07	78	1	T
137	E-4	230	SSH	3.86	98	1	T
137	E-4	230	SSH	2.76	70	1	T
137	E-4	230	SSH	2.44	62	1	T
137	E-4	230	SSH	3.27	83	1	T
137	E-4	230	SSH	3.15	80	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	2.87	73	1	T
137	E-4	230	SSH	2.99	76	1	T
137	E-4	230	SSH	2.91	74	1	T
137	E-4	230	SSH	3.11	79	1	T
137	E-4	230	SSH	3.03	77	1	T
137	E-4	230	SSH	2.56	65	1	T
137	E-4	230	SSH	2.91	74	1	T
137	E-4	230	SSH	2.52	64	1	T
137	E-4	230	SSH	3.19	81	1	T
137	E-4	230	SSH	3.15	80	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	3.27	83	1	T
137	E-4	230	SSH	3.03	77	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	2.76	70	1	T
137	E-4	230	SSH	3.94	100	1	T
137	E-4	230	SSH	3.74	95	1	T
137	E-4	230	SSH	3.11	79	1	T
137	E-4	230	SSH	2.83	72	1	T
137	E-4	230	SSH	2.91	74	1	T
137	E-4	230	SSH	3.11	79	1	T
137	E-4	230	SSH	3.27	83	1	T
137	E-4	230	SSH	3.07	78	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	2.99	76	1	T
137	E-4	230	SSH	3.19	81	1	T
137	E-4	230	SSH	2.83	72	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	2.48	63	1	T
137	E-4	230	SSH	3.31	84	1	T
137	E-4	230	SSH	3.98	101	1	T
137	E-4	230	SSH	4.17	106	1	T
137	E-4	230	SSH	3.27	83	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	3.15	80	1	T
137	E-4	230	SSH	3.15	80	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	3.03	77	1	T
137	E-4	230	SSH	3.15	80	1	T
137	E-4	230	SSH	3.23	82	1	T

137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	2.83	72	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	2.99	76	1	T
137	E-4	230	SSH	2.76	70	1	T
137	E-4	230	SSH	3.11	79	1	T
137	E-4	230	SSH	3.62	92	1	T
137	E-4	230	SSH	2.76	70	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	3.07	78	1	T
137	E-4	230	SSH	2.83	72	1	T
137	E-4	230	SSH	2.95	75	1	T
137	E-4	230	SSH	2.91	74	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	2.83	72	1	T
137	E-4	230	SSH	4.33	110	1	T
137	E-4	230	SSH	3.03	77	1	T
137	E-4	230	SSH	3.07	78	1	T
137	E-4	230	SSH	3.31	84	1	T
137	E-4	230	SSH	2.76	70	1	T
137	E-4	230	SSH	4.13	105	1	T
137	E-4	230	SSH	3.23	82	1	T
137	E-4	230	SSH	3.94	100	1	T
137	E-4	230	SSH	3.43	87	1	T
137	E-4	230	SSH	2.44	62	1	T
137	E-4	230	SSH	3.35	85	1	T
137	E-4	230	SSH	3.98	101	1	T
137	E-4	230	SSH	2.80	71	1	T
137	E-4	230	SSH	2.76	70	1	T
137	E-4	230	SSH	2.68	68	1	T
137	E-4	230	SSH	3.50	89	1	T
137	E-4	230	SSH	3.27	83	1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	230	SSH			1	T
137	E-4	260	BMW	3.27	83	1	T
137	H-3	310	WHS	15.47	393	1	I
137	E-3B	310	WHS	7.40	188	1	B
137	E-3B	310	WHS	5.00	127	1	B
137	E-3B	310	WHS	5.59	142	1	B
137	E-3B	310	WHS	4.09	104	1	B
137	E-4	310	WHS	7.09	180	1	T
137	E-4	310	WHS	4.80	122	1	T
137	E-4	310	WHS	5.00	127	1	T
137	E-4	310	WHS	4.41	112	1	T
137	E-4	310	WHS	4.65	118	1	T
137	E-4	310	WHS	6.02	153	1	T
137	E-4	310	WHS	4.57	116	1	T
137	E-4	310	WHS	4.92	125	1	T
137	E-4	310	WHS	4.80	122	1	T
137	E-5	310	WHS	18.23	463	1	T
137	E-5	310	WHS	16.42	417	1	T
137	E-5	310	WHS	18.27	464	1	T
137	E-5	310	WHS	18.58	472	1	T
137	E-5	310	WHS	18.58	472	1	T
137	E-5	310	WHS	17.01	432	1	T
137	E-5	310	WHS	18.43	468	1	T
137	E-3B	420	SMB	16.57	421	1	B
137	E-3B	420	SMB	16.54	420	1	B
137	E-3B	420	SMB	16.14	410	1	B
137	E-3B	420	SMB	14.49	368	1	B
137	E-3B	420	SMB	12.76	324	1	B
137	E-3B	420	SMB	17.83	453	1	B

137	E-3B	420	SMB	19.49	495	1	B		
137	E-3B	420	SMB	16.93	430	1	B		
137	E-3B	420	SMB	14.49	368	1	B		
137	E-4	420	SMB	16.77	426	1	T		
137	E-4	420	SMB	12.68	322	1	T		
137	E-4	420	SMB	16.85	428	1	T		
137	E-4	420	SMB	14.13	359	1	T		
137	E-4	420	SMB	15.79	401	1	T		
137	E-4	420	SMB	12.95	329	1	T		
137	E-4	420	SMB	12.17	309	1	T		
137	E-4	420	SMB	13.58	345	1	T		
137	E-4	420	SMB	12.40	315	1	T		
137	E-4	420	SMB	13.54	344	1	T		
137	E-4	420	SMB	12.13	308	1	T		
137	E-4	420	SMB	4.49	114	1	T		
137	E-4	420	SMB	11.73	298	1	T		
137	E-4	420	SMB	10.83	275	1	T		
137	E-4	420	SMB	13.23	336	1	T		
137	E-4	420	SMB	14.33	364	1	T		
137	E-4	420	SMB	13.15	334	1	T		
137	E-4	420	SMB	14.76	375	1	T		
137	E-4	420	SMB	9.84	250	1	T		
137	E-4	420	SMB	13.54	344	1	T		
137	E-4	420	SMB	14.13	359	1	T		
137	E-4	420	SMB	16.10	409	1	T		
137	E-4	420	SMB	10.63	270	1	T		
137	E-4	420	SMB	11.26	286	1	T		
137	E-4	420	SMB	4.33	110	1	T		
137	E-5	420	SMB	11.81	300	1	T		
137	E-5	420	SMB	13.35	339	1	T		
137	E-5	420	SMB	18.11	460	1	T		
137	E-5	420	SMB	14.06	357	1	T		
137	E-5	420	SMB	13.03	331	1	T		
137	E-5	420	SMB	12.20	310	1	T		
137	E-5	420	SMB	17.05	433	1	T		
137	E-5	420	SMB	10.94	278	1	T		
137	E-5	420	SMB	15.04	382	1	T		
137	E-5	420	SMB	13.98	355	1	T		
137	E-5	420	SMB	12.76	324	1	T		
137	E-5	420	SMB	15.16	385	1	T		
137	E-5	420	SMB	15.31	389	1	T		
137	E-5	420	SMB	17.80	452	1	T		
137	E-5	420	SMB	4.76	121	1	T		
137	E-5	420	SMB	13.94	354	1	T		
137	E-5	420	SMB	11.85	301	1	T		
137	E-5	420	SMB	4.37	111	1	T		
137	E-5	420	SMB	15.39	391	1	T		
137	E-5	420	SMB	13.54	344	1	T		
137	E-5	420	SMB	4.45	113	1	T		
137	E-5	420	SMB	11.50	292	1	T		
137	E-5	420	SMB	8.66	220	1	T		
137	E-5	420	SMB	4.92	125	1	T		
137	E-5	420	SMB	4.25	108	1	T		
137	E-5	420	SMB	4.25	108	1	T		
137	E-5	430	LMB	14.57	370	1	T		
137	E-5	430	LMB	12.80	325	1	T		
137	H-2	460	PKS	2.44	62	1	I		
137	H-2	460	PKS	2.56	65	1	I		
137	H-2	460	PKS	2.36	60	1	I		
137	H-2	460	PKS	2.01	51	1	I		
137	H-2	460	PKS	2.76	70	1	I		
137	H-2	460	PKS	2.20	56	1	I		
137	E-3B	460	PKS	7.52	191	1	B		
137	H-1	480	RKB	8.07	205	1	I		
137	H-3	480	RKB	8.86	225	1	I		
137	E-3B	480	RKB	8.50	216	1	B		
137	E-4	480	RKB	8.07	205	1	T		
137	E-5	480	RKB	9.09	231	1	T		
137	G-1	510	YLP	3.98	101	1	I		
137	H-3	510	YLP	9.69	246	1	I	M	R
137	H-3	510	YLP	4.76	121	1	I	M	R
137	H-4	510	YLP	11.02	280	1	I	M	R
137	H-4	510	YLP	7.36	187	1	I	M	R

137	E-3B	510	YLP	10.83	275	1	B	F	R	
137	E-3B	510	YLP	8.98	228	1	B	F	R	
137	E-3B	510	YLP	9.53	242	1	B	F	R	
137	E-3B	510	YLP	11.50	292	1	B	F	S	
137	E-3B	510	YLP	9.25	235	1	B	M	R	
137	E-3B	510	YLP	10.63	270	1	B	F	S	
137	E-3B	510	YLP	4.72	120	1	B	M	R	
137	E-3B	510	YLP	5.47	139	1	B	M	R	
137	E-3B	510	YLP	4.72	120	1	B	M	R	
137	E-4	510	YLP	3.19	81	1	T			
137	E-5	540	TDD	2.56	65	2	T			
137	G-2	840	TGM	28.82	732	1	I			
137	E-4	1310	TRP	4.41	112	2	T			
137	G-3						I			
138	H-4	230	SSH	3.54	90	1	I			
138	G-1	320	SRH	20.75	527	1	I	F	R	1.65
138	G-1	320	SRH	19.72	501	1	I	F	R	1.35
138	G-1	320	SRH	19.41	493	1	I	F	R	1.95
138	H-3	420	SMB	5.24	133	1	I			
138	H-3	440	WCR	4.96	126	1	I			
138	H-2	460	PKS	2.09	53	1	I			
138	H-4	460	PKS	2.36	60	1	I			
138	H-4	460	PKS	2.20	56	1	I			
138	G-2	480	RKB	7.56	192	1	I			
138	G-1	510	YLP	4.45	113	1	I	M	R	0.03
138	H-3	510	YLP	10.20	259	1	I	M	R	0.2
138	H-3	510	YLP	11.14	283	1	I	M	R	0.3
138	H-3	510	YLP	10.24	260	1	I	F	R	0.25
138	H-3	510	YLP	10.04	255	1	I	M	R	0.2
138	H-3	510	YLP	9.53	242	1	I	M	R	0.2
138	H-3	510	YLP	9.84	250	1	I	M	R	0.2
138	H-3	510	YLP	8.27	210	1	I	M	R	0.1
138	H-3	510	YLP	10.31	262	1	I	M	R	0.25
138	H-3	510	YLP	10.75	273	1	I	F	S	0.25
138	H-3	510	YLP	8.27	210	1	I	M	R	0.1
138	H-3	510	YLP	9.09	231	1	I	M	R	0.2
138	H-3	510	YLP	10.04	255	1	I	M	R	0.2
138	H-3	510	YLP	9.45	240	1	I	F	UNKNOWN	0.15
138	H-3	510	YLP	8.46	215	1	I	M	R	0.1
138	H-3	510	YLP	8.27	210	1	I	M	R	0.1
138	H-3	510	YLP	8.78	223	1	I	M	R	0.15
138	H-3	510	YLP	5.55	141	1	I	M	R	0.1
138	H-3	510	YLP	7.56	192	1	I	M	R	0.1
138	H-3	510	YLP	7.76	197	1	I	M	R	0.1
138	H-3	510	YLP	5.00	127	1	I	M	R	0.05
138	H-3	510	YLP	8.54	217	1	I	M	R	0.1
138	H-3	510	YLP	5.24	133	1	I	M	R	0.05
138	H-3	510	YLP	8.07	205	1	I	M	R	0.1
138	H-3	510	YLP	6.06	154	1	I	M	R	0.05
138	H-3	510	YLP	4.76	121	1	I	M	R	0.05
138	H-3	510	YLP	8.11	206	1	I	M	R	0.1
138	H-3	510	YLP	4.69	119	1	I	M	R	0.05
138	H-3	510	YLP	4.88	124	1	I	M	R	0.05
138	H-3	510	YLP	4.61	117	1	I	M	R	0.05
138	H-3	510	YLP	4.41	112	1	I	M	R	0.05
138	H-3	510	YLP	5.67	144	1	I	M	R	0.05
138	H-3	510	YLP	5.35	136	1	I	M	R	0.05
138	H-3	510	YLP	4.25	108	1	I	M	R	0.05
138	H-3	510	YLP	4.92	125	1	I	M	R	0.05
138	H-3	510	YLP	5.04	128	1	I	M	R	0.05
138	H-3	510	YLP	5.12	130	1	I	M	R	0.05
138	H-3	620	BBH	12.13	308	1	I			
138	G-3						I			
138	H-1						I			
152	E-3A	220	GSH	3.50	89	1	B			
152	E-3A	230	SSH	3.66	93	1	B			
152	E-3A	230	SSH	2.52	64	1	B			
152	E-3A	240	CCB	2.36	60	1	B			
152	G-4	310	WHS	20.47	520	1	B			
152	E-3A	310	WHS	7.20	183	1	B			
152	A-1	420	SMB	8.74	222	1	B			
152	A-1	420	SMB	9.53	242	1	B			
152	A-1	420	SMB	10.12	257	1	B	F	R	0.20

152	A-1	420	SMB	3.31	84	1	B			
152	A-2	420	SMB	7.87	200	1	B			0.10
152	A-2	420	SMB	8.39	213	1	B			0.10
152	A-2	420	SMB	7.48	190	1	B			0.08
152	A-2	420	SMB	8.58	218	1	B			0.12
152	E-3A	420	SMB	4.49	114	1	B			
152	E-3A	420	SMB	4.13	105	1	B			
152	E-3A	420	SMB	4.61	117	1	B			
152	E-3A	420	SMB	3.58	91	1	B			
152	E-3A	420	SMB	4.33	110	1	B			
152	E-3A	420	SMB	3.78	96	1	B			
152	A-1	480	RKB	3.35	85	1	B	F	R	0.15
152	A-1	480	RKB	8.31	211	1	B	F	R	0.25
152	G-4	480	RKB	7.56	192	1	B			
152	G-5	480	RKB	7.05	179	1	B			
152	G-5	480	RKB	8.03	204	1	B			
152	G-6	480	RKB	2.52	64	1	B			
152	E-3A	480	RKB	3.11	79	1	B			
152	E-3A	480	RKB	3.03	77	1	B			
152	E-3A	480	RKB	2.91	74	1	B			
152	E-3A	480	RKB	3.39	86	1	B			
152	E-3A	480	RKB	3.35	85	1	B			
152	E-3A	520	LGP	2.76	70	1	B			
152	E-3A	520	LGP	2.56	65	1	B			
152	E-3A	520	LGP	2.09	53	1	B			
152	E-3A	520	LGP	2.44	62	1	B			
152	E-3A	520	LGP	2.68	68	1	B			
152	E-3A	520	LGP	2.64	67	1	B			
152	E-3A	520	LGP	2.40	61	1	B			
152	E-3A	520	LGP	2.56	65	1	B			
152	E-3A	520	LGP	2.44	62	1	B			
152	E-3A	520	LGP	2.68	68	1	B			
152	E-3A	520	LGP	2.05	52	1	B			
152	E-3A	520	LGP	1.97	50	1	B			
152	E-3A	520	LGP	2.20	56	1	B			
152	E-3A	520	LGP	2.48	63	1	B			
152	E-3A	520	LGP	2.76	70	1	B			
152	E-3A	520	LGP	2.40	61	1	B			
152	E-3A	520	LGP	2.17	55	1	B			
152	E-3A	520	LGP	2.01	51	1	B			
152	E-3A	520	LGP	2.05	52	1	B			
152	E-3A	520	LGP	2.52	64	1	B			
152	E-3A	520	LGP	2.68	68	1	B			
152	E-3A	520	LGP	2.24	57	1	B			
152	E-3A	540	TDD	2.05	52	1	B			
152	E-3A	540	TDD	2.44	62	1	B			
152	E-3A	540	TDD	2.17	55	1	B			
152	E-3A	540	TDD	2.01	51	1	B			
152	E-3A	540	TDD	1.97	50	1	B			

APPENDIX D

FERC-APPROVED STUDY PLAN

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D. C. 20426

Project No. 2539-003-NY
School Street Hydroelectric Project
Niagara Mohawk Power Corporation

AUG 10 1993

Mr. Jerry Sabattis
Licensing Coordinator
Hydro Licensing & Regulatory Compliance
300 Erie Boulevard West
Syracuse, New York 13202

Dear Mr. Sabattis:

We have reviewed the letters of June 21 and July 2, 1993, requesting review of your proposed study plan to evaluate fisheries communities of the Mohawk River, prepared by Kleinschmidt Associates on behalf of the Niagara Mohawk Power Corporation (Niagara Mohawk). The proposed supplemental fisheries study plan is adequate except for the issue of seasonal sampling frequency.

The major area of disagreement between Niagara Mohawk, the New York Department of Environmental Conservation (NYSDEC) and the U. S. Fish and Wildlife Service (USFWS) appears to be with the sampling frequency requirements.

NYSDEC and USFWS interpret the original AIR No. 4 to require an evaluation of fisheries on a seasonal basis. Therefore, the resource agencies state that the frequency of sampling is not adequate to satisfy the AIR. You have recommended sampling the fishery communities in the project area over three-day intervals during late spring, summer and fall, while the resource agencies have requested biweekly sampling from March through November.

Seasonal sampling of fishes in the area or fish passage is not evident from previous studies. Your proposed sampling frequency would not provide sufficient additional information related to seasonal fisheries or fish movement.

The proposed supplemental fisheries study adequately responds to AIR No. 4 except for the issue of seasonal sampling frequency. We concur with NYSDEC and the USFWS that seasonal sampling is necessary. Specifically, seasonal sampling will provide an indication of seasonal utilization. A spring sampling period is necessary since this may be the primary spawning period

for species that potentially inhabit the project area, such as smallmouth bass and walleye. Summer sampling will provide an indication of which species survive under adverse conditions of low flow and high temperature and are therefore likely present year round. Fall sampling is important to determine any potential fall spawning runs and whether flow or temperature limitations are reduced.

We understand that for scheduling reasons, you have gone forward with the study plan as submitted and will await guidance from the Commission as to the required level of effort (i.e., sampling frequency). The current study plan will satisfy the summer sampling requirements. Additional sampling in the fall (October, 1993) and the spring (April/May 1994) are required to adequately address the issue of fish movement within the project area. We recognize your concerns with respect to potentially hazardous conditions during early spring flows. However, spring sampling is necessary to determine potential runs of spring spawning species. In this regard, the spring sampling may be contingent on river flows to avoid safety concerns, which you should coordinate with the participating resource agencies.

Accordingly, you must conduct additional sampling at the School Street Project following the protocol identified in the June 21, 1993 letter on the Fish Resources Baseline Study in response to AIR No. 4. Particularly, you must consult with the resource agencies to identify adequate dates and extend the studies to include monthly sampling throughout the fall, 1993, and April and May 1994. Study results must be filed with the Commission by July 15, 1994.

You must file agency comments on your study results. You must allow a minimum of 30 days for the agency to respond before filing the information. If the agencies do not reply, you should provide the Commission with dated copies of the letters of request.

In conjunction with this requested information, you must file three-month progress reports with the Secretary of the Commission. The reports should include identification of any conferences or meetings, copies of any important correspondence, letters of consultation and studies or study conclusions, and a schedule for completing any remaining work. The first report will be due on October 1, 1993.

We are aware that you propose to file a fish protection plan for the School Street Project before the end of 1993. Should you elect to file fish protection plans for the School Street Project that adequately protect upstream and downstream passage of fishes, additional fish baseline study sampling may not be needed. Should such a fish passage plan be filed with the Commission, you may request relief from the remainder of the sampling associated with AIR No. 4.

Within 5 days of receipt, provide a copy of this letter to all agencies you will consult in response to this letter. Then, when you file the requested information with the Commission, you must file a complete copy of the information to each agency consulted under Section 16.8 of the regulations and the service list entities. You are advised to contact Mr. John Novak on (202) 219-2828 with any questions.

Sincerely,

Edward J. Fowlkes

for Dean L. Shumway
Director
Division of Project Review

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NIAGARA MOHAWK POWER CORPORATION

Syracuse, New York

SCHOOL STREET PROJECT

(FERC NO. 2539)

FISH RESOURCES BASELINE STUDY PLAN

JULY 1993

Prepared by
KLEINSCHMIDT ASSOCIATES
Consulting Engineers
Pittsfield, Maine

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET PROJECT
(FERC NO. 2539)

FISH RESOURCES BASELINE STUDY PLAN

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Appendix A - Agency Correspondence

NIAGARA MOHAWK POWER CORPORATION
SCHOOL STREET PROJECT
(FERC NO. 2539)

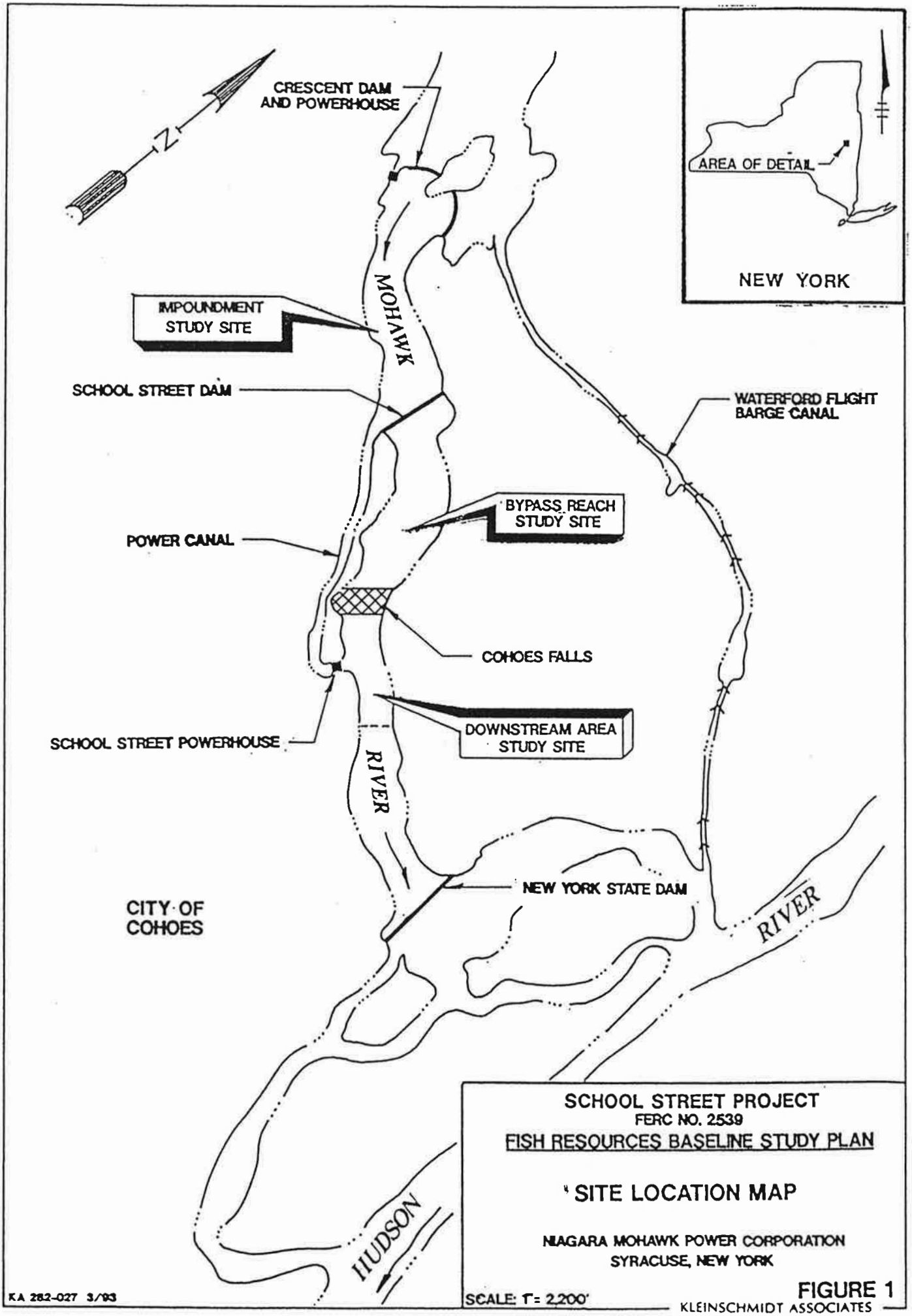
FISH RESOURCES BASELINE STUDY PLAN

1.0 INTRODUCTION

On December 20, 1991, Niagara Mohawk Power Corporation (Niagara Mohawk) submitted a relicense application to the Federal Energy Regulatory Commission (FERC) for the School Street Project (FERC No. 2539). The project consists of one hydroelectric development on the Mohawk River in the City of Cohoes, Towns of Colonie and Waterford, Albany and Saratoga Counties, New York. The project is located approximately two miles upstream of the confluence of the Mohawk River with the Hudson River (see Figure 1). The School Street Project is located between the Crescent Project (FERC No. 4678) located approximately one mile upstream, and the New York State Dam Project (FERC No. 7481) located approximately one mile downstream.

Aquatic habitat in the project area includes a riverine impoundment, and an approximately 4,500-foot long bypass reach between the dam and the powerhouse. In addition, a downstream river reach between the bypass reach and the New York State Dam impoundment is influenced by flows from the School Street Project.

By letter dated September 2, 1992, the FERC concluded that the fisheries resources of the project area were not adequately documented by the study data submitted in the existing license application. The existing license application provides data from a 1988 fisheries survey conducted in the School Street impoundment and bypass reach, and also provides data obtained through a series of incidental sampling efforts conducted by the New York State Department of Environmental Conservation (NYSDEC) upstream at Crescent Lake and downstream at the mouth of the river.



SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

SITE LOCATION MAP

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

KA 282-027 3/93

SCALE: 1"= 2,200'

FIGURE 1
KLEINSCHMIDT ASSOCIATES

However, the FERC concluded that inadequate fisheries baseline information was presented to portray the fisheries resource immediately downstream of the powerhouse (at the location where the bypass reach discharge and the powerhouse discharge would be combined), and issued an Additional Information Request (AIR) to Niagara Mohawk to further describe fishery resources (AIR item 4).

As a result of this concern, the FERC has requested that Niagara Mohawk conduct a study to describe the fisheries downstream of the School Street Project. The study must follow a study plan which documents the methods used in the study, as well as agency consultation in designing the study.

This study plan is intended to provide the basis for responding to the request for information from the FERC. As per the AIR, this study plan was sent to the U.S. Fish and Wildlife Service (USFWS), the New York State Department of Environmental Conservation (NYSDEC) and the FERC on April 16, 1993 for review and comment. The USFWS and the NYSDEC provided comments on the study plan. Appropriate agency comments have been incorporated into the plan (see attached letter to FERC dated June 21, 1993). This study plan reflects both agency comments, and site information gleaned from the late spring fish sampling conducted during the week of June 14, 1993. Appendix A contains consultation regarding study scoping. The plan will be executed as approved by FERC.

2.0 DESCRIPTION OF STUDY AREAS

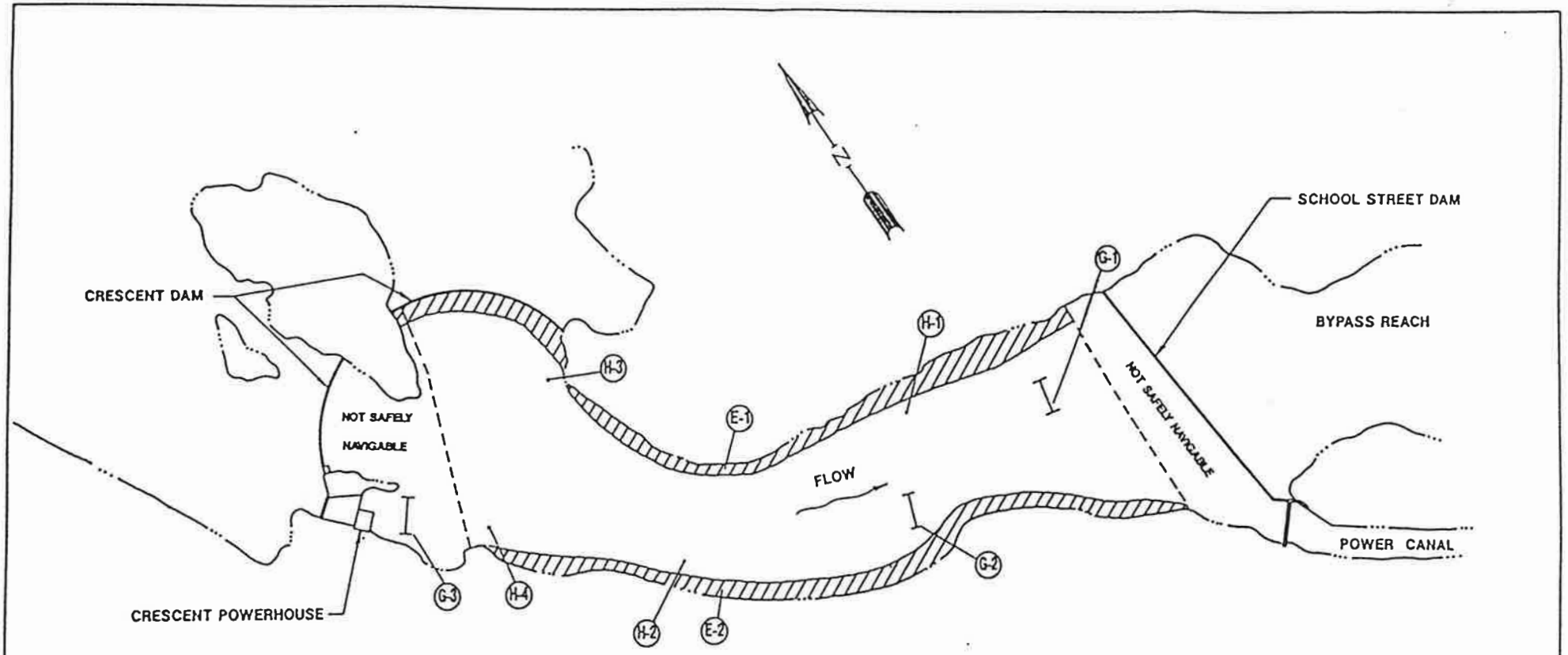
While the FERC AIR only specified the downstream tailwater area as the area of concern, NMPC has proposed to collect concurrent fisheries data for the impoundment project bypass and tailrace areas. Based on the initial sampling effort, they are described below, with references to sampling locations.

2.1 Impoundment

The School Street impoundment measures approximately 100 acres in size and is surrounded by near vertical ledges on its northern shore and forested to the south. Impoundment depths range from 6 to 25 meters and average 13 meters. Substrate in the area consists of mud/sand, steep banks, providing generally fair fish cover. As depicted in Figure 2, sampling stations are proposed throughout the impoundment in an effort to characterize the fish population at various depths and substrate types. Boat electrofishing at sites E-1 and E-2 is proposed for shallow rocky shoreline areas. Gill nets are proposed to be deployed for areas G-1 through G-3 near the bottom in channel areas, while hoop nets H-1 through H-4 are proposed for areas located closer to shore at intermediate depths.

2.2 Bypass Reach

The bypass reach area extends 4500 feet from the School Street dam to the powerhouse and is separated into upper and lower sections by the Cohoes Falls. Depths in the bypass average approximately 3-4 meters. Both areas are dominated by bedrock ledge providing generally poor fish cover. Intermittent, deep pools are dispersed throughout the upper reach while only two sizable pools are found below the falls. Riffle run habitat, wetted by leakage connects these pools. With the exception of one backpack electrofishing site in the riffle, (Figure 3, E-4), sampling in the bypass reach is proposed in the deep



LEGEND

H-3 = HOOP NET

E-4 = ELECTROFISHING

G-2 = GILL NET

SCHOOL STREET IMPOUNDMENT

500 0 500

SCALE IN FEET

SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

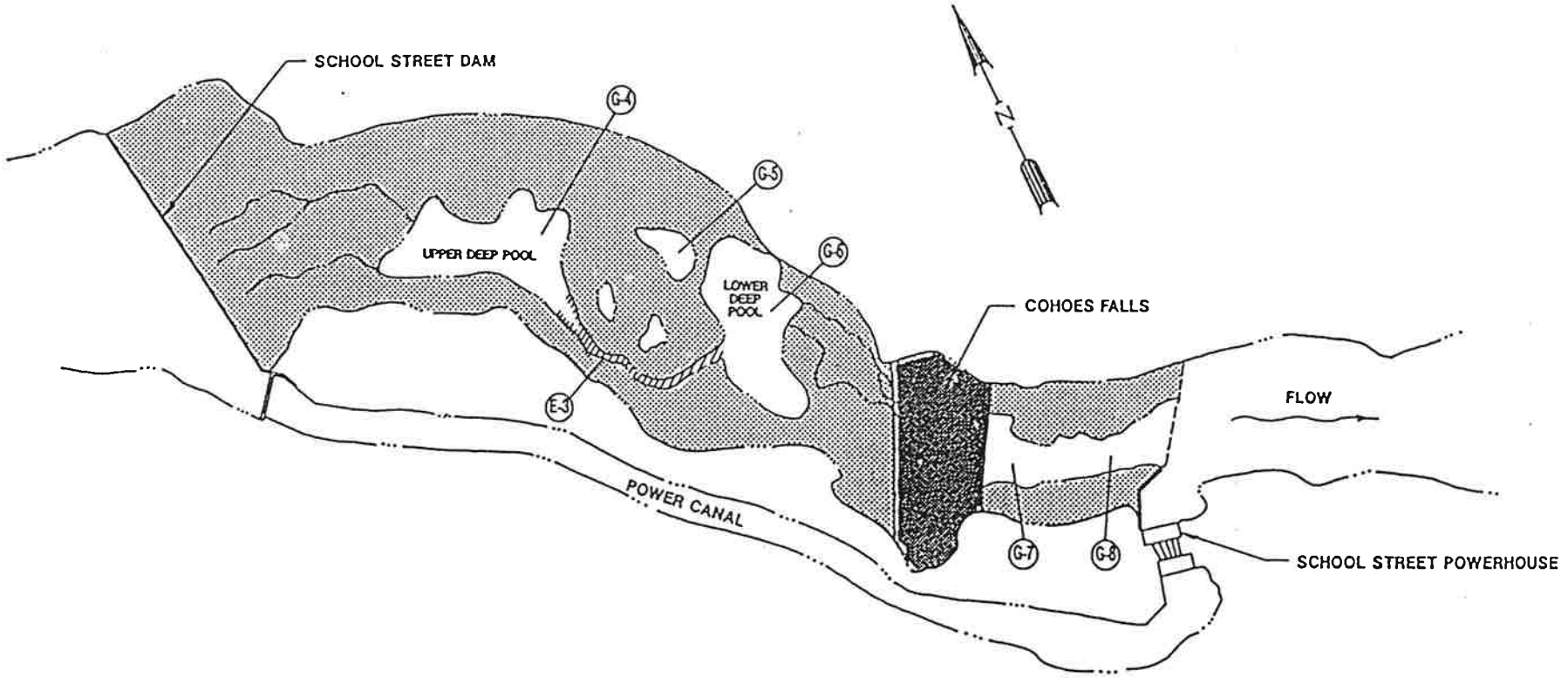
IMPOUNDMENT SAMPLING LOCATIONS

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

FIGURE 2

KA 363-027 3/93

Kleinschmidt Associates
Consulting Engineers
Pittsfield, Maine



LEGEND

G-5 = GILL NET

E-3 = ELECTROFISHING

= EXPOSED BEDROCK

BYPASS REACH

500 0 500

SCALE IN FEET

SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

BYPASS REACH SAMPLING LOCATIONS

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

FIGURE 3

KA 252-027 8/95

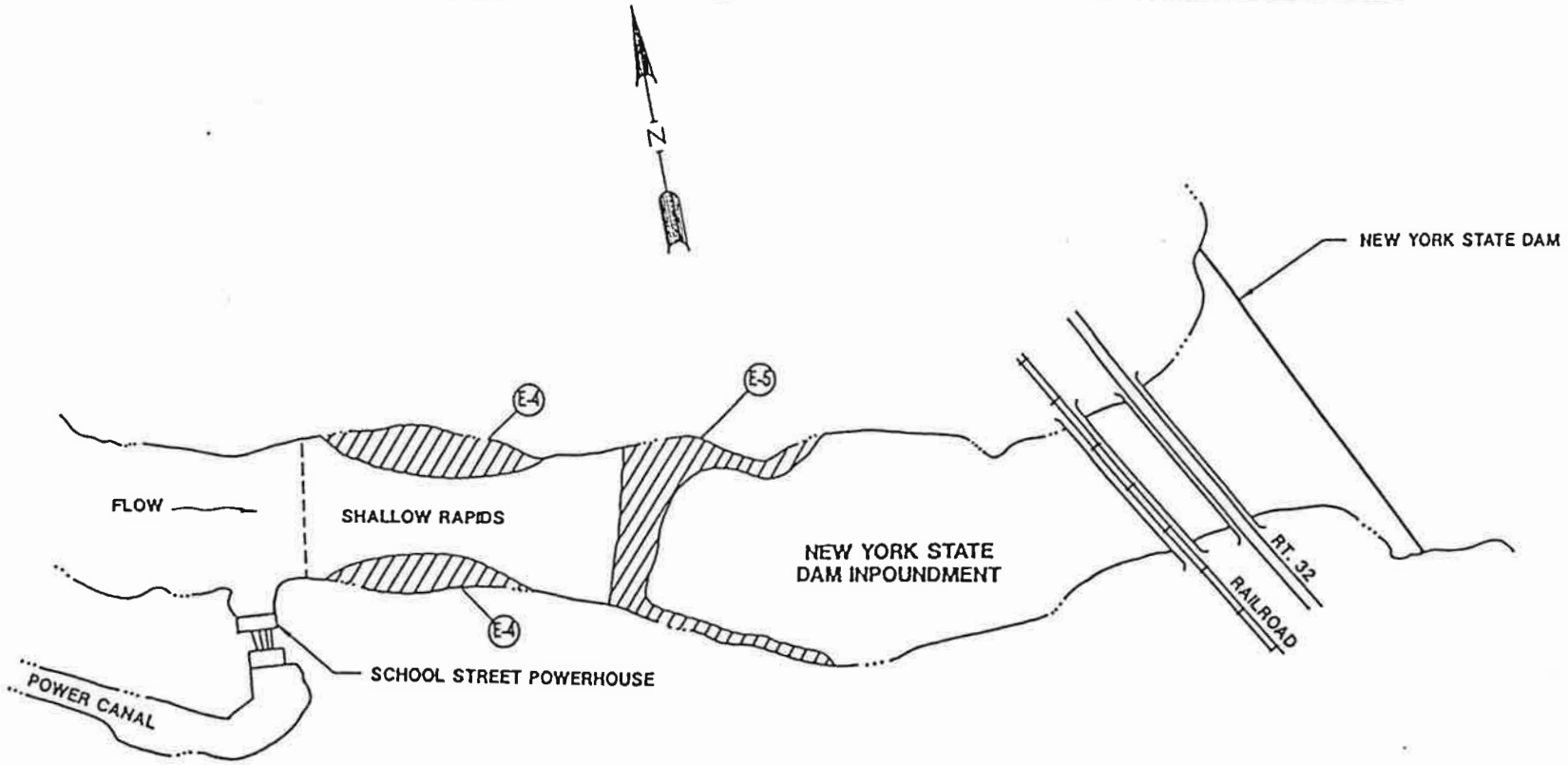
Kleinschmidt Associates
Consulting Engineers
Pittsfield, Maine

pools, using gill netting at locations G-4 through G-8. Gill nets are the most effective sampling technique given the depth and nature of the pools' substrate.

Beach seining in the bypass reach is not proposed due to the nature of the available habitat and problems associated with deployment.

2.3 Below Powerhouse

The area below the powerhouse is characterized by a shallow, fast flowing channel surrounded on both sides by bedrock shoals and ledge. Shoal water depths average approximately 1 meter. Submergent aquatic vegetation covers the ledges. Shale cliffs rise from both shorelines of this reach and extend upstream to Cohoes Falls. Figure 4 illustrates proposed sampling locations for the area downstream of the powerhouse. Backpack electrofishing is proposed to be used in the wadable shoal areas, E-4 and E-5. Due to an un-navigable channel, standard boat electrofishing is difficult in the immediate vicinity of the tailrace (see NMPC letter to USFWS cc: NYSDEC, dated June 30, 1993 regarding boat electrofishing below the powerhouse). It is proposed that the shallow navigable portions of the riffle downstream of the powerhouse be sampled using a jet-pump powered electrofishing boat.



LEGEND

E-5 = ELECTROFISHING

500 0 500
SCALE IN FEET

SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

DOWNSTREAM SAMPLING LOCATIONS

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

FIGURE 4

KA 882-067 3/93

Kleinschmidt Associates
Consulting Engineers
Pittsfield, Maine

3.0 PROPOSED METHODS

3.1 General Study Design

Although FERC only requested sampling to occur below the bypass reach, Niagara Mohawk believes it is prudent to concurrently re-sample previously studied project areas (impoundment and bypass reach), so that all biological data is from a comparable time frame. By letter dated, May 20, 1993 the USFWS stated that it agreed with this approach. Therefore, fish sampling to determine relative abundance and size-frequency distribution will occur in three study areas: the impoundment upstream of the School Street dam, in the bypass reach, and in the reach of the Mohawk River between the bypass reach and the New York State Dam impoundment (see Figure 1). Although not specifically requested by FERC, field work is proposed to occur as a three season effort. It is proposed that samples will be taken concurrently in the three locations during late spring (post-run-off), summer, and fall of 1993 in order to detect seasonal differences in species composition or abundance.

Three sampling efforts will therefore occur at each study area during 1993. The first sampling period event occurred in late spring, after spring run-off had receded. The remaining two proposed sample periods are summer (August) and fall (October), 1993. Sampling in the three locations (impoundment, downstream of the powerhouse, and in the bypass reach) will occur as close to concurrently as scheduling and manpower allow (*i.e.* within hours to days) so that the fish species distribution is portrayed in both spatial and temporal terms.

Data will be gathered using standard fisheries techniques, with at least three sampling gear types (whenever possible) to minimize potential sampling bias resulting from the inherent gear efficiencies related to any single gear type, and to account for gear effectiveness under a given set of physical conditions. Fish will be sampled using anchored horizontal gill nets, trap nets, and electrofishing. Beach seining may also be conducted when and if appropriate.

3.2 Field Techniques

3.2.1 Impoundment

Gill- and trap net sampling will be located to sample depths and channel areas outside of the effective range of electrofishing, and will consist of at least two overnight, 12-hour minimum duration sets per study area, where applicable. Gillnets will be employed with graduated experimental mesh panels ranging from 0.5 in. up to 2.5 in. Trap net mesh size (1/4" Delta) will be suitable for the capture of fish 3 inches or greater in length.

Shoal and near-shore areas of the impoundment will be sampled by boat-mounted electrofishing, during night-time hours whenever possible, along the shoreline in each habitat type. Field decisions regarding sampling will be made based on feasibility and site-specific constraints which could affect the safety of the field collection staff. Due to significant safety concerns associated with working in the bypass area and the area immediately downstream of the powerhouse in darkness, NMPC must limit electrofishing in these areas only during early morning or daylight hours.

The NYSDEC has recommended that the impoundment electrofishing samples should include four 15-minute fish collections where all fish are collected and one lap of the entire impoundment or stream where gamefish only are collected. However, this technique is not necessarily appropriate for a general fisheries survey (See letter from NMPC to USFWS cc: NYSDEC dated June 30, 1993). Therefore, Niagara Mohawk has proposed to alter this component of the plan to provide more field data by electrofishing the impoundment shoreline based on a breakdown by habitat type. As of this date, there has been no agency response.

3.2.2 Bypass Reach

Bypass reach sampling will be based on backpack electrofishing, and gill netting. Gill nets will be set in each of the series of deep basins which exist in the reach; total fishing time for each net will be at least overnight (i.e. 12 hours). Backpack shocking will be employed in the riverine channel running through the reach. Due to safety reasons, no sampling can occur during periods of spillage or at night.

3.2.3 Area Below Powerhouse

Navigable, unwadable portions of the rapids, tailwater area, and the adjacent impoundment will be sampled using boat electrofishing. For safety reasons, this technique must be conducted during daylight. Un-navigable, wadable shoal areas will be sampled using backpack electrofishing, where feasible as discussed above.

3.3 Data Reporting

Recorded data for each sample will include location, depth, gear type, time and duration of sample, prevailing weather and water quality (temperature, dissolved oxygen, and Ph; conductivity will be recorded concurrent with electrofishing samples). The water quality data will be gathered *in situ* at gear sampling depth, both at the beginning and end of each sampling event, using calibrated YSI-type meters.

All fish will be field identified to species, enumerated, measured to the nearest mm (total length), and released. In accordance with the USFWS's recommendation, subsampling may occur if large, single species catches are encountered, as follows: in the event that more than 100 individuals of a single species are captured in one collection, individual length data will only be gathered from a random subsample (n=100). The remainder of the species within the sample will be enumerated.

A limited number of fish difficult to field identify may be preserved for subsequent laboratory identification. As recommended by the USFWS, the species total length, and spawning condition will be recorded. Copies of the field data sheets will be provided to the USFWS and the NYSDEC upon completion of the study and reporting of the results to the FERC.

Data will be prepared in summary table and graphic format for each study area, with appropriate text describing the specific methods and discussing results. Detailed field data will be presented in appendices.

4.0 REPORT SCHEDULE

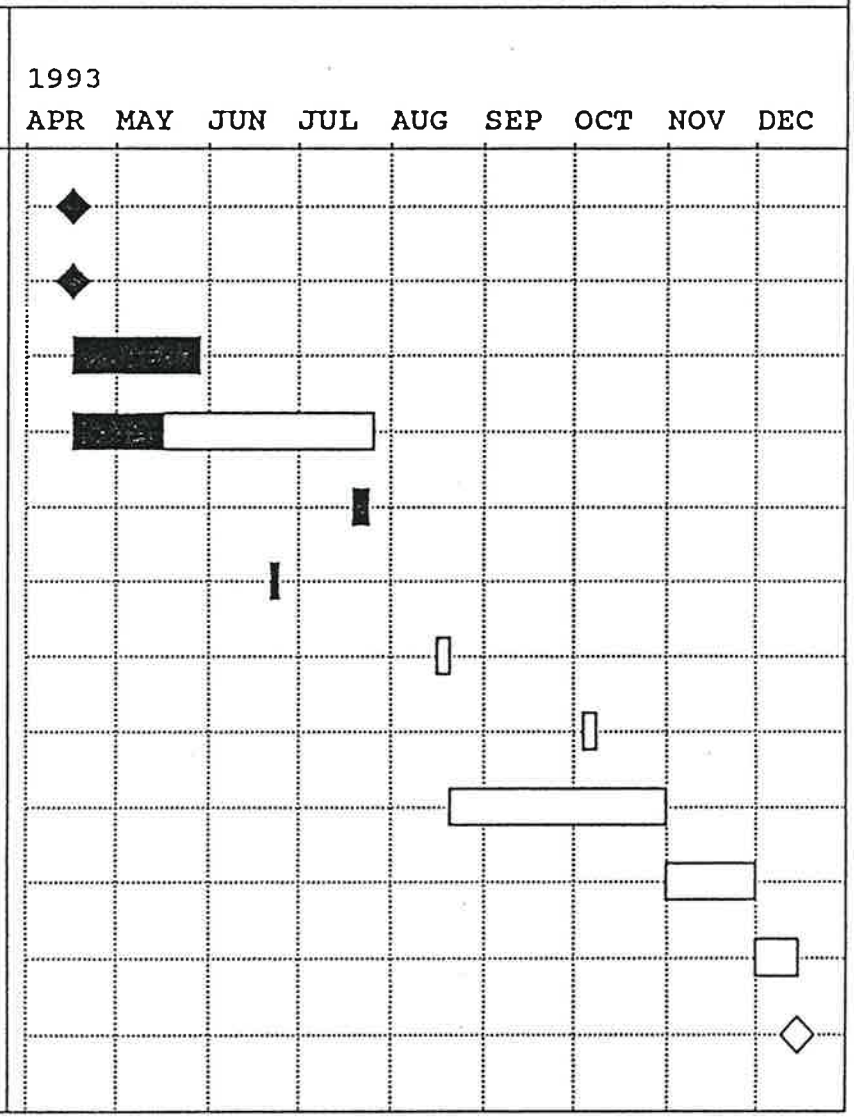
A draft report summarizing the data collections will be prepared for USFWS and NYSDEC review and comment prior to final report preparation. After reviewing agency comments, a final report will be prepared for submittal to the FERC by December 15, 1993. The report will include copies of the original data sheets, and written descriptions of the results. A detailed bar chart schedule is attached.

PROJECT: SCHOOL ST BASELINE

SCHEDULE OF MAJOR ACTIVITIES

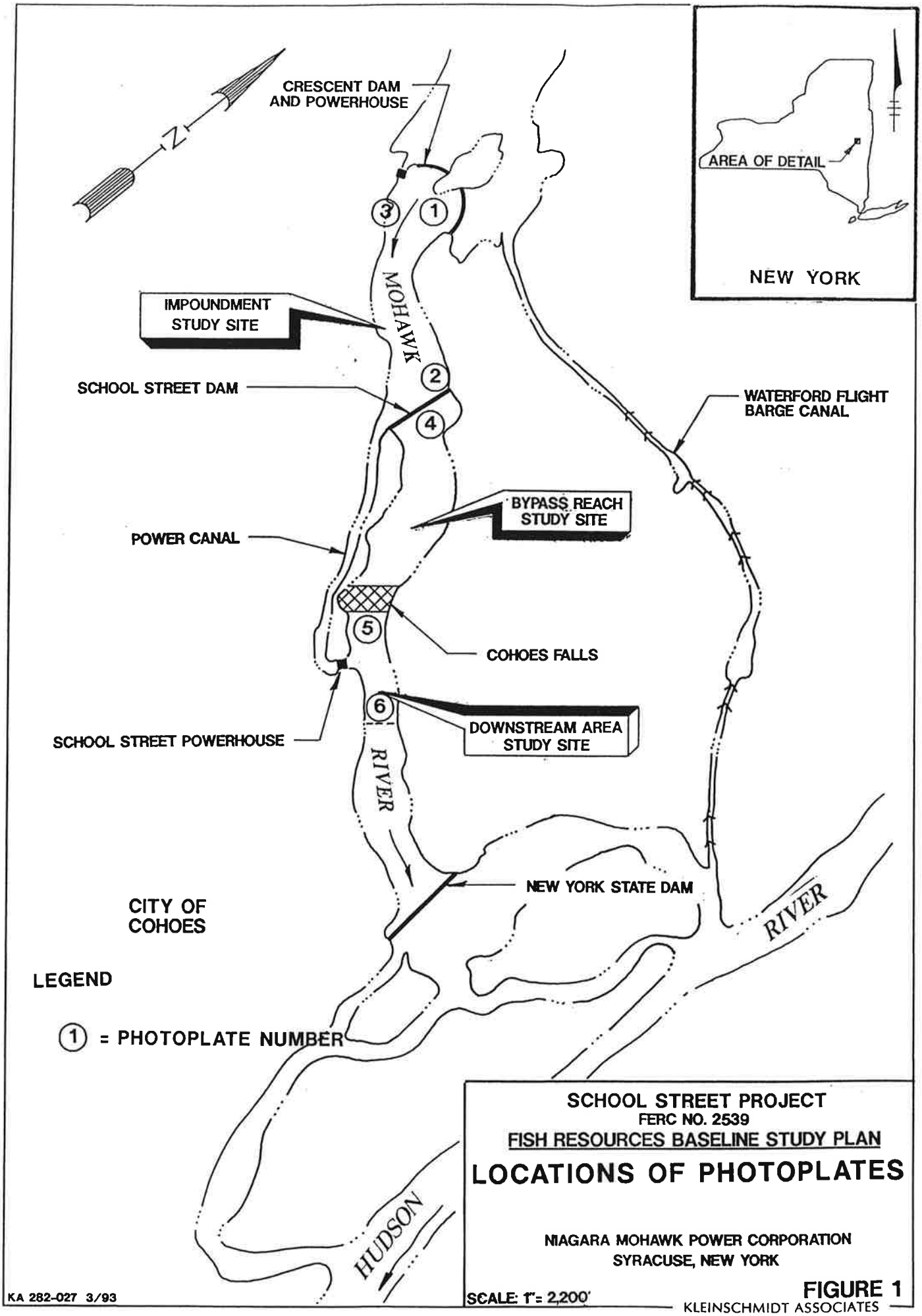
CURRENT DATE: 07/23/93

Name	Dates	
DRAFT STUDY PLANS TO AGENCIES	04/16/93	04/16/93
DRAFT STUDY PLANS TO FERC	04/16/93	04/16/93
AGENCY REVIEW OF DRAFT PLANS	04/16/93	05/28/93
FERC REVIEW OF DRAFT PLANS	04/16/93	07/26/93
FINALIZE STUDY PLANS	07/19/93	07/24/93
SPRING COLLECTIONS	06/21/93	06/24/93
SUMMER COLLECTIONS	08/16/93	08/20/93
FALL COLLECTIONS	10/04/93	10/08/93
REPORT PREPARATION	08/20/93	10/31/93
AGENCY REVIEW OF DRAFT REPORT	10/31/93	11/30/93
FINALIZE REPORT	11/30/93	12/15/93
FILE WITH FERC	12/15/93	12/15/93



APPENDIX E

PHOTOPLATES INDICATING REPRESENTATIVE HABITAT TYPES WITHIN SCHOOL STREET PROJECT



SCHOOL STREET PROJECT
FERC NO. 2539
FISH RESOURCES BASELINE STUDY PLAN

LOCATIONS OF PHOTOPLATES

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

KA 282-027 3/93

SCALE: 1"= 2,200'

FIGURE 1

KLEINSCHMIDT ASSOCIATES
CONSULTING ENGINEERS

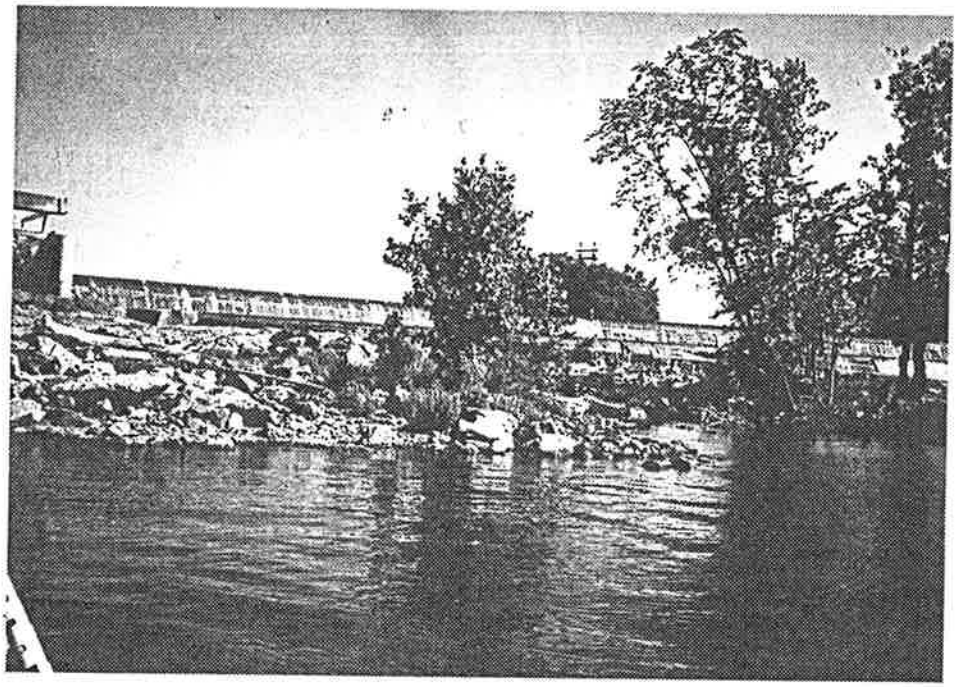


PHOTO 1: Aquatic habitat within School Street Project impoundment (below Crescent Dam) located near sampling station E-1B.

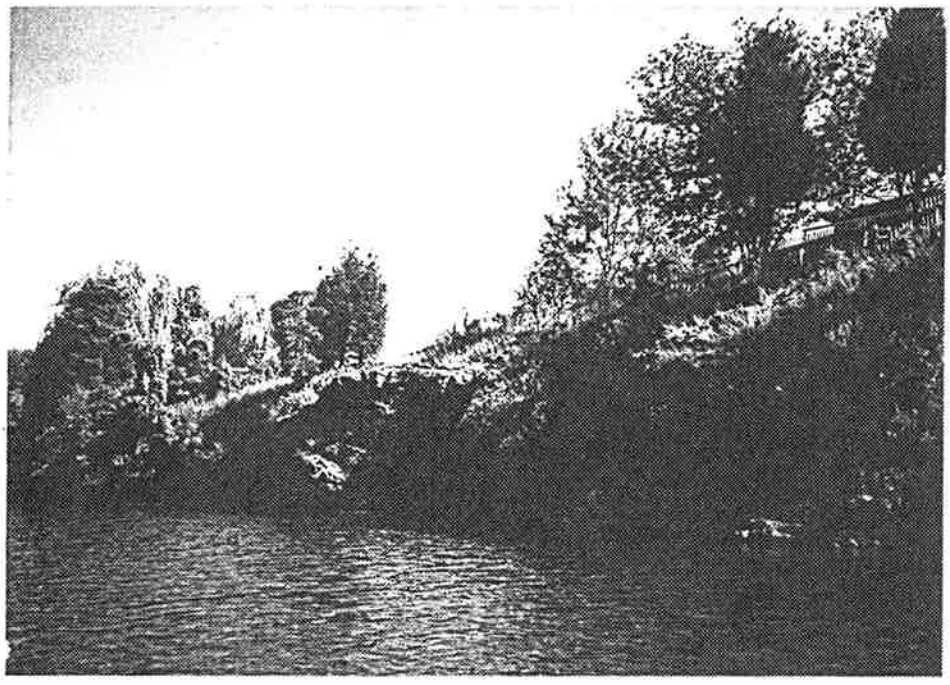


PHOTO 2: Aquatic habitat within School Street Project impoundment (Eastern shoreline) located near sampling stations G-1 and E-1A.

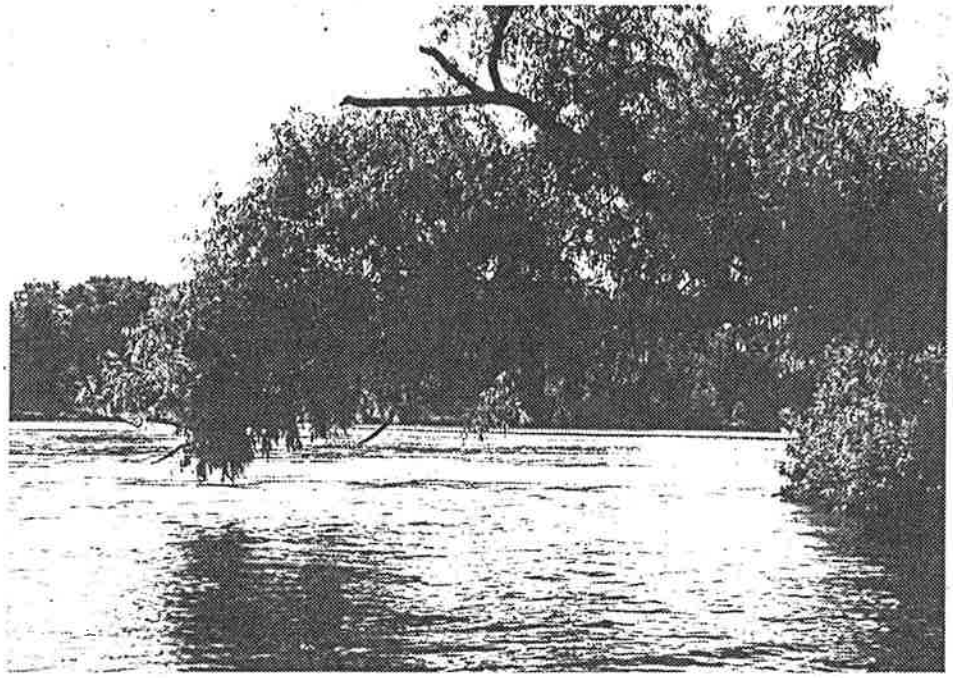


PHOTO 3: Aquatic habitat within School Street Project impoundment (Western shoreline) located near sampling stations H-4 and E-2.

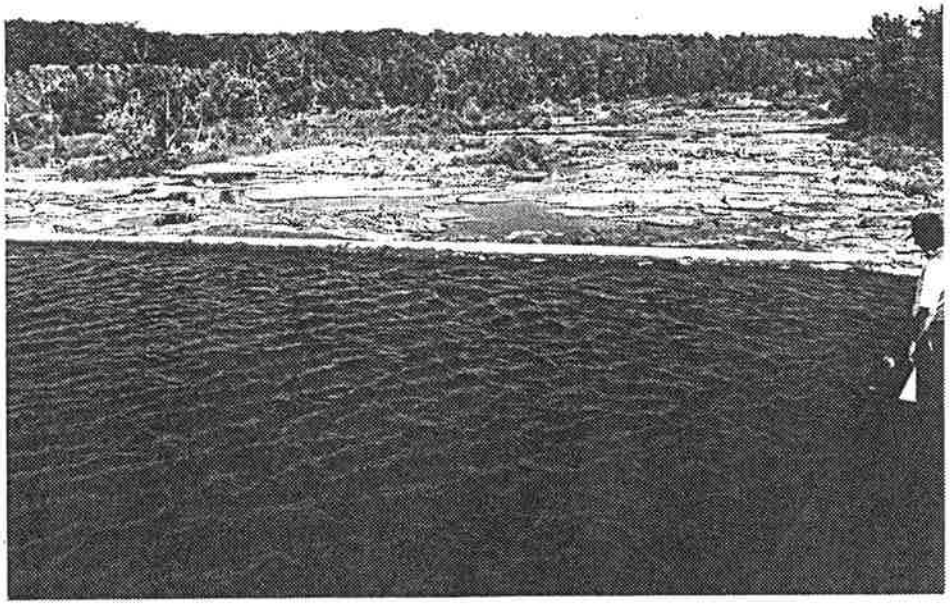


PHOTO 4: Aquatic habitat within School Street Project upper bypass reach (below School Street Dam).

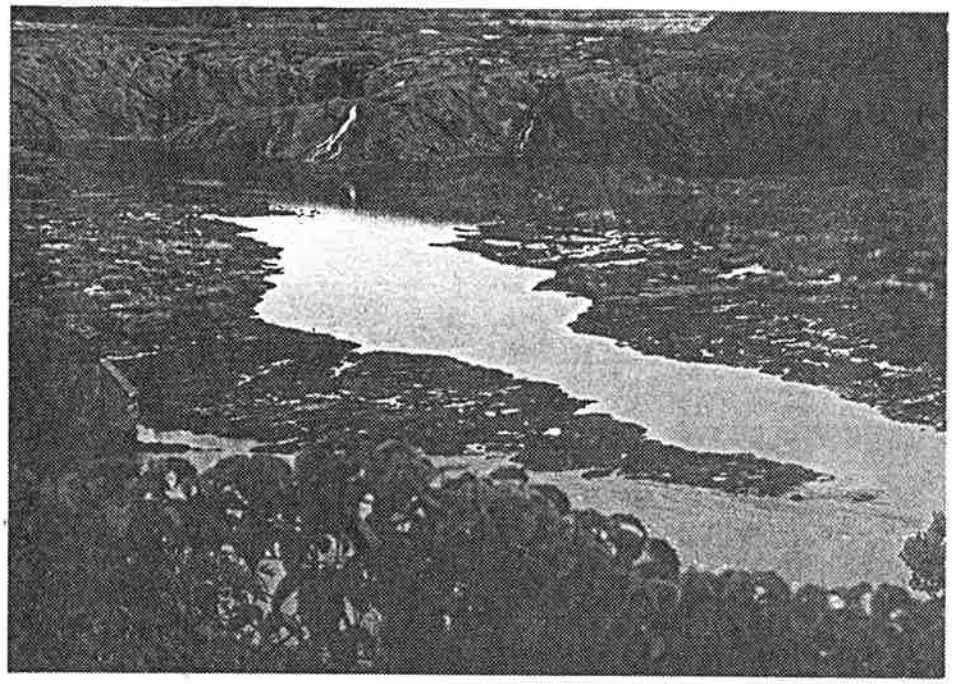


PHOTO 5: Aquatic habitat within School Street Project Lower Bypass Reach (below Cohoes Falls) located near sampling stations E-3B, G-7

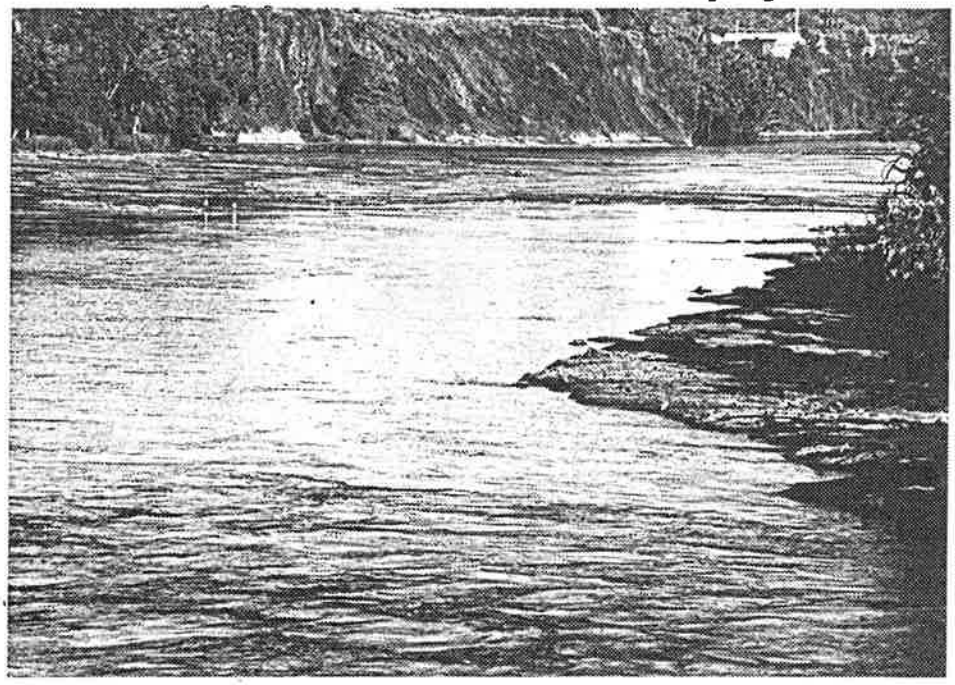


PHOTO 6: Aquatic habitat within School Street Project tailwater located near sampling station E-4. View is looking downstream from powerhouse (tailrace is in foreground). Uppermost rapids/riffles are visible in distance.

APPENDIX E: Reimagine the Canals Report



REIMAGINE THE CANALS
TASK FORCE REPORT

JANUARY 2020

NEW YORK
STATE OF
OPPORTUNITY.

REIMAGINE THE CANALS
TASK FORCE REPORT

JANUARY 2020

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Tainter gates at Lock CS-1

REIMAGINE THE CANALS

LETTER FROM THE CO-CHAIRS

The opportunity to lead the *Reimagine the Canals* Task Force has been immensely gratifying for all three of us. As former state and county officials, each of us knows well the Erie Canal – but in our wildest dreams could never have imagined a vision for its future as ambitious and exciting as the one we present in the pages that follow.

This Task Force report lays out a bold and inspiring vision that builds on the Canal System's legacy by leveraging and adaptively reusing its unique ability to control one of our State's most precious resources – its water. The Task Force was formed as a response to the many compelling ideas submitted to the New York Power Authority's *Reimagine the Canals* ideas competition in 2017. From ecologic restoration to economic regeneration and from agricultural irrigation to flood mitigation, the Task Force studied a wide array of challenges and opportunities facing canal communities.

The findings presented in this report are the product of Task Force member meetings, public engagement sessions, stakeholder focus groups, and hundreds of hours of expert consultation. While no analysis undertaken over a six-month period could be fully comprehensive, we believe the diversity of voices and opinions presented in this report provide a clear road map for the transformation that lies ahead.

We want to graciously thank our fellow Task Force members who provided their time and expertise to ensure that our work was grounded in a fine-grained understanding of the inter-related challenges and opportunities that the last half century of change has left in its wake. We benefitted greatly from their diverse knowledge bases - scientists, farm experts, former elected officials, geologists, developers, environmental and preservation advocates, fishermen, boaters, and marina owners, all of whom conveyed the concerns of their own constituencies.

We also want to thank the institutions participating in our effort, whose work in shaping New York State goes far beyond this short effort. This includes both public institutions – such as SUNY's College of Environmental Science and Forestry, Rockefeller Institute and Monroe Community College – and private ones, including Union College and Clarkson University. It includes federal agencies, such as the US Geological Survey and Corps of Engineers, and New York State ones – most notably the six agencies who participated directly in the Task Force.



Waterford, NY

The process of seeing through the work of this Task Force has been educational for all three of us. Despite our respective years of experience in government, no single individual could ever hope to fully understand the issues touching canalside communities across more than 350 miles of our great state. Every town, village, and city along the Canal has its own specific culture, industrial history, and set of physical challenges. By dividing the work into three watersheds – the Western, the Central and the Mohawk - we were able to engage in a depth of analysis and discussion that could not otherwise have been achieved over such a short period.

Though our panel's deliberations are complete, the task of delivering this vision has just begun. As we work together toward realizing these goals, we will inevitably encounter challenges – much like the visionaries behind the 19th century Erie Canal and its successor, the 20th century Barge Canal. As they were convinced of the wisdom of their ambitions, so too are we. The bicentennial of the original Erie Canal offers an opportune moment to reinvent and reinvest in our shared legacy, and we look forward to working with groups represented by Task Force members, with New York State agencies and the Governor, and with communities along the corridor to realize a vibrant third century for this storied waterway.

Joanie Mahoney, Task Force Chair

Joe Martens, Task Force Co-Chair

Bob Duffy, Task Force Co-Chair

EXECUTIVE SUMMARY

Marking the beginning of the third century of the New York State Canal System, the *Reimagine the Canals* Task Force was convened in May of 2019 by Governor Andrew Cuomo to determine how this historic infrastructure asset can be mobilized anew to promote the health and well-being of upstate New York's communities, economies, and ecosystems.

This panel, comprised of community leaders and experts in canal-related fields, worked over the ensuing six months to review studies and analyses that addressed a wide array of challenges and opportunities and to develop its own set of findings. This report outlines the panel's work.

The *Reimagine the Canals* initiative takes place at an important juncture. Over the last half century, commercial shipping on the Erie Canal declined and then largely disappeared – a reflection of the decline of manufacturing industry in towns along its route. In response to this structural change, and to the demographic shifts it caused, canalside communities have been required to embrace new land use patterns and modes of development to stabilize populations and encourage new industries and tourism. Recent investments by the State have supported and facilitated these changes, recognizing the shift from commercial to recreational use along the waterway and priming towns along the Erie spine to engage in adaptive reuse of land, buildings and infrastructure.

Yet challenges to fully realizing the waterway as an economic development engine over the course of the next century are significant. Climate change increasingly threatens upstate New York with extreme, unpredictable weather - ranging from damaging summer droughts in western New York to chronic flooding year-



Pittsford, NY

round in towns throughout the Mohawk River Valley. With 40 percent of the State's water bodies connected to the NYS Canal System, the growth of recreational boating and fishing across the State is separately threatened by a rise in aquatic invasive species within, or poised to travel through, the canal vector. And water quality remains a major issue across the State – most notably in Mohawk Valley towns, some of whom draw water from the Canal.

The Task Force attempted to address and balance these opportunities and threats. Its work was largely inspired by the *Reimagine the Canals* competition run by the New York Power Authority (NYPA) in 2017, which produced innovative ideas for canal activation. But it also builds on work being done by a variety of state agencies actively engaged in upstate economic development and resilience – the Department of Environmental Conservation (DEC), the Office of Parks, Recreation and Historic Preservation (OPRHP), Empire State Development (ESD), the Department of Agriculture and Markets, NYPA's Canal Corporation and the Department of State. Together, the Task Force's 25 appointed members and six *ex-officio* agency nominees reached broad consensus on a variety of recommendations designed to keep up the momentum initiated by local and state projects, most notably the imminent completion of portions of the Empire State Trail running along the Erie Canal from Albany to Buffalo.

Acknowledging the diversity of communities and economies located across more than 360 miles of the Erie spine, Task Force work was undertaken both in plenary sessions and in subcommittees devoted to each of three regions: the Mohawk Region, running approximately from Waterford to Rome; the Central Region, embracing the Finger Lakes area through Oneida Lake; and the Western Region, from Macedon to Buffalo. This report contains both system-wide findings and recommendations relating specifically to those individual regions.

The Task Force's system-wide recommendations recognize opportunities to expand and improve existing recreational uses and also introduce new ones. A series of recommendations for immediate **operational improvements** have been made, most notably enhanced coordination among the constituencies that oversee and manage programs relating to the Canal and unified marketing and branding to greatly



Waterford Flight

widen its renown and appeal. A range of new economic development opportunities were identified for near-term investment. **Novel forms of water recreation**, including paddleboarding, rafting, surfing, and ice-skating, can strengthen tourism and build on existing recreational boating activity as well as tap into ecotourism trends. **"Iconic Infrastructure" destinations** should be identified, to create year-round tourist attractions and a backdrop for community celebrations. Improvements in **overnight accommodations** can support forecasted growth in tourism and recreation, enabling visitors to stay longer and spend more in canal towns. **Redevelopment of industrial property** held by the Canal Corporation should be pursued at scale, activating now-moribund downtown waterfronts. **New connections to the Empire State Trail** should be made, providing better access to the trail from towns, cultural and educational institutions, and hospitality destinations.

In the Western Region, existing Canal infrastructure can be adaptively reused to greatly strengthen rural economies. Using Erie Canal water to **expand agricultural irrigation** will enable farmers to invest in high-value crops, such as apples or other fruits and vegetables, safeguarding these crops against the increasing droughts, which are forecast to accompany climate change. **Recreational fishing growth** in Lake Ontario tributaries will result from more reliable access to canal water, optimizing fish habitats and greatly expanding opportunities for angling-related tourism.

In the Central Region, restoring and **expanding wetlands** should be pursued now to increase ecotourism—sites like the Montezuma wetlands are an important habitat for migratory birds—and restore the health of a now-compromised ecosystem. **Combatting aquatic invasive species** would improve the health of New York State's waterways, which today suffer from the ravages of hydrilla, algal blooms and a range of invasive fish and mollusks, and would protect investment in new canal uses from being undermined by future invasive outbreaks. Further study of strategies to counter invasives is warranted to protect and enhance New York's waterways and the businesses that depend on them.

The Mohawk Region, due to its riverine nature, continues to be plagued by flooding from summer storms and winter ice jams, both of which are exacerbated by the changing climate. The Task Force recognized there are significant opportunities to **mitigate the effects of ice jams**, **reduce summer flooding**, and **improve forecasting and early-warning systems** in ways that allow residents to better prepare for flood events and lead to the benefits that come from reviving natural systems. The Task Force also recommends further study into Mohawk **tributary restoration**, which could prove an important method for enhancing water quality and improving the health of fish and wildlife habitats in this region.

Together, the findings laid out by the *Reimagine the Canals* Task Force offer a road map for transformation - not simply from an industrial to a recreational waterway but also to a 21st century tool for communities to meet and overcome unprecedented economic and environmental challenges.

TASK FORCE OVERVIEW

TASK FORCE OVERVIEW

INTRODUCTION

Stretching from Albany to Buffalo, perhaps no single piece of infrastructure is more responsible for New York's rise as a state, and New York City's rise as a global capital, than the storied Erie Canal.

The 1817 plan to build a man-made ditch across hundreds of miles of wilderness was unprecedented in its reach—one of the most ambitious American engineering visions of all time. The construction of the original Erie Canal, and its expansion and eventual replacement by the present Barge Canal over the course of the 19th and early 20th centuries, supported the growth of industries across its breadth - powering the development of towns such as Schenectady, Amsterdam, Utica, Syracuse, Rochester, and Buffalo.

Yet over the last half century, commercial shipping on the Erie Canal waned and then virtually disappeared. Changing trade patterns and industrial decline, as well as competition from alternative modes of transport, have left the waterway devoid of the barges it was designed to serve. The Canal, however, continues to be operated much as it has been for the past hundred years, including maintaining and operating the costly infrastructure designed for its original commercial uses.

In the absence of commercial traffic, recreational use along the waterway and its trail has grown steadily over the last several decades. Motorized boating is now accompanied by kayaking, canoeing and other forms of human-powered boating; biking, walking and running along the trail have expanded as well. The number of community-based events, such as concerts and festivals, has increased significantly and these now take place seasonally across the breadth of the Canal.

At the same time, under Governor Cuomo's leadership, new forms of investment have supported the transformation of canalside communities. Programs like the Downtown Revitalization Initiative, the Local Waterfront Revitalization Program, and the Canalway Grant Program have helped activate waterfronts along the Canal and continue to do so. Places like Pittsford, Baldwinsville and Fairport have become models for adaptive reuse of waterside infrastructure. Most recently, the *Reimagine the Canals* Ideas Competition, undertaken by NYPA, provided initial funding for the development of a new form of canalside housing on former industrial lands on a historic section of the Canal - a "pocket neighborhood" in Canastota, New York.

New York State Canal System



To explore these opportunities further, the *Reimagine the Canals* Task Force was convened by Governor Cuomo in May 2019 to investigate how the Erie Canal can be used as a catalyst for economic development and tourism, improved quality of life, and environmental resiliency. Chaired by Joanie Mahoney, former Onondaga County Executive, the Task Force was asked to:

- **Identify potential new uses for the Erie Canal aimed at improving the quality of life for New Yorkers**
- **Evaluate how the Erie Canal can support and enhance economic development along the canal corridor**
- **Find new opportunities to enhance recreation and tourism along the Erie Canal**
- **Assess how the Erie Canal can help mitigate impacts from flooding and ice jams to improve resiliency and restore ecosystems in canal communities**
- **Identify opportunities for using Erie Canal infrastructure to expand irrigation for Western New York farms**

The Task Force's findings, described on the pages that follow, represent a bold, forward-looking vision designed to anchor resilient communities and improve the quality of life for the 3.6 million New Yorkers who live along the Erie Canal's spine. Harnessing the full potential of this unique piece of infrastructure could transform the future for these New Yorkers and many others and cement the State's place as a leader in the fight against the ravages of climate change.

TASK FORCE OVERVIEW

TASK FORCE MEMBERS

The *Reimagine the Canals* Task Force included 25 members representing important constituencies and interests across the NYS Canal System.

In addition, six representatives of state agencies served *ex-officio* on the panel (Department of Environmental Conservation, Empire State Development, Department of Agriculture and Markets, Office of Parks, Recreation and Historic Preservation, Canal Corporation, and Department of State).

Because of the expansive geography that comprises the Canal System, Task Force work was undertaken both in plenary and in three regional subcommittees: the *Central*, chaired by Joanie Mahoney (Chief Operating Officer at the SUNY College of Environmental Science and Forestry in Syracuse and former County Executive of Onondaga County), the *Mohawk*, chaired by Joe Martens (Director of the New York Offshore Wind Alliance and former New York Department of Environmental Conservation Commissioner), and the *Western*, chaired by Bob Duffy (CEO of the Greater Rochester Chamber of Commerce and former Lieutenant Governor of New York).

Between May and November 2019, each regional subcommittee convened multiple times and the full Task Force convened three times. At each meeting, the Task Force reviewed commissioned analyses from technical experts in fields relevant to its appointed mission as well as public input garnered by the State University of New York (SUNY) Rockefeller Institute of Government, which conducted outreach with Canal communities across the State. Drawing on their varied areas of professional expertise, Task Force members produced the findings outlined in this report.

Task Force Chairs

Joanie Mahoney Chair; Central Region	SUNY College of Environmental Science and Forestry
Bob Duffy Co-Chair; Western Region	Greater Rochester Chamber of Commerce
Joe Martens Co-Chair; Mohawk Region	NY Offshore Wind Alliance

Task Force Members

Michael Arcuri	Arcuri Ward Law
Andy Beers	Empire State Trail, Hudson River Valley Greenway
Ron Bierstine	Oak Orchard Tackle and Lodge
Leslie Becraft-Corrigan	Winter Harbor Marina
David Buicko	Galesi Group
John Courain	Genesee Waterways Center
Marie Cramer	Canal New York
Maureen Doyle	Central NY Waterways
Robin Dropkin	Parks and Trails New York
John Garver	Union College
Stu Gruskin	The Nature Conservancy
Bruce Van Hise	Corn Hill Navigation/Sam Patch Tours
Jill Jedlicka	Buffalo Niagara Waterkeeper
Robert King	Monroe Community College, Agriculture and Life Science
Amanda Krenning-Muoio	New York Farm Bureau
Chris Lajewski	National Audubon Society
Cornelius B Murphy Jr.	SUNY College of Environmental Science and Forestry
Bill Nechamen	Association of State Floodplain Managers/Nechamen Consulting
Derrick Pratt	Erie Canal Museum
Bob Radliff	Erie Canalway National Heritage Corridor
John Robinson	Our Ability
David Wolfe	Cornell University, School of Integrative Plant Science

Task Force Ex-Officio Members

Richard Ball	Department of Agriculture and Markets
Erik Kulleseid	Office of Parks, Recreation and Historic Preservation
Rossana Rosado	Department of State
Basil Seggos	Department of Environmental Conservation
Brian Stratton	NYS Canal Corporation
Howard Zemsky	Empire State Development





Community engagement workshops in Schenectady and Brockport, July 2019

TASK FORCE OVERVIEW

TASK FORCE SUPPORT

BuroHappold Engineering served as lead consultant and secretariat to the Task Force. In addition to coordinating Task Force meetings and producing this report on behalf of the panel, the firm commissioned and managed a group of sub-consultants to undertake technical analysis for each of the topics under evaluation by the Task Force. A list of these sub-consultants as well as information about their reports is found in the Appendices.

To assist in and inform its mission, the Task Force appointed SUNY's Rockefeller Institute of Government to simultaneously carry out a community engagement process. The Institute held five open community engagement sessions across the Canal corridor in July 2019, attended by a total of 400 participants. Additionally, over 250 comments were submitted to the Rockefeller Institute's online survey tool for the public engagement process. The Institute's goals were to (1) share innovative concepts from the *Reimagine the Canals* Ideas Competition and precedents for waterway revitalization, (2) gather and report on the concerns and ideas of canalside communities, (3) identify projects likely to increase Canal engagement, and (4) encourage public participation in Canal transformation going forward. The Rockefeller Institute also collected information online from Canal users across the country. A link to the full report is provided in the Appendices to the Task Force report.

Following the Rockefeller Institute's engagement with the general public, in September 2019, a separate series of stakeholder focus groups was organized by BuroHappold with the assistance of Task Force members. These brought together experts from government, academia, private industry, business owners, community leaders and non-profit advocacy organizations to further explore the concepts and opportunities raised in the public workshop sessions. The input from these sessions also helped to inform and shape the findings detailed in this Task Force report.

ERIE CANAL BACKGROUND

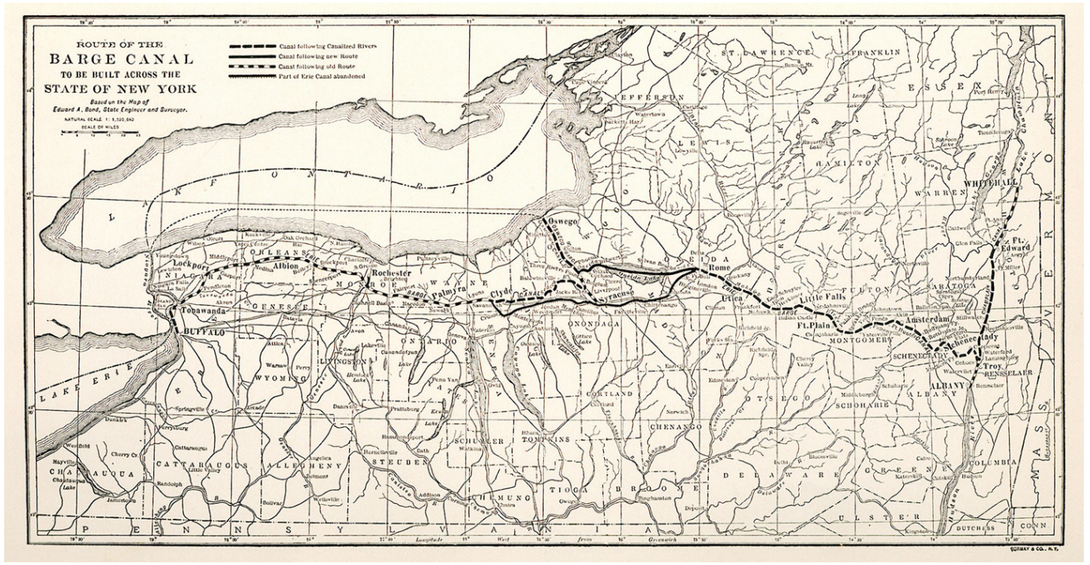
ERIE CANAL BACKGROUND

A HISTORY OF REIMAGINATION

The story of the Erie Canal is the story of America: a story of leadership in innovation and industry, of westward expansion, and of courage, foresight, and agile adaptation in the face of changing circumstances.

In 1817, New York Governor DeWitt Clinton approved funding for a wildly imaginative construction project: a canal that would cut clear across New York State, connecting the Hudson River to Lake Erie. Before the Erie Canal, a traveler between Albany and Buffalo would face a two-week journey on roads that baked in the summer and dissolved in a sea of mud in winter; after the Canal opened in 1825, that same trip could take five days. The Canal thus provided a critical supply line that in many ways "made the nation," moving trade and settlement from the east coast into the center of the country. Its innovative engineering contributed to the founding of upstate New York's many excellent engineering and science universities, such as Rochester Institute of Technology, Rensselaer Polytechnic Institute and Union College.

As the 19th century wore on, the Canal struggled to accommodate traffic and increasingly large barges. Between 1836 and 1862, the original Erie Canal—sometimes called "Clinton's Ditch"—was made wider and deeper, resulting in what became known as the "enlarged Canal." But commercial shipping continued to outgrow the Canal – and was increasingly shifting to rail. In an attempt to compete with the railroads for freight, New York State approved an ambitious plan to deploy new technologies to 'canalize' the Mohawk, Oswego, Seneca, and Clyde Rivers (i.e., building canal infrastructure in the rivers themselves) and reroute the central portion of the Erie Canal north through Oneida Lake. The reimagined and relocated "New York State Barge Canal" opened in 1918, with its Erie section featuring a deeper and wider channel as well as dams along the Mohawk River that allowed the river to be



Historic map showing 19th century and proposed 20th century Erie Canal routes

converted seasonally into a series of navigable pools for deep-draft vessels.[1]

While the Barge Canal did attract a significant amount of cargo in its early decades, increasingly stiff competition from railroads and new competition from roads and highways would make its success short-lived. Commercial traffic on the system as a whole peaked in 1951 and, partially due to the opening of the St. Lawrence Seaway in 1959, has declined steadily since. Today, no regular commercial traffic remains on the Erie Canal portion of the Barge Canal.

Recognizing the decline in commercial shipping, New York State undertook a number of initiatives in the late 20th century to examine opportunities for recreation along the waterway. In 1992, the New York State Thruway Authority took ownership of the Barge Canal, and the New York State Canal Recreationway Commission was created to advise on canal-related activities. The Commission developed the Canal Recreationway Plan in 1995 and the New York State Canal Revitalization Program in 1996. These plans laid an early foundation for the repositioning of the Canal as a spine of recreation and tourism, yet were subject to the constraint that the Barge Canal continue to be maintained and operated for commercial traffic. In 2000, Congress established the Erie Canalway National Heritage Corridor, which, together with the non-profit Erie Canalway Heritage Fund, partners with federal, state, and local organizations to preserve the Canal's history, provide recreational and educational opportunities, and foster economic revitalization. In 2014, the Barge Canal was designated as a National Historic District in the National Register of Historic Places.

As the Erie Canal enters its third century, it also stands poised for its third reimagining. The year 2017 marked 200 years since construction on the Erie Canal began. That year, control of the Barge Canal shifted to NYPA, the *Reimagine the Canals* competition was launched, the NYS Canal System was designated as a National Historic Landmark, and construction began on the Empire State Trail - nearly half of which runs alongside the asset. These actions set the stage for the visioning, engagement and analysis undertaken by the *Reimagine the Canals* Task Force.

1 *The Barge Canal System consisted of four separate canals: the relocated Erie, the Cayuga-Seneca (connecting Cayuga and Seneca Lakes to the Erie Canal), the Oswego (following the path of the Oswego River from Baldwinsville and Clay to Oswego) and the Champlain (running north from Troy into Lake Champlain).*

LOOKING FORWARD

Opportunities

Today, the Erie Canal ("the Canal") operates seasonally from May to October as a recreational waterway. During what is referred to as "the navigation season," most boaters spend time cruising 'pools' of water between locks; only about 24 percent of users travel through a lock, the majority of them in the Central region. Motorized boating still dominates on much of the Canal, but human-powered recreation - such as paddleboarding and kayaking - is growing rapidly: between 2011 and 2016, the number of human-powered boat lockages nearly tripled, and the Canal Corporation presently maintains over 125 kayak launches.

Most regular users of the Canal, however, are not on the water at all. The 750-mile long Empire State Trail, which upon completion in 2020 will be the longest multi-use trail network in the nation, runs alongside the towpath of the original Erie Canal from Albany to Buffalo. Known as the Canalway Trail, this 360-mile path is heavily used as a place of landside recreation in its fully completed sections – most notably along the channelized, western portions of the Canal. The Trail provides the communities along its banks with a place to bike, walk and run – or simply relax and enjoy views of the water.

Beyond the Trail itself, the canal waterfront has served to stimulate regeneration and redevelopment in communities along its banks. Supported by a variety of state programs, recent development projects in communities such as Fairport, Pittsford, Baldwinsville, Little Falls, Amsterdam and Schenectady have proven the viability of diverse types of canalside development and new waterfront public spaces. Regular programming in other canal towns attract visitors from nearby communities, primarily but not exclusively during the summertime navigation season.

Other factors suggest that the Canal is ripe for a reimagining. Opportunities to attract tourists from other locations are close at hand, thanks to the steady flow of tourists who already visit upstate New York every year; the Canal is within an hour's drive of Niagara Falls, the Adirondacks, and the Finger Lakes. A burgeoning millennial population coming out of upstate universities offers opportunities to expand local population bases, and constitutes a receptive audience for human-powered boating as well as new and innovative forms of canal activity. With increased recreational opportunities and improved branding and marketing, the Canal could take its place among New York State's most popular attractions.



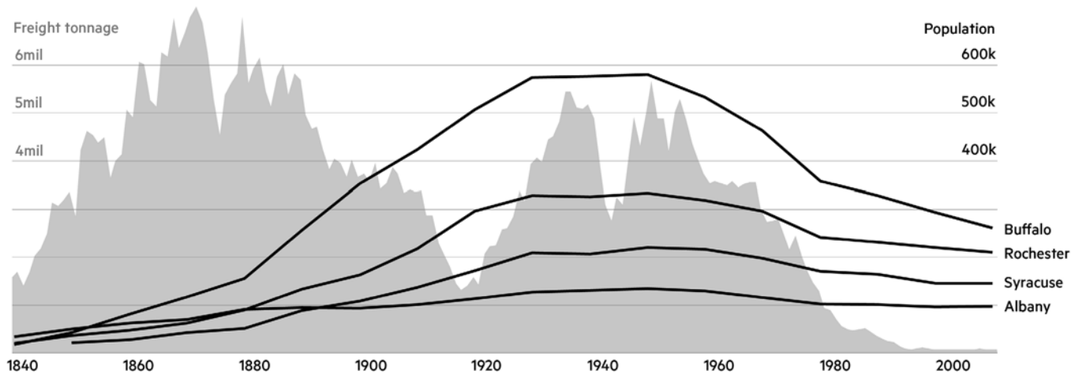


Programming and events in Amsterdam and the Tonawandas





Commercial Shipping and Upstate Population Decline



Challenges

As commercial shipping on the Canal has declined, so too have the populations of cities along its path. Cities like Buffalo, Rochester and Syracuse – industrial powerhouses during the era of waterborne transportation – are now much smaller than they were even a half century ago.

Apart from declining population and use, the Canal's infrastructure itself is now a century old – with much of it approaching the end of its useful life. Major components of this industrial-sized infrastructure, such as the locks, movable dams, and guard gates, constructed expressly to support commercial use, require either replacement or increased maintenance. The total budget for the Canal System is rising rapidly: while historic costs have been between $90M and $100M annually, total capital and operating costs during the last two years have increased to $125M and $140M respectively.

Canal infrastructure and the communities it abuts face significant climate-related and resilience challenges – challenges that are more acute with each decade. Floods have been recorded in the Mohawk River Valley since the 1600s, but climate change has increased the frequency and intensity of flood-inducing storms: four of the region's six most destructive floods have taken place in the last ten years and studies indicate that flood levels in the Mohawk Valley could rise nearly 20 percent over the next decade. Recent ice jams have further increased the risk of severe flooding along the Mohawk River, with 8- to 17-mile ice jams recorded in the Canal above Schenectady in 2017 and 2018. Both winter and summer flooding events contribute to the capital costs associated with canal infrastructure, in addition to the losses incurred in canal communities.

Flooding at Lock E-10, June 2006

Water chestnut growth in the Finger Lakes

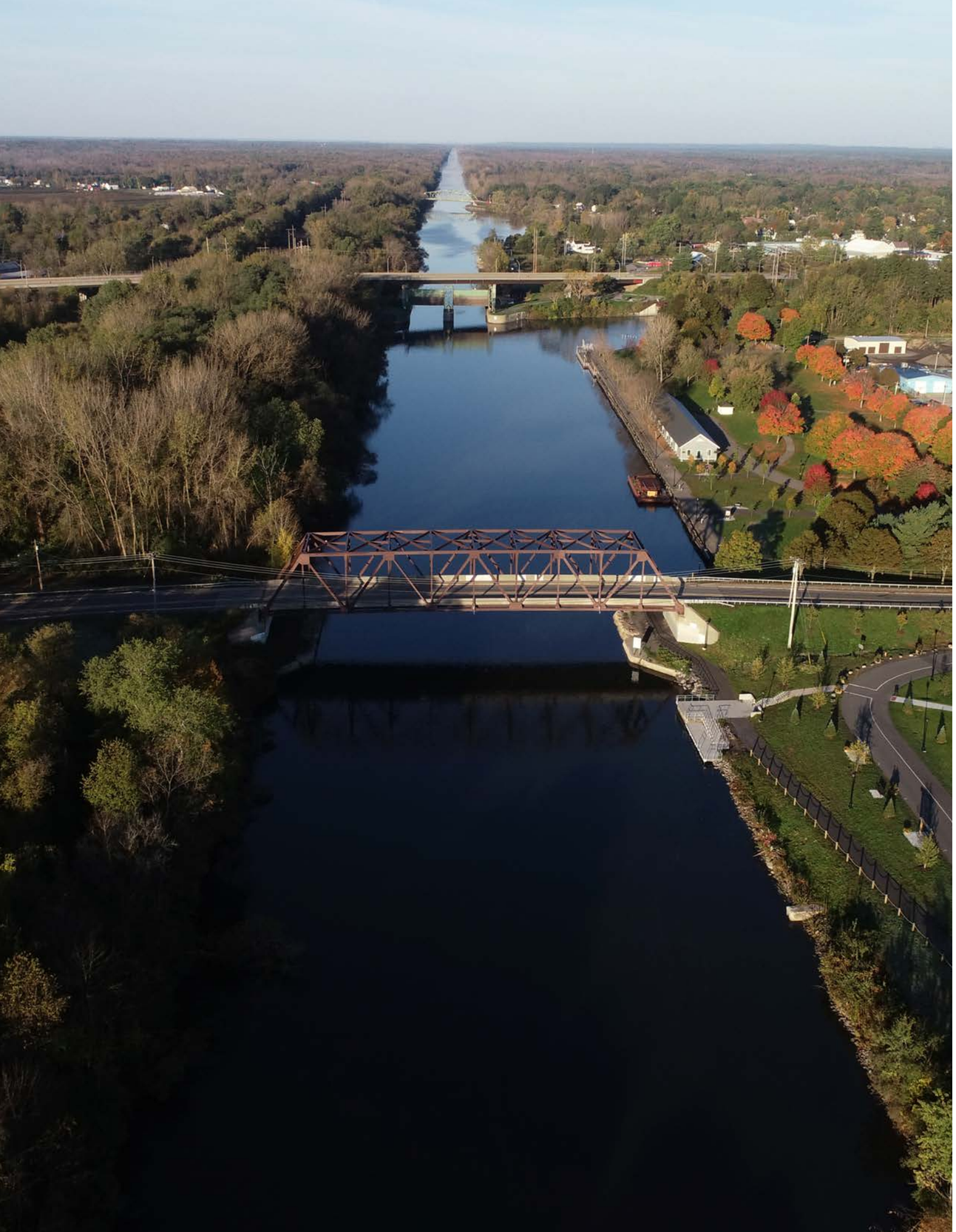
Climate change has also impacted canal communities in western New York. Increasingly severe droughts in Niagara, Monroe, and Orleans Counties threaten the future of the State's primary region for fruit and vegetable production. Even in otherwise wet years, periods of drought can significantly lower the quality and yield of agricultural products. The absence of natural aquifers in the area leaves farmers in that region particularly vulnerable to these incidences of drought: Western New York faced a 43 percent crop yield loss on average during the 2016 drought, making it the hardest-hit region in New York State.

Challenges to the resilience of canal regions and their economies go beyond climate change. By connecting bodies of water that had historically been isolated, the Canal inadvertently created opportunities for aquatic invasive species to easily spread from the Great Lakes through New York waterways, undermining the natural ecosystem balance and leading to consequences such as depleted fish populations and the proliferation of hydrilla and harmful algal blooms among others. At the same time, canal infrastructure has changed the natural flows of the Mohawk River, disconnecting it from its tributaries and significantly impacting the health of the watershed as a whole. Such damage to ecosystems ripples across local economies as the number and quality of birding, fishing, ecotourism, and boating opportunities diminishes.

The size and scope of the Erie Canal make it a powerful tool for shaping the future of upstate communities. The Task Force's findings offer strategies to adaptively reuse the unique water control systems that power the Erie Canal in ways that anchor more resilient communities, provide expanded and new recreational opportunities, revive damaged ecosystems, and improve quality of life for the 3.6 million New Yorkers who live along its spine. In doing so, the Task Force intends to set precedents for reimagining yesterday's infrastructure to address the challenges of today and seize the opportunities of tomorrow.

TASK FORCE FINDINGS





Rome, NY

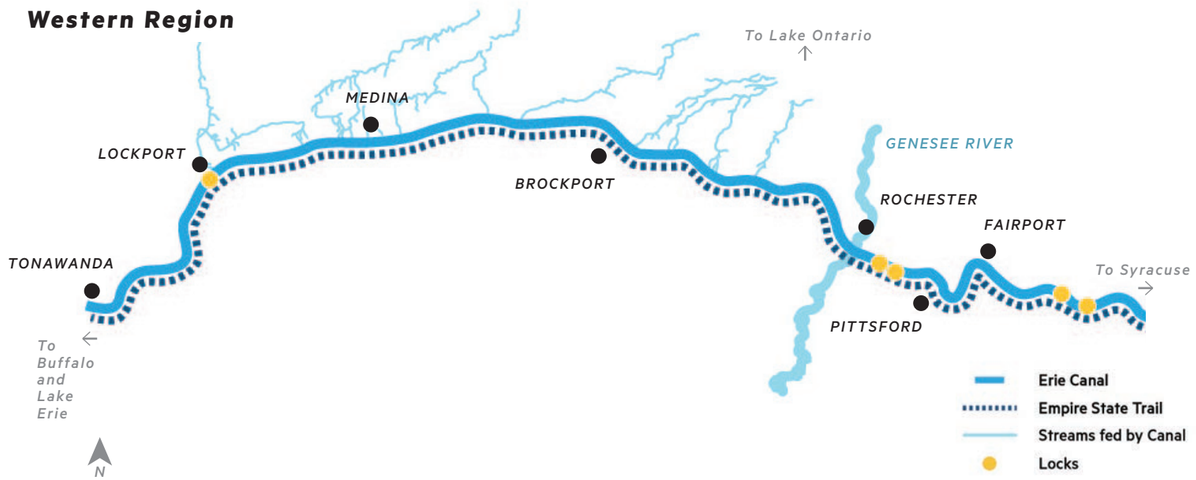
TASK FORCE FINDINGS

INTRODUCTION

The Erie Canal cuts across 360 miles of New York State - through major cities and small towns, mountains, marshes, and farmland. The Canal's reach thus incorporates areas with strikingly different needs, topographies, and ecosystems: what is important to Rochester is likely less important to Rome, or to the dozens of smaller villages through which the Canal and Mohawk River pass. Indeed three separate and relatively distinct watersheds comprise the Erie portion of the NYS Barge Canal system: a man-made channel in the west (emptied for maintenance in the winter), the central portion (encompassing both man-made and riverine stretches), and the Mohawk River Valley in the east. Each watershed is characterized by unique forms of infrastructure necessary to support the waterway's integrity and use.

Reflecting this geographic and economic diversity, the *Reimagine Task Force* was undertaken in plenary as well as in three regional subcommittees: the Mohawk subcommittee, the Central subcommittee, and the Western subcommittee. Multiple subcommittee meetings were held to develop findings relevant to the challenges and opportunities in these respective regions. The Task Force subsequently came together as a group to debate the findings of these subcommittees. These deliberations, and the ultimate findings of the Task Force as a whole, are summarized in the sections that follow.





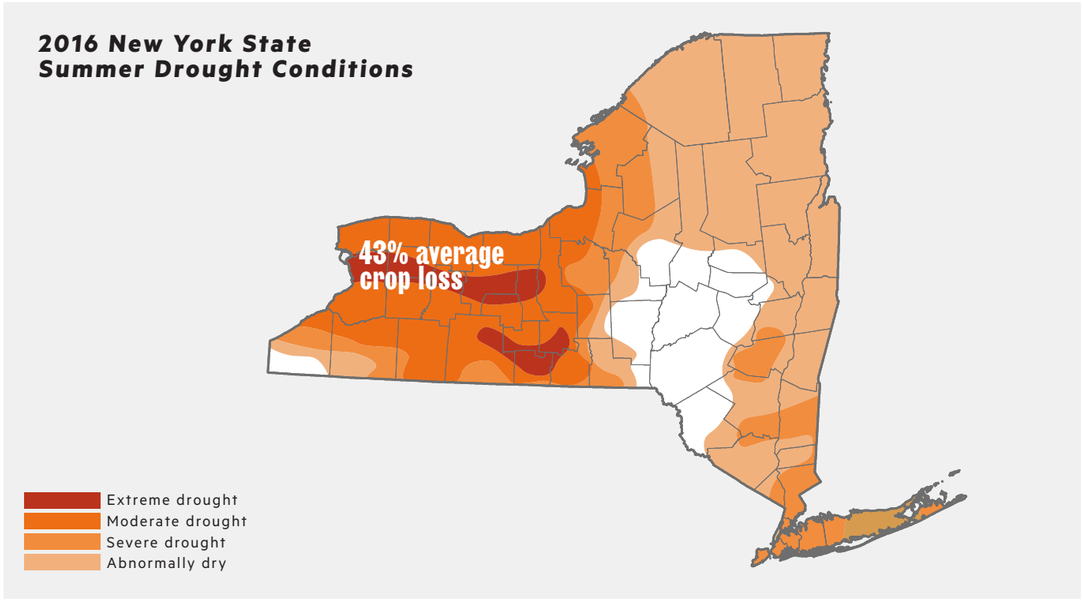
TASK FORCE FINDINGS

THE WESTERN REGION

The Western region is loosely anchored by two of New York's largest cities, Buffalo in the west and Rochester in the east, but is largely rural. In this region, the Erie Canal is entirely a man-made channel supported by earthen berms with a uniform width and depth (unlike other regions where the Canal is mainly 'riverine' and manipulates the flows of a river). Small streams flow north to Lake Ontario, which is 270 feet lower than the man-made waterway. They serve as an outlet for many of the Canal's 16 waste weirs, which are gates raised or lowered to maintain water levels in the Canal and to empty it during the winter for maintenance.

Water from the western portion of the Canal is used for purposes other than recreational boating - most notably for agriculture. For example, Orleans County, which is bisected by the Canal, boasts a robust agricultural economy: it has the second-highest annual revenue from vegetable production and the third highest from fruit production in the State. This high-value crop production is in part driven by fertile soils and temperature moderation by Lake Ontario, but it is also influenced by the ability to irrigate via the Canal. Farmers with property adjacent to the Canal or streams have the option of siphoning water from the system for seasonal irrigation when it is available.

Western New York also boasts some of the best recreational fishing in the State, a main driver of tourism in this largely rural area. Flows from canal waste weirs enhance conditions in the tributaries running north to Lake Ontario - particularly in October or November, when the Canal is emptied. Brown-trout fishermen and others overwhelm available lodging during this brief window in time.



THE WESTERN REGION

Expanding Irrigation

The idea of using canal water to expand irrigation originated from a proposal by Dr. Stephen Shaw of SUNY's School of Environmental Science and Forestry (ESF), submitted during the *Reimagine the Canals* competition in 2017. While the proposal was not one of the two financial winners of the competition, the jury determined that the short-listed idea merited further study. Dr. Shaw was retained as a consultant to better understand current irrigation usage as well as the potential value and feasibility of bringing canal water to a larger population of farmers in this region in the future.

Dr. Shaw's report concluded that the opportunity to use canal water for irrigation is largely untapped, and that canal water could be feasibly used to combat drought and the vagaries of climate change. Once supplied with a reliable source of water during the season, western farms may be able to shift from low-value crops (like feed corn and soybeans) to high-value crops (like apples, berries and vegetables).

Dr Shaw's report noted that:

- While New York is a relatively wet place with abundant rainfall on an annual basis, even brief periods of dry weather between rain events can significantly affect the yield and quality of crops.
- There is no readily available alternative water supply. Western New York has very limited groundwater, and using the municipal water supply for irrigation would quickly exceed the capacity of the water distribution system.
- Agricultural production can be sensitive to even brief rain-free periods during the season, especially in the case of fruits and vegetables. With only five percent of agricultural land in the region irrigated, the majority of farmers are susceptible to drought. For instance, 2016 saw the worst drought in two generations, dealing a massive blow to Western New York's farmers.[1]
- There is general consensus that the frequency of high-temperature, rain-free periods is likely to increase between 2020 and 2050, and that irrigation could serve as an important resilience measure in an area facing increasing periods of drought.
- Absent irrigation, farmers have a difficult time growing high-value crops such as apples and vegetables. These crops require a significantly higher investment in time and labor than low-value crops like feed-corn and soybeans, hence a guaranteed water supply is crucial for farmers to commit the investment needed to grow apples and vegetables.
- An increase in high-value crop production not only increases total revenue for farms, but employs more people and has a ripple effect on the food packaging and distribution industries. Unirrigated feed-corn yields approximately $600 per acre, whereas a well-managed apple orchard can result in anywhere between $10,000 to $20,000 per acre for farmers.
- Southwest Michigan exemplifies a region similar to Western New York that has benefited significantly from expanding irrigation. Between 1982 and 2013, irrigated acreage more than doubled from 175,000 acres to 352,000 acres; acreage of blueberries increased by 200 percent and vegetables by 54 percent. Today, the value of crops per acre in Southwest Michigan is almost double that of the rest of the state.

Dr. Shaw and members of the BuroHappold team carried out a series of interviews in the fall of 2018 at 12 farms in Orleans and Monroe Counties. While farmers almost universally expressed an interest in expanded access to water, two major barriers were identified: (1) irrigation infrastructure can be a large capital expense, and investments associated with higher-value crops are even higher (specialized equipment, labor, etc.) and (2) farmers were unwilling to make such a large capital investment unless guaranteed a reliable water source during the critical season. While the Canal Corporation today issues permits to farms for siphons to convey water from the Canal into streams, there is no guarantee that water will be present in those streams during summer's low-flow months, when farmers need it the most. Farmers surveyed knew little about the policies of the Canal Corporation in relation to water distribution, making them hesitant to commit to large-scale investments in irrigation infrastructure.

This research was presented to the Task Force Subcommittee and then to the full Task Force. There was consensus that irrigation should be expanded given the value it offers to farmers, local economies, and the State as a whole. Task Force members emphasized the importance of moving forward with this initiative quickly, given forecasts of increasing frequency of drought in the area, and recommended developing a 'smarter' water management system that would have the ability to better monitor flows in streams and adjust them more frequently to respond to both weather conditions and the use of water by farmers.

The findings by the Task Force are as follows:

- **Enhance communication between irrigation users and Canal Corporation managers**
- **Identify water management programs to regulate water releases into streams as needed for irrigation, including implementation of smart metering**
- **Assess viability of, and parameters for, an "irrigation district" or other advisory entity to oversee water management associated with irrigation**
- **Develop a grant program to incentivize farms to invest in equipment needed to utilize Canal water**
- **Identify methods to ensure that agricultural needs are coordinated with other Canal Corporation capital investments on the Canal**

1 *On average, farmers lost 43 percent of their crops. Losses on vegetable farms were even higher, almost 60 percent.*



Recreational fishing on the Oak Orchard Creek

THE WESTERN REGION

Enhancing Recreational Fisheries

Western New York is a popular recreational fishing destination for trout and salmon in New York State, partly due to the impact of the Canal's release of water into tributary streams of Lake Ontario. In similar fashion to the way DEC stocks fish in Lake Ontario, there is potential to enhance existing angling opportunities in these streams by providing more predictable fish runs; this would attract many more anglers to the region.

Currently, water is released into north-flowing streams from the Canal either to maintain water levels needed for navigation or at the end of the season when the Canal is drained. These releases are episodic, but do have some ancillary benefits - most notably in encouraging fish to enter these streams from Lake Ontario and thus creating angling hot spots on a few north-flowing streams fed by the Canal when it is drained each fall. The irregularity of releases is not optimum for fish habitat in these streams; it also creates unpredictable angling conditions and limits anglers' ability to plan trips during the most productive angling periods.
Ron Bierstine, a Task Force member and owner of Oak Orchard Tackle and Lodge, helped convene a focus group with five licensed NYS fishing guides, Orleans County Tourism Director and County legislators, as well as DEC regional managers to brainstorm ways in which recreational angling opportunities can be enhanced using canal water. Thomas McDonald, Dam Safety Manager at NYPA and a licensed fishing guide, facilitated this session and assisted the group in understanding the feasibility of various possible interventions. There was general consensus among stakeholders and supporting technical consultants that:

- modifying the Canal's water management regime could help enhance recreational fishing opportunities
- the period when the Canal is drained at the end of the navigation season could be extended and optimized in order to prolong the recreational fishing season in the fall, distribute fish into area tributaries more uniformly, and attract more anglers to the region for better and more predictable fishing
- sustaining elevated base flows in the north-flowing streams during the summer months would provide optimal conditions for fish to run upstream from Lake Ontario and promote natural reproduction
- because streams in this area have limited fishing access, public fishing access along these streams should be expanded to ensure that enhanced flows do not result in crowding that would negatively affect the fishing experience
- a new water management regime designed to support recreational fishing will not affect current recreational boating activity on the Canal and will be able to support increased flows for expanded irrigation

The outcomes of the focus group meeting and technical analysis were presented to the Task Force. There was consensus among the group that a longer fishing season and more robust fish habitat would help increase ecotourism spending on lodging, meals, tackle, and other support businesses, and that the State should endorse any water management regime changes. Task Force members asked to make sure that the overall ecological impact from augmenting flows is assessed, and that expanding access along these streams includes a commitment to improve the amenities available to anglers (parking, toilets, etc.).

The findings by the Task Force are follows:

- **Develop, in conjunction with Department of Environmental Conservation, a program for summer and fall release of canal water into specific tributaries**
- **Work with local communities and Department of Environmental Conservation to increase public fishing access and amenities on private property along the tributaries**
- **Deploy water management strategy that includes flow and water quality monitoring**
- **Work with Department of Environmental Conservation to conduct basin stream biology assessments to analyze impacts of additional water releases into tributaries**
- **Develop a website or other mechanism to provide flow-release information to anglers and tourism entities**

Western Region Canal and Streams





Seneca Falls, NY



TASK FORCE FINDINGS

THE CENTRAL REGION

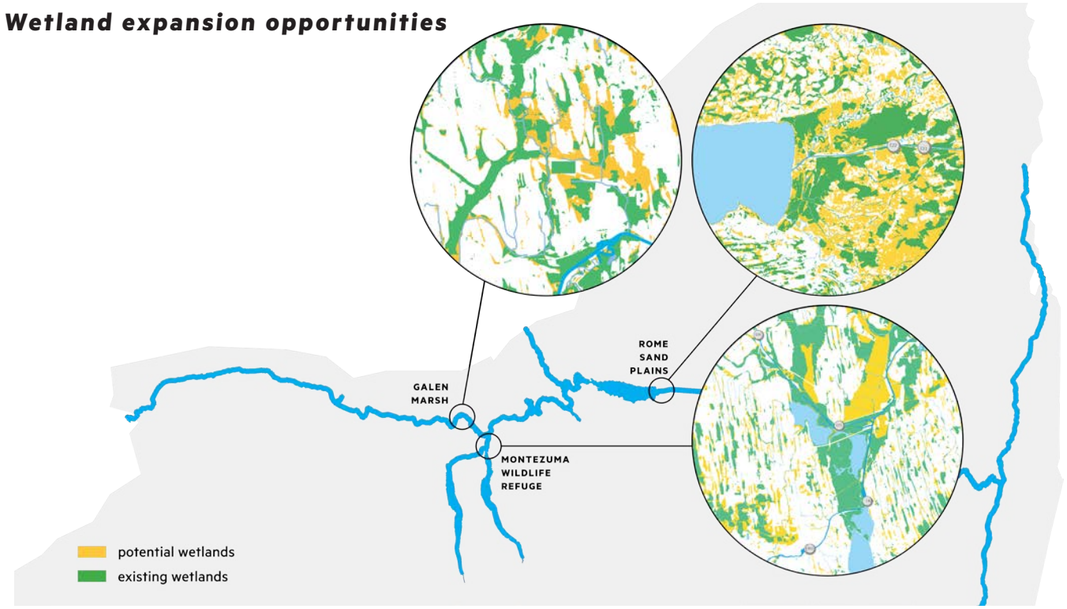
The Central region presents some of the most promising opportunities to expand tourism along the Erie Canal. It is home to some of the busiest locks on the entire NYS Barge Canal system, thanks to recreational traffic moving seasonally between the Finger Lakes, Oneida Lake, and Lake Ontario. The Finger Lakes, including Cayuga and Seneca, already attract tourists with their breweries, distilleries, and vineyards, and serve as a hub for localized recreational boating. Syracuse, Ithaca and many smaller college towns in the area draw in tens of thousands of young people during the academic year.

While new forms of tourism have proved a boon to local economies, this same area faces substantial ecological challenges - in part the legacy of moves made to expand the Erie Canal over time. The Erie Canal's first iteration consisted of a channelized canal that ran through Syracuse, south of Oneida Lake. However, the marshy areas north of the Finger Lakes were poorly suited to the needs of an expanded, industrial-sized canal; as a result, the Canal in the Central region was rerouted north to its current location to take advantage of and utilize existing waterbodies such as Oneida Lake and the Clyde River. [1]

The construction of the Canal in the 20th century impacted the region's ecosystem in several ways. Wetlands were partially drained, including those associated today with the Montezuma Wildlife Refuge complex, a crucial stopover point for more than one million migratory birds annually along the Atlantic Flyway. In addition, the Canal channelized natural rivers and separated streams from their floodplains. Designers of this section cleverly connected multiple watersheds for freight passage – never imagining that this would over time facilitate the spread of aquatic invasive species from the Great Lakes and the Mohawk and Hudson Rivers into New York waters, and thus alter the ecosystems of the Finger Lakes and other local water bodies.

1 *Today this region of the NYS Barge Canal also includes the Oswego Canal, a riverine canal that links the Erie Canal with Lake Ontario via the Oswego River, and the Cayuga-Seneca Canal, a riverine canal along the Seneca River that connects Cayuga and Seneca Lakes to each other and to the Canal.*

Wetland expansion opportunities



THE CENTRAL REGION

Restoring and Expanding Wetlands

Wetlands traditionally serve a variety of ecological functions, including providing habitat for many species and storing and filtering vast quantities of stagnant or slow-moving water from naturally-overflowing waterways. The Central region of the Erie Canal is home to three major wetland complexes: the Montezuma wetlands, Galen Marsh (known locally as the Marengo Swamp), and Rome Sand Plains. While these wetlands are now largely protected as federal and state lands and conservation areas, their volume and utility was impaired during the Barge Canal's construction. Channelization of natural rivers isolated them from their water sources and led to a reduction in the natural water table; new canal infrastructure, such as locks and dams, blocked waterways and trapped nutrients and silt - the movement of which is critical to wetland health.

Today, there are opportunities to enhance and expand these wetlands by coordinating their management with that of the Canal and by restoring hydrologic connections between former wetlands and the waterways that once fed them.[1] To that end, The Nature Conservancy was commissioned to identify and assess specific restoration opportunities. In addition, David Klein, a wetlands expert from The Nature Conservancy, facilitated a focus group consisting of Department of Environmental Conservation regional and wildlife management area managers, a United States Fish and Wildlife Service reserve manager, Cornell University faculty, a Cornell Cooperative Extension representative, and two Task Force members (Neil Murphy from SUNY-ESF and Chris Lajewski from the Montezuma Audubon Center). The group confirmed that restoration opportunities exist at the Montezuma wetlands and Galen Marsh (largely achievable by restoring floodways and hydrologic connections) and that the Rome Sand Plains could potentially be expanded beyond its current borders. The group also noted the lack of regional coordination between state/federal wetland managers and Canal management, highlighting this as a challenge to overcome in order to facilitate future restoration efforts.

1 This idea originated from a short-listed submission in the Reimagine the Canals competition in 2017 by Maria Goula and Jamie Vanucchi of Cornell University and Sandi Bastedo of Cornell Cooperative Extension.

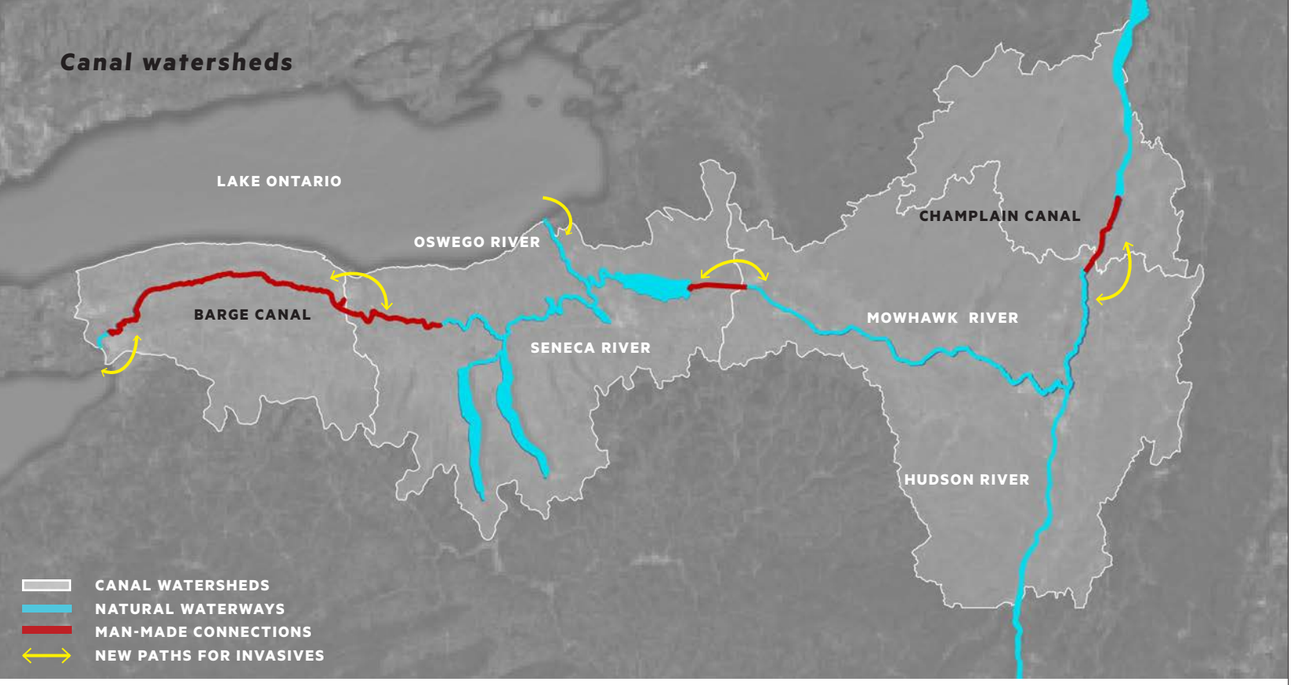
The outcomes of the focus group session and The Nature Conservancy analysis were presented to the Task Force subcommittee. Some members initially expressed concerns about the potential impact of wetlands restoration on property values and recreational navigation, however the subcommittee (and subsequently the full Task Force) ultimately reached a consensus that wetland restoration and expansion has the potential to generate substantial ecological and recreational benefits without negatively impacting navigation or other stakeholders. It was agreed that the specific opportunities should be studied further and that potential environmental and economic impacts should be rigorously evaluated.

The findings by the Task Force are follows:

- **Identify specific opportunities for wetland expansion in three key locations:**
  - **At Montezuma, study potential restoration of floodways, flowpaths, and creation of new hydrologic connections**
  - **At Galen Marsh, study potential for enhancing flows in the Clyde River**
  - **At Rome Sand Plains, identify specific opportunities for westward expansion of wetlands**
- **Develop preliminary designs and assess cost, economic, environmental, and operational implications associated with restoration and expansion of wetlands in targeted areas**



Montezuma National Wildlife Refuge



THE CENTRAL REGION

Preventing the Spread of Aquatic Invasive Species

An aquatic invasive species (AIS) is a waterborne organism – fish, mollusk or vegetation - that causes ecological or economic harm in a new environment where it is not native. AIS outcompete native species for space and resources, destroying habitats, reducing property values, and hindering recreational activities such as fishing, boating, swimming, and kayaking. Such damage to ecosystems and infrastructure has ripple effects across a local economy as the number and quality of birding, commercial and recreational fishing, and boating opportunities diminish.[1]

AIS invasions can be facilitated when naturally-separated watersheds become connected through human interventions, as in the case of the Erie Canal. In connecting the Hudson River to the Great Lakes, the designers of the Canal inadvertently created an "invasive species superhighway." Many invasive species have already made their way into state waters, such as water chestnut, a plant that forms thick nets that hinder navigation and lower property values, and zebra mussels, which create million-strong colonies that siphon nutrients from water that native species need to survive and that clog water conveyance infrastructure. The threats from AIS are quite literally at the doorstep (e.g., Asian carp in the Mississippi River Basin but not yet the Great Lakes). Any invasive species in the Great Lakes can, and likely will, travel into the internal waters of New York State, unless preventive measures are taken.[2]

R2 Resource Consultants, a leading natural resource consultant, was engaged to identify ways canal infrastructure might be used to stop AIS transport. The analysis was not designed to address or consider the impacts on navigation, property, or broader ecosystems associated with these alternatives but rather to examine the effectiveness of different AIS deterrents using canal infrastructure itself. R2 engaged dozens of NYS DEC scientists, lake association representatives, NGOs, research organizations, and academics to better understand: (1) AIS threats to state waters, (2) the successes and failures of existing mitigation efforts, and (3) potential deterrent approaches.

1 *In the Great Lakes, a hotbed for AIS from global maritime shipping, it is estimated that $200 million per year are lost to AIS.*

2 *US Army Corps of Engineers is conducting a study and preliminary design of measures to prevent invasive species from being conveyed via the Champlain Canal.*

The R2 report examined a range of technologies, identified three alternatives, and assessed their suitability for further study based on effectiveness, cost, and permitting feasibility. The approach recommended for further study consisted of:

1. Hydrologic separation at Rochester to protect the Finger Lakes and Oneida Lake from invasive species coming from Lake Erie
2. Hydrologic separation at Rome to protect the Mohawk and Hudson River Estuary from threats coming from the Great Lakes;
3. Piloting a boat lift/wash station in Oswego to prevent threats moving from Lake Ontario to Oneida Lake and the Finger Lakes
4. Installation of a Bio-Acoustic Fish Fence (BAFF) near Tonawanda, to deter Asian carp flowing into the Canal from Lake Erie

Recognizing that "fail-safe" hydrologic separation at Rochester and Rome would impact navigation by requiring portage, "dry lock," or boat lift mechanisms, the Central Region Subcommittee questioned the necessity to undertake such comprehensive measures. The consultants indicated that a variety of technologies can deter the spread of AIS, but that only hydrologic separation achieves the highest levels of effectiveness. One Task Force member questioned the potential economic impact of complicating the journey for the long-distance boaters who transit those two points along the Canal.[3] Another noted that the Erie Canal has global recognition, and that impacts on through-navigation could alter the perception of the Canal, and hence its brand. Other Task Force members noted that stopping the spread of AIS has not only environmental benefits, but also economic ones: NYS DEC spends millions annually on mitigating the impacts of invasive species that are already in New York, in an effort to protect recreation, property, water-dependent businesses, and the broader ecosystem. Some questioned how the State could justify *not seizing* the opportunity to prevent the spread of invasive species, given that the benefits of any *Reimagine* investments would be at risk should invasive species continue to spread. With one exception, the Task Force members came to a general consensus that ways of combatting invasive species merit further evaluation and that both alternatives proposed by the consultant and others should be studied further – including analyses of potential navigational impacts and associated costs and benefits.[4]

The findings by the Task Force are follows:

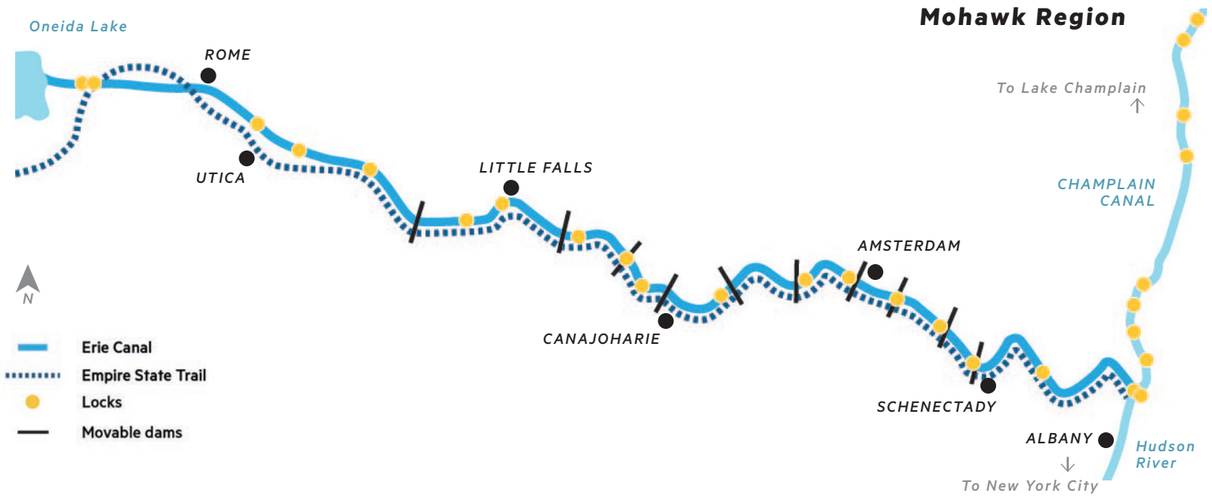
- **In cooperation with Department of Environmental Conservation, further study mechanisms for retrofitting canal infrastructure to establish AIS cordon points with potential locations in Rome, Rochester and Oswego. This study will:**
  - **evaluate new technologies**
  - **assess impacts on through-navigation and identify ways to mitigate them**
  - **calculate avoided environmental costs**
  - **identify any alternative or additional locations**
- **Further evaluate, with Department of Environmental Conservation, cost and feasibility of a "bio-acoustic fish fence" (BAFF/SILAS) or similar technologies to deter Asian carp near Tonawanda**
- **Coordinate with the US Army Corps of Engineers and Department of Environmental Conservation on existing AIS mitigation efforts on the Champlain Canal**

3 *Initial estimates using Canal Corporation data for lock traffic indicate that only 24 percent of boats (5,100) go through locks, and only a small fraction of those would be impacted by the recommended approach.*

4 *The representative from the Erie Canal National Heritage Corridor expressed his opposition to further study of the issue as recommended by the remaining Task Force members.*



Bellamy Harbor Park, Rome, NY



TASK FORCE FINDINGS

THE MOHAWK REGION

The Mohawk River Valley, reaching from Rome in central New York to Waterford on the Hudson River, includes some of New York State's most disadvantaged communities. Once home to a thriving industrial manufacturing sector, post-industrialization in the region has led to significant economic decline. The region also suffers from chronic flooding – a function of many factors, both natural and man-made – which undermines property values. Despite these challenges, there are signs of regeneration across the region. Schenectady, Little Falls, and Utica now boast new waterfront developments; a number of other Mohawk towns and cities have recently been selected as winners of the Downtown Revitalization Initiative (DRI), which provides recipients funding towards economic and community development.

From a water perspective, the Mohawk River is the largest tributary of the Hudson River, with a total length of 155 miles and a drainage area of 3,462 square miles. Major Mohawk tributaries include West Canada Creek, East Canada Creek, Oriskany Creek, and Schoharie Creek. In places, the Canal is a man-made channel that runs parallel to the river, cutting the river off from its northern tributaries; in others it runs within it and manipulates its flows and depth. Construction of the NYS Barge Canal in 1918 'canalized' (i.e., made into a canal) the eastern section of the River with the help of movable dams and locks; these dams permit Mohawk water levels to be increased during the navigation season (10-12 feet) to allow for the passage of commercial barges and then returned to normal (4-6 feet) in the winter. The riverine nature of this section of the Canal presented the Task Force with an unusual set of challenges and opportunities revolving primarily around potential strategies to address flooding.



Ice jam at Lock E-8, near Schenectady, NY

THE MOHAWK REGION

Mitigating Ice Jams

Ice jams are perhaps the most unique phenomenon native to this stretch of the Canal. Whereas flooding typically happens during springtime melts of snowpack or during heavy rainfall events at other times of the year, ice jams generate flood risk to Mohawk River communities during the winter. They typically occur when warming temperatures and heavy rains cause snow and ice to melt rapidly. As river waters rise and river discharge increases, the surface layer of ice breaks into chunks that are carried downstream by the rushing waters; the chunks lodge against one another, pushing river water into communities adjacent to the jams and causing significant structural and environmental damage, as well as health and safety risks.

On behalf of the Task Force, BuroHappold, with technical assistance from NYPA, convened an Ice Jam Mitigation Panel to review the historical ice jam-related flood events in the Mohawk River, identify changes in climate and river conditions contributing to future ice jam formation, and determine ways that canal and NYPA infrastructure could be used to reduce or eliminate this threat. The Panel was comprised of representatives from the Canal Corporation, NYPA, US Geological Service, US Army Corps of Engineers, and academic experts - including Task Force member Dr. John Garver of Union College.

A bathymetric survey of the ice jam-prone areas was commissioned by NYPA and used by Dr. Hung Tao Shen of Clarkson University, a global expert in ice jam hydraulics, to develop a highly-sophisticated ice jam model which allowed Panel members to better assess both the causes of ice jams and the impact of various potential solutions.[1]

The Ice Jam Panel considered ten potential interventions and recommended four for further analysis, noting that more modeling work and/or further analysis would need to be done to determine the specifics of each intervention as well as their combined impact:

1. Using specialized ice breakers/cutters to physically break up ice jams in hotspot areas
2. Modifying the Vischer Ferry Dam crest to better manage water flows, and potentially "flush out" ice jams
3. Modifying the Mohawk River channel through dredging and filling activities to alleviate choke points to water flow which contribute to ice jam formation
4. Deploying an Early Monitoring and Warning System that will better predict ice jam formation and flooding, providing communities and emergency managers more lead time to prepare for flood events

These potential interventions were presented to the Mohawk Region subcommittee and subsequently to the full Task Force by Dr. Garver of Union College and endorsed by all. A number of Task Force members who live in the Mohawk Valley stressed the importance of mitigating ice jams, not only for the hardest-hit areas around the Stockade District in Schenectady but also for other areas such as Herkimer and Little Falls. They also noted that the current warning system is ineffective, as emergency managers cannot forecast when ice jam flooding is going to occur. Enhancing this system to better forecast these events and warn people in advance would be a significant benefit for communities.

The findings by the Task Force are follows:

- **In conjunction with NYS Office of Emergency Management, US Geological Survey, and the National Weather Service, develop an Early Warning System (EWS) for ice jams in the lower Mohawk and identify an approach for developing similar system to address ice jams in Herkimer County**
- **Assess alternative designs, and recommend one or more approaches, for modifying Vischer Ferry Dam with Obermeyer gates (pneumatically-actuated crest gates) to maximize reduction in ice jam and summer flooding impacts**
- **Assess (and subsequently recommend) potential river channel modifications to mitigate ice jams, including considerations of negative or positive impacts on summer flooding and the environment**
- **Further quantify effects of using ice breakers/cutters, including any downstream impacts, and identify appropriate equipment/deployment locations**



Ice jam-related flooding in the Stockade District, Schenectady, NY

1 *Prior to this survey, NYPA/the Canal Corporation had only rudimentary surveys of the bathymetry of the area, rendering any predictive modeling extremely limited.*



Fort Plain, NY, June 2006

THE MOHAWK REGION

Mitigating Summer Flooding

Mohawk River flooding is documented back to the 17th century, but the 'canalization' of the River in the 20th century is generally agreed to have exacerbated the problem by placing additional structures in the river.[1] In recent times, Hurricane Irene (August 2011) and Tropical Storm Lee (September 2011) wreaked havoc in areas around Schenectady and Amsterdam, wiping out bridges and destroying homes; Fort Plain and Canajoharie were flooded in July 2006 and June 2013. Most recently, heavy rains in late-October 2019 caused record-level flooding in Little Falls and Utica. Climate predictions suggest that the frequency of floods in this region will double over the next two decades, and that the magnitude of floods will increase by 15 to 20 percent.

Bergmann Associates, an engineering consultancy with expertise in Mohawk River flood mitigation, was contracted to identify potential interventions to reduce flood risk, model these interventions to assess their benefits, and provide associated cost estimates. Bergmann assessed a wide variety of solutions, then undertook analysis of six interventions that fell into three categories:

1 **Infrastructure modifications:** Modifying Vischer Ferry Dam's crest by adding gates that can be lowered preemptively during a flood to convey water downstream, reducing water levels in the Canal and thus mitigating flooding around Schenectady.
2 **Operational changes:**
   a. Reducing the summer water level in Delta Reservoir (that feeds water to the Mohawk River) to provide additional water retention storage, mitigating flooding in and downstream of Rome.
   b. Raising movable dams either (a) preemptively (prior to storms), or (b) permanently to allow the Mohawk River to flow at its natural (lower) water level.
3 **Channelization improvements:** Using portions of the Canal where the Mohawk and the Canal are bifurcated (around Little Falls, Herkimer, and between Rome and Utica) as surge basins during floods, in order to reduce peak flows in the Mohawk River to mitigate flooding in those areas.

Bergmann presented these findings to the Task Force, noting that several of the potential interventions would impact water levels on the Mohawk portion of the Canal. These interventions would not, however, impact the majority of local, recreational boaters.

The Mohawk Region Task Force Subcommittee met multiple times to discuss Bergmann's potential solutions. Some members welcomed the ability to adapt canal infrastructure to tackle flooding issues related to climate change and capture the ecosystem benefits that result from 'naturalizing' a river; others were opposed to interventions that could impact the ability of deep-draft vessels to navigate the Mohawk. It was noted that moving to a more natural Mohawk River would not eliminate flooding, but would contribute significantly to reducing its effects. It was also noted that the interventions that would have the highest flood mitigation impact would also have significant ecosystem benefits. Other Task Force members noted that any intervention that affects water levels in the Mohawk could impact businesses (such as marinas, restaurants, and shops), since deep-draft long-distance boaters spend more heavily than local boaters and would be forced to shift to the Champlain stem of the NYS Barge Canal system to access the Great Lakes from the Hudson.

Subcommittee members were curious to know more about the flood resilience efforts that the Canal Corporation had undertaken to date. It was noted that after Hurricane Irene, the Canal Corporation retrofitted movable dams in the Mohawk so they could be preemptively raised during a flood event to reduce water levels. However, this has not proved to be effective because the Canal Corporation requires at least two days' notice before a storm to alert boaters on the system; the forecasting system rarely provides that amount of advance notice and is subject to inherent uncertainties in weather forecasting.

Collectively, the Task Force recognized the value that flood reduction opportunities present, but did not come to a consensus as to how best to balance the goals of maximizing flood mitigation and maintaining navigability for deep-draft (long-distance) boaters. The Task Force accordingly recommended further evaluation of economic and environmental costs, benefits, opportunities, and impacts, before a decision is made to pursue one or more interventions.

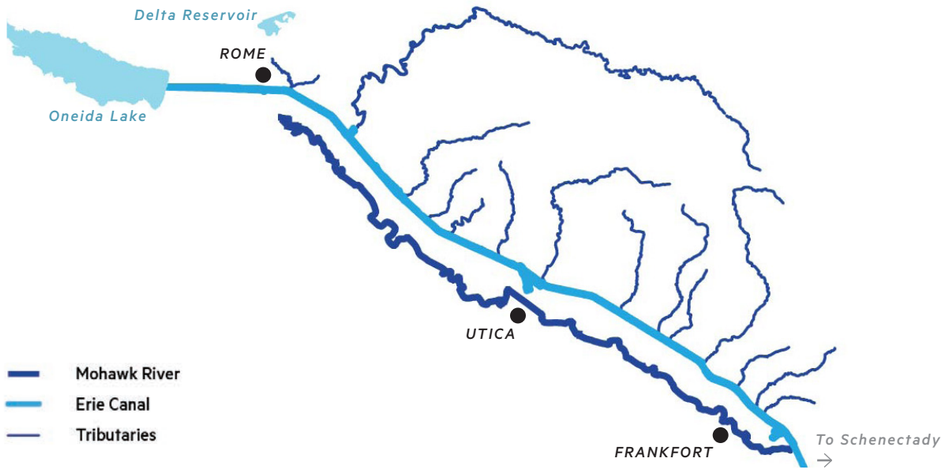
Members also asked that further work be done to consider compromise positions, such as reducing the depth of the Canal to maintain navigation and limiting full or partial draft navigation to a shorter navigation season. The Task Force agreed that the existing forecasting system needs to be improved to allow communities and NYS agencies to better plan for flood events.

The findings by the Task Force are follows:

- **Further evaluate the following interventions to use Canal infrastructure to mitigate flooding in the Mohawk River, including assessing positive and negative impacts on navigation, local communities and businesses, and the environment:**
  - **modification of Vischer Ferry Dam crest**
  - **changes to Delta Reservoir operating water levels**
  - **creation of in-channel stormwater retention basins and diversions (between Utica and Rome, Lock E-16 and MD 12, and Lock E-18 and MD 14)**
  - **changes to movable dam operations**
- **Investigate the impact and value of enhancing the Flood Warning Optimization System (FWOS) on flood forecasting and Canal operations**

1 *Although historic preservation focus is on the building and use of the Erie Canal, Task Force members noted the rich history of Native Americans and colonial settlers using the Mohawk River before it was industrialized.*

Mohawk River tributaries and the Erie Canal



THE MOHAWK REGION

Restoring Tributary Connections with the Mohawk River

The Mohawk River was substantially altered by the Erie Canal's construction. Between Rome and Frankfort, the Canal was built parallel to the River, which had the effect of intercepting Mohawk tributaries prior to their connection to the main stem of the River. This isolated the Mohawk River from over a third of its watershed and undermined its natural flow, impacting water levels, quality, and temperature as well as fish connectivity. The Nature Conservancy was asked to evaluate the potential to restore the River's watershed and riparian ecosystems in this reach by reconnecting the disconnected tributaries to the River's main stem.

The Nature Conservancy concluded that the impact of reconnecting tributaries could be profound, and identified potential reconnection opportunities using aerial imagery. Identifying these potential 'reconnection reaches' allowed the Conservancy to evaluate their feasibility, assuming a future scenario in which this stretch of the Canal is largely naturalized. Given the nascence and complexity of restoration techniques, the Conservancy conceived of a phased approach that would start conservatively with the simplest reconnections and progress to those of increasing ecosystem complexity and ecological benefit. This implementation sequence was recommended to allow the lead agency to develop experience with such restoration practices and build trust with other stakeholders.

This research was presented to the Task Force to consider. While concerns were raised about the strategy's incompatibility with the maintenance of high water levels (i.e., deep-draft navigation) in this reach of the Canal, the long-term nature and complex mechanics of this suite of interventions was also recognized. There was a consensus that the strategy could have significant ecotourism and ecological benefits, but that its implementation should be contingent on other Task Force findings. In acknowledgement of this contingency, further study was recommended, beginning with an evaluation of pilot reconnection opportunities that have minimal impact on water levels and navigation.

The findings by the Task Force are follows:

- **Evaluate options for a tributary reconnection pilot that has minimal impact on existing Canal operations**
- **Determine whether tributary reconnections align with the future hydrologic state and management regime of the Canal System**
- **If so, study the feasibility, ecological, operational and economic impact of tributary reconnections**



Healthy riparian corridors

TASK FORCE FINDINGS

SYSTEM-WIDE PLACEMAKING AND ACTIVATION

Over the last 50 years, upstate New York has seen a decline in economic activity concurrent with a decline in industrial manufacturing and shipping. Once an engine of New York State's economic growth, today's upstate communities are uniformly smaller than they were a century ago – though they remain centers of education, health care and government among other industries. Despite historic declines in manufacturing industry once situated along the Canal, population remains concentrated along the waterways: roughly 80 percent of New York's upstate population lives within 25 miles of the four canals that comprise the NYS Barge Canal system.

The *Reimagine the Canals* effort seeks to reverse this long-term decline in population and offers recommendations to stabilize and grow upstate communities and economies. The Task Force has identified strategies that will use the Canal and its companion trail as a catalyst to support local populations, introduce novel forms of waterfront development to improve quality of life, promote economic development through tourism that activates canalside properties and destinations, and improve the health and well-being of upstate residents through expanding access to outdoor recreation.

Task Force findings aim to capitalize on the momentum that recent state initiatives have set in motion. The Empire State Trail is close to completion - realizing the vision of an interconnected, state-wide, multi-modal trail system. New York's Downtown Revitalization Initiative, Restore NY, and Local Waterfront Revitalization Program among others now provide well-organized funding opportunities to help reinvigorate downtowns and waterfront communities, while Taste NY and I LOVE NY represent marketing efforts that champion New York's products and destinations. The operational improvements and activation opportunities outlined below should be viewed as complementary to these efforts, focusing on ways the Canal itself might accelerate revitalization efforts.



Bellamy Harbor Park, Rome, NY

SYSTEM-WIDE PLACEMAKING

Operational Improvements

A series of recommended operational improvements were identified over the course of Task Force deliberations. These priorities emerged from discussions among Task Force members, reports and presentations submitted by subject matter experts, letters from canal constituents, stakeholder focus groups, and the Rockefeller Institute's community engagement events and online platform.

The Task Force found that the Canal Corporation should:

- **Serve the needs of existing constituencies while appealing to new ones:** The NYS Barge Canal system is widely used by recreational boaters and residents of canalside communities. Given the presence of so many universities across the Erie spine, there is an opportunity to expand the Canal's user base to younger and more diverse populations. More active forms of outdoor and water-based recreation and cultural programming were two of many ways identified to attract a younger demographic.
- **Finish building out a comprehensive set of trail amenities:** The Canal and the Empire State Trail should be seen as two parts of one network. Completion of the Empire State Trail highlights the need for more trail amenities to activate it, connect it to the waterway, and ensure that it appeals to a broad audience that includes local families and youth as well as visitors.
- **Establish better coordination between entities that have a stake in the Canal:** With different geographies and hydrologic conditions across its length, the Canal has many stewards and champions. Enhanced coordination between municipalities, state agencies, non-profits, business owners and residents is required to ensure that resources are well-prioritized and that organizations are not competing with one another for them.
- **Enhance ties to educational institutions to celebrate the Canal's history, reimagine its future, and engage its ecology:** Upstate New York is rich in academic institutions, many of which grew around expertise developed during the Canal's construction. Universities and colleges along the Canal



Waterford, NY

corridor can be incubators for new projects, ideas and programs to transform the Canal corridor, while local schools can be tied more closely to the waterway as a source of experiential and academic learning.

- **Maximize connectivity between the Empire State Trail, New York State Canalway Water Trail, and adjacent communities:** More connections – bridges, pathways, and access points between the trails, canal, and local communities – are needed to expand recreational usage, improve quality of life, and ensure that local businesses capture benefits from an expanded user base.
- **Address the issue of water quality to maximize recreational possibilities and support municipalities who draw drinking water from the Canal:** Canal infrastructure presents unique opportunities to cost-effectively introduce new forms of water recreation. Without clean and healthy water, however, the benefits of these facilities will be limited and ultimately undermined.
- **Enhance the branding, image, and advertising for the Canal System:** The New York State Canal System is a historical gem, but is largely unknown in the US outside certain niche audiences. A coordinated branding and communications strategy is needed to draw additional visitors from other parts of the country and expand the number of foreign visitors.
- **Find ways of increasing revenue, including considering the use of lockage fees:** Use of the Erie Canal is free to long-distance boaters, many of whom consider it a "short-cut" to get from New York to the Great Lakes (without having to travel through the St. Lawrence Seaway) and all of whom pay tolls or usage fees elsewhere. Separately, considerable land along the Canal not needed for operational purposes lies fallow and could be developed. These and other revenue opportunities should be pursued to help offset the cost of maintaining the Canal.



Cayuga Lake whitewater course at Lock CS-1

SYSTEM-WIDE PLACEMAKING

Expanding Water Recreation



Existing conditions

The Canal's extensive early 20th century water management infrastructure offers unique opportunities for 21st century forms of water recreation – e.g., swimming, fishing, kayaking, rafting, floating, ice-skating, and paddleboarding in addition to motorized boating. Access to water recreation in all of its forms can help create world-class destinations, enhance quality of life in local communities, and offer youth—as well as people of all ages and abilities—the chance to learn new skills and stay healthy. New recreational opportunities can build on the New York State Canalway Water Trail, which runs alongside the Empire State Trail for much of its length and incorporates 524 miles of interconnected canals, lakes, and rivers.

The Task Force discussed various locations for new water-based recreational opportunities, among them a potential whitewater course at the top of Cayuga Lake adjacent to the Montezuma National Wildlife Refuge, an outdoor "water park" along the Mohawk River in Utica, a float course and winter ice park adjacent to Bellamy Park in Rome, and the expansion of waterskiing activities in Amsterdam. These and other opportunities that build on the expanding popularity of recreational water uses should be evaluated.

Task Force Findings:

- **Develop new water recreation destinations to attract a more diverse audience to the Canal and enhance health and well-being**



Hydro-powered illumination of movable dams in the Mohawk Valley

SYSTEM-WIDE PLACEMAKING

Celebrating "Iconic Infrastructure" Destinations

Much of the Canal System's infrastructure is unique to its place and time, and – like the Erie Canal before it - represents the ambition and prowess of the State's engineering heritage. These include locks, movable dams, lift bridges, guard gates, reservoirs and more. As part of the Erie Armada, a multi-day festival and *Reimagine the Canals* competition winner, Lock 30 near Macedon Canal Park was transformed into an iconic overnight destination; this included evening cruises on the *Colonial Belle* canal boat to experience a temporary lighting installation, demonstrating a new model for after-dark canal engagement.

Iconic and interactive lighting installations represent one among many ways of celebrating these historic structures, by offering programming opportunities for local communities and serving as an attraction for tourists year-round. Lighting projects along post-industrial waterways have contributed to redevelopment in former industrial centers across the globe – for example, Providence, Rhode Island's WaterFire festival or Central Scotland's 150-foot Kelpie sculptures. Like the historic bridges found in European capitals, the Canal offers the authenticity that comes with experiencing historic waterway infrastructure.



Existing conditions

Task Force Findings:

- **Invest in "iconic infrastructure" destinations that celebrate the future by drawing attention to the waterway's past and attracting local visitors and tourists**



Adaptive reuse of Guy Park Manor and new connection to the Empire State Trail, Amsterdam, NY

SYSTEM-WIDE PLACEMAKING

Expanding Overnight Accommodation



Existing conditions

Overnight accommodation options along the spine of the Erie Canal are at present uneven – easy to find in the larger cities and towns, but few and far between in smaller and more rural locations. Enhancing the supply of lodging options is one way to amplify canalside tourism and expand the economic benefits visitors bring to canalside towns. Extending stays mean more engagement with cultural and recreational assets, more traffic to restaurants, and more support for a variety of retail businesses – from canal tours to shops to sporting outfitters.

Numerous paths to expanding these options can be pursued simultaneously. Glampsites, a combination of "glamour" and "camping," offer unique outdoor camping experiences and can be established on state land along the Canal or Empire State Trail in close proximity to local businesses.[1]

For those looking to engage with the Canal's history, the adaptive reuse of industrial and commercial buildings as well as private residences offers considerable appeal. Unused canal powerhouses, which once provided hydropower to locks, provide a particularly robust opportunity for accommodation. They are located across the Canal System, making them ideal for long-distance travelers, and were built in a uniform style, offering a distinct branding and marketing opportunity.

Task Force Findings:

- **Expand overnight accommodation, such as camping, 'glamping' and adaptive reuse of historic structures for hospitality**

1 *The Erie Armada, a multi-day festival and Reimagine the Canals competition winner, featured glamping tents designed by a Buffalo-based interior designer and enabled festivalgoers to forgo cars and take full advantage of the wide range of activities that the Erie Armada offered.*



"Pocket Neighborhood" development, Canastota, NY

SYSTEM-WIDE PLACEMAKING

Transforming Industrial Property

The properties along the Canal reflect its industrial past, with underutilized or abandoned warehouses and factories occupying significant waterfront real estate. These industrial areas are slowly starting to be transformed with new types of businesses, residences, and recreational opportunities. By transforming the contaminated site of the defunct American Locomotive Company (ALCO) in Schenectady into a new marina, casino, hotel, retail, offices, and homes, the Mohawk Harbor project points the way towards a vibrant, mixed-use future for the revitalized canal waterfront. Smaller towns have also seen waterfront transformations, including the Residences at Canalside, which extends Fairport's walkable downtown, and the continued investments made at Pittsford's Schoen Place, widely considered one of the most charming spots on the entire Canal.

The Canal Corporation owns thousands of acres of upstate land, and has historically been willing to both grant permits and to sell, lease, or transfer property to facilitate new canalside projects. More can be done to incentivize these transformations, building on existing NYS programs such as the Downtown Revitalization Initiative, BOA, Restore NY, and a series of other grant programs now overseen by the Regional Economic Development Councils (REDCs) for each region. The Canastota Pocket Neighborhood, a *Reimagine the Canals* competition winner being undertaken by Madison County, provides one model; it will offer townhomes and cottages, communal workspaces and gardens, walking paths to nearby shops and restaurants, and direct access to the Canal.



Existing conditions

Task Force Findings:

- **Facilitate canalside development on Canal Corporation-owned land and other public and private lands**



Connecting the College at Brockport to the Empire State Trail

SYSTEM-WIDE PLACEMAKING

Connecting Communities to the Empire State Trail



Existing conditions

When it is completed in 2020, the Empire State Trail will be the United States' longest multi-use trail, connecting Montreal with New York City and Albany with Buffalo. New York State has already committed $200 million to completing the project, which will include "gateways" and "trailheads" replete with amenities such as parking, picnic tables, and self-service bicycle "fix-it" stations. The Trail's smooth grade and ADA compliance will make it accessible to a wide array of visitors.

Yet connections between the Trail and the communities through which it passes between Albany and Buffalo remain uneven, and in some places are convoluted or non-existent. In Brockport, for example, the Trail along the Canal runs opposite the College at Brockport, but its students cannot access it directly. Here and in other places, canal infrastructure – guard gates, movable dams, and other forms of water control infrastructure – can be retrofitted to serve as the backbone for pedestrian and bike connections that do not currently exist.

Task Force Findings:

- **Connect local education, cultural and community destinations to the Empire State Trail**



Interactive lighting installations to connect to the Empire State Trail

TASK FORCE FINDINGS

THE FUTURE

Waterways have played a prominent role in societies throughout time; indeed the industries they fostered and the trade they facilitated form a large part of the story of civilization. Across the United States, vestiges of late nineteenth and early twentieth-century canals, waterside factories, and mills pay homage to the industrial revolution that transformed a largely unpopulated and unheralded place into a global superpower. No example of this rich history is more recognized than the man-made Erie Canal, a symbol of the ingenuity, determination and political will, that made our nation.

In contrast to the silent mills, crumbling dams, and remnants of canals that can today be found in post-industrial towns across America, the Erie Canal offers something wholly unique: it is still functioning. Though its mission as a commercial waterway is long gone, its extraordinary network of robust water control infrastructure can, as it was in the early 20th century, be reimagined – and adaptively reused to meet the 21st century challenges that threaten upstate communities. The Task Force's findings identify just some of the opportunities at hand: water for irrigation, fishing, and ecological restoration, and infrastructure for place-making and to combat invasive species, ice jams, and flooding. Undoubtedly, further reflection and study will identify more.

As one member of the Task Force noted, the question that confronts us is no longer "what is the canal for?," but rather "who is it for?" The Task Force answered that question clearly, in acknowledging that the waterway no longer

serves anonymous barges making their way between New York City and the Great Lakes markets but now needs to be deployed to improve the lives of people in the communities of upstate New York. This report sets the stage for an ambitious reimagining of the Canal as a local amenity and an attraction for both old and new constituencies – a source of newfound resilience, a pillar of cultural identity, and an engine of economic development.

Though the direction of further 'reimagining' work is clear, the process of identifying and then implementing the specific programs and interventions that will bring most value to communities will be challenging. Protecting canalside towns from the ravages of climate change will demand new ways of using the State's most precious resource – its water – and new ways of operating the infrastructure that carries it across the State. Maximizing economic development in communities abutting the Canal will require new and different forms of investment than those that have historically served to maintain the Canal in its original state.

The issues are complex and technical, and solutions are unlikely to be without controversy due to the wide range of stakeholders involved. Balancing the interests of those who rely on the Canal for their health, safety and quality of life – floodplain residents, waterfront property owners, hikers and boaters, fishermen and birders – with those who rely on it for business – developers and retailers, tour companies and marina operators – will not be easy. Thoughtful collaboration and inclusive discussion at a scale much wider than that undertaken by the Task Force will be required over the coming years. Compromises will need to be found and agreed upon; so too will new resources – for scientific studies, for community engagement, and for the physical interventions that this report has identified.

Adapting the Canal for the next century does not mean walking away from its past. To the contrary, addressing the challenges of climate change, invasive species, and water quality is perhaps the safest way to ensure that this unique waterway recaptures its historic role as an economic engine for those who live along its path – strengthening local economies, reducing vulnerability to flooding, protecting and reviving ecosystems, and ensuring healthy levels of investment across its reach. New York has always been a national leader in progressive and creative thinking: successfully ushering in the "third coming" of the iconic Erie Canal will provide a global example of how the past can once again be put towards the service of the future.

Potential walkway across the Waterford Flight

ACKNOWLEDGEMENTS

The *Reimagine the Canals* Task Force would like to extend special thanks to a diverse group of people and organizations, without whom this report could not have been accomplished.

The Rockefeller Institute at the State University of New York ably mounted and delivered a comprehensive program of outreach to canal stakeholders, led by Laura Schultz and Robert Turner, during the summer of 2019. In addition to organizing five public workshops across the Canal corridor, the Institute hosted an online platform for the public to provide input and comments for the future of the Canals. This robust public engagement process was critical to ensuring that a wide cross-section of voices were heard by the Task Force. Additionally, the Task Force would like to thank stakeholders who participated in focus groups, generously lending their expertise to relevant discussions.

The work in this report relies in large part on the skill and insight of technical consultants. Dana Postlewait and MaryLou Keefe at R2 Resource Consultants performed a thorough analysis of potential strategies to prevent the spread of aquatic invasive species through the Canal System. Dr. Hung Tao Shen and Dr. Fengbin Huang at Clarkson University and Dr. John Garver from Union College lent their unique expertise in ice jam hydrology to develop ice jam models based on new bathymetric surveys of the Mohawk Valley as members of the Ice Jam Mitigation Panel. The rest of the ice Jam Mitigation Panel participants included Stephen Couch and Roman Rakoczy from the US Army Corps of Engineers, Chandler Engel and Joseph Rocks from Cold Regions Research and Engineering Laboratory, Chris Gazoorian from US Geological Survey, as well as experts from NYPA and Canal Corporation. Kenneth Avery and Jim Guistina from Bergmann Associates and Bo Juza from Aquatrend, LLC lent their extensive engineering expertise with the Canal to identify potential strategies to mitigate flooding in the Mohawk Valley. Dr. Andrew Peck, Rebecca Shirer and Kristen France at The Nature Conservancy identified potential opportunities for restoring tributary connections to the Mohawk River; The Nature Conservancy's David Klein identified and assessed specific wetland restoration opportunities. Dr. Steven Shaw at SUNY College of Environmental Science and Forestry proposed the idea for using the Canal for irrigation of western NY farms and then studied the possibilities in great detail. Thomas McDonald, a NYS Outdoor Fishing Guide and Waterways Dam Safety Manager at NYPA, developed strategies for enhancing recreational fishing in Western New York.

Various staff members from New York State agencies were appointed by their respective commissioners to serve on the Task Force. They provided valuable information on existing state initiatives and knowledge to the Task Force on various issues discussed. These staff members included Brian Stratton from the Canal Corporation, Matt Marko from NYS Department of Environmental Conservation, David Valesky from NYS Department of Agriculture and Markets, Sarah Crowell from NYS Department of State, Ross Levi, Tamara Mayberry, Jim Fayle and Daniel Kolinski from Empire State Development, and Alane Ball-Chinian, Robert Hiltbrand, Mark Mistretta, and Daniel Mackay from NYS Office of Parks, Recreation and Historic Preservation.

The SUNY College of Environmental Science and Forestry, The College at Brockport, the Rochester Chamber of Commerce, the Rockefeller Institute of Government, the NYS Fairgrounds, Orleans County Tourism, and Orleans County Cornell Cooperative Extension generously provided space and catering that facilitated multiple task force meetings and stakeholder focus group sessions.

Graphic support was provided by many talented firms and individuals. The graphic design and layout of this report document was provided by Pure+Applied with the talent of Paul Carlos and Ciara Mitchell. Drone photography was provided by Lenny Pridatko. Matthew Urbanski and Jack Ohly at Michael Van Valkenburgh Associates (MVVA) provided input on the concepts for iconic destinations and creative adaptive reuse of Canal infrastructure and generated the rendering visualizations for these concepts. Lighting design and visualization was provided by Enrique Peiniger, Jean Sundin, and Markus Fuerderer at the Office for Visual Interaction. The Brockport Loop bridge designs and visualization were developed as part of a related pre-feasibility study that included designs by WXY Architecture and Urban Design, SHoP Architects, CLUAA, and John Ronan Architects as well as engineering support from Davood Liaghat at BuroHappold Engineering.

Stephanie Obkirchner from Amsterdam, NY contributed the image on the back cover of the report and the Erie Canalway National Heritage Corridor shared the photograph of the Albany Symphony's 2017 Water Music event in Amsterdam on pg. 20.

The work in this report could not have been done without the expertise and cooperation of the staff at the New York Power Authority and the New York Canal Corporation, among many others Gil Quiniones, Joseph Kessler, Kimberly Harriman, Thomas McDonald, Cindy Brady, Alex Brey, James Candiloro, Rob Daly, Robert Knowlton, Peter Ludewig, Brian Saez, Frank D'Eufemia, Chris Carey, Steve Gosset, John Joyce, Erin Nolan, Randy Kreus, Jeff Cohen, Darby Racey, Sharon Leighton, Jackie Schillinger, Sasha Eisenstein, and most notably Howard Goebel - whose decades of experience with the Canals and dedication to the *Reimagine the Canals* initiative has been integral to this effort.

And, finally, for bringing together dozens of stakeholders, managing multiple technical consultants, and providing insights, ideas, and enthusiasm, the Task Force would like to thank the staff of its secretariat BuroHappold Engineering, working under the direction of Kate Ascher, including: Adam Friedberg, Sabina Uffer, Alice Shay, Shivam Jumani, Josh Margul, Ian Nicholson, David Bigio, Anna Hippee, Samantha Fox, Huanyu Chen, and Luyun "Aurora" Shao.

APPENDICES

APPENDIX A

Technical Analysis and Sub-consultants

A wide group of sub-consultants, shown below, were commissioned to undertake technical analysis for each of the topics under evaluation by the Task Force subcommittees.

Region	Topic	Consultant	Report title
Mohawk Region	Mitigating summer flooding	Bergmann Associates	*Mohawk Flood Assessment Report*
	Eliminating ice jams	Ice Jam Mitigation Panel comprised of US Geological Service, US Army Corps of Engineers, Dr. John Garver (Union College), Dr. Hung Tao Shen and Dr. Fengbin Huang (Clarkson University), Canal Corporation, NYPA	*Ice Jams in the Mohawk River Valley*
	Restoring previously disconnected tributaries to the Mohawk River	The Nature Conservancy	*Restoring Tributary and River Connections in the Mohawk Valley*
Central Region	Preventing the spread of aquatic invasive species through the Canal System	R2 Resource Consultants	*Erie Canal Aquatic Invasive Deterrent Study*
	Restoring and creating wetlands	The Nature Conservancy	*Restoring Wetlands in the Central New York Canal Region*
Western Region	Expanding irrigation	Dr. Stephen Shaw, SUNY's College of Environmental Science and Forestry	*Expanding Irrigation in Western New York Using Canal Water*
	Enhancing recreational fishing	Thomas McDonald, NYPA	*Opportunities for Enhancing Recreational Fishing in Western NY*

Additionally, SUNY's Rockefeller Institute of Government report on the community engagement process is available at the following link: https://www.ny.gov/sites/ny.gov/files/atoms/files/Rockefeller_Institute_Reimagine_the_Canals_Community_Engagement_Report.pdf.





Light installation and programming at Erie Armada in Macedon, NY

APPENDICES

APPENDIX B

Stakeholder Meetings and Focus Groups

BuroHappold organized stakeholder meetings, phone calls and focus groups on specific topics to further explore the concepts raised in the public workshop sessions and garner input on opportunities being addressed by the Task Force. A list of people involved in these meetings and related calls follows.

Water recreation

- Marie Cramer, Canal New York, Task Force member
- Maureen Doyle, Central NY Waterways, Task Force member
- Leslie Becraft-Corrigan, Winter Harbor Marina, Task Force member
- Bruce Van Hise, Corn Hill Navigation/ Sam Patch Tours, Task Force member
- John Courain, Genessee Waterways Center, Task Force member
- Kim Russo, America's Great Loop Cruisers' Association
- Barb Castor, Boaters Industry Association of Upstate NY

Historic preservation

- Bob Radliff, Erie Canalway National Heritage Corridor, Task Force member
- Derrick Pratt, Old Erie Canal Community Working Group, Task Force member
- Jean MacKay, Erie Canalway National Heritage Corridor
- Erin Tobin, Preservation Society of NYS
- Jay DiLorenzo, Preservation Society of NYS

Recreational fishing

- Ron Bierstine, Oak Orchard Tackle & Lodge, Task Force member
- Jessie Hollenbeck, Wide Sky Fly Fishing
- Dave Agness, Trout Unlimited/OASIS Adaptive Sports/Project Healing Waters Fly Fishing
- Lindsay Agness, Lindsay Agness Fly Fishing Guide Service
- Danny Evans, Lone Wolf Sport Fishing
- Web Pearsall, NYSDEC
- Dawn Borchert, Orleans County Tourism Director
- John DeFilipps, Orleans County Legislator
- Ken DeRoller, Orleans County Legislator

Trail recreation

- Andy Beers, Empire State Trail, Task Force member
- Robin Dropkin, Parks and Trails NY, Task Force member
- Bob Radliff, Erie Canalway National Heritage Corridor, Task Force member
- John Robinson, Our Ability, Task Force member
- Derrick Pratt, Erie Canal Museum, Task Force member
- Sasha Eisenstein, Canal Corporation
- Kathy Moser, Open Space Institute

Wetlands restoration

- David Klein, The Nature Conservancy
- Neil Murphy, SUNY-ESF, Task Force member
- Chris Lajewski, Montezuma Audubon Center, Task Force member
- Matt Marko, NYSDEC
- Emily Sheridan, NYSDEC
- Elizabeth Tracy, NYSDEC
- Jean Foley, NYSDEC
- Jana Lantry, NYSDEC
- Mike Wasilco, NYSDEC
- Frank Morlock, NYSDEC
- Scott Healy, NYSDEC
- Bill Stewart, US Fish and Wildlife Service
- Maria Goula, Cornell University
- Jamie Vanucchi, Cornell University
- Sandi Bastedo, Cornell Cooperative Extension

Invasive species

- Matt Snyder, Oneida Lake Association
- Kristen Holleck, Cornell Biological Field Station
- Hilary Lambert, Cayuga Lake Watershed Network
- Jennifer Tufano Grillo, Cayuga Lake Watershed
- Kristin King, Western New York PRISM
- Andrea Locke, Western New York PRISM
- Hilary Mosher, Finger Lakes PRISM
- Gwendolyn Grace Temple, Capital-Mohawk PRISM
- Rob Williams, SLELO PRISM
- Meg Modley, Lake Champlain Basin Program
- Kathy Moser, Open Space Institute
- Rick Relyea, Rensselaer Polytechnic Institute
- Ian Smith, Finger Lakes Institute
- Stuart Gruskin, The Nature Conservancy
- Brittney Rogers, The Nature Conservancy
- Lindsay Chatterton, The Nature Conservancy
- Steve Hurst, NYSDEC
- Aimee Clinkhammer, NYSDEC
- Jean Foley, NYSDEC
- Jana Lantry, NYSDEC
- David Lemon, NYSDEC
- Matt Marko, NYSDEC
- Steven Pearson, NYSDEC
- Justin Perry, NYSDEC
- Emily Sheridan, NYSDEC
- Alexander J. Smith, NYSDEC
- Robert Breault, USGS
- Katherine Czajkowski, NYSDEC
- Judy Drabecki, NYSDEC
- Frances Dunwell, NYSDEC
- Heather Gierloff, NYSDEC
- Gregg Kenney, NYSDEC
- Sandra Keppner, USFWS
- Jacqueline Lendrum, NYSDEC
- Josh Thiel, NYSDEC
- Eric Wiegert, NYSDEC
- Cathy McGlynn, NYSDEC

Irrigation and Agriculture

- David Valesky, NYS Agriculture and Markets
- David Wolfe, Cornell Institute for Climate Smart Solutions, Task Force member
- Amanda Krenning-Muoio, NYS Farm Bureau, Task Force member
- Elizabeth Buck, Cornell Cooperative Extension
- Katie Sommerfeldt, Orleans County Soil & Water Conservation District
- Ken DeRoller, Orleans County Legislator
- John DeFilpps, Orleans County Legislator
- Craig Kahlke, Cornell Cooperative Extension
- Jeff Toussaint, Toussaint Farms
- Alan Panek, Panek Farms
- Peter Martin, Kreher Family Farms
- Maureen Torrey, Torrey Farms
- Gary Kludt, Kludt Brothers, Inc.
- Adam Kirby, A & J Farms
- Jim Kirby, A & J Farms
- Steve Nesbitt, Nesbitt Fruit Farms
- Oded Kalir
- Mike Kreher, Kreher Family Farms
- Amy Machamer, Hurd Orchards

