UNITED STATES OF AMERICA

BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

DRAFT APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT – EXISTING DAM

BLENHEIM-GILBOA PUMPED STORAGE POWER PROJECT

FERC PROJECT NO. 2685

EXHIBIT E
ENVIRONMENTAL REPORT

December 2016

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NEW YORK STATE OF OPPORTUNITY.

NY Power Authority

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Appendix A: State Historic Preservation Office Correspondence

List of Abbreviations

A.D.	anno Domini
ADA	Americans with Disabilities Act
APE	Area of Potential Effects
B.P.	Before Present
B-G Project	Blenheim-Gilboa Pumped Storage Power Project
ca.	circa
cfs	cubic feet per second
CSD	Central School District
CWA	Clean Water Act
DLA	Draft License Application
DO	dissolved oxygen
EAB	emerald ash borer
EMS	emergency medical services
ESA	Endangered Species Act
FERC	The Federal Energy Regulatory Commission
FPA	Federal Power Act
FPC	Federal Power Commission
fps	feet per second
FRO	First Responder Organization
GRP	gross regional product
HPMP	Historic Properties Management Plan
ILP	Integrated Licensing Process
kWh	kilowatt-hour
MERT	medical emergency response team
mg/L	milligrams per liter
MW	megawatt
New York SHPO	New York State Historic Preservation Office
NLEB	northern long-eared bat
NMFS	National Marine Fisheries Service
NPV	Net Present Value
NRHP	National Register of Historic Places
NRI	National River Inventory
NYCDEP	New York City Department of Environmental Protection
NYISO	New York Independent System Operator
NYNHP	New York Natural Heritage Program
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
NYSOPRHP	New York State Office of Parks, Recreation and Historic Preservation
PAD	Pre-Application Document
PM&E	protection, mitigation, and enhancement
Power Authority	New York Power Authority
Project	Blenheim-Gilboa Pumped Storage Power Project
PSP	Proposed Study Plan
RSP	Revised Study Plan
RTE	rare, threatened, and endangered

SAV	submerged aquatic vegetation
SD1	Scoping Document 1
SD2	Scoping Document 2
SUNY Cobleskill	State University of New York at Cobleskill
U.S.	United States
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
Value	Schoharie County Real Property Tax Services Office's valuation of Project lands
WI/PWL	Waterbody Inventory/Priority Waterbodies List

1 Introduction

The Power Authority of the State of New York (d/b/a "New York Power Authority" and referred to as "the Power Authority or the Applicant) is licensed by the Federal Energy Regulatory Commission (FERC or Commission) to operate the Blenheim-Gilboa Pumped Storage Power Project (B-G Project or Project) (FERC No. 2685). The Project is located on Schoharie Creek, a tributary to the Mohawk River, in the towns of Blenheim and Gilboa, New York. The Project does not occupy any federal lands.

1.1 Application

The original license was issued on June 6, 1969 and expires on April 30, 2019. As required under the Federal Power Act (FPA), the Power Authority must file with the Commission its application for a new license for the Project on or before April 30, 2017. The Power Authority is preparing its new license application for the Project in accordance with FERC's Integrated Licensing Process (ILP). The Power Authority proposes no new capacity and no new construction. The Power Authority has prepared this Exhibit E Environmental Exhibit as part of the Draft License Application (DLA) and, in accordance with 18 CFR §5.18(b), following the Commission's *Preparing Environmental Assessments: Guidelines for Applicants, Contractors, and Staff*.

1.2 Purpose of Action and Need for Power

FERC must determine whether to issue a license to the Power Authority for the B-G Project and what conditions should be placed in any license issued. In deciding whether to issue a license, FERC must determine that the Project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the developmental purposes for which licenses are issued, FERC must give equal consideration to the purposes of energy conservation, the protection, mitigation or damage to, and the enhancement of fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

FERC's issuance of a new license for the continued operation of the B-G Project will allow the Power Authority to continue producing electric power from a renewable resource for the term of the new license, while addressing the affected environmental, land use, public recreation, and cultural resources in accordance with license conditions. Exhibit E was prepared consistent with the ILP requirements as set forth in 18 CFR §5.18(b) and is designed to support FERC's required analysis under the National Environmental Policy Act (NEPA), as amended. In this Exhibit E, the Applicant assesses the environmental and economic effects of continuing to operate the Project as proposed herein. The Applicant also considers the effects of the no-action alternative.

The Project is a critical resource used by the Power Authority to meet its statutory and contractual obligations to its customers and provides cost saving benefits to the statewide grid and consumers. As discussed in Exhibit B, Section 2.3.1, the Project cycles water between two reservoirs (Upper, Lower). During periods of low demand for electricity and lower electricity prices, water is pumped from the Lower Reservoir to the Upper Reservoir. During periods of peak demand for electricity, water is released from the Upper Reservoir to the Lower Reservoir through the turbines to generate electricity.

The B-G Project is typically operated to serve these two purposes: to provide power at times of high consumer use, and to be available in a reserve mode to respond to an unanticipated loss of elements of the electric system.

The New York electric grid is expected to require greater flexibility in the future to operate reliably given expected increasing variability and uncertainty associated with larger installations of wind and solar generation. The B-G Project, a pumped storage facility, has the technical capabilities that closely match the power system's growing need for flexibility to accommodate renewable generators such as wind and solar. The B-G Project can be used effectively to serve some of the electricity storage needed to provide a consistent and reliable grid based increasingly on renewable sources.

Another significant contribution of pumped storage facilities is the ability to contribute to the more efficient use of the fossil-fueled and nuclear generation fleets. Traditional power plants such as coal-fired and nuclear plants operate more efficiently when they are maintained at a steady level of electrical output and are not subject to adjustments for constantly changing loads (i.e., cycling). Pumped storage facilities are capable of significant flexibility in operations, such that they can be used to increase load in the off-peak hours by drawing electricity for pumping water to the upper reservoir when thermal units might otherwise need to reduce generation or be shut off. Reducing the need for thermal plant cycling results in much more efficient operations, which lowers overall emissions from fuel consumption.

1.3 Public Review and Comment

FERC's regulations for the ILP require applicants to consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, and other federal statutes. Pre-filing consultation must be completed and documented according to FERC's regulations.

1.3.1 Scoping

The Power Authority filed a Notice of Intent (NOI) and Pre-Application Document (PAD) for the Project on April 10, 2014, which included preliminary study plans for the Project. The PAD provided summaries of existing, relevant, and reasonably available information related to the Project that was in the Applicant's possession or was obtained with the exercise of due diligence. The purpose of the PAD was to provide participants in the relicensing proceeding with a summary of the information necessary to identify issues and related information needs, and develop study requests and study plans.

FERC published Scoping Document 1 (SD1) for the Project on June 4, 2014, and held scoping meetings on July 7, 2014 at the Gilboa-Conesville Central School in Gilboa, New York, and on July 9, 2014, at the Best Western Inn in Cobleskill, New York, where potential issues were identified by agencies, stakeholders and the public. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of FERC's public record for the Project. FERC also held a site visit on July 8, 2014. In addition to comments provided at the scoping meetings, several entities provided written comments. Following the scoping meetings, the Commission issued its Scoping Document 2 (SD2) on September 18, 2014.

1.3.2 Studies

The Power Authority responded to comments on the PAD and study plans as well as requests for additional studies. Based on these comments, the Proposed Study Plan (PSP) was developed, which served to address and respond to all comments and requests received. The Power Authority filed the PSP with FERC on September 22, 2014. Subsequent to the PSP filing, the Power Authority held a PSP meeting on October 16, 2014. The purpose of the meeting was to provide a presentation on each individual study plan in the PSP and to provide an opportunity for meeting attendees to ask questions related to the proposed studies. FERC and stakeholders attended this meeting.

Based on comments received on the PSP, the Power Authority filed a Revised Study Plan (RSP) with FERC on January 20, 2015. On February 19, 2015, the FERC issued a Study Plan Determination approving the following studies:

- Historic Structures Survey
- Phase 1A Archaeological Survey
- Fish Entrainment/Protection Assessment Study
- Effect of Project Operations on Downstream Flooding Study
- Recreation Use/User Contact Study and Assessment of Effects the Project has on Recreation Use (approved with modification)
- Socioeconomics Study (approved with modification)

The Power Authority filed a Study Progress Report on August 19, 2015 that described each study's objectives, progress, and remaining activities. The Initial Study Report was filed on February 19, 2016 and an Initial Study Report Meeting was held on March 3, 2016. The Initial Study Report included completed study reports for the Historic Structures Survey, the Phase IA Archaeological Survey, the Fish Entrainment/Protection Assessment Study, and a portion of the Recreation Use/User Contact Study and Assessment of Effects the Project has on Recreation Use. In its Study Plan Determination letter dated June 17, 2016, FERC did not require any modifications to the completed studies or require new studies.

On September 15, 2016, an Updated Study Report was filed with FERC that included the completed reports for the Recreation Use/User Contact Study and Assessment of Effects the Project has on Recreation Use and the Socioeconomics Study.

In accordance with FERC's amended ILP process plan and schedule issued on September 6, 2016, a study report meeting was held on September 29, 2016. FERC's study plan determination on requests for new or modified recreation and socioeconomic studies is anticipated by January 13, 2017.

Also, in accordance with FERC's amended ILP process plan and schedule, the Applicant will file the completed report for the Effect of Project Operations on Downstream Flooding Study on or about February 18, 2017 and will hold a study report meeting with stakeholders on or about March 5, 2017.

2 Statutory and Regulatory Requirements

FERC's issuance of a new license for the Project is subject to numerous requirements under the FPA and other applicable statutes. The major requirements are described below. The actions that the Power Authority has taken to address these requirements are also described below.

2.1 Federal Power Act

2.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA, 16 U.S.C. § 811, states that FERC shall require construction, maintenance, and operation by a licensee of such fishways as the secretaries of the Department of Commerce (DOC) and the Department of Interior (DOI) may prescribe. During the environmental studies phase of this ILP, neither the U.S. Fish and Wildlife Service (USFWS) nor the National Marine Fisheries Service (NMFS) has raised fish passage as a potential relicensing issue. Under the Commission's ILP regulations, 18 CFR §5.23(a), and regulations of DOC and DOI, fishway prescriptions, if any, will be filed within 60 days after FERC's Notice for Acceptance and Ready for Environmental Analysis (REA Notice) following the Power Authority's filing of the Final License Application.

2.1.2 Section 10(j) Recommendations

Under the provisions of Section 10(j) of the FPA, each hydroelectric license issued by FERC is required to include conditions based on recommendations of federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the Project, unless FERC determines they are inconsistent with the purpose and requirements of the FPA or other applicable laws. During the relicensing, the Power Authority consulted with those agencies with authority to recommend Section 10(j) conditions, including USFWS and the New York State Department of Environmental Conservation (NYSDEC). Under the Commission's ILP regulations, 18 CFR §5.23(a), federal and state fish and wildlife agencies will have 60 days following the REA Notice to submit Section 10(j) recommendations.

2.2 Clean Water Act

Under Section 401 of the Clean Water Act (CWA), any federal license or permit to conduct any activity that may result in a discharge into navigable waters requires a certification from the state in which the discharge originates that such discharge will comply with the applicable provisions of the CWA, unless such certification is waived. Therefore, a Section 401 Water Quality Certification or waiver is required prior to FERC's issuance of a new license for the Project. The NYSDEC is the state agency designated to carry out the certification requirements prescribed in Section 401 of the CWA. Pursuant to 18 C.F.R. §5.23(b), the Power Authority will request Section 401 Water Quality Certification from NYSDEC within 60 days of FERC's REA Notice.

2.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

The Power Authority was granted designation as FERC's non-federal representative for ESA consultation on June 4, 2014. The Power Authority has consulted with federal agencies that manage endangered species, including USFWS. One federally listed species may occur in the B-G Project vicinity: the threatened northern long-eared bat (*Myotis septentrionalis*). The Power Authority's analysis of Project impacts on threatened and endangered species is presented in section 4.8, *Rare, Threatened, and Endangered Species*.

2.4 Coastal Zone Management Act

Under Section 307 (c)(3) of the Coastal Zone Management Act (CZMA), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification. The New York State Department of State (NYSDOS) is the agency responsible for implementing New York's coastal management program.

The B-G Project is not located within and does not affect the designated coastal zone for the State of New York. Therefore, the Project is not subject to coastal zone management review and no consistency certification is needed for the Commission's relicensing of the Project. Concurrent with the distribution of this DLA, the Power Authority is seeking concurrence from NYSDOS that the Commission's licensing of the B-G Project will not affect New York's coastal zone, pursuant to 18 CFR §5.18(b)(3)(iv).

2.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (Section 106) requires federal agencies to take into account the effects of their undertakings on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such actions. Historic properties include significant sites, buildings, structures, districts, and individual objects that are listed in or eligible for inclusion in the National Register of Historic Places (NRHP) (National Register). FERC's issuance of a new license for the Project is considered an undertaking subject to the regulations and requirements of Section 106 and its implementing regulations at 36 C.F.R. Part 800.

The Power Authority was designated as FERC's non-federal representative for Section 106 consultation on June 4, 2014. As part of its role as FERC's non-federal representative, the Power Authority developed and conducted cultural resource studies in consultation with the New York State Historic Preservation Officer and Native American Nations, as described in Section 4.10 of this DLA. The Power Authority anticipates that the Commission will meet its obligations under NHPA Section 106 through a Programmatic Agreement with the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP), which will require implementation of a Historic Properties Management Plan (HPMP) that addresses the management and treatment of historic properties identified within the Project's area of potential effects.

2.6 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal agencies to consult with NMFS on all actions that may adversely affect Essential Fish Habitat (EFH). No designated species or habitats designated under the Magnuson-Stevens Act occur within the B-G Project boundary; therefore this act is not applicable to the relicensing of the Project.

3 Proposed Actions and Alternatives

This section outlines the No-Action Alternative as defined by the FERC, the Power Authority's Proposed Action and alternatives considered by the Power Authority but eliminated from further analysis.

3.1 No-Action Alternative

The No-Action Alternative would allow the Power Authority to continue B-G Project operations under the terms of the current license, including maintaining the current Project boundary, facilities, and operation and maintenance procedures. No new environmental protection, mitigation, or enhancement measures would be implemented. FERC uses this alternative to establish baseline environmental conditions for comparison with other alternatives

3.1.1 Existing Project Location and Lands

The Project is located on Schoharie Creek in the northern Catskill Mountains, approximately 40 miles southwest of Albany in the towns of Blenheim and Gilboa, New York. The FERC Project boundary encompasses 2,893 acres of land including the two reservoirs which have a total surface area of approximately 812 acres. The downstream Project boundary extends 1.2 miles north of the Lower Dam, along Schoharie Creek to State Route 30 (Figure 3.1.1-1).

3.1.2 Existing Project Facilities

The Project consists of an Upper Reservoir and Dike, a Lower Reservoir and Dam, conduits connecting the reservoirs and an underground powerhouse, a spillway and related facilities (Figure 3.1.2-1) The Upper Reservoir is situated on the top of Brown Mountain and was created by the construction of a dike with a crest elevation of 2,008 ft mean sea level (msl) (NGVD29). The Lower Reservoir was formed by damming the Schoharie Creek and has a crest elevation of 911.1 ft. Additional detail regarding Project facilities is provided in Exhibit A of this license application.

3.1.2.1 Upper Reservoir and Dike

At full pool elevation of 2,003 ft, the Upper Reservoir has a water surface area of 399 acres and a total drainage area of approximately 0.7 square mile. The total storage capacity of 18,791 acre-ft is comprised by 15,085 acre-ft of usable storage between operating levels of 1,955 ft and 2,003 ft and dead storage of 3,706 acre-ft below elevation 1,955 ft). The average depth at the full pool elevation is 48 ft.

Three sides of the Upper Reservoir are formed by a U-shaped, 2.25 mile-long earth and rock-filled embankment called the Upper Dike (National Inventory of Dams (NID) NY00691). The fourth side of the Upper Reservoir is formed by the existing slope of Brown Mountain. The Upper Dike has a maximum height of 110 ft above existing ground and 162 ft above bedrock. The crest is 30 ft wide at elevation 2,008 ft. The dike is a homogenous, glacial till, and rolled fill structure with toe blanket or toe blanket and chimney drains in it with the exception of the shallowest sections.

The Upper Reservoir has an emergency spillway located at the northeastern corner of the Upper Dike to pass flows in the unlikely event of over-pumping. In such an event, flows would be discharged over the emergency spillway and down a slope of natural terrain before entering Schoharie Creek downstream of the Lower Dam. The 655-ft-long spillway has a 25-ft-wide asphaltic concrete crest and it is armored with

riprap on the upstream and downstream slopes. The emergency spillway's crest elevation is 2,005 ft, which is 3 ft lower than the rest of the Upper Reservoir Embankment.

3.1.2.2 Upper Reservoir Intake Structure and Penstocks

The Upper Reservoir is connected to the powerhouse penstocks by a 28-ft-diameter, 1,042-ft-long vertical shaft inside Brown Mountain, where it is joined at a right angle to a horizontal 906-ft-long power tunnel leading to a 460-ft-long manifold. At the head of the vertical shaft is a concrete morning glory intake structure located in the northwestern corner of the reservoir. The trashracks have a clear spacing of 5.25 inches (PB Power, 2007). Approach velocities at the upper intake are approximately 3.28 fps during generation mode when all 4 turbines are operating at the reported peak discharge (12,800 cfs).

The manifold divides the flow into four 12-ft-diamter penstocks. The maximum penstock length is 1,960 feet, 1,760 ft of which is steel-lined. Each penstock delivers water to a pump-generating unit at the powerhouse.

3.1.2.3 Powerhouse

The powerhouse is a reinforced concrete-gravity structure founded on bedrock situated at the toe of Brown Mountain. The building is 526-ft-long, 172-ft-wide, and 132-ft-high and contains four Hitachi, reversible, modified, vertical Francis-type pump turbines. The turbines have seven 20-ft-diameter blades that operate at 257 revolutions per minute. The units have a reported maximum discharge of 12,800 cfs during generation and 10,200 cfs during pumping (FERC, 2006). More than three-quarters of the powerhouse is underground.

All four of the 32-year old original pump turbine generating units and spherical valves were refurbished between 2006 and 2010 as part of the $135-million Life Extension and Modernization (LEM) license amendment. The spherical control valve controls the flow of water into the pump turbine generator. Other work involved with the LEM amendment included replacement of main power transformers, circuit breakers, exciters and related equipment.

Water flows through the turbines and enters the Lower Reservoir through draft tubes which have invert elevations of 784 ft. The draft tubes are equipped with trashracks to protect the draft tube and Hitachi units when they are in pumping mode. Each draft tube has an upper and lower trashrack. The upper trashrack has a clear spacing of 5.25 inches while the bottom one has a clear spacing of 5 5/8 inches (NYPA, 2011). Approach velocities at the draft tube are approximately 1.38 fps when the units are operated in pumping mode.

Lower Reservoir and Dam

The Lower Dam impounds the waters of Schoharie Creek creating the Lower Reservoir, which is about 3 miles long and has a surface area of 413 acres. The Lower Reservoir operates at maximum and minimum levels of 900 ft and 860 ft, respectively. The total storage is 16,167 acre-ft of storage, which is composed of 12,422 acre-ft of usable storage between the two operating levels and 3,745 acre-ft of dead storage below elevation 860 ft. The average depth of the Lower Reservoir is 40 ft.

The Lower Reservoir is formed by a 1,800-ft-long central-core, rock-filled dam. The foundation of the Lower Dam is sealed by a 1,200-ft-long, slurry trench cutoff to bedrock and a 400-ft-long, partial slurry trench seepage cutoff into an impervious layer. In December, 2011, construction of an increased crest (to elevation

911.1 ft) was completed in order to provide 1+ ft of freeboard during the predicted Probable Maximum Flood (PMF) of 174,099 cfs. The embankment has a maximum height of 100 ft and an average height of 80 ft; the top width is 30 ft. The embankment has a 2H:1V slope on the upstream and downstream faces except for the portion above elevation 892 ft, which is a 1.5H:1V slope. The embankment is armored with stone on both the upstream and downstream slopes.

3.1.2.4 Lower Reservoir Spillway

The 425-ft-long, 134-ft-wide concrete-lined side-chute spillway has a design crest elevation of 855 ft and is electrically controlled by three, 38-ft-wide, 45.5-ft-tall Tainter gates. Power to operate the three Tainter gates is supplied by National Grid. If electric power from National Grid is interrupted, other sources of power are a diesel-powered emergency generator, and a power line from the powerhouse to the spillway.

3.1.2.5 Stilling Basin

Outflows from the spillway are discharged to a 238-ft-long, 68.5-ft-deep stilling basin at the bottom of the spillway. The stilling basin reduces turbulence and velocity prior to flows returning to Schoharie Creek. The stilling basin is designed to dissipate the energy from the PMF flow of 174,099 cfs.

3.1.2.6 Low Level Outlet

In addition to the three Tainter gates, the Lower Reservoir has a low-level outlet with an invert elevation of 813.0 ft. The outlet is located in the east spillway abutment at the Lower Dam and intake. Protected with a steel trashrack, it draws water from the northwestern portion of the Lower Dam near the spillway. The outlet has four low-level discharge valves of 4, 6, 8 and 10 inches for releasing 5 to 25 cfs. There are also two hydraulically operated, 36-in diameter, Howell-Bunger valves that can discharge a combined flow of 25 to 700 cfs. The elevation of the centerline of the Howell-Bunger valves is 816.05 ft. Discharge from the low-level discharge valves and Howell-Bunger valves is free-flowing into the air.

3.1.2.7 Access Roads

Two roads provide access to the Project. The north access road runs south from State Route 30 in North Blenheim on the west side of Schoharie Creek where it crosses the Lower Dam and then transverses on the east side of the Lower Reservoir to the powerhouse. The south access road runs along the east side of the Lower Reservoir from Valenti Road north to the powerhouse.

3.1.2.8 Switchyard/Transmission Lines

A switchyard on the eastern bank of Schoharie Creek south of the powerhouse connects the generating units to the New York Independent System Operator (NYISO)-controlled transmission network through three non-Project 345 kV transmission lines.

3.1.2.9 Project Recreation Facilities

Recreation facilities associated with the Project are described in Section 4.9.

3.1.2.10 Project Safety

The Project has been operating for more than 45 years under the existing license and during this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms

of the license, and proper maintenance. In addition, the Project has been inspected and evaluated every 5 years by an independent consultant and a consultant's safety report has been submitted for Commission review.

3.1.3 Existing Project Operations

The Project provides low-cost energy and stores water for power production during peak energy demand periods. The Project's Upper Reservoir serves as an energy storage device. Project operations are based on the energy needs of the region and state. In general, Project operations are determined by the demand for electricity. The NYISO, governed by FERC, coordinates between energy producer bids and utility demands to secure reliable, low-cost energy throughout New York. When needed, the Project can provide black start capability to restart other Power Authority facilities, and eventually, the statewide energy grid. Within several minutes the Project can generate power when other facilities within the NYISO are shut down. The Project also provides the ancillary services of regulation reserve and voltage support to the power system.

3.1.3.1 Pumped Storage Operations

During generation, the Project passes water through the pump-turbine units producing electricity. Unlike conventional hydroelectric facilities, the water that flows through the powerhouse is supplied from an upper reservoir (Figure 3.1.3.1-1). During periods of low electrical demand and lower electricity prices, water is pumped into the Upper Reservoir from the Lower Reservoir (Figure 3.1.3.1-2). The Upper Reservoir stores potential energy and allows the Project to start generating up to 1,160 MW of electricity within minutes. The pump-turbines may be turned on or off several times throughout the day; however, the four units in the powerhouse will generate during the day generally when consumer demand is high and other power sources are more expensive. Pumping usually occurs at night and on weekends when there is excess electricity in the system available for use.

3.1.3.2 Flow Management

The current FERC license dictates that releases from the Lower Reservoir to Schoharie Creek equal inflows from Schoharie Creek upstream of the Project. Between the low level outlet and Tainter gates, the Project has the ability to release water at the Lower Dam into Schoharie Creek for the whole range of inflows to the Project. Inflow to the Project includes spillage from the New York City Department of Environmental Protection's (NYCDEP's) Gilboa Dam located 5 miles upstream of the Lower Reservoir, and runoff from the small intervening watershed of about 40 square miles between Gilboa Dam and the Project. The Project is considered a closed cycle because water is recycled between reservoirs during Project operation. No additional water is required on a continual bases, except for small amount needed to replenish whatever water is depleted from the system by means of evaporation, minor seepage losses, or operating releases. Low flow periods occur when NYCDEP's Schoharie Reservoir is below spillway crest and there is no storm runoff. During this time, Project outflows can be as low as 5 cfs when evaporation and seepage losses are accounted for (FPC, 1975). The Project does not have flood storage capabilities.

Four U.S. Geological Survey (USGS) gages monitor inflow and outflow to and from the Lower Reservoir (See Figure 3.1.3.2-1 for gage locations). Three gages monitor inflow to the Lower Reservoir; they are Schoharie Creek gage downstream of Gilboa Dam (01350101) from the south; Platter Kill gage (01350120) from the east and the Mine Kill gage (01350140) from the west. Flows less than 10 cfs are not measured at the gage below Gilboa Dam (01350101). A fourth gage on Schoharie Creek at North Blenheim

(01350180), below the Lower Dam, measures outflow from the Project and is used to determine minimum flow releases from the Lower Reservoir.

For flows less than 25 cfs, the four low-level discharge valves are used to release downstream flows. During moderate flow periods, when releases greater than 25 cfs need to be made, two Howell-Bunger valves are used to release flows up to 700 cfs. For flows over 700 cfs, the three spillway Tainter gates are used to maintain the normal maximum elevation of 900 ft.

3.1.4 Existing Environmental Measures

3.1.4.1 Geologic and Soil Resources

The Power Authority currently implements the following protection, mitigation, and enhancement (PM&E) measures related to geologic and soil resources:

- The existing license requires the Power Authority to prevent soil erosion, stream siltation or pollution resulting from construction, operation, or maintenance of the Project, through implementation of its Flood Erosion Control Plan, which was approved by FERC on July 13, 1998.

3.1.4.2 Water Resources

The Power Authority currently implements the following PM&E measures related to water resources:

- The objectives of the 1975 FERC approved Water Management Plan are "1) to prevent floods and fluctuations downstream of the Project from being more severe than they would be without the Project, 2) to maintain low flows as nearly as practicable to what they would be without the Project, and 3) to keep fluctuations in downstream flow from being more severe than they would be without the Project" (FPC, 1975). In order to implement this Plan the Project is operated so that outflow generally equals inflow except for low flows. Low flow periods are defined as times when Schoharie Reservoir is below spillway crest and there is no storm runoff. During these times, the Power Authority releases water (< 10 cfs) from storage to result in flows comparable to those that would have occurred if the B-G Project had not been built. An approximate volume of 2,378 ac-ft is retained in the Upper Reservoir to provide for evaporation losses and low flow supplementation (i.e. providing excess water when inflow is less than minimum outflow requirements). The Water Management Plan also has a ramping schedule for outflows to minimize downstream water level fluctuations.
- Project outflows up to 700 cfs are aerated through atmospheric mixing (passively through the low level outlet valves for releases up to 25 cfs) or by the Howell-Bunger type valves, which are designed to add oxygen to the released water through atmospheric mixing for releases between 25 to 700 cfs.
- The Power Authority has an agreement with the U.S. Geological Survey for the funding of eight streamflow gages within the Schoharie Creek watershed. The gage locations are Schoharie Creek at Prattsville, Manor Kill at West Conesville near Gilboa, Schoharie Reservoir near Grand Gorge, Schoharie Creek at Gilboa, Platter Kill at Gilboa, Mine Kill near North Blenheim, Schoharie Creek at North Blenheim, and Schoharie Creek at Breakabeen, New York. Information from these gages supports implementation of the Power Authority's Water Management Plan.

3.1.4.3 Aquatic Resources

The Power Authority currently implements the following PM&E measures related to aquatic resources:

- The Power Authority presently supports a NYSDEC fish stocking program, and NYSDEC's active management of the Upper and Lower Reservoirs for recreational fishing.
- The Power Authority installed four constant level ponds in the Upper Reservoir in 1979 to provide spawning and feeding area for nest building fish.

3.1.4.4 Terrestrial Resources

The Power Authority currently implements the following PM&E measures related for terrestrial resources:

- The Power Authority presently maintains an approximate 1,600 acre management area, including 2 acres of wetlands.
- The Power Authority, in cooperation with NYSOPRHP and SUNY Cobleskill, presently maintains a bluebird trail developed in the mid-1980s. The trail includes nesting boxes and the Power Authority provides regular mowing in the area so to ensure quality bluebird habitat.
- The Power Authority presently maintains a white-tailed deer management area as a winter forage source. The area is mowed to prevent the establishment of unwanted woody vegetation.

3.1.4.5 Recreation, Land Use, and Aesthetics

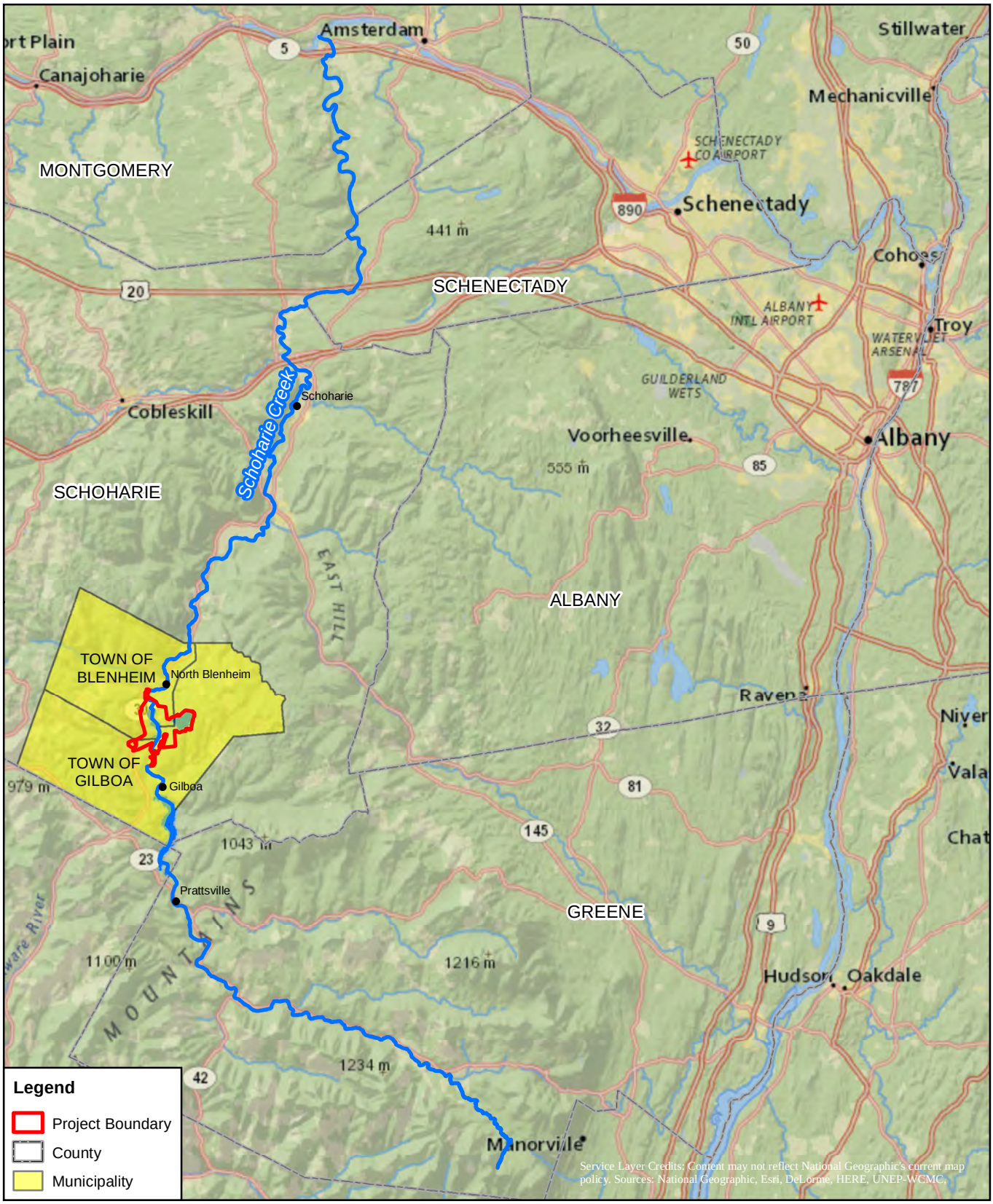
In accordance with the FERC-approved Recreation Management Plan, recreation access is provided to Project lands and waters primarily through the following Project recreation facilities:

- There are three sites that provide access to the Upper Reservoir for fishing and boating. These are the Upper Reservoir South access site, Upper Reservoir North access site, and the Upper Reservoir boat launch site.
- Mine Kill State Park is located on the Lower Reservoir and includes a swimming pool, bathhouse, picnic areas, playgrounds, boat launch, an overlook, hiking trails, disc golf, active recreation areas, and opportunities for winter recreation such as ice skating.
- The Schoharie Creek Fishing Access site is located north of the Lower Dam and provides dispersed recreation access from the shoreline to Schoharie Creek.
- The Lansing Manor Complex includes two visitor centers, an overlook, picnic areas, hiking trails, and interpretive signs and displays.

In addition, the Power Authority, in cooperation with NYSDEC, administers a permit-only archery hunting program on Project lands, with the exception of those areas that are closed to the public for security purposes.

3.1.4.6 Cultural Resources

The Power Authority maintains the Lansing Manor Complex, which is a collection of historic buildings, including a manor house, tenant house, horse barn, corn crib and other structures associated with a 19th century farming operation. The Lansing Manor Complex is listed on the National Register of Historic Places (NRHP). In addition, the former dairy barn was renovated as part of the Project's original construction and serves as the project's Visitors Center.



Blenheim-Gilboa Pumped Storage Power Project
FERC No. 2685

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Figure 3.1.1-1:
Project Location Map

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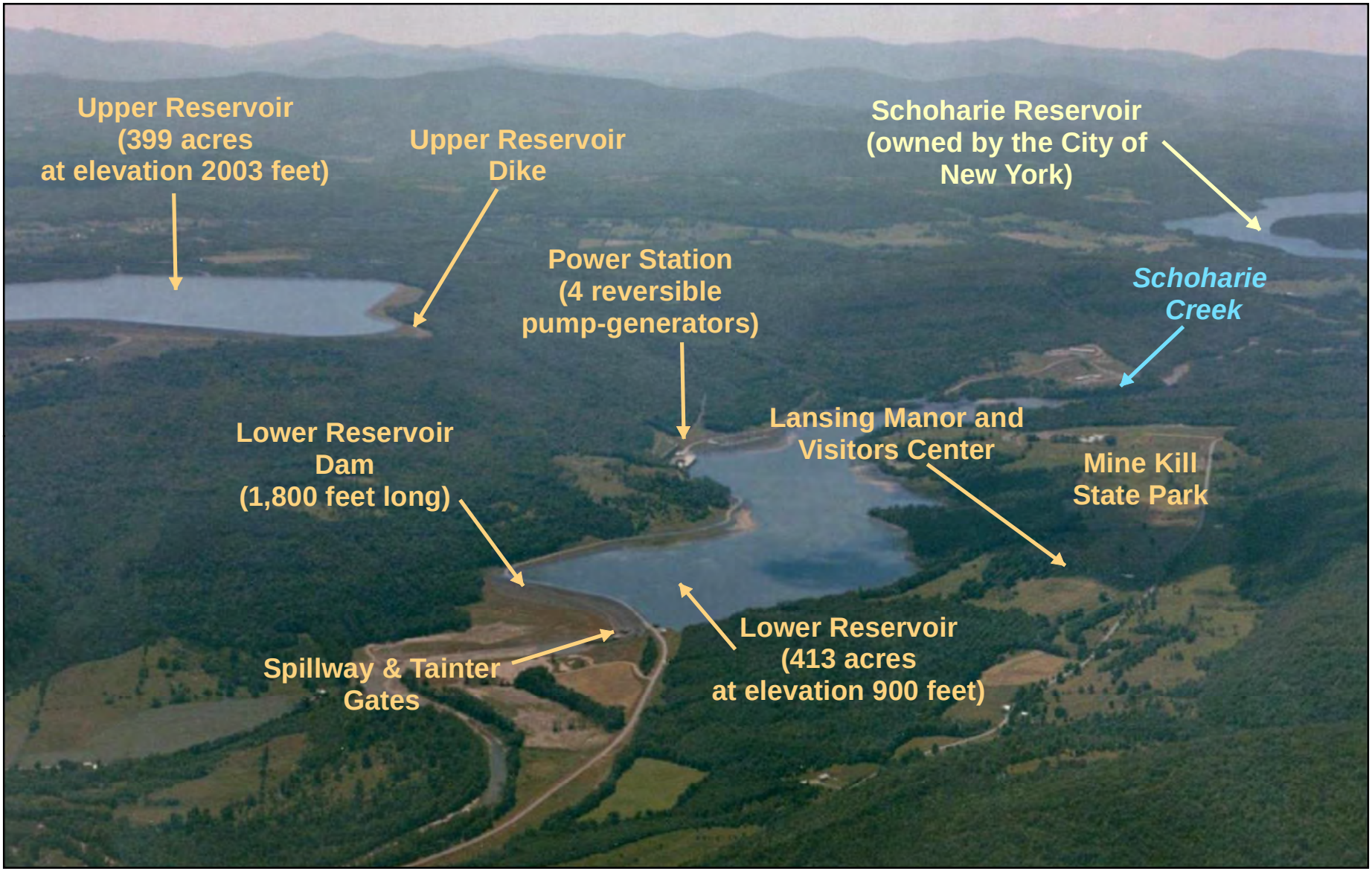

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Figure 3.1.2-1:
Project Facilities

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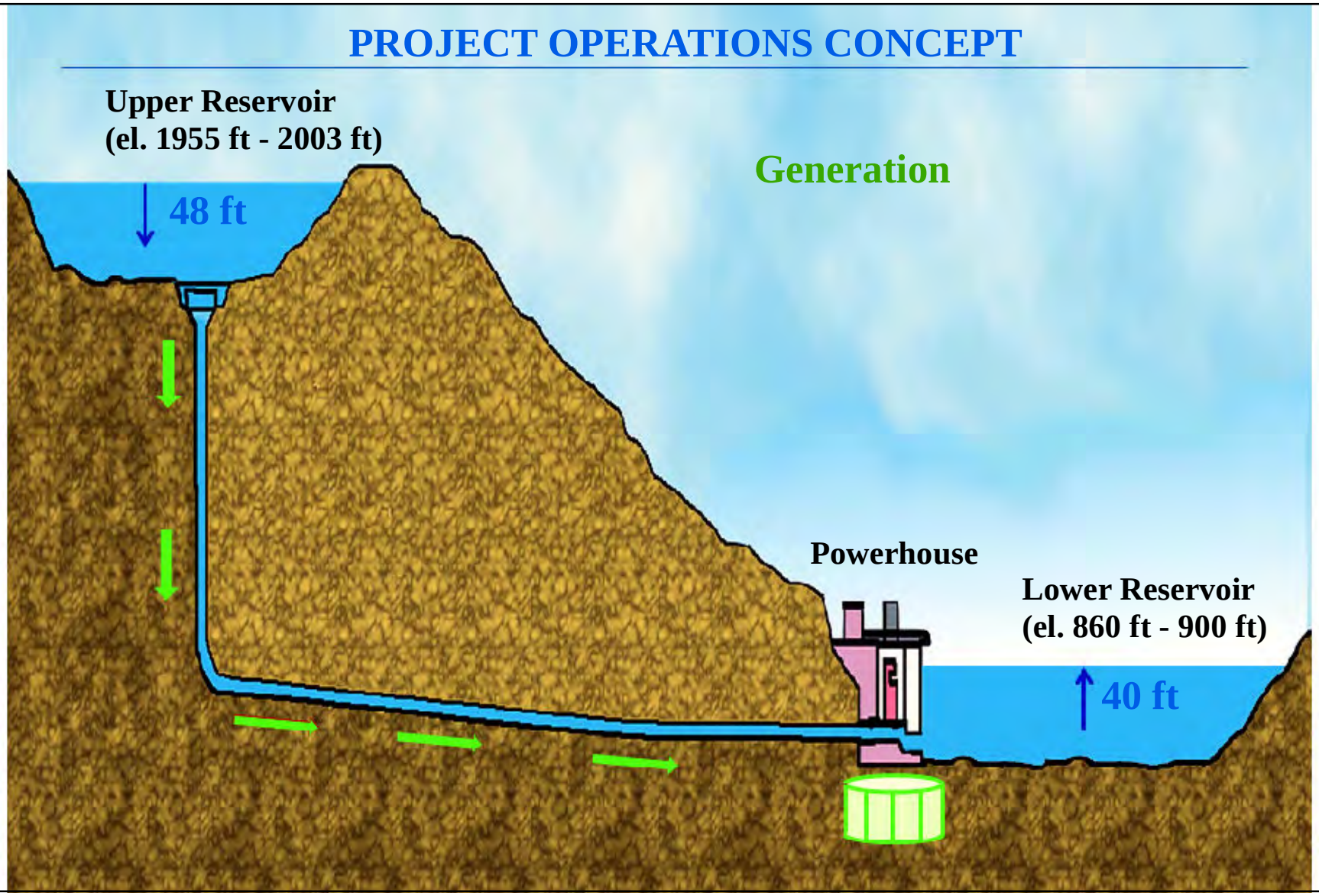

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Figure 3.1.3.1-1
Project Operations - Generation

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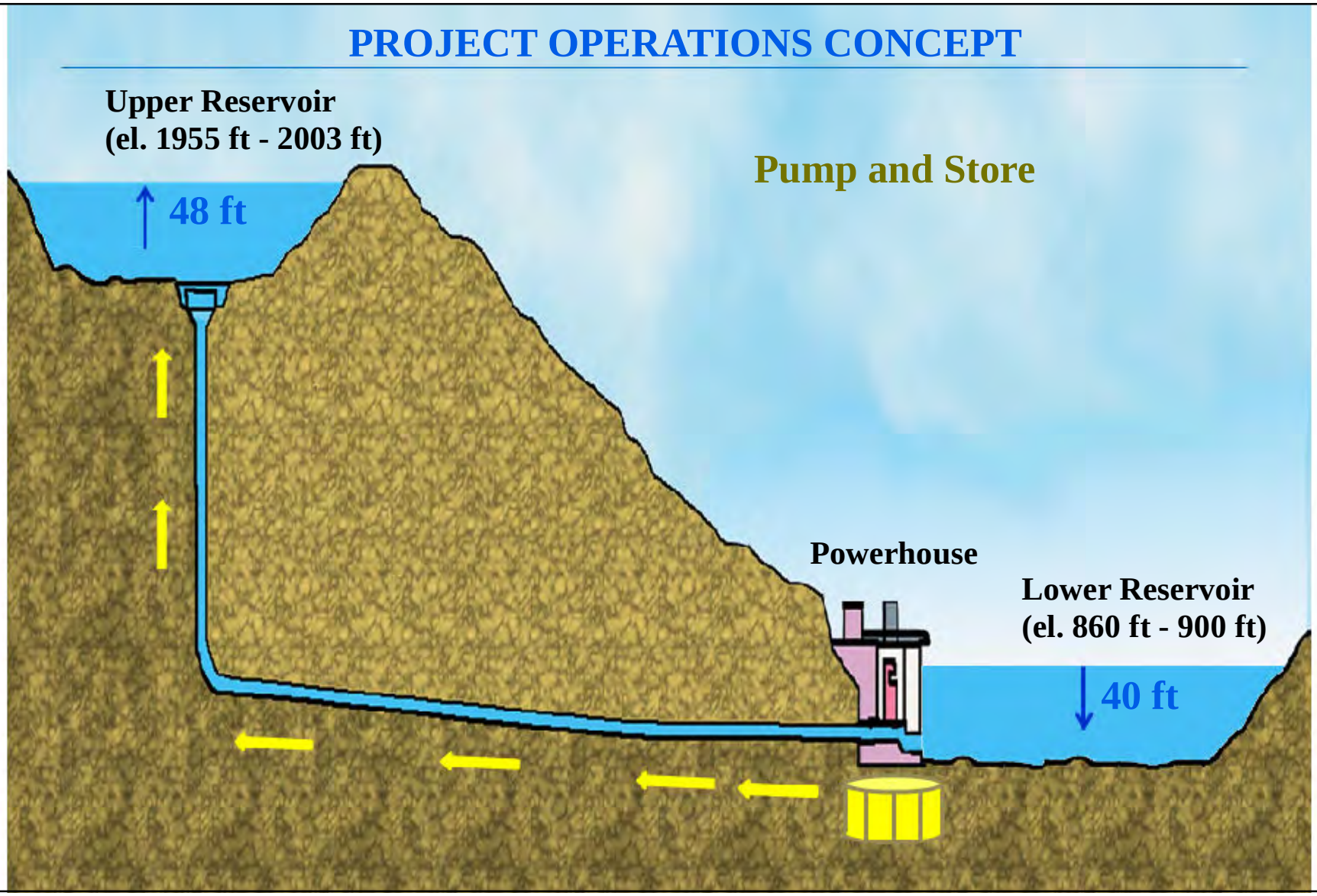

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Figure 3.1.3.1-2
Project Operations - Pump & Store

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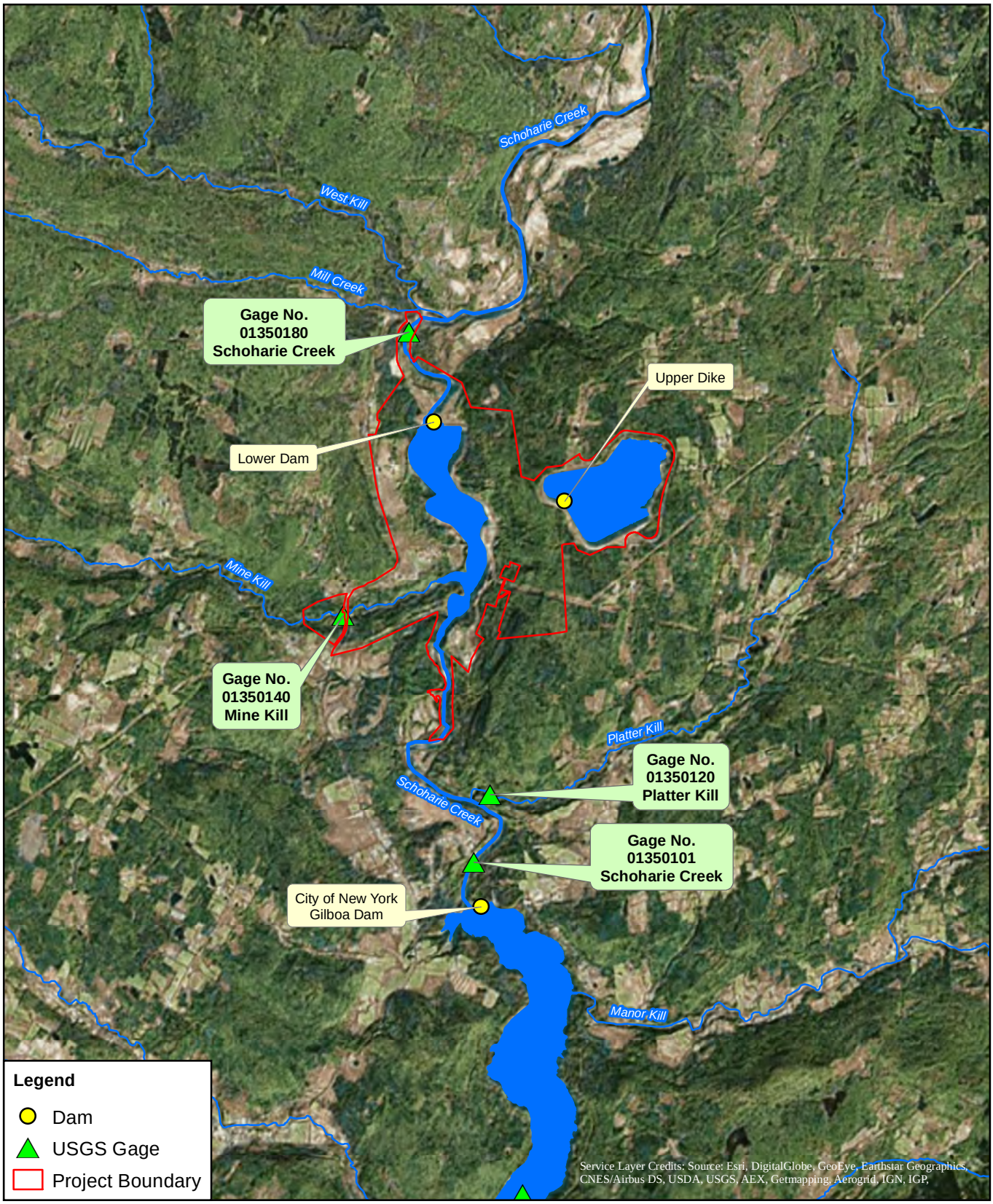

Blenheim-Gilboa Pumped Storage Power Project
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Figure 3.1.3.2-1:
USGS Stream Gages
in the Vicinity of the Project

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3.2 Applicant's Proposal

The Power Authority proposes to continue to operate and maintain the B-G Project on Schoharie Creek, and implement certain environmental protection, mitigation, and enhancement (PM&E) measures as described in the license application. The Power Authority proposes no new development or changes in Project operation.

3.2.1 Proposed Project Facilities and Operations

The Power Authority proposes no new or upgraded facilities, structural changes, or operational changes to the B-G Project during the term of the new license.

3.2.2 Proposed Environmental Measures

Any proposed environmental measures will be included in the Final License Application.

3.3 Alternatives Considered but Eliminated from Further Analysis

3.3.1 Federal Government Takeover of the Project

FERC's statement from Scoping Document 2 (SD2) regarding a federal government takeover alternative is as follows:

> "*In accordance with § 16.14 of the Commission's Regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric power project with a license that is subject to Sections 14 and 15 of the FPA. We do not consider federal takeover to be a reasonable alternative. Federal takeover of the project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that a federal takeover should be recommended to Congress. Although one party has suggested that federal takeover would be appropriate, no federal agency has expressed interest in operating the project."*

3.3.2 Issuing a Non-Power License

FERC's Statement from SD2 regarding a non-power license alternative is as follows:

> *"A non-power license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no governmental agency has sought a non-power license, and we have no basis for concluding that the Blenheim-Gilboa Project should no longer be used to produce power. Thus we do not consider a non-power license a reasonable alternative to relicensing the project."*

3.3.3 Retiring the Project

FERC's statement from SD2 regarding Project decommissioning alternative is as follows:

> *"Decommissioning of the project could be accomplished with or without dam removal. Either alternative would require denying the relicense application and surrender or*

termination of the existing license with appropriate conditions. There would be significant costs involved with decommissioning the project and/or removing any project facilities. The project provides a dependable source of electric energy for the region. When needed, the project can provide black-start capability to restart other generating facilities in the statewide grid. With decommissioning, the project would no longer be authorized to generate power. Thus we do not consider project decommissioning a reasonable alternative to relicensing the project with appropriate environmental measures."

4 Environmental Analysis

4.1 Cumulative Effects

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) (40 CFR Section 1508.7), a cumulative effect is the impact on the environment which results from the incremental impact of a Proposed Action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydroelectric Project operations and other land and water development activities.

FERC indicated in SD2 that based upon review of the PAD and preliminary staff analysis, they did not identify any resources that could be cumulatively affected by the proposed continued operation and maintenance of the B-G Project.

4.2 General Description of the River Basin

4.2.1 Schoharie Creek Basin

The B-G Project is located on Schoharie Creek, which originates in the northern Catskill Mountains and flows generally north for about 83 miles to join the Mohawk River. The Mohawk River, which is approximately 140 miles long and drains approximately 3,460 mi^2 of land area, is a tributary to the Hudson River. The total drainage area for Schoharie Creek is approximately 923 mi^2.

The Project's Lower Dam is located approximately 53 miles upstream of the confluence of Schoharie Creek with the Mohawk River. The man-made Upper Reservoir is situated on the top of Brown Mountain, to the east of Schoharie Creek and the Lower Reservoir. The watershed area above the Lower Dam is 356 mi^2.

Schoharie Creek originates at approximately 4,100 ft elevation, and its headwaters descend steeply down the slopes of the Catskill Mountains before reaching the gentle rolling lowlands of the Schoharie Valley. Schoharie Creek drops approximately 3,200 ft over the first 25 miles of its descent from its headwaters; most of this descent occurs in the Creek's first 10 miles. Schoharie Creek, about 30 miles downstream from the headwaters in the area of the Project's Lower Reservoir, is generally characterized as a wide stream with steep banks on either side (Town of Blenheim, 2012). Below the Lower Reservoir, the elevation of Schoharie Creek drops approximately 10 ft/mile over the approximately 50-mile span to the Creek's confluence with the Mohawk River.

Several significant tributaries drain into Schoharie Creek. These are described in Section 4.2.5, below. Figure 4.2.1-1 presents a map of the Schoharie Creek watershed.

4.2.2 Major Land Uses

The upper watershed of Schoharie Creek (upstream of the Gilboa Dam and Schoharie Reservoir) is primarily undeveloped and sparsely populated. This is exemplified within the Schoharie Creek Watershed Management Plan, which reports that based on 2001 data, approximately 86% of the Schoharie Creek upper watershed is covered by coniferous, deciduous, or mixed forest (Greene County, 2007). Land cover statistics of the entire Schoharie Creek watershed are presented in Table 4.2.2-1. Data obtained from the

National Land Cover Database (2006) is shown in Figure 4.2.2-1. A large amount of land within the Project boundary is occupied by the Project reservoirs and Project facilities. Predominant uses of remaining land within the Project boundary, as well as on immediately adjacent lands, include, agriculture, forested/undeveloped lands, and recreation.

The Project is located in the towns of Blenheim and Gilboa in Schoharie County. Much of Schoharie County is rural in nature. According to the 2010 US Census, 83 percent of the population lives in a rural area, with 17 percent inside an urban cluster (U.S. Census, 2013a). An urban cluster is a densely settled territory with at least 2,500 people, but fewer than 50,000. "Rural" encompasses all population, housing, and territory not within an urban area. Blenheim and Gilboa are both characterized by the U.S. Census as 100 percent rural.

As set forth in Section 4.12, there are no known Tribal uses of Project lands.

4.2.3 Major Water Uses

Major water uses within the Project boundary are predominantly associated with power production and recreation. Municipal water use of Schoharie Creek downstream of Gilboa Dam appears to be limited; the Town of Gilboa does not have a public water supply or public sewers (SCPDD, 2004). The Town of Blenheim also does not have a public water supply or public sewers (Town of Blenheim, 2014). Residents use on-site septic systems for the removal of wastes and they rely on private wells for their water supply.

The NYCDEP's Gilboa Dam and associated Schoharie Reservoir are located approximately 5 miles upstream (and south) of the Project's Lower Dam and diverts 316 square miles of the watershed for New York City's water supply. The NYCDEP's Schoharie Reservoir is a headwater reservoir derived from precipitation and runoff. Water is diverted from the Schoharie Reservoir (in a southerly direction) through the 18-mile-long Shandaken Tunnel to Upper Esopus Creek, and is eventually delivered into the New York City drinking water supply system. The Shandaken Tunnel is capable of diverting approximately 600 million gallons of water per day (approximately 900 cfs).

The inflow to the B-G Project's Lower Reservoir is primarily made up of spillage from NYCDEP's Gilboa Dam and from runoff from the small intervening watershed of about 40 square miles between NYCDEP's Gilboa Dam and the Project. Flows in Schoharie Creek below NYCDEP's Gilboa Dam are influenced by the quantity or lack of releases/spill from the Schoharie Reservoir. The sources of inflow in this section include flow from two tributaries: Mine Kill and Platter Kill (see Section 4.2.5 below).

Discharges from the Lower Reservoir are typically made to equal Schoharie Creek inflow as required by the Project's FERC license. The Project is a closed cycle, pumped-storage system which operates by recycling the same water between two reservoirs. Additional use of water is limited to small amounts that are needed to replenish that which is depleted from the system by means of evaporation, minor seepage losses, or operating releases.

4.2.4 Basin Dams

Schoharie Creek is impounded in two locations: once by the NYCDEP's Gilboa Dam, and again by the B-G Project's Lower Dam. In addition, there are three flood-control dams located on the Batavia Kill, a tributary to Schoharie Creek located upstream of the NYCDEP's Gilboa Dam (see Section 4.2.5). The locations of these dams are shown in Figure 4.2.1-1.

The B-G Project is the only power producing facility associated with Schoharie Creek. The NYCDEP's Gilboa Dam and associated Schoharie Reservoir have no power production facilities and are used for drinking water supply. The Schoharie Reservoir is approximately 5.8 miles long and has a total storage capacity of approximately 60,000 acre-ft.

4.2.5 Tributary Streams

There are approximately ten major tributary streams to Schoharie Creek (Figure 4.2.1-1). Roaring Kill, West Kill, East Kill, and Batavia Kill drain into Schoharie Creek upstream of NYCDEP's Schoharie Reservoir. Bear Kill and Manor Kill drain directly into the Schoharie Reservoir. Platter Kill flows into Schoharie Creek between NYCDEP's Schoharie Reservoir and the B-G Project's Lower Reservoir. Mine Kill flows directly into the Project's Lower Reservoir. Downstream of the Lower Reservoir, Schoharie Creek continues to flow north to its confluence with the Mohawk River; Cobleskill Creek and Fox Creek both flow into this lower section of Schoharie Creek.

Table 4.2.2-1: 2006 Land Cover of Schoharie Creek Watershed

Land Use Category	Acres	Percent Cover (%)
Open Water	4,896	0.82
Developed, Open Space	23,118	3.89
Developed, Low Intensity	4,471	0.75
Developed, Medium Intensity	1,071	0.18
Developed, High Intensity	189	0.03
Barren Land (Rock/Sand/Clay)	715	0.12
Deciduous Forest	247,586	41.68
Evergreen Forest	63,239	10.65
Mixed Forest	92,162	15.52
Shrub/Scrub	1,398	0.24
Grassland/Herbaceous	5,031	0.85
Pasture/Hay	89,873	15.13
Cultivated Crops	29,371	4.94
Woody Wetlands	29,388	4.95
Emergent Herbaceous Wetlands	1,478	0.25
Total	593,986	100

Source: Fry *et al.*, 2011

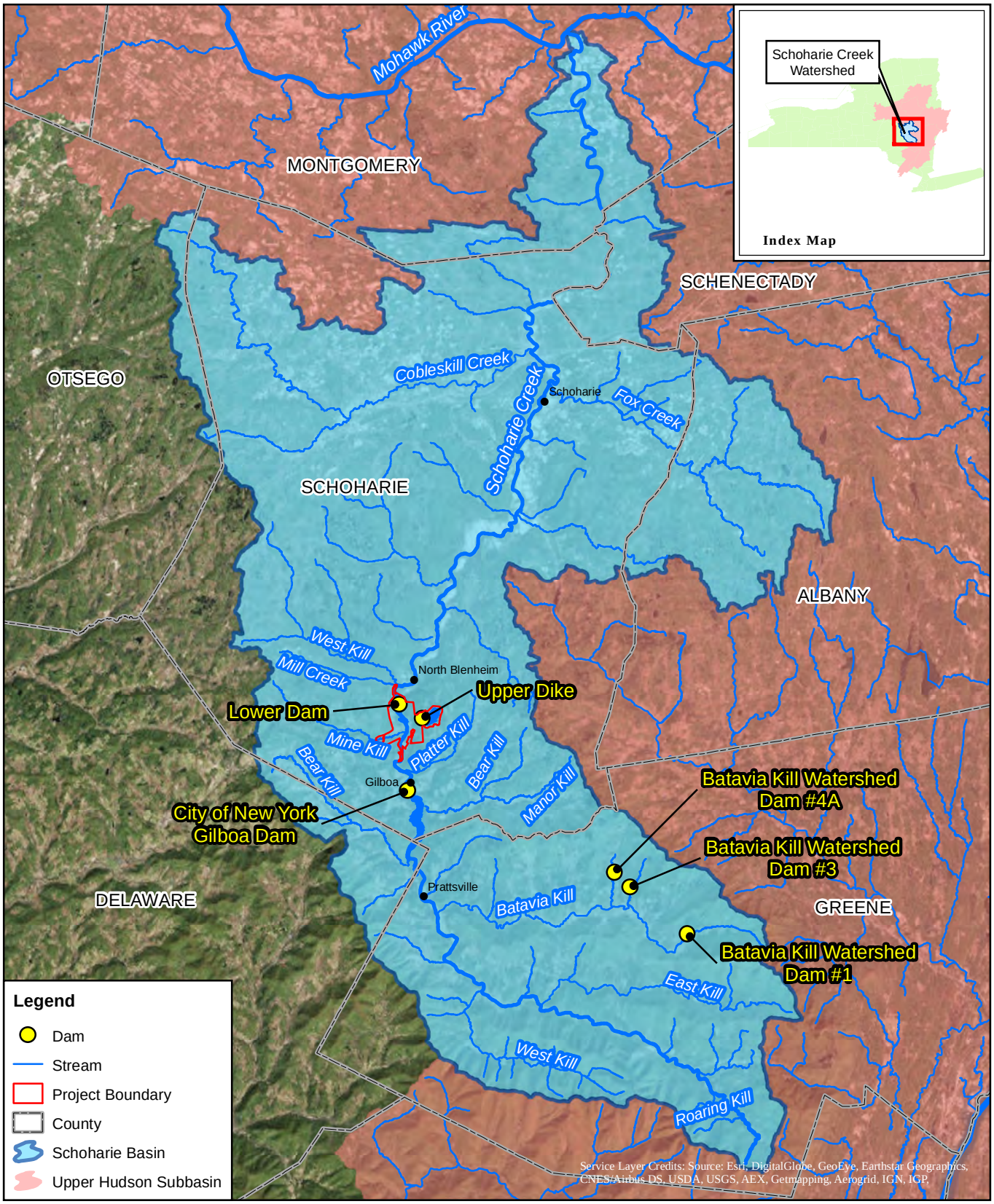

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Figure 4.2.1-1: Schoharie Creek Watershed Map

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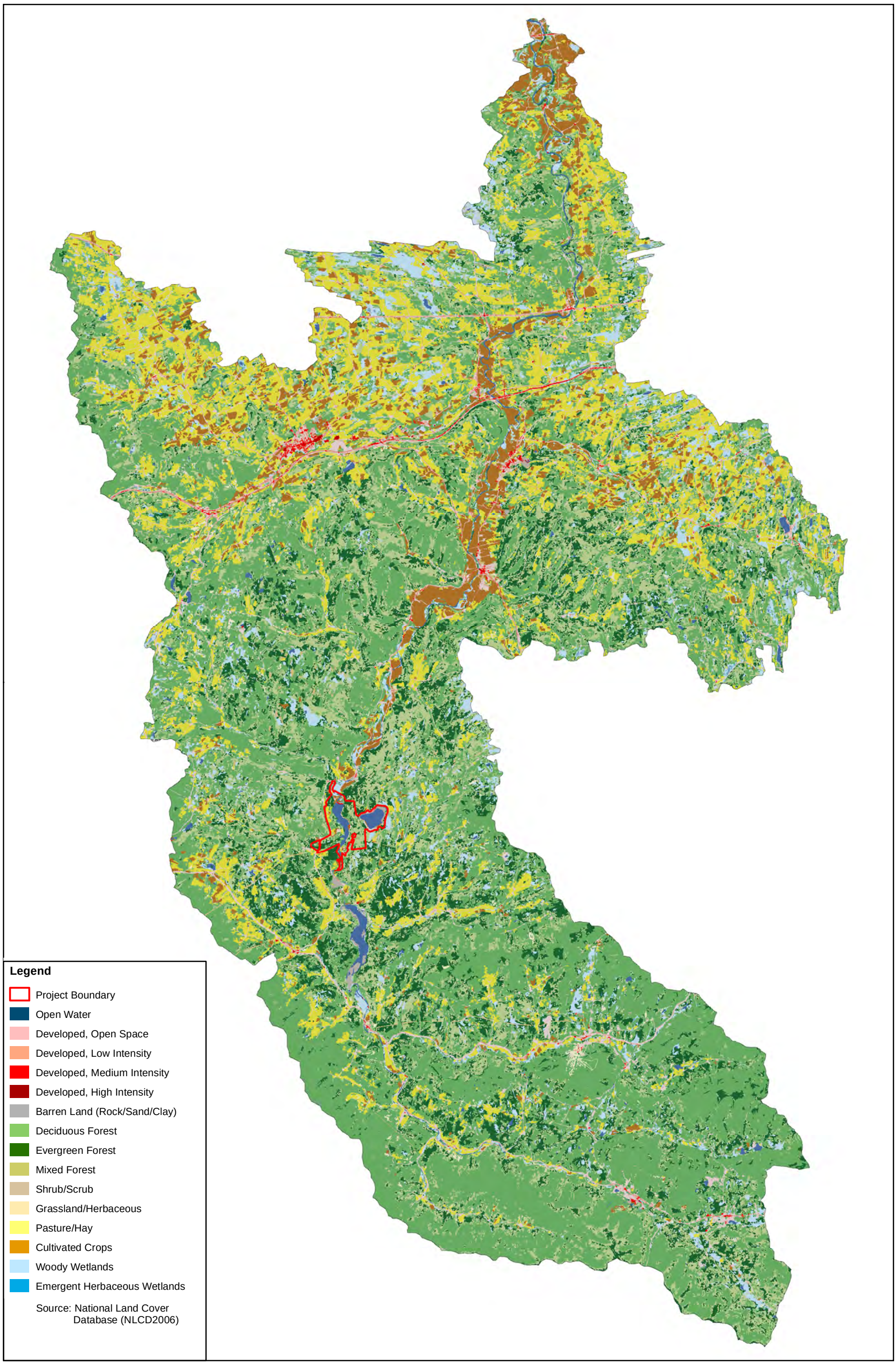

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Figure 4.2.2-1:
2006 Land Cover of
Schoharie Creek Watershed

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4.3 Geological and Soil Resources

4.3.1 Affected Environment

4.3.1.1 Topography

The general topography of the Schoharie Creek watershed in the vicinity of the Project is shown in Figure 4.3.1.1-1. The Project is located in the glaciated northern extremities of the Alleghany Plateau, which extends from the Mohawk Valley of New York southwest to central Alabama. The uplands between the Mohawk River Valley in the north and the peaks of the Catskill Mountains in the south maintain a general elevation of 2,000 ft above msl with relief of 1,000 ft or more. The elevation of the Lower Reservoir is approximately 900 ft, while the elevation of the Upper Reservoir is approximately 2,000 ft. The surface of the so called "2,000 ft plateau" is gently undulating and was developed by erosion during long periods of relative geologic stability (NYPA, 2015d). Schoharie Creek and other drainage systems have developed deep, narrow valleys in the plateau, resulting in fairly rugged terrain with flat-topped mountains.

A notable feature of the Schoharie Valley in the vicinity of the Project is the number of tributary streams which plunge over falls or cascades just prior to entering the main stem. The falls of Manor Kill, Mine Kill, Mill Creek, Platter Kill, Keyser Kill, and Panther Creek are examples. These falls have resulted from the inability of the tributaries to keep pace with the erosional progress of Schoharie Creek, both prior to and subsequent to the Pleistocene epoch (NYPA, 2015d).

4.3.1.2 Geology

The Allegheny Plateau is part of the Appalachian Plateau physiographic region within the Northeastern Highlands ecoregion. The Appalachian Plateau is a large natural region lying west of the Hudson lowlands and south of the Mohawk River valley and the Lake Ontario-Lake Erie plains. The Appalachian Plateau is underlain with nearly horizontal rock strata, all of which were covered by a glacier as recently as 10,000 to 12,000 years ago. Ice and the force of rivers have dissected or cut into the bedrock, giving the region a rugged, hilly aspect. The Appalachian Plateau is highest in the eastern portion of the State where it forms the Catskill Mountains.

All rock in the area is of sedimentary origin and has not been metamorphosed or intruded by igneous bodies. The strata consist of thin to massive bedded sandstone, siltstone, and shale, with a few thin beds of volcanic ash or bentonite at widely scattered intervals. The rocks are fine grained with coarsest lithology of a sandstone or sugary texture. The shales are very fine grained.

4.3.1.2.1 Bedrock Geology

The bedrock geology in the vicinity of the Project is illustrated in Figure 4.3.1.2.1-1. Rock outcrops exist all around the Project site. The Lower Reservoir spillway and powerhouse are constructed on bedrock while the Upper and Lower Reservoir embankment dams have seepage cutoff systems which extend to bedrock.

The bedrock underlying the region is of sedimentary origin resulting from the erosion of an ancient high peaks Taconic mountain range that existed to the east approximately 370 million years ago in the Devonian Period (Greene County, 2007). The rock formations in the Project vicinity include various facies of the Genesee and Hamilton Groups, both of the upper to middle Devonian Age. Some sedimentary bedrock associated with these groups, specifically the Hamilton Group, is known to be calcareous in nature thus contributing to the alkaline soils found in this region. The youngest unit exposed is the Oneonta Formation,

which includes the Kaaterskill sandstone member. It is composed of interbedded sandstone and red shale, and caps the plateau between Reed Hill (south of the Upper Reservoir) and Brown Mountain (north of the Upper Reservoir), thereby underlying the entire Upper Reservoir area. Some of this rock unit was removed by pre-glacial erosion, and more was removed by the ice. Depending on the present topography, the thickness of the formation varies from 200 to 500 ft.

Underlying the Oneonta Formation is approximately 400 to 500 ft of interbedded shale, siltstone, and sandstone of the Moscow Formation. The vertical shaft that extends from the Upper Reservoir to the horizontal power tunnel penetrates the full thickness of the Moscow Formation. The powerhouse and horizontal portion of the power tunnel are constructed in the rocks of the Panther Mountain Formation. The Panther Mountain Formation is similar to the Moscow formation but separated from it on the basis of fossil content. In addition, the Panther Mountain Formation possesses some beds of more massive and durable character than are found elsewhere in the area (NYPA, 2015d).

An extensive amount of fossils were discovered within these rock formations during the excavation and rock coring that occurred before and during Project construction. Fossil discoveries in the rocks within the Project site provided evidence of conditions during the Devonian period when plants and tiny animals were making the transition from water to land on the shores of the inland Devonian Sea. Important finds included centipedes, spiderlike creatures, and a mite that lived 380 million years ago. These fossils are thought to show that animals had adapted to a strictly land environment much earlier than had been previously believed. In addition, a 375 million year old fossil lycopod plant was discovered at the Project in 1972. This five-spined leaf specimen is believed to be a possible evolutionary link between the leaves of ancient and modern plants. Fossils such as these occur throughout the region (Various, 1985).

4.3.1.2.2 Surficial Geology

The surficial geology at the Project is primarily related to the glacial history of the Catskill Mountains. In this area, mountain glaciers commonly merged with continental ice sheets. Large lakes often formed in front of the glaciers as they retreated. The glacial retreat resulted in deltaic (sands and gravels) and lacustrine (clays and silts) sediments being deposited in the site area. Four major intervals of glaciation reportedly occurred during the Pleistocene Epoch (which occurred from 10,000 to 2,000,000 years ago), often characterized by multiple advances and retreats of ice. The most recent ice sheet advance was the Laurentide, which occurred during the late part of the Wisconsin Stage (Woodfordian Substage) approximately 8,000 to 15,000 years ago.

Both the thickness of soil deposits and the depth of bedrock are highly variable at the Project site. Drilling activities during past investigations at the site indicate thick sequences of glacial till deposits and thinner interbedded lacustrine (clay) layers, which overlie the bedrock (Rizzo, 1999). Figure 4.3.1.2.2-1 depicts the surficial geology of the Project vicinity.

4.3.1.2.3 Rock Cut Stabilization & Slide Movements

Rock Cut Stabilization

In 2007, a sedimentary bedrock outcrop experienced a rock cut failure in the vicinity of the Lower Reservoir spillway approximately 12 ft southeast of the spillway channel and 150 ft northwest of the crest of the dam adjacent to an access road and parking lot (see Figure 4.3.1.2.3-1). The bedrock outcrop protrudes out of

the earthen embankment of the Lower Dam; the rock cut was formed during dam construction in the early 1970s (Murphy, 2007).

Following the rock cut failure, the Power Authority hired Tectonic Engineering & Surveying Consultants to complete an investigation of the existing rock cuts. Tectonic Engineering found that the investigated rock cuts were highly irregular in profile due to the differential weathering of individual beds of the sedimentary rock. More easily eroded beds resulted in the undermining of overlaying, more resistive beds. Undermined beds had locally failed and blocks ranging from cobble size up to several cubic ft were found on the slopes and at the base of the cuts. In 2009, to stabilize the site, the Power Authority installed concrete "Jersey" barriers as recommended by Tectonic Engineering (Murphy, 2007).

Slide Movement

In the early 1970s, a series of slide movements developed at the Project. Originally starting along the South Access Road, these slide movements eventually incorporated the entire east shoreline between the switchyard and transmission tower GF-6 (Figure 4.3.1.2.3-1). Following exploration testing and evaluation, stabilization measures, including a series of berms and horizontal drains, were implemented.

Since the initial sliding occurred, the Power Authority has monitored the rate of movement. Remedial measures, completed from May 2001 to November 2002, included construction of a large stabilization berm and drainage improvements to reduce pore pressures within the weak soil layer. Instrumentation within the slide area indicates movements have diminished from 1 to 3 inches per year prior to the installation of the remedial measures to about 0.15 to 0.30 inches per year since construction of the rock-filled berm and drainage system.

In May 2004, following a significant rain event, a landslide occurred on the western side of the North Access Road (Figure 4.3.1.2.3-1). The geological settings in the slide area were believed to be similar to those found at the South Access Road slide area. The landslide occurred at a location outside of the main perimeter of the Project (Broderick, 2004a and 2004b). Significant slide movements have not occurred at the Project since 2004.

4.3.1.3 Soils

Dominant soil types within the Project boundary are shown in Figure 4.3.1.3-1. Soil erodibility factors, or K factors, and erosion hazard classifications of these soil types can be found in Table 4.3.1.3-1. K factor values typically range from 0.02 for the least erodible soils to 0.64 for the most erodible. In addition, the K factor is often divided into two sub-categories, Kw and Kf factors. The Kw factor is calculated by taking into consideration the whole soil, while the Kf factor only considers the fine-earth fraction (<2.0 mm diameter). Soil properties affecting the K factor can include texture, organic matter content, structure, infiltration, and permeability. Erosion hazard classifications take into account the characteristics of the soil, slope of the land surface, protective vegetative cover, and precipitation characteristics. Erosion hazard ratings are typically defined as slight, moderate, or severe.

Based on the erosion hazard rating and range of K-factors according to depth of soil found in Table 4.3.1.3-1, Barbour & Tioga fine sandy loams (Ba), Schoharie & Hudson silt loams (ShB), Schoharie & Hudson silty clay loams (SnB3), and Volusia, Morris, & Eerie very stony soils (VmC) were found to be the least erodible soils in the vicinity of the Project. These soils are typically found along the shorelines of

the Lower Reservoir. While Lordstown & Oquaga very stony soils (LoE), Lordstown, Oquaga, & Nassau soils (LrF), Mardin & Culvers very stony soils (MeE), and Schoharie soils (SoE) were found to be the most erodible (NRCS, 2013). The rugged topography (moderate to steep slopes) in this region of the Catskill Mountains contributes to the moderate to severe erosion hazard classifications of many of the dominant soil types.

The soil types shown in Figure 4.3.1.3-1 were compiled into soil series and ranked by dominance within the Project boundary (percent of total land within the Project boundary covered). The dominant soil series within the Project boundary are listed below:

- Lordstown & Oquaga Series – 33%
- Schoharie Series – 25%
- Lordstown, Oquaga, & Nassau Series – 8%
- Schoharie & Hudson Series – 6%
- Mardin & Culvers Series – 5%
- Volusia, Morris, & Erie Series – 4%
- Barbour & Tioga Series – 4%

4.3.1.4 Reservoir Shoreline

The Lower and Upper Reservoir shoreline characteristics vary throughout the Project. The variation in streambank and shoreline characteristics is directly related to the geologic bedrock control and glacial history of the region.

Upper Reservoir

The shoreline of the Upper Reservoir consists of a manmade dike on the north, west, and south banks, which is lined with riprap and minimal to no vegetation. The shoreline on the northeast and east bank is composed primarily of lodgement till and is naturally vegetated and undeveloped.

There is no significant erosion along the shorelines of the Upper Reservoir. Steeper shoreline areas (along the Upper Dike) consist of riprap and are well-armored. Gently sloping shoreline areas are vegetated with littoral vegetation (NYPA, 2013). Soils directly adjacent to the Upper Reservoir shoreline can be seen in Figure 4.3.1.3-1 Extent 2.

Lower Reservoir

The shoreline composition of the Lower Reservoir varies depending on location. The eastern shoreline is dominated by bedrock outcrops, while the western shoreline is largely lacustrine silt/clay. Upstream of the reservoir in the riverine section of Schoharie Creek, the shoreline is composed of floodplain alluvium. Steepness typically ranges from 20 to 40 percent slopes depending on location. Steeper shoreline areas consist of exposed bedrock and riprap and are therefore well-armored (NYPA, 2013). Gently sloping shoreline areas are well vegetated with littoral vegetation (NYPA, 2013). As detailed in Section 4.3.1.5, the bed and banks of the Schoharie Creek upstream and downstream of the Lower Reservoir are dynamic and experience significant erosion during flood events, however, the Lower Reservoir itself is more depositional

(because it is wider and deeper and therefore, quieter, allowing sediments to settle) and does not tend to erode along the shoreline. Soils directly adjacent to the Lower Reservoir shoreline can be seen in Figure 4.3.1.3-1.

4.3.1.5 Erosion and Deposition Features

1955-1996 Flood Events

Following a January 1996 flood event, FERC directed the Power Authority to restore and maintain the affected section of Schoharie Creek (right bank of the Creek downstream of the spillway) to its pre-1996 flood condition. To comply with FERC's directive, the Power Authority conducted a site inspection and geomorphologic assessment of the spillway channel and Schoharie Creek. The Power Authority found that while portions of the reach were relatively stable, portions of the Project reach downstream of the spillway, extending approximately one mile to the Project boundary, demonstrated characteristics of instability (Clear Creeks, 1998).

The assessment also found considerable near-bank stress associated with the tight radius bend of the downstream meander, a reduction in channel capacity caused by downstream aggradation, and overtopping flood waters that resulted in: 1) the erosion of a wide bypass channel in the right bank; 2) the scouring and uprooting of riparian vegetation; and 3) the cutting of multiple channels in the floodplain. Records indicated that Schoharie Creek had historically overtopped at this point during past flood events and that the Soil Conservation Service (predecessor of the Natural Resources Conservation Service) had attempted to block the bypass channel and restore the banks following the 1955 flood (Clear Creeks, 1998). Remedial restoration work was also conducted by the Power Authority in 1980 and 1988 due to flooding (Clear Creeks, 1998).

Following the 1996 flood event, and in accordance with FERC's directive, a number of restoration measures were conducted, including: the excavation of materials on the inner bend, placement of the excavated material as fill on the outer bend, restoration of the outer bend to El. 810 ft, placement of riprap to serve as reinforced armor protection, the realignment of the Schoharie Creek centerline to redirect flow from the bypass to the main channel, and the placement of riprap to protect the spillway's shoreline. Unfortunately, these stabilization efforts did not last and the banks were again bypassed by flooding due to Tropical Storm Irene in 2011.

Tropical Storm Irene

In August 2011, Tropical Storm Irene affected much of the east coast of the United States. Rainfall from Tropical Storm Irene resulted in a 500-year flood event in the Project area. Peak inflow during the flood event was 129,135 cfs while peak outflow was 118,614 cfs. By comparison, the peak inflow and outflow during the 1996 flood event were 84,000 cfs and 74,677 cfs, respectively (NYPA, 2015d). Flood flows resulted in widespread erosion and deposition of sediment as well as dramatic changes in the elevation of the Lower Reservoir bottom. Bottom elevations in and around the Lower Reservoir had net changes ranging from -25 ft to +16 ft (TVGA, 2012).

The change in bathymetry of the Lower Reservoir was directly related to the erosion, transport, and deposition of sediment throughout the watershed. During and immediately following the Tropical Storm Irene flood event, 156,733 cu yds of sediment was eroded while 724,535 cu yds was deposited resulting in

a net gain of 567,802 cu yds of sediment throughout the Lower Reservoir and surrounding area (TVGA, 2012). This erosion and deposition resulted in significant changes in elevation; specifically in the middle to southern portion of the Lower Reservoir, south of the Power Station. Erosion occurred along the south and southwest shorelines, specifically at the confluence of the Mine Kill. Additional erosion activity occurred along the northwestern shoreline south of the Dam. The area of greatest deposition occurred along the linear center of the reservoir, southwest of the Power Station. While these areas experienced significant changes in elevation, the majority and remainder of the Lower Reservoir experienced only minor changes. Although localized, significant changes in elevation occurred, as noted above, there was no significant impact to reservoir capacity that would require mitigation. Figure 4.3.1.5-1 depicts areas that were impacted by erosion or deposition.

Additionally, as a result of the flows associated with Tropical Storm Irene, the berm built following the 1996 flood event on the right bank downstream of the spillway was washed out. In 2012, the Power Authority completed restoration efforts, which included: restoring the Schoharie Creek berm, adding additional channel slope protection, and repairing other damage caused by Tropical Storm Irene within the Project boundary.

4.3.2 Environmental Effects

In SD1 and SD2, FERC identified the following issues related to geology and soils: (1) the effects of Project operation and Project-related recreation on shoreline erosion within the Upper and Lower Reservoirs; (2) the effects of Project operation on erosion of farmland, including prime farmland; (3) the effects of potential seismic events and subsidence of Project facilities; and (4) the effects of Project operation, specifically downstream flow releases, on channel maintenance in Schoharie Creek. Each of these issues is discussed in greater detail below.

There is no significant erosion along the shorelines of the manmade Upper Reservoir. The shoreline of the Upper Reservoir is armored with riprap along the manmade dike on the north, west, and south banks. While not armored with riprap, the shoreline of the northeast and east bank is typically gently sloping and vegetated with littoral vegetation providing protection against erosion processes. As such, Project operations do not impact erosion processes in the Upper Reservoir.

In regard to the Lower Reservoir, limited erosion was observed in certain areas due to the naturally occurring high flows associated with Tropical Storm Irene, however, in general, the Lower Reservoir does not tend to erode. Furthermore, the Lower Reservoir is far less likely to erode than the upstream and downstream riverine sections of Schoharie Creek due to its shoreline composition (i.e. moderately erodible soils as opposed to severely erodible) and geomorphic setting (i.e., wider and deeper allowing sediments to settle). The eastern shoreline is dominated by bedrock outcrops while the western shoreline is largely lacustrine silt/clay. Lacustrine silt/clay shorelines are typically found to be gently sloping and are well vegetated with littoral vegetation providing protection against erosion processes. Due to the shoreline characteristics of the Lower Reservoir combined with its geomorphic setting, erosion in the Lower Reservoir has not been observed during periods of typical or low flow conditions or when the Project is operating.

The shoreline along the channel of Schoharie Creek immediately downstream of the Lower Dam spillway (up to the first meander bend approximately 0.5 miles downstream) has been armored with riprap and other erosion prevention measures in order to limit or prevent erosion in this area. While erosion can be prevalent in the upstream and downstream riverine sections of Schoharie Creek due to natural high flows, erosion

from Project operations (specifically downstream releases) is unlikely and has not been observed to occur. The Lower Reservoir is managed such that outflow is equal to or less than inflow. As a result, any erosion that occurs in the downstream reach is generally the result of natural high flows or flood events, which are passed through the reservoir. During these instances, the Lower Reservoir provides a benefit as it attenuates the inflow before passing it through the Tainter gates (e.g., peak inflow during Tropical Storm Irene was 129,135 cfs while peak outflow was 118,614 cfs).

In regard to whether Project operations could potentially affect erosion of farmland, including prime farmland, it is observed that there is limited to no farmland in the vicinity of the Project boundary. In the areas where limited farmland is observed (i.e. the Upper Reservoir), no significant erosion has been observed. In other areas (i.e. the riverine reaches of Schoharie Creek upstream and downstream of the Lower Reservoir), any erosion that does occur is the result of naturally occurring high flows. As such, Project operations do not appear to impact erosion of farmland.

In accordance with FERC Engineering Guidelines, the Project's dam safety program addresses the potential effects of potential seismic events and subsidence of Project facilities. Stability analyses for all water retaining structures at the Project consider seismic loading. It has been determined as recently as December 2015 by the Independent Part 12 Consultant that the Project has adequate factors of safety against failure due to seismic loading and that current surveillance and monitoring programs at the Project relative to failures due to seismic loads are adequate (NYPA 2015d).

The dam safety surveillance and monitoring program for the Project requires formal site inspections following any seismic event felt at the site (NYPA, 2015c). Since April 2013, the Power Authority has had a Seismic Events Procedure to provide guidelines for the inspection of the B-G Project if a significant earthquake occurs near the Project. These guidelines require a physical inspection of the Upper Reservoir Dike, Lower Reservoir Dam and Tainter gates as well as a review of instrumentation readings of all wells, piezometers, and inclinometers (NYPA, 2015b). This procedure was used on September 26, 2015 after a 3.0 magnitude earthquake occurred near the Project (NYPA, 2015b). An inspection of the Project facilities by the Power Authority occurred on the subsequent two days (September 27-28, 2015). No anomalies were noted (NYPA, 2015a). The Seismic Events Procedure was updated October 1, 2015 to include Schoharie County Emergency Management and Communication Center on the notification list for an earthquake of magnitude 2.0 or greater.

4.3.3 Proposed Environmental Measures

No environmental measures related to geology and soils resources are proposed at this time.

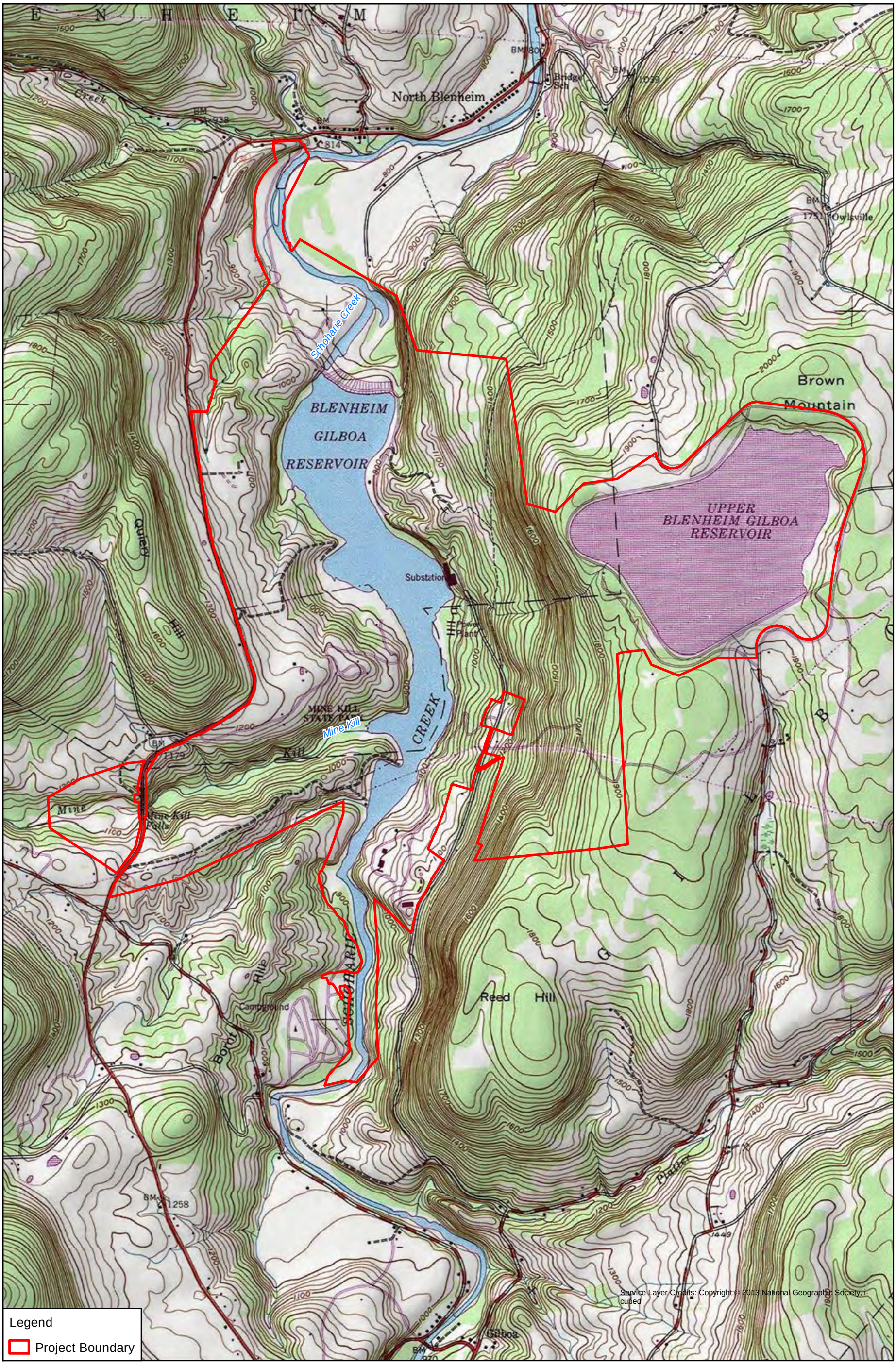
4.3.4 Unavoidable Adverse Impacts

Continued Project operation is not expected to adversely affect geology and soils resources.

Table 4.3.1.3-1: Soil Erodibility

Map Symbol	Map Unit Name	Soil Series	Depth (in)	Erosion Factors		Erosion Hazard
				Kw	Kf	
Ba	Barbour & Tioga fine sandy loam	Barbour	0-65	0.17-0.32	0.24-0.43	Moderate
		Tioga	0-60	0.24-0.28	0.24-0.43	Moderate
LoE	Lordstown and Oquaga very stony soils, 0 to 35 percent slopes	Lordstown	0-31	0.24-0.28	0.32-0.64	Severe
		Oquaga	0-28	0.20-0.24	0.32-0.64	Severe
LrF	Lordstown, Oquaga, and Nassau soils, 35 to 70 percent slopes	Lordstown	0-31	0.24-0.28	0.32-0.64	Severe
		Oquaga	0-28	0.20-0.24	0.32-0.64	Severe
		Nassau	0-24	0.20-0.24	0.32-0.64	Severe
MeE	Mardin and Culvers very stony soils, 0 to 35 percent slopes	Mardin	0-60	0.24	0.32-0.64	Severe
		Culvers	0-72	0.24-0.28	0.32-0.43	Severe
ShB	Schoharie and Hudson silt loams, 2 to 6 percent slopes	Schoharie	0-60	0.28-0.49	0.28-0.49	Moderate
		Hudson	0-60	0.28-0.49	0.28-0.49	Moderate
SnB3	Schoharie and Hudson silty clay loams, 2 to 6 percent slopes, eroded	Schoharie	0-60	0.28-0.49	0.28-0.49	Moderate
		Hudson	0-60	0.28-0.49	0.28-0.49	Moderate
SoE	Schoharie soils, 20 to 40 percent slopes	Schoharie	0-60	0.28-0.49	0.28-0.49	Severe
VmC	Volusia, Morris, and Erie very stony soils, 0 to 15 percent slopes	Volusia	0-60	0.24	0.32-0.64	Moderate
		Morris	0-60	0.24	0.32-0.49	Moderate
		Erie	0-60	0.24	0.32-0.55	Moderate

Source: NRCS, 2013



Blenheim-Gilboa Pumped Storage Power Project
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0 1,000 2,000 4,000 Feet

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Figure 4.3.1.1-1:
Topography

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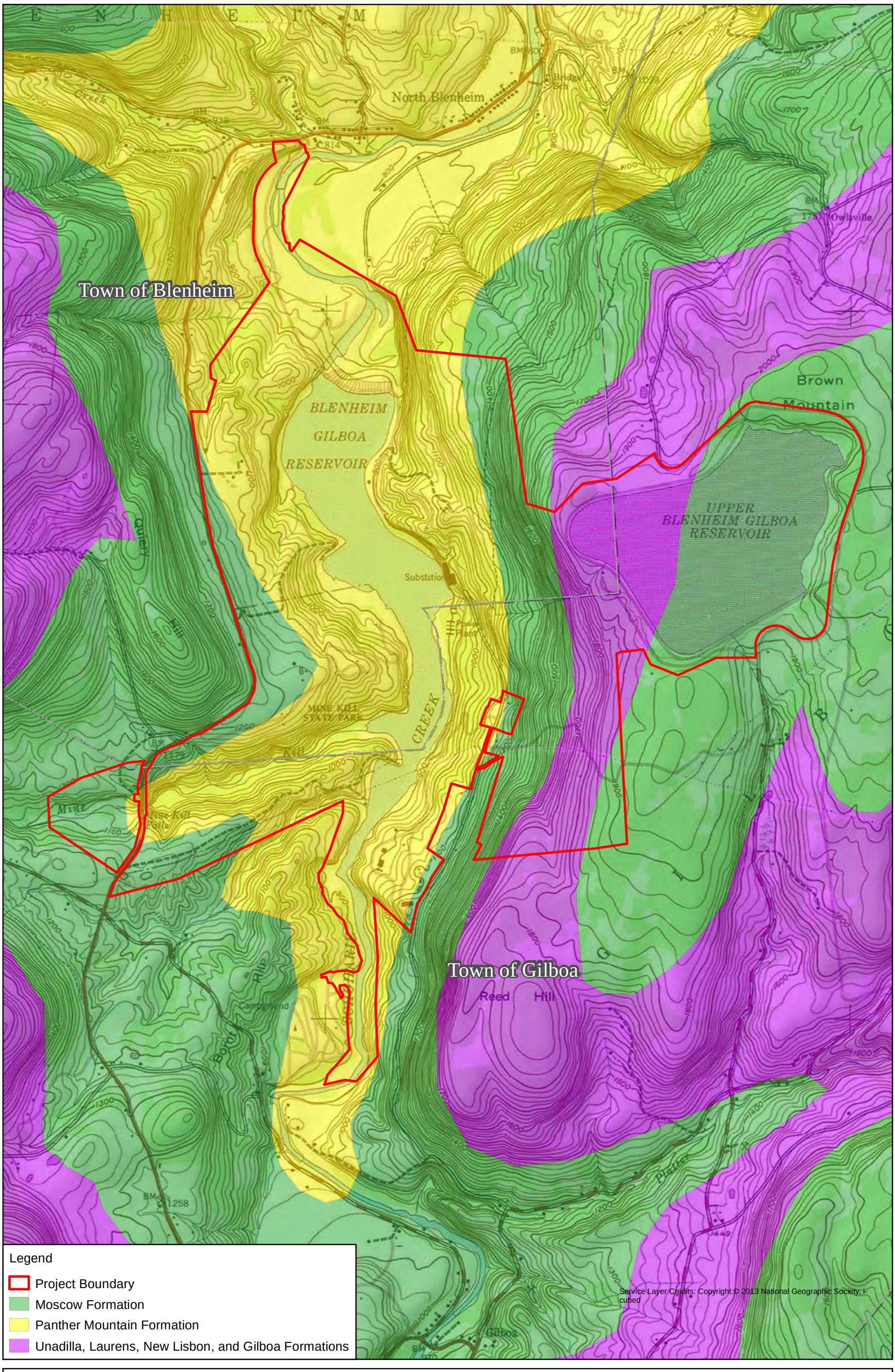

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Figure 4.3.1.2.1-1:
Bedrock Geology

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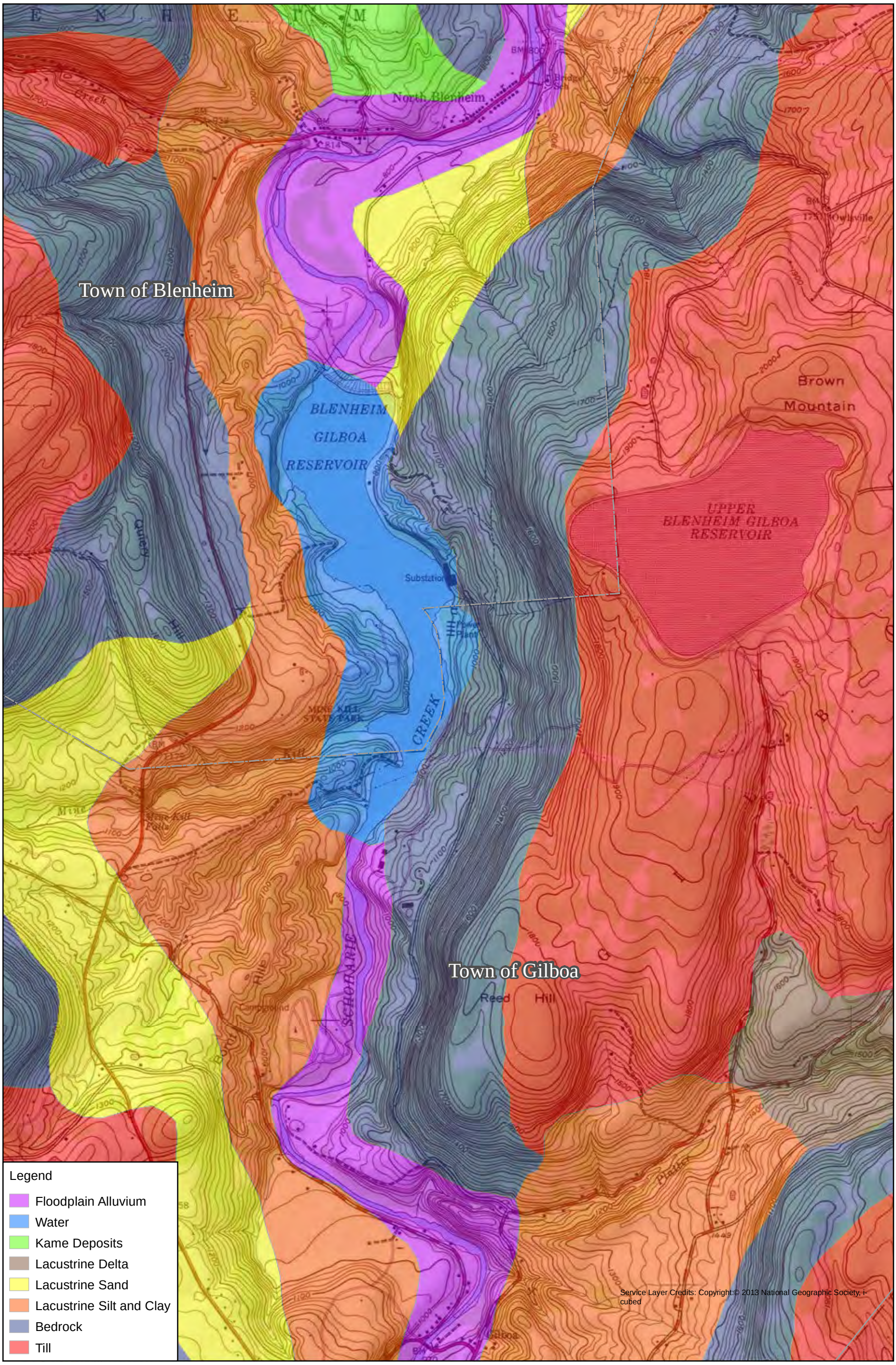

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Figure 4.3.1.2.2-1:
Surficial Geology

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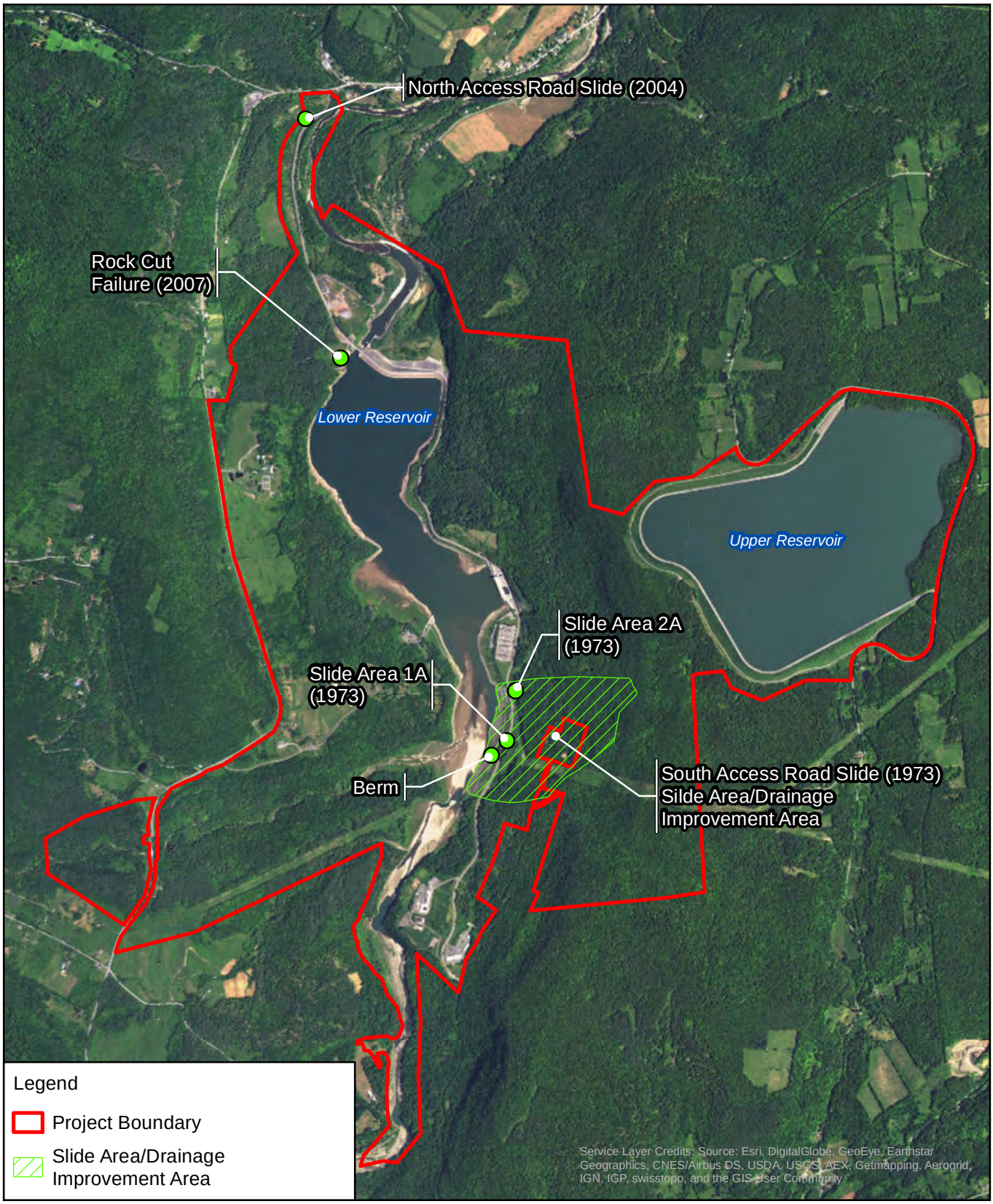

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0 0.25 0.5 1 Miles

Figure 4.3.1.2.3-1: Rock Slides

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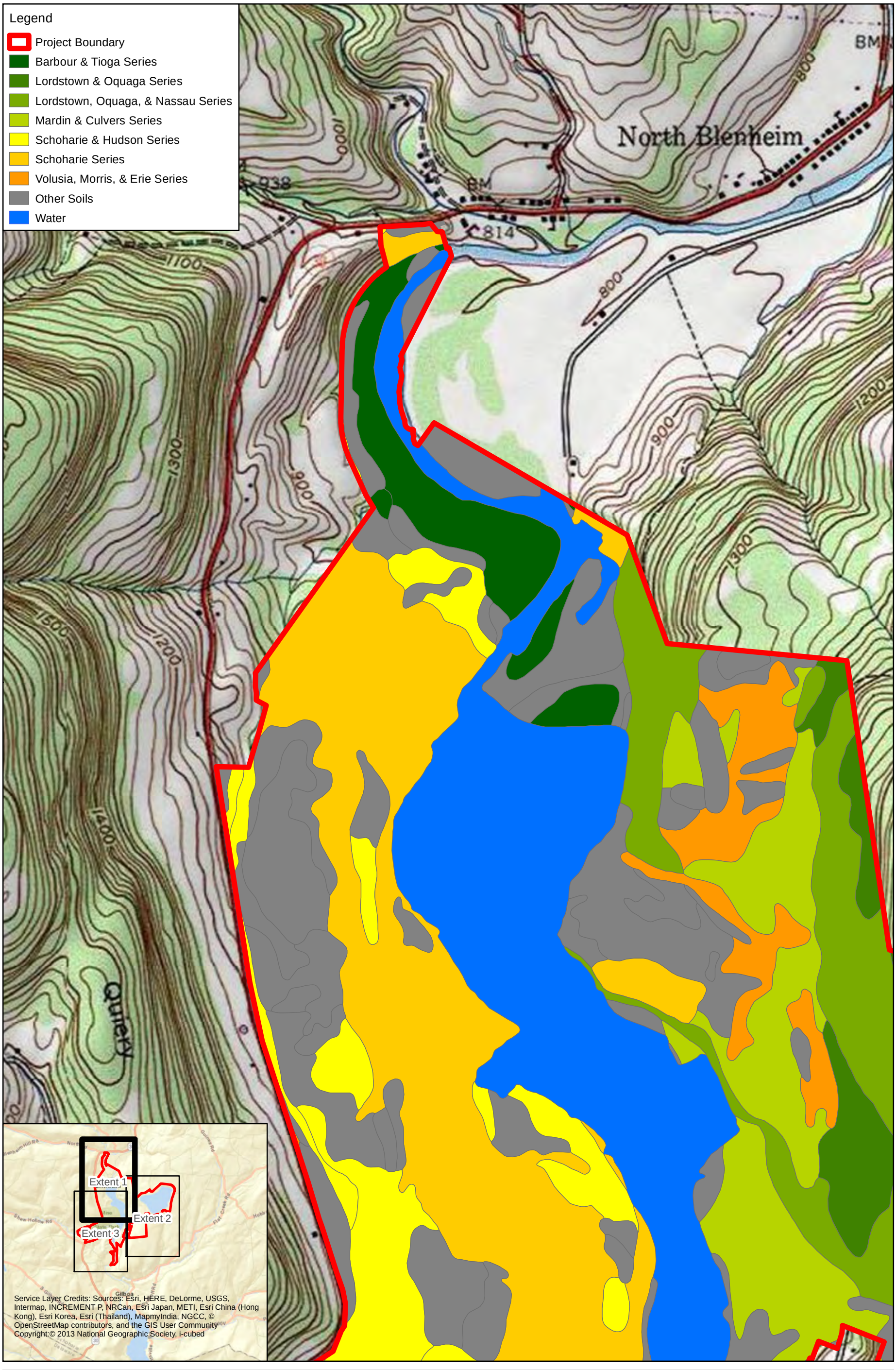

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0 500 1,000 2,000 Feet

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Figure 4.3.1.3-1:
Soils Extent 1

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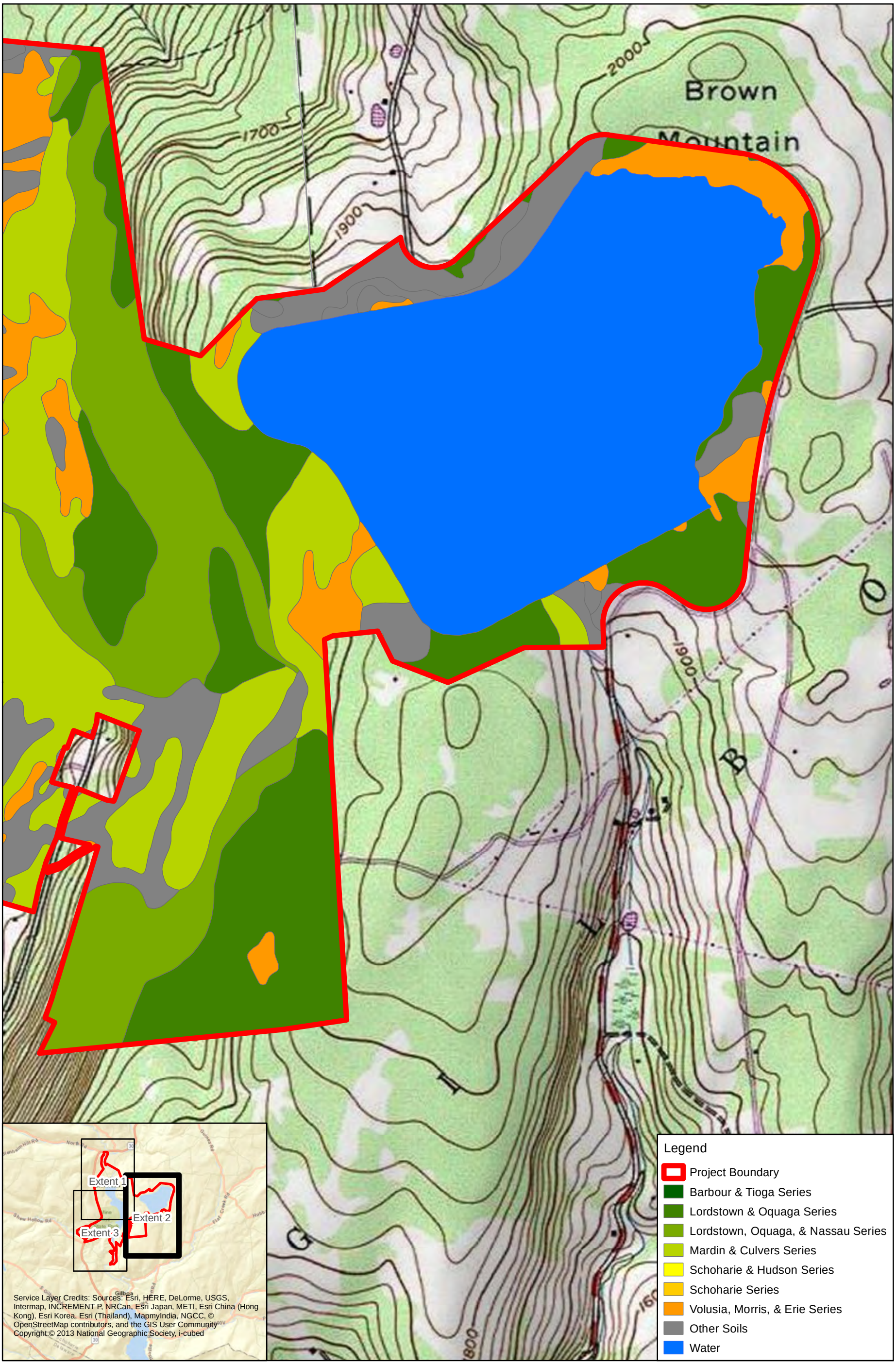

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0 500 1,000 2,000 Feet

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Figure 4.3.1.3-1:
Soils Extent 2

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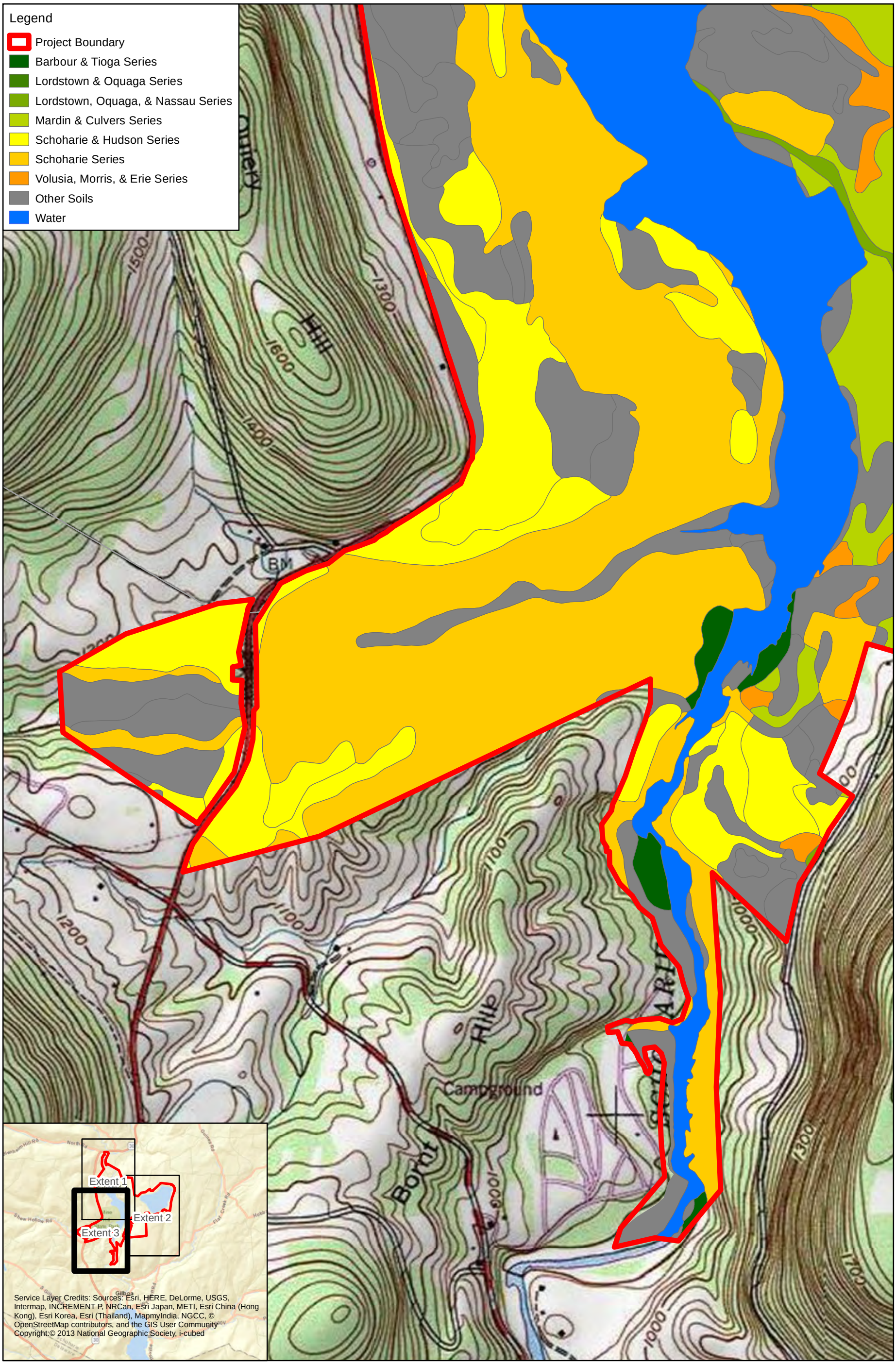

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0 500 1,000 2,000 Feet

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Figure 4.3.1.3-1:
Soils Extent 3

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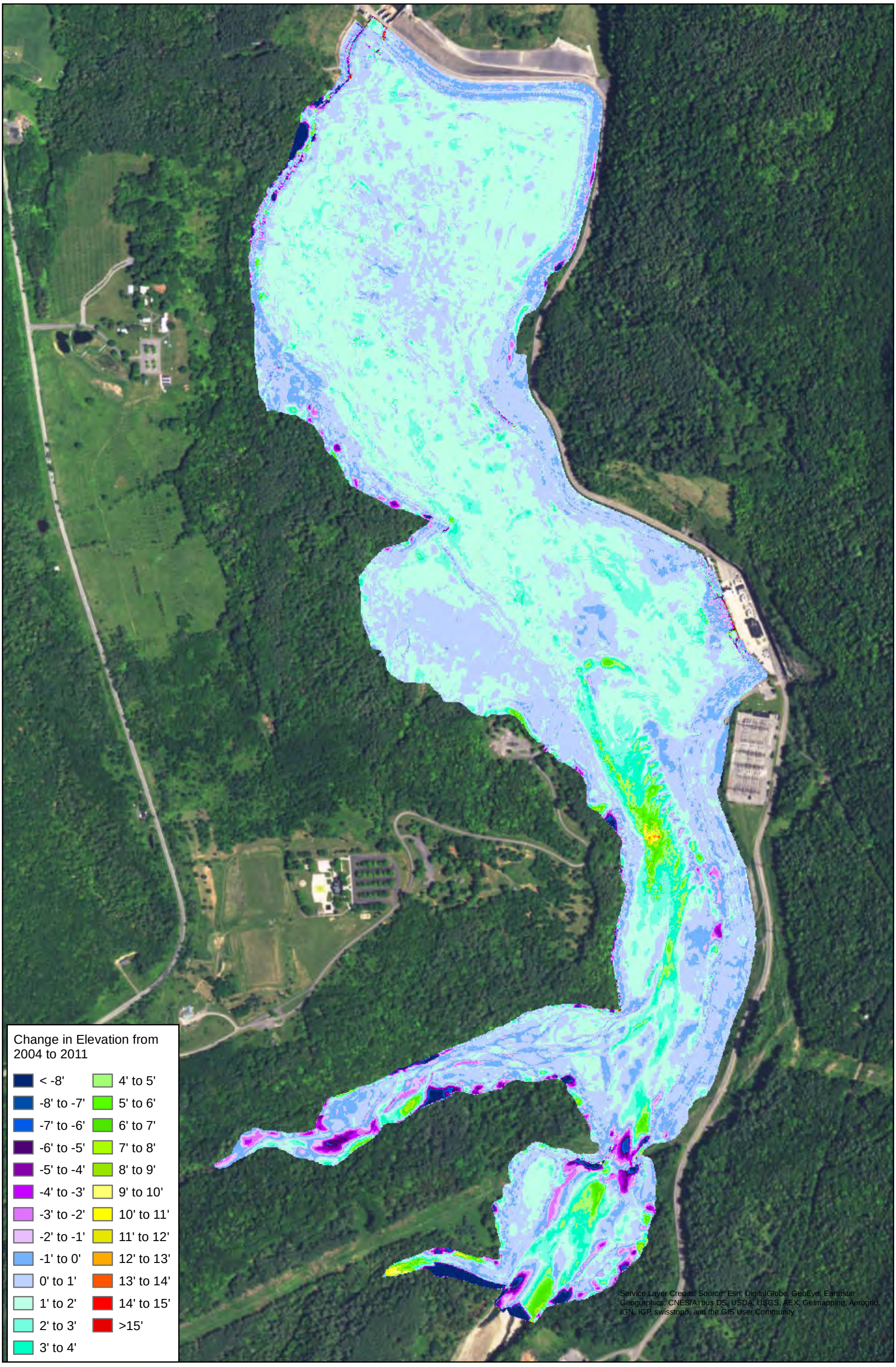

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0 350 700 1,400 Feet

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Figure 4.3.1.5-1:
Lower Reservoir Bathymetry
Post Tropical Storm Irene

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4.4 Water Resources

4.4.1 Affected Environment

4.4.1.1 Water Quantity

Overview

Within the Project boundary, water resources of the Project include the Upper and Lower Reservoir, Schoharie Creek upstream and downstream of the Lower Reservoir, and tributaries which feed the Lower Reservoir (Figure 4.4.1.1-1).

The Lower Reservoir has a surface area of 413 acres at full pool and has a total storage capacity of 16,167 acre-ft. The reservoir is operated between a maximum pool elevation of 900 ft and a minimum pool elevation of 860 ft. The drainage area at the Lower Dam is 356 mi^2. The Lower Reservoir is an elongated-shaped reservoir with generally a gently sloping shoreline; the shoreline length is approximately 9.4 miles. The average depth and maximum depth at full pool are approximately 40 ft and 80 ft, respectively. Figure 4.4.1.1-2 shows the bathymetry of the Lower Reservoir. The bottom substrates of the Lower Reservoir are composed primarily of silt and clay.

The Upper Reservoir has a surface area of 399 acres at full pool and a limited drainage area of approximately 0.7 mi^2. The Upper Reservoir has a total storage capacity of 18,791 acre-ft. The normal reservoir fluctuation is from elevation 2,003 ft to approximately elevation 1,955 ft. The Upper Reservoir is generally bowl-shaped with steep banks and has approximately 3.5 miles of shoreline. The maximum depth at full pool is near the intake structure at approximately 95 ft. Away from the intake structure, the deepest spot is approximately 80 ft at full pool located in the southwest area of the reservoir. The average depth of the Upper Reservoir is 48 feet. Figure 4.4.1.1-3 shows the bathymetry of the Upper Reservoir.

Figures 4.4.1.1-4 through 4.4.1.1-16 illustrate annual and monthly surface water elevation duration curves for the Upper and Lower Reservoirs for the period from 2002 to 2014. Table 4.4.1.1-1 shows the median surface water elevations for the period from 2002 to 2014 for the Upper and Lower Reservoirs.

Hydrology and Streamflow

Water is provided to the Lower Reservoir from Mine Kill flowing in from the west, Platter Kill and Schoharie Creek upstream of the Project, and by spilling from NYCDEP's Schoharie Reservoir, which is located approximately 5 miles upstream of the Lower Dam. Most of the time except during spring freshet and flood flows, streamflows from 316 square miles of the watershed are diverted by Schoharie Reservoir for New York City's water supply. Under normal conditions, there is little or no spill from NYCDEP's Schoharie Reservoir, so the inflow to the Project during these times is only from the 40 mi^2 of drainage between the NYCDEP's Gilboa Dam and the Lower Reservoir.

Flows are released from the Project's Lower Reservoir in accordance with a 1975 order from the Federal Power Commission. The associated Water Management Plan specifies that flows should be maintained as nearly as practicable to what they would be without the Project. Project outflows essentially equal Project inflows. During low flows (<10 cfs), the Project is operated to account for evaporative losses and releases water from storage to result in flows comparable to those which would have occurred if the Project had not been built. The Lower Dam is equipped with spillway gates and low level valves that permit the release of

water downstream. Discharges from the Lower Reservoir are typically made to equal inflow, which is determined by gages upstream and downstream of the Project and by reservoir volume calculations. Between the low level outlet and Tainter gates, the Project has the ability to release at the Lower Dam the whole range of inflows to the Project into Schoharie Creek.

The U.S. Geological Survey (USGS) operates several streamflow gaging stations in the vicinity of the Project. Four USGS gages monitor inflow and outflow to and from the Lower Reservoir (Figure 4.4.1.1-17). Releases from NYCDEP's Gilboa Dam, upstream of the Project, are monitored using USGS Gage No. 01350101. Because there are no required minimum flows from NYCDEP's Gilboa Dam, flows recorded at USGS Gage 01350101 are a function of leakage and spillage.

The two tributaries to the Lower Reservoir that contribute inflow to the Project are also gaged. The Platter Kill gage (No. 01350120) and Mine Kill gage (No. 01350140) monitor inflow into the Project's Lower Reservoir from the east and west, respectively. A fourth gage on Schoharie Creek at North Blenheim (No. 01350180), below the Lower Dam, measures outflow from the Project. The gages listed in Table 4.4.1.1-2 are for both Schoharie Creek upstream and downstream of the Project and the two major tributaries that contribute flow to the Project's Lower Dam.

The monthly flow statistics for the USGS Gage below the Project's Lower Dam (No. 01350180) showing minimum, median, mean, and maximum flows are presented in Table 4.4.1.1-3. At this gage, the highest mean daily flows occur during April (1,309 cfs) and the lowest mean daily flows occur during July (90 cfs). Monthly and annual flow duration curves for the full period of record (October 1970 – September 2015) were calculated using mean daily flows from this same gage, and are presented in Figures 4.4.1.1-18 through 4.4.1.1-22.

On August 28, 2011, the Schoharie Valley experienced its flood of record as a result of runoff from precipitation caused by Tropical Storm Irene. Reports of the flooding event indicate that the average rainfall within the basin was over 8 inches during a 24-hour period; the maximum estimated rainfall occurred on the eastern edge of the basin, near Windham (estimated 15.87 inches during a 24-hour period) (NYPA, 2012b). A USGS assessment has classified the event as at least a 500-year flood event. The inflow to the Lower Reservoir was estimated to be 129,135 cfs, and the peak outflow discharged at the Lower Reservoir spillway was estimated to be 118,614 cfs (Hait, 2012). Prior to Tropical Storm Irene, the USGS had estimated the 100-year flood as 97,000 cfs. The previous flood of record was 82,899 cfs in January 1996 (USGS, 1998).

There are no water withdrawals from the Project's two reservoirs.

4.4.1.2 Water Quality

The following sections discuss water quality standards and classifications applicable to waterbodies in the Project vicinity. The results from water quality investigations that pertain to Schoharie Creek and related waterbodies at the Project are also discussed.

Water Body Classification and Water Quality Standards

The New York State waterbody classifications and water quality standards apply to all surface water and groundwater throughout the State. All waters in New York State are assigned a letter classification that denotes their best uses. Table 4.4.1.2-1 identifies the waterbody classifications of Schoharie Creek, Mine

Kill, Platter Kill, and the Lower and Upper Reservoirs. All of these waterbodies are in the Project Boundary except the Platter Kill. Waters within the Project boundary are classified as either Class B or Class C water.

The NYSDEC defines the best usages of Class B waters as primary and secondary contact recreation and fishing. Class B waters are suitable for fish, shellfish, and wildlife propagation and survival. The best usage of Class C waters is fishing, however, Class C waters should be able to be used for the same purposes as Class B, but other factors may limit their use for these purposes.

Schoharie Creek from Schoharie Reservoir downstream to the Lower Reservoir is classified as Class B water while the tributaries to the Lower Reservoir (Mine Kill and Platter Kill), the Upper Reservoir, the Lower Reservoir and Schoharie Creek from the Lower Dam downstream to Breakabeen are classified as Class C waters. The lower reach of Platter Kill is designated as Class C (TS) Trout Spawning waters (NYSDEC 2016a).

The NYSDEC establishes water quality standards and other criteria for many specific parameters. These standards can be either narrative or numeric. Table 4.4.1.2-2 outlines the water quality standards and criteria applicable to the surface waters of the Project.

In order to fulfill certain requirements of the Clean Water Act, the NYSDEC provides regular, periodic assessments of the quality of the water resources in the state and their ability to support specific uses. This information is compiled by NYSDEC into an inventory database. The database is used to record current water quality information, characterize known and/or suspected water quality problems and issues, and track progress toward their resolution. This inventory of water quality information is known as the Waterbody Inventory/Priority Waterbodies List (WI/PWL).

The most recent Mohawk River Basin WI/PWL Report was issued in July 2010 and includes an overall evaluation of water quality in the Mohawk River Basin, as well as assessments for specific waterbody segments within the basin. Causes (pollutants) and sources of water quality problems for those waterbodies with known or suspected impacts are also outlined. The assessments reflect the best available water quality information at the time of publication of the list (NYSDEC, 2010). A description of the assessments of the waterbodies in the Project vicinity from the WI/PWL is summarized in Table 4.4.1.2-3.

The Federal Clean Water Act requires states to periodically assess and report on the quality of waters in their state. Section 303(d) of the Act also requires states to identify impaired waters, where designated uses are not fully supported. The current New York State Section 303(d) list is from 2014 and there is currently a draft in preparation for 2016. These lists were reviewed. No waters within the Project boundary are listed as impaired.

Existing Water Quality Conditions

Water quality data have been collected from Project waters and the surrounding area since 1974 by various entities including the Power Authority. A discussion of the historical water quality data collected and the trends observed was provided in the Pre-Application Document.

The Power Authority conducted a water quality monitoring study in 2012 (NYPA, 2014a) to characterize water quality conditions and determine compliance with New York State Surface Water Quality Standards. This study examined seasonal water quality within both the Upper and Lower Reservoirs, tributaries, and

in Schoharie Creek upstream and downstream of the Project. The results of the water quality monitoring study were reported in the PAD (NYPA, 2014a) and are briefly summarized here.

The water quality monitoring study was conducted on a biweekly basis from April through October 2012. Eleven sites were selected in the Lower Reservoir, Upper Reservoir, one of the Upper Reservoir constant level ponds, the main stem of Schoharie Creek upstream and downstream of the Project, and two tributaries that empty into Schoharie Creek (Mine Kill and Platter Kill) and the Lower Reservoir (Figure 4.4.1.2-1). The eleven sites consisted of seven discrete sites and four vertical profile sites in the Upper and Lower Reservoirs (Table 4.4.1.2-4). Continuous water temperature data were also collected at 15-minute intervals at three sites: above and below the Lower Reservoir, and in one of the constant level ponds. Discrete measurements were also collected for the following parameters: water temperature (°C), dissolved oxygen (DO in mg/L and % saturation), specific conductance (µS/cm), pH, and turbidity (NTU). Water clarity was also collected using a Secchi disk at the four reservoir profile locations. The results are summarized below and in Table 4.4.1.2-5; a full discussion can be found in NYPA, 2014a.

Temperature and DO

The vertical temperature and DO profiles collected at the four sites in the Upper and Lower Reservoir during the 2012 water quality sampling indicate that both reservoirs can thermally stratify, though at different times and for different durations, and that Project operations can influence stratification in localized areas in the Lower Reservoir near the powerhouse. In 2012, thermal stratification in the Upper Reservoir began to occur in May and lasted until October. The two profile sites in the Upper Reservoir showed similar temperature profile trends; however, the Upper Reservoir South location was deeper and further away from the intake, which seemed to preclude any mixing due to Project operations.

Within the Lower Reservoir, thermal stratification at the site near the Lower Reservoir Dam was evident in May and lasted until mid-August, while the Powerhouse site was thermally stratified only in May during a period when the frequency of Project operations was reduced. The DO vertical profiles collected at the four profile sites in the Upper and Lower Reservoir demonstrate that DO concentrations (mg/L) follow a similar profile pattern as temperature. In addition, hypoxic conditions were present in the hypolimnion at all reservoir sites except the Lower Reservoir Powerhouse, which remained well-oxygenated over the duration of the study. Hypoxic conditions in the hypolimnion manifested in July and lasted until the reservoirs became well mixed in the fall. Overall, the temperature and DO profile data suggest that Project operations mix the water column near the Lower Reservoir Powerhouse, and stratification is more apt to occur when the Project is not operating (NYPA, 2014a).

Water temperature at the seven discrete sites followed a similar pattern over the duration of the study period, reflecting typical seasonal patterns of increasing temperatures during the spring and decreasing temperatures during the fall. On average, the tributaries were the coolest, while the Lower Reservoir Inflow and Schoharie Creek Downstream sites were the warmest (Table 4.4.1.2-5). However, temperature measurements at the Schoharie Creek Tailwater site were cooler than the temperatures at the Lower Reservoir Inflow site from July to early-September, which is the same period of time when the Lower Reservoir exhibits thermal stratification, indicating that flow releases from the cooler bottom water near the Lower Dam influenced downstream water temperatures. Once stratification was disrupted in late-September, temperatures at the Schoharie Creek Tailwater site were similar to the temperatures at the Lower Reservoir Inflow site. In general, average daily water temperatures at the Lower Reservoir Inflow

and Schoharie Creek Downstream locations increased in April, May, and June, were relatively consistent through July and August, and then decreased through September into October. The results of the 2012 water quality monitoring study indicate that the Project does not adversely affect water temperatures in the Schoharie Creek watershed in the vicinity of the Project (NYPA, 2014a).

Dissolved oxygen concentrations at all the discrete sites were in compliance with the New York State Surface Water Quality Standards. All surface waters remained well oxygenated even during summer low flow conditions. Average DO concentrations (mg/L) were highest in the tributaries and lowest at the Constant Level Pond site (Table 4.4.1.2-5). Furthermore, DO measurements collected in Schoharie Creek upstream of the Project were obtained under various Gilboa Dam spilling scenarios. When the Gilboa Dam was observed to be spilling during the sampling events on April 26, June 5, and October 23, DO levels were at or near 100% saturation, but when the Gilboa Dam was not spilling, DO levels were variable, the lowest being 62.4% saturation. This suggests reduced flows result in lower DO concentrations.

The hypoxic conditions in the Lower Reservoir near the Lower Dam do not adversely affect the DO concentrations at the Schoharie Creek downstream sites. When hypoxic hypolimnetic water is released through the low level outlet valves at the Lower Dam, the water is aerated sufficiently as it enters Schoharie Creek through atmospheric mixing (passively through the low level outlet valves for releases up to 25 cfs) or by the Howell-Bunger type valves, which are designed to add oxygen to the released water through atmospheric mixing for releases between 25 to 700 cfs. Oxygenation of the released water is further enhanced by turbulence where outlet flows enter Schoharie Creek below the Lower Dam. Average DO levels at the Schoharie Creek Tailwater and Downstream sites were 8.56 mg/L (94.2%) and 9.94 mg/L (109.6%), respectively (Table 4.4.1.2-5). The results of the 2012 monitoring indicate that the Project does not adversely affect DO levels of waters in the Schoharie Creek watershed (NYPA, 2014a).

Turbidity

Maximum, minimum, and average turbidity measurements collected at the seven discrete sampling locations are presented in Table 4.4.1.2-5. Turbidity levels at the discrete sampling sites were generally low during the summer, but higher in the spring and after rain events in the fall. Turbidity was observed to increase at most sites shortly after or during a precipitation or high flow event, which is a common observation throughout the watershed. Extended periods of increased turbidity in the watershed are associated with exposure of glacial clay deposits to runoff from intense rainfall, which causes the water to turn a reddish-brown color. An example of this was documented during a sampling event in October, when heavy rains in the upper watershed caused high turbidity levels at all sample sites. Like the discrete sample sites, higher turbidity levels and shallow Secchi disk measurements were observed at the surface of the Upper and Lower Reservoirs during the fall, which suggest that watershed inflows from precipitation are a main factor affecting turbidity and clarity in the reservoirs. Furthermore, turbidity levels observed at the Lower Reservoir Inflow site and the two outflow locations (Schoharie Creek Tailwater and Schoharie Creek Downstream) were similar and relatively low, especially during low flow periods during the summer. During this period, turbidity levels remained low even when the project was operating, suggesting that pumping and generation at the B-G Project does not adversely affect turbidity (NYPA, 2014a). Overall, turbidity levels reflect the prevailing environmental conditions, as the turbidity of streams within the Schoharie Creek watershed is primarily driven by the geology and hydrology of the landscape.

pH

The pH measurements at all sites, except at times in the Schoharie Creek Downstream site and at both vertical profile sites in the Upper and Lower Reservoirs, were within the acceptable limits imposed by the New York State Surface Water Quality Standards (NYPA, 2014a). The pH at the Schoharie Creek Downstream site exceeded the upper limit of 8.5 on four occasions from July 3 to August 13 (range 8.6 - 9.2) (Table 4.4.1.2-5). The pH levels were also periodically measured above 8.5 in the top layers of both the Upper and Lower Reservoirs in May (range 8.52 - 8.98) and in the Lower Reservoir in August (8.51). Comparison of DO and pH profiles during periods when pH was above the New York State Standard (8.5) near the surface of the reservoirs indicated that pH followed a similar profile pattern as DO, especially through the epilimnion and metalimnion. This suggests photosynthetic processes are influencing pH levels in the upper layers of the reservoirs. In contrast, the elevated pH levels at the Schoharie Creek Downstream site are likely due to groundwater hydrology and an influence of bedrock material.

Conductivity

Conductivity levels throughout the Project vicinity are relatively low and typical for unpolluted freshwater streams. Conductivity measurements varied in relation to streamflow conditions, and were greatest at all seven discrete sites during the dry, summer months (NYPA, 2014a). Generally, conductivity levels were higher for water flowing into the Lower Reservoir compared to outflow (Table 4.4.1.2-5). Surface conductivity at the four vertical profile reservoir sampling sites showed slight increases over the duration of the study period, until levels decreased in the Lower Reservoir after a high flow event in late-October. There is no New York State Surface Water Quality Standard for conductivity. Nevertheless, the results of the 2012 water quality monitoring study indicate that the Project does not adversely affect conductivity of waters within the vicinity of the Project.

4.4.2 Environmental Effects

In SD1 and SD2, FERC identified the following issues related to water resources: (1) the effects of Project operation during flood events on Schoharie Creek below the Lower Dam; and (2) the effects of project facilities and operation on water quality, particularly water temperature and dissolved oxygen in Project reservoirs.

4.4.2.1 Water Quantity

Under the Power Authority's proposed action, the Project would continue to operate as it currently does. The Upper Reservoir would continue to pump and discharge water to and from the Lower Reservoir. This operation would continue to result in the same fluctuations in the Lower Reservoir as currently occurs. Under the Power Authority's proposed action, the Project would be operated in accordance with FERC approved Water Management Plan so that outflow generally equals inflow except for low flows minimum flows would continue to be released such that Project outflow equals inflow. When the inflow is less than 10 cfs, the Power Authority will maintain a minimum discharge of 10 cfs by tapping into the storage. The minimum discharge will be reduced to 7 cfs when a certain volume has been depleted. The result is that the flows downstream of the project during low inflow periods are improved over what occurred during the period after Gilboa Dam was built and before the BG project was built. Thus, operation of the Project does not result in any net water loss to Schoharie Creek.

Under the Power Authority's proposed action, the Power Authority would continue to fund the eight USGS streamflow gaging stations within the Schoharie Creek Basin as they provide information to support implementation of the Power Authority's Water Management Plan.

The Power Authority is conducting a study on the Effect of Project Operations on Downstream Flooding (Flooding Study) to understand the effect of Project operations, if any, on downstream flooding conditions. The results of the study will be presented in the Updated Study Report anticipated to be filed with the Commission on or about February 17, 2017, and will be analyzed in the Power Authority's Final License Application.

4.4.2.2 Water Quality

The Power Authority's 2012 water quality monitoring study did not reveal any adverse environmental effects of Project operation on DO, water temperature, turbidity, pH, or conductivity. Both the Upper and Lower Reservoirs enter a period of seasonal thermal stratification, but Project operations may interrupt stratification of the Lower Reservoir by mixing the water column, especially near the Lower Reservoir Powerhouse. Bottom water releases at the Lower Dam during periods of hypoxia in the hypolimnion did not reduce DO concentrations below the New York State Surface Water Quality Standard downstream of the Project. The elevated pH levels measured downstream of the Project at the Schoharie Creek Downstream site are likely an effect of groundwater seepage and buffering by bedrock material in the watershed. In contrast, the elevated pH levels in the reservoirs are most likely due to photosynthetic activity. Turbidity levels among all sampling sites appear to reflect the natural conditions and variability, and do not appear to be influenced by Project operations. Specifically, high turbidity correlates with precipitation and high flow events while turbidity levels remain low during low inflow periods regardless of Project operation. DO and turbidity levels are within the constraints imposed by the New York State Surface Water Quality Standards, while the pH levels exceeding the standard are explained by natural phenomena.

4.4.3 Proposed Environmental Measures

The Power Authority proposes to continue to operate the Project in accordance with Water Management Plan (FERC, 1975). Thus Project operation as proposed will not result in any significant adverse effects to water quantity or quality.

4.4.4 Unavoidable Adverse Impacts

Continued operation of the B-G Project is not expected to adversely affect water resources.

Table 4.4.1.1-1: Median Monthly and Annual Reservoir Water Surface Elevations (2002-2014)

Month	Upper Reservoir	Lower Reservoir
January	1992.8	875.51
February	1994.3	873.98
March	1992.9	875.8
April	1994.3	874.11
May	1994.3	874.04
June	1994.5	873.71
July	1995.4	872.28
August	1994.2	873.78
September	1990.8	876.97
October	1994.1	873.09
November	1993.3	874.61
December	1993.8	875.21
Annual	**1993.0**	**874.4**

Table 4.4.1.1-2: USGS Gages in the Vicinity of the Project

Gage No.	Gage Name	Drainage Area	Comments
01350101	Schoharie Creek at Gilboa, NY	316 mi^2	0.4 mi downstream from NYCDEP's Gilboa Dam (Schoharie Reservoir). Entire flow, runoff from 316 mi^2, except for periods of spill, diverted from Schoharie Reservoir for water supply of City of New York. Discharge <10 cfs not determined at this station.
01350120	Platter Kill at Gilboa, NY	10.9 mi^2	Located 0.3 mi upstream from mouth
01350140	Mine Kill near N. Blenheim, NY	16.2 mi^2	Located 0.6 mi upstream from mouth
01350180	Schoharie Creek at N. Blenheim, NY	358 mi^2	Regulation of flow by New York Power Authority Blenheim-Gilboa Pumped Storage Power Project immediately upstream from gage.

Table 4.4.1.1-3: Monthly Flow Statistics below Lower Dam, Water Years 1971- 2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	3	7	8	9	5	<1	<1	<1	<1	<1	<1	2
max	29,900	8,200	18,000	21,600	9,700	15,700	4,490	46,600	15,500	14,800	11,700	11,500
mean	444	350	938	1,309	595	330	90	94	157	255	331	466
median	109	98	415	866	331	23	9	8	7	9	34	73

Source: USGS Gage No. 1350180 Schoharie Creek at North Blenheim

Table 4.4.1.2-1: Surface Waterbody Classifications of Upper Reservoir, Lower Reservoir, Schoharie Creek and Tributaries to Lower Reservoir

Waterbody	Classification	Best Usages	Notes
Schoharie Creek	B	The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.	NYCDEP's Gilboa Dam to upstream extent of Lower Reservoir (at small tributary south of Mine Kill)
Lower Reservoir	C	The best usage of Class C waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors (such as flow/depth, access, conflicting use) may limit the use for these purposes.	From small tributary south of Mine Kill to Lower Dam
Schoharie Creek	C		Downstream from Lower Dam to extent of Project boundary
Mine Kill	C		-
Upper Reservoir	C		-
Platter Kill	C (TS)		(TS) Trout Spawning Waters

Source: 6 NYCRR 879.6

Table 4.4.1.2-2: Summary of New York State Surface Water Quality Standards for Class B and Class C Waters

Parameter	Standard
Taste-, color-, and odor producing, toxic and other deleterious substances	None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages.
Turbidity	No increase that will cause a substantial visible contrast to natural conditions.
Suspended, colloidal and settleable solids	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.
Oil and floating substances	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.
Phosphorus and nitrogen	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.
Flow	No alteration that will impair the waters for their best usages.
pH	Shall not be less than 6.5 nor more than 8.5.
Dissolved Oxygen	For trout spawning waters (TS), the DO concentration shall not be less than 7.0 mg/L from other than natural conditions. For trout waters (T), the minimum daily average shall not be less than 6.0 mg/L, and at no time shall the concentration be less than 5.0 mg/L. For non-trout waters, the minimum daily average shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/L.
Dissolved Solids	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.
Total Coliform (per 100mL)	The monthly median value and more than 20 percent of the samples, from a minimum of five examinations, shall not exceed 2,400 and 5,000, respectively.
Fecal Coliforms (per 100mL)	The monthly geometric mean, from a minimum of five examinations, shall not exceed 200

Source: NYSDEC 2012a, 2012b

Table 4.4.1.2-3: Waterbody Assessment of the Waters in the Project Vicinity

Waterbody	Segment Description	Assessment Category	Use(s) Impacted	Severity
Schoharie Creek , Lower, Main Stem	From Fultonham to Lower Reservoir	Minor Impacts	Habitat/Hydrology	Stressed
Lower Reservoir	Entire reservoir	Needs Verification	Recreation	Threatened
Schoharie Creek , Middle, Main Stem	From Lower Reservoir to Schoharie Reservoir	Needs Verification	Aquatic Life, Habitat/Hydrology	Stressed
Upper Reservoir	Entire reservoir	Needs Verification	Recreation	Threatened
Mine Kill	Entire stream and tributaries	No Known Impacts	No Use Impairment	n/a
Platter Kill	Entire stream and tributaries	No Known Impacts	No Use Impairment	n/a

Source: NYSDEC 2010

Table 4.4.1.2-4: 2012 Water Quality Sampling Locations

Station Number	Description	Sample Type
1	Schoharie Creek Upstream	Surface
2	Platter Kill	Surface
3	Mine Kill	Surface
4	Lower Reservoir Inflow	Surface; continuous water temperature
5	Lower Reservoir Powerhouse	Vertical Profile
6	Lower Reservoir Near Dam	Vertical Profile
7	Schoharie Creek Downstream	Surface; continuous water temperature
8	Upper Reservoir Intake	Vertical Profile
9	Upper Reservoir South	Vertical Profile
10	Upper Reservoir Constant Level Pond	Surface; continuous water temperature
11	Schoharie Creek Tailwater	Surface

Source: NYPA, 2014a

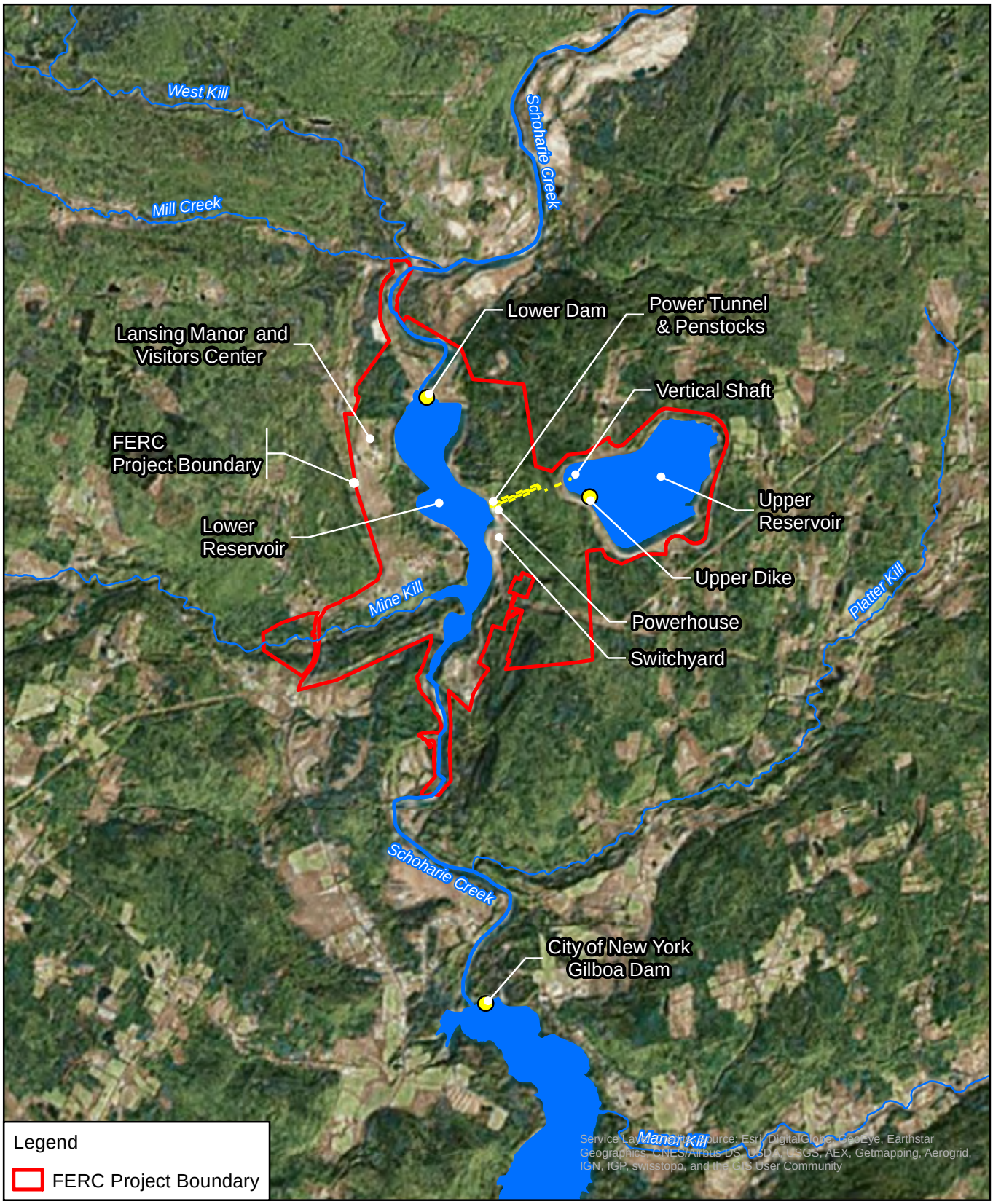
Table 4.4.1.2-5: Summary of Water Quality Results as Measured at the Seven Discrete Sites by NYPA in 2012

Statistic	Schoharie Creek Upstream	Platter Kill	Lower Reservoir Inflow	Mine Kill	Schoharie Creek Tailwater[1]	Schoharie Creek Downstream	Constant Level Pond
Temperature (°C)							
Max	24.11	17.88	29.36	23.01	24.06	28.86	25.00
Min	9.22	7.28	9.22	6.39	12.50	9.28	9.06
Average	18.32	12.72	20.38	15.71	19.66	19.59	18.25
Dissolved Oxygen (mg/L)							
Max	11.58	12.84	10.98	11.94	11.47	11.82	10.76
Min	6.22	9.26	7.32	8.68	6.92	7.99	5.70
Average	8.56	10.68	9.14	9.97	8.56	9.94	7.76
Dissolved Oxygen (% saturation)							
Max	111.5	111.2	120.1	119.5	109.9	132.6	101.4
Min	62.4	85.4	84.5	89.7	78.7	90.2	59.9
Average	92.4	102.4	103.1	101.7	94.2	109.6	84.0
Turbidity (NTU)[2,3]							
Max	1677.0 (39.0)	788.0 (198.5)	1557.0 (46.6)	73.9 (22.1)	2674.0 (6.6)	1850.5 (42.4)	373.8 (373.8)
Min	3.5 (3.5)	6.0 (6.0)	0.0 (0.0)	0.0 (0.0)	4.0 (4.0)	3.2 (3.2)	0.0 (0.0)
Average	141.0 (13.0)	117.0 (61.1)	130.7 (11.9)	11.2 (6.0)	450.2 (5.4)	152.4 (10.9)	38.2 (36.9)
pH							
Max	8.3	8.2	8.5	8.2	7.9	9.2	7.7
Min	7.4	6.9	7.4	7.4	7.4	7.3	6.7
Average	7.8	7.9	8.1	7.8	7.5	8.1	7.2
Conductivity (µS/cm)							
Max	569.0	193.2	323.6	247.0	130.7	162.2	102.9
Min	72.5	106.4	79.1	88.7	86.6	86.9	68.7
Average	330.5	159.7	207.6	179.6	118.0	121.3	83.1

1 Schoharie Creek Tailwater site was added part way through the study because of concerns of suppressed DO in hypolimnetic water of the Lower Reservoir near the dam affecting DO concentrations downstream of the Project.

2 Turbidity summary statistics do not include measurements made on 9/25/2012 because the turbidity sensor malfunctioned.

3 Values in parentheses omit high turbidity measurements obtained on 10/23/2012 after a rain event.



Blenheim-Gilboa Pumped Storage Power Project
FERC No. 2685

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0 0.5 1 2 Miles

Figure 4.4.1.1-1:
Water Resources
of the Project

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Blenheim-Gilboa Pumped Storage Power Project
FERC No. 2685

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Figure 4.4.1.1-2:
Lower Reservoir Bathymetry

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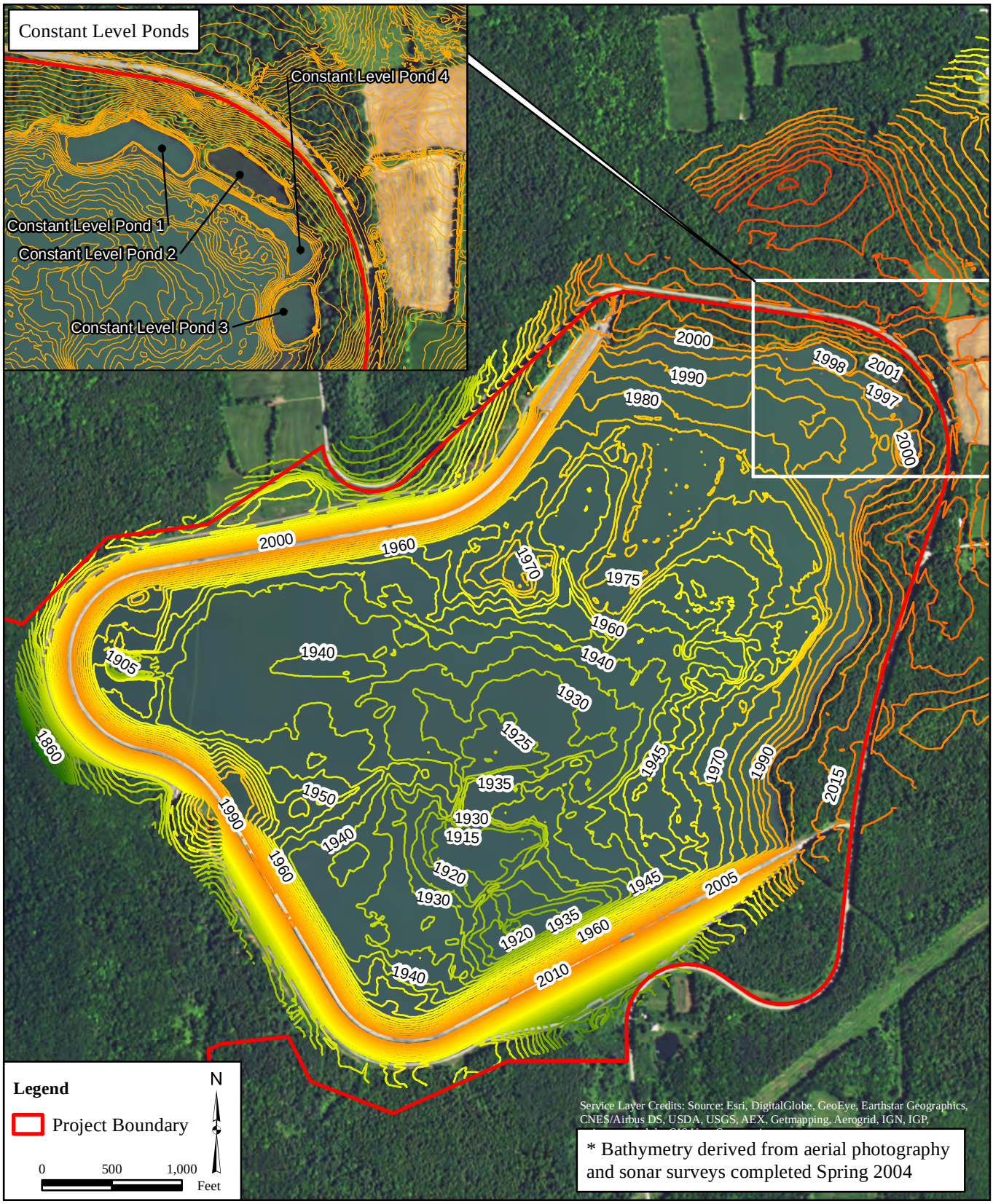

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Figure 4.4.1.1-3: Upper Reservoir Bathymetry

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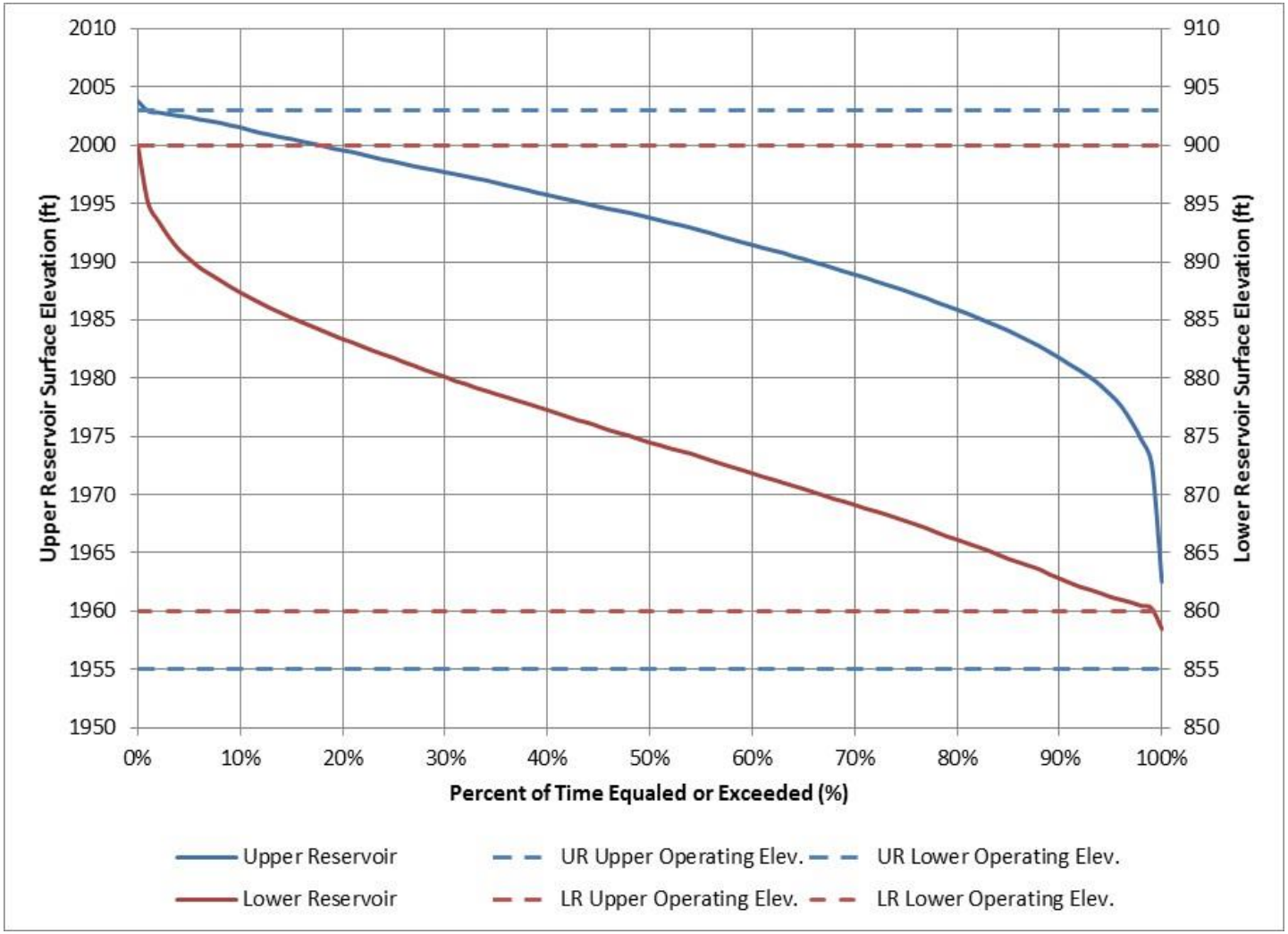

Figure 4.4.1.1-4: Upper and Lower Reservoir Water Surface Elevation Annual Duration Curve (2002-2014)

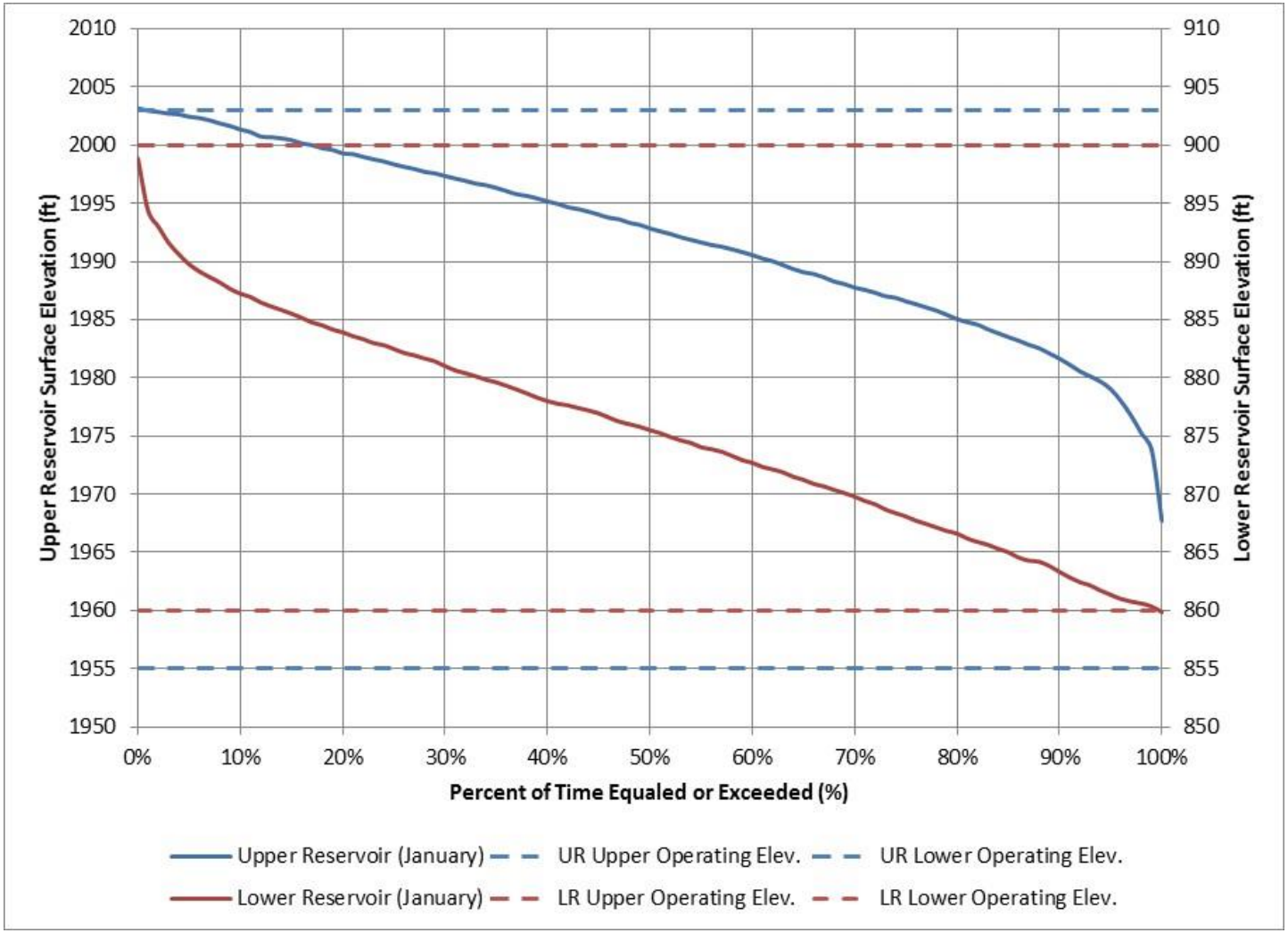

Figure 4.4.1.1-5: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - January (2002-2014)

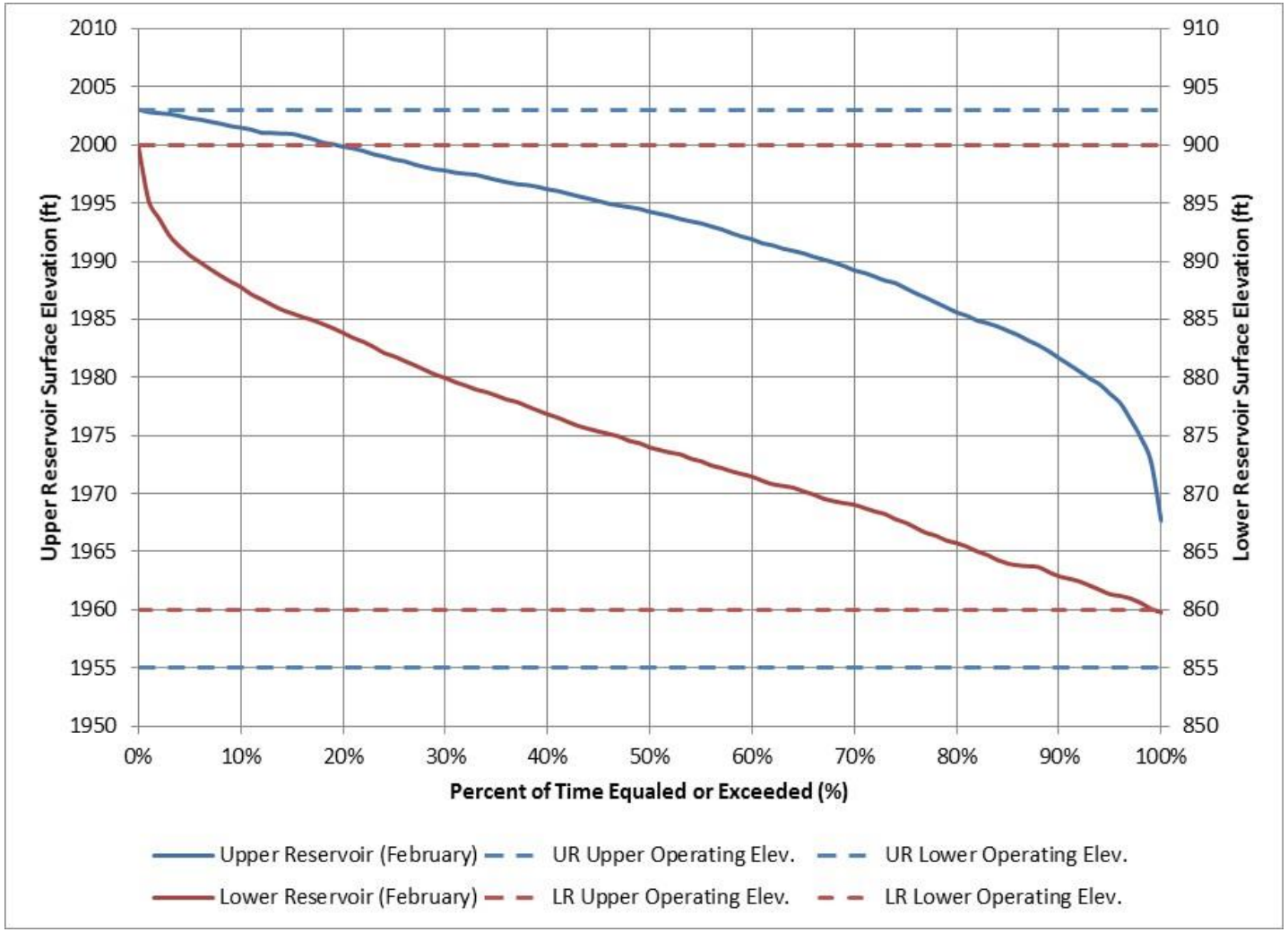

Figure 4.4.1.1-6: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - February (2002-2014)

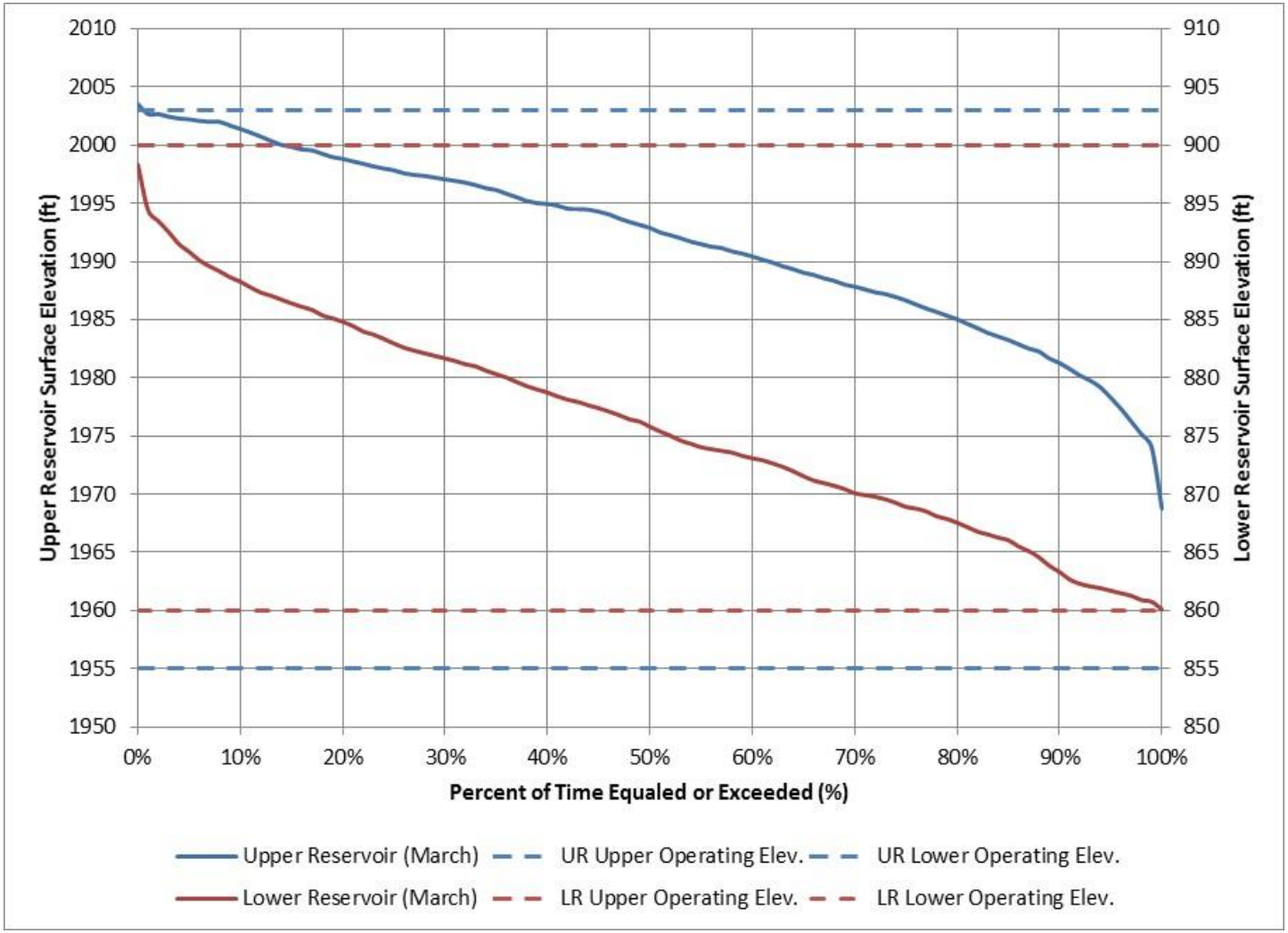

Figure 4.4.1.1-7: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - March (2002-2014)

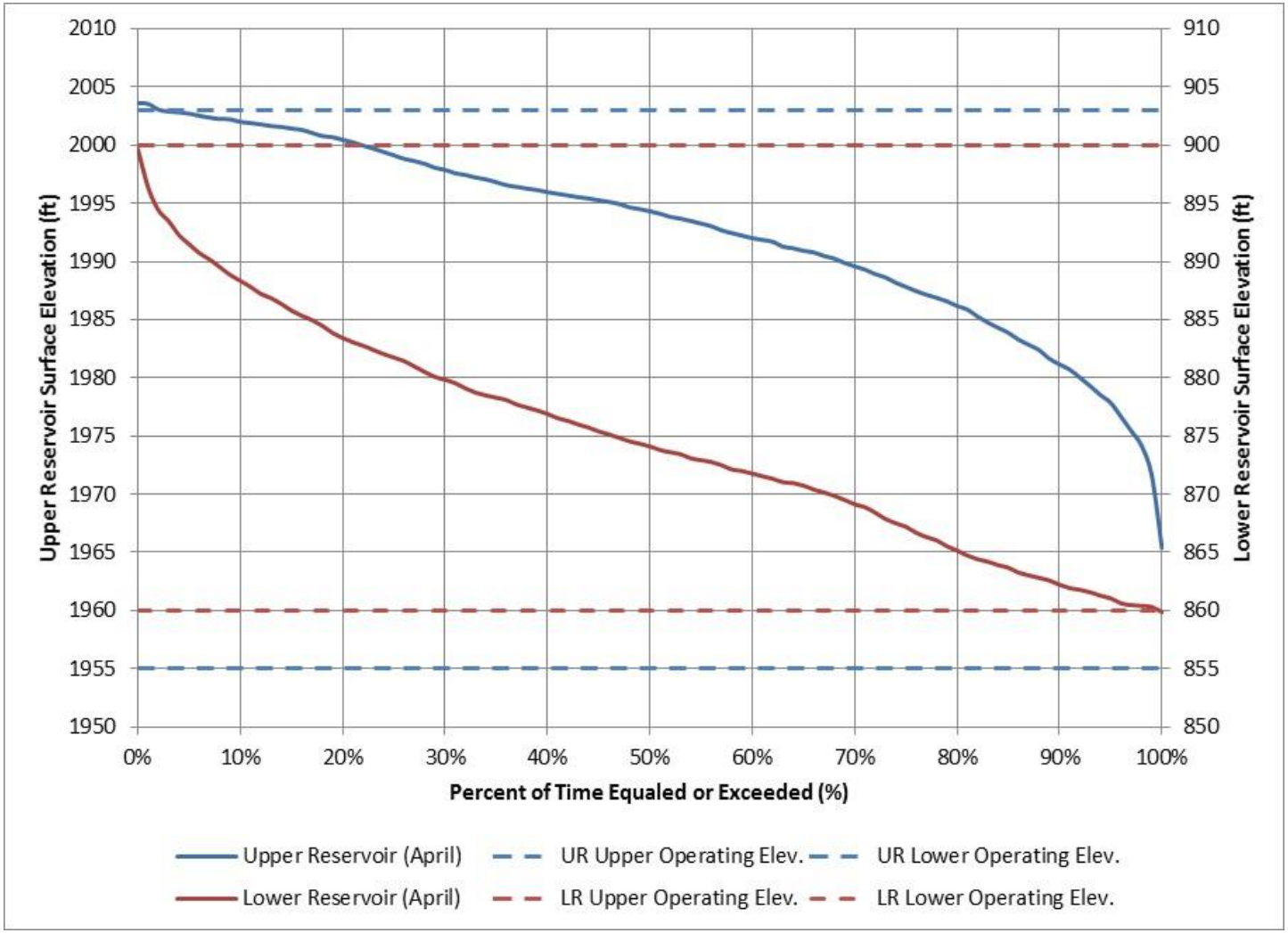

Figure 4.4.1.1-8: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - April (2002-2014)

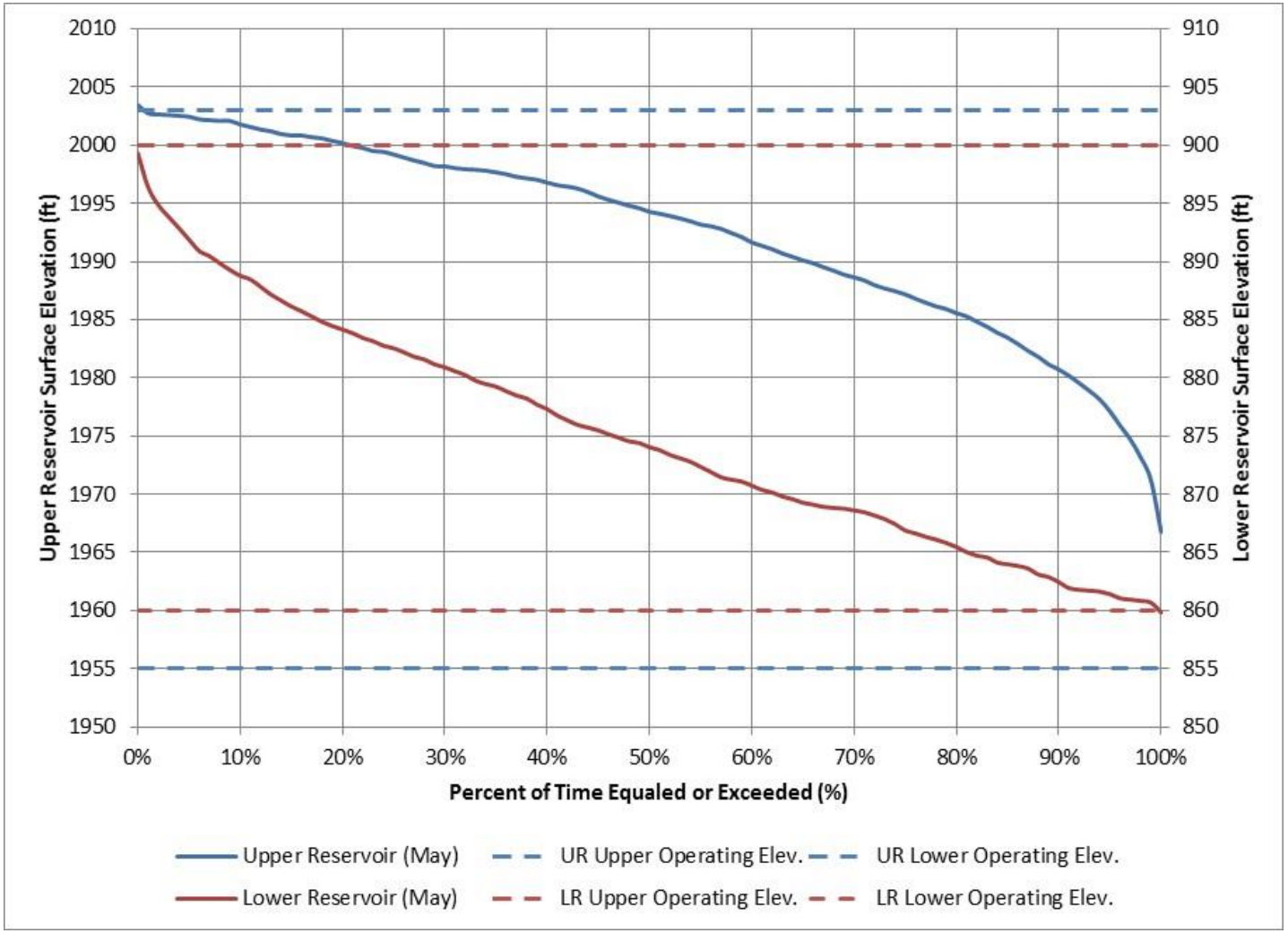

Figure 4.4.1.1-9: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - May (2002-2014)

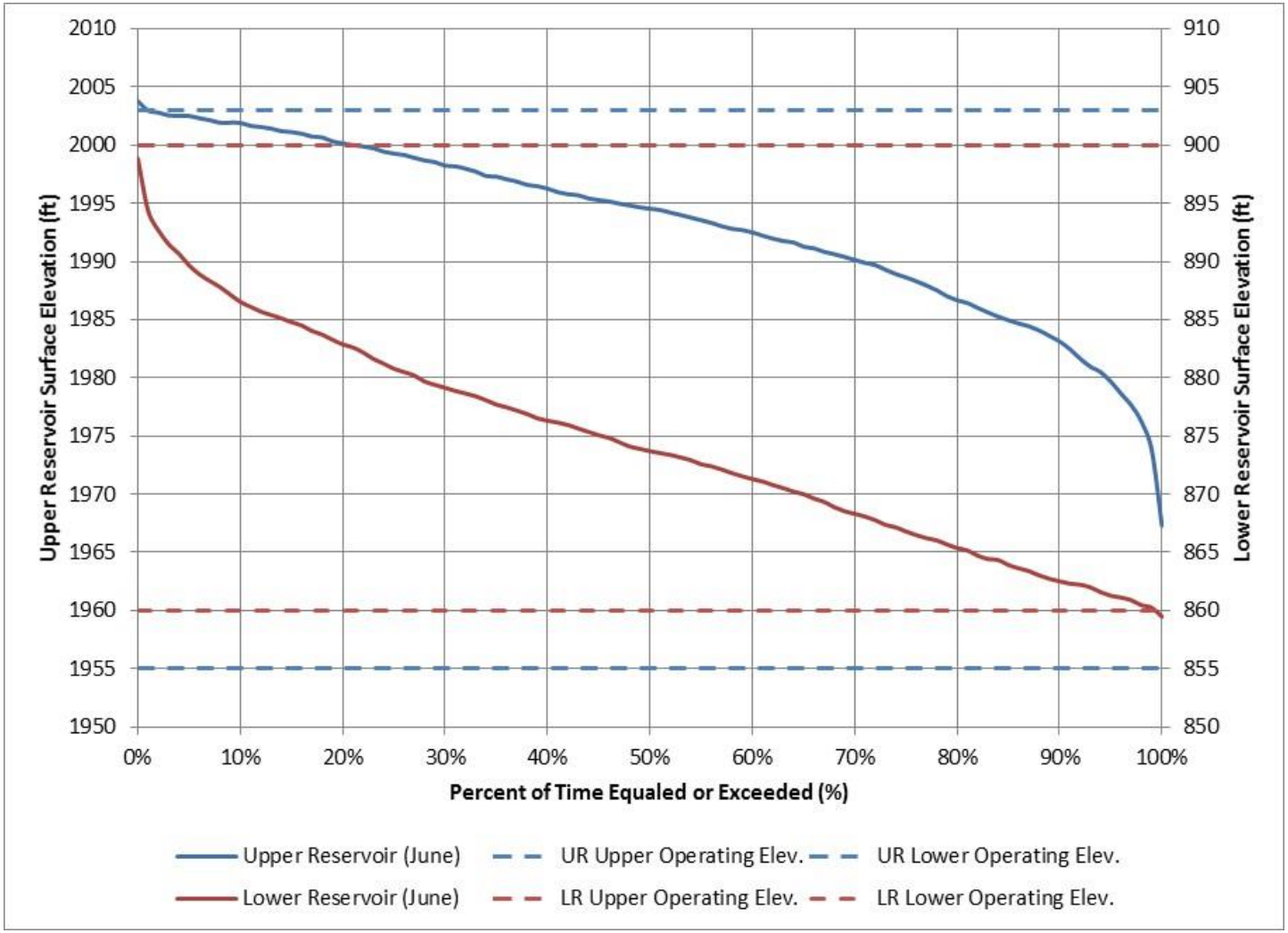

Figure 4.4.1.1-10: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - June (2002-2014)

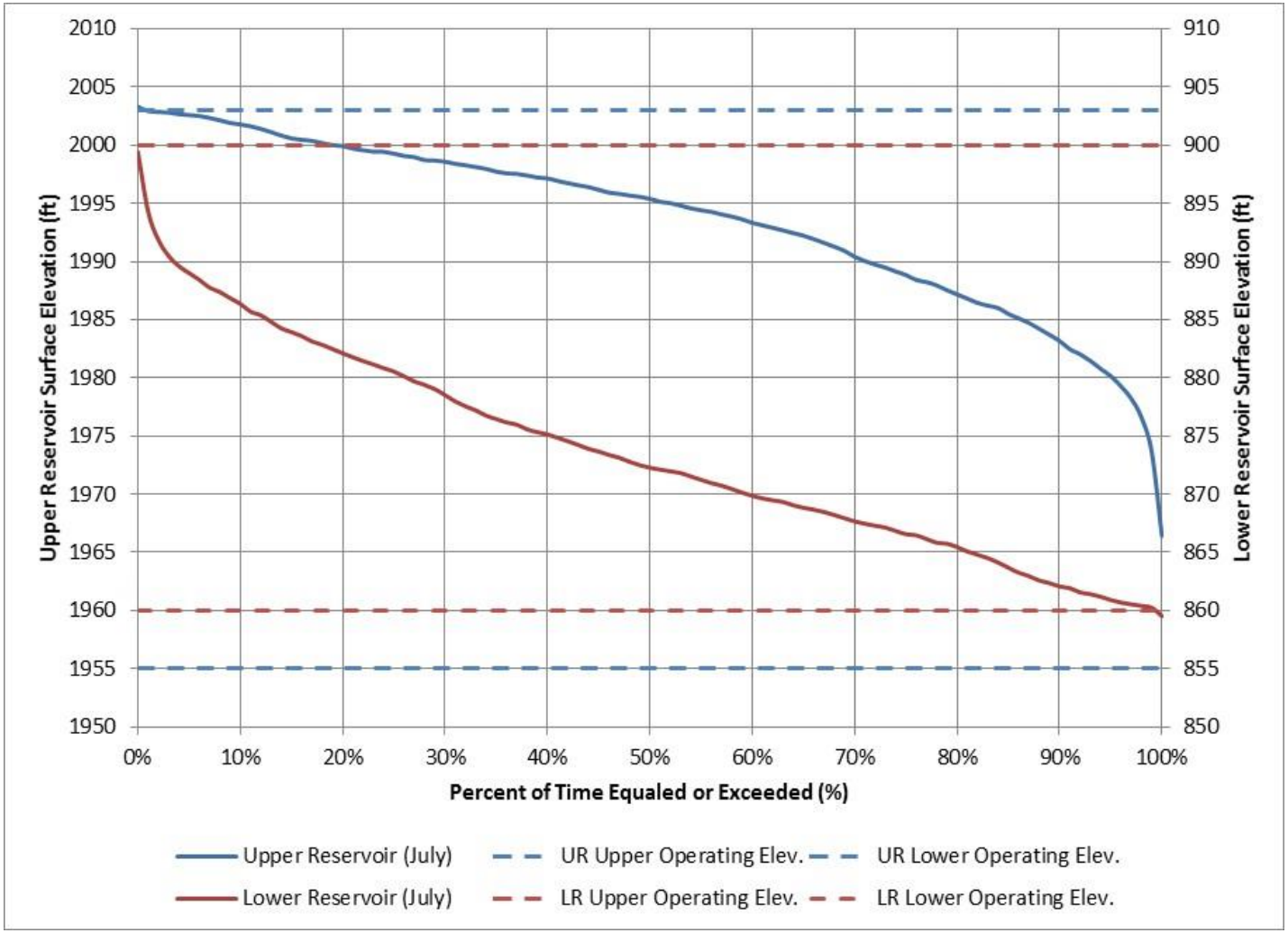

Figure 4.4.1.1-11: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - July (2002-2014)

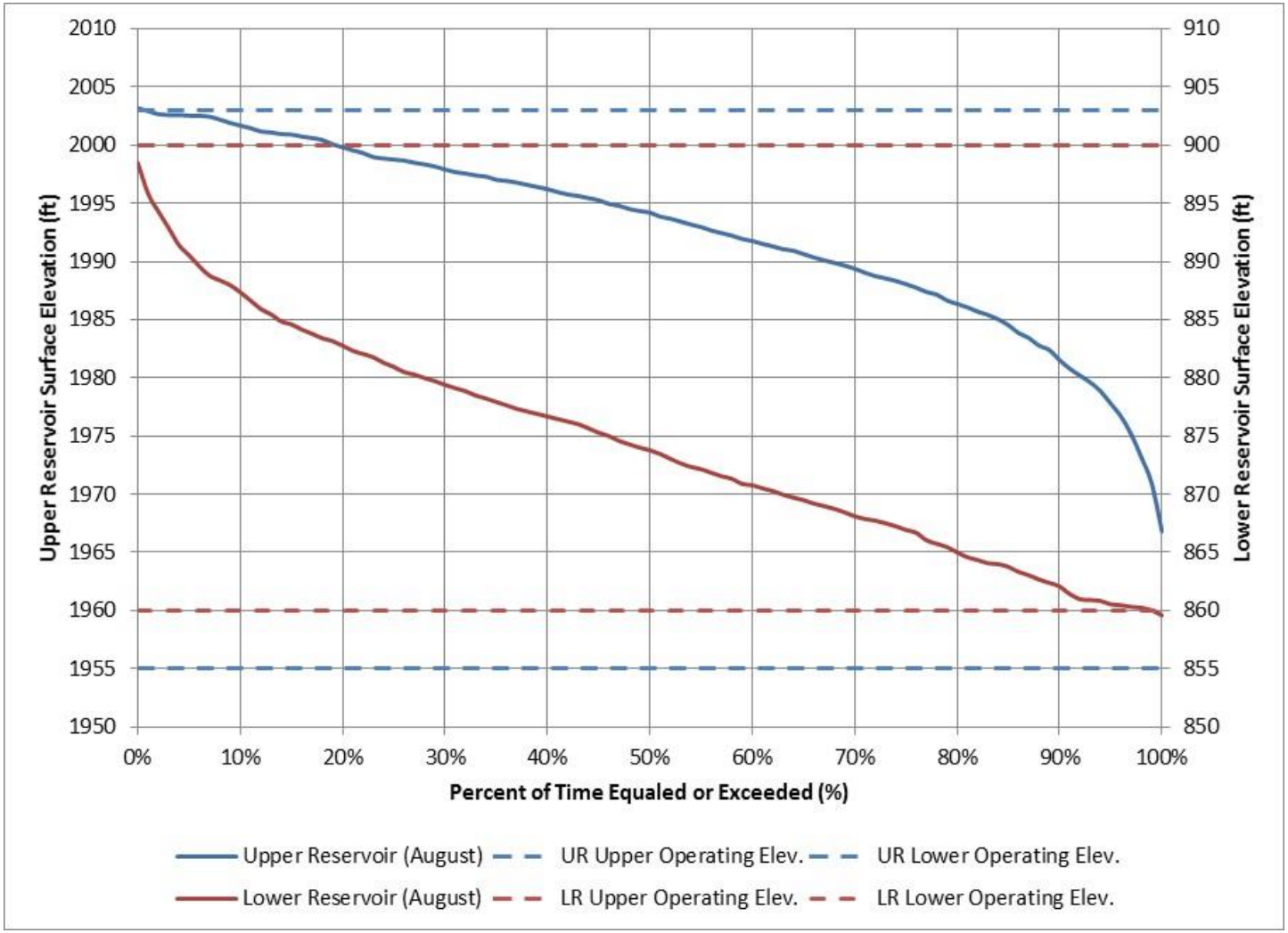

Figure 4.4.1.1-12: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - August (2002-2014)

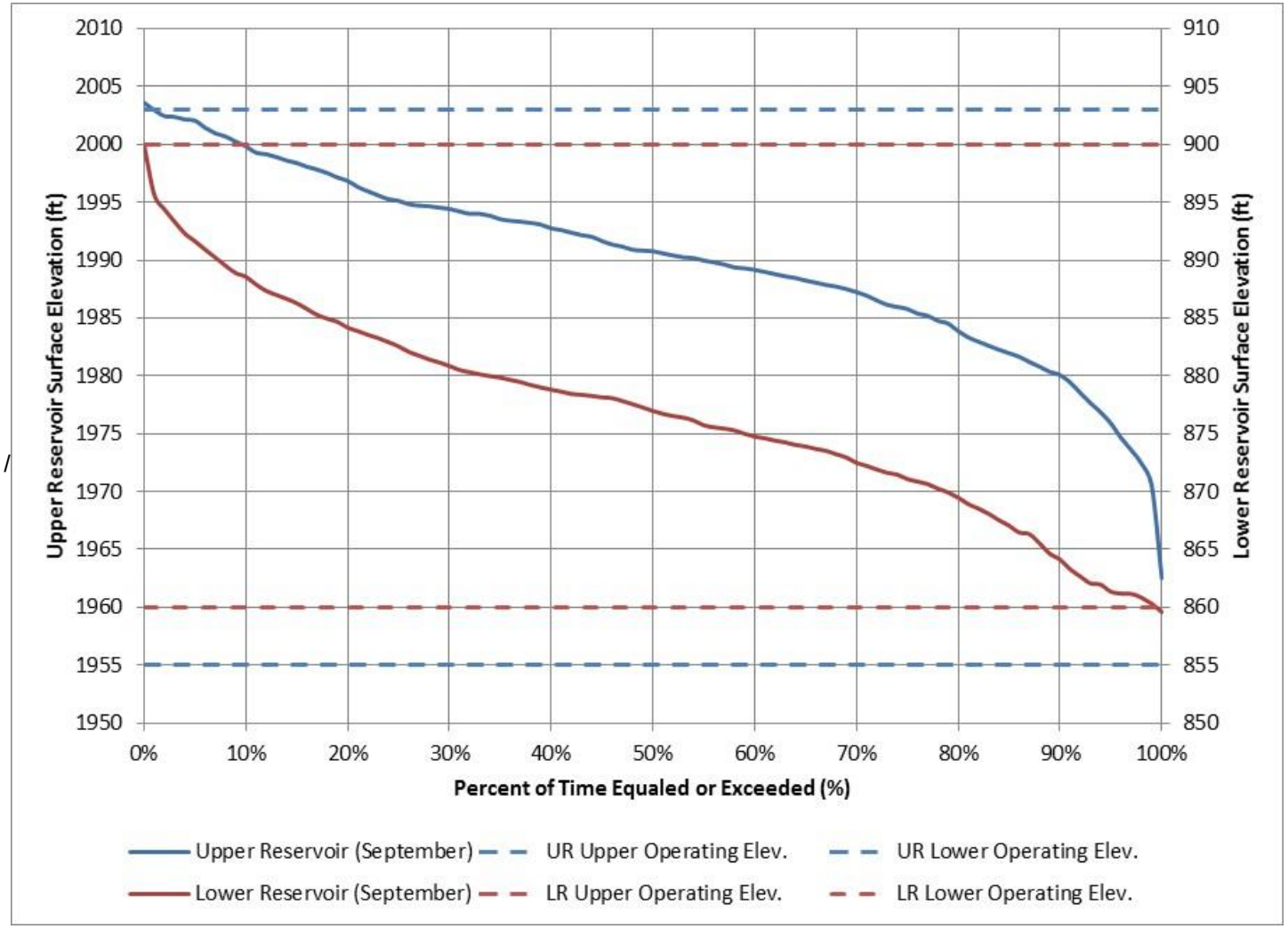

Figure 4.4.1.1-13: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - September (2002-2014)

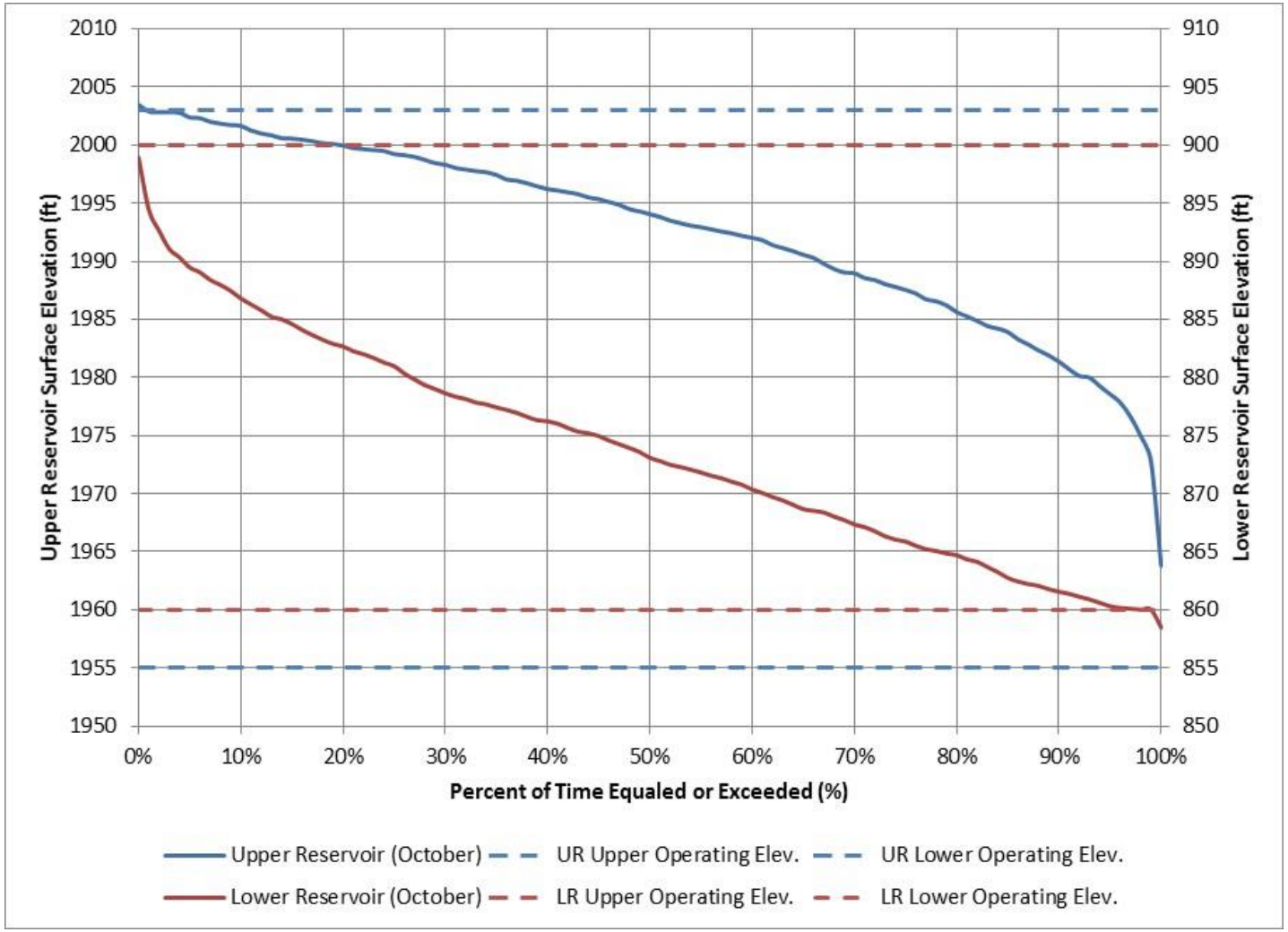

Figure 4.4.1.1-14: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - October (2002-2014)

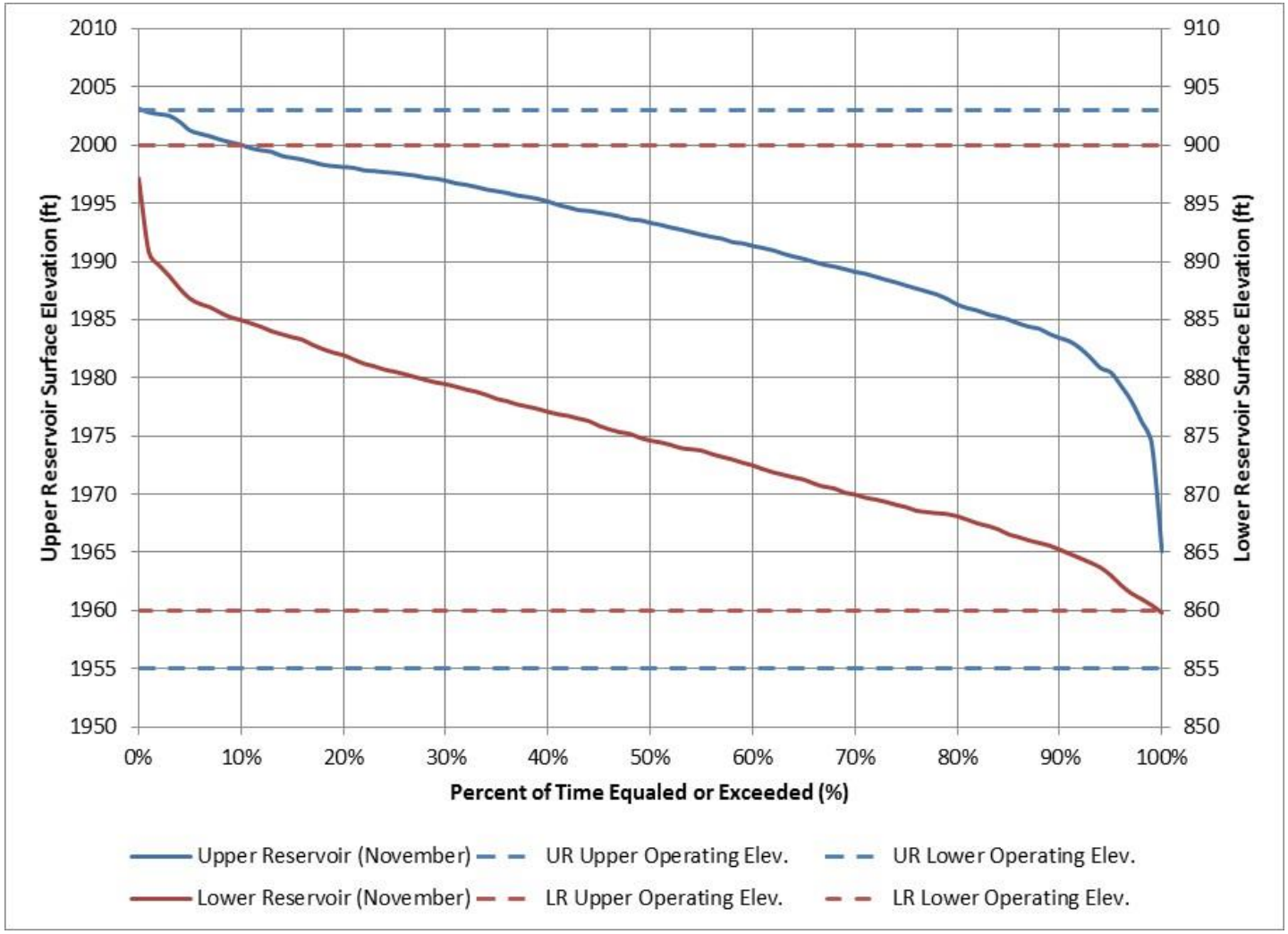

Figure 4.4.1.1-15: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - November (2002-2014)

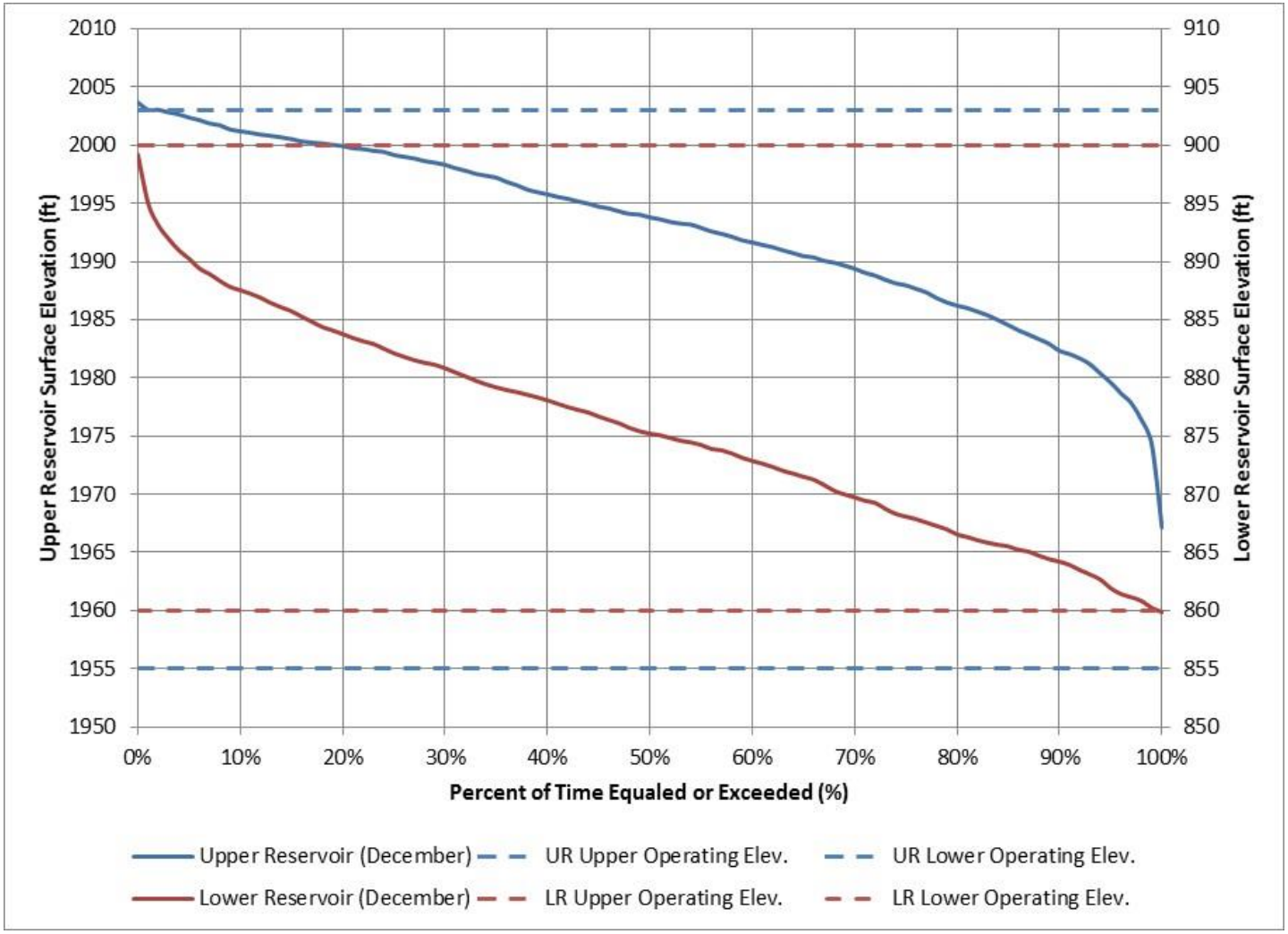

Figure 4.4.1.1-16: Upper and Lower Reservoir Water Surface Elevation Monthly Duration Curve - December (2002-2014)

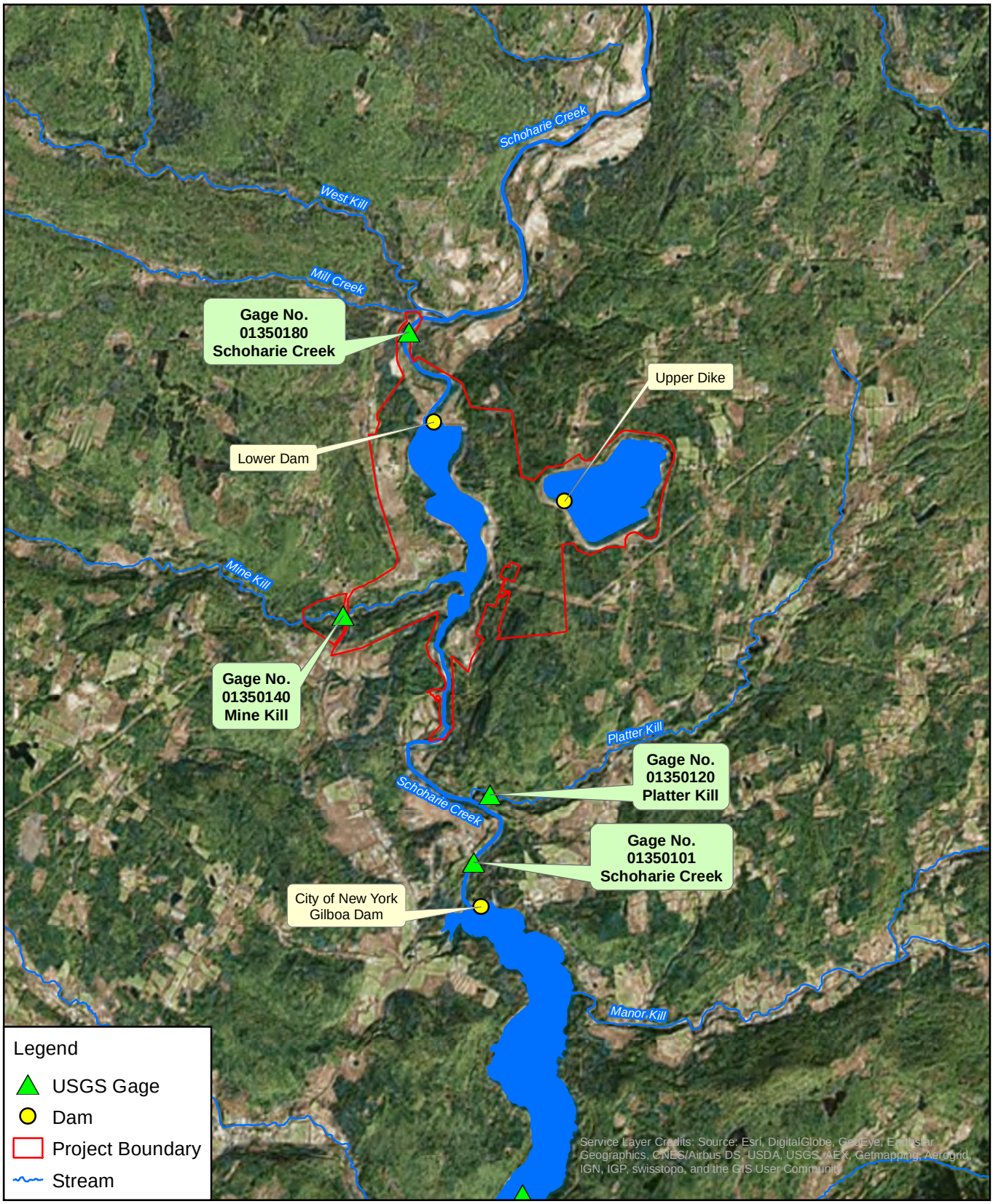

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Figure 4.4.1.1-17:
USGS Stream Gages
in the Vicinity
of the Project

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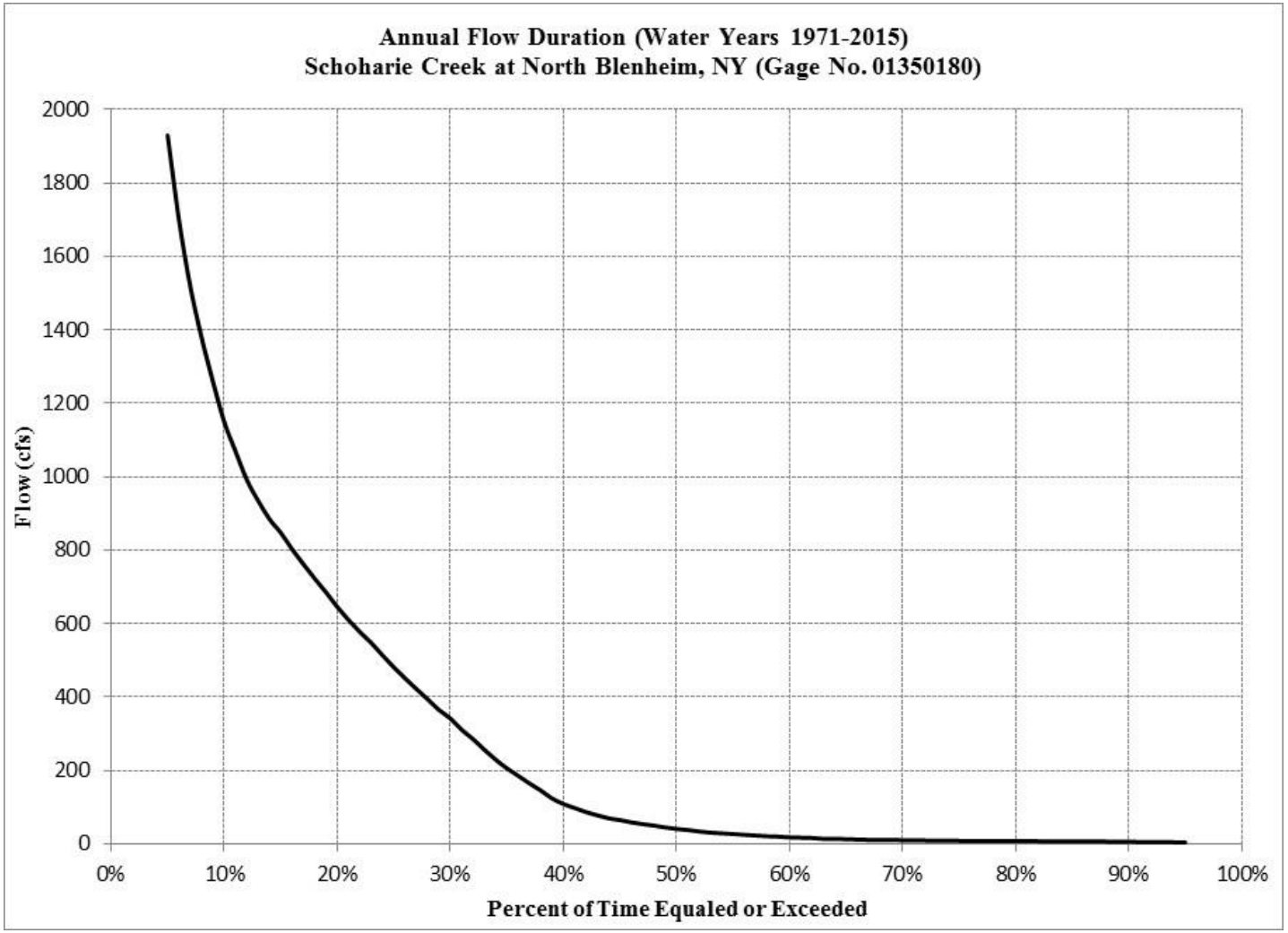

Figure 4.4.1.1-18: Annual Flow Duration Curve

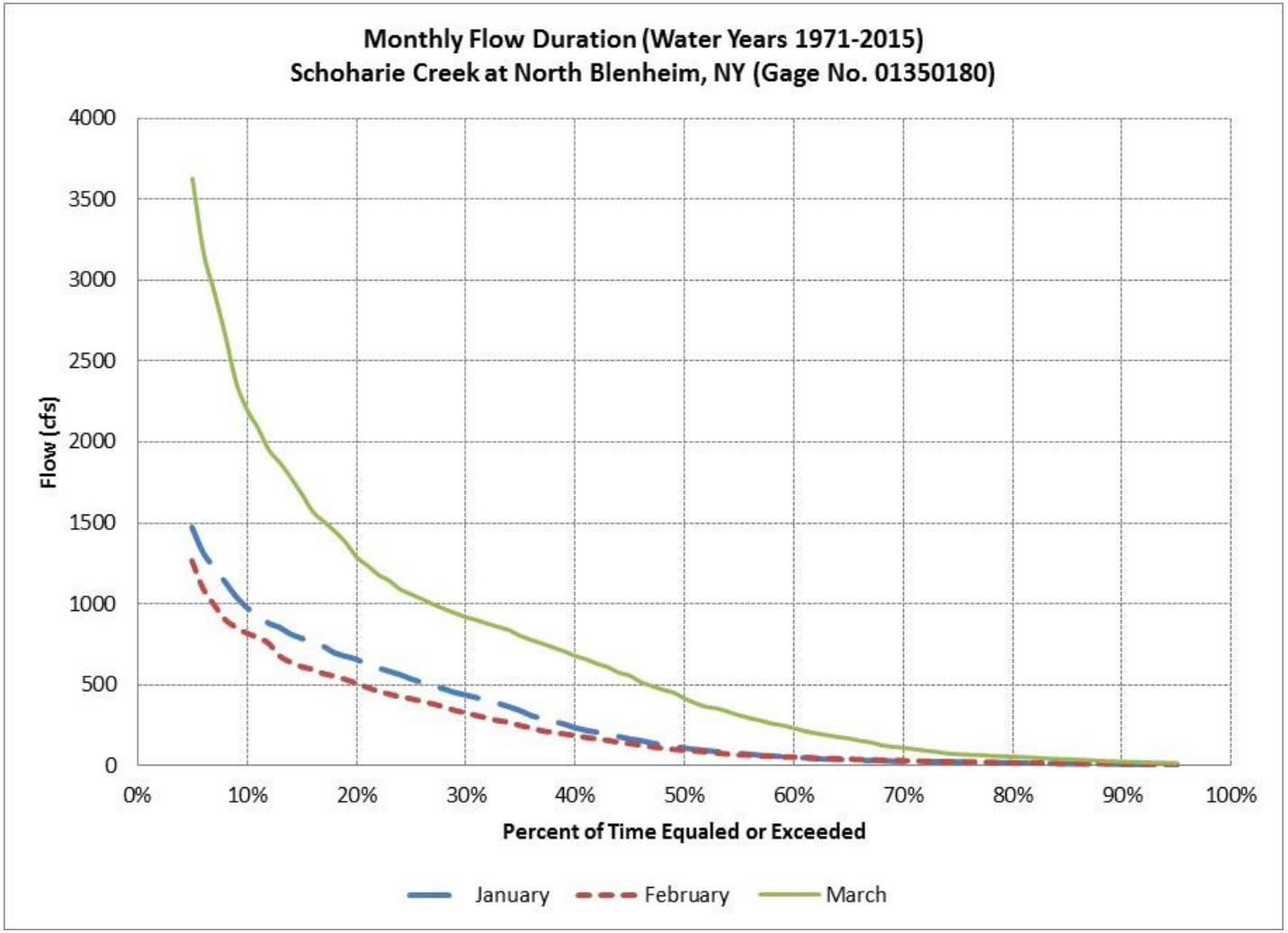

Figure 4.4.1.1-19: Monthly (January, February, March) Flow Duration Curves

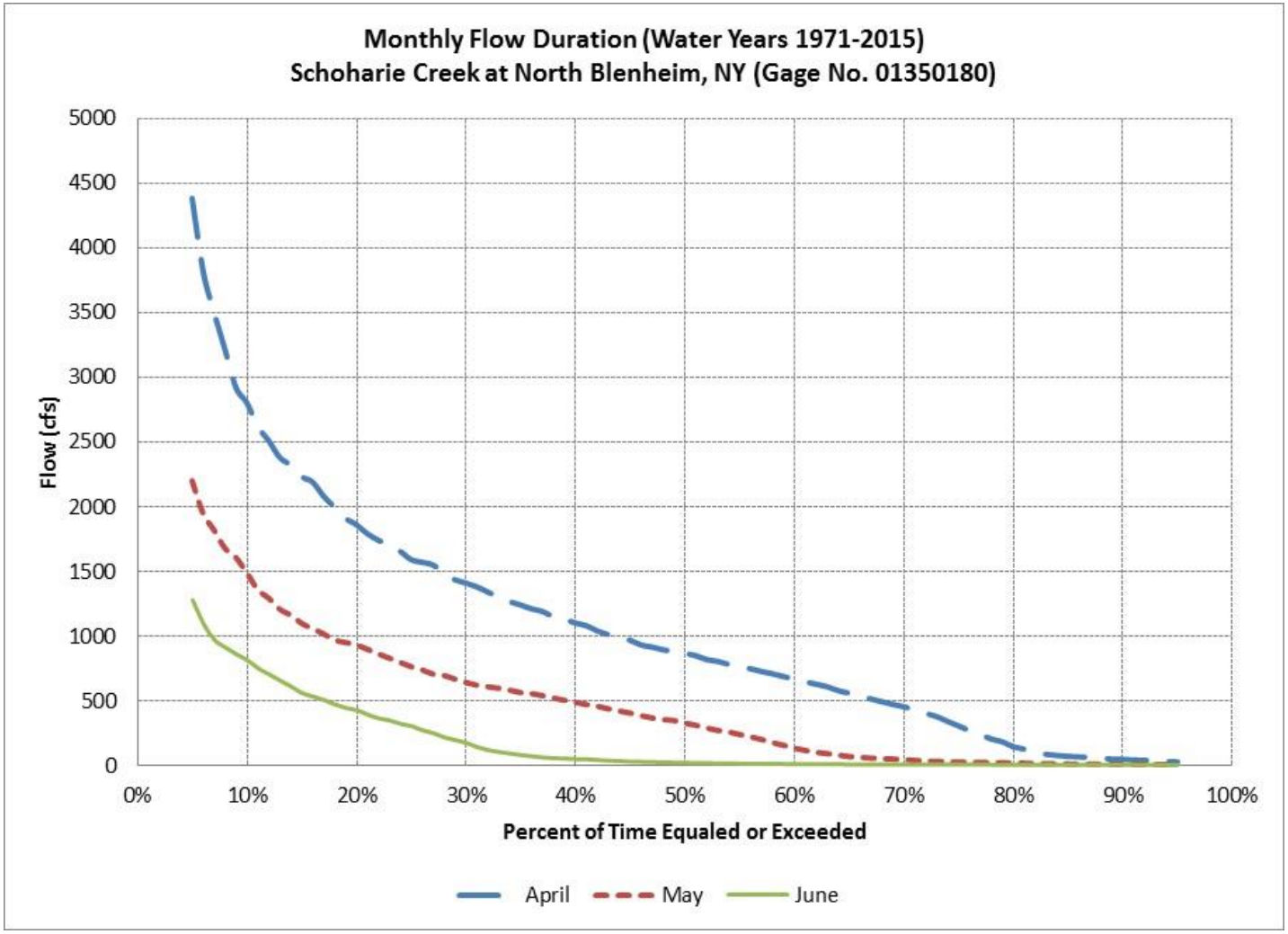

Figure 4.4.1.1-20: Monthly (April, May, June) Flow Duration Curves

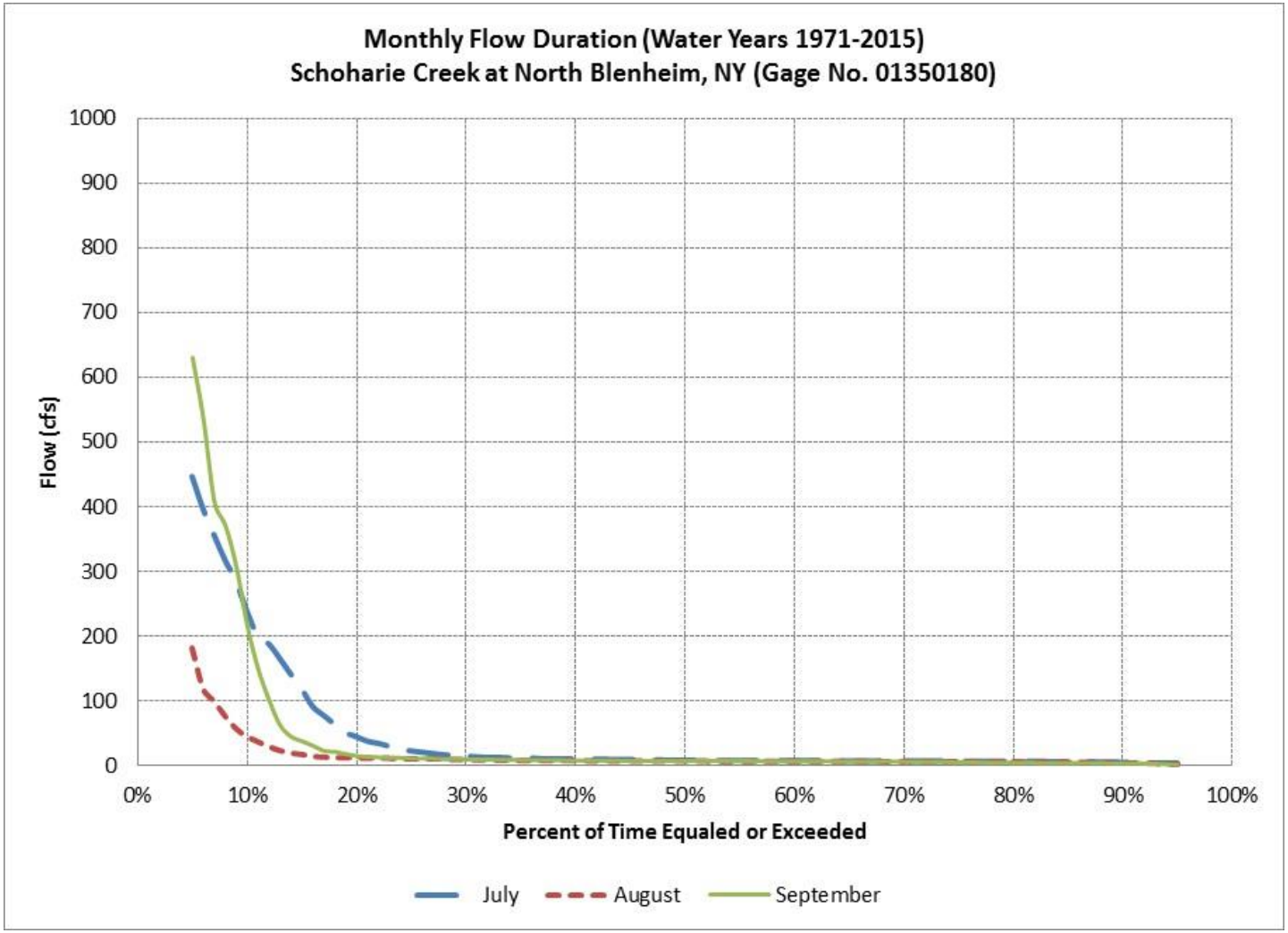

Figure 4.4.1.1-21: Monthly (July, August, September) Flow Duration Curves

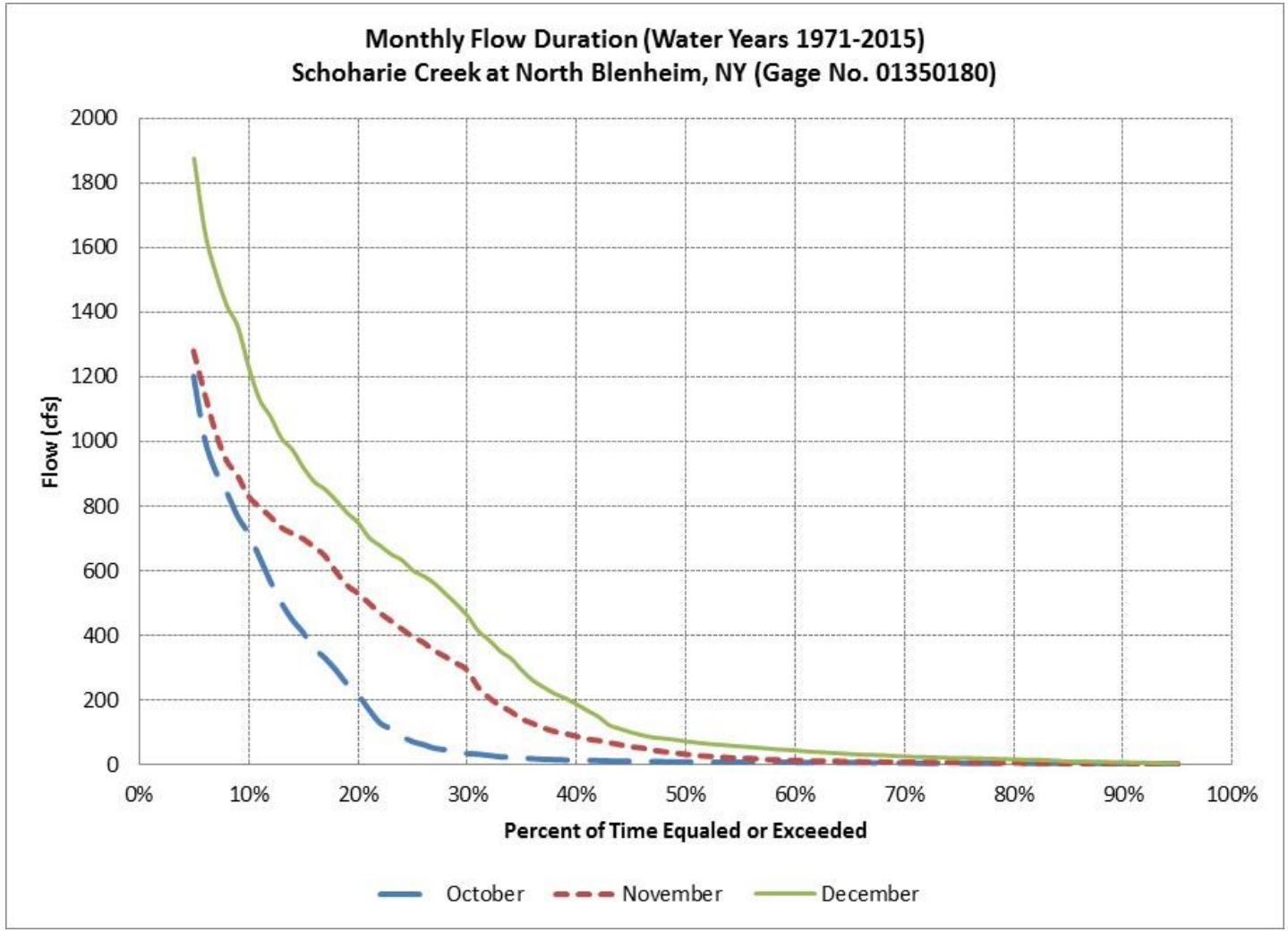

Figure 4.4.1.1-22: Monthly (October, November, December) Flow Duration Curves

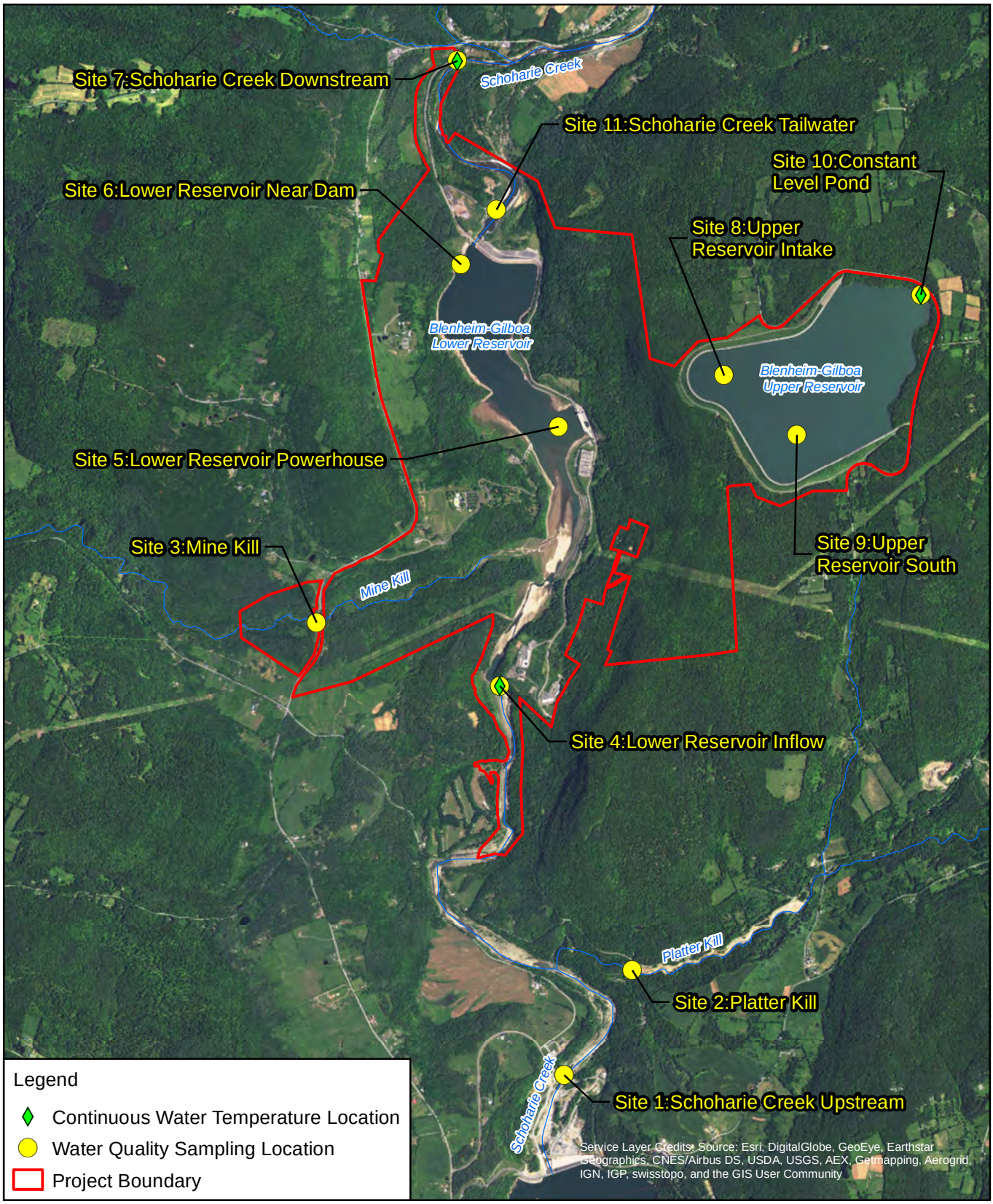

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Figure 4.4.1.2-1:
2012 Water Quality
Sampling Locations

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4.5 Fishery Resources

4.5.1 Affected Environment

This description of the fishery resources in the Project waters were first reported in the PAD (NYPA, 2014c) and are briefly summarized here. Subsequent to the issuance of the PAD, one study pertaining to fishery resources was required by FERC as a result of the study phase of the relicensing process.

4.5.1.1 Aquatic Habitat

Lower Reservoir

The Lower Reservoir has a gently sloping basin and the substrate is predominantly silt and clay. In the upstream portion of the reservoir above the confluence with Mine Kill, there is a predominance of rocky substrate, and the shoreline consists of steep bedrock cliffs with little or no riparian vegetation. The littoral zone of the Lower Reservoir consists primarily of exposed shoreline (cobble shore/exposed shoreline) and well-established broad emergent wetlands. Topography dictates the location of wetland features along the shoreline, with steep banks devoid of wetlands while areas of level topography and fine sediments (sand and silt) support broad emergent wetlands (NYPA, 2013). Submerged aquatic vegetation is largely absent from the Lower Reservoir as well as in Schoharie Creek and the tributaries. During low flow conditions, the only flows into the Lower Reservoir are provided by the tributaries Mine Kill and Platter Kill, as the NYCDEP's Gilboa Dam currently has no mandated minimum flow.

Upper Reservoir

The majority of the shoreline of the Upper Reservoir is a steeply sloped, man-made embankment. Within the Upper Reservoir, riparian habitat and vegetation is limited to the eastern shoreline. Wetlands occur only along the eastern and northeastern shoreline and contain primarily emergent vegetation. As with the Lower Reservoir, submerged aquatic vegetation is largely absent from the Upper Reservoir. The remainder of the shoreline consists of angular rip-rap with little vegetation.

The aquatic habitat in the Upper Reservoir consists primarily of open water pelagic habitat. The greater abundance of pelagic fish species is a reflection of preferences for open water and rocky substrates. This habitat is preferred by those species that are not dependent upon structure or cover and the species can be distributed throughout the entire water column.

In 1979, the Power Authority constructed four constant-level ponds to provide spawning and rearing habitat for warm water, nest-building fish species. The constant-level ponds are located in the northeast portion of the Upper Reservoir. They were designed with overtoppable dikes so that the ponds are inundated when the Upper Reservoir is full, and were constructed such that they maintain water levels when the reservoir is drawn down. Of the four constant-level ponds, the lowest outlet elevation is at 1996 ft. At the full pond elevation of 2003 ft, there is connectivity between the ponds and the reservoir, so fish can move back and forth and enhance diversity in both the ponds and the reservoir. The constant-level ponds provide refugia during water level fluctuations and provide spawning habitat that helps encourage natural fish production in the Upper Reservoir.

Weedy, littoral zone associated fish species occur in the constant-level ponds. The ponds contain habitat to support Largemouth Bass, Yellow Perch, Pumpkinseed and Bluegill. The ponds were surveyed by SUNY

Cobleskill in 2006 through 2009 (Lydon *et al*., 2009). Pumpkinseed and Bluegill dominated the large-bodied fish community while Emerald Shiner dominated the minnow community. The highest relative abundance of Largemouth Bass collected in the Upper Reservoir during the surveys occurred in the constant-level ponds.

4.5.1.2 Fisheries

Public recreational fishing began in the Lower Reservoir in 1972 and in the Upper Reservoir in 1979. The Reservoirs were allowed to colonize naturally from the fish in Schoharie Creek, but stocking was initiated in order to develop a supplemental fishery. There are no diadromous fish species found in the Project reservoirs.

Lower Reservoir Fisheries

A total of 19 fish species have been captured during sampling in the Lower Reservoir (Table 4.5.1-1). The Lower Reservoir is primarily a warmwater fishery supplemented by trout and Walleye stocking. The fish assemblage also includes cool and coldwater fish, and like the Upper Reservoir, the composition is influenced by stocking practices intended to support the recreational fishery, although recruitment of some species likely occurs from Schoharie Creek and tributaries.

Stocking of the Lower Reservoir began in 1977 with Rainbow and Brown Trout. Rainbow Trout were the major focus of stocking until 2005 with up to 3,325 fish stocked annually (Table 4.5.1-2). Tiger Trout stocking began in 2004, and continues to be supplemented with Brown Trout and Brook Trout. Walleye were first stocked in the Lower Reservoir in 2009, and stocking typically occurs annually. Other game fish in the Lower Reservoir include: Largemouth Bass, Smallmouth Bass, and several panfish species such as Pumpkinseed and Bluegill.

In 2005, SUNY Cobleskill conducted a fisheries assessment of the Lower Reservoir using a combination of trap nets, trammel nets, and seines. As a result, a total of 90 fish were captured. Pumpkinseed and Rock Bass were the two most numerically abundant fish captured. Largemouth and Smallmouth Bass were also captured (Nichols, 2006). In addition, the NYSDEC sampled the Lower Reservoir in 2007 by electrofishing at night and gill netting. The electrofishing resulted in the capture of 698 fish, most were Emerald Shiners. The most common game fish species was Smallmouth Bass and the most common non-game, large-bodied fish captured was White Sucker. Table 4.5.1-1 provides a comparison of the recent fisheries assessments with the historical data collected by the Power Authority from 1973- 1982. The comparison shows that the fish community of the Lower Reservoir has remained largely unchanged.

Upper Reservoir Fisheries

The Upper Reservoir primarily contains warmwater and coolwater fish species, but is stocked with trout for recreational fishing. Twenty-six species are present in the Upper Reservoir (Table 4.5.1-1). The fish assemblage is similar to the Lower Reservoir and includes Brook Trout, Brown Trout, Tiger Trout, Largemouth Bass, Smallmouth Bass, Walleye, and several panfish species including Yellow Perch and sunfish. The composition of the fish community is largely defined by varying stocking practices intended to support a recreational fishery. The forage fish base consists primarily of Tessellated Darters, Emerald Shiners, Banded Killifish and landlocked Alewives. Landlocked Alewives were introduced into Schoharie Reservoir in 1988 via an unauthorized introduction (McBride 1998), where they could have been washed

over Gilboa Dam to the Lower Reservoir and potentially entrained to the Upper Reservoir. It is also possible that Alewife and some of the other forage species were introduced directly to the Upper Reservoir as a result of unintentional "bait bucket" introductions or deliberately introduced by fishermen, similar to Schoharie Reservoir.

Stocking began in the Upper Reservoir in 1977 with Brown Trout and Rainbow Trout. Largemouth Bass were stocked in the Upper Reservoir in 1979 and 1981 - 1983. Rainbow Trout were the major focus of stocking until 2005, with up to 5,650 fish stocked annually. Tiger Trout stocking began in 2004 and continues to be supplemented with Brown and Brook Trout (Table 4.5.1-3).

The fish assemblage of the Upper Reservoir was surveyed by SUNY Cobleskill from 2006 to 2009 by seining shallow areas during the Life Extension and Modernization work when the reservoir was drawn down. The surveys reported that Emerald Shiner and Tessellated Darter were the most numerically abundant fish captured. Smallmouth Bass, Walleye and Rock Bass were also captured (Lydon *et al*., 2009).

The NYSDEC sampled the Upper Reservoir in 2008 by electrofishing at night, and in 2009 using gill nets. The electrofishing effort produced a total of 280 fish. Smallmouth Bass and Walleye were the common game fish species captured. As with the Lower Reservoir, the comparison shows that the fish community in the Upper Reservoir has remained largely unchanged (Table 4.5.1-1).

Schoharie Creek

Schoharie Creek above and below the Lower Reservoir was sampled in 1973 prior to the initiation of Project operation. Fourteen species of fish were collected in Schoharie Creek above the Project and 28 species were collected downstream of the Project (Culp, 1974). Pumpkinseed and Rock Bass were the most abundant species captured above the Project, although collections also included game fish such as Walleye and Smallmouth Bass (Table 4.5.1-4). Pumpkinseed, Fallfish, and Rock Bass were the most abundant species captured below the Project. Walleye, Smallmouth Bass and Largemouth Bass were also captured.

The NYSDEC conducted an angler diary study of lower Schoharie Creek for the years 2004-2008 (McBride 2009). The study reaches began at the Lower Dam and ended at the mouth of the Schoharie River. The results of the angler diary study showed that Walleye fishing in lower Schoharie Creek was determined to be fair by NYSDEC standards. Smallmouth Bass catch rates tended to be very good from either shore or boat, prompting a recommendation to adopt statewide bass regulations (McBride 2009).

4.5.1.3 Rare, Threatened and Endangered Fish Species

No federally listed threatened or endangered fish species have been identified within the Project vicinity. A search of the National Marine Fisheries Service's Essential Fish Habitat Mapper did not identify any waters in the Project vicinity as containing Essential Fish Habitat. By letter dated November 16, 2011, the NYSDEC indicated that no state-listed rare, threatened or endangered fish species are known to be in the vicinity of the Project.

4.5.2 Environmental Effects

FERC identified the following issues related to aquatic resources at the B-G Project: (1) the effects of project facilities and operation, including fish entrainment and mortality associated with pump-storage operation on

fish populations in project reservoirs; and (2) the adequacy of existing minimum flow releases for supporting aquatic resources downstream of the project.

4.5.2.1 Entrainment

The potential for entrainment and turbine passage mortality at the B-G Project was evaluated in a relicensing study; the report was filed with FERC on February 19, 2016 as part of the Initial Study Report. In the *Fish Entrainment/Protection Assessment Study* (NYPA, 2016f), fish entrainment in the Upper and Lower Reservoirs was evaluated to qualitatively determine which fish species and life stages have the potential to become entrained during generation and pumping phases of operation based on the physical and operational characteristics of the pump-turbines, reservoirs, and intake structures at the Project, and the life histories, habitat preferences, behavior, and swimming capabilities of the fish species present. Survival of potentially entrained fish through the pump-turbines was also evaluated by: 1) reviewing available entrainment survival field studies at other hydroelectric facilities with turbine types and sizes similar to those at the Project (Table 4.5.2-1); 2) performing calculations which theoretically predict turbine passage survival using a blade-strike model; and 3) comparing the differences in water pressure an entrained fish would experience during both pumping and generating conditions at varying reservoir elevations.

Susceptibility to Entrainment

The intake structures in the Upper and Lower Reservoir have attributes that minimize the potential for fish entrainment. Although velocities immediately in front of the trashracks at the Upper Reservoir intake could approach 3.28 fps during generation at hydraulic design capacity of the units (12,800 cfs), exceeding the swimming speeds of some fish species present in the Upper Reservoir, other factors contribute to reducing the entrainment potential in the Upper Reservoir during generation. These factors are primarily related to the absence of a natural shoreline (i.e., suitable shoreline habitat) near the intake structure and the depth of the intake structure. The area around the intake does not provide shoreline (littoral zone) or rearing habitat for structure-oriented fish species.

Conversely, the intake structures in the Lower Reservoir are comparatively large and each opening serving the four units has a vertical elevation range of 66 feet. Maximum velocities observed near the intake opening during pumping were 1.95 fps when all four units were operated near Project capacity. This allows most fish species to swim away from the intake velocity field and avoid entrainment. Entrainment potential at this location is also minimized due to the lack of shallow riparian zone habitat that would be attractive to many fish species.

The assessment of fish life histories, habitat preferences, behavior, and swimming capabilities, along with Project characteristics and operations identified fish species that may be susceptible to entrainment in the Project reservoirs. Reservoir fish species at different life stages and their overall entrainment potential under maximum intake velocity conditions based on burst swim speed and body length are listed in Table 4.5.2-2. Fish species most likely to be entrained in the Upper Reservoir include adult panfish, which may move to deeper water in winter to seek thermal refuge, forage fish (shiners), which are generally weaker swimmers, and smaller bottom-oriented fish. Juvenile Walleye may be susceptible to entrainment based on habitat preferences and swimming performance. In the Lower Reservoir, the assessment determined eight species of juvenile fish are susceptible to entrainment: four forage species (Alewife, Emerald Shiner, Spottail Shiner

and Logperch) and four benthic-oriented species (Brown Bullhead, Yellow Bullhead, Stonecat and Margined Madtom).

Although there are other ways fish could have entered the Upper Reservoir, such as "bait bucket" introductions or bird-mediated dispersal, the fish community in the Upper Reservoir has most likely been established in large part through historical entrainment from the Lower Reservoir. Small fish species or fish in early life stages were likely entrained during pumping and survived to colonize the Upper Reservoir.

Survival of Entrained Fish

Consistent with the qualitative entrainment classification, a review of scientific literature indicated that small fish are the most likely to be entrained based on swim speed. Additionally, the EPRI (1997) database on entrainment and turbine passage survival was reviewed and revealed that fish less than 8 inches in length are more likely to survive entrainment should it occur. For example, survival of fish less than 8 inches in length that passed through Francis turbines with similar hydraulic capacities to those of the B-G Project was on average 85 to 95%, while the survival of fish larger than 8 inches was on average 84 to 88%. However, most fish greater than 8 inches are not likely to become entrained due to their swimming performance, which enables them to escape entrainment. According to the analysis, most of the fish likely to be entrained at the Project are small fish such as Alewife, minnow species or juvenile life stages which in turn experience high survival during turbine passage.

In addition, a quantitative analysis of turbine passage survival was performed using a blade-strike model. The results of analysis using specific Project characteristics indicate that turbine passage survival was calculated to be above 95% for fish less than 8 inches in length, and above 83% for fish greater than 8 inches in length during both pumping and generating modes of operation.

Pressure differentials are also important in determining the probability of survival. Fish without swim bladders may not be affected by changes in pressure. Two separate pressure differentials factor into fish entrainment at a hydropower project with a deep intake structure. One gradient is between the pressure at the entrance to the intake structure compared to the pressure at the downstream release (and vice versa in the case of pumped-storage projects). There is also a pressure gradient inside of the turbine, where fish will encounter high pressure prior to entering the turbine followed by a brief low pressure region on the downstream side of the runner blades. Physostomous species (*e.g.*, trout, minnows, and catfish) have a pneumatic duct that connects the swim bladder to the esophagus and allows for venting air from the swim bladder within seconds. This results in the ability to rapidly adjust to changing water pressure. Physoclists (*e.g.*, basses, sunfish, perch), must adjust pressure within the swim bladder via diffusion into the blood, which may take hours. Therefore, physoclistic fish are more susceptible to injury when exposed to abrupt pressure differentials.

A comparison of the differences in pressure a fish would experience passing through the pump-turbines at the Project during both pumping and generating conditions and at varying reservoir elevations was conducted. The comparison indicated that under most operating and water surface elevation scenarios, the differences in pressure any entrained fish would experience pre- and post- entrainment would not cause mortality. The exception is during pump-back when the Lower Reservoir is full and the Upper Reservoir is at its minimum operating level. The resulting pressure differential under this scenario may induce mortality in some individual physoclistous fish.

Pressure gradients inside of the turbine are also important in determining the potential for survival. Inside of the turbine, fish will encounter high pressure prior to entering the turbine followed by a brief low pressure region on the downstream side of the runner blades. The magnitude and the rate of change from the pressure that the fish was acclimated to is the driving factor of within-turbine pressure related injury, whereby fish acclimated to surface waters may be unaffected by the low pressure in the turbine, but a fish acclimated to deep water will experience a greater pressure decrease passing through the same turbine.

The lowest pressure encountered is referred to as the "nadir" pressure. Multiple studies on a variety of species have shown that the brief pressure increase in turbines is unlikely to injure or directly kill fish (Čada *et al.,* 1997). However, the rapid and brief exposure to extreme low pressures within the turbine is more likely to cause injury among fish with swim bladders, regardless of whether they are physoclistous or physostomous (Čada *et al.,* 1997). The relationship of exposure pressure[1] (P_e) to acclimation pressure[2] (P_a) is expressed as a ratio = P_e /P_a. Čada et al. (1997) described a threshold ratio of 60% to avoid fish mortality. However, a 30% threshold was suggested by Abernathy, et al., (2001) for physostomous fish. At the B-G Project, the nadir pressure within the turbines remains sufficiently high to prevent cavitation, and is above atmospheric, which is much higher than the nadir pressures observed through Francis units at other projects and therefore results in a lower pressure differential for fish potentially entrained at the Project. Assuming an estimated nadir pressure of 15 psi, and an atmospheric pressure of 14 psi, the 60% pressure differential threshold would be exceeded at intake depths below 26 feet and the 30% pressure differential threshold would be exceeded at intake depths below 84 feet (Figure 4.5.2-1).

The depth of the centerline of the intake in the Upper Reservoir is 36.5 feet to 84.5 feet given the water level operation range of the reservoir (El. 1955 to 2003 ft). However, based on the bathymetry, the areas surrounding the intake outside of the narrow, deep trench, would be 43 to 63 feet in depth at full pool (El. 2003), and the depth of the intake cover would be approximately 71 feet. Most fish in the area would be acclimated to these depths or shallower and physostomous fish would not be likely to incur mortality, and physoclistous fish may incur mortality if they are acclimated to depths greater than 25 feet. At the lowest impoundment level (i.e., El. 1955 ft), the areas surrounding the intake outside of the narrow trench would be shallow (depth < 15 feet), the top of the intake cover would be at 23 feet, and all fish would be expected to exhibit high survival. Though no generation would occur at this time due to the low water level, it illustrates the variability that potentially exists for survival of physoclistous fish, which would be more likely to survive entrainment during generation at lower water levels. Overall, fish survival in the Upper Reservoir is likely to be high for physostomous fish most of the time, but the potential for survival of physoclistous fish is likely to be inversely related to water levels (high water level, low survival versus low water level, high survival).

The span of the intake structure in the Lower Reservoir ranges from 50 to 116 feet during maximum reservoir water level (El. 900 ft), and from 10 to 76 feet during minimum reservoir water level (El. 860 ft). Given these depths, physostomous fish acclimated to deeper waters near the intake structure may incur mortality during high water levels, but those suspended less than 84 feet down may not. Physoclistous fish would be more likely to incur mortality given the deep water. The likelihood of survival also increases for fish with both swim bladder types as water level (or acclimation pressure) decreases, and physostomous

1 Exposure pressure is the nadir pressure potentially experienced by fish within the turbine.
2 Acclimation pressure is assumed to be the water pressure experienced by fish at the point of entrance to the intake structure.

fish would not be likely to incur mortality when entrained from any depth under low water level conditions, whereas physoclistous fish entrained within the top 25 feet would be most likely to survive.

Entrainment Summary

In summary, entrainment risk to fish resources at the B-G Project is low overall due to the following:

- Positions of intakes relative to fish habitat and typical seasonal and daily movements of fish,
- Low velocities at both the Upper and Lower Reservoir intakes,
- Of the individual fish susceptible to entrainment, most are either forage species or juveniles that are small in size,
- Larger fish are not likely to be involuntarily entrained due to swimming performance,
- Survival of physostomous fish entrained in the Upper Reservoir during generation is likely to be high, whereas survival of physoclistous fish is inversely proportional to water level and may be highly variable,
- Survival of physostomous fish entrained in the Lower Reservoir during pumping is likely high for fish acclimated to depths less than 84 feet. Survival of physoclistous fish entrained in the Lower Reservoir may be low if entrained during high water levels (if they are acclimated to depths greater than 26 feet) but chances of survival increase with decreasing water levels.
- There are no diadromous or threatened/endangered species present in the Upper or Lower Reservoir, and
- The stocked Walleye and trout species present in the Project reservoirs are not natural populations and will not likely be entrained in large numbers because of their strong swimming ability compared to the intake velocities at the B-G Project.

4.5.3 Proposed Environmental Measures

The Power Authority will continue to support a NYSDEC fish stocking program and NYSDEC's active management of the Upper and Lower Reservoirs for recreational fishing. The Power Authority will continue to maintain the four constant level ponds constructed in the Upper Reservoir to provide spawning and feeding area for nest building fish.

The Power Authority is conducting an investigation of potential Habitat Improvement Projects for the Blenheim-Gilboa Pumped Storage Power Project including potential enhancement or expansion of the constant level ponds in the Upper Reservoir. The purpose is to assess the feasibility of potential Habitat Improvement Projects that the Power Authority may propose in the Final License Application as an enhancement measure to be undertaken during the term of a new license.

4.5.4 Unavoidable Adverse Impacts

While the entrainment risk to fish species at the Project is low, some entrainment of fish is likely to occur at the Project.

Table 4.5.1-1: Current and Historic Fish Species Captured in Project Reservoirs

Common Name	Historical (1973-1982)	Lower Reservoir (2005-2007)	Upper Reservoir (2006-2009)
Alewife (landlocked)		x	x
Banded killifish			x
Blacknose dace	x		
Bluegill	x	x	x
Bluntnose minnow	x		
Brown bullhead	x	x	x
Brook trout		x	x
Brown trout	x	x	x
Central stoneroller	x		
Chain pickerel	x		
Cisco	x		
Common carp	x	x	x
Common shiner	x		
Creek chub	x		
Cutlips minnow	x		
Emerald shiner	x	x	x
Fallfish	x	x	
Fantail darter	x		
Golden shiner	x	x	x
Green sunfish	x		x
Largemouth bass	x	x	x
Logperch	x		x
Longnose dace	x		
Margined madtom			x
Northern hog sucker	x		
Pumpkinseed	x	x	x
Rainbow trout	x		
Redbreast sunfish	x		x
Rock bass	x	x	x
Rosyface shiner	x		x
Satinfin shiner	x		
Shorthead redhorse	x		
Smallmouth bass	x	x	x
Spottail shiner	x	x	x
Stonecat	x		x
Tesselated darter	x		x
Tiger trout		x	x
Walleye	x	x	x
White perch		x	
White sucker	x	x	x
Yellow bullhead			x
Yellow perch	x	x	x

Data Sources: Historic: Thomas et al. 1984. Lower Reservoir: Nichols, 2006; NYSDEC 2007 sampling (N. McBride, NYSDEC, personal communication, February 25, 2011). Upper Reservoir: Lydon et al. 2009; and NYSDEC 2008-2009 sampling (N. McBride, NYSDEC, personal communication, February 25, 2011).

Table 4.5.1-2: Lower Reservoir Stocking History from 1977 through 2015

Year	Brown Trout	Brook Trout	Rainbow Trout	Tiger Trout	Largemouth Bass	Pumpkinseed	Walleye[1]	Stocking Entity
1977	1100		1100					NYSDEC
1978	1100		1100					NYSDEC
1979	1176		1174		1100	100		NYPA
1980	701		2134					NYPA
1981			2482			136		NYPA
1982			1000					NYPA
1983			1530					NYPA
1984			1550					NYPA
1985			1550					NYPA
1986			1550					NYPA
1987			1600					NYPA
1988			2050					NYPA
1989			2050					NYPA
1990			2571					NYPA
1991			2550					NYPA
1992			2550					NYPA
1993			3325					NYPA
1994			3325					NYPA
1995			3325					NYPA
1996			3325					NYPA
1997			3325					NYPA
1998			3325					NYPA
1999			3325					NYPA
2000			3325					NYPA
2001			3325					NYPA
2002			3325					NYPA
2003			3325					NYPA
2004	500		1087	500				NYPA
2005			1500	750				NYPA
2006	200			800				NYPA
2007	45	480		1000				NYPA
2008	907	676		50				NYPA
2009	500			500			600	NYPA
2010	525			525			775	NYPA
2011	643			644			900	NYPA
2012	475	475		475			550	NYPA
2013		400		900				NYPA
2014	75	650		150				NYPA
2015	275	1050		250			1000	NYPA

1: Walleye are stocked as pond fingerlings in cooperation with SUNY-Cobleskill.

Table 4.5.1-3: Upper Reservoir Stocking History from 1977 through 2015

Year	Brown Trout	Brook Trout	Rainbow Trout	Tiger Trout	Largemouth Bass	Pumpkinseed	Walleye[1]	Stocking Entity
1977	1100		1100					NYPA
1978	1250		1250					NYPA
1979	1288		1235		1210	130		NYPA
1980	750		2255					NYPA
1981			4088		2581	136		NYPA
1982			5650		2000			NYPA
1983			5120		2000			NYPA
1984			5100					NYPA
1985			5100					NYPA
1986			5100					NYPA
1987			5200					NYPA
1988			4600					NYPA
1989			4600					NYPA
1990			4121					NYPA
1991			4100					NYPA
1992			4100					NYPA
1993			3325					NYPA
1994			3325					NYPA
1995			3325					NYPA
1996			3325					NYPA
1997			3325					NYPA
1998			3325					NYPA
1999			3325					NYPA
2000			3325					NYPA
2001			3325					NYPA
2002			3325					NYPA
2003			3325					NYPA
2004	500		2173	500				NYPA
2005			1500	750				NYPA
2006	200			800				NYPA
2007	650	750	300	250				NYPA
2008	965	894		50				NYPA
2009	500			500				NYPA
2010	525			525				NYPA
2011	643			644				NYPA
2012	500			500				NYPA
2013				900			1900	NYPA
2014	475	1225		250				NYPA
2015	275	525		250				NYPA

1: Walleye are stocked as pond fingerlings in cooperation with SUNY-Cobleskill.

Table 4.5.1-4: Fish Species Captured in Schoharie Creek Upstream and Downstream of the Project in 1973

Common Name	Total Number Captured	
	Schoharie Creek Downstream of Project	Schoharie Creek Upstream of Project
Pumpkinseed	127	405
Fallfish	104	9
Rock bass	66	75
Bluntnose minnow	49	-
White sucker	35	11
Rosyface shiner	25	-
Walleye	16	8
Fantail darter	15	-
Cutlips minnow	15	11
Satinfin shiner	15	-
Brown bullhead	13	12
Redbreast sunfish	12	2
Common shiner	12	-
Greenside darter	10	-
Largemouth bass	8	-
Northern hog sucker	7	3
Yellow perch	7	6
Logperch	6	2
Johnny darter	5	2
Northern redhorse	5	-
Smallmouth bass	4	6
Common carp	3	-
Golden shiner	2	1
Longnose dace	2	-
Chain pickerel	2	-
Bluegill	2	-
Blacknose dace	1	-
Creek chub	1	-

Notes: Total; all gear used.

Source: Culp 1974

Table 4.5.2-1: Summary of Pumped Storage Projects Evaluated as Part of the Entrainment Literature Review at the Blenheim-Gilboa Project

Project	State	Generation Capacity (MW)	Hydraulic Capacity in Pumping Mode (cfs)	Lower Reservoir	Upper Reservoir	Intake Velocity During Pumping	Conclusions
Bad Creek	SC	1,065	~12,000	Jocassee Reservoir - 7,500 acres	Bad Creek Reservoir - 367 acres	-	- Entrainment was highest when drought conditions caused low water levels (water surface elevation ~1,093 ft) and a considerable entrainment event occurred in late 1993. - 94.4-99.6% of these fish were clupeids, ictalurids, and centrarchids, with lower numbers of game fish such as Rainbow and Brown Trout observed entrained. - Most fish entrained were characterized as being small or intermediate in length, with very few fish over 11.8 inches captured in the entrainment nets. -It was determined that entrainment had no statistical impact on the abundance of prey and sport fish, the harvest of fish by anglers, and that there was no predicted long-term impact on the prey fish population.
Balsam Meadow	CA	199.8	1,522	Shaver Lake - 2,177 acres	Balsam Meadow Reservoir - 60 acres	-	- Higher entrainment rates were correlated with longer pumping times up to but not beyond three hours. - 77.7% of the fish entrained were juveniles. - Hydroacoustic data in 1991-1992 resulted in an estimated 2,855 fish entrained. - Estimates of entrainment for each species varied by season. - Losses were not considered to be significant to the maintenance of populations in Shaver Lake.
Northfield Mountain	MA	1,119.2	15,200	Connecticut River (Turners Falls Impoundment) - 2,110 acres	Northfield Mountain Upper Reservoir - 278 acres	4.5 ft/s (max pumping trashrack)	- No adult American Shad were observed becoming entrained using radio telemetry. - Entrainment of Atlantic Salmon smolts was 10.2% and 5.8% during 1993 and 1994. - Entrainment of Atlantic Salmon smolts was reduced to 1.3-1.7% after installation of a guide net. - Juvenile American Shad were becoming entrained, with the highest rates corresponding to times of peak emigration. [Project is currently undergoing FERC relicensing.]
Muddy Run	PA	800	28,000	Susquehanna River (Conowingo Pond) - 9,000 acres	Muddy Run Reservoir - 900 acres	4.2 ft/s (pumping trashrack)	- Entrainment rates of adult American Shad were estimated at 3.8-5.1%; low entrainment rates were determined to be the result of the deep intakes and the tendency of shad to travel shallow in the water column. - Entrainment rates of emigrating juvenile American shad were estimated at 2.9-6.6%. - Entrainment rates of emigrating American Eel were estimated at 7.0%.
Richard B. Russell	GA	600 (8 units total, 4 of which are reversible)	30,000	Savannah River (Lake Thurmond) - 71,000 acres	Richard B. Russell Lake - 26,650 acres	> 2 ft/s within 30 feet	- Configuration of the Richard B. Russel project is different than conventional pumped storage, as the facility was integral with a dam. - 90% of entrained fish were 1.5-3.5 inches long and only 0.2% were greater than 8.5 inches long. - 91% were Threadfin Shad followed by Blueback Herring (7%). - Very low numbers relative to annual stocking numbers of Striped Bass and hybrid Striped Bass were entrained annually.
Ludington	MI	1,872 (currently upgrading)	66,600	Lake Michigan – 8.4 million acres	Ludington Reservoir – 842 acres	Up to 5.5 ft/s in tailrace channel	- Studies in 1975-1978 determined that 532 million fish were entrained annually, of which 99% were early life stage and juvenile fish. Most were forage fish (Alewife) but some were important sport and commercial fish. - Seasonal barrier net in place since 1989. [Project is currently undergoing FERC relicensing.]

Table 4.5.2-2: Overall Entrainment Potential of Reservoir Fish Species at the Blenheim-Gilboa Project under Maximum Intake Velocity Conditions

Family	Fish Species	Life Stage	Burst Swim Speed (fps)	Length (inches)	Entrainment Potential	
					Upper Reservoir ≤ 3.3 fps	Lower Reservoir ≤ 1.95 fps
Catostomidae	White Sucker	Adult	5.2 – 10.2	NA	None	None
		Juvenile	2.4 – 3.8	7.0 – 9.0	Minimal	None
Centrachidae	Bluegill	Adult	2.9 – 4.1	5.0 – 7.0	Moderate	None
	Green Sunfish	Adult	2.3 – 3.5	4.0 – 6.0	Moderate	None
	Pumpkinseed	Adult	2.3 – 2.9	4.0 – 5.0	Moderate	None
	Redbreast Sunfish	Adult	2.3 – 4.7	4.0 – 8.0	Moderate	None
	Largemouth Bass	Adult	3.5 – 5.6	8.4 – 8.8	None (no habitat for juveniles)	None
		Juvenile	2.0 – 3.2	3.0 – 3.5		
	Rock Bass	Adult	3.5 – 4.7	6.0 – 8.0	None	None
	Smallmouth Bass	Adult	3.5 – 5.6	10.0 – 15.0	None (no habitat for juveniles)	None
		Juvenile	2.0 – 3.2	3.0 – 3.5		
Clupeidae	Alewife	Adult spawning	3.8	4.0 – 6.0	None	None
		Adult	3.8	4.0 – 6.0		
		Juvenile	≤3.8	2.5 – 3.0	Minimal	Minimal
Cyprinidae	Common Carp	Adult	3.9 – 14.0	NA	None	None
	Emerald Shiner	Adult	2.2 – 2.5	3.0 – 4.0	Moderate	None
		Juvenile	1.0 – 1.3	2.0 – 2.5		Moderate
	Golden Shiner	Adult	3.1 – 3.6	8.0 – 12.0	Minimal	None
		Juvenile	2.2 – 2.5	1.5 – 4.3		
	Spottail Shiner	Adult	2.2 – 2.5	3.0 – 4.0	Moderate	None
		Juvenile	1.0 – 1.3	2.0 – 2.5		Moderate

Table 4.5.2-2 (continued from previous page).

Family	Fish Species	Life Stage	Burst Swim Speed (fps)	Length (inches)	Entrainment Potential	
					Upper Reservoir ≤ 3.3 fps	Lower Reservoir ≤ 1.95 fps
Ictaluridae	Brown Bullhead	Adult	4.7 – 8.2	8.0 – 14.0	None	None
		Juvenile	<4.7	<8.0	Moderate	Moderate
	Yellow Bullhead	Adult	4.7 – 7.0	8.0 – 12.0	None	None
		Juvenile	<4.7	<8.0	Moderate	Moderate
	Margined Madtom	Adult	2.9 – 3.5	5.0 – 6.0	Minimal	None
		Juvenile	<2.9	<5.0		Minimal
	Stonecat	Adult	3.0	5.2	Minimal	None
		Juvenile	<3.0	<5.2		Minimal
Moronidae	White Perch	Adult	3.5 – 5.7	6.0 – 10.0	Not found	None
		Juvenile	2.4 – 3.2	3.0 – 6.0		
Percidae	Logperch	Adult	2.3 – 2.9	4.0 – 5.0	Moderate	None
		Juvenile	1.0 – 2.6	1.5 – 2.7		Moderate
	Walleye	Adult	5.2 – 8.5	7.0 – 26.4	None	None
		Juvenile	2.4 – 3.8	3.0 – 7.0	Moderate	
	Yellow Perch	Adult	2.6 – 5.6	4.5 – 9.6	Minimal	None
Salmonidae	Brook Trout	Adult	7.0 – 12.7	6.0 – 16.0	None	None
	Brown Trout	Adult	7.0 – 12.7	6.0 – 14.0	None	None
	Tiger Trout	Adult	7.0 – 12.7	6.0 – 16.0	None	None

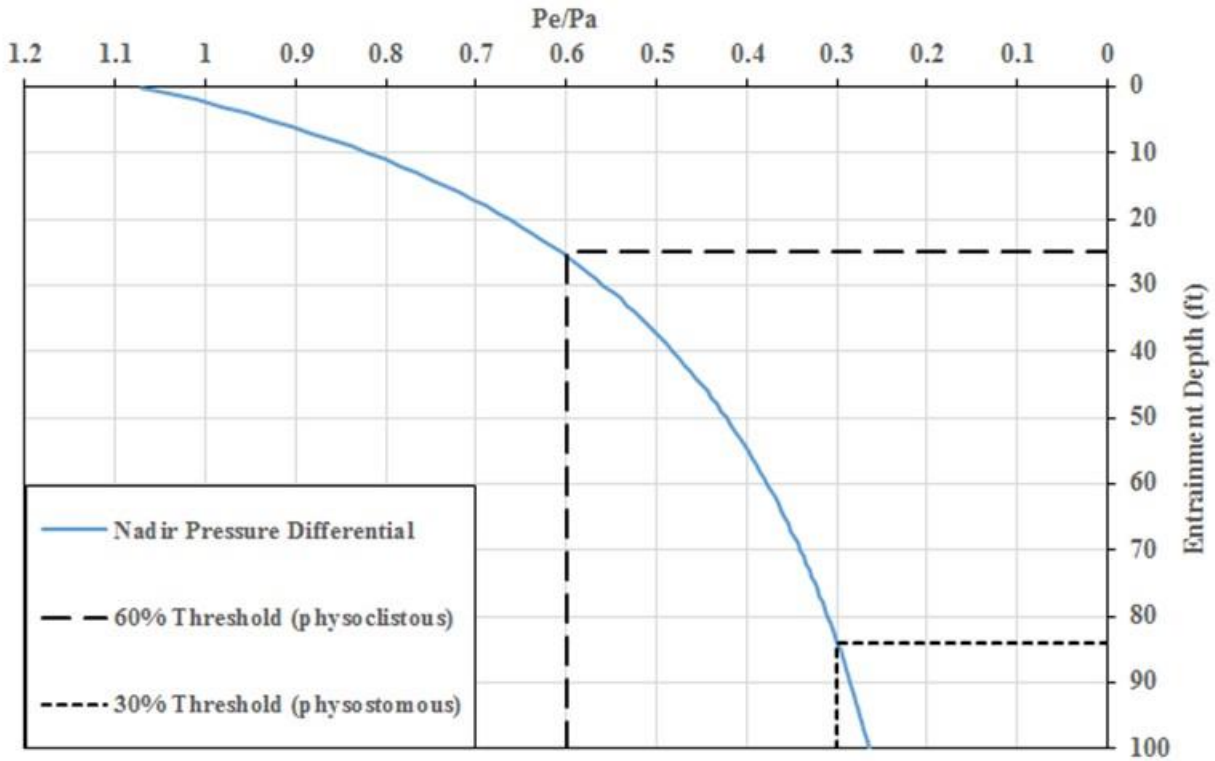


Figure 4.5.2-1: Nadir Pressure Differentials Potentially Experienced within the Turbine by Entrained Fish at the Blenheim-Gilboa Project3

3 The curve was calculated with a nadir pressure of 15 psi, and an atmospheric pressure of 14 psi. High ratios of exposure pressure (Pe) to acclimation pressure (Pa) indicate that swim bladders of fish would experience a less severe pressure differential when passing through the nadir zone of a turbine relative to lower ratios. Lower ratios indicate high acclimation pressures relative to the nadir pressure, and a more severe pressure differential. At a nadir exposure pressure of 15 psi within the turbine, fish acclimated to areas within the top 25 feet of the water column would not be expected to incur pressure-induced injury because the exposure pressure is similar to the acclimation pressure, with a Pe/Pa ratio greater than 0.6 (60%). However, physoclistous fish acclimated to water deeper than 25 feet may incur injury and possibly mortality because they will be exposed to a pressure differential where the Pe/Pa ratio is below 0.6 (60%) (Čada et al. 1997). Alternatively, physostomous fish would not be likely to incur pressure-related injury/mortality unless acclimated to depths greater than 84 feet, when the Pe/Pa ratio is 0.3 (30%) or lower (Abernathy et al. 2001).

4.6 Wildlife Resources

In 2012, in preparation for development of the PAD, the Power Authority conducted a baseline survey to identify wildlife species in the Project boundary, the results of which were described in the PAD. Subsequent to the issuance of the PAD, no studies pertaining to wildlife resources were required by FERC as a result of the study planning portion of the relicensing process.

4.6.1 Affected Environment

4.6.1.1 Terrestrial Wildlife

Habitat within the Project boundary is primarily upland forest with some areas of upland meadow and shrub land. In addition to natural habitats within the Project boundary, the Power Authority has developed wildlife management areas to improve wildlife habitat.

In the mid-1980s, the Power Authority established a bluebird trail extending from the Visitors Center to Mine Kill State Park which includes nesting boxes and regular mowed areas to ensure quality bluebird habitat. The Power Authority also maintains an area that is available for white-tailed deer management. This area contains over 2,000 northern white cedar trees as a winter forage source and is mowed to reduce establishment of unwanted woody vegetation. The area is intended to provide additional forage during the winter and to recreate habitat lost when the Lower Reservoir was constructed (Hamor, 1989).

In 1996, the Power Authority established a Wildlife Management Task Force, which includes representatives from the Power Authority, the New York State Department of Environmental Conservation (NYSDEC), New York State Department of Corrections, State University of New York (SUNY) Cobleskill, NYSOPRHP, Schoharie County Soil and Water Conservation District (SCSWCD), and the Schoharie County Conservation Association (SCCA). The goals of this task force are to maintain, enhance and perpetuate wildlife, as well as to increase awareness and interactive opportunities with the environment (NYPA, 2005a, 2005b).

Mammals

Tracking surveys completed during the winter of 1977-78 (Burt *et al.,* 1978) identified mammal species that occurred within the vicinity of the Project. Based on field observations and a review of available data, 50 mammal species have the potential to occur within the vicinity of the Project (Burt *et al.,* 1978; Degraaf and Yamasaki, 2001; NYPA, 2013). Table 4.6.1.1-1 includes a list of mammals observed during surveys conducted in 2012.

Northern hardwood-coniferous forest is the dominant habitat within the Project boundary and vicinity (NYPA, 2013). These forests provide important wildlife food sources associated with mast-crop producing species such as oak and beech. In addition, hemlock and white pine stands interspersed with occasional open fields and shrublands make the habitat ideal for several mammal species. Small mammals such as masked shrew, deer mouse, white footed mouse, woodland jumping mouse, meadow jumping mouse, woodchuck, gray squirrel, chipmunk and red squirrel use this habitat mosaic for foraging and shelter. In general, areas of mixed hardwoods within the Project vicinity have good canopy closure and relatively open understory, which may provide good habitat for bats including little brown, big brown, eastern red and hoary bats (Degraaf and Yamasaki, 2001).

Larger mammals such as eastern cottontail and snowshoe hare use the habitat mosaic within the Project vicinity, especially areas with denser understory vegetation for improved cover. The tributary streams and intermittent drainages are used by generalist species (e.g., porcupine, weasel, skunk, opossum and raccoon) that feed on a variety of food sources. With an adequate prey base, predators such as coyote, red fox, grey fox, fisher, and bobcat have the potential to occur within these forests.

Birds

Bird surveys completed within the Project vicinity in 1977 identified a number of bird species (Burt *et al.,* 1989). Field work completed in 2012 identified 37 bird species (by sight or vocalizations), including many of the species found in 1977 (NYPA, 2013). Table 4.6.1.1-2 contains a list of 37 bird species observed during field work in 2012 (NYPA, 2013).

The land within the Project boundary includes areas of open meadow and shrublands as well as areas of un-fragmented forest. This diversity of habitats supports a variety of species that require open grasslands (e.g., Bobolink) as well as interior forest bird species (e.g., Ovenbirds, Wood Thrush). Based on a review of previous survey work (Burt *et al.,* 1989), range data, and habitat, a total of 128 species have the potential to occur within the Project boundary and vicinity (NYPA, 2013).

4.6.1.2 Wetland, Littoral, and Riparian Wildlife

Amphibians and reptiles (herptiles) utilize the habitats within the Project boundary including the wetlands, littoral zone, and forests. Several species utilize both aquatic and terrestrial environments as part of their life history. Table 4.6.1.2-1 contains several species identified within the Project boundary (NYPA, 2013) as well as several species with the potential to occur based on range and habitat preferences (Degraaf and Yamasaki, 2001). Based on a review of habitat and range information, a total of 31 herptile species have the potential to occur within the Project vicinity. While some of these species are entirely terrestrial (e.g., red back salamander), several require wetlands, littoral, and riparian habitats for all or portions of their life history. Green frogs were commonly observed along the Lower Reservoir shoreline and associated wetlands as well as in the larger tributaries. Green frogs and bullfrogs were observed or heard in each of the control-level ponds along the shoreline of the Upper Reservoir. Several of the small intermittent and permanent tributaries to the Lower Reservoir contained northern dusky and Alleghany mountain dusky salamanders (NYPA, 2013).

Other wildlife that may utilize wetlands or littoral habitat within the reservoirs and tributaries includes dabbling ducks, Canada goose, beaver, and raccoon. In general, a wide range of terrestrial wildlife species (Section 4.6.1.1) may use riparian areas within the Project boundary for foraging and shelter.

4.6.2 Environmental Effects

In SD1 and SD2, FERC identified the following issues related to wildlife resources: (1) the effects of Project operation, maintenance, and Project-related recreation on botanical resources and wildlife, including game species; (2) the effects of Project reservoir fluctuations on riparian and wetland habitat and associated wildlife; (3) the effects of Project operation, maintenance, and Project-related recreation on New York State listed wildlife species, including timber rattlesnake and Bald Eagle; and (4) the effects of Project operation, maintenance, and Project-related recreation on federally listed threatened and endangered species identified by the USFWS.

The existing riparian, wetland habitat, and associated wildlife has adapted to the current conditions along the reservoir shorelines. The existing habitat types appear to be stable under the existing fluctuation regime, Project operation and maintenance, and recreation activities. Further, there is no evidence of any on-going adverse effects on wildlife resources associated with these habitat types, including timber rattlesnake and Bald Eagle. Because the Power Authority is proposing no changes or modifications to the existing B-G Project facilities, maintenance, or recreation sites at this time, no impacts to habitats or associated wildlife resources are anticipated.

4.6.3 Proposed Environmental Measures

The Power Authority proposes to continue the existing environmental measures of maintaining the approximate 1,600 acre management area, including 2 acres of wetlands located in front of the Blenheim-Gilboa Visitors Center.

The Power Authority proposes to continue to maintain the bluebird trail, in cooperation with NYSOPRHP and SUNY Cobleskill, to provide quality bluebird habitat. Bluebird houses will be inspected and maintained annually and regular mowing of portions of the area will be completed to maintain quality bluebird habitat.

The Power Authority proposes to continue maintaining the white-tailed deer management area as a winter forage source. The area will continue to be mowed to prevent the establishment of unwanted woody vegetation.

4.6.4 Unavoidable Adverse Impacts

Continued operation of the B-G Project will not result in unavoidable adverse effects to wildlife resources.

Table 4.6.1.1-1: Mammals Observed within the Project Vicinity in 2012

Common Name	Scientific Name
Coyote	*Canis latrans*
Beaver	*Castor canadensis*
Porcupine	*Erethizon dorsatum*
White tailed deer	*Odocoileus virginianus*
Muskrat	*Ondatra zibethicus*
Raccoon	*Procyon lotor*
Grey squirrel	*Sciurus carolinensis*
Chipmunk	*Tamias striatus*
Red squirrel	*Tamiasciurus hudsonicus*
Black bear	*Ursus americanus*
Red fox	*Vulpes vulpes*

Table 4.6.1.1-2: Birds Observed within the Project Vicinity in 2012

Common Name	Scientific Name
Spotted Sandpiper	*Actitis macularius*
Red-Winged Blackbird	*Agelaius phoeniceus*
Mallard	*Anas platyrhynchos*
American Black Duck	*Anas rubripes*
Ruffed Grouse	*Bonasa umbellus*
Canada Goose	*Branta canadensis*
Red Tailed Hawk	*Buteo jamaicensis*
Canada Warbler	*Cardellina canadensis*
Turkey Vulture	*Cathartes aura*
Veery	*Catharus fuscescens*
American Crow	*Corvus brachyrhynchos*
Blue Jay	*Cyanocitta cristata*
Gray Catbird	*Dumetella carolinensis*
Bald Eagle	*Haliaeetus leucocephalus*
Wood Thrush	*Hylocichla mustelina*
Belted Kingfisher	*Megaceryle alcyon*
Wild Turkey	*Meleagris gallopavo*
Song Sparrow	*Melospiza melodia*
Northern Waterthrush	*Parkesia noveboracens*
Cliff Swallow	*Petrochelidon pyrrhonota*
Hairy Woodpecker	*Picoides villosus*
Scarlet Tanager	*Piranga olivacea*
Black Capped Chickadee	*Poecile atricapillus*
Ovenbird	*Seiurus aurocapilla*
Cerulean Warbler	*Setophaga cerulea*
Chestnut Sided Warbler	*Setophaga pensylvanica*
Black Throated Green Warbler	*Setophaga virens*
Bluebird	*Sialia sialis*
Field Sparrow	*Spizella pusilla*
Tree Swallow	*Tachycineta bicolor*
Winter Wren	*Toxostoma rufum*
Brown Thrasher	*Troglodytes roglodytes*
American Robin	*Turdus migratorius*
Eastern Kingbird	*Tyrannus tyrannus*
Red-Eyed Vireo	*Vireo olivaceus*
Mourning Dove	*Zenaida macroura*
White Throated Sparrow	*Zonotrichia albicollis*

Table 4.6.1.2-1: Herptile Species Observed within the Project Vicinity in 2012

Common Name	Scientific Name
Green frog	*Lithobates clamitans*
Red newt	*Notophthalmus viridescens*
Redback salamander	*Plethodon cinereus*
Northern two-lined salamander	*Eurycea bislineata*
Northern dusky salamander	*Desmognathus fuscus*
Allegheny mountain dusky salamander	*Desmoganthus ochrophaeus*
American toad	*Bufo americanus*
Gray treefrog	*Hyla versicolor*
Common garter snake	*Thamnophis sirtalis*
Wood frog	*Lithobates sylvaticus*
Pickerel frog	*Lithobates palustris*

4.7 Botanical Resources

In 2012, in preparation for development of the PAD, the Power Authority conducted a baseline survey to identify botanical resources in the Project boundary, the results of which were described in the PAD.

4.7.1 Affected Environment

4.7.1.1 Upland Botanical Resources

The land within the Project boundary is in the Northern Appalachian and Atlantic Maritime Highlands ecoregion, which is characterized primarily by mixed northern hardwoods and occasional spruce and fir in the highest elevations (CEC, 2011). Lands within the Project boundary are predominantly forested. Exceptions are a narrow strip of maintained, open habitat along the Upper Dike that is dominated by mowed meadows and unvegetated rip-rap, and routinely mowed and maintained areas surrounding the Mine Kill State Park facilities, Lansing Manor, the Visitor's Center and the Project facilities at and around the Lower Dam. Forested uplands dominate the remaining areas within the Project boundary and include mixed northern hardwoods, pine-dominated forest, and hemlock-dominated forest. Small areas of xeric (dry) woodlands occur along the tops of cliffs and ridges where there is little to no contributing watershed. Shear cliffs of exposed sedimentary bedrock occur along portions of the Lower Reservoir, particularly along the southern (or upstream) shoreline.

A week-long survey effort was conducted in July 2012 within the Project boundary and vicinity to complete cover type mapping and to assess plant and wildlife habitats (Figure 4.7.1.1-1). This work was completed in conjunction with a detailed cover-type mapping effort using aerial photo interpretation. Table 4.7.1.1-1 contains a summary of mapped cover types within the Project boundary (NYPA, 2013).

A diversity of upland plant species occurs within the Project boundary and vicinity (Table 4.7.1.1-1). Higher elevations, including the eastern edge of the Upper Reservoir and the sloping hillside between the two reservoirs, are dominated by mixed northern hardwoods, and pine and hemlock forests. Mixed northern hardwoods in this area are generally dominated by sugar and red maple, red oak, white ash, black cherry, birches (white and yellow), basswood, white pine, and hemlock. Shrub layer vegetation is dominated by beech, maple, hemlock, and ash saplings. Herbaceous vegetation within these mixed forests includes bracken fern, bluebead, twisted stalk, false Solomon's seal, and wild sarsaparilla. White pine and hemlock dominated forests have a canopy comprised primarily of white pine and/or hemlock, with a shade-limited shrub layer. Hemlock stands may contain an occasional beech, or hemlock saplings. Herbaceous layer vegetation within the coniferous forests is also limited, but may include Christmas fern, wood fern, Virginia creeper, starflower, Canada mayflower, poison ivy, and white avens. The routinely mowed outer slope of the Upper Dike is dominated by species such as red fescue, timothy, ragweed, Queen Anne's lace, spotted knapweed, and white sweet clover; the inside slope is largely unvegetated rip-rap (NYPA, 2013).

Lower elevations within the Project boundary (including the shore of the Lower Reservoir, forested areas along Schoharie Creek, and Mine Kill State Park) are dominated by mixed northern hardwoods. Low ravines (e.g., along the Mine Kill and other tributaries) and portions of the Lower Reservoir shoreline are dominated by hemlock. Stands of white pine are also present, sometimes in nearly pure plantations. Based on the presence of historic rock walls and successional forests observed during the field effort, these areas were likely planted during efforts to reforest historic agricultural lands or pasture. Mixed forests surrounding the Lower Reservoir are characterized by species similar to the Upper Reservoir area, yet also contain a few additional species more typical of lower elevations. These species include white oak, black locust, shagbark

hickory, and ironwood in the tree stratum; honeysuckles, multiflora rose and European barberry in the shrub/sapling stratum; and Jack-in-the-pulpit, New York fern, and mayapple in the herbaceous stratum (NYPA, 2013).

Rich forests associated with stream banks along the tributaries to the Lower Reservoir are generally dominated by sycamore, cottonwood and green ash with some areas, primarily sloping banks, dominated by hemlock. Shrub layer vegetation in these areas is primarily dominated by saplings (ash, sycamore, or hemlock), honeysuckle, and *Spiraea*, spp (meadowsweet, steeplebush). Herbaceous vegetation is primarily comprised of bloodroot, Jack-in-the-pulpit, twisted stalk, goldthread, starflower, wild sarsaparilla, coltsfoot and virgin's bower. Poison ivy and Virginia creeper are dominant vines in these riparian forests (NYPA, 2013).

Non-forested areas within the Project vicinity include upland meadow and xeric habitat (i.e., rock outcrops and sparsely wooded areas of ridge tops). Within upland meadows, occasional shrubs such as honeysuckle, staghorn sumac and red cedar occur. Herbaceous vegetation includes mullein, milkweed, yarrow, black and red raspberry and white sweet clover. Xeric areas are dominated by occasional red cedar and white pine, saplings of red oak and bur oak, and honeysuckle in shrub form. Herbaceous vegetation includes wild columbine, panicled hawkweed, bluestem, yarrow, and lowbush blueberry. Areas without herbaceous cover were often dominated by lichen (NYPA, 2013).

The sedimentary bedrock and associated calcareous till within the Project boundary and vicinity influence the plant community. During the study, several indicator species of rich, basic soils were observed in the mixed northern hardwood and riparian forests. These include herb Robert, blue cohosh, bloodroot mayapple, and Solomon's seal in the herb stratum, European (or common) barberry in the shrub stratum, and basswood in the tree stratum. The forests with a strong white pine component lacked these indicator species because the accumulated litter layer lowers the pH (NYPA, 2013).

Invasive species pose a risk to both native flora and fauna. In general, invasive species out-compete native vegetation and reduce habitat variability within the environment they occupy. In addition, most invasive species offer no benefit to native wildlife (*i.e.*, forage). While upland invasive plant species are occasionally found within the Project vicinity, large stands are not widespread. In most cases, invasive plants occur as small discontinuous patches across the landscape. Invasive shrub honeysuckles (Morrow's and Tatarian) and barberry (primarily European) are the most common invasive species found within the Project vicinity, where they primarily occupy the understory of mixed northern hardwood stands and occasionally white pine dominated forests. Japanese knotweed occurs in several stands, primarily within a large area of recent alluvium at the upstream limit of the area within the Project boundary. Garlic mustard and white sweet clover are dominant herbaceous invasive species within upland forest edges and roadsides. Other species such as hawkweed, spotted knapweed and Japanese stiltgrass are present but not widespread within the Project boundary (NYPA, 2013).

The hemlock woolly adelgid (*Adelges tsugae*), a destructive pest that kills eastern hemlock trees, has been discovered throughout Mine Kill State Park. During the 2012 survey, occasional dead hemlock trees and infested live branches were observed to the north of the State Park along the northwest shore of the lower Reservoir (NYPA, 2013). This infestation is noteworthy because hemlock is a dominant canopy tree in the Mine Kill State Park and within the Project boundary and vicinity. Field observations also indicated that most of the hemlock within the Project boundary occurs in forests where hemlock is <50% of the canopy

cover (these were mapped as other dominant forest types). No woolly adelgid infestations were observed along the Upper Reservoir (NYPA, 2013). The NYSOPRHP is in the process of mapping woolly adelgid infestations in the Mine Kill State Park and surrounding area. The NYSOHRHP began a control program and monitoring program in 2013 that utilizes both chemical and biological treatments for woolly adelgid. The Catskill Regional Invasive Species Partnership (CRISP) recently released 500 Laricobius beetles (approved for adelgid control by the United States Department of Agriculture in 2000) to help mitigate potential damage from the adelgid within Mine Kill State Park (CRISP, 2013).

The emerald ash borer (EAB) (*Agrilus planipennis*), was first discovered in the U.S. in 2002 in southeastern Michigan. The beetle is of Asian origin and infests and kills North American ash (*Fraxinus*) species. Although a specific search was not conducted, EAB was not identified within the Project vicinity during field surveys. There were several EAB traps observed in the Mine Kill State Park in 2012; however these traps were not set by the Power Authority and it is unknown whether EABs were identified within the traps (NYPA, 2013). According to maps from the NYSDEC, EABs were identified within Schoharie County by a trap detection. Within the NYSDEC's latest EAB map edition, published July 2016, it was identified that Towns within Schoharie County including Conesville, Gilboa, Middleburgh, and Wright were included within the Hudson Valley EAB Quarantine Boundary (restrictive zone). Conesville was additionally specified as an infested core area for EAB (NYSDEC, 2016c).

4.7.1.2 Wetlands, Riparian, and Littoral Botanical Resources

Wetland Habitat and Vegetation

Field surveys and cover type mapping in 2012 (NYPA, 2013) identified 826 acres of wetland within the Project boundary. Wetland types include emergent, scrub-shrub, and forested wetlands, in addition to open water wetlands including the reservoirs, streams, and control-level ponds. Outside of the Lower and Upper Reservoirs, the most commonly occurring wetland type is palustrine emergent (108.4 acres). The remaining wetland acreage is made up of forested wetlands, shrub wetlands, and the created control level ponds. Table 4.7.1.2-1 contains wetland acreage totals identified within the Project boundary. Wetland vegetation observed with the Project vicinity is included in Table 4.7.1.2-2.

Lower Reservoir

Wetlands adjacent to the Lower Reservoir and Schoharie Creek are primarily emergent wetlands with occasional forested floodplains. Most of the shoreline upstream from the confluence with the Mine Kill consists of steep bedrock cliffs with little or no riparian vegetation. Emergent areas tend to be associated with silty and sandy terraces (*e.g.*, near the boat launch) or deltas resulting from sediment settling at tributary mouths (most notably at the Mine Kill).

Upper emergent marsh terraces (higher elevation) and lower emergent marsh terraces (lower elevation) were observed along the Lower Reservoir shoreline. Upper emergent areas are found on slightly higher terraces and deltas within the Lower Reservoir, and are, therefore, inundated less frequently. These areas are dominated by marsh purslane, ladies thumb, spotted and marsh St. John's wort, moneywort, wool grass, tear thumb, Joe-pye weed, white boneset, fringed loosestrife, blue and white vervain, false nettle and various goldenrods. In wetter microsites within the upper terraces, spikerushes, three-square and soft stem bulrush become more prevalent (NYPA, 2013). Lower emergent wetlands, which are exposed to regular water level fluctuations during the growing season, occur in a few locations along the Lower

Reservoir, and at the mouth of the Mine Kill. Lower emergent areas are dominated by smartweeds, with occasional inclusions of lesser forget-me-not, spike rush, and Indian hemp. These species are commonly found along rivers and streams and are adapted to rapid changes in water level. Areas dominated by smartweeds are particularly valuable as seasonal forage for waterfowl (USDA, 2001).

Forested floodplains occur in isolated locations, primarily near the mouth of the Mine Kill and adjacent to Schoharie Creek downstream of the Lower Dam. These wetlands are dominated by sycamore, black willow, green ash and cottonwood in the overstory, and deer-tongue grass, sensitive fern, whorled loosestrife, tussock sedge, Joe-pye weed, reed canary grass, stinging nettle and Canada bluejoint in the herbaceous stratum. The shrub/sapling stratum is typically very sparse in these forested floodplains. In drier locations within some forested floodplains, small patches of the invasive plants garlic mustard and Japanese knotweed were observed (primarily at the upstream extend of the Lower Reservoir) (NYPA, 2013).

Upper Reservoir

Most of the Upper Reservoir shoreline consists of angular rip-rap with little or no vegetation. Wetlands occur only along the eastern and northeastern shoreline of the Upper reservoir and contain primarily emergent vegetation. Vegetation in emergent areas is dominated by three square, white boneset, Joe-pye weed, dark green bulrush, deer-tongue grass, smartweeds and willows. There are also willow-dominated scrub-shrub sections below the tree line. Embedded within the shoreline wetlands of the Upper Reservoir are several constant-level ponds that are connected during periods of low water. These ponds were constructed by the Power Authority in 1979 as a habitat improvement project, as a way to create pockets of stable water for warm-water fish, and as wetland vegetation and wildlife habitat. Invasive wetland species within the Upper Reservoir are limited to primarily purple loosestrife, occurring as occasional stems rather than dense monocultures (NYPA, 2013).

Mitigation Wetlands

In September 2000, the United States Army Corps of Engineers (USACE) issued the Power Authority a permit for remediation of a landslide that occurred at the Project. Requirements of the permit called for the creation of 6.19 acres of freshwater wetlands to compensate for unavoidable impacts to hillside wetlands in the landslide area (EDR, 2003). In order to fulfill the requirements of the permit conditions, the Power Authority constructed mitigation wetlands at three sites. These wetlands, which are set back from the Project reservoirs outside of the influence of Project operations, are clustered to the south of the Visitors Center and just northwest of the Lower Dam. These wetlands exhibit wetland plant communities, hydric soils and wetland hydrology as determined by field surveys during 2012. They are mostly emergent and scrub-shrub communities dominated by cattail, water parsnip, wool grass, dark green bulrush, white boneset, willow and speckled alder, as well as a variety of other hydrophytic plant species that were either planted during the construction of these features or colonized on their own from nearby wetlands in subsequent years (NYPA, 2013).

In 2015, a 0.33 acre palustrine emergent and scrub/shrub mitigation wetland was constructed north of the spillway as a result of the construction of the new warehouse facility adjacent to the North gate access road. A small seep fed depression which directed water toward a maintained rock lined ditch was identified as a wetland, which fell into the jurisdiction of the U.S. Army Corps of Engineers requiring mitigation where the corner of the build was to be placed. NYPA, unable to change the building design was required to construct a mitigation wetland within close proximity to impacted one. The design included excavating the

upland to an elevation equal and slightly lower than that of the adjacent wetland. By excavating to this depth and having a connection to Schoharie Creek, the hydrology of the mitigated wetland includes both groundwater and surface water interaction. After final grading of the mitigated wetland, it was planted with native emergent and scrub/shrub plants that thrive in a wetland environment.

Invasive Species

Invasive wetland plants within the Project boundary are also not widespread. Purple loosestrife occurs along both the Upper and Lower Reservoirs and north of the dam in the backwater area, but not in dense monocultures, rather as isolated stems or small patches. Japanese knotweed is dispersed along the shores of the Lower Reservoir and the common reed occurs primarily near the maintenance area located adjacent to the Lower Reservoir. A second smaller stand of common reed occurs along the fence line of the Upper Reservoir. Similar to purple loosestrife and Japanese knotweed, common reed does not appear to be widespread within the Project boundary and occurs in only a few isolated stands. Reed canary grass occurs as a component of several wetlands within the Project boundary, but is co-dominant with native vegetation. Moneywort is present in small dense patches, primarily near the Mine Kill. The wetland mitigation area near the Visitors Center contains several stems of invasive yellow iris, but this species was not observed anywhere else during the survey (NYPA, 2013).

Riparian Zone Botanical Resources

The riparian zone along the Lower Reservoir shoreline is vegetated with mixed or coniferous (white pine and hemlock) forests, and occasionally meadows or shrublands. However, in many locations, upland forest transitions abruptly to the Lower Reservoir shoreline (*e.g.*, where there are steep cliffs and hillsides). In these areas, there is limited riparian vegetation within the influence of the Project waters. The tributaries to the Lower Reservoir pass through riparian forests dominated by hemlock. In most cases, the Lower Reservoir riparian vegetation includes sycamore, green ash, basswood, hemlock and white pine. Understory vegetation includes beech, ash, or hemlock saplings with herbaceous species including coltsfoot, bloodroot, starflower, twisted stalk, goldthread, wild sarsaparilla and virgin's bower. Microhabitat features important to wildlife such as large woody debris, snags and overhanging cliffs are prevalent within the riparian zone (NYPA, 2013).

Surrounding the Upper Reservoir, riparian habitat and vegetation are limited to the eastern shoreline since the remainder of the shoreline consists of angular rip-rap with little vegetation. Land adjacent to the eastern shore is dominated by upland forest with primarily hemlock and mixed hardwoods occurring in the overstory. In areas dominated by hemlock, understory vegetation includes beech and hemlock saplings. Herbaceous species include twisted stalk, starflower, goldthread and sarsaparilla (NYPA, 2013).

Littoral Zone Botanical Resources

The primary habitat within the littoral zone of the Lower Reservoir is emergent marsh and exposed shoreline (cobble/shore/exposed shoreline). Rocky substrates do not provide good submerged aquatic vegetation (SAV) habitat, and as such, the SAV zone is largely absent from the Lower Reservoir as well as in Schoharie Creek and the tributaries. Limited SAV development was observed in occasional small depressions within the emergent zone of the Lower Reservoir. These areas were dominated by pondweed species. In areas where there are gentle shoreline slopes, the primary habitat is emergent marsh which includes lesser forget-me-not, Indian hemp, smartweeds, marsh purslane, ladies thumb, spotted St. John's wort, moneywort, wool

grass, tear thumb, Joe-pye weed, fringed loosestrife, blue vervain, false nettle and various goldenrods. The remaining shoreline is steeply sloped and dominated by cobble and exposed bedrock; however, vegetation such as pimpernel, Indian hemp, or goldenrod is occasionally present.

Similar to the Lower Reservoir littoral zone, the primary habitat within the Upper Reservoir is emergent marsh (to the east) and exposed shoreline (cobble shore/rip-rap) and the SAV zone is largely absent from the Upper Reservoir. Limited SAV development was observed in the control level ponds along the Upper Reservoir. These areas were dominated by pondweed species (NYPA, 2013).

4.7.2 Environmental Effects

In SD1 and SD2, FERC identified the following issue related to botanical resources: (1) the effects of Project operation, maintenance, and Project-related recreation on botanical resources and wildlife, including game species. An analysis of Project effects on wildlife, including game species, is located in Section 4.6.2.

The existing botanical resources appear to be stable under the existing fluctuation regime, Project operation and maintenance, and recreation activities. Because the Power Authority is proposing no changes or modifications to the existing B-G Project facilities, maintenance, or recreation sites at this time, no impacts to botanical resources are anticipated.

4.7.3 Proposed Environmental Measures

The Power Authority is not proposing any new environmental measures related to botanical resources at this time.

4.7.4 Unavoidable Adverse Impacts

Continued operation of the B-G Project will not result in unavoidable adverse effects to botanical resources.

Table 4.7.1.1-1: Representative Upland Plant Species Observed within the Project Boundary and Vicinity in 2012

Common Name	Scientific Name
Sugar maple	*Acer saccharum*
Yarrow	*Achillea millefolium*
Garlic mustard	*Alliaria petiolata**
Ragweed	*Ambrosia spp.*
Blue stem	*Andropogon gerardii*
Wild columbine	*Aquilegia canadensis*
Wild sarsaparilla	*Aralia nudicaulis*
Jack in the pulpit	*Arisaema triphyllum*
Milkweed	*Asclepias sp.*
Japanese barberry	*Berberis thunbergii**
European barberry	*Berberis vulgais**
Yellow birch	*Betula alleghaniensis*
Black birch	*Betula lenta*
Paper birch	*Betula papyrifera*
Iron wood (American hornbeam)	*Carpinus caroliniana*

Common Name	Scientific Name
Shagbark hickory	*Carya ovata*
Blue cohosh	*Caulophyllum thalictroides*
Spotted knapweed	*Centaurea stoebe**
Virgin's bower	*Clematis occidentalis*
Bluebead	*Clintonia borealis*
Goldthread	*Coptis trifolia*
Wood fern	*Dryopteris carthusiana*
Japanese knotweed	*Fallopia japonica**
American beech	*Fagus grandifolia*
Red fescue	*Festuca rubra*
White ash	*Fraxinus americana*
Green ash	*Fraxinus pennsylvanica*
Wintergreen	*Gaultheria procumbens*
Herb Robert	*Geranium robertianum*
White avens	*Geum canadense*
Common hawkweed	*Hieracium iachenalii*
Panicled hawkweed	*Hieracium paniculatum*
Eastern red cedar	*Juniperus virginiana*
Japanese honeysuckle	*Lonicera japonica**
Tartarian honeysuckle	*Lonicera tatarica**
Canada mayflower	*Maianthemum canadense*
False solomon's seal	*Smilacina racemosum*
White sweet clover	*Melilotus officinalis**
Japanese stiltgrass	*Microstegium vimineum**
Partridge berry	*Mitchella repens*
Hop hornbeam	*Ostrya virginiana*
Mountain sorrel	*Oxalis montana*
Virginia creeper	*Parthenocissus quinquefolia*
Timothy	*Phleum pretense*
Red pine	*Pinus resinosa*
White pine	*Pinus strobus*
Mayapple	*Podophyllum peltatum*
Solomon’s seal	*Polygonatum pubescens*
Christmas fern	*Polystichum acrostichoides*
Cottonwood	*Populus deltoids*
Black cherry	*Prunus serotina*
Bracken fern	*Pteridium aquilinum*
White oak	*Quercus alba*
Bur oak	*Quercus macrocarpa*
Red oak	*Quercus rubra*
Sumac	*Rhus spp.*
Red raspberry	*Rubus idaeus*

Common Name	Scientific Name
Black raspberry	*Rubus occidentalis*
Purple flowering raspberry	*Rubus odoratus*
Bloodroot	*Sanguinaria canadensis*
Goldenrod	*Solidago spp.*
Meadow sweet	*Spiraea alba*
Steeplebush	*Spiraea tomentosa*
Twisted stalk	*Streptopus lanceolatus*
American basswood	*Tilia americana*
Poison ivy	*Toxicodendron radicans*
Starflower	*Trientalis borealis*
Hemlock	*Tsuga canadensis*
Coltsfoot	*Tussilago farfara*
Lowbush blueberry	*Vaccinium angustifolium*
Common mullein	*Verbascum thapsus*

*Invasive Species (as identified by NYSDEC)

Table 4.7.1.2-1: Wetland Acreage Identified in the Project Boundary

Cover Type	Acres
Control Level Ponds	3.3
Forested Wetland	4.4
Shrub Swamp	12.4
Floodplain Forest	14.2
Stream or River	41.2
Emergent Marsh	108.4
Artificial Pond or Reservoir	641.9
Total	**826**

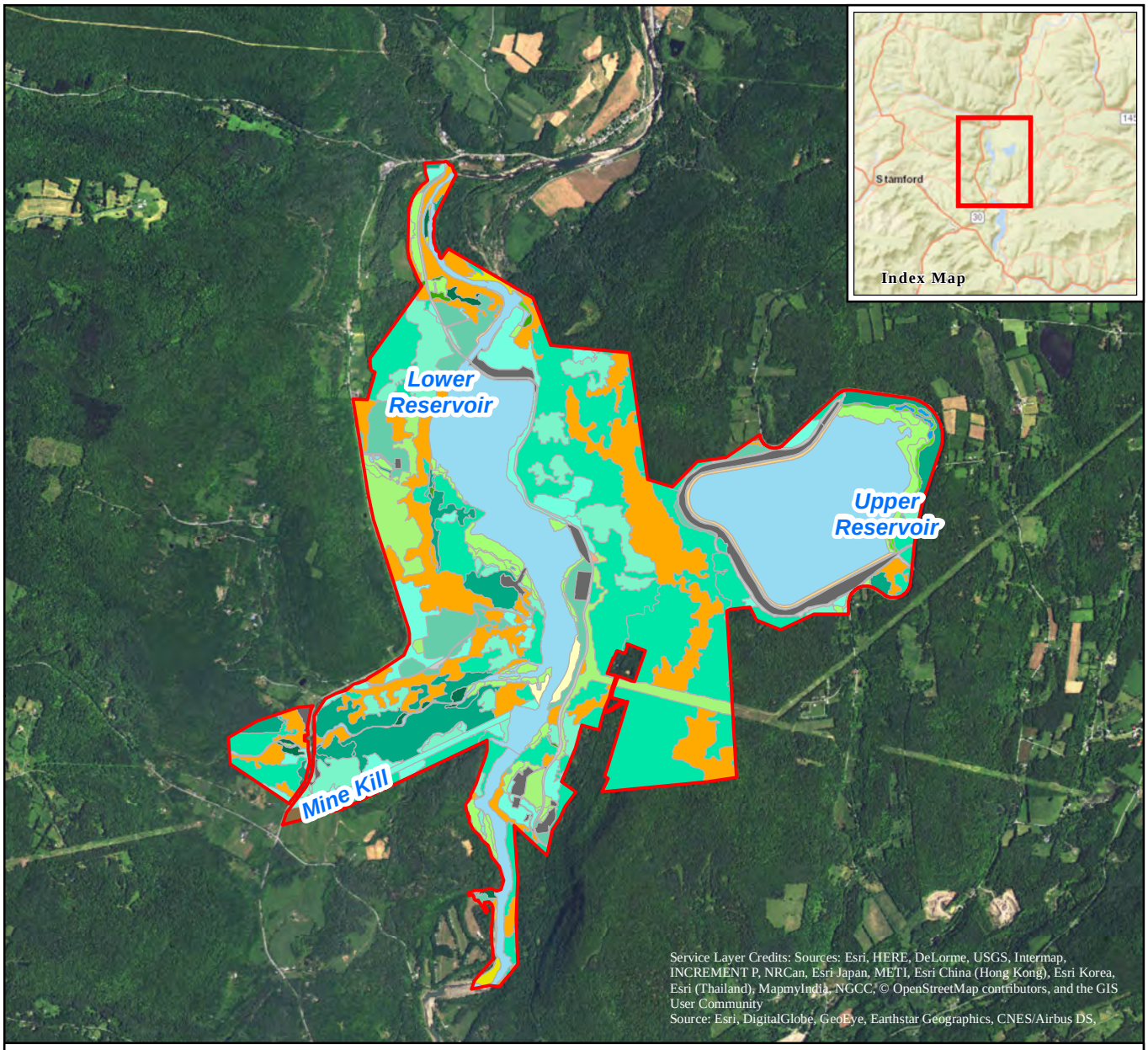
Table 4.7.1.2-2: Wetland Vegetation Observed within the Project Vicinity

Common Name	Scientific Name
Sweetflag	*Acorus americanus*
Northern water plantain	*Alisma triviale*
Speckled alder	*Alnus incanna*
Pimpernel	*Anagallis arvensis*
Indian hemp	*Apocynum cannabinum*
Dogbane	*Apocynum spp.*
Swamp milkweed	*Asclepias incarnata*
Beggar's tick	*Bidens spp.*
False nettle	*Boehmeria cylindrica*
Canada bluejoint	*Calamagrostis canadensis*
Hedge bindweed	*Calystegia sepium*
Bladder sedge	*Carex crinita*
Yellow sedge	*Carex flava*
Greater bladder sedge	*Carex intumescens*
Hop sedge	*Carex lupulina*
Broom sedge	*Carex scoparia*
Tussock sedge	*Carex stricta*
Fox sedge	*Carex vulpinoidea*
Button bush	*Cephalanthus occidentalis*
Water hemlock	*Cicuta maculata*
Silky dogwood	*Cornus amomum*
Smooth bedstraw	*Cruciata laevipes*
Deer tongue grass	*Dichanthelium clandestinum*
American waterwort	*Elatine americana*
Spike rush	*Eleocharis spp.*
Hairy willow-herb	*Epilobium hirsutum*
Water horsetail	*Equisetum fluviatile*
Joe-pye weed	*Eupatoriadelphus maculatus*
White boneset	*Eupatorium album*

Common Name	Scientific Name
White snakeroot	*Eupatorium rugosum*
Flat-top goldenrod	*Euthamia graminifolia*
Green ash	*Fraxinus pennsylvanica*
Bedstraw	*Galium spp.*
White geum	*Geum canadense*
Purple geum	*Geum rivale*
Winterberry	*Ilex verticillata*
Jewelweed	*Impatiens capensis*
Yellow flag iris	*Iris pseudacorus**
Blue flag iris	*Iris versicolor*
Canada rush	*Juncus canadensis*
Soft rush	*Juncus effusus*
Water willow	*Justica americana*
Marsh purslane	*Ludwigia palustris*
American water horehound	*Lycopus americanus*
Fringed loosestrife	*Lysimachia ciliata*
Moneywort	*Lysimachia nummularia**
Swamp candle	*Lysimachia terrestris*
Purple loosestrife	*Lythrum salicaria**
Wild mint	*Mentha arvensis*
Monkeyflower	*Mimulus ringens*
Lesser forget-me-not	*Myosotis laxa*
Sweetgale	*Myrica gale*
Evening primrose	*Oenothera biennis*
Small sundrop	*Oenothera perennis*
Sensitive fern	*Onoclea sensibilis*
Switchgrass	*Panicum virgatum*
Wild parsnip	*Pastinaca sativa*
Reed canary grass	*Phalaris arundinacea**
Common reed	*Phragmites australis**
Bracted plantain	*Plantago aristata*
Sycamore	*Platanus occidentalis*
Arrow leaved tearthumb	*Polygonum sagittatum*
Smartweed spp.	*Polygonum spp.*
Pickerelweed	*Pontederia cordata*
Heal-all	*Prunella vulgaris*
Creeping yellow cress	*Rorippa sylvestris*
Swamp rose	*Rosa palustris*
Curly dock	*Rumex crispus*
Arrowhead	*Sagittaria latifolia*
Black willow	*Salix nigra*
Willow species	*Salix spp.*

Common Name	Scientific Name
Common elderberry	*Sambucus canadensis*
Three square	*Schoenoplectus pungens*
Soft stem bulrush	*Schoenoplectus tabernaemontani*
Dark green bulrush	*Scirpus atrovirens*
Woolgrass	*Scirpus cyperinus*
Barberpole sedge	*Scirpus microcarpus*
Water parsnip	*Sium suave*
Goldenrod species	*Solidago spp.*
Burreed	*Sparganium americanum*
New York aster	*Symphyotrichum novi-belgii*
Tall meadow rue	*Thalictrum pubescens*
New York fern	*Thelypteris noveboracensis*
Marsh fern	*Thelypteris palustris*
Marsh St. Johnswort	*Triadenum virginicum*
Narrow-leaved cattail	*Typha angustafolia*
Broad-leaved cattail	*Typha lattifolia*
Hybrid cattail	*Typha x glauca*
Blue vervain	*Verbena hastata*
White vervain	*Verbena urticifolia*
Vetch species	*Vicia spp.*

*Invasive Species (as identified by NYSDEC)



Legend

- BG FERC Project Boundary
- Artificial Pond or Reservoir
- Stream or River
- Control Level Ponds
- Scoured Shoreline
- Exposed Shoreline (mud/silt)
- Cobble Shore
- Emergent Marsh
- Shrub Swamp
- Forested Wetland
- Floodplain Forest
- Eastern Hemlock
- Evergreen-Northern Hardwood Forest
- Eastern White Pine
- Northern Hardwoods; Northern Hardwoods
- Successional Old Field/Shrubland
- Grass Land
- Rock-outcrop
- Cropland
- Manicured Lawn
- Transportation
- Development

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Figure 4.7.1.1-1: Cover Types within the Project Boundary

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4.8 Rare, Threatened, and Endangered Species

In 2012, in preparation for development of the PAD, the Power Authority conducted a baseline survey to identify rare, threatened, and endangered (RTE) wildlife species in the Project boundary, the results of which were described in the PAD.

4.8.1 Affected Environment

Letters of inquiry were sent to the USFWS and the New York Natural Heritage Program (NYNHP) to identify RTE species within the Project boundary and vicinity. In 2012, the USFWS did not identify any federally protected species within the Project boundary (D. Stilwell, USFWS, personal communication, July 12, 2012). However, since 2012, the northern long-eared bat (NLEB) has been listed as a federally threatened species under the ESA. According to the USFWS IPaC Resource Mapper, the northern long-eared bat may have presence within the Project vicinity. The NYNHP identified two additional species with the potential to occur within the Project boundary and vicinity: Bald Eagle (*Haliaeetus leucocephalus*) and timber rattlesnake (*Crotalus horridus*) (N. Haelsip, NYSDEC, personal communication, August 15, 2012; J. Pietrusiak, NYSDEC, personal communication, November 16, 2011). No federally designated critical habitat or other habitat for listed species was identified by the USFWS or the NYNHP as occurring within the Project vicinity.

The USFWS identified the Indiana bat (*Myotis sodalist*) as historically occurring within Schoharie County. Based on the general range and habitat requirements of the Indiana bat, this species could have historically occurred within the Project vicinity. This species, however, was not identified by the NYNHP as occurring within the Project boundary. Indiana bats historically wintered in adjacent Albany County, and the bats are known to migrate long distances. The USFWS stated that the bats are likely extirpated or in such small numbers that the bats are not likely existent within Schoharie County (USFWS 2012).

4.8.1.1 Bald Eagle

Bald Eagle, a New York State-Threatened species that is also federally protected under the Bald and Golden Eagle Protection Act, occurs in and uses the waters in the Project vicinity, including both reservoirs and Schoharie Creek, for feeding (S. Van Arsdale, NYSDEC, personal communication, August 3, 2012).

One of the two nest locations has moved over the years and is sometimes within and sometimes just outside of the Project boundary. The second nest has remained just outside the Project boundary (S. Van Arsdale, NYSDEC, personal communication, August 3, 2012). In 2013, one nest occurred within the Project boundary and one just outside the Project boundary (within ¼ mile); a third nest occurred near a water body within 1-2 miles of the Project boundary (S. Van Arsdale, NYSDEC, personal communication, April 2013). B-G Environmental staff have confirmed that these three nests remained in these locations through 2016.

Regardless of nest location, Bald Eagles use the Project waters to feed. During the winter, Schoharie Creek, above and below the Lower Reservoir, is an important feeding area for Bald Eagles where there is open water and no ice cover. Transient, non-breeding Bald Eagles (*e.g.*, sub-adults) may use the Project vicinity during nesting season as well. No eagles were directly observed during field work during July 2012, however fresh Bald Eagle flight feathers and plumage, in addition to whitewash, were found beneath snags and tall white pines adjacent to the Lower Reservoir (NYPA, 2013).

4.8.1.2 Timber Rattlesnake

Timber Rattlesnake, a New York State-Threatened species that occurs in the Catskill region was noted by the NYNHP as potentially occurring in the vicinity of the Project. No documented occurrences of this species exist within the Project boundary itself; however, there is a documented historic occurrence of this species associated with an area of exposed bedrock in the vicinity of the Project (N. Heaslip, NYSDEC, personal communication, August 15, 2012). In 2012, a timber rattlesnake expert surveyed the Project boundary and identified the most likely areas for potential rattlesnake habitat. No rattlesnakes or viable den habitat were observed (NYPA, 2013).

Further surveys were conducted during May and June of 2013 during optimal weather and dates for timber rattlesnake emergence and basking. The 2013 survey did not identify any timber rattlesnake occurrences within the Project boundary or adjacent lands. The lack of suitable basking and gestating habitat in the vicinity of the ledges, the failure to locate any timber rattlesnakes or shed skins, and the lack of any reported observations in the past 30 years lead to the conclusion that timber rattlesnakes are not present within the Project boundary or adjacent lands (NYPA, 2014b).

4.8.1.3 Northern Long-Eared Bat

The NLEB was listed as a threatened species under the ESA on April 2, 2015. The NLEB is one of the species of bats most impacted by the white-nose syndrome (WNS) disease. The USFWS maintains a list of counties within the United States that are located within NLEB range. This information indicates that Schoharie County is located within NLEB range (USFWS, 2016b). The USFWS additionally maintains a list of known NLEB hibernacula and maternity roost locations. While no known maternity roost locations were identified in Schoharie County, several hibernacula were identified in the county (USFWS, 2016c).

On April 27, 2016, the USFWS issued a determination stating that designating critical habitat for NLEB is not prudent because NLEB summer habitat is not limited or in short supply and because designating NLEB winter critical habitat would likely lead to an increase in vandalism, disturbance, and the increase of WNS.

4.8.1.4 Species of Special Concern

The NYNHP did not identify any species of special concern as occurring within the Project vicinity. A week-long survey effort was conducted during July 2012 within the Project area to complete cover type mapping and assess plant and wildlife habitats, including habitat for rare species (NYPA, 2013). The Cerulean Warbler (*Dendroica crulea*) was the only species of special concern observed during the field work in 2012. The Eastern small-footed Myotis (*Myotis leibii*) was additionally identified by the NYSDEC in and around the Project boundary during a state funded tracking study.

Additional species of Special Concern may occur within the Project vicinity. Species listed in Table 4.8.1.5-1 have the potential to occur based on habitat, range, and historic observation, but were not identified by the NYNHP as occurring within the Project boundary or vicinity. In addition, these species, while not specifically part of the survey objectives, were not identified during the 2012 field effort.

4.8.2 Environmental Effects

In SD1 and SD2, FERC identified the following issue related to threatened and endangered resources: (1) the effects of Project operation, maintenance, and Project-related recreation on New York State listed wildlife species, including timber rattlesnake and Bald Eagle; and (2) the effects of Project operation,

maintenance, and Project-related recreation on federally listed threatened and endangered species identified by the USFWS. These issues are discussed in greater detail below.

The Power Authority conducted a baseline study in July of 2012 and again in May-June of 2013 to update information pertaining to RTE species potentially occurring within the Project vicinity. The 2012 survey was habitat-based and included qualitative habitat surveys, for both timber rattlesnake and bald eagle. The 2013 study included a focused habitat and species survey for timber rattlesnake, which was identified by the NYNHP as potentially occurring in or near the Project. The 2013 survey did not identify any timber rattlesnake occurrences within the Project boundary or adjacent lands. The 2013 survey concludes that timber rattlesnake is not present within the Project boundary or adjacent lands due to the lack of sufficient habitat. Bald Eagle habitat and extant nesting pairs are present and documented within the Project boundary and vicinity. Based on this study, continued Project operation is not expected to affect these resources (NYPA, 2014b).

During development of the Proposed Study Plan, the Power Authority met with the USFWS on September 3, 2014 to discuss needs for NLEB studies and reached a consensus that a field study was not needed. The Power Authority agreed to consult with the USFWS on specific management measures that should be taken in the future if any activities, such as tree-clearing, are proposed that would involve the potential to affect this species or its habitat.

The Power Authority is proposing no changes or modifications to B-G Project operation, maintenance, or recreational sites at this time. Therefore, no impacts to threatened or endangered species are anticipated.

4.8.3 Proposed Environmental Measures

The Power Authority proposes to consult with the NYNHP and USFWS if there is any proposed tree clearing or ground disturbing activities to ensure that the timing and scope of these activities does not adversely impact NLEB or Bald Eagles.

4.8.4 Unavoidable Adverse Impacts

Continued operation of the B-G Project will not result in unavoidable adverse effects to rare, threatened or endangered species.

Table 4.8.1.5-1: Species of Special Concern that May Occur within the Project Vicinity

Common Name	Scientific Name	Status
Blue-spotted salamander	*Ambystoma laterale*	Special Concern
Jefferson salamander	*Ambystoma jeffersonianum*	Special Concern
Wood turtle	*Clemmys insculpta*	Special Concern
Osprey	*Pandion haliaetus*	Special Concern
Cooper's hawk	*Accipiter cooperii*	Special Concern

4.9 Recreation, Land Use, and Aesthetic Resources

4.9.1 Recreation

4.9.1.1 Affected Environment

4.9.1.1.1 Regional Recreation

The B-G Project is located in the Saratoga/Capital District Region, as designated by NYSOPRHP. This region includes twelve state parks, such as Mine Kill State Park and Max V. Shaul State Park, eight historic sites, and several state forests, such as Blenheim Hill State Forest, Leonard Hill State Forest, High Knob State Forest, Keyserkill State Forest Complex, and Burnt-Rossman Hills State Forest. Recreation sites in the vicinity of the B-G Project include hiking trails, camping, wildlife viewing, fishing access, boating, and swimming (NYPA 2014c).

The Long Path is a hiking trail that extends 357 miles from Fort Lee Historical Park, New Jersey to Altamont, New York. The trail passes through Blenheim and Gilboa, and follows the western shoreline of the Lower Reservoir of the B-G Project (NYPA 2014c). A 5 mile portion of the trail through Mine Kill State Park is a designated National Recreation Trail. A new 38-mile multi-use trail has been proposed that would travel between the towns of Esperance and North Blenheim, and would follow the Schoharie Creek (SALT 2016).

Schoharie Reservoir is approximately 5 miles upstream from the B-G Project's Lower Dam and has numerous New York City Department of Environmental Protection (NYCDEP) boat launches that allow access to the Schoharie Reservoir. Certain regulations are required, such as the boat must be registered with NYCDEP, and it cannot have a motor.

In addition to boating facilities on Schoharie Reservoir, two formal and four informal sites exist downstream of the B-G Project that provide access for boating on Schoharie Creek. The two formal access sites include a hand-carry launch site at Max V. Shaul State Park and the New York State Department of Environmental Conservation (NYSDEC) Schoharie Creek Access. There are four informal access sites; two between the two formal sites (Bielfeldt Road and Breakabeen Route 30 Bridge Access) and two upstream of the NYSDEC Access (North Blenheim Route 30 Bridge Access and Bear Ladder Road Access). Three of the access sites are associated with Route 30 crossings over Schoharie Creek. These boating access sites and their proximity to the B-G Project are depicted on Figure 4.9.1.1.1-1.

There are also numerous recreational boating opportunities, including Class II and III waters, on Schoharie Creek and within 50 miles of the B-G Project. The boating opportunities on Schoharie Creek include reaches downstream of the B-G Project from Middleburgh to Esperance, Esperance to Power House Road, and from Power House Road to the Mohawk River. There are also recreational boating excursions along Schoharie Creek upstream of the B-G Project, including at Mine Kill State Park. (NYPA 2016a)

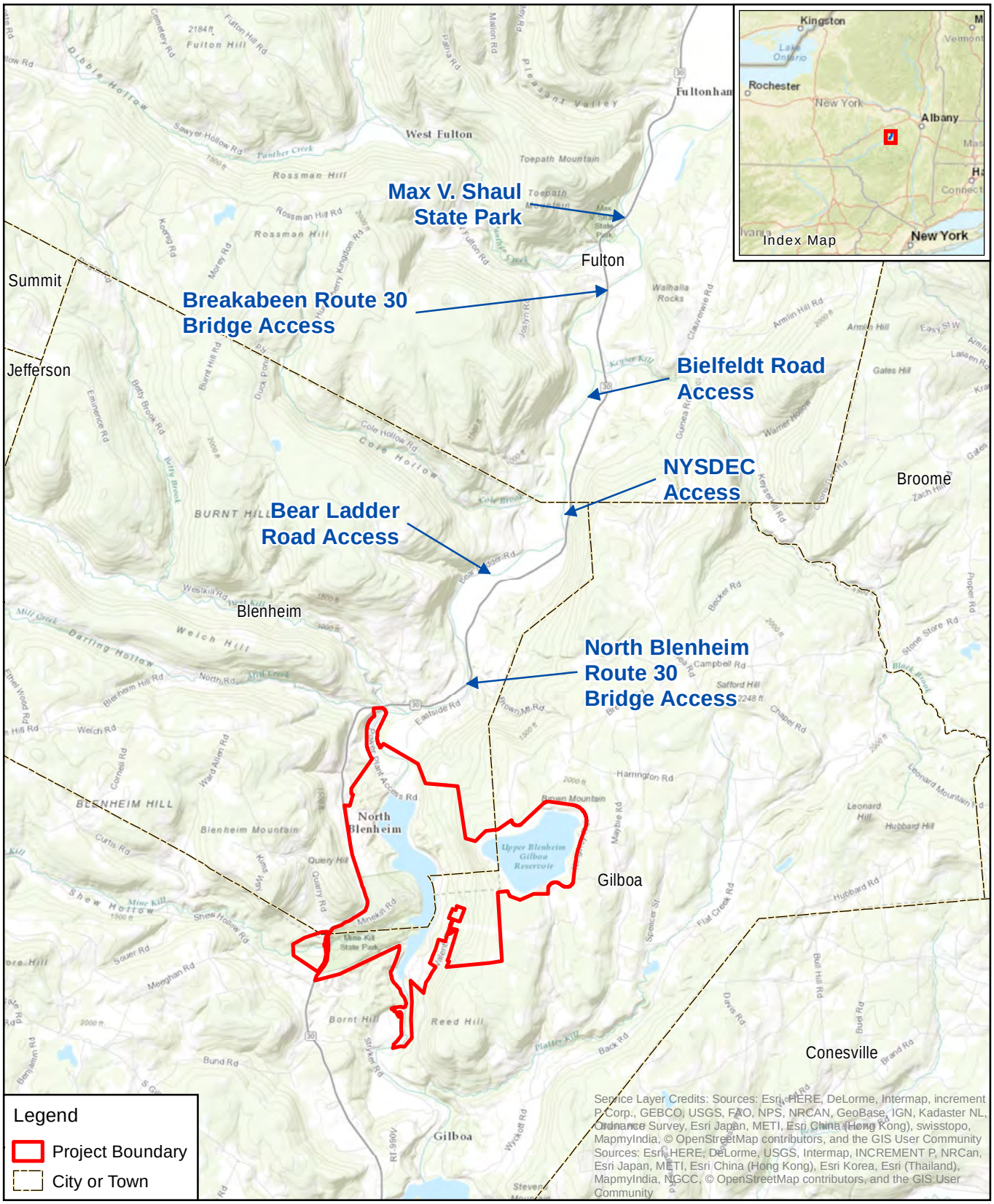

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Figure 4.9.1.1.1-1: Schoharie Creek Access Sites

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4.9.1.1.2 Project Recreation Sites and Current Project Recreation Plan

The FERC-approved Recreation Plan and Exhibit R drawings include the following project recreation sites: the Lansing Manor Complex (Lansing Manor and Visitors Center); Mine Kill State Park, which includes the Mine Kill Falls Overlook; the Upper Reservoir Recreational Facilities; and the Schoharie Creek Fishing Access Site. Table 4.9.1.1.2-1 summarizes these recreation sites and facilities and Figure 4.9.1.1.2-1 depicts their location.

Table 4.9.1.1.2-1: Commission Approved Recreation Sites at the B-G Project

Recreation Site Name	Recreation Facilities
Lansing Manor Complex	Approximately 42 vehicle parking spaces (3 ADA), restrooms (ADA), picnic area (~10 tables; 2 ADA), picnic shelter, interpretive signs and displays, overlook, 2 visitor centers, accessible routes, and trails.
Mine Kill State Park	Approximately 350 vehicle parking spaces (~11 ADA), restrooms (ADA), swimming pool, bathhouse (ADA), 4 picnic areas (~200 tables; ~7 ADA), boat launch area (~49 vehicle with trailer parking spaces; 1 ADA), active recreation areas, interpretive displays, winter areas, 2 overlooks, picnic shelter, 6 trails, and accessible route.
Upper Reservoir Access Areas	North: ~3 vehicle parking spaces, informal use area South: ~6 vehicle parking spaces, informal use area Boat Launch: ~2 vehicle parking spaces, boat launch area
Schoharie Creek Fishing Access Site	Approximately 14 vehicle parking spaces, access point

The plan also states that B-G Project lands, are open to the public for outdoor recreation with the exception of those areas that are closed to the public for security purposes. Finally, the plan includes lands that are available for archery hunting in cooperation with the NYSDEC. Areas where hunting is considered unsafe and therefore prohibited are designated and posted as safety zones. Archery hunting is allowed on the remainder of B-G Project lands for permitted hunters only. The Power Authority issues up to 100 permits annually. The archery hunting season generally occurs during New York State's deer hunting season.

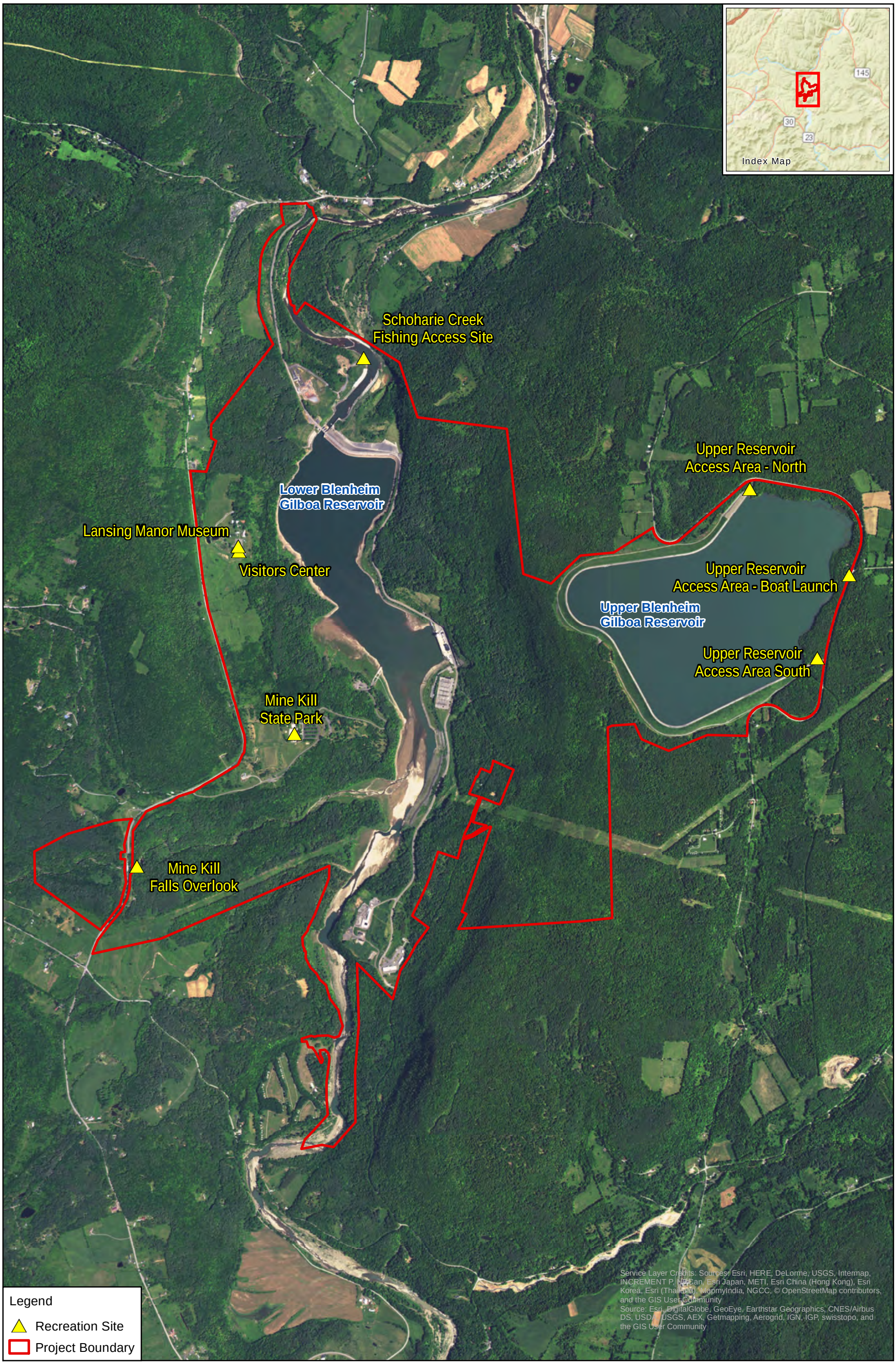

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Figure 4.9.1.1.2-1:
Existing Project Recreation Sites

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Lansing Manor Complex (Blenheim-Gilboa Visitors Center and Lansing Manor Museum)

The Lansing Manor Complex is located on the western shore of the Lower Reservoir on Route 30 in North Blenheim. The Complex is owned by the Power Authority, and consists of Lansing Manor Museum (including outbuildings such as a Tenant House, Land Office, and Corn Crib) and the Blenheim-Gilboa Visitors Center, which is housed in what was once the dairy barn of the manor. The Manor is operated as a house museum in cooperation with the Schoharie County Historical Society and shares parking and restroom facilities with the Visitors Center. The Visitors Center, operated by the Power Authority, hosts programs and events throughout the year, including a quilt show, classic car show, and family movie weekends. Amenities at the site include a paved walking trail to the Manor and Visitor Centers, which are both Americans with Disabilities Act (ADA) accessible. Interpretive signs and displays, several picnic tables, and a picnic pavilion are also located at the site. The Complex offers views of the Lower Reservoir. The site does not charge a fee for use, and is open to the public seven days a week from 10:00 am to 5:00 pm, year-round, with closures on major holidays.

Mine Kill State Park

Mine Kill State Park is located on the western shore of the Lower Reservoir on Route 30 in North Blenheim. The facility is owned by the Power Authority and operated/maintained under an agreement with the NYSOPRHP. Amenities at the site include a swimming pool, wading pool, diving pool, disc golf course, playgrounds, basketball courts, horseshoe pits, walking/hiking/mountain biking trails, picnic tables, picnic shelters, and soccer fields. A two-lane, hard surface boat launch provides access to the Lower Reservoir from the park. Much of the park is ADA accessible, including a lift in the pool, ADA bathrooms, changing rooms, showers, picnic tables, and parking spaces. Just south of the main park area on Route 30, is an overlook which offers views of Mine Kill Falls from a series of decks and stairs. Amenities at the overlook include access to some of the trails at the park, picnic tables, and grills. Hunting is also allowed in certain portions of the park, but a permit must be acquired from the Power Authority. The park is open to the public year round with summer hours from 7:30 am to 8:00 pm and winter hours from 7:30 am to 4:30 pm. During the swimming season, the pool is open from 10:00 am to 6:00 pm. No fee is charged for use of the park. There is, however, a rental fee for use of the picnic shelters.

In August 2015, the Power Authority and NYSOPRHP agreed to eliminate parking and swimming fees at Mine Kill State Park, which is adjacent to the B-G Project's Visitors Center, saving park visitors over $20,000 annually. The Power Authority compensates NYSOPRHP for the operation and maintenance of Mine Kill State Park, paying over $4.6 million in operation and maintenance, and $2.1 million for capital projects since 2005.

Upper Reservoir Recreational Facilities

There are three recreation areas on the Upper Reservoir, all of which are owned and maintained by the Power Authority. Sites on the north and south sides of the reservoir provide walking areas and angler access, along with parking along the sides of the Upper Reservoir Service Road. These sites are available between April 1 and September 30 from dawn till dusk. A third site, located on the eastern side of the reservoir, provides access for hand-carry boats and row boats on trailers. To access this launch, the Power Authority must be contacted during normal business hours. The site is open from 7:00 am to 7:00 pm. All three sites are available to the public with no fee charged.

Schoharie Creek Fishing Access Site

The Schoharie Creek Fishing Access Site is located north of the Lower Dam, off Power Plant Road in North Blenheim. This site has parking and provides dispersed recreation access to Schoharie Creek. The site is free to the public year round with no posted hours.

4.9.1.1.3 Recreation Use

On September 29, 2016, subsequent to the filing of the Recreation Use/User Contact Study and Assessment of Effects the Project has on Recreation Use, the NYSOPRHP provided revised 2015 June through August attendance data at Mine Kill State Park, as well as attendance data for the same period in 2016. The revised figures indicate that pool attendance in 2015 totaled 14,987, roughly 40 percent higher than the figure of 10,649 that had been provided on April 25, 2016 and used in NYPA, 2016e. The higher use at the pool in 2015 derived from NYSOPRHP's discovery that its database had not included non-paying school group attendance. Total June through August attendance figures, as counted at the entrance gates, were revised by less than one percent.

The Recreation Use/User Contact Survey report presented study results based on data collected at the B-G Project between March 2015 and February 2016, as well as Visitor Center and Lansing Manor use data provided by Power Authority staff and Mine Kill State Park data provided by NYSOPRHP. Mine Kill State Park results for the level of use, types of activities, and projected future use were based on data provided by NYSOPRHP on April 25, 2016, which has since been revised. The Recreation Use/User Contact Survey report shows that the total annual recreation use of surveyed recreation sites was estimated to be 124,489 recreation days. More than half of the recreation use occurred during the summer with 59 percent of recreation days. Approximately 24 percent of the use was in the fall. Recreation use was lowest in spring (8%) and winter (9%). Annual recreation use was greatest at Mine Kill State Park (73,125 users annually), followed by the Visitors Center (28,331), Mine Kill Falls Overlook (14,487), Lansing Manor (3,619) and Schoharie Creek Fishing Access (2,685). Use at the three Upper Reservoir access sites was minimal, with 836 recreation days at the Upper Reservoir Access—North, 713 recreation days at the Upper Reservoir Access—Boat Launch, and 693 recreation days at the Upper Reservoir Access—South (NYPA, 2016e).

Based on the revised 2015 recreation data provided by NYSOPRHP on September 29, 2016, recreation use at Mine Kill State Park was revised to 72,701. Project-wide recreation use was 124,065, with the seasonal distribution of use unchanged.

Table 4.9.1.1.3-1 summarizes the estimated or calculated use for each activity type project-wide. As shown, the most popular recreation activity type at the B-G Project was visiting an interpretive center (either Lansing Manor or the Visitors Center) at 26 percent. Based on Power Authority records, 31,950 recreation days at the B-G Project were spent participating in visiting interpretive centers (NYPA, 2016e).

As shown in the Recreation Use/User Contact Study, data from the NYSOPRHP, which was provided on April 25, 2016, found that walking/hiking/running accounted for the second most frequent recreational use, accounting for an estimated 22,409 recreation days, or 18 percent of the total number of recreation days at the B-G Project. This activity was primarily observed at Mine Kill Falls Overlook and Mine Kill State Park. The next most popular recreation uses of the B-G Project include picnicking (10%), sightseeing (9%), pool swimming (9%), and disc golf (8%) (NYPA, 2016e).

The updated 2015 figures did necessitate revisions to the mix of activities estimated to have been enjoyed at Mine Kill State Park as more of the traffic into the Park was likely associated with pool use. The revisions to the activities' mix at the Park also affected the activity mix Project-wide for some activities.

After adjusting for the revised 2015 pool use data, the most popular recreation activity type at the B-G Project was still visiting an interpretive center (either Lansing Manor or the Visitors Center) and walking/hiking/running still accounted for the second most frequent recreational use, accounting for an estimated 22,055 recreation days, or 18 percent of the total number of recreation days at the B-G Project. The next most popular recreation uses of the B-G Project include pool swimming (12%), picnicking (9%), sightseeing (8%), and disc golf (8%). Table 4.9.1.1.3-1 presents the recreation use by activity as shown in the Recreation Use/User Contact Study as well as the recreation use by activity that has been revised to reflect the revised 2015 attendance data.

Table 4.9.1.1.3-1: Recreation Use by Activity Type Based on Spot Counts, Calibration Counts, and Use Records, March 2015 through February 2016

	Recreation Report (NYPA 2016e) **Based on 2015 Recreation Season Data Provided by NYSOPRHP on April 25, 2016**			**Revised** **Based on 2015 Recreation Season Data Provided by NYSOPRHP on September 29, 2016**	
Recreation Activity	**Estimated Use (Recreation Days)**	**Percent (%) of Recreation Use**	**Recreation Activity**	**Estimated Use (Recreation Days)**	**Percent (%) of Recreation Use**
Interpretative Center	31,950	26%	Interpretative Center	31,950	26%
Walk/Hike/Jog	22,409	18%	Walk/Hike/jog	22,055	18%
Picnic	12,842	10%	Swim	14,987	12%
Sight See	10,914	9%	Picnic	11,316	9%
Swim	10,649	9%	Sight See	10,485	8%
Disc Golf	10,576	8%	Disc golf	9,795	8%
Playground	5,256	4%	Playground	5,117	4%
Soccer Camp	3,090	2%	Soccer Camp	3,090	3%
Fishing	2,525	2%	Fishing	2,521	2%
Photography	1,441	1%	Photography	1,441	1%
Ride Bikes	751	1%	Ride Bikes	673	1%
Motor Boat	667	1%	Motor Boat	667	1%
Non Motor Boat	388	0%	Non motor boat	349	0%
XC Ski	291	0%	XC Ski	291	0%
Hunt	77	0%	Hunt	77	0%
Snowmobile	-	0%	Snowmobile	-	0%
Other Use	10,662	9%	Other Rec Use	9,251	7%
Total	**124,489**			**124,065**	

* A total of 89 hunting permits were issued. Hunters with permits are assigned specific areas of the B-G Project and were typically not observed hunting or parking in the recreation sites included in the spot or calibration counts. Based on observations, an estimated 27 hunters utilized parking spaces at the Upper Reservoir recreation sites. The remaining 62 are estimated to have used other locations for parking.

** Other Use includes special events, meetings, geocaching, and general relaxation. Other Use also includes use that was unidentified, which may include both recreation-related and non-recreation use.

The future recreation demand calculations for the existing B-G Project recreation sites are dependent on regional population trends with predicted increases in recreation use/demand for various types of recreation activities to create estimated growth for recreation activity types. The growth projections shown in Recreation Use/User Contact Study were based on the 2015 pool use data provided by NYSOPRHP on April 25, 2016. These growth projections developed indicated that for the period from 2015 through 2060, B-G Project recreation sites would average a 26 percent increase in recreation days, for a total of 156,435 projected recreation days in 2060 (Table 4.9.1.1.3-2) (NYPA 2016e).

The park-wide summertime admission fees and the swimming pool user fees at Mine Kill State were eliminated towards the end of the 2015 summer season. Data that were received from the NYSOPRHP on September 29, 2016 indicate that the 2015 pool attendance was roughly 40 percent higher than originally reported by the NYSOPRHP and analyzed in the Recreation Use/User Contact Study report (14,987 pool attendees versus 10,649 pool attendees). In 2016 pool attendance was 20,967, which is approximately 40 percent higher than the revised 2015 pool attendance of 14,987). Boating at Mine Kill State Park was also found to have increased from 2015 to 2016, with recorded boating activity increasing by 84 percent from 193 vessels (motor boats, canoes, kayaks, and jet skis) to 356 vessels. Finally, at Mine Kill State Park overall recreation use during the summer months of June through August was 29 percent higher in 2016 than in 2015.

Because the Recreation Use/User Contact Survey report projected future use based on the earlier reported NYSOPRHP data, demand projections for Mine Kill State Park were adjusted to include the 2016 attendance counts from June, July, and August rather than the 2015 figures for those months that had been provided on April 25, 2016. This approach captures the increase in summer attendance that may be related to the removal of fees at Mine Kill State Park. The updated project-wide growth projections indicate that for the period from 2015 through 2060, B-G Project recreation sites will average a 38 percent increase in recreation days, for a total of 170,899 projected recreation days in 2060. Table 4.9.1.1.3-2 presents the projected use by site as shown in the Recreation Use/User Contact Study, as well as updated use at Mine Kill State Park and Project-wide.

Table 4.9.1.1.3-2: Projected 2060 Recreation Days by Site

Site	Recreation Report (NYPA 2016e) Based on Pool Data for the 2015 Recreation Season Provided by NYSOPRHP on April 25, 2016			Revised Based on Data for the 2015 and 2016 Recreation Seasons Provided by NYSOPRHP on September 29, 2016		
	Estimated Recreation Days March 2015 – February 2016	2060 Projected Recreation Days	Percent Growth, 2015 to 2060	Estimated Recreation Days March 2015 – February 2016	2060 Projected Recreation Days	Percent Growth, 2015 to 2060
Mine Kill State Park	73,125	91,643	25%	72,701	106,107	46%
Visitors Center	28,331	36,059	27%	28,331	36,059	27%
Mine Kill Falls Overlook	14,487	18,210	26%	14,487	18,210	26%
Lansing Manor	3,619	4,606	27%	3,619	4,606	27%
Schoharie Creek Fishing Access	2,685	3,184	19%	2,685	3,184	19%
Upper Reservoir Access—North	836	1,014	21%	836	1,014	21%

Site	Recreation Report (NYPA 2016e) Based on Pool Data for the 2015 Recreation Season Provided by NYSOPRHP on April 25, 2016			Revised Based on Data for the 2015 and 2016 Recreation Seasons Provided by NYSOPRHP on September 29, 2016		
	Estimated Recreation Days March 2015 – February 2016	2060 Projected Recreation Days	Percent Growth, 2015 to 2060	Estimated Recreation Days March 2015 – February 2016	2060 Projected Recreation Days	Percent Growth, 2015 to 2060
Upper Reservoir Access—Boat Launch	713	870	22%	713	870	22%
Upper Reservoir Access—South	693	849	22%	693	849	22%
Annual Total	**124,489**	**156,435**	**26%**	**124,065**	**170,899**	**38%**

The growth rates for each recreation site serve as the basis for projecting future parking lot demand figures, and, thereby, percent utilization of capacity, for average summer weekend use. Table 4.9.1.1.3-3 provides the projected level of parking lot use (percent utilization) for 2060 at each of the recreation sites in the B-G Project area. Both the utilization included in the Recreation Use/User Contact Survey Report and the revised utilization based on the 2016 pool data are included.[4] As shown, it is projected that all of the recreation sites at the B-G Project will be under-capacity on an average summer weekend in 2060. At the majority of the sites, the parking lots will have less than half of their available capacity occupied.

Table 4.9.1.1.3-3: Projected 2060 Average Summer Weekend Use by Site

Site	Available Spaces	Recreation Report (NYPA 2016e) Based on Pool Data for the 2015 Recreation Season Provided by NYSOPRHP on April 25, 2016		Revised Based on Data for the 2016 Recreation Season Provided by NYSOPRHP on September 29, 2016	
		2060 Projected Spaces in Use, Summer Weekend	Percent Capacity	2060 Projected Spaces in Use, Summer Weekend	Percent Capacity
Mine Kill State Park	406	58	14%	67	17%
Lansing Manor House and Visitors Center	45	6	14%	6	14%
Mine Kill Falls Overlook	23	5	22%	5	22%
Schoharie Creek Fishing Access	8	1	15%	1	15%
Upper Reservoir Access—North	3	1	41%	1	41%
Upper Reservoir Access—Boat Launch	2	1	60%	1	60%
Upper Reservoir Access—South	6	1	20%	1	20%
Total	**493**				

[4] The utilization in the Recreation Use/User Contact Survey Report was based on data for the 2015 recreation season provided by NYSOPRHP on April 25, 2016 (NYPA 2016e).

4.9.1.1.4 Recreation User Opinions

A recreation use survey provided an opportunity to gather information about the types of recreation activities that users were participating in, user opinions on a number of aspects of the recreation opportunities offered in connection with the B-G Project, and basic information about party size and length of stay. User surveys were collected from 160 respondents.

The survey results reveal that recreationists at the B-G Project overwhelmingly rate the facilities positively. Ninety-five percent (95%) of respondents said that they would return to the recreation site over the course of the next year. When asked if the recreation site/facility served their interests, 100 percent of the respondents answered yes. The survey asked recreationists to rate several aspects of the recreation sites, facilities, and amenities provided at the project on a scale of 1 (poor) to 5 (excellent). The majority of the respondents gave a rating of Excellent (5) or Fair-Excellent (4) when asked about the availability of parking (91%), site condition (98%), the variety of facilities/amenities (88%), and the availability of access to B-G Project waters (83%) (NYPA 2016e).

When respondents were asked to provide their perception of the amount of use occurring at the site on a scale of 1 (not crowded) to 5 (extremely crowded), the majority of respondents' stated either Not Crowded (1) (69%) or Somewhat Crowded – Not Crowded (2) (14%). When asked about the number of available recreation facilities on a scale of 1 (not satisfied at all) to 5 (extremely satisfied), the majority of respondents were either Extremely Satisfied (5) (47%) or Moderately Satisfied (4) (24%). When asked whether they were aware of water levels, 70 percent stated that they were not. When asked how satisfied were they with water levels during their trip all of the survey respondents answered that they were Extremely Satisfied (32%), Moderately Satisfied (38%), or Satisfied (30%). Finally, when asked to rate the recreation site as a public recreation opportunity on a scale of 1 (no value at all) to 5 (highly valued) the majority of respondents stated Highly Valued (74%) or Some Value to Highly Valued (22%) (NYPA 2016e).

Respondents to the recreation user survey did not identify debris as an issue or concern in the Lower Reservoir.

4.9.1.1.5 Recreational Boating Feasibility

In 2015, the Power Authority conducted a desktop assessment of the feasibility of providing recreation boating flows in Schoharie Creek downstream of the B-G Project's Lower Dam. The assessment included a literature review, hydrology assessment, and structured interviews of individuals who have experience boating on the portion of Schoharie Creek, which begins at Lower Dam and ends downstream at Max V. Shaul State Park, a reach of approximately 9.2 miles. The B-G Project boundary is approximately 1.2 miles below the Lower Dam.

The literature review produced limited information regarding recreational boating conditions in the 9.2 mile reach of Schoharie Creek between the Lower Dam and Max V. Shaul State Park. The most informative source was the now out of print 2005 Adirondack Mountain Club Canoe and Kayak Guide East Central New York State, which described the portion of the Schoharie Creek from North Blenheim Route 30 bridge to Max V. Shaul State Park as Class I to I+ waters, normally runnable in April and early May, or after a storm that causes water to be spilled from NYCDEP's Schoharie Reservoir. Structured interviews conducted as part of the study noted that this reach has changed significantly since Tropical Storm Irene (NYPA 2016a).

Boating within the study area is limited primarily to high flow months in the spring following the freshet, or when there is spillage from Gilboa Dam. At flows below 1,000 cubic feet per second (cfs), travel downstream can be difficult in spots, and may require a portage. Respondents to the structured interviews noted that typically water conditions are low in Schoharie Creek, and that even when there is enough water to boat, the stretch has limited area of whitewater and would be rated as no more than a Class II water. The literature review identified numerous boating opportunities, including Class II and III waters, outside of the primary study area, on Schoharie Creek, and within 50 miles of the B-G Project.

The hydrologic analysis found that diverting water from available B-G Project storage for boating releases would adversely impact the ability of the B-G Project to replenish storage lost through evaporation and seepage, and to continue to provide downstream flows comparable to those that would have occurred if the B-G Project had not been built as required by the current license (NYPA 2016a).

4.9.1.1.6 Specially Designated Areas

There are no federal lands, national wild or scenic rivers, state protected rivers or wilderness areas located within the B-G Project boundary (NPS 2016a; NYSDEC 2016b; USFWS 2016a). The National River Inventory (NRI) is a program that lists river segments that are believed to possess one or more "outstandingly remarkable" natural or cultural values. A segment of Schoharie Creek within the B-G Project boundary is listed due to its abundance of representative geologic features, including Boucks, Towpath Mountain, and Wallhalla Rocks (NPS 2016b). This segment starts at the Lower Dam and ends near Vroman's Nose. The portion of the Long Path that runs through Mine Kill State Park was designated as a National Recreation Trail in 2014 (American Trails 2016).

4.9.1.2 Environmental Effects

In SD1 and SD2, FERC identified the following issues related to recreational resources: (1) the adequacy of public access and recreational facilities to meet current and future recreation demand; and (2) the effects of Project operation and maintenance on recreational opportunities and river access within the Project area, including the adequacy of flows for recreational activities and the effects of debris accumulation on recreational access.

The continued operation of the B-G Project, as proposed, will have a beneficial effect on the recreation opportunities provided by the B-G Project. There are four Commission-approved B-G Project recreation sites (Table 4.9.1.1.2-1), which provide the public with a variety of recreational opportunities including interpretive programs, hiking, picnicking, sightseeing, boating, swimming, hunting, cross-country skiing, disc golf, and fishing. The *Recreation Use/User Contact Study and Assessment of Effects the Project has on Recreation Use* found that recreationists at the B-G Project overwhelmingly rate the current recreation sites and facilities, as well as the recreation opportunities provided, positively.

Continued operation and maintenance of the recreation facilities will support future recreation use. The *Recreation Use/User Contact Study and Assessment of Effects the Project has on Recreation Use* found that the project recreation facilities are used at equal to or less than 50% capacity on an average summer weekend. With respect to projected recreation demand over the term of a new license, parking percent of capacity at all of the project's recreation sites is projected to be anywhere from 14 percent to 60 percent of capacity in 2060. Even with the 40 percent increase in actual pool usage from 2015 to 2016, parking percent capacity at Mine Kill State Park is projected to be at 17 percent of capacity, on average, during summer

weekends in 2060. Thus, all existing project recreation sites are currently meeting recreation demand and can meet anticipated demand through 2060.

Continued Project operation will support boating access to both the Lower and Upper Reservoirs, along with fishing access to the Upper Reservoir and Schoharie Creek. The boat launch at Mine Kill State Park provides boating access to the Lower Reservoir under the full range of the Lower Reservoir elevations. Similarly, the three recreation sites on the Upper Reservoir provides angling and boating access under the full range of Upper Reservoir elevations. The Lower Dam will continue to release flows into Schoharie Creek that are generally equal to inflow from upstream of the B-G Project. These flows do not affect the ability to use the Schoharie Creek Fishing Access for dispersed fishing from the shoreline.

The Recreational Boating Desktop Feasibility Assessment found that limited boating occurs from the Lower Dam to Max V. Shaul State Park, which appears to be due to insufficient flow and corresponding low water depths throughout much of the boating season (April to October). For most of the year, except during the spring freshet months of April and May, runoff from 316 square miles of the watershed is diverted to the New York City water supply system. The hydraulic analysis confirmed that water depths in this reach of Schoharie Creek are often less than 1.5 to 2 feet at flows between 350 cfs and 1,000 cfs. These flows typically only occur during the spring freshet when water is spilled over NYCDEP's Gilboa Dam and there is snowmelt runoff. Paddling opportunities downstream of Lower Dam will continue to be available during the spring freshet (April/May) or during a significant storm event, as natural flow events allow. Additional paddling opportunities are available nearby that offer a more challenging paddle.

4.9.1.3 Proposed Environmental Measures

The Power Authority is proposing no changes or modifications to the existing B-G Project recreation sites at this time. The Power Authority proposes to continue operation and maintenance of the FERC-approved recreation sites, which include the Lansing Manor Complex, the three Upper Reservoir Access Sites, and the Schoharie Creek Fishing Access. The Power Authority also proposes to continue to work with NYSOPRHP cooperatively to assure the continued operation and maintenance of Mine Kill State Park in accordance with NYSOPRHP's objectives for the Park. The Power Authority is proposing to develop and implement a Recreation Management Plan for the B-G Project consistent with the Commission's current guidelines for such plans.

4.9.1.4 Unavoidable Adverse Impacts

Continued B-G Project operation will not result in unavoidable adverse impacts to recreation resources.

4.9.2 Land Use

4.9.2.1 Affected Environment

The B-G Project boundary encompasses approximately 2,893 acres, of which approximately 838 acres are open water. As shown in Table 4.9.2.1-1, the majority of lands within the B-G Project are undeveloped forested areas (approximately 44% of B-G Project lands). Forested and undeveloped lands include lands available for management of white-tailed deer, a bluebird trail as described in Section 4.6.1, and lands available for archery hunting in cooperation with NYSDEC. Recreation facilities account for 20% of Project land use. Areas of development related to the B-G Project account for approximately 5% of B-G Project lands. On the eastern shoreline between the Upper and Lower reservoirs of the B-G Project, there is significant development where the power generation facilities and auxiliary structures are located. Figure

4.9.2.1-1 shows the land uses within the B-G Project boundary. There is no non-project use of B-G Project lands.

Table 4.9.2.1-1: Land Use within the B-G Project

Land Use Type	Acres	Percent (%) of Total
Forested/Undeveloped	1,264	44
Water	838	29
Recreation	573	20
Developed	139	5
Transportation	43	1
Wetland	24	1
Crop Land and Pasture	12	<1
Total	**2,893**	**100***

*Numbers do not add up to 100% due to rounding

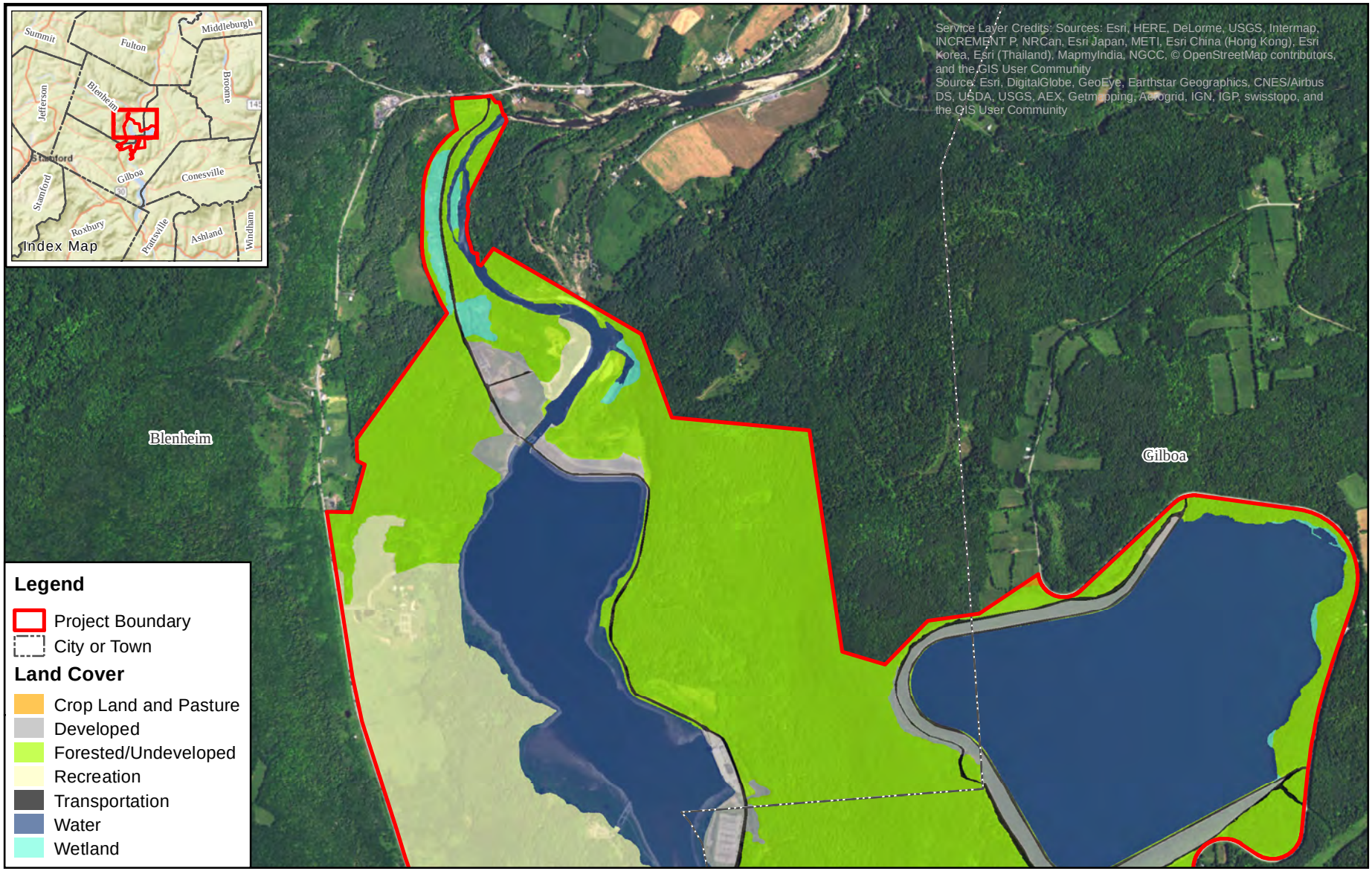

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Figure 4.9.2.1-1:
Existing Land Uses
within the B-G Project Boundary
Sheet 1 of 3

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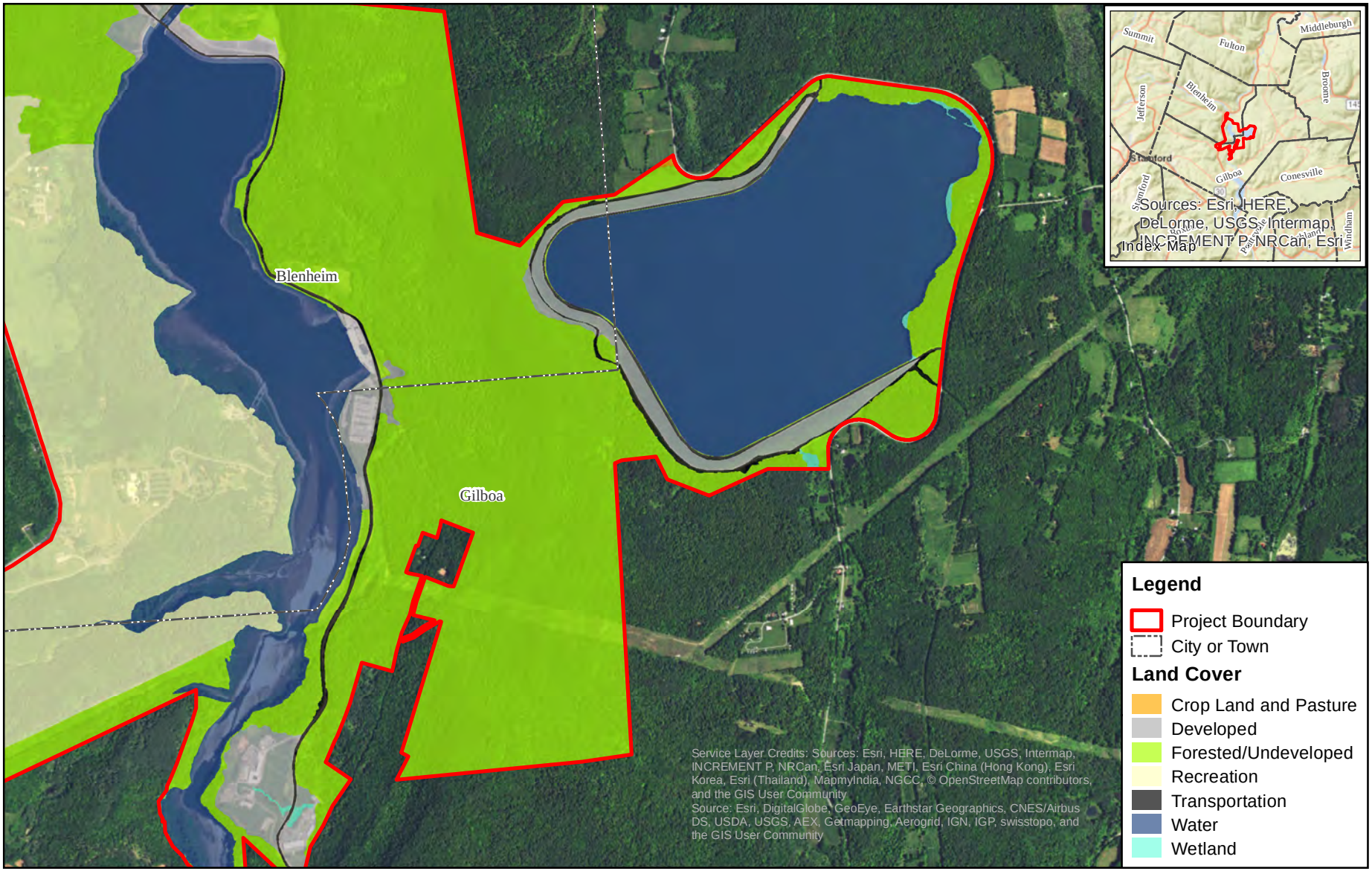

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Figure 4.9.2.1-1:
Existing Land Uses
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Sheet 2 of 3

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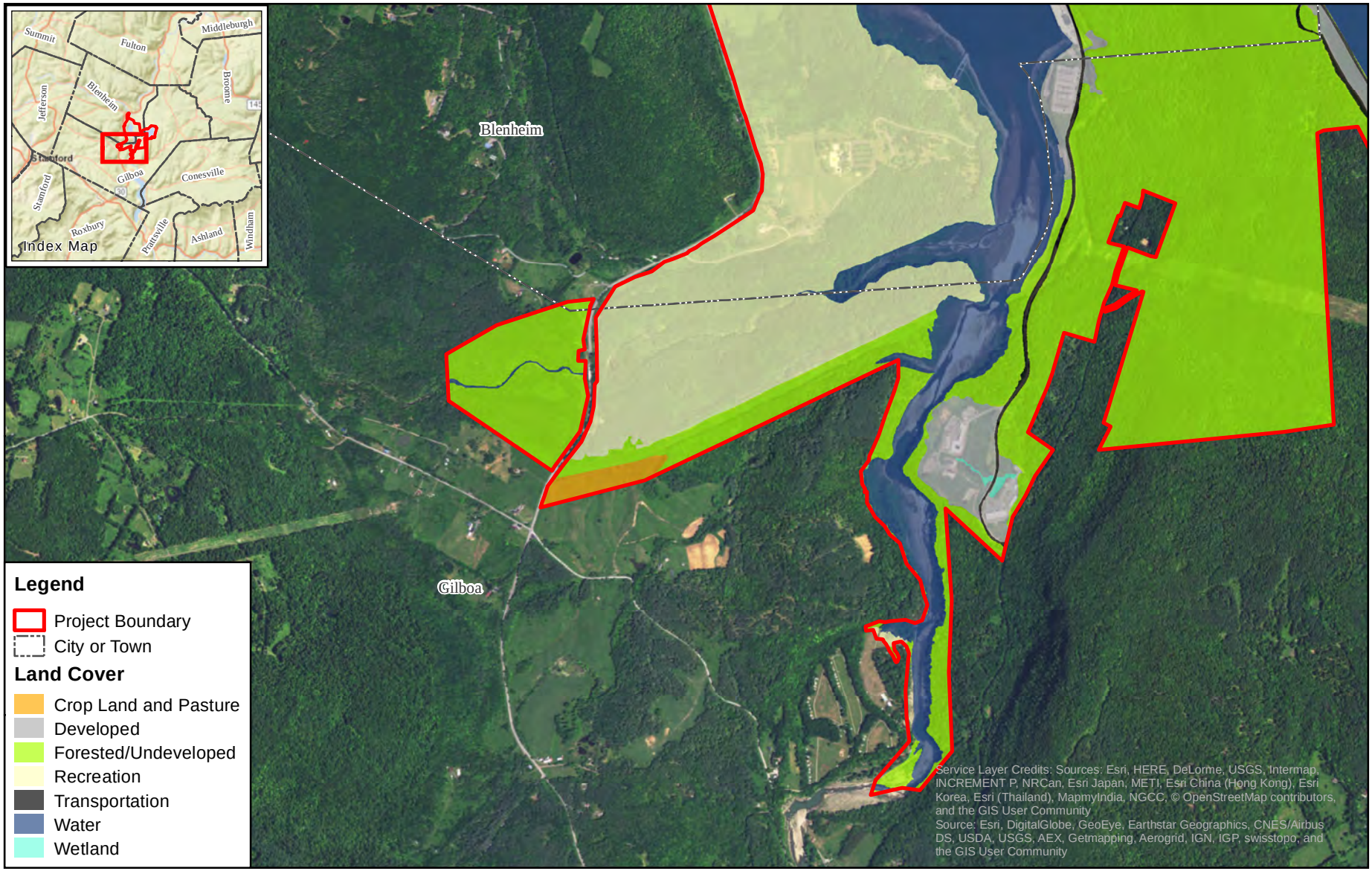

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Figure 4.9.2.1-1:
Existing Land Uses
within the B-G Project Boundary
Sheet 3 of 3

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4.9.2.2 Environmental Effects

In SD1 and SD2, FERC identified the following issue related to land use: the effects of Project operation on land use within the Project area.

Continued operation of the B-G Project, as proposed, will enable B-G Project lands to continue to be a mix of undeveloped, forested, and recreational lands most of which will remain available for public use. The continued operation of the B-G Project, as proposed, will maintain the character of surrounding lands and will provide opportunities for the public to continue to be exposed to the area's nature and history.

4.9.2.3 Proposed Environmental Measures

No changes are proposed to the Power Authority's management of B-G Project lands. As described in Section 4.6.3, the Power Authority proposes to continue to manage lands for white-tailed deer management and to maintain the bluebird trail. These projects are in keeping with current land use (primarily a mix of undeveloped lands and lands developed for recreation and public use) at the B-G Project.

4.9.2.4 Unavoidable Adverse Impacts

Continued B-G Project operation will not result in unavoidable adverse impacts to land use.

4.9.3 Aesthetics

4.9.3.1 Affected Environment

4.9.3.1.1 Landscape Description

The region surrounding the B-G Project is comprised of riverside farmlands, woodlands, historic hamlets, and small towns with vistas of Schoharie Creek and the surrounding hillsides. Steep hills rise up from the floodplains that border Schoharie Creek.

4.9.3.1.2 Scenic Viewpoints

Development within the B-G Project boundaries is limited to the Power Authority's facilities, the Lansing Manor Complex, and Mine Kill State Park.

The historic Lansing Manor, located on the northwest side of the Lower Reservoir, provides views of the reservoir and its eastern shoreline from the overlook and lawn area. Mine Kill State Park is a 650-acre day use park to the south of Lansing Manor. Views of the Lower Reservoir, powerhouse, and adjacent switchyard are provided from several locations in the park, including the mid-level picnic area, several trails that access the shoreline, and the boat launch. The boat launch also provides a view of Brown Mountain and a limited view of the Lower Dam. From the Lower Reservoir, various views of the powerhouse, switchyard, dam, and Brown Mountain are available, depending on the location on the reservoir and proximity to the facilities. Mine Kill Falls Overlook is located within the park, and overlooks Mine Kill Falls, an 80-foot tall waterfall located approximately one mile from the reservoir on Mine Kill.

Downstream of the Lower Dam, B-G Project lands are undeveloped, except for a small gravel parking lot and an access road on the west shore for angler access approximately 700 feet downstream of the dam. The dam and spillway are visible from this section of river bank.

The Upper Reservoir is located on Brown Mountain, east of the Lower Reservoir. The impoundment is contained on three sides by an earth and rock embankment, approximately 2.25 miles long with an access road constructed along the top (the Upper Dike). There are three access areas on the Upper Reservoir. Two locations offer foot access to the reservoir, while a third location provides a gravel launch for non-motorized boats. Views of the entire Upper Reservoir and Upper Dike are available from all three access points.

4.9.3.2 Environmental Effects

In SD1 and SD2, FERC identified the following issue related to aesthetic resources: effects of Project operation and maintenance on aesthetic resources within the Project area.

No changes are proposed to the Power Authority's management of B-G Project lands. Continued operation of the B-G Project, as proposed, will maintain the existing aesthetics of the area. Most of the land surrounding the few developed areas within the B-G Project boundary are forested, maintaining the nature of the surrounding area.

4.9.3.3 Proposed Environmental Measures

The Power Authority is not proposing any specific measures to enhance aesthetic resources. As described in Section 4.6.3, the Power Authority proposes to continue to manage lands for white-tailed deer management and to maintain the bluebird trail. These projects will continue to maintain the B-G Project's existing aesthetic resources.

4.9.3.4 Unavoidable Adverse Impacts

Continued B-G Project operation will not result in unavoidable adverse impacts to aesthetic resources.

4.10 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 (Section 106), as amended, requires the Commission to evaluate the effects of continued B-G Project operation on properties listed on or eligible for listing in the National Register of Historic Places (NRHP) within the B-G Project's Area of Potential Effects (APE). Section 106 also requires FERC to seek concurrence with the State Historic Preservation Office (SHPO) on any finding of effects, and allow the Advisory Council on Historic Preservation an opportunity to comment. The Power Authority conducted two studies to identify cultural resources eligible for listing on the National Register of Historic Places (NRHP) in accordance with Section 106 of the National Historic Preservation Act. These studies included a Phase IA archaeological survey (Precontact and Historic archaeological resources) and a historic structures survey.

4.10.1 Affected Environment

4.10.1.1 Area of Potential Effects

Pursuant to the January 20, 2015 Revised Study Plan (RSP), as approved by FERC in its Study Plan Determination letter dated February 19, 2015, the APE for Precontact and Historic archaeological resources and architectural resources for the B-G Project includes *"the lands enclosed by the Project's boundary and lands or properties outside of the Project's boundaries where Project construction and operation or project related recreational development or other enhancements may cause changes to the character or use of historic properties."* Because there are no effects outside of the Project boundary resulting from the B-G

Project's continued operation and maintenance, the APE consists of lands within the Project boundary. The New York State Historic Preservation Office (New York SHPO) concurred with the APE in a letter dated January 2, 2015. The APE for the B-G Project is shown on Figure 4.10.1.1-1.

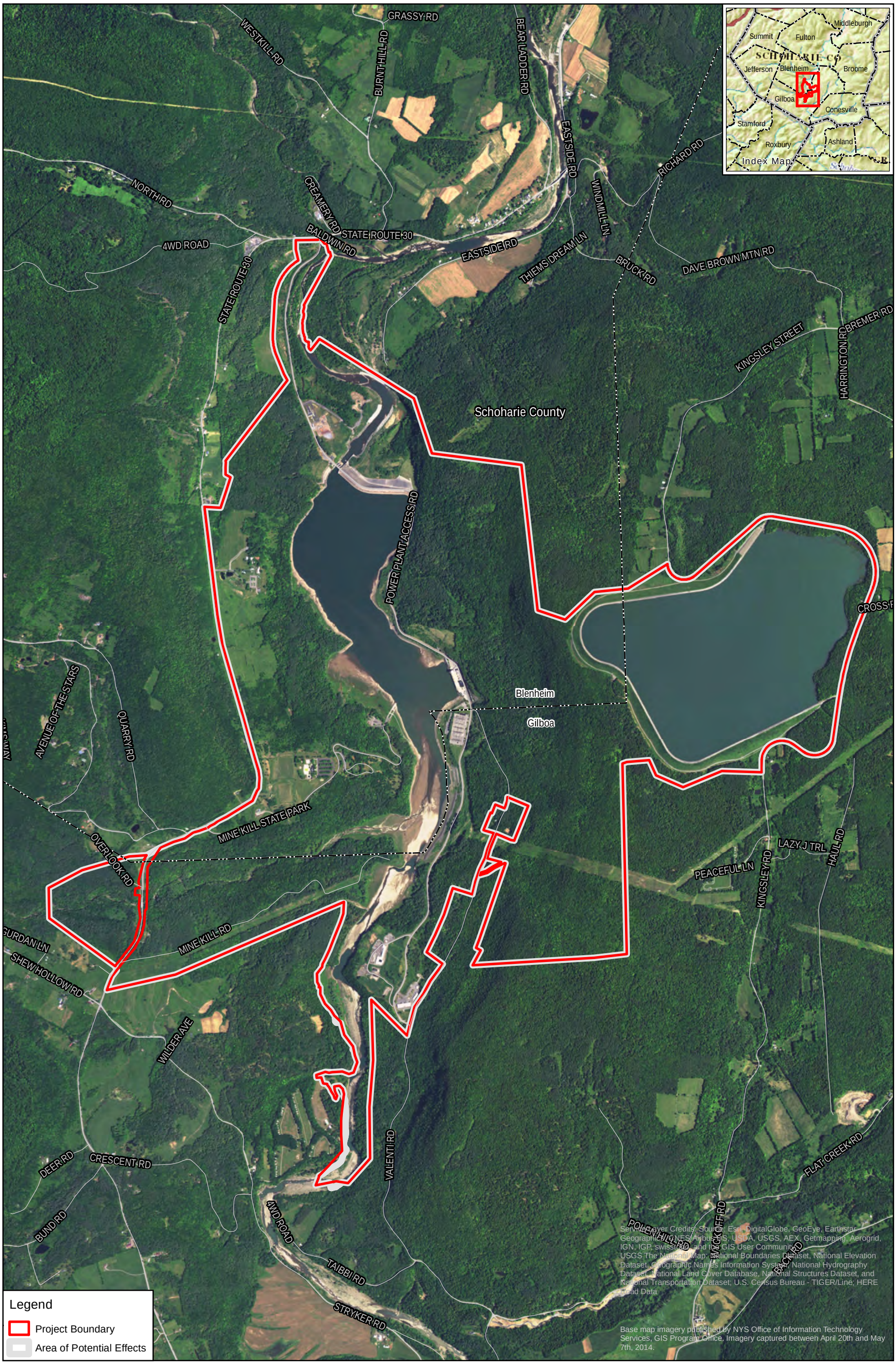

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Figure 4.10.1.1-1:
Project Location Map
Showing APE

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4.10.1.2 Precontact Period Background

The Blenheim-Gilboa Pumped Storage Power Project (B-G Project) is located on the Schoharie Creek in the towns of Blenheim and Gilboa, New York, approximately 40 miles southwest of Albany in the northern Catskill Mountains. The Lower Dam of the B-G Project is located 53 miles upstream of the confluence of Schoharie Creek with the Mohawk River at Fort Hunter, New York. From there, the Mohawk River flows east for approximately 44 miles before emptying into the Hudson River at Cohoes, New York.

Although a large amount of archaeological investigation has focused on the Hudson River valley, little has been conducted near the B-G Project area. For that reason, the Precontact period cultural history of the general Hudson River valley is discussed to provide a Precontact period cultural backdrop for the B-G Project area. Local histories were consulted to provide a context for potential historic resources in the area.

The archaeological record of New York dates back to approximately 12,000 years before present (B.P.). Archaeologists have divided this record into three major periods known as the Paleoindian, Archaic, and Woodland cultural periods, as synthesized by Ritchie (1980).

Paleoindian Period (ca. 12,000 – 9,000 Years B.P.). The earliest occupation of New York State began approximately 12,000 years ago, when people from the south and perhaps west began moving into the state after retreat of the Laurentide Ice Sheet, an ice mass that once covered the project area (Ritchie 1980). The first people in New York arrived with a distinctive stone technology and way of life that included a highly mobile settlement pattern, and a subsistence pattern adapted to hunting large mammals and exploiting local small animal populations. Some of the best known and documented Paleoindian period sites in the Northeast are located in the mid-Hudson River valley, including West Athens Hill, the Kings Road, and Dutchess Quarry Cave. Research on these sites by Funk (1976) indicates that a large exchange network of hunting and gather bands was active in the Hudson River watershed.

Archaic Period (ca. 9,000 – 3,000 Years B.P.). The Archaic period is typically divided into three subperiods: Early, Middle, and Late. Their archaeological expression varies by region. In general, the Archaic period is defined in terms of broad-spectrum foraging patterns and settlement patterns adapted to modern environments of the Holocene Epoch. No Early Archaic period sites were known from the mid-Hudson River valley at the time of Funk's synthesis, and none appear in subsequent cultural resources research. Funk (1976) observes that Archaic period sites in the Hudson River valley tend to be small and characterized largely by lithics with few preserved organic remains. As a result, archaeologists have relied on using classic sequences of projectile point typologies to interpret the framework of the Archaic. There is a paucity of data for reconstructing subsistence and settlement patterns, and site location data are generally used to infer these patterns (Ritchie 1980).

Archaeological sites are more abundant in the Late Archaic period throughout the region. Laurentian tradition sites are the most common Late Archaic manifestation, and sites containing Vergennes phase artifacts (Otter Creek points, gouges, ground slate points, ulus, and plummets) are well known in the Hudson River valley. Point styles from several phases of the Archaic period have been identified from sites in the middle Hudson Valley with stratigraphic integrity. Sites containing transitional or terminal Archaic deposits have also been found in the mid-Hudson River valley. These sites often contain cultural materials clearly attributed to the Woodland period as well.

Woodland Period (ca. 3,000 B.P. – Contact). Regional diversification increased during the Woodland period with the adoption of agriculture introduced from the South; new technologies, such as the manufacture of pottery; and the origins of Native American groups reported at the time of contact with Europeans and in existence today. Like the Archaic period, it is subdivided into early, middle, and late subperiods. In broad outline, the earliest culture in eastern New York is identified as Adena. It is followed by Point Peninsula, Owasco, and finally Iroquois in the Late Woodland period.

Few Early Woodland period sites are reported from the mid-Hudson River valley. Important and well-documented sites from the mid-Hudson valley are predominately Middle Woodland period in age. For example, the Tufano site (Greene County, New York) is a rich, Middle Woodland habitation site with numerous burials, pit features, hearths, and post molds. A radiocarbon date returned a date of anno Domini (A.D.) 700 +/- 100 years (Y-1382). Faunal and floral remains from the numerous pit features provided data on subsistence practices and primary and secondary food sources (Funk 1976).

Another well-documented Middle Woodland location is the Black Rock Site, which is a large, open-air site near the Hudson River in Athens, Greene County. The site is known from extensive surface collections from disturbed contexts, and from excavations in a dense midden component. As with the Tufano site, the Black Rock site contained numerous burials and pit features, assignable “almost exclusively” to the late Middle Woodland period. A radiocarbon date of A.D. 850 +/- 95 years (I-3444) supports the late Middle Woodland designation (Funk 1976).

Late Woodland period sites are not unknown from the mid-Hudson River valley, but they appear to be much less common than Middle Woodland sites. Of particular note is the Bronck House Rockshelter, where the uppermost cultural stratum was designated Late Woodland II (historic Iroquoian) based on the presence of trade goods and diagnostic Iroquoian pottery. According to Funk, rockshelter sites located along the mid-Hudson River valley were “probably a briefly and intermittently occupied camp for parties of hunter-gatherers and later agriculturists, who exploited the animal food resources of the surrounding terrain during the fall and winter” (Funk 1976: 123).

4.10.1.3 Native American Occupation at the Time of Contact

As reported by Hartgen Archeological Associates, Inc. (1987: 6), the Schoharie Creek valley was a borderline between the Mohawks to the west and the Mohicans (or Mahicans) to the east. This changed in the mid-1600s, when the Mohicans relinquished all of their lands to the west of the Hudson to the Mohawks. During the French and Indian Wars and the American Revolution, the Iroquois fought on the side of the British in the Schoharie County area. After defeat of the British, the Mohawks resettled in Canada, leaving the Schoharie County area open to further European settlement that had begun in the late 1600s.

4.10.1.4 Historic Period Context

Initial Agricultural Settlement (1600s – 1800). In the latter part of the 1600s, Dutch fur traders began traveling through the area to hunt and barter for skins, while scouts and woodsmen in the 1700s used the region as a short cut between the Hudson River valley and the Niagara Frontier (Hartgen et al. 1976: 7).

The Blenheim Patent was a 40,000-acre tract of land located in southern Schoharie County, which comprised parts of the present townships of Blenheim, Gilboa, and Jefferson in Schoharie County and a small portion of the northeast corner of the township of Stamford in Delaware County. The tract was

surveyed for the first time in 1738; in 1769, King George II granted title to the 40,000 acres of land to 41 patentees (Manly 1974: Section 8; Sherwood 1992: 3).

By 1800, through inheritance and land transactions, the original 40,000 acres was in the hands of four owners (John Lansing, Cornelius Ray, John Tayler, and Francis Bloodgood), with each owner having some acreage in hill and valley areas, timber and field, and along water courses. These owners began selling individual lots to settlers, as well as leasing land (Sherwood 1992: 4). John Lansing granted a leasehold to Abraham Shoemaker from ca. 1800 to 1804 on the land on which Lansing Manor is currently located. The Tenant House on the Lansing Manor property was most likely constructed at this time because the building is comparable to other Schoharie Valley farmhouses built during the first decade of the nineteenth century (Sherwood 1992: 45).

Several turnpikes crossed the southern part of Schoharie County, which opened the area to settlement in the early 1800s. The Susquehanna Turnpike from Catskill to Unadilla, a primary western route from the Hudson River valley, crossed Schoharie Creek at Gilboa and was joined just west of Gilboa by a well-traveled alternative route known as the Windham Turnpike. The Delaware and Albany Turnpike crossed Schoharie Creek at North Blenheim (formerly Patchin Hollow) and continued west through Schoharie County as the Blenheim and Jefferson Mountain Turnpike. The Gilboa and Jefferson Turnpike linked these primary routes, following Minekill Creek northwest from Gilboa (LoRusso 2004: 3).

Development of Lansing Manor (1819 – 1860s). On November 8, 1827, John Lansing conveyed the 120 acres of land formerly occupied by Abraham Shoemaker, including a barn, to the Hon. Jacob Sutherland and his wife (Lansing's daughter) to occupy the land in order to manage Lansing's estate (Rennenkampf 1973: Section 8). The Sutherlands had begun to reside on the property in 1819, and the Manor House was built for them by Lansing (Sherwood 1992: 6). The Sutherlands resided at the Manor House from at least 1819 to 1836, when they moved to Geneva, New York. At that time, they liquidated their outright holdings in the Blenheim Patent by sale, and as leases expired, lands held by them were sold. As of the mid-1850s, the Sutherlands were no longer owners of the property. Between 1836 and 1852, members of the Ray family were the remaining owners of Blenheim Patent lands; and as absentee owners they were among the persons who broadened the scope of leasehold land tenure within the patent, particularly the quit-rent system, which came to an end in approximately 1852, at which time tenants were able to purchase their leaseholds from the absentee landlords (Sherwood 1992: 6, 10).

Numerous roads were built across Mine Kill Creek in the 1830s and 1840s as farm-to-market connectors to the turnpikes. By the 1850s a road from North Blenheim to the Gilboa-Jefferson Turnpike crossed the creek just west of Mine Kill Falls, on the general course of present day Route 30. Historic maps show that this road approached the creek near the existing crossing, but jogged sharply to the west to cross the shallows above the falls. The dwelling of Peter Mattice, a saw mill, and the Mine Kill Post Office were located at the crossings in the 1850s and 1860s, at the southern point of the former Lansing Manor Land within the B-G Project boundaries (Wenia and Lorey 1856; Stone and Stewart 1866). A family cemetery, which is still extant, was established on a hill overlooking the north side of the creek (LoRusso 2004: 3). Just south of the Mattice Property was the Lansing Turnpike, which ran eastward crossing over the Schoharie Creek. Remnants of the bridge abutments and road bed can be found at various points along the former route.

Emergence of Dairy Farming and the Modern Period (1870s – 1973). Just north of the Project boundary is the town of North Blenheim and by 1872-73 there were two churches, two schools, two hotels, two stores, two wagon shops, two blacksmith shops, a harness shop, a shoemaker shop, a tailor shop, a paint shop, a grist mill, two saw mills, a sash and blind factory, and approximately 50 dwellings. Wheat, butter, hops, wool, and broomcorn were important agricultural products, and the village was a center that serviced farm families for miles around (Manly 1974: Section 8).

Following the opening of the Ulster and Delaware Railroad through Grand Gorge in 1879, dairying emerged as the primary economic product on farms in the region. Milk and other dairy products, could be transported to metropolitan markets. This switch to dairying is evidenced by the large Dairy Barn (present Visitors Center) at Lansing Manor. Erected by Olney J. Spring in 1881, the barn is one of the oldest large dairy barns in the Schoharie-Delaware County area (Sherwood 1992: 19). Aside from the corn crib, which dates from the early years of the twentieth century, the large barn and the Harder silo (1896-1911) are the most recent structures built in connection with Lansing Manor's operation as a dairy farm. Following the building of the large barn, the Springs razed several of the older buildings on the property and relocated others to integrate them with the needs of the dairy economy. Such was a typical occurrence on large farms in the area during the last years of the nineteenth century, which consolidated several functions under one roof (Sherwood 1992: 19).

The next shift in the agricultural system began around the turn of the twentieth century. After 1910, farm numbers dropped, and average farm size rose, coinciding with a major shift from farm butter making and diversification, to relatively specialized fluid milk dairying. Depression conditions starting in the 1920s buffeted agricultural communities. Between 1935 and 1969, the number of farms in Schoharie County decreased and between 1945 and 1969, the amount of farm acreage also decreased (Uhl, Hall, and Rich 1972: Appendix 2). Places such as North Blenheim were no longer commercial trading centers but became small residential centers (Manly 1974: Section 8).

Beginning in 1968, the Power Authority was authorized to develop pumped storage facilities. On August 15 of that year, the Power Authority applied to the Federal Power Commission (FPC) for a license to construct the 1,000 megawatt (MW) Blenheim-Gilboa Pumped Storage Power Project. On June 6, 1969, the FPC issued a license to the Power Authority and on July 12, ground was broken starting construction of the B-G Project. In 1972, the Power Authority acquired Lansing Manor (then known as Beechwood Farm) as part of the development of the B-G Project. On July 5, 1973, the B-G Project generated its first power, and on December 17 of that year, the B-G Project reached full power production.

4.10.1.5 Precontact and Historic Archaeological Resources

A Phase IA Archaeological Survey was conducted in 2015 within the project APE (NYPA 2016b). The study objectives of the survey were to: identify known archaeological resources listed in, or potentially eligible for listing in, the NRHP within the B-G Project's APE; review archaeological and other related data that are pertinent to the formulation of a sensitivity model for determining where archaeological resources may be located in the B-G Project's APE; and offer a field strategy for archaeological testing to determine whether such properties are present in the APE. These objectives resulted in a three-part methodology: review of known archaeological sites from both maps and literature; a sensitivity model to determine potential locations for unknown sites; and a field reconnaissance of selected portions of the study area based on the results of the modeling.

4.10.1.5.1 Review of Existing Archaeological Information

A review of the New York State archaeological file database found that there are few archaeological sites recorded from the B-G Project area. One Precontact period site (A095-08-011) is recorded from within the Lower Reservoir, but there is no information about what was found at the site or what cultural time period it belongs to. Four Historic-period archaeological sites have been reported in the B-G Project area. Two of the Historic period sites (A09501.000099 and A095-08.0008), remnants of cellar holes located on the floodplain of the Schoharie Creek prior to inundation, were previously recorded based on historic map review and cultural resources survey. The cellar holes have never been field checked because their exact locations are not known. The third site (A09508.000011) is reported as "scattered pieces of field stone that appear to be foundation stone." The fourth site, Lansing Manor, is also considered an NRHP-eligible Historic period archaeological site as well as a Historic Structure.

4.10.1.5.2 Mapped Information Review

The study reviewed three different mapped datasets: the B-G Project environment prior to the start of construction, soil information, and bedrock geology. A USGS topographic map from 1903 was examined. It demonstrates the steepness of the Schoharie Creek valley walls for almost all of the project area. The only flat land around the B-G Project was adjacent to the Schoharie Creek generally on the east side of the creek. This area was farmed in the nineteenth and twentieth centuries. The map shows that the pre-inundated geographical and cultural landscape is of a very rural environment that was topographically controlled to the east and west by steep terrain and farmed in areas along the creek where wide bends in the creek created arable lands largely on the east side of the Lower Reservoir.

These topographic controls also influenced where Native American land use could have occurred within the B-G Project's APE. People did not live in steep areas, nor did they live far from water bodies. The places where Native American occupation may have occurred are generally the same places where Euroamericans would have farmed in the project area.

Soil data were examined to evaluate whether some soils were more or less better for occupation (USDA 1969). For Native American use, this would have been locations where soils were well drained or beneficial to farming. Soils good for crop growing were the important factor for Euroamericans. Three soils dominate the B-G Project area. All three are reasonably deep, well-drained soils, and are valuable for agricultural use. Although soil data can provide information on where Native Americans and Euroamericans may have lived, in this case because all soil associations are reasonably deep, well-drained soils, the soil data provided little information to distinguish where people may have lived.

The last type of mapped data reviewed was surficial geology (Caldwell and Dineen 1987). All of the rock outcrops mapped in the B-G Project area consist of Paleozoic sedimentary rocks that are draped with glacial till (Fisher et al. 1970). None of these shales and sandstones would have been useful for making either chipped stone tools or ground stone tools. In other words, the surficial geology of the project would not have lent itself to Native American use of the area.

4.10.1.5.3 Sensitivity Model

The sensitivity model identified the following environmental variables that correlated with the locations of known sites: steepness of terrain, proximity to a waterbody, and presence of arable soils. The variables were scored as either low or high for archaeological sensitivity depending on their value for assisting to

predict where archaeological resources might be located. The sensitivity model was used to determine which portions of the B-G Project area were visited in the field reconnaissance visit. Most of the lands within the APE scored low for both Precontact period and Euroamerican archaeological sensitivity due to the steepness of the terrain. The area around Schoharie Creek where there is level land adjacent to the waterbody and where arable soils are present, scored high for both Precontact period and Euroamerican archaeological sensitivity. The mouth of Mine Kill Creek also scored high because it is an area where two waterbodies come together and where terrain is level.

4.10.1.5.4 Field Reconnaissance Visit to the Project

The purpose of the field reconnaissance was to calibrate the sensitivity model and eliminate areas from further survey as warranted. The field reconnaissance focused on visual examination of those portions of the B-G Project APE with landforms that have the greatest potential to contain archaeological resources, as well as confirmed areas of disturbance, steep slope, and wetlands, which would have little potential to contain in situ buried archaeological resources. The purpose of the field reconnaissance visit was also to examine conditions in the fluctuation zone of the Lower Reservoir as they existed on that date in order to determine whether Native American and Euroamerican people may have lived in any areas other than the bottomlands around the former course of Schoharie Creek.

Field reconnaissance of the B-G Project was conducted on October 15, 2015. The field visit began at the B-G Visitors Center and the associated NRHP listed Lansing Manor House. When maintenance and other ground-disturbing activities are proposed, the Power Authority consults with the New York SHPO regarding recommendations for archeological testing. Because no ground-disturbing activities are proposed in connection with the B-G Project relicensing, no additional archaeological investigation is recommended.

The field reconnaissance also found that a Phase IB testing program to locate additional sites is not justified because there are no areas sensitive for testing except in the fluctuation zone. Shovel test pits in that zone could yield artifacts or uncover foundation stones, but none of these discoveries would produce archaeological materials in primary context because all of the original soils have been reworked. Consequently, no further archaeological investigation of the B-G Project's APE is recommended.

The model predicted that the Mine Kill and Lower Reservoir areas had the potential to be archaeologically sensitive, but that sensitivity assessment had to be revised due to the field observation that no intact soils remain in the area due to erosion. None of the areas observed on the west side of the Lower Reservoir appeared suitable for Precontact Native American settlement. If settlement by Native Americans occurred on lands beneath the Lower Reservoir at high water, then they are likely to have been plowed during the historic period or entirely reworked and secondarily deposited after dam construction. The Upper Reservoir was not identified as archaeologically sensitive. This was verified by the road-side visit that confirmed extensive alteration of the landscape by project construction except at its far western end.

The New York SHPO concurred that Phase IB archaeological testing is not warranted in a letter dated March 1, 2016. In its review of the final Phase IA Archaeological Survey Report, the New York SHPO had no comments or concerns on the report, as stated in a letter dated April 8, 2016. Copies of the two letters from the SHPO are included in Appendix A.

4.10.1.6 Historic Buildings and Structures

In 2015, the Power Authority conducted a Historic Structures Survey, which consisted of consultation with the SHPO, background research, a field survey of all architectural resources 50 years or older within the APE, historic context development, and NRHP evaluation of the eligibility of architectural resources located within the APE (NYPA 2016c). The final report for the Historic Structures Survey was filed with the SHPO in May 2016.

The architectural history survey documented two previously-identified resources, including the NRHP-listed Lansing Manor (90NR02671) and the Mattice Cemetery. The survey also documented five newly identified architectural resources in the APE, including the Baldwin House, Lansing Turnpike, Coyne Cottage, the B-G Project, and Mine Kill State Park.

Lansing Manor is recommended as remaining eligible for listing in the NRHP. Lansing Manor was listed on the NRHP in 1973 with an early nomination that lacked the detailed building descriptions, integrity evaluations, and historic context that is expected from modern nominations. Most notably, the original nomination did not include a full inventory or assessment of the property's eight historic outbuildings. As part of the FERC-approved RSP, the entire property was comprehensively surveyed and reevaluated with its outbuildings, as well as additional modern buildings and structures that were built to adaptively reuse the property as a Visitors Center and museum. Lansing Manor is recommended eligible for listing in the NRHP under Criterion A and C at the local level in the areas of Settlement and Architecture. The property has a period of significance from circa 1804-circa 1910, which includes the construction date of its earliest extant building, the Tenant House, and the year that the final additions were made to the Dairy Barn/Visitors Center. In accordance with the RSP, the Power Authority has prepared a separate, updated Lansing Manor Historic Structures Report, which will be filed with the New York SHPO.

The six other surveyed properties are recommended not eligible for listing in the NRHP. The Mattice Cemetery, Baldwin House, Lansing Turnpike, and Coyne Cottage are not eligible for listing in the NRHP due to a lack of historic significance or a lack of physical integrity, or both.

The B-G Project was evaluated as a potential historic district and is recommended not eligible because it is not yet 50 years of age. Criterion Consideration G was applied during the evaluation and while the B-G Project does possess significance under Criteria A and C and it retains integrity, it does not have "exceptional importance" in the history of hydroelectric power production. The B-G Project is recommended eligible for listing in the NRHP when it reaches 50 years of age.

Mine Kill State Park was also evaluated as a potential historic district and is recommended not eligible because it is not yet 50 years of age. Criterion Consideration G was applied during the evaluation and while the state park does possess significance under Criteria A and C and it retains integrity, it does not have "exceptional importance" in the history of recreational facilities associated with hydroelectric power production. Mine Kill State Park is recommended eligible for listing in the NRHP when it reaches 50 years of age.

The New York SHPO concurred with the findings of the draft Historic Structures Survey (architectural) Report in a letter dated February 22, 2016. Following their review of the final report, the New York SHPO had no comments or concerns, as stated in a letter dated June 15, 2016. Copies of the SHPO letters are included in Appendix A.

Table 4.10.1.4-1 lists each of the identified resources, their locations, and an NRHP eligibility recommendation.

Table 4.10.1.4-1: Identified Architectural Resources within the APE

Site Name	Address/Location	Construction Date	NRHP Status/Recommendation
Lansing Manor (90NR02671)	1378 NY-30, Blenheim, New York	ca.1804 – ca.1910	NRHP-Listed in 1973
Mattice Cemetery	West Side of NY-30, South of Overlook Road at Mine Kill Falls (Gilboa)	1840s – 1870s	Not Eligible
Baldwin House	Off of Power Plant Access Road on North Side of Fishing Access Road (Blenheim)	ca. 1850, 1874	Not Eligible
Lansing Turnpike	Between Valenti Road and Kingsley Reservoir (Blenheim/Gilboa)	ca.1850	Not Eligible
Coyne Cottage	Within B-G Project at South End of Power Plant Road (Gilboa)	1966	Not Eligible
The Blenheim-Gilboa Pumped Storage Power Project	397 Power Plant Access Road, Gilboa, New York	1969-1973	Recommended as Eligible in 2019 When it Reaches 50 Years of Age
Mine Kill State Park	161 Mine Kill Road, Blenheim/Gilboa, New York	1971-1973	Recommended as Eligible in 2019 When it Reaches 50 Years of Age

4.10.2 Environmental Effects

In SD1 and SD2, FERC identified the following issues related to cultural resources: (1) the effects of Project operation and maintenance on historic properties that are included in, eligible for listing in, or potentially eligible for inclusion in the NRHP and (2) effects of Project operation and maintenance on any previously unidentified historic or archaeological resources or traditional cultural properties that may be legible for inclusion in the NRHP.

The Power Authority is not proposing any changes in the operation of the B-G Project that would affect any of the identified archaeological or architectural resources found within the project APE. The Power Authority is not proposing the construction of any new project facilities or recreation facilities or ground disturbing activities that have the potential to impact NRHP-listed or eligible historic properties. No Precontact or Historic archaeological sites worthy of further investigation or with intact integrity were identified within the project APE and no further archaeological investigation of the B-G Project's APE was recommended. One NRHP-listed historic structure (Lansing Manor) was identified and two historic structures were recommended to be NRHP-eligible in 2019 (the Blenheim-Gilboa Pumped Storage Power Project and Mine Kill State Park).

4.10.3 Proposed Environmental Measures

To ensure protection of cultural resources over the term of a new license, the Power Authority is proposing to develop a Historic Properties Management Plan (HPMP), which will be filed with FERC and sent to the New York SHPO as privileged. The purpose of the HPMP is to set forth specific actions and processes to

manage historic properties within the project APE during the term of a new license. It is intended to serve as a guide for the Power Authority's operating personnel when performing necessary activities and to prescribe site treatments designed to address ongoing and future effects to historic properties. The HPMP also describes a process of consultation with state and federal agencies, training of Applicant staff, appointment of an HPMP coordinator for the Applicant, and periodic review and revision of the HPMP.

Development and implementation of the HPMP will ensure the adequate protection and management of historic properties as part of the continued operation of the B-G Project during the term of the new license.

4.10.4 Unavoidable Adverse Impacts

Continued operation of the B-G Project will not result in unavoidable adverse effects to cultural resources.

4.11 Socioeconomics

4.11.1 Affected Environment

4.11.1.1 Geographic Area

The Socioeconomic Study evaluated the socioeconomic effects of the B-G Project on local and neighboring communities, the B-G Region, and the State of New York. The local communities are the taxing entities in which the B-G Project is located including the towns of Blenheim and Gilboa, the Gilboa-Conesville Central School District (CSD) and Schoharie County. The neighboring communities are those that provide first responder services (Conesville, Roxbury, Jefferson, and Middleburgh). The B-G Region includes Albany, Delaware, Greene, Montgomery, Otsego, Schenectady, and Schoharie counties.

4.11.1.2 Demographic, Housing, and Economic Profile

4.11.1.2.1 Demographics

The population of New York State grew by approximately 8 percent between 1970 and 2014. The population of the B-G Region grew by 6 percent over the same period. Schoharie County, in contrast, experienced more rapid growth, with a population increase of 28 percent over the same time period. Blenheim's population expanded by 43 percent; Gilboa experienced a 50 percent increase in population; and the neighboring communities combined grew by 34 percent over the same time period.

The median age for the state in 2014 was 38.1 years. Schoharie County and the local and neighboring communities have populations that are older than that of the state, with a range of 42.2 years in Middleburgh to 49.3 years in Blenheim.

The populations of the local and neighboring communities predominately identify as white, with less than 5 percent of the population identifying as minorities. In contrast, more than one-third of the state of New York as a whole identifies as a minority race. The Census Bureau also collects information on the Hispanic or Latino ethnicity of the population. Overall, New York State's population is 18.2 percent Hispanic, while the B-G Region's population is 5.6 percent Hispanic. In the local and neighboring communities, less than 5 percent of the population identifies as Hispanic (New York Power Authority 2016d).

4.11.1.2.2 Housing

The housing units of the towns typically were built in the 1970s, with Conesville and the Gilboa-Conesville CSD having slightly newer housing units. The area's housing is younger than New York State's housing as

a whole, which has a median year built of 1956. Housing units in the local and neighboring communities tend to be owner-occupied, rather than renter-occupied, at a higher rate than those in the B-G Region or New York State. Blenheim, Gilboa, the Gilboa-Conesville CSD, Conesville, and Roxbury all have occupancy rates of less than 50 percent. While the occupancy rates of Schoharie County and the Towns of Jefferson and Middleburgh are higher than the other locations in the study area, they are still lower than that of the region and the state. The majority of the vacant housing units in the local and neighboring communities are vacant because they are in seasonal or recreational use. This use type accounts for 88 to 91 percent of the vacant housing in Blenheim, Gilboa, the Gilboa-Conesville CSD, Conesville, Jefferson, and Roxbury. Middleburgh's occupancy rate is 80%, similar to the 81% occupancy rate for the region as a whole. Forty-one percent of the vacant housing is in seasonal use (New York Power Authority 2016d).

4.11.1.2.3 Economics

A member of the labor force is one who is either employed or actively seeking work. For the B-G Project area, the lowest level for which Bureau of Labor Statistics data are available is the county-level. In February 2016, Schoharie County had a labor force of 15,070 persons, which is less than 5 percent of the B-G Region's labor force. Of those in the Schoharie County labor force, 14,106 were employed, leaving 6.4 percent unemployed. Schoharie County's unemployment rate in February 2016 was higher than that of New York State.

During the 2010 to 2014 period, the American Community Survey found that the majority of the local and neighboring communities had a median family income lower than the state's median of $71,419. Only Gilboa's median family income of $72,426 exceeded the state median. All of the communities and the B-G Region as a whole experienced lower per capita incomes than the state's average of $32,829. New York State, the B-G Region, and Roxbury all had 15.6 percent of the population below the poverty level. Each of the local communities and Jefferson had a poverty rate below 15.6 percent. Conesville and Middleburgh had poverty rates higher than that of the state (New York Power Authority 2016d).

4.11.1.2.4 First Responder Organizations

The Project uses volunteer First Responder Organizations (FROs) to provide emergency services to its hydroelectric projects, including the B-G Project. These services typically are funded by villages, towns, donations, and other agreements, but the Power Authority has provided financial support to local FROs for many years in recognition of the services they provide to the B-G Project. The project receives support from five fire departments and four emergency medical services (EMS) organizations. Amongst the FROs that provide services to the B-G Project, there are 192 firefighters operating under a mutual aid agreement. The FROs providing services include the towns of Blenheim, Conesville, Roxbury, Jefferson, and Middleburgh. In addition to receiving external support from FROs, the B-G Project has a medical emergency response team (MERT). The MERT comprises members of B-G Project staff who are experienced first responders and are also active with volunteer fire companies. The MERT is not equipped or intended to supplant FROs (New York Power Authority 2016d).

4.11.2 Economic Effects of the B-G Project

4.11.2.1 B-G Project's Direct Effects on the New York Power Markets

The B-G Project is the sixth largest pumped storage facility in the United States and has four generating units that have a combined generating capacity of 1,160 megawatts (MW).[5] The B-G Project is part of the New York electric grid and provides installed generating capacity, produces electrical energy, and provides several ancillary services that help keep the power grid operating reliably.[6]

The B-G Project's effect on New York power markets is measured by its contribution to three New York energy markets: the wholesale energy market, the capacity market, and the market for ancillary services. An integrated planning model was used to perform an analysis quantifying, in terms of Net Present Value (NPV), the potential effects of the B-G Project on the three electric markets. For the wholesale energy markets, the benefit from the B-G Project is largely felt during the on-peak hours when its dispatch is able to reduce an otherwise high cost of electric generation.

With respect to the wholesale energy markets, the B-G Project was shown to reduce power prices, particularly on-peak electric energy prices. From 2019 through 2060, the B-G Project reduces the total electric energy costs in the wholesale markets by $62 million on a present value basis. Further, should the B-G Project remain available for the period, the capacity costs to New York consumers were determined to be reduced, from the case where it would not be available, by $6.5 billion dollars on a present value basis for the period 2019 to 2060. Note that this is not actual compensation that the B-G Project is expected to get from the market, but is the value of the savings that the Project provides to the New York consumers.

The B-G Project was also shown to provide benefit to the ancillary markets. In the case of ancillary markets, only operating reserves were evaluated, although the facility provides voltage support and Black Start services. The operating reserve costs were estimated to be reduced by $33 million on a present value basis (2019-2060) when the B-G Project is assumed to remain online through 2060.

Overall, the NPV of the expected benefits to consumers through reduction in the wholesale market electricity, capacity, and ancillary markets is $6.6 billion dollars ($493 million per year on an annualized basis) for the continued operation of the B-G Project as compared to a situation when B-G is not online. Again, this estimate is not meant to imply any specific revenue amounts that the B-G Project obtains, rather an estimate of the value that the B-G Project provides by its service (New York Power Authority 2016d).

4.11.2.2 B-G Project's Direct Effects on Retail Electric Rates

In addition to the effect of the B-G Project on wholesale markets (energy, capacity, and ancillary services), there is also an impact on retail electric rates. Overall, the retail rates are driven by not only wholesale power prices, but also by transmission and distribution system costs, and other utility expenses. Annual

5 New York State's other major pumped storage facility is the Lewiston Pump-Generating Plant near Niagara Falls with a generating capacity of 240 MW (2014 EIA 860).

6 The New York Independent System Operator (NYISO) defines Ancillary Services as *"…services necessary to support the transmission of capacity and energy from generation resources to consumers, while maintaining the reliable operation of New York's transmission system. These services include Regulation and Operating Reserve, Energy Imbalance (using market-based pricing), and the cost-based services of Scheduling, System Control and Dispatch, Voltage Control and Black Start*." For further information see NYISO.com: http://www.nyiso.com/public/markets_operations/market_data/ancillary/index.jsp

costs to typical customers in the state (assuming an average of 1,000 kilowatt hours [kWh] per month consumption) were found on average to be reduced by as much as $65 in year 2020 for residential customers because of the existence of the B-G Project. Annual savings in Schoharie County are anticipated to be $1.5 million in 2020 and $0.04 million in 2060, with $0.79 million in the B-G Region.[7] Statewide, the B-G Project produces savings of $22.63 million in 2060 for all customer classes i.e., residential, commercial, and industrial. Of this savings, $12.2 million in savings would be realized by commercial customers, with $8.2 million in savings for residential customers and $2.2 million in savings for industrial customers (New York Power Authority 2016d).

4.11.2.3 B-G Project's Direct Effects on Local Economies

4.11.2.3.1 Employment

The B-G Project employs 150 people at the project and at the adjacent Visitors Center. Fifty-seven percent (57 percent) of employees reside in Schoharie County, with more than nine out of ten employees residing in the B-G Region. The B-G Project had a total payroll in 2014 of $12,395,819. More than half of the payroll ($6,858,788) was to employees who reside in Schoharie County. Employees in the B-G Region accounted for 93 percent ($11,539,694) of the total payroll (New York Power Authority 2016d).

4.11.2.3.2 Spending

The B-G Project also affects the state, the B-G Region, and the local and neighboring communities through its expenditures, which include salaries to employees, and operation and maintenance costs (e.g., hiring, contractors, and purchasing materials). The B-G Project contributed about $17.7 million in total direct expenditures to the local economies in 2014. Labor and benefits, including overtime and training, for employees was the largest category, representing more than 77 percent of spending. Materials were the next largest expenditure at 8.6 percent of spending in 2014. The Power Authority also compensates NYSOPRHP for the operation and maintenance of Mine Kill State Park, paying over $4.6 million in operation and maintenance, and $2.1 million for capital projects since 2005 (New York Power Authority 2016d).

4.11.2.3.3 First Responders

Expenditures at the B-G Project also include payments that the Power Authority makes to support FROs in providing first responder services to the B-G Project. During the period 2009 – 2011 and 2013, total payments ranged from a low of $10,000 in 2011 to a high of $18,000 in 2010. Payments in 2012 were $182,526 and reflect the assistance the Power Authority provided to the local and neighboring communities to support recovery efforts from the effects of Tropical Storm Irene (New York Power Authority 2016d).

4.11.3 Socioeconomic Effects of the B-G Project

In SD1 and SD2, FERC identified the following issue related to socioeconomic resources: effects of Project operation on socioeconomic resources in Schoharie County.

Using estimates of the direct effects of the B-G Project, including the project's employment and expenditures as well as the electricity savings, the REMI model was customized to evaluate the B-G Project's overall effect on the economies of the state, region, and local and neighboring communities. The

7 Data are not available to allow for the analysis of bill savings at the town or school district level.

"project-supported" jobs, income, gross regional product (GRP), and population are related to the direct effects of employment and spending at the project, as well as the indirect (business to business spending) and induced effects (spending related to changes in consumer income) that occur as a result of the B-G Project's operation.

In the Power Authority's Socioeconomics Study, the direct effects of the Power Authority's tax-exempt status was also evaluated. However, because the Commission concluded in its June 17, 2016 Study Plan Determination letter that this issue is beyond its authority to address in this relicensing proceeding, this Exhibit E does not analyze the Power Authority's tax- exempt status.

4.11.3.1 B-G Project's Socioeconomic Effects on Local Economies

4.11.3.1.1 Employment

The REMI forecast show that in 2020, the B-G Project is expected to support 22 jobs in the towns of Blenheim and Gilboa (4 in Blenheim and 18 in Gilboa). By 2060, project-supported jobs are forecast to rise to 6 in Blenheim and 28 in Gilboa. The B-G Project is expected to support 31 jobs in 2020 and 50 jobs in 2060 in the Gilboa-Conesville CSD, which covers a larger area but includes portions of Blenheim and Gilboa.[8] The neighboring communities also benefit from the presence of the B-G Project in the area because of its contribution to the economic base of the region by providing economic opportunities for the local labor force, whose income and spending generate subsequent economic activities in the wider region (i.e., secondary effects). For example, in Middleburgh the B-G Project is forecast to support 50 jobs in 2020 and 80 jobs in 2060. Although the B-G Project may directly employ few people from Middleburgh, the town is likely to benefit from the secondary effects of the B-G Project. The B-G Project also is forecast to support jobs in Jefferson (21 jobs in 2020 and 34 jobs in 2060), Conesville (8 jobs in 2020 and 13 jobs in 2060), and Roxbury (1 job in 2020 and 2 jobs in 2060). Total jobs supported by the B-G Project are forecast to be 423 jobs in 2020 and 682 in 2060 within Schoharie County.

The contributions of the B-G Project to the electricity markets ensure a stable supply of electricity in times of peak demand, thereby, avoiding price spikes. As a result, the state as a whole is projected to benefit by 5,620 jobs annually in 2020 and 2,053 in 2060. REMI forecasts 903 of those project-supported jobs will be in the B-G Region in 2020, with 1,222 jobs within the region in 2060. The remaining jobs, 4,717 jobs in 2020 and 831 jobs in 2060, will be in the rest of New York. In contrast to the projected effect in the local and neighboring communities, most of the benefit in the rest of New York is projected to occur in the early years of the modeled period; about 85 percent of the jobs are projected to be available in the rest of the state in 2020, and the remaining 15 percent in the B-G Region. Thereafter, the relative benefits to the rest of New York are projected to decrease. The relative benefit of the jobs is projected to shift towards the immediate B-G Region, such that more than 60 percent of the jobs accrue to the B-G Region in 2060, and the remaining 40 percent to the rest of the state. This results from the fact that, over time, the positive effect of B-G Project on electricity rates throughout the state declines as other factors, such as the need for new capacity to meet demand, have a larger effect on retail rates throughout the state.

8 A portion of the jobs in the towns of Blenheim and Gilboa are included in the total jobs figure for the Gilboa-Conesville CSD.

Table 4.11.3.1.1-1 summarizes the effects of the continued operation on the B-G Project in the years 2020 and 2060 (New York Power Authority 2016d).

Table 4.11.3.1.1-1: Effect of Operation of the B-G Project on Annual Employment

	2020	2060
New York State	5,620	2,053
B-G Region	903	1,222
Rest of New York	4,717	831
Local Communities		
Blenheim	4	6
Gilboa	18	28
Gilboa-Conesville CSD*	31	50
Schoharie County	423	682
Neighboring Communities		
Conesville	8	13
Jefferson	21	34
Middleburgh	50	80
Roxbury	1	2

**The Gilboa-Conesville CSD includes portions of the towns of Blenheim and Gilboa.*

Source: New York Power Authority 2016d

4.11.3.1.2 Income

For the towns of Blenheim and Gilboa, the B-G Project is expected to generate total additional disposable annual incomes of $1.1 million and $1.7 million, respectively, in 2020. By 2060, project-supported income is forecasted to be $6.2 million in Blenheim and $9.5 million in Gilboa. With the presence of the B-G Project, disposable income in the Gilboa-Conesville CSD is projected to be approximately $1.9 million per year higher in 2020 and $10.7 million per year higher in 2060. For the neighboring communities, the B-G Project is expected to generate a total additional disposable income of about $4.3 million annually in 2020 and $25 million annually in 2060. More than half of the project-supported disposable income is expected to be in Middleburgh ($2.3 million in 2020 and $13.5 million in 2060). For Schoharie County, the B-G Project is expected to generate economic activity that results in additional annual income of about $28.9 million in 2020 and $165.9 million in 2060. These figures translate to roughly a 2 percent increase in disposable income in 2020, and a 7 percent increase in disposable income in 2060.

Within the B-G Region the B-G Project is expected to generate an additional $56.7 million in annual disposable income in 2020 and $195.8 million in 2060. Fifty-one percent of the project-supported disposable income in the B-G Region is expected to be within Schoharie County in 2020. By 2060, that proportion is anticipated to reach almost 85. The B-G Project also has a positive secondary effect on disposable income in other regions of New York. The income effects observed outside of the B-G Region are generally related to lower electricity bills that result from the B-G Project. The projected annual income benefits for the wider regions of the state are about $446.2 million in 2020 and $158.4 million in 2060. Statewide, annual disposable income is forecasted to be $502.9 million higher with the B-G Project than without it in 2020 and $354.2 million higher in 2060 (New York Power Authority 2016d). Table 4.11.3.1.2-1 presents the effect of the B-G Project's operation on annual income.

Table 4.11.3.1.2-1: Effect of Operation of the B-G Project on Annual Income ($ Million)

	2020	2060
New York State	$502.90	$354.17
B-G Region	$56.71	$195.81
Rest of New York	$446.19	$158.36
Local Communities		
Blenheim	$1.08	$6.22
Gilboa	$1.66	$9.51
Gilboa-Conesville CSD*	$1.87	$10.72
Schoharie County	$28.89	$165.85
Neighboring Communities		
Conesville	$0.70	$4.01
Jefferson	$1.20	$6.89
Middleburgh	$2.34	$13.46
Roxbury	$0.01	$0.01

**The Gilboa-Conesville CSD includes portions of the towns of Blenheim and Gilboa.*
Source: New York Power Authority 2016d

4.11.3.1.3 Gross Regional Product

Continued operation of the B-G Project is anticipated to provide two types of benefits to Schoharie County residents: lower electricity bills and higher economic activity. These benefits produce GRP effects that are fairly substantial. In 2020, the towns of Blenheim and Gilboa are forecasted to account for about $3.7 million and about $5.4 million, respectively, of the annual GRP supported by the B-G Project. By 2060, Blenheim is expected to have project-supported GRP of $7.5 million, with Gilboa having $11.2 million. The Gilboa-Conesville CSD is anticipated to account for about $5.6 million of the total effect on GRP in 2020 and $11.5 million in 2060. Among the neighboring communities, Middleburgh which has a larger economic base, is expected to account for just over $14.6 million of the annual GRP supported by the B-G Project in 2020, with $30.1 million in project-supported GRP in 2060. Other neighboring communities also gain in GRP with the operation of the B-G Project. Jefferson and Conesville are anticipated to experience about $6.8 million and about $6.1 million, respectively, of annual GRP supported by the B-G Project in 2060. Roxbury in Delaware County is forecast to have project-supported GRP of about $0.07 million in 2060.

For Schoharie County, the B-G Project is expected to support annual GRP of roughly $76 million in 2020 and more than $156 million in 2060. These increases in GRP are significant in relative terms because they translate to about 8 to 9 percent of the county's current economic output. These projected increases are larger than those projected for income, which suggests that the jobs supported by continued operations of B-G Project (both direct jobs and secondary effects) are likely to have higher outputs (or GRP) than the average jobs in the county.

The B-G Project also has positive secondary effects on GRP in other regions of New York. The GRP that the B-G Project supports outside of Schoharie County is largely tied to the savings in electricity costs made possible by the project. Annual GRP in the B-G Region is expected to be $158.4 million higher in 2020 with the B-G Project in operation than without the project. By 2060, project-supported annual GRP is forecasted to be $380.9 million. In 2020, the rest of New York is forecast to realize $517.9 million in additional GRP with the B-G Project as compared to a scenario without the project. Project-supported GRP in 2060 is expected to be $180.8 million in the rest of New York. Total GRP supported by the B-G Project in New York is projected to be $676.2 million in 2020 and $561.8 million in 2060. The GRP that the B-G Project supports

outside of Schoharie County is largely tied to the savings in electricity costs made possible by the project (New York Power Authority 2016d). Table 4.11.3.1.3-1 shows the projected effects of the operation of the B-G Project on annual GRP.

Table 4.11.3.1.3-1: Effect of Operation of the B-G Project on Annual GRP ($ Million)

	2020	2060
New York State	$676.24	$561.75
B-G Region	$158.36	$380.92
Rest of New York	$517.88	$180.83
Local Communities		
Blenheim	$3.66	$7.53
Gilboa	$5.44	$11.18
Gilboa-Conesville CSD*	$5.57	$11.45
Schoharie County	$75.97	$156.22
Neighboring Communities		
Conesville	$2.95	$6.06
Jefferson	$3.33	$6.84
Middleburgh	$14.63	$30.09
Roxbury	$0.03	$0.07

**The Gilboa-Conesville CSD includes portions of the towns of Blenheim and Gilboa.*
Source: New York Power Authority 2016d

4.11.3.1.4 Population

Continued operation of the B-G Project supports population increases, as the local economies grow and benefit from the project's contributions to the local and neighboring communities and B-G Region. In 2020, the populations of Blenheim and Gilboa are forecasted to have 4 and 14 more people, respectively, with the project, than would reside in the towns without the project. By 2060, these population figures are expected to rise to 38 in Blenheim and 136 in Gilboa. The project-supported population of the Gilboa-Conesville CSD is forecasted to be 26 in 2020 and 263 persons in 2060. Countywide, in 2020 the B-G Project is expected to support 323 additional residents in Schoharie County and an additional 3,215 persons in 2060. Populations in the neighboring communities are also projected to be higher with the B-G Project's continued operations. Middleburgh is forecasted to have 37 project-supported residents in 2020 and 368 in 2060. Higher populations are also anticipated for Conesville (7 residents in 2020 and 72 residents in 2060), Jefferson (16 residents in 2020 and 157 residents in 2060), and Roxbury (1 resident in 2020 and 2 residents in 2060) with the B-G Project.

Similarly, the B-G Project is expected to support population increases for the entire B-G Region of 496 residents in 2020 and 3,630 persons in 2060. Of these increases 65 percent in 2020 and 89 percent in 2060 would be attributable to Schoharie County. The rest of New York is projected to have 2,152 more residents in 2020 and 990 more residents in 2060 with the project than without the project. New York State as a whole is projected to have 2,648 more residents in 2020 and 4,620 more residents in 2060 with the continued operations of the B-G Project (New York Power Authority 2016d). The effects of the operation of the B-G Project on annual population, as forecast by REMI, is shown in Table 4.11.3.1.4-1.

Table 4.11.3.1.4-1: Effect of Operation of the B-G Project on Annual Population

	2020	2060
New York State	2,648	4,620
B-G Region	496	3,630
Rest of New York	2,152	990
Local Communities		
Blenheim	4	38
Gilboa	14	136
Gilboa-Conesville CSD*	26	263
Schoharie County	323	3,215
Neighboring Communities		
Conesville	7	72
Jefferson	16	157
Middleburgh	37	368
Roxbury	1	2

**The Gilboa-Conesville CSD includes portions of the towns of Blenheim and Gilboa.*
Source: New York Power Authority 2016d

4.11.3.2 B-G Project's Effects on First Responder Organizations

The number of calls each FRO typically handles per year varies widely from organization to organization. The Blenheim Hose Company had an average of approximately 15 calls per year from 2009 through 2013. Middleburgh Fire/MEVAC, however, responded to an average of 635 calls per year. On average, the FROs that support the B-G Project handle a total of 1,175 emergency calls per year within their communities. Over the 5-year period from 2009 through 2013, first responders were dispatched to a total 19 calls at the B-G Project, for an average of 3.8 calls per year. This call load represents 0.32 percent of the total calls to the five FROs that support the B-G Project.

Based on historical budgets and call loads, the Power Authority calculated that the per-call burden for first responders is approximately $295. This does not, however, consider the additional costs that may be incurred on calls with a higher hazard factor or technical rescue factor, as might be encountered in responding to a call at the B-G Project. Based on a formula that considers the Project share of land in the call area, fixed costs, apparatus costs, a hazard factor, a technical rescue factor, and the per-call average cost, the Power Authority estimates the average value of first responder services provided to the B-G Project by the five FROs to be $7,343 annually (New York Power Authority 2016d).

4.11.4 Proposed Environmental Measures

The Power Authority proposes to operate the B-G Project in the same manner in which it has been historically operated. The Project will continue to have beneficial impacts on the socioeconomic resources of the state, the B-G region, and the local and neighboring communities. The Power Authority is not proposing any new measures related to socioeconomic resources.

4.11.5 Unavoidable Adverse Impacts

Continued operation of the B-G Project will not result in unavoidable adverse effects to socioeconomic resources.

4.12 Tribal Resources

4.12.1 Affected Environment

No Precontact archaeological sites worthy of further investigation or with intact integrity were identified within the project APE and no further archaeological investigation of the B-G Project's APE was recommended as discussed in Section 4.10.

The following federally recognized Native American Nations were consulted for the relicensing of the B-G Project: the St. Regis Mohawk Tribe, the Delaware Nation, The Delaware Tribe of Indians, and the Stockbridge Munsee Band of Mohican Indians.

4.12.2 Environmental Effects

In SD1 and SD2, FERC identified the following issues related to Native American resources: effects of Project operation and maintenance on any archaeological resources or traditional cultural properties that may be legible for inclusion in the NRHP.

By letter dated May 5, 2014, the Delaware Tribe stated that it did not wish to be a consulting party in the B-G Project relicensing. By letter dated May 8, 2014, the Stockbridge Munsee Band of Mohican Indians stated that they did not have any concerns with the proposed relicensing but requested to be notified if new construction is proposed. By letter dated May 9, 2014, the Delaware Nation stated that the location of the B-G Project does not endanger cultural or religious sites of interest to the Delaware Nation and to proceed as planned but also stated that they would like to be notified immediately should the B-G Project inadvertently uncover an archaeological site or object. The St. Regis Mohawk Tribe was sent a copy of the draft Phase IA Archaeological Survey Report for its comment. No comments on the draft report were received from the St. Regis Mohawk.

The Power Authority is not proposing any changes in the operation of the B-G Project, any new project facilities or recreation facilities, or ground disturbing activities that have the potential to impact tribal resources. Development and implementation of an HPMP will ensure that the continued operation of the B-G Project will not have an effect on historic properties during the term of the new license.

4.12.3 Unavoidable Adverse Impacts

Continued operation of the B-G Project will not result in unavoidable adverse effects to Native American resources.

5 Developmental Analysis

This section analyzes the cost of continued operation and maintenance of the Project under the No Action and Proposed Alternatives. Costs are associated with the operation and maintenance of the B-G Project's facilities as well as the cost of providing proposed PME measures.

5.1 Power and Economic Benefits of the Project

An analysis will be provided in the Final License Application

5.2 Comparison of Alternatives

An analysis will be provided in the Final License Application

5.3 Cost of Environmental Measures

An analysis will be provided in the Final License Application

6 Conclusions and Recommendations

6.1 Comparison of Alternatives

An analysis will be provided in the Final License Application.

6.2 Comprehensive Development and Recommended Alternative

[This section will be completed by FERC in its NEPA document.]

6.3 Unavoidable Adverse Impacts

Continued Project operation is not expected to adversely affect geology and soils, water, wildlife, botanical, recreation, land use, aesthetic, socioeconomic, cultural, and tribal resources, and rare, threatened or endangered species. While the entrainment risk to fish species at the Project is low, some entrainment of fish is likely to occur at the Project.

6.4 Consistency with Comprehensive Plans

Section 10(a)(2) of the FLA requires the Power Authority to review applicable federal and state comprehensive plans, and to consider the extent to which a project is consistent with the federal or state plans for improving, developing, or conserving a waterway or waterways affected by the Project. A list of existing FERC-approved State of New York and federal plans was obtained from the Commission's website as of October 2016. FERC currently lists 39 comprehensive plans for the State of New York. Of those, the Power Authority identified the following plans as pertaining to waters in the vicinity of the Project. No inconsistencies were found.

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Appendix A:
State Historic Preservation Office Correspondence

Groom, Tara

From: Howe, Kathy (PARKS) <Kathy.Howe@parks.ny.gov>
Sent: Monday, February 22, 2016 9:18 AM
To: Panepinto, Robert
Cc: Daly, Rob; Gerlach, Jeff; Groom, Tara; Verville, Sarah (Augusta,ME-US) (SVerville@trcsolutions.com); Price, David (DPrice@trcsolutions.com); Mackey, Linda (PARKS)
Subject: RE: BG Relicensing Draft Archirtecture report

Hi Rob,

Thank you for sending us the draft Historic Structure Survey for the Blenheim-Gilboa Power Project Relicensing project. We concur with the findings and would also like to add that the report was very well written and researched.

Please let me know when you plan to submit this to us via CRIS as we would prefer to set this up as a "request for more info" which will then give you a token so you can add the survey and specific property data under the CRIS Survey wizard. In other words, do not submit this until we have sent your our request through CRIS.

Best,

Kathleen A. Howe
Survey and Evaluation Unit Coordinator
Division for Historic Preservation

New York State Parks, Recreation & Historic Preservation
Peebles Island State Park, P.O. Box 189, Waterford, NY 12188-0189
518-268-2168 kathy.howe@parks.ny.gov
www.nysparks.com/shpo

From: Panepinto, Robert [mailto:Robert.Panepinto@nypa.gov]
Sent: Friday, February 05, 2016 1:48 PM
To: Howe, Kathy (PARKS)
Cc: Daly, Rob; Gerlach, Jeff; Groom, Tara; Verville, Sarah (Augusta,ME-US) (SVerville@trcsolutions.com); Price, David (DPrice@trcsolutions.com)
Subject: BG Relicensing Draft Archirtecture report

Hi Kathy—

Thanks for taking a look at this for us. Anxious to get any feedback you can provide.

Thanks,
Rob

Robert F. Panepinto

Cultural Resources Specialist I—Environmental, Health & Safety

New York Power Authority
123 Main Street—5E
White Plains, NY 10601
914.681.6404 | 914.275.1529 (Cell) | 914.287.3294 (Fax) | robert.panepinto@nypa.gov
www.nypa.gov

NYPA IT Warning – this is an external email, think before you CLICK to open any links or attachments and NEVER provide IDs or passwords.

NEW YORK STATE OF OPPORTUNITY. | Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

March 01, 2016

Mr. Robert Panepinto
Cultural Resources Specialist
New York Power Authority
123 Main Street--5E
White Plains, NY 10601

Re: FERC
Gilboa Dam Relicensing
Town of Gilboa & Blenheim, Schoharie County, NY
14PR01593

Dear Mr. Panepinto:

Thank you for requesting the comments of the New York State Historic Preservation Office (SHPO). We have reviewed the *DRAFT Phase IA Archaeological Survey Report, prepared by TRC and dated January 2016*, in accordance with Section 106 of the National Historic Preservation Act of 1966.

Based on this review, the SHPO concurs that Phase IB archaeological testing is not warranted, and we have no further comments or concerns regarding this document.

If you have any questions, I can be reached at (518) 268-2179.

Sincerely,

Nancy Herter

Nancy Herter
Archeology Unit Program Coordinator
e-mail: nancy.herter@parks.ny.gov

via e-mail only

NEW YORK STATE OF OPPORTUNITY. | Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

April 08, 2016

Mr. Robert Panepinto
Cultural Resources Specialist
New York Power Authority
123 Main Street--5E
White Plains, NY 10601

Re: FERC
Gilboa Dam Relicensing
Town of Gilboa & Blenheim, Schoharie County, NY
14PR01593

Dear Mr. Panepinto:

Thank you for requesting the comments of the New York State Historic Preservation Office (SHPO). We have reviewed the final Phase IA Archaeological Survey Report, prepared by TRC and dated April 2016, in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources.

Based on this review, the SHPO has no comments or concerns regarding this document.

If you have any questions, I can be reached at (518) 268-2179.

Sincerely,

Nancy Herter

Nancy Herter
Archeology Unit Program Coordinator
e-mail: nancy.herter@parks.ny.gov

via e-mail only

NEW YORK STATE OF OPPORTUNITY. | Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

June 15, 2016

Mr. Robert Panepinto
Cultural Resources Specialist
New York Power Authority
123 Main Street--5E
White Plains, NY 10601

Re: FERC
Blenheim-Gilboa Pumped Storage Power Project
Off Power Plant Access Rd, Towns of Gilboa and Blenheim, NY
14PR01593

Dear Mr. Panepinto:

Thank you for requesting the comments of the New York State Historic Preservation Office (SHPO). We have reviewed the Architectural Survey Report, prepared by TRC and dated April 2016, in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources.

Based on this review, the SHPO has no comments or concerns regarding this document.

If you have any questions, I can be reached at (518) 268-2164.

Sincerely,

Weston Davey
Historic Site Restoration Coordinator
e-mail: weston.davey@parks.ny.gov

via e-mail only