Southern Company Generation.
241 Ralph McGill Boulevard, NE
BIN 10193
Atlanta, GA 30308-3374
404 506 7219 tel

November 21, 2017

Wallace Dam Project (FERC No. 2413-117)
Wallace Dam Relicensing Preliminary Licensing Proposal

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Room 1-A- Dockets Room
Washington, D.C. 20426

Dear Secretary Bose:

On behalf of Georgia Power Company, Southern Company is filing with the Federal Energy Regulatory Commission the Wallace Dam Preliminary Licensing Proposal in compliance with the Commission's Integrated Licensing Process regulations at 18 CFR § 5.16.

If you require further information, please contact me at 404.506.7219 or cromara@southernco.com.

Sincerely,

Courtenay R. O'Mara

Courtenay R. O'Mara, P.E.
Hydro Licensing & Compliance Supervisor

Attachment

cc: FERC/OEP – Allan Creamer
Geosyntec – Steve Layman, Ph.D.
Troutman Sanders – Hallie Meushaw, Fitzgerald Veira

Georgia Power

WALLACE DAM

Lake Oconee

Preliminary Licensing Proposal

Wallace Dam Hydroelectric Project
FERC Project Number 2413

Prepared with:

Southern Company Generation Hydro Services

and

Geosyntec consultants

November 2017

Geosyntec consultants

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EXECUTIVE SUMMARY

This document is Georgia Power Company's (Georgia Power's) Preliminary Licensing Proposal (PLP) for Federal Energy Regulatory Commission (FERC) relicensing of the existing Wallace Dam Hydroelectric Project (Wallace Dam Project, the Project) (FERC No. 2413). Georgia Power is using the Integrated Licensing Process and is filing a PLP instead of a draft license application. Relicensing participants may file comments on the PLP with FERC within 90 days of the November 21, 2017 filing date; comments are due February 19, 2018.

The Wallace Dam Project is a pumped storage project consisting of Wallace Dam, a powerhouse, and a reservoir (Lake Oconee) on the Oconee River in Hancock, Putnam, Greene, and Morgan Counties, Georgia. Georgia Power operates the Project in a pumped storage mode for peaking power generation. The Wallace Dam Project has a nameplate capacity of 321.3 megawatts. The Project uses Lake Oconee as the upper reservoir and Lake Sinclair, located immediately downstream, as the lower reservoir. Lake Sinclair is operated by Georgia Power as part of the separately licensed Sinclair Hydroelectric Project. Georgia Power is not proposing to add capacity or make any major modifications to the Wallace Dam Project under the new license. The Project occupies about 370 acres of U.S. Forest Service lands within the Oconee National Forest. The current license expires May 31, 2020.

This PLP provides a draft environmental analysis by resource area of the continuing and incremental impacts of Georgia Power's PLP. The analysis focuses mainly on the environmental measures Georgia Power is considering. Georgia Power developed this PLP based on input received during consultation with state and federal resource agencies, local governments, Indian tribes, and members of the public, and by using information generated from nine resource studies conducted under the FERC-approved study plan. Additional preliminary environmental measures received from stakeholders during the comment period for the PLP will be analyzed in Exhibit E (environmental exhibit) of the license application, to be filed by May 31, 2018.

Project Setting

The Wallace Dam Project is located on the main stem of the Oconee River in the Piedmont physiographic province in east-central Georgia. The Project is situated in the upper Oconee River basin of the greater Altamaha River basin. Wallace Dam is located at river mile 172.7, about 13.4 air miles east of the city of Eatonton; 15.4 air miles south of the city of Greensboro; and19 air miles north of the city of Milledgeville. Wallace Dam is 29.7 river miles upstream of Georgia Power's Sinclair Dam and immediately upstream of Lake Sinclair. Releases from

Wallace Dam flow directly into Lake Sinclair; there is no intervening free-flowing or bypassed reach of river.

The watershed upstream of Wallace Dam covers an area of 1,830 square miles, comprising about 34 percent of the Oconee River basin. At its normal full pool elevation of 435 feet (ft) plant datum (PD), Lake Oconee covers 19,050 acres, has 374 miles of shoreline, and extends about 39 river miles upstream on the Oconee River. The pool elevation of Lake Oconee fluctuates an average of 1.5 ft daily as part of the pumpback operation of Wallace Dam. The average depth of Lake Oconee is 21 ft and the maximum depth is about 120 ft.

Current Operation

Georgia Power operates the Wallace Dam Project in a pumped storage mode for the purpose of peaking power generation. Generation releases occur during peak power demand hours to meet the electrical system demand with renewable, low-emission power that generates no wastes for disposal. Some of this water subsequently passes downstream for hydropower generation at Sinclair Dam to meet both electrical system demand and river flow requirements in the Oconee River downstream of Sinclair Dam. The remaining volume of water from Wallace Dam remains in Lake Sinclair for a few hours before being pumped back up and into Lake Oconee by the reversible units for reuse in the next day's generation cycle. Pumpback operations occur during off-peak demand hours (mostly at night), when electrical system demand is low, and therefore, the cost of power is lower.

During normal daily operations, Lake Oconee fluctuates an average of 1.5 ft, between elevations 435.0 ft and 433.5 ft PD. Lake Oconee typically begins the generation cycle near elevation 435.0 ft and ends near 433.5 ft PD. During nighttime, the pumping cycle refills Lake Oconee, typically to 435.0 ft PD. Depending on power demand, the reservoir does not fluctuate the full amount every day. Daily fluctuations are 2.0 ft or less 100-percent of the time.

Preliminary Licensing Proposal

For the new license term, Georgia Power proposes to continue operating the Wallace Dam Project in a pumped storage mode for the generation of peaking power. Georgia Power proposes the following environmental measures for the continued operation of the Project. These proposed measures are based on Georgia Power's assessment of the Project, the findings of resource studies conducted under the FERC-approved Study Plan, and discussions with resource agencies and stakeholders.

The measures have been identified for the purpose of eliciting public comment and are subject to change based upon comments received on the PLP and in light of project economics and other considerations:

- Continue to operate the Project during peak power demand hours to meet the electrical system demand with renewable, low-emission power that generates no wastes for disposal.

- Continue to operate the Project to supplement flows during drought to support the downstream Sinclair Project minimum flow requirements. Supporting these requirements would continue to enhance aquatic resources by maintaining flow regimes in the free-flowing reach of the Oconee River downstream of Sinclair Dam and moderating fluctuations of Lake Sinclair.

- Install and operate a forebay oxygen line diffuser system in Lake Oconee to enhance summer dissolved oxygen (DO) concentrations in the tailrace area. This would benefit water quality in the tailrace and downstream fisheries, aquatic resources, and recreational fishing by supporting applicable water quality standards throughout the hottest months of the year.

- Continuously monitor and report tailrace DO concentrations in the months May through September for 3 years following deployment of the forebay oxygen line diffuser system to verify DO enhancements in the tailrace area.

- Enhance recreation amenities at Lawrence Shoals Park by constructing new facilities to replace two campground restrooms, a beach house, a boat ramp restroom, a courtesy dock at the boat ramp, a pavilion and dedicated pavilion restroom, and a guest relations gate house. In addition, upgrade the current well system that supplies water to park facilities and customers. These improvements would continue to support quality recreation opportunities.

- Enhance recreation amenities at Old Salem Park by constructing new facilities to replace two group docks (and add a third group dock), a pavilion and dedicated pavilion restroom, a boat ramp restroom, a courtesy dock at the boat ramp, a beach house, and a guest relations gate house. In addition, upgrade the current well system that supplies water to park facilities and customers, and reconfigure the park entrance and gate house to reduce single-lane traffic congestion and allow for year-round operation of the boat

ramp. These improvements would continue to support quality recreation opportunities and enhance year-round boat-fishing and tournament-fishing access to Lake Oconee.

- Enhance recreation amenities at Parks Ferry Park by constructing new facilities to replace two campground restrooms, a beach house, a courtesy dock at the boat ramp, and a pavilion and dedicated pavilion restroom. In addition, upgrade the current well system that supplies water to park facilities and customers; replace the underground water and electrical service; and reconfigure the entrance gate and gate house to reduce single-lane traffic congestion and allow for year-round operation of the boat ramp. These improvements would continue to support quality recreation opportunities and enhance year-round boat-fishing and tournament-fishing access to Lake Oconee.

- Increase bank fishing access on Lake Oconee by providing a new bank fishing access development at the Area C-5 tract to include a pier and gravel parking.

- Increase bank fishing access on Lake Oconee by providing a new bank fishing access development at Jerry's Hwy 44 to include a pier and gravel parking.

- Enhance recreation amenities and increase bank fishing access at Sugar Creek Boat Ramp by adding a new fishing pier, upgrading the vault toilet with a flush toilet, and upgrading the courtesy dock.

- Enhance recreation amenities at Armour Bridge Boat Ramp by upgrading the courtesy dock and replacing the vault toilet with a flush toilet.

- Enhance recreation amenities and improve bank fishing access at Long Shoals Boat Ramp by upgrading the courtesy dock and trimming vegetation to provide additional bank fishing access.

- Enhance recreation amenities and improve tailrace bank fishing access at the Georgia Hwy 16 Bridge Boat Ramp downstream of the dam by providing a new tailrace fishing pier and a vault toilet. The new fishing pier would replace the bank fishing access provided at the Tailrace Fishing Area, which would be closed due to its limited public use and for security of Wallace Dam's adjacent equipment yard.

- Enhance recreational access at Georgia Power boat launch facilities by installing improved lighting at Lawrence Shoals Park, Old Salem Park, Parks Ferry Park, Sugar

Creek Boat Ramp, Armour Bridge Boat Ramp, Long Shoals Boat Ramp, Area C-5 tract, Jerry's Hwy 44, and Hwy 16 Bridge Boat Ramp.

- Continue to manage shorelines in accordance with Shoreline Management Guidelines for Georgia Power Lakes and to promote the maintenance of vegetative buffers around the reservoir to protect water quality, aquatic habitat, and cultural and aesthetic resources.

- Install shoreline stabilization consisting of riprap at Old Salem Park, Parks Ferry Park, Long Shoals Boat Ramp, and Armour Bridge Boat Ramp to conserve soil resources, maintain shoreline recreational uses, reduce sedimentation and turbidity of adjacent waters, and enhance littoral-zone aquatic habitat.

- Repair the eroded shoreline at the Pond 2 waterfowl impoundment and inspect the water level control structure on the eastern shore of the Wallace Dam tailrace area to conserve soil resources, maintain waterfowl refuge habitat, and protect water quality and aquatic habitat.

- Implement a Historic Properties Management Plan through a Programmatic Agreement to assure the preservation and long-term management of archaeological sites and historic buildings and structures within the project boundary.

ACRONYMS AND ABBREVIATIONS

APP	Avian Protection Program
BGEPA	Bald and Golden Eagle Protection Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
DO	dissolved oxygen
EA	environmental assessment
ENR	Environmental and Natural Resources
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
FERC	Federal Energy Regulatory Commission
fps	feet per second
FS	U.S. Forest Service
ft	feet
FWS	U.S. Fish and Wildlife Service
GDNR	Georgia Department of Natural Resource
Georgia Power	Georgia Power Company
GEPD	Georgia Environmental Protection Division
GEPPC	Georgia Exotic Pest Plant Council
GFC	Georgia Forestry Commission
hp	horsepower
HPD	Historic Preservation Division
HPMP	Historic Properties Management Plan
Hwy	Highway
I-20	Interstate 20
ILP	Integrated Licensing Process
kV	kilovolt
lbs	pounds
MBTA	Migratory Bird Treaty Act
mgd	million gallons per day
mg/L	milligrams per liter
MW	megawatt
NEGRC	Northeast Georgia Regional Commission
NEPA	National Environmental Policy Act
NF	National Forest
NRHP	National Register of Historic Places
PAD	Pre-Application Document

PD	plant datum
PLP	Preliminary Licensing Proposal
PSP	Proposed Study Plan
RIR	Regionally Important Resource
ROW	right-of-way
rpm	revolutions per minute
RSP	Revised Study Plan
RTE	rare, threatened, and endangered
RV	recreational vehicle
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SD1	Scoping Document
sq mi	square miles
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WMA	Wildlife Management Area
WRD	Wildlife Resources Division
WY	water year

1.0 INTRODUCTION

Georgia Power Company (Georgia Power) is filing with the Federal Energy Regulatory Commission (FERC) its Preliminary Licensing Proposal (PLP) for relicensing the Wallace Dam Hydroelectric Project (Wallace Dam Project, the Project) (FERC No. 2413). Georgia Power is using the Integrated Licensing Process (ILP) to develop the license application following FERC regulations at 18 Code of Federal Regulations (CFR) Part 5. As provided for in 18 CFR §5.15 and set forth in the Process Plan and Schedule for the Project, Georgia Power is filing a PLP instead of a draft license application. Following receipt of comments by relicensing participants within 90 days of the PLP filing, the final license application will be filed by May 31, 2018.

The Wallace Dam Project is a pumped storage project consisting of Wallace Dam, a powerhouse, and a reservoir (Lake Oconee) on the Oconee River in Hancock, Putnam, Greene, and Morgan Counties, Georgia (Figures 1 and 2). Georgia Power operates the Project in a pumped storage mode for peaking power generation. The Wallace Dam Project has a nameplate capacity of 321.3 megawatts (MW). The Project uses Lake Oconee as the upper reservoir and Lake Sinclair, located immediately downstream, as the lower reservoir. Lake Sinclair is operated by Georgia Power as part of the separately licensed Sinclair Hydroelectric Project (FERC No. 1951). Georgia Power is not proposing to add capacity or make any major modifications to the Wallace Dam Project under the new license. The Project occupies about 370 acres of U.S. Forest Service (FS) lands within the Oconee National Forest (NF), which abuts Lake Oconee's northernmost reaches. The current license expires May 31, 2020.

1.1 Purposes

In accordance with 18 CFR §5.16, the purposes of this PLP are to:

- Describe the existing project facilities, including project lands and waters.
- Describe the existing and proposed project operation and maintenance plan, to include measures for the protection, mitigation, and enhancement (environmental measures) with respect to each resource area affected by the project proposal.
- Provide a draft environmental analysis by resource area of the continuing and incremental impacts of Georgia Power's PLP.

The draft environmental analysis in this PLP focuses mainly on Georgia Power's proposed environmental measures, as required at 18 CFR §5.16(b)(3). Recommendations made by stakeholders are also evaluated. Any preliminary environmental measures received from the resource agencies, Indian tribes, or the public during the comment period for the PLP will be analyzed in Exhibit E (environmental exhibit) of Georgia Power's final license application, as required at 18 CFR §5.18(b)(5)(ii)(C).

Georgia Power developed this PLP in consultation with state and federal resource agencies, local governments, Indian tribes, various stakeholders, and other members of the public, and by using the information generated by nine resource studies conducted under the FERC-approved Study Plan (FERC, 2015a, 2017a). The results of Georgia Power's resource studies are detailed in nine Study Reports filed with FERC on November 18, 2016 (seven final study reports, one initial study report); and two Study Reports filed on October 11, 2017 (one final study report, one new study report).

1.2 Review Schedule

Relicensing stakeholders and FERC staff may file comments on Georgia Power's PLP with FERC within 90 days of the November 21, 2017 filing date of this PLP, in accordance with 18 CFR §5.16(e). Comments must be filed with FERC by February 19, 2018.

1.3 Document Organization

This PLP follows the content requirements at 18 CFR § 5.16 and is organized according to the following major sections:

- **Section 2** – Proposed action, including descriptions of the existing project facilities, project lands and waters, current operation, Georgia Power's proposed operation, and a summary listing of Georgia Power's proposed environmental measures.

- **Section 3** – Pre-filing consultation summary, including a listing of all agencies, governments, and non-governmental organizations consulted and an overview of the National Environmental Policy Act (NEPA) scoping process conducted by FERC, the study plan development process, Georgia Power's resource study reports, and stakeholder meetings.

- **Section 4** – Environmental analysis, presented by resource area and consisting of descriptions of the affected environment and the environmental impacts of Georgia Power's proposal, including environmental measures.

- **Section 5** – References cited in the text.

2.0 PROPOSED ACTION

This section sets out Georgia Power's PLP for continuing to operate the Wallace Dam Project under the new license. The section first describes the existing Project, including the facilities, lands, and waters. Current and proposed project operations are then described, followed by a summary of the environmental measures proposed with respect to each resource area.

2.1 Project Description

The Wallace Dam Project is located on the main stem of the Oconee River in east-central Georgia (Figure 1). The Project is situated in the upper Oconee River basin of the greater Altamaha River basin. Wallace Dam is located at river mile 172.7, about 13.4 air miles east of the city of Eatonton; 15.4 air miles south of the city of Greensboro; 19 air miles north of the city of Milledgeville (Figure 2). Wallace Dam is 29.7 river miles upstream of Georgia Power's Sinclair Dam (river mile 143) and immediately upstream of Lake Sinclair. Releases from Wallace Dam flow directly into Lake Sinclair; there is no intervening free-flowing or bypassed reach of river.

The watershed upstream of Wallace Dam covers an area of 1,830 square miles (sq mi), comprising about 34 percent of the Oconee River basin (Figure 1). At its normal full pool elevation of 435 feet (ft) plant datum (PD)[1], Lake Oconee covers 19,050 acres, has 374 miles of shoreline, and extends about 39 river miles upstream on the Oconee River (Figure 3). The pool elevation of Lake Oconee fluctuates on average 1.5 ft daily as part of the pumpback operation of Wallace Dam. The average depth of Lake Oconee is 21 ft and the maximum depth is about 120 ft.

2.1.1 Project Facilities

The Wallace Dam Project was built and the reservoir filled to the full pool elevation of 435 ft PD by May 1980. Commercial operation began in December 1979. The Project consists of a reservoir (Lake Oconee), an earth and concrete gravity dam, a powerhouse integral with the dam, a five-gate spillway, a 20,200-ft-long excavated tailrace (into Lake Sinclair), a 230-kilovolt (kV) substation, a 15.67-mile-long transmission line, and appurtenant facilities (Figures 3 and 5).

The main dam has a crest elevation of 445 ft PD, a crest length of 2,395 ft, and height above streambed of 120 ft. The project works across the main dam consist of the following components (and their length) from west to east (Figure 5):

- West earth embankment (347 ft);

[1] Plant datum = mean sea level (NAVD88) - 0.20 feet (+/- 0.01 feet).

- West concrete non-overflow section (300 ft);
- Concrete spillway (266 ft);
- Powerhouse (intake) (531 ft 4 inches);
- East concrete non-overflow section (226 ft); and
- East earth embankment (725 ft).

The west and east earth embankments are homogenous earth sections with chimney drains (Figure 5). The crests are at elevation 445 ft PD. Riprap protects the upstream slopes against wave action. The east and west non-overflow sections are concrete structures with a crest elevation of 445 ft PD.

The concrete spillway has a crest elevation of 391.0 ft PD. The spillway contains five taintor gates, each 48-ft high by 42-ft wide (Figure 5). The discharge capacity of each gate is 35,000 cubic ft per second (cfs) at the normal full pool elevation of 435 ft PD.

In addition, there are two small saddle dikes located east of the main dam. They have a total length of about 900 ft and a maximum height of 20 ft. The original ground grade at each location was at or slightly above elevation 435 ft PD and was built up to a crest elevation of 445 ft PD.

At normal full pool, the total reservoir storage of Lake Oconee is approximately 370,000 acre-ft (120.5 billion gallons). The maximum pool for spillway design flood is elevation 441 ft. The normal maximum tailwater elevation is 340 ft.

The powerhouse is integral with and located immediately downstream of the dam on the east side of the river (Figure 5). The intake is integral with the powerhouse and has an invert elevation of 345.655 ft PD. The intake opening is located approximately between elevations 386 ft and 346 ft PD (49 to 89 ft below the normal full pool elevation). There are six penstocks with a diameter of 25.5 ft.

Steel trash racks in front of the intake consist of vertical bars with clear spacing between bars ranging from 9.5 to 10.5 inches (Southern Company, 2017). The steel trash racks in front of the downstream draft tubes consist of vertical bars with clear spacing between bars of 10.5 inches, with openings at each end being 16.5 inches.

The powerhouse contains six turbine-generator units, numbered 1 through 6 from west to east (Table 1). Two units are conventional units (Units 3 and 4), and four units can also reverse direction and become pumps (Units 1, 2, 5, and 6). The nameplate generating capacity of the Wallace Dam Project is 321.3 MW, and the total turbine hydraulic capacity is 50,545 cfs at

full gate operations. Normal operation is to operate at best gate (total of 44,750 cfs) unless there is a need for more hydraulic or power capacity.

The Wallace Dam powerhouse operates at rated net head of 89 ft. Table 2 summarizes the turbine design characteristics. Units 1, 2, 5, and 6 are vertical-shaft, Francis type, reversible pump turbines each rated 73,000 horsepower (hp) at 89 ft net head generating and 83,000 hp at 103 ft total dynamic head pumping. Their rated speed is 85.8 revolutions per minute (rpm). The four-unit pumping capacity totals 26,800 cfs. Units 3 and 4 are vertical-shaft, modified propeller type turbines each rated 78,000 hp at 89 ft net head and with rated speed of 120 rpm.

The maximum generating capacity of the Wallace Dam Project is 333.8 MW (generator limited). The dependable capacity of the Project is 328.1 MW in the summertime, the most critical power demand season. Dependable capacity is defined as the maximum average capacity available for 8 hours each day for 5 consecutive days using average summer inflows. Average annual generation for the period 1994 through 2013 was 383,038 megawatt-hours (Georgia Power, 2015a).

The transmission facilities at the Wallace Dam Project consist of the 13.8-kV generator leads, two 13.8/230-kV step-up transformers with transformer capacity of 420,000 kV-amps, a 230-kV substation, and a 230-kV transmission line 15.67 miles long. The transmission line begins at Wallace Dam, extends west, and terminates at a switching station in the vicinity of Eatonton, Georgia (Figure 2). The Pre-Application Document (PAD) (Georgia Power, 2015a) provides a map of the transmission line in Appendix C.

2.1.2 Project Lands and Waters

The FERC project boundary around Lake Oconee encompasses the normal full pool elevation of 435 ft PD and a fee-simple strip of land owned by Georgia Power around the entire shoreline (with the exception of FS lands) (Figure 3). The shoreline strip is generally 25-ft wide, with the exception of lands comprising the Oconee NF, and expands to widths of 100- or 200-ft across the reservoir from certain recreation areas (Georgia Power, 1971). The project boundary is measured as metes and bounds or elevation contour, depending on location around the reservoir. Larger land parcels define the project boundary in the areas of the project works, Georgia Power's public recreation facilities, and other areas reserved for recreation development. The project boundary extends downstream of Wallace Dam within Lake Sinclair approximately 1.3 river miles to the Georgia Highway (Hwy) 16 bridge. It extends downstream of Wallace Dam on the shoreline about 4.0 river miles as thin strips of land on each side of the narrow upper reach of Lake Sinclair. Thin strips of the project boundary also extend up each side of the Shoulderbone Creek embayment, located downstream of Hwy 16.

The project lands include seven project recreation facilities owned and operated by Georgia Power (Figure 3). Six are on Lake Oconee, and one is on the west shoreline of the tailrace. All seven facilities include a day-use area; six provide boat ramps, picnic tables, and restrooms; and three provide full-service campgrounds and swimming beaches (see Section 4.3.6). The

facilities include: Armour Bridge, Long Shoals Boat Ramp, Sugar Creek Boat Ramp, Lawrence Shoals Park, Old Salem Park, Parks Ferry Park, and Tailrace Fishing Area.

The project lands include ten undeveloped areas that are reserved for future recreational use in accordance with the current Recreation Plan for the Project (Figure 4). The areas are dispersed around the shoreline of Lake Oconee and vary in size from 5 to 561 acres (see Section 4.3.6). The project lands reserved for future recreational use include: Area A-1, Area A-2, Tract B, Area B-3, Area B-5, Area C-2, Area C-4, Area C-5, Area C-6, and Area C-7.

The project boundary downstream of Wallace Dam encompasses three small waterfowl impoundments in the floodplain adjacent to the channel within the Oconee Wildlife Management Area (WMA) (Figures 3 and 5). They include Pond 2 on the east side of the tailrace, and Ponds 3 and 4 on the west side downstream of Hwy 16 (Figure 6) (Section 4.3.4). Pond 1 is located within the Sinclair project boundary.

There are approximately 4,442 acres of project lands inside the project boundary between the normal full pool elevation of 435-ft PD and the project boundary. These project lands include about 370 acres of FS lands within the Oconee NF along the Oconee River and Apalachee River embayments upstream of Interstate 20 (I-20) (Figure 3). Project lands provide a buffer for aesthetics, wildlife habitat, water quality protection, and recreation.

Georgia Power leases, at no cost, 5,375 acres in and adjacent to project lands to the Georgia Department of Natural Resources (GDNR) for use as the Oconee WMA (Figure 3). The Oconee WMA is managed for waterfowl habitat, hunting, and other recreational purposes.

There are 4,427 parcels of land adjacent to the shoreline of Lake Oconee leased by individual residential property owners for lake access. No residences, residential outbuildings, or permanent structures, other than permitted shoreline structures, are allowed within the project boundary. Georgia Power manages the shoreline of Lake Oconee under its Shoreline Management Guidelines (Georgia Power, 2017a) to ensure compliance with the Wallace Dam FERC license and other applicable federal, state, and local laws and regulations.

The FERC project boundary also includes the 15.67-mile-long, 230-kV transmission line extending from Wallace Dam west to a switching station in the vicinity of Eatonton (Figure 3).

2.2 Current Operation

Georgia Power operates the Wallace Dam Project in a pumped storage mode for the purpose of peaking power generation. Generation releases occur during peak power demand hours to meet the electrical system demand with renewable, low-emission power that generates no wastes for disposal. Some of this water subsequently passes downstream for hydropower generation at Sinclair Dam to meet both electrical system demand and river flow requirements

in the Oconee River downstream of Sinclair Dam.[2] The remaining volume of water from Wallace Dam remains in Lake Sinclair for a few hours before being pumped back up and into Lake Oconee by the reversible units for reuse in the next day's generation cycle. Pumpback operations occur during off-peak demand periods (mostly at night), when electrical system demand is low, and therefore, the cost of power is lower.

2.2.1 Normal Operation

During normal daily operations, Lake Oconee fluctuates between elevations 435.0 ft and 433.5 ft PD. Lake Oconee typically begins the generation cycle near elevation 435.0 ft and ends near 433.5 ft PD. During nighttime, the pumping cycle refills Lake Oconee, typically to elevation 435.0 ft. Depending on power demand, the reservoir does not fluctuate the full amount every day. Daily fluctuations are 2.0 ft or less 100-percent of the time.

The Wallace Dam Project discharges directly into Lake Sinclair, with no intervening riverine reach or bypassed reach. Although there is no instantaneous discharge requirement, daily average discharges exceed 0 cfs about 85 percent of the time and 1,000 cfs about 64 percent of the time (Georgia Power, 2015a).

Nameplate capacity with all units operating is 321.3 MW. Maximum generating capacity is 333.8 MW. The majority of the total annual generation at Wallace Dam comes from the reuse of water pumped back into Lake Oconee during off-peak demand periods (mostly at night), which shows the critical importance of the pumpback operations to the power benefits of the Project (see Table 1 of Appendix D in the PAD). During the summer, Wallace Dam usually generates about 7 to 8 hours across the afternoon peak demand period. During fall and winter, peak generation typically lasts 5 to 6 hours.

Because of its large generating capacity, Wallace Dam is also a black-start facility for Georgia Power. That means it can assist in restoring electricity to the nearby system if another major generation facility goes off-line.

2.2.2 Drought Operation

The Wallace Dam Project supports the minimum flow requirements of the Sinclair Project during drought, as described in the FERC-approved Drought Contingency Plan for Lakes Oconee and Sinclair. When Sinclair's calculated inflow drops below 250 cfs, water is released from Lake Oconee for continued release downstream of Lake Sinclair. This allows Lake Sinclair to have a consistent elevation so that pumpback operation at Wallace Dam may continue during drought. If Lake Sinclair was lowered below its normal elevation range, the pump units at Wallace Dam would cavitate and could become damaged. The normal minimum pond level at Lake Sinclair is 338.2 ft PD, and the pump units begin to cavitate at elevation

[2] The river flow requirements are included as articles in the separate FERC license for the Sinclair Project and in the FERC-approved Drought Contingency Plan for Lakes Oconee and Sinclair.

337.2 ft PD. During recent drought years, the Wallace Dam Project supplemented river flow in the Oconee River downstream of the Sinclair Project for several months, resulting in sustained periods when the elevation of Lake Oconee was below its normal operating range (Appendix D of the PAD).

2.3 Proposed Operation

Georgia Power proposes to continue operating the Wallace Dam Project in a pumped-storage mode for the generation of peaking power. The Project would continue to supplement flows during drought to support the downstream Sinclair Project minimum flow requirements.

Georgia Power is not proposing to add capacity or make any major modifications to the Project under the new license.

2.4 Proposed Environmental Measures

Georgia Power proposes the following measures to protect, mitigate adverse impacts to, or enhance environmental resources at the Wallace Dam Project.

These proposed environmental measures are based on Georgia Power's assessment of the Project, the findings of resource studies conducted under the FERC-approved Study Plan, and discussions with resource agencies and stakeholders. The measures have been identified for the purpose of eliciting public comment and are subject to change based upon comments received on the PLP and in light of project economics and other considerations:

- Continue to operate the Project during peak power demand hours to meet the electrical system demand with renewable, low-emission power that generates no wastes for disposal.

- Continue to operate the Project to supplement flows during drought to support the downstream Sinclair Project minimum flow requirements. Supporting these requirements would continue to enhance aquatic resources by maintaining flow regimes in the free-flowing reach of the Oconee River downstream of Sinclair Dam and moderating fluctuations of Lake Sinclair.

- Install and operate a forebay oxygen line diffuser system in Lake Oconee to enhance summer dissolved oxygen (DO) concentrations in the tailrace area. This would benefit water quality in the tailrace and downstream fisheries, aquatic resources, and recreational fishing by supporting applicable water quality standards throughout the hottest months of the year.

- Continuously monitor and report tailrace DO concentrations in the months May through September for 3 years following deployment of the forebay oxygen line diffuser system to verify DO enhancements in the tailrace area.

- Enhance recreation amenities at Lawrence Shoals Park by constructing new facilities to replace two campground restrooms, a beach house, a boat ramp restroom, a courtesy dock at the boat ramp, a pavilion and dedicated pavilion restroom, and a guest relations gate house. In addition, upgrade the current well system that supplies water to park facilities and customers. These improvements would continue to support quality recreation opportunities.

- Enhance recreation amenities at Old Salem Park by constructing new facilities to replace two group docks (and add a third group dock), a pavilion and dedicated pavilion restroom, a boat ramp restroom, a courtesy dock at the boat ramp, a beach house, and a guest relations gate house. In addition, upgrade the current well system that supplies water to park facilities and customers, and reconfigure the park entrance and gate house to reduce single-lane traffic congestion and allow for year-round operation of the boat ramp. These improvements would continue to support quality recreation opportunities and enhance year-round boat-fishing and tournament-fishing access to Lake Oconee.

- Enhance recreation amenities at Parks Ferry Park by constructing new facilities to replace two campground restrooms, a beach house, a courtesy dock at the boat ramp, and a pavilion and dedicated pavilion restroom. In addition, upgrade the current well system that supplies water to park facilities and customers; replace the underground water and electrical service; and reconfigure the entrance gate and gate house to reduce single-lane traffic congestion and allow for year-round operation of the boat ramp. These improvements would continue to support quality recreation opportunities and enhance year-round boat-fishing and tournament-fishing access to Lake Oconee.

- Increase bank fishing access on Lake Oconee by providing a new bank fishing access development at the Area C-5 tract to include a pier and gravel parking.

- Increase bank fishing access on Lake Oconee by providing a new bank fishing access development at Jerry's Hwy 44 to include a pier and gravel parking.

- Enhance recreation amenities and increase bank fishing access at Sugar Creek Boat Ramp by adding a new fishing pier, upgrading the vault toilet with a flush toilet, and upgrading the courtesy dock.

- Enhance recreation amenities at Armour Bridge Boat Ramp by upgrading the courtesy dock and replacing the vault toilet with a flush toilet.

- Enhance recreation amenities and improve bank fishing access at Long Shoals Boat Ramp by upgrading the courtesy dock and trimming vegetation to provide additional bank fishing access.

- Enhance recreation amenities and improve tailrace bank fishing access at the Georgia Hwy 16 Bridge Boat Ramp downstream of the dam by providing a new tailrace fishing pier and a vault toilet. The new fishing pier would replace the bank fishing access provided at the Tailrace Fishing Area, which would be closed due to its limited public use and for security of Wallace Dam's adjacent equipment yard.

- Enhance recreational access at Georgia Power boat launch facilities by installing improved lighting at Lawrence Shoals Park, Old Salem Park, Parks Ferry Park, Sugar Creek Boat Ramp, Armour Bridge Boat Ramp, Long Shoals Boat Ramp, Area C-5 tract, Jerry's Hwy 44, and Hwy 16 Bridge Boat Ramp.

- Continue to manage shorelines in accordance with Shoreline Management Guidelines for Georgia Power Lakes and to promote the maintenance of vegetative buffers around the reservoir to protect water quality, aquatic habitat, and cultural and aesthetic resources.

- Install shoreline stabilization consisting of riprap at Old Salem Park, Parks Ferry Park, Long Shoals Boat Ramp, and Armour Bridge Boat Ramp to conserve soil resources, maintain shoreline recreational uses, reduce sedimentation and turbidity of adjacent waters, and enhance littoral-zone aquatic habitat.

- Repair the eroded shoreline at the Pond 2 waterfowl impoundment and inspect the water level control structure on the eastern shore of the Wallace Dam tailrace area to conserve soil resources, maintain waterfowl refuge habitat, and protect water quality and aquatic habitat.

- Implement a Historic Properties Management Plan through a Programmatic Agreement to assure the preservation and long-term management of archaeological sites and historic buildings and structures within the project boundary.

3.0 PRE-FILING CONSULTATION SUMMARY

3.1 Stakeholder Consultation

Georgia Power identified and consulted with numerous stakeholders prior to filing the PLP. In addition to FERC, the following agencies, governments, and non-governmental organizations were contacted via telephone, e-mail, mail, website distribution of information, and face-to-face meetings in accordance with the distribution protocol established in the PAD (Georgia Power, 2015a):

- American Rivers;
- Altamaha Riverkeeper;
- Baldwin County, Georgia;
- Blue Springs Marina;
- Boathouse at Harbor Club;
- Bone Island Grill;
- Cherokee Nation of Oklahoma;
- City of Eatonton, Georgia;
- City of Greensboro, Georgia;
- City of Madison, Georgia;
- City of Milledgeville, Georgia;
- City of Sparta, Georgia;
- Cuscowilla;
- Ducks Unlimited;
- Eastern Band of Cherokee Indians;
- Georgia Bass Federation;
- GDNR – Environmental Protection Division (GEPD); Historic Preservation Division (HPD); Wildlife Resources Division (WRD);

- GDNR – Oconee WMA;
- Georgia Forestry Commission (GFC);
- Georgia Soil and Water Conservation District Region IV;
- Greene County, Georgia;
- Hancock County, Georgia;
- Homeowners Associations – Harbor Club; Double Branches; Indian Hills Estate; Rock Island Cove; Oconee Heights; Parks Mill Crossing; Pioneer Woods; Salem Plantation; Sebastian Cove; Stoneridge; Sugar Bend; The Pointe; Waters Edge;
- Harbor Club;
- Lake Oconee Anglers;
- Lake Oconee Bass Club;
- Lake Oconee Water Watch;
- Morgan County, Georgia;
- Muskogee (Creek) Nation;
- Putnam County, Georgia
- Reynolds Plantation;
- Ritz Carlton;
- Sugar Creek Marina;
- United Keetoowah Band of Cherokee;
- U.S. Department of Agriculture (USDA) Forest Service – Southern Region;
- USDA Forest Service, Chattahoochee-Oconee NF;
- USDA – Oconee River Resource Conservation and Development Office;
- U.S. Environmental Protection Agency (EPA) Region 4;
- U.S. Fish and Wildlife Service (FWS); and

- Waterfront Marina.

3.2 Scoping Process

Pursuant to FERC's ILP regulations at 18 CFR §5.6, Georgia Power filed its PAD for the Wallace Dam Project with FERC on February 18, 2015 (Georgia Power, 2015a). The PAD described the existing facilities and the current and proposed operation of the Project; characterized the affected environment and potential resource impacts of continued operation under a new license; and provided the initial version of the Process Plan and Schedule for all pre-application activities and stakeholder participation.

FERC (2015b) issued a NEPA Scoping Document (SD1) on April 17, 2015 to federal, state, and local agencies, non-governmental organizations, and the public to solicit comments on the scope of FERC's environmental assessment (EA) and encourage stakeholder participation in the relicensing process. FERC staff held scoping meetings and a site visit on May 19-20, 2015. As part of the meetings, participants were given an opportunity to tour the Wallace Dam Project.

Relicensing stakeholders subsequently filed their comments on the PAD and SD1, as well as study requests, by June 19, 2015.

3.3 Study Plan Development

Georgia Power filed its Proposed Study Plan (PSP) with FERC on July 27, 2015 for review and comment by relicensing stakeholders, who had until October 26, 2015 to file their comments. The PSP included a total of seven studies of geology and soils resources, fish and aquatic resources, water resources, terrestrial resources, threatened and endangered species, recreation and land use resources, and cultural resources.

Georgia Power held two Study Plan Meetings on August 25 and 26, 2015. The goal of these meetings was to discuss information gathering needs and any differences between the PSP and study requests filed by stakeholders. On November 24, 2015, Georgia Power filed its Revised Study Plan (RSP) to reflect the efforts made during the Study Plan Meetings and subsequent discussions to resolve issues and accommodate stakeholder input on the PSP (Georgia Power, 2015b).

On December 17, 2015, FERC's Office of Energy Projects Director (Director) issued a Study Plan Determination (FERC, 2015a). All seven studies were approved as filed in the RSP.

3.4 Resource Study Reports

Georgia Power conducted the first season of studies between January 2016 and September 2016. A Study Progress Report was filed with FERC on August 31, 2016. After completing

the first season of studies, Georgia Power filed on November 18, 2016, an Initial Study Report for six finalized studies and one ongoing study, the Water Resources Study.

Georgia Power held Initial Study Results Meetings on December 5-6, 2016, and filed a meeting summary on December 21, 2016. During the Study Results Meetings, Georgia Power indicated that the previously approved tailrace water quality monitoring would continue in 2017 and that a new study would be proposed to assess alternative aeration methods for improving summer DO concentrations in the tailrace area. Subsequent to the Study Results Meetings held in December 2016, several stakeholders filed comments on the resource study reports by January 20, 2017. Comments on the study report and meeting summaries, including requests for study modifications, were filed by: FERC; FWS; FS; GDNR HPD; and GDNR WRD. On February 20, 2017, Georgia Power filed reply comments and the newly proposed study plan entitled "Study of Aeration Methods to Enhance Summer Dissolved Oxygen in the Wallace Dam Tailrace Area."

The Director issued a determination on requests for study modifications and new studies on March 17, 2017, based on FERC staff recommendations. The determination approved the new study proposed by Georgia Power. Regarding requested study modifications to the desktop fish entrainment analysis in the Fish and Aquatic Resources Study, FERC staff recommended that Georgia Power provide or develop certain requested information in the PLP.

Georgia Power conducted the second season of studies between March 2017 and September 2017. A Study Progress Report for the second season of studies was filed with FERC on August 30, 2017. After completing the second season of studies, Georgia Power filed on October 11, 2016, an Updated Water Resources Study Report and a final study report on Aeration Methods to Enhance Summer Dissolved Oxygen in the Wallace Dam Tailrace Area.

Georgia Power held an Updated Study Results Meeting on the morning of October 17, 2017, followed in the afternoon by a PLP meeting to discuss Georgia Power's proposal for continued project operation, including enhancement measures. Georgia Power filed an Updated Study Results Meeting Summary on November 10, 2017. Stakeholder comments on the meeting summary are to be filed by December 11, 2017.

In summary, Georgia Power completed the following resource studies:

- Geology and Soils;
- Water Resources (Initial Study Report and Updated Study Report);
- Fish and Aquatic Resources;
- Terrestrial Resources;
- Rare, Threatened, and Endangered Species;

- Recreation and Land Use;
- Cultural Resources (two reports); and
- Aeration Methods to Enhance Summer Dissolved Oxygen in the Wallace Dam Tailrace Area.

3.5 Stakeholder Meetings

Georgia Power held numerous stakeholder consultation meetings beginning in November 2014, in public forums and in one-on-one and small-group settings. Three months prior to filing the PAD, Georgia Power held two informational sessions on November 19-20, 2014, near the Wallace Dam Project. These meetings included ILP orientation by the FERC Project Manager and dissemination of information on the Project by members of the Georgia Power relicensing team who were available for one-on-one discussions with stakeholders.

After Georgia Power filed its PAD and the relicensing proceeding began in February 2015, FERC held a site visit on May 19, 2015, followed by two public scoping meetings on May 20, 2015, at the Rock Eagle 4-H Center in Eatonton, Georgia. Georgia Power held two days of Study Plan Meetings on August 25-26, 2015, at the Rock Eagle 4-H Center, with the goals of informally discussing Georgia Power's PSP and resolving any issues with respect to study requests filed by stakeholders.

Upon completion of the first season of studies, Georgia Power held Initial Study Results Meetings on December 5-6, 2016, again convening at the Rock Eagle 4-H Center in Eatonton. The meetings provided an opportunity for Georgia Power to discuss the study results and for stakeholders to ask questions and provide their feedback on the findings.

Most recently, Georgia Power held an Updated Study Results Meeting on October 17, 2017, to present the findings of its final study on water resources and a study investigating aeration methods to improve tailrace DO. The meeting was held at the Rock Eagle 4-H Center and was followed in the afternoon by a PLP meeting to share and discuss Georgia Power's proposal for continued operation of the Project. The PLP Meeting was not required by FERC regulations.

In addition to public meetings, Georgia Power has met with many stakeholders in one-on-one and small-group settings throughout the licensing process, and electronic and telephone communications continue. Among these stakeholders are GDNR, FWS, FS, multiple homeowners' associations, and others. The input received from these stakeholder meetings has been carefully considered and incorporated into preparation of Georgia Power's relicensing documents, including this PLP. Stakeholder consultation is ongoing and will continue through the preparation of the license application, which Georgia Power will file by May 31, 2018.

4.0 ENVIRONMENTAL ANALYSIS

4.1 General Description of the River Basin

The Wallace Dam Project is located on the Oconee River at river mile 172.7 in the upper Oconee River basin of the greater Altamaha River basin (Figure 1). The Altamaha River basin includes the Oconee, Ocmulgee, and Altamaha Rivers. The Middle Oconee and North Oconee Rivers originate in the Piedmont physiographic province (Edwards et al., 2013). These streams meet at the southern border of Athens-Clarke County to form the Oconee River about 20 river miles upstream of Lake Oconee. The Oconee River flows south for 220 miles and joins the Ocmulgee River in the Coastal Plain physiographic province to form the Altamaha River. The Altamaha River flows 137 miles southeast to the Atlantic Ocean. The Altamaha River basin drains an area of 14,000 sq mi located entirely within Georgia.

The Oconee River basin drains a total watershed area of 5,330 sq mi in east-central Georgia (GEPD, 1998). The watershed upstream of Wallace Dam covers an area of 1,830 sq mi., comprising about 34 percent of the Oconee River basin (Figure 1). From Wallace Dam, the river flows immediately into Lake Sinclair, a 15,330-acre reservoir formed by Sinclair Dam (Figures 2 and 3). From Sinclair Dam, the Oconee River flows 143 miles to its confluence with the Ocmulgee River. About 5 miles downstream of Sinclair Dam, the Oconee River enters the Fall Line Hills District, the hilly transition zone that descends from the Piedmont into the Coastal Plain (Edwards et al., 2013).

4.1.1 Dams in the Basin

Two major dams are located on the mainstem Oconee River: Wallace Dam and Sinclair Dam (Figure 2). Sinclair Dam is part of the Sinclair Project and has a generating capacity of 45 MW. There is no intervening reach or bypassed reach of river between Wallace Dam and Lake Sinclair. The two dams impound about 69 river miles of the mainstem Oconee River in the Piedmont physiographic province. There are no other major mainstem dams on the Oconee and Altamaha Rivers downstream.

Two small hydroelectric dams are located upstream of the Wallace Dam Project. Barnett Shoals Dam is located on the Oconee River about 16 river miles upstream. It includes a low-head dam and powerhouse with 2.8 MW of capacity. The Tallassee Shoals Hydroelectric Project (FERC No. 6951), with a capacity of 2.3 MW, is located farther upstream on the Middle Oconee River. In addition, several reservoirs are located in tributary systems upstream of Lake Oconee. The larger ones include Bear Creek Regional Reservoir, a 505-acre water supply reservoir next to the Middle Oconee River, and Hard Labor Creek Regional Reservoir, a newly constructed 1,370-acre water supply reservoir in the Apalachee River system.

4.1.2 Major Land Uses

Fourteen counties and over 40 cities and towns are located upstream of the Wallace Dam Project in the upper Oconee River basin. The consolidated government of Athens-Clarke County, with an estimated 124,700 residents in 2016, has the largest upstream population (U.S. Census Bureau, 2017). Estimated 2016 populations for the project counties were 21,477 Putnam, 18,170 Morgan, 17,003 Green, and 8,640 Hancock.

The 116,731-acre Oconee NF includes an area north of I-20 at the upper end of Lake Oconee and an area south of I-20 to the southwest (Figure 2). Four WMAs are located in the vicinity. The Redlands WMA is on Oconee NF lands north of I-20. The Oconee WMA surrounds Wallace Dam and the tailrace area. The Redlands and Oconee WMAs have lands within the project boundary. The Cedar Creek and B. F. Grant WMAs are located west and southwest of the Project. Other public land uses in the project vicinity include the 1,500-acre Rock Eagle 4H Center in Eatonton, which includes the Rock Eagle Mound, a stone effigy shaped like a bird and similar to the Rock Hawk Effigy located adjacent to the Project near Lawrence Shoals Park.

The predominant land uses in northern counties upstream of the Project include a suburban or rural residential mix of low-intensity urban, forested lands, and row crop and pasture lands. With the exception of urban lands around the cities of Eatonton and Greensboro, most of the lands around the Project contain forest, row crop/pasture, or clearcut/sparse vegetation. Lake Oconee is also known for its private residential and resort developments, including many golf courses and marinas (Figure 3).

Livestock, poultry, and dairy operations are relatively intensive in the area. Morgan County ranks among the top beef-producing counties in Georgia (USDA, 2017). Putnam and Morgan Counties are among the top dairy counties (Georgia Milk Producers, Inc., 2017). Timber production and related businesses such as saw mills are also common (GFC, 2015).

4.1.3 Major Water Uses

Surface water provides 94-percent of the water supply used by the municipal, industrial, energy, and agricultural water-use sectors in the upper Oconee River basin (Jacobs, 2017). Sustainable groundwater yields are limited in the crystalline-rock aquifer system that underlies the upper Oconee River basin in the Piedmont province. Substantial portions of the Oconee River watershed upstream and downstream of the Wallace Dam Project are classified for drinking water supply, including Lake Oconee and Lake Sinclair. Other primary uses of the Oconee River in the vicinity of the Project include fishing, aquatic life, recreation, multiple resorts, hydropower generation, and municipal/industrial water supply.

The Oconee River also serves as a primary receiving water for assimilating treated sanitary effluent in the basin. The majority of wastewater is treated by facilities with point source discharges (Jacobs, 2017). About 45 percent of the municipal wastewater generated in the

region is treated by onsite treatment systems, such as septic tanks, in areas where public collection systems are unavailable.

4.1.4 Tributary Streams

Lake Oconee and its tributary streams, exclusive of the Oconee River, comprise about 40 percent of the drainage area upstream of Wallace Dam. The five largest tributaries entering Lake Oconee include the following streams (Figures 2 and 3):

- Apalachee River – originates in Gwinnett, Barrow, Walton, and Oconee Counties, flows southeast through Morgan and Greene Counties, and enters the Apalachee River embayment of Lake Oconee; watershed area of about 233 sq mi.

- Hard Labor Creek – originates in Walton County, flows east through Morgan County, and enters the Apalachee River embayment; watershed area of about 86 sq mi.

- Richland Creek – drains portions of Greene County north and west of Greensboro, flows south, and enters the Richland Creek embayment south of I-20; watershed area of about 53 sq mi.

- Sugar Creek – drains portions of southeastern Morgan County and enters the western side of Lake Oconee south of I-20; watershed area of about 49 sq mi.

- Fishing Creek – originates in southwestern Oglethorpe County, drains portions of Greene County, flows west, and enters the eastern upstream end of the Oconee River embayment; watershed area of about 39 sq mi.

4.1.5 Climate

The Oconee River basin is characterized by a moist and temperate climate. Summers are long and hot, and winters are mild and short. Average annual air temperature ranges from 60 to 65°F (GEPD, 1998). Average daily temperatures vary from 40 to 45°F in January to 75 to 80°F in July. Winter low temperatures fall below freezing for only short periods. Average annual precipitation ranges from 47 inches in the lower basin to 56 inches in the upper basin. The wettest month is usually March, and the driest months are usually September and October (U.S. Geological Survey [USGS], 2017).

4.2 <u>Cumulative Effects</u>

4.2.1 Geographic Scope

The geographic scope of analyses for Georgia Power's Wallace Dam Project defines the Project's area of potential effect as primarily the FERC project boundary, including:

- Lake Oconee (19,050 acres);

- Wallace Dam tailrace extending downstream to the Hwy 16 bridge; and
- Approximately 4,442 acres of project lands inside the project boundary.

Consistent with FERC's criteria for defining cumulatively affected resources (FERC, 2015b), Georgia Power has analyzed water resources and fishery resources as cumulatively affected resources in this PLP. The geographic scope of the cumulative effects analysis extends beyond the Project's area of potential effect to the physical limits or boundaries of contributing effects from other hydropower and non-hydropower activities within the Oconee River basin. Because the proposed action would affect these resources differently, their geographic scopes of analysis differ, as described below.

The geographic scope of analysis for cumulative effects on water resources encompasses the Oconee River basin from the confluence of the Middle Oconee and North Oconee Rivers in Athens-Clarke County downstream to Sinclair Dam at Milledgeville. This scope of analysis includes those land uses and activities upstream in the basin that contribute to water quality conditions in Lake Oconee and the Wallace Dam tailrace area.

The geographic scope of analysis for cumulative effects on fish and aquatic resources encompasses the historic ranges of highly migratory and formerly more widely distributed native species of fish and freshwater mussels. The historic ranges may extend both upstream of Lake Oconee and downstream through the Altamaha River basin to the Atlantic Ocean.

The analysis of specific resources focuses on how the action of issuing a new license for the continued operation and maintenance of the Wallace Dam Project, as proposed herein by Georgia Power, may cumulatively affect those resources located within the geographic scope of influence.

4.2.2 Temporal Scope

The temporal scope of Georgia Power's cumulative effects analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on water resources and fish and aquatic resources. The temporal scope considered the potential for actions occurring 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion of past actions and effects is limited, by necessity, to the amount of available information for each resource. Georgia Power has identified the present resource conditions in this PLP based on the best available information.

4.3 Proposed Action

4.3.1 Geology and Soils

4.3.1.1 Affected Environment

The Wallace Dam Project is located in the Washington Slope District of the Piedmont physiographic province (Clark and Zisa, 1976). The Piedmont is a hilly upland province underlain by crystalline metamorphic and igneous rocks. The topography is gently rolling and descends from around 700-ft elevation near its northern limits to about 500-ft elevation at its southern margin. Streams in the Washington Slope District occupy broad, shallow valleys separated by broad, rounded divides, with local relief of 50 to 100 ft (Clark and Zisa, 1976).

The Project is located in the Southern Outer Piedmont ecoregion. This ecoregion has low hills, major forest types of loblolly-shortleaf pine, underlying rocks of gneiss, schist and granite, fine sandy loam soils, and a deep, red clayey subsoil (Griffith et al., 2001; Edwards et al., 2013).

The Lake Oconee shoreline is characterized by gently sloping topography in most areas. Rock outcroppings and boulders occur along the shoreline in some areas of the lower end of the reservoir, particularly at the confluence of the Oconee River and Richland Creek (Area A-1) and in Tract B (within the Oconee WMA) next to Lawrence Shoals Park (Figures 3 and 4).

Shoreline Erosion and Sedimentation

Georgia Power (2016a) conducted a shoreline reconnaissance survey of Lake Oconee and the Wallace Dam tailrace area in June 2016. The survey inventoried and characterized existing shoreline conditions and potential sources of erosion and sedimentation within the project boundary. It also characterized physical aquatic habitat and available sources of littoral-zone cover for fish. A total of 146 shoreline segments, or sites, were selected, including 35 sites in each of four sections of the reservoir (upper reservoir, middle reservoir, Richland Creek embayment, lower reservoir) and 6 sites in the tailrace area. The sites included all seven project recreation facilities, three FS recreation areas in the upper reservoir section, nine undeveloped areas on the reservoir reserved for future recreational development, and one site in the tailrace area next to Pond 2 in the Oconee WMA. WRD has indicated that the dike creating Pond 2, along the tailrace shoreline, has been experiencing erosion. The remaining 126 survey sites were randomly selected within each reservoir and tailrace section. Each site was visually assessed and rated for vegetative buffer zone condition, adjacent land uses, bank stability and vegetative protection, shoreline structural stabilization practices (e.g., seawalls, riprap), potential causes of shoreline erosion (project related and non-project related), and sources of littoral-zone fish cover.

The shoreline survey found the vast majority of sites to have stable or moderately stable banks. These sites exhibited low potential for erosion problems due to a high degree of bank vegetative protection and/or the use of shoreline structural stabilization practices, including

seawalls, riprap, and combinations thereof. Natural vegetative buffer zone conditions were most widespread in the upper reservoir section (upstream of I-20) and in the tailrace area. Sites with landscaped riparian zones occurred throughout the reservoir but were most prevalent in the Richland Creek embayment and the lower reservoir section (between Hwy 44 and Wallace Dam), reflecting the intensity of shoreline residential land uses in these areas. Sites with a mixture of landscaped and natural riparian zones were more numerous in the lower reservoir and middle reservoir sections than in the upper reservoir section. Overall, the most common categories of shoreline land uses, in descending frequency of observation, were residential, forested, and recreation access.

The most common potential sources of shoreline erosion inventoried on Lake Oconee, in descending frequency of observation, were wave action from wind and watercraft, and residential landscape. These non-project related sources of erosion were identified most frequently in the lower and middle reservoir sections. In these sections, residential shoreline uses are widespread, the reservoir is more open and the shoreline more exposed to wave action, and boating activity is more concentrated. Other less frequently observed potential sources of erosion were stormwater runoff, recreational access, reservoir fluctuations, tributary inflows, roads and bridges, and lack of natural vegetation.

Reservoir or water level fluctuations related to project operations were identified as a potential source of erosion at seven sites, including five reservoir sites and two tailrace sites. Only one site in the tailrace exhibited an active erosion problem (next to Pond 2). All five reservoir sites were along undeveloped, heavily vegetated shorelines with natural vegetative buffers; none exhibited active erosion problems. One tailrace site next to the project works was 100-percent stabilized with riprap. The site in the tailrace next to Pond 2, although bordered by a well-vegetated riparian zone, exhibited a steep erosion cut at the Pond 2 outflow pipe.

All seven sites surveyed at Georgia Power's project recreation facilities were rated as having stable or moderately stable banks. The most common potential sources of shoreline erosion inventoried at these sites included wave action from wind and watercraft and recreational access, the latter being a project-related effect. Although the surveyed sites had stable or moderately stable banks, Georgia Power land management personnel routinely monitor the entire shorelines of the recreation facilities and have identified a need to add protective riprap to the shorelines of four project recreation facilities, including Old Salem Park, Parks Ferry Park, Long Shoals Boat Ramp, and Armour Bridge Boat Ram (Figure 3). In addition, riprap is needed along the shoreline of Area C-5, a tract reserved for future recreation development that currently provides informal bank fishing access (Figure 4).

Sixty percent of the surveyed sites had shoreline structural stabilization structures in place, either seawall, riprap, or seawall with riprap at the base. The majority of sites with structural stabilization were located in the lower reservoir, middle reservoir, and Richland Creek embayment sections and were associated with residential lots. Fifty percent of the total

shoreline length surveyed had structural stabilization in place in the proportions of 21 percent seawall and riprap combined, 19 percent seawall only, and 10 percent riprap only.

The 15.67-mile transmission line included as part of the Wallace Dam Project (Section 3.3; Appendix C) is also located entirely within the Piedmont province and Southern Outer Piedmont ecoregion. Relief along the right-of-way (ROW) is gently sloping.

4.3.1.2 Environmental Impacts and Recommendations

Georgia Power proposes to continue operating the Wallace Dam Project in a pumped-storage mode for the generation of renewable peaking power. The Project would continue to supplement flows during drought to support the downstream Sinclair Project minimum flow requirements.

Shoreline Erosion and Sedimentation

Georgia Power's proposed operation would not adversely affect shorelines within the project boundary as a result of erosion and sedimentation. For normal operation, Lake Oconee would continue to be operated year-round between a full-pond elevation of 435.0 ft PD and elevation 433.0 ft, with average daily fluctuations of approximately 1.5 ft. Daily fluctuations would continue to be 2.0 ft or less 100 percent of the time.

During the drier seasons in some years, the daily maximum reservoir elevation may fall below 435.0 ft PD but the daily fluctuation typically remains within a 2.0-ft range. In drought years, the reservoir level may be drawn down seasonally in the summer or fall due to the combination of low inflows and downstream flow supplementation releases. During these periods, daily fluctuations also usually remain within 2.0 ft as long as pumpback operations can continue. During the period 1997-2016, the reservoir reached a peak elevation of 435.99 ft during a high-flow event and a low elevation of 430.59 ft during the 2007 drought. During the high-flow and low-flow events, the daily reservoir fluctuations remained less than 2.0 ft. With the exception of drought years, there tends to be little seasonal variation in reservoir operating levels. For the years 1997 through 2016 (September 2016), the elevations for Lake Oconee were analyzed on an hourly basis. For the total number of hours during this period, Lake Oconee was below elevation 433.0 ft only 5 percent of the total hours and above 435.0 ft for 14 percent of the total hours.

For the years 1997-2016, daily fluctuations of Lake Oconee were less than 2.0 ft on 100 percent of the days (Georgia Power, 2016a). Daily fluctuations were less than 1.0 ft on 83 percent of the days, and less than 0.75 ft on 57 percent of the days.

Reservoir fluctuations were identified during the shoreline reconnaissance survey as a potential source of erosion at five sites on Lake Oconee but other contributing sources of erosion were also observed, including wave action from wind and watercraft at four of the sites. None of the sites exhibited severe erosion or bank failure due to reservoir fluctuations.

Georgia Power's operations proposal would not adversely affect shoreline conditions in the project tailrace area. Although instantaneous project releases from Wallace Dam go as low as 0 cfs on a daily basis, there is no dewatering of the tailrace channel because it is located in the impounded upper reach of Lake Sinclair. Lake Sinclair is operated within a normal elevation range of 338.0 to 340.0 ft PD. Thus, daily fluctuations of Lake Sinclair average less than 2.0 ft.

The potential for shoreline erosion in the Wallace Dam tailrace area is further moderated by the use of riprap bank protection just below the dam, along the western shore of the tailrace channel, and along a portion of the eastern shore. In addition, bank and riparian zone vegetation helps to maintain bank stability and minimize erosion along both sides of the tailrace area. One exception is an active erosion problem area next to the Pond 2 outlet area along the eastern shore of the tailrace area.

Georgia Power proposes to repair the eroded shoreline at the Pond 2 waterfowl impoundment and inspect the water level control structure on the eastern shore of the Wallace Dam tailrace area within the Oconee WMA to conserve soil resources, maintain waterfowl refuge habitat, and protect water quality and aquatic habitat. The repair and inspection activities would be conducted in cooperation with WRD.

Shoreline Stabilization

Georgia Power proposes to install shoreline stabilization consisting of riprap at Old Salem Park, Parks Ferry Park, Long Shoals Boat Ramp, and Armour Bridge Boat Ramp (Figure 3) to protect the sites from further erosion. Protection of these sites would conserve soil resources, maintain bank fishing and other shoreline recreational uses, reduce sedimentation and turbidity in adjacent waters, and enhance littoral-zone aquatic habitat. Georgia Power proposes to install riprap along approximately 5,100 ft of shoreline at Old Salem Park, 6,000 ft of shoreline at Parks Ferry Park, 2,000 ft of shoreline at Long Shoals Boat Ramp, and 3,400 ft of shoreline at Armour Bridge Boat Ramp. Relevant scientific literature dealing with the effects of shoreline structural stabilization practices on littoral zone fish habitat supports the use of riprap, either alone or in front of sea walls, as providing more beneficial fish habitat than the use of seawalls alone (Georgia Power, 2016a).

Shoreline Erosion Next to Pond 2 in the Tailrace Area

To address an active erosion problem area documented in the tailrace area, Georgia Power proposes to repair the eroded shoreline next to Pond 2 and inspect the water level control structure for the waterfowl refuge in cooperation with GDNR. During PAD development, GDNR raised concerns about the streambank erosion occurring at this site. Georgia Power viewed the site from land in February 2015 and noted that the erosion cut is located on the dike creating the pond at the location of the water level control structure for the waterfowl refuge area. The dike is very steep along its entire length. In addition, the dike slopes are covered by various species of trees and other vegetation having the potential to compromise the integrity of the dike. Implementing the proposed measures in cooperation with GDNR would repair the

bank undercutting that is currently taking place next to the Pond 2 dike, conserve soil resources, assist GDNR in identifying needed repairs to the water level control structure, maintain waterfowl refuge habitat within Oconee WMA, and protect water quality and aquatic habitat in the tailrace area.

Construction of Proposed Enhancement Measures

Construction of the proposed shoreline stabilization measures and Pond 2 erosion repair, construction of the proposed forebay oxygen line diffuser system (Section 4.3.2), and construction of the proposed recreational enhancements (Section 4.3.6) would cause temporary shoreline disturbances in local areas. Georgia Power proposes to perform all construction associated with these enhancements in such a manner as to minimize impacts on shoreline vegetation, bank stability, and water quality. Proper erosion control and restoration practices during and immediately following all construction activities would minimize impacts. Construction of the proposed riprap stabilization would take place during the fall to minimize impacts to littoral-zone habitats and water quality during the spawning seasons of resident fish.

Unavoidable Adverse Impacts

Unavoidable adverse impacts would include temporary effects of shoreline disturbance from construction of proposed shoreline stabilization, the forebay oxygen line diffuser system, and proposed recreation enhancements. Impacts would be minimized through the implementation of best management practices (BMPs) for minimizing soil disturbance, controlling erosion, restoring natural contours, and re-vegetating disturbed areas.

4.3.2 Water Resources

4.3.2.1 Affected Environment

Water Quantity

Georgia Power calculated a daily inflow record at Wallace Dam using data from the two nearest USGS stream gages (Oconee River at Penfield and Apalachee River at Bostwick) and applying a ratio of the remainder of the ungaged drainage area (Georgia Power, 2015a, 2016b). Daily minimum, mean, and maximum inflows at Wallace Dam for the years 1997 through 2016 are provided in Table 3. Mean flows ranged from a low of 1,003 cfs in August to a high of 3,577 cfs in March. The highest mean daily flows occurred in the months December through April. The lowest mean daily flows occurred in the months August through October. The average annual discharge at Wallace Dam is approximately 2,037 cfs.

Water Withdrawals

Surface withdrawals supply the vast majority of water uses in the project vicinity (Jacobs, 2017). Two local governments/water utilities withdraw surface water from Lake Oconee

within the project boundary (GEPD, 2016a). The City of Greensboro in Greene County is permitted to withdraw 3.31 million gallons per day (mgd) and a monthly average of 3.00 mgd. The Greensboro intake is in the Oconee River embayment toward the upstream end of Lake Oconee. The City of Madison in Morgan County is permitted for maximum daily and monthly withdrawal of 2.0 mgd. The Madison intake is in the Apalachee River embayment toward the upstream end of Lake Oconee. Piedmont Water Resources in Greene County has also been permitted for maximum daily and monthly withdrawals of 2.0 mgd but does not have an intake on Lake Oconee at this time (GEPD, 2017).

Treated Wastewater Discharges

The majority of wastewater in the upper Oconee River basin is treated by facilities with point source discharges (Jacobs, 2017). In 2016, there were four water treatment plants, 10 land application permits, four private/industrial permits, and 18 National Pollutant Discharge Elimination System permitted discharges in the four nearest counties upstream of Lake Oconee, including Greene, Morgan, Oconee, and Clarke Counties (GEPD, 2016a). These discharges are primary sources of phosphorus to the reservoir. The addition of nutrients to the reservoir contributes to Lake Oconee's trophic status of mesotrophic conditions (Georgia Power, 2016b, 2017b).

Water Quality

Water Use Classifications and Attainment Status

GEPD (2015) classifies the water uses of Lake Oconee and the Wallace Dam tailrace area as Recreation and Drinking Water. These classifications also support the Fishing use. In addition to general criteria applicable to all waters, specific criteria apply to these water uses, including numeric criteria for bacteria, DO, pH, and temperature. The applicable DO numeric criteria are a daily average of 5.0 milligrams per liter (mg/L) and no less than 4.0 mg/L at all times.

GEPD (2016b) currently lists Lake Oconee as "assessment pending" relative to its attainment status because of occasional pH excursions outside the numeric criterion range of 6.0 to 8.5 at one of three stations monitored by GEPD, but sampling was recently suspended due to personnel issues. Georgia Power's monthly water quality sampling at nine stations in Lake Oconee in 2015-2016 found rare instances of pH above 8.5 (less than 1.5 percent of measurements) (Georgia Power, 2016b). GEPD (2016b) currently lists the Wallace Dam tailrace area (Lake Sinclair) as supporting its designated uses.

Numerous tributary streams to Lake Oconee upstream of the project boundary are listed as not supporting their designated uses due to fecal coliform violations and/or fish community impacts (GEPD, 2016b; Georgia Power, 2016b; Jacobs, 2017). Non-point sources and urban runoff are the likely causes of impairment to these streams. Sixteen miles of the Oconee River and 35 miles of the Apalachee River immediately upstream of Lake Oconee are impaired due

to fecal coliform violations. Segments of Richland Creek, Sugar Creek, Fishing Creek, and several other tributaries upstream of Lake Oconee also do not support their designated uses.

Studies have indicated that cattle farming areas in the Lake Oconee watershed contribute significantly to the impairment of main tributaries entering the lake (Bachoon et al, 2009). GEPD (2013) intends to propose rules for specific numeric criteria for Lake Oconee for chlorophyll-*a* and nutrients to reduce nutrient over-enrichment of the reservoir from human activities and natural sources in the upstream watershed. Proposed rules are expected by 2019.

Water Quality of Lake Oconee

Historically, quarterly water monitoring data collected by Georgia Power have indicated good overall water quality conditions in Lake Oconee (Georgia Power, 2015a). Georgia Power (2016b) conducted water quality monitoring of Lake Oconee from August 2015 through August 2016. Monitoring included monthly vertical profile measurements of water temperature, DO, pH, specific conductivity, and turbidity at 1-meter intervals throughout the water column at nine stations. Surface grab samples were collected quarterly at six stations and analyzed for a range of water chemistry parameters. In addition, Georgia Power (2016b) conducted hourly measurements of vertical profiles in Lake Oconee over the course of two, day-night sampling events in summer 2016 to represent normal summer generation and pumpback operations. Lake Oconee water quality monitoring, including vertical profiles and water chemistry, continued quarterly in a second season of study from fall 2016 through summer 2017 (Georgia Power, 2017b).

Quarterly water chemistry data indicated good overall water quality conditions in Lake Oconee for the duration of the two-year study (Georgia Power, 2016b, 2017b). As with historical data, total phosphorus concentrations, turbidity, and fecal coliform densities were usually higher at upstream or tributary stations, indicating likely influences from upstream non-point or urban runoff sources. Trophic State Index scores continued to indicate mesotrophic conditions.

Monthly water quality vertical profiles recorded for Lake Oconee from June 2015 through August 2016 revealed the extent of mixing in Lake Oconee that occurs as a result of pumpback operations. Typically, southeastern reservoirs exhibit summertime thermal stratification with warmer temperatures near the surface, a sharp decrease in temperature at mid-depths, and cooler waters at the bottom. The monthly temperature profiles at Station OC1 in the Wallace Dam forebay (Figure 7) show that the water column remained well mixed for most of the year with little variation from the surface to the bottom. Very limited thermal stratification was observed in the late spring and early summer (March-April 2016, June 2015, and June 2016). The monthly DO profiles at Station OC1 exhibited a similar pattern of relatively uniform values for most of the year, indicative of a well-mixed water column, but there was a more pronounced gradient of declining DO values with increasing depth observed in June 2015, June and July 2016, and to a lesser extent in March and April 2016. DO gradients near the surface in summer months were likely due to photosynthesis.

Seasonal water quality vertical profiles of Lake Oconee collected in 2003-2017 indicate that vertical stratification becomes most developed in the spring and early summer, as surface temperatures rise and cooler water is still available (Georgia Power, 2016b, 2017b). By August, the water column exhibits warmer temperatures and only narrow temperature variation from the surface to the bottom. The effects of mixing on reduced temperature variation were most evident in the forebay, at other mainstem reservoir stations, and the tributary embayments closest to Wallace Dam.

Hourly monitoring events conducted in Lake Oconee over day-night periods in July and August 2016 indicated that temporary stratification develops in the forebay and other mainstem locations during the quiet period following pumpback and during generation (Georgia Power, 2016b). However, once pumpback begins, the water column becomes completely mixed in the forebay, as water is pumped in from Lake Sinclair. Similar but less complete effects of mixing occurred at other mainstem reservoir sampling stations. Tributary locations, especially the one in Richland Creek, remain stratified throughout the generation and pumpback cycle with respect to DO concentrations and that dam operations have little short-term effects on water quality in Richland Creek.

Water Quality of Wallace Dam Tailrace Area

Georgia Power (2016b, 2017b) conducted continuous DO and water temperature monitoring in the Wallace Dam tailrace from July 2015 through September 2017 to characterize the effects of continued project operation on water quality. Water quality data were recorded every 60 minutes. The continuous monitoring data were aligned with real-time project operational data from the same periods, which indicated how the turbines were being operated (generation, pumpback, number of units). In addition, Georgia Power conducted hourly measurements of DO and water temperature in the tailrace area over the course of two, day-night events in August 2016.

The tailrace monitoring data indicated similar overall seasonal patterns between the two seasons of study. As average water temperature increased in spring and summer, average DO values decreased. As water began cooling in late summer and early fall, average DO values increased. Lower DO concentrations in summer months are expected as warmer temperatures decrease oxygen solubility in water and the growing season contributes additional biomass to the water column, increasing biological oxygen demand.

Summer tailrace DO values below 4.0 mg/L occurred daily during periods throughout much of the summer. These DO depressions were correlated with generation. In summer 2016, tailrace DO depressions occurred almost exclusively in June and July. In summer 2017, DO depressions began in May and extended into August. Pumpback operations and photosynthesis during interim daytime periods on the same days corresponded with increases in tailrace DO values usually, to above 4.0 mg/L. The DO values during generation corresponded with DO levels in the forebay of Wallace Dam at depths of 2 to 7 m and greater.

In water year (WY) 2016 (October 1, 2015, through September 30, 2016), DO values less than 4.0 mg/L occurred in 8.6 percent of the hourly readings (Georgia Power, 2017b). In water year 2017, 14.0 percent of the readings were less than 4.0 mg/L. Sixty-nine days of WY 2016 (19 percent) and 93 days of WY 2017 had daily average DO values less than 5.0 mg/L. Outside of the months May-August, tailrace minimum DO values were always higher than 4.0 mg/L.

Hourly tailrace monitoring events in August 2016 indicated water quality to be relatively uniform across the tailrace channel during each event (Georgia Power, 2016b). DO values decreased after generation began and remained low throughout the interim and pumpback periods. DO recovery began during the daylight interim period, presumably as a result of photosynthesis in Lake Sinclair.

Although DO depressions occurred daily in the tailrace area during summer generation, overall water quality conditions are good and support an aquatic community typical of southeastern reservoirs and the designated uses of the tailrace reach (Section 4.3.3.2). In addition, the tailrace supports important fishing and other recreational opportunities.

Transmission Line

The Wallace Dam transmission line is located entirely within the upper Oconee River basin. The headwaters and small streams crossed by the ROW, including Jenkins Branch, Crooked Creek, Turkey Creek, and Rooty Creek, all drain south to Lake Sinclair (Figure 3). The water quality of these streams is affected by non-point source runoff from rural and urban land uses. Turkey Creek and Rooty Creek are part of the total maximum daily load for fecal coliform in the Oconee River Watershed (EPA, 2002).

4.3.2.2 Environmental Impacts and Recommendations

Project Operations

During the drier seasons in some years, the daily maximum reservoir elevation may fall below 435.0 ft PD but the daily fluctuation typically remains within a 2.0-ft range. In drought years, the reservoir level may be drawn down seasonally in the summer or fall due to the combination of low inflows and downstream flow supplementation releases. During these periods, daily fluctuations also usually remain within 2.0 ft as long as pumpback operations can continue. During the period 1997-2016, the reservoir reached a peak elevation of 435.99 ft during a high-flow event and a low elevation of 430.59 ft during the 2007 drought. During the high-flow and low-flow events, the daily reservoir fluctuations remained less than 2.0 ft. With the exception of drought years, there tends to be little seasonal variation in reservoir operating levels. For the years 1997 through 2016 (September 2016), the elevations for Lake Oconee were analyzed on an hourly basis. For the total number of hours during this period, Lake Oconee was below elevation 433.0 ft only 5 percent of the total hours and above 435.0 ft for 14 percent of the total hours.

Georgia Power proposes to continue operating the Wallace Dam Project in a pumped storage mode for the generation of peaking power. The Project would continue to supplement flows during drought to support the downstream Sinclair Project minimum flow requirements.

Downstream Minimum Flow

Wallace Dam has no minimum flow requirement because it releases directly into the downstream Lake Sinclair. Georgia Power's Wallace Dam operation proposal would continue to support the minimum flow requirements of Sinclair Dam during drought. When Sinclair Dam's calculated inflow drops below 250 cfs, water from Lake Oconee is released to supplement Oconee River flows downstream of Sinclair Dam.

Lake Elevations during Normal, Drought, and Flood Operations

For normal operations, Lake Oconee fluctuates between elevation 435 ft PD, which is full pond, and elevation 433 ft PD. The average daily fluctuation of Lake Oconee is approximately 1.5 ft; however, 100 percent of the time daily fluctuations are 2.0 ft or less.

Georgia Power's operations proposal includes continuing to operate Lake Oconee within a 2.0-ft range to support the pumpback operations at Wallace Dam. Operating within this range enables Georgia Power to optimize the generating capacity of the Project to meet peak power demand. Maintaining this range allows for both consistent access to the reservoir for recreation. It also protects the various permitted intake structures on the reservoir.

During drought conditions and because of Wallace Dam's support role in meeting minimum flow requirements downstream of Sinclair Dam, there may be sustained low lake levels outside of the upper 2.0-ft range proposed during normal conditions. In most recent droughts, there was a gradual multi-month drawdown as the flows released downstream exceeded the incoming flows under extreme dry conditions. In 2016, the low level was approximately 5 ft below full pool elevation, and like previous droughts, occurred in the late fall. During developing drought conditions, Georgia Power proposes to notify GEPD, WRD, FWS, and FERC once the Lake Oconee lake level drops below the upper 3.0-ft range as an informational warning of developing extreme drought conditions. Even in drought conditions and resulting low lake levels, Georgia Power is still able to maintain the 2.0-ft fluctuation range limitation.

Outside of drought conditions, Georgia Power's operations proposal does not call for regular drawdowns of Lake Oconee because drawdowns are not conducted for homeowner and shoreline maintenance. However, there may be a future need to conduct a drawdown for planned dam maintenance activities. In this case, Georgia Power proposes to consult with WRD prior to any non-emergency drawdowns outside of the upper 2.0-ft range and notify FWS and FERC at least 10 days in advance. Under emergency operating conditions, the same agencies would be notified within 10 days after the incident.

During flood conditions, the lake elevation at Wallace sometimes rises above the 435-ft elevation (14 percent of the hours for 1997-2016). The turbine units are large and pass a large amount of flow (about 7,250 cfs at best gate setting and up to 8,825 cfs at full gate setting [Table 1]). There is also a minimum gate setting at which the turbines can operate without causing damage to the unit. During rising flood conditions, there is a point in time at which the rising inflows do not justify adding another turbine unit because it would make downstream flooding worse, and the units cannot be operated at a lower gate setting to match the inflow because they cannot be operated safely at such a low setting. During this condition, the reservoir elevation rises slightly until either the inflows subside or there is enough flow to justify adding another turbine unit.

Water Quality in the Tailrace Area

In its Comments on Relicensing Study Reports dated January 20, 2017, the GDNR WRD expressed concern about summer DO concentrations and requested that Georgia Power examine options for improving DO concentrations at the Project. Georgia Power (2017) filed a study plan for a newly proposed "Study of Aeration Methods to Enhance Summer Dissolved Oxygen in the Wallace Dam Tailrace Area" on February 20, 2017. The Director issued a determination on requests for study modifications and new studies on March 17, 2017, which approved the new study (FERC, 2017a).

Georgia Power (2017c) conducted the aeration methods study to identify and evaluate, using water quality data collected during the first season of study (2015-2016), technically feasible and cost-effective aeration methods for increasing summer DO concentrations in the tailrace area. To perform the aeration methods assessment, Georgia Power contracted the support of Richard J. (Jim) Ruane, Mark H. Mobley, and Paul J. Wolff, all highly experienced water quality management specialists who have designed aeration systems for similar large reservoir systems in the southeastern U.S. Their report (Ruane et al., 2017) is provided as an appendix to the study report.

The aeration methods assessment characterized and modeled the water withdrawal zone at the turbine intakes, screened a full range of aeration alternatives for technical feasibility and efficacy, modeled turbine aeration to assess the potential for turbine venting and the addition of forced air, and modeled in-lake aeration approaches (Georgia Power, 2017c). In all, ten aeration approaches were reviewed and evaluated for improving summer DO conditions in the Wallace Dam tailrace.

Two alternatives were identified as being technically feasible, including a forebay oxygen line diffuser system and draft tube aeration using compressed air. Conceptual designs were developed for these two alternatives for further evaluation and comparison as to installation and annual operation costs, practicality of system deployment, and other potential issues associated with system operation. In addition, Georgia Power conducted site visits of two oxygen line diffuser systems operated by the U.S. Army Corps of Engineers (USACE) at

J. Strom Thurmond Lake and Richard B. Russell Lake on the Savannah River, which are similar in overall design to the concept evaluated for Wallace Dam. The site visits provided an opportunity to discuss operation and maintenance of the systems with USACE personnel.

The study concluded that a forebay oxygen line diffuser system is the most technically feasible and cost-effective approach for enhancing summer DO concentrations in the Wallace Dam tailrace. Forebay oxygen line diffuser systems are designed to place oxygen in a reservoir in the intake withdrawal zone to meet a target DO concentration in the dam releases. Diffuser lines consisting of porous hose weighted to sink to depth are used to spread oxygen bubbles over a large area, sometimes more than a mile long, to obtain high oxygen transfer efficiencies. The diffusers are supplied with oxygen from an on-shore liquid oxygen storage facility. As the bubbles rise in the water column, they oxygenate water in the withdrawal zone above. The system is designed so that a sufficient volume of enhanced-DO water passes through the turbines and into the tailrace to meet the DO target. Oxygen line diffuser systems are currently being successfully operated at 15 hydropower projects across the U.S., including 11 applications in the southeastern U.S. Although draft tube aeration using compressed air would also be technically feasible, the installation costs would be substantially higher and important limitations for such a system would include potential total dissolved gas issues, reduced generating efficiency, and turbine maintenance issues.

The estimated capital cost of a forebay oxygen line diffuser system at Wallace Dam is $4,699,000 (Ruane et al., 2017). The cost estimate includes the diffuser lines, supply lines, and liquid oxygen storage facility. Annual liquid oxygen costs are estimated to range from $150,000 to $240,000 based on tailrace monitoring data for 2015 and 2016. By comparison, the estimated capital cost of draft tube aeration using compressed air is $15,190,000 (Ruane et al., 2017). This cost assumes two blowers per turbine. Estimated annual costs are $140,000 due to losses in net generation.

Proposed Forebay Oxygen Line Diffuser System

Based on the findings of the aeration methods study, Georgia Power proposes to install and operate a forebay oxygen line diffuser system in Lake Oconee to enhance summer dissolved DO concentrations in the Wallace Dam tailrace area. This system would benefit water quality in the tailrace and downstream fisheries, aquatic resources, and recreational fishing by supporting applicable water quality standards throughout the hottest months of the year. The analysis for the conceptual design showed that a diffuser system with a maximum oxygen capacity of 200 tons per day would be required for worst-case conditions, but that median oxygen use would be about 60 tons per day (Ruane et al., 2017). The conceptual design includes two sets of diffuser lines to provide operational flexibility for oxygen placement in the forebay. The two sets would be installed in sequence and extend longitudinally about 0.7 mile upstream of the dam as shown in Figure 8. The upstream set of diffusers would be operated to inject a low level of oxygen continuously to maintain an oxygenated forebay volume during non-generation. The set closest to the dam would be operated to boost oxygen

output during generation. The diffuser lines would be placed at various levels above the bottom to efficiently aerate the withdrawal zone. Operation of the system would be optimized to the extent practical to achieve tailrace DO concentration targets in the tailrace of 4.0 mg/L instantaneous and 5.0 mg/L daily average. The system would operate in the months May through August, when needed.

Installation of the proposed forebay oxygen line diffuser system in Lake Oconee would require the construction of an onshore liquid oxygen facility (Ruane et al., 2017). Georgia Power proposes to construct the facility at the location shown in Figure 9. The facility would include a driveway, liquid oxygen tanks, a vaporizer system, oxygen flow control valves, and piping leading to the reservoir. The liquid oxygen facility would be approximately 3 acres in total area on the northeast side of Wallace Dam in Hancock County.

Proposed Tailrace Monitoring

Georgia Power proposes to continuously monitor and report tailrace DO concentrations in the months May through September for 3 years following deployment of the forebay oxygen line diffuser system to verify DO enhancements in the tailrace area. The monitoring would be conducted using an automatic probe recording measurements at 60-minute intervals at Station OCTR in the tailrace. Prior continuous monitoring at the same location in 2015-2017, and hourly tailrace transect measurements from August 2016, validate station OCTR as being representative of tailrace water quality during project operations (Georgia Power, 2016b).

Cumulative Effects

Georgia Power operates the Wallace Dam Project as a peaking and pumped-storage plant. Daily reservoir fluctuations average about 1.5 ft and are 2.0 ft or less 100 percent of the time. By consistently operating Lake Oconee within a relatively narrow and highly predictable range of reservoir elevations, Wallace Dam operation also benefits public water supply intakes in the reservoir as well as the reservoir's designated Recreation uses. Georgia Power's proposal to continue operating the Project to supplement flows during drought to support the downstream Sinclair Project minimum flows would continue to enhance aquatic habitat for riverine species of fish and mussels, and highly migratory and diadromous fishes, in the Oconee River downstream of Sinclair Dam (Section 4.3.3.2).

Historical water quality studies and the two-year study conducted as part of the relicensing documented that Lake Oconee receives water from upstream watersheds that is high in nutrients. The main streams entering Lake Oconee and numerous other upstream tributaries are not currently supporting their designated uses, primarily due to impaired biological communities (fish or macroinvertebrates) or due to high fecal coliform levels (Jacobs, 2017). The surrounding agricultural land uses upstream of Lake Oconee are a likely a major contributor to the nutrient-enriched waters entering the reservoir and the water quality conditions that result in summer DO depressions in the Wallace Dam tailrace area. Georgia Power's proposal to install and operate a forebay oxygen line diffuser system would reduce

effects of nutrient enrichment originating in the upstream watershed and benefit downstream water quality, fisheries, aquatic resources, and recreation opportunities by supporting applicable water quality standards through the hottest months of the year.

Pending nutrient criteria for Lake Oconee will also bring about improved water quality. The state water plan has targeted both Lake Oconee and Lake Sinclair for the implementation of management practices to reduce nutrient loading in the upstream watershed (Jacobs, 2017). Reduced nutrient loading combined with the addition of oxygen to the forebay will increase the assimilative capacity of the reservoir for the incoming oxygen demand.

For these reasons, continued operation of the Wallace Dam Project would have a highly beneficial cumulative effect on the Oconee River in providing a popular fishery and recreation destination, as well as protecting the river's designated uses within the project reservoir and downstream of the Project to the free-flowing Oconee River below the Sinclair Project.

Unavoidable Adverse Impacts

Construction of the proposed forebay oxygen line diffuser system would likely have some short-term unavoidable adverse impacts upon water quality. Installation of the system would cause disturbance of soil and minimal disturbance to the reservoir bottom sediments. This could result in short-term adverse effects on local water quality with increased turbidity and oxygen demand from sediments and soils. All affects are likely to be short-term and minimal in magnitude.

4.3.3 Fish and Aquatic Resources

4.3.3.1 Affected Environment

The Wallace Dam Project is located on the upper Oconee River in the Piedmont of the larger Altamaha River basin. The upper Oconee River basin principally supports warm-water fisheries. The impounded waters of Lake Oconee dominate aquatic habitats within the project boundary and the principal fisheries inhabiting project waters are reservoir fisheries. Wallace Dam discharges directly into Lake Sinclair, which also supports a reservoir fishery. Free-flowing streams in the project area are the Oconee River, Apalachee River, and other tributaries entering Lake Oconee (Section 4.1.4). The Sinclair Project impounds 29.7 miles of river and separates Wallace Dam from the lower free-flowing reach of the Oconee River. The Oconee River flows 143 miles from Sinclair Dam through the Fall Line Hills District and into the Coastal Plain to join the Ocmulgee River and form the Altamaha River.

The upper Oconee River basin in the vicinity of the Wallace Dam Project supports about 57 species of fish (Table 4). The families with the most species include minnows, catfishes, sunfishes, suckers, and perches. Standardized surveys conducted by WRD have documented the occurrence of at least 28 species of fish within Lake Oconee (GDNR, 2014a); several other non-game species not targeted by the surveys also likely reside there. The principal sport fishes

inhabiting Lake Oconee include largemouth bass, black crappie, striped bass, white bass-striped bass hybrids (hybrid bass), white bass, channel catfish, blue catfish, flathead catfish, and a variety of sunfishes. Nine fish species believed to be introduced and non-native to the Oconee River basin occur in the project vicinity.

Lake Oconee

Lake Oconee covers 19,050 acres and has 374 miles of shoreline (Figure 3). The bottom is mostly clay with rocky outcroppings in some areas in the lower end of the reservoir, particularly around the confluence of the Oconee River and Richland Creek. Standing timber and fish plots (stands topped out below the surface) are distributed throughout Lake Oconee and provide cover for black crappie and other sunfishes, and serve as nursery habitat for forage species, including gizzard shad and threadfin shad (Van den Avyle and Petering, 1988). When Lake Oconee was constructed, about 1,250 acres of timber were left standing in flooded channels and smaller inlets as wildlife habitat. Fifty timber stands totaling about 250 acres were cut off 10 ft below the full-pool surface as submerged habitat for reservoir fish. Other important fish habitat structure in Lake Oconee includes anchored fish attractors, artificial reefs, native aquatic vegetation, sunken trees, spawning gravel, and riprap.

Based on a shoreline reconnaissance survey of Lake Oconee and the Wallace Dam tailrace area conducted in June 2016 (Georgia Power, 2016a, 2016c), the most frequently observed sources of littoral-zone fish cover, in descending order, were overhanging vegetation, docks and piers, riprap, emergent vegetation, and large woody debris. On the basis of proportional length, riprap was the predominant source of shoreline fish cover, followed by overhanging vegetation and docks and piers. Riprap was most prevalent in the lower reservoir, middle reservoir, and Richland Creek sections of Lake Oconee, where residential and resort development are widespread and riprap is commonly used to stabilize shorelines. Overhanging vegetation was the predominant cover type in the less developed upper reservoir section.

Lake Oconee supports a popular fishery for largemouth bass, black crappie, striped bass, hybrid bass, channel catfish, blue catfish, and a variety of other species (GDNR, 2017b). The lake has numerous public access areas providing for a wide range of boat- and bank-fishing opportunities and tournament fishing. Tournament fishing is popular and primarily targets largemouth bass. For the years 1996 through 2014, the average tournament bass weight on Lake Oconee (1.8 to 2.1 pounds [lbs]) ranked among the top five reservoirs in Georgia in 17 of the 19 years (Georgia Bass Chapter Federation, 1996-2014). The average largest bass reported in Lake Oconee tournaments during those years weighed from 3.5 to 4.6 lbs.

GDNR annually stocks striped bass and hybrid bass into Lake Oconee. Since 2011, stocking numbers have transitioned away from a predominance of striped bass to that of hybrid bass, based on angler preferences for hybrid bass (GDNR, 2017b). Current stocking rates are about 15 hybrid bass and 5 striped bass per acre.

Lake Oconee also provides a popular year-round catfish fishery. Blue catfish and flathead catfish were introduced in the mid-1990's and their populations expanded rapidly (Homer and Jennings, 2011). Anglers now have the opportunity to catch trophy-size catfish, with some blue catfish and flathead catfish exceeding 40 lbs (GDNR, 2017b).

Wallace Dam Tailrace Area

From Wallace Dam the Oconee River flows directly into Lake Sinclair, a 15,330-acre reservoir. Shorelines in the tailrace area are primarily forested downstream to the end of the project boundary. The Lake Sinclair fishery is dominated by many of the same reservoir species found in Lake Oconee (Table 4). Lake Sinclair supports a popular fishery for largemouth bass, hybrid bass, striped bass, channel catfish, blue catfish, black crappie, bluegill, and redbreast sunfish (GDNR, 2017b). The tailrace area also supports at least four species of native freshwater mussels, as described below.

Freshwater Mussels

The Altamaha River basin is inhabited by a freshwater mussel fauna consisting of about 18 species, seven of which are endemic to the basin (Johnson et al., 2012; Wisniewski et al., 2005). Two freshwater mussel surveys were conducted in summer 2016, one in Lake Oconee and the other in the Wallace Dam tailrace area (Dinkins, 2016a, 2016b). The surveys documented the occurrence of four native freshwater mussel species within the project boundary, none of which are listed as federally threatened or endangered, or state protected. All four species were found in both Lake Oconee and the tailrace area, including:

- Altamaha slabshell (*Elliptio hopetonensis*) – endemic;
- Inflated floater (*Pyganodon gibbosa*) – endemic;
- Paper pondshell (*Utterbackia imbecillis*); and
- Variable spike (*Elliptio* sp. cf. *icterina*).

The Lake Oconee mussel survey yielded 355 live specimens. All four species were found in the main channel and tributary embayments. The vast majority of mussels (98.3 percent) were found downstream of I-20. The most common species was Altamaha slabshell, which comprised 71 percent of the live native mussels found in Lake Oconee, followed in relative abundance by inflated floater, paper pondshell, and variable spike. The largest number of live mussels (168) was found at a main-channel site located 2 kilometers (1.2 miles) upstream of Wallace Dam, near the reservoir forebay. This was the only site where boulders were present and the only site where all four species were found together in Lake Oconee.

The Wallace Dam tailrace survey yielded 1,479 live specimens of the same four species. The Altamaha slabshell comprised 97.5 percent of all live native mussels found and was followed

in relative abundance by variable spike, and inflated floater and paper pondshell. The vast majority of the mussels found in the tailrace area (98.2 percent) occurred in the main channel. The largest number of live mussels (501) was found in the main channel about 300 meters (984 ft) downstream of the powerhouse along the east bank.

Migratory Fishes

The Wallace Dam Project is located approximately 310 river miles upstream of the Atlantic Ocean (Figure 1) and 35 river miles upstream of the Fall Line Hills District. Sinclair Dam impedes or blocks diadromous[3] and other migratory riverine fishes from migrating upstream into the project area.

Eight highly migratory and/or diadromous species presently occur in portions of the Altamaha River basin, including six anadromous[4] species, one catadromous species[5], and one migratory riverine species:

- Shortnose sturgeon (*Acipenser brevirostrum*) – anadromous; federally endangered;
- Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) – anadromous; federally endangered;
- American shad (*Alosa sapidissima*) – anadromous;
- Blueback herring (*Alosa aestivalis*) – anadromous;
- Hickory shad (*Alosa mediocris*) – anadromous;
- Striped bass (*Morone saxatilis*) – anadromous or highly migratory;
- American eel (*Anguilla rostrata*) – catadromous; and
- Robust redhorse (*Moxostoma robustum*) – highly migratory riverine.

Of the eight species, striped bass and American shad are the only species presently known to occur within the Wallace Dam project boundary. Striped bass occur as a land-locked population maintained by stocking, with no evidence or expectation of successful natural reproduction upstream of Wallace Dam. GDNR began stocking American shad into Lake Oconee in 2015 based on historical evidence that the species formerly occurred as far upstream in the Oconee River as Athens-Clarke County (GDNR, 2014b). Successful natural reproduction of American shad is not expected to occur upstream of Wallace Dam.

[3] Diadromous species migrate between freshwater and marine/estuarine environments to complete their life cycles.
[4] Anadromous species migrate from marine/estuarine to freshwater environments to spawn.
[5] Catadromous species migrate from freshwater to marine environments to spawn.

Downstream in the river basin, American shad migrate upstream as far as Sinclair Dam and likely spawn in portions of the lower Oconee River).

American eels presently range upstream in the Oconee River basin as far as Sinclair Dam, although a relatively recent occurrence is known from Hard Labor Creek upstream of Lake Oconee (Table 4) (GDNR, 2014c). No American eels have been reported from annual GDNR fishery surveys of Lake Oconee GDNR (2014a).

Shortnose sturgeon and Atlantic sturgeon, both listed as federally endangered species, use portions of the Altamaha River and lower Ocmulgee River and/or Oconee River downstream of Sinclair Dam for spawning runs. Critical habitat has been designated for Atlantic sturgeon to include the lower Oconee River below Sinclair Dam but not the Oconee River upstream of Sinclair Dam or Wallace Dam (National Oceanic and Atmospheric Administration, 2017).

Blueback herring and hickory shad are currently limited in distribution to the Altamaha River and Ocmulgee River (GDNR, 2014d; Straight et al., 2009).

Robust redhorse, a Georgia endangered species, is a migratory riverine species that inhabits the Oconee and Ocmulgee Rivers in the Altamaha River basin. It inhabits the Oconee River downstream of Sinclair Dam and a tributary of Lake Sinclair. Recent surveys upstream of Lake Oconee and in the Wallace Dam tailrace area did not detect the species (Robust Redhorse Conservation Committee's Oconee Technical Working Group, 2014, 2015; Zelko, 2012, 2013). Because the robust redhorse is currently undergoing status review by FWS to determine if federal listing is warranted, a more detailed account of the species is provided in Section 4.3.5 (Threatened and Endangered Species).

State Protected Aquatic Species

Georgia Power (2016c, 2016d) identified and evaluated federally and state protected species, and other species of interest, with known records of occurrence in the project vicinity. No federally threatened and endangered aquatic species are presently known to occur within the project boundary.

Four Georgia protected fish and freshwater mussel species potentially occur in the project vicinity (Table 12). State protected species in Georgia are listed as endangered, threatened, rare, or unusual, in descending order of rarity. None of these species are presently known to occur within the project boundary:

- Atlantic pigtoe (*Fusconaia masoni*) – Georgia endangered;
- Robust redhorse (*Moxostoma robustum*) – Georgia endangered;
- Altamaha shiner (*Cyprinella xaenura*) – Georgia threatened; and

- Goldstripe darter (*Etheostoma parvipinne*) – Georgia rare.

The mussel species Atlantic pigtoe, although reported for Hancock County, does not occur in the Oconee River basin. It inhabits the adjacent Ogeechee River basin. The goldstripe darter occupies spring-fed headwater creeks in the Coastal Plain downstream in the basin. The robust redhorse inhabits the Oconee River below Lake Sinclair and a tributary of Lake Sinclair but has not been found upstream of Wallace Dam (see Section 4.3.5).

Of the state protected aquatic species, only the Altamaha shiner presently occurs in the Oconee River basin upstream of Wallace Dam (Georgia Power, 2016c). This species is endemic to the Piedmont of the upper Altamaha River basin in north-central Georgia. The Altamaha Shiner inhabits rocky and sandy pools in creeks and small rivers. There are no known occurrence records of the species from Lake Oconee within the project boundary. Since 2010, the Altamaha Shiner has been reported from tributary streams upstream of Lake Oconee and outside of the project boundary (Albanese et al., 2015a). The nearest collections documented since 2010 were from the lower Apalachee River upstream of Lake Oconee. The most recent occurrence records from Richland Creek, Oconee River, and Hard Labor Creek just upstream of Lake Oconee are over 11 years old.

Transmission Line

Fish and aquatic resources inhabiting the headwaters and small streams crossed by the Wallace Dam transmission line likely include several of the same fish species listed for smaller tributaries to Lake Oconee (Table 4).

4.3.3.2 Environmental Impacts and Recommendations

Project Operations

Georgia Power proposes to continue operating the Wallace Dam Project in a pumped storage mode for the generation of peaking power. The Project would also be operated to continue to supplement flows during drought to support the downstream Sinclair Project minimum flow requirements. Supporting the downstream Sinclair minimum flow requirements would continue to enhance aquatic resources in the Oconee River downstream by maintaining flow regimes in the free-flowing reach of river downstream of Sinclair Dam and moderating fluctuations of Lake Sinclair.

Georgia Power's proposed operation would not adversely affect fish and aquatic resources because daily fluctuations of Lake Oconee would continue to be 2.0 ft or less 100 percent of the time, there would be no dewatering of the tailrace area because it is within the impounded upper reach of Lake Sinclair, and average daily fluctuations of Lake Sinclair would continue to be less than 2.0 ft. Annual GDNR fishery survey data for Lake Oconee indicate an overall healthy and balanced fish community typical of southeastern Piedmont reservoirs. In addition, recent and historic water quality monitoring data show that although pumpback causes mixing

of the entire water column of the lower mainstem reservoir during summer, water temperature and DO conditions within the forebay and lower reservoir remain within acceptable ranges for most of the resident sport fish species, as analyzed below.

During drought years, Wallace Dam operations to support downstream Sinclair minimum flow requirements would result in periods of up to several months when the elevation of Lake Oconee falls below its normal operating range. Lake Oconee drawdowns during several recent drought years were up to 5 ft below the normal full pond elevation (Georgia Power, 2015a). The lowered elevations would occur only during the drier months of drought years, usually from mid-summer to fall, after the spring and early summer spawning seasons of many resident sport fishes. The drought drawdowns would reduce the area of available littoral-zone habitat for the rearing of young fish. However, impacts to Lake Oconee habitat would be offset by maintaining consistency of littoral-zone habitat in Lake Sinclair over the drought period and sustaining minimum flow releases downstream of Sinclair Dam. Continued drought operations in this manner would not be expected to result in significant adverse effects to fisheries resources in Lake Oconee and the Oconee River.

Summer Habitat for Sport Fishes

Lake Oconee

During pre-filing consultation, GDNR WRD expressed interest in the effects of continued project operations on summer reservoir water quality and habitat for sport fish species such as largemouth bass and striped bass (J. Biagi, GDNR, June 15, 2015 letter to K.D. Bose, FERC). To address this concern, Georgia Power (2016c) assessed the availability of suitable summer water quality for sport fish species in Lake Oconee. The assessment used water quality data collected by Georgia Power, standardized fisheries survey data for Lake Oconee collected by WRD, and species-specific water quality preference criteria reported in the scientific literature.

First, vertical water temperature and DO profile data collected during the warmest months of the year were analyzed for the spatial and temporal extent of mixing that occurs in Lake Oconee from pumpback and generation cycles. Based on mixing tendencies and patterns, the reservoir was segregated into three areas for analysis of the fisheries data: mainstem reservoir, tributary embayments, and upstream reservoir. Next, multiple years of fisheries survey data for the lake were analyzed to compare population characteristics of representative sport fishes between these different areas of the reservoir. The analysis included largemouth bass and striped bass as the primary species of interest, as well as black crappie, bluegill, and hybrid bass. In addition, summer habitat suitability for largemouth bass and striped bass in Lake Oconee was evaluated on the basis of temperature, DO concentration, and time of year, with consideration for ranges defined by scientific literature sources as appropriate for each species.

Most sport fish species residing in Lake Oconee are capable of tolerating seasonally high water temperatures and occasionally lower DO levels in summer. GDNR standardized fishery survey data for Lake Oconee indicate an overall healthy and balanced fish community (Georgia

Power, 2016c). Recent and historic water quality monitoring data show that although pumpback operations cause mixing of the entire water column of the lower mainstem reservoir by August, water temperature and DO conditions remain within acceptable ranges for most of the resident sport fish species.

One exception is striped bass. Summer temperature profiles for Lake Oconee sufficiently explain the limiting nature of habitat suitability for striped bass, as reflected in low catch rates and low relative condition of the population based on length-weight relationships (Georgia Power, 2016c). Summer water temperatures exceeding 29°C throughout the reservoir in many summers is likely the principal factor limiting survival and growth of the population. While juvenile striped bass have a higher thermal tolerance, up to 32°C (90°F), adult striped bass prefer temperatures around 25°C (77°C) or less and begin to experience mortality above 28 or 29°C (82-84°F) (Crance, 1984; Coutant, 1985, 2013). Although suitable DO conditions were available throughout much of the reservoir, by late July and August, temperatures were often higher than temperature criteria defining suitable adult striped bass habitat. Thus, the evidence indicates that it is naturally high water temperatures throughout Lake Oconee, and not low DO concentrations, that limit the availability of suitable summer habitat for striped bass (Georgia Power, 2016c). Hybrid bass on the other hand, which are now stocked in larger numbers than striped bass, exhibit a wider tolerance range to temperature than striped bass. Hybrid bass can tolerate a temperature range of 4-33°C (33-91°F) although optimal growth is between 25-27C (77-81F) (Hodson, 1989).

Largemouth bass survival and growth are supported by summer water quality conditions in Lake Oconee based on the documented temperature and DO tolerances of largemouth bass (Georgia Power, 2016c). The catch rates, relative condition, and length-frequency distribution of largemouth bass in Lake Oconee indicate the presence of an overall healthy population. In addition, the weight characteristics of tournament bass caught in Lake Oconee compare favorably to other Georgia reservoirs.

Wallace Dam Tailrace

Continuous DO monitoring in the Wallace Dam tailrace recorded summer DO depressions below 4.0 mg/L and daily average values less than 5.0 mg/L in parts of three consecutive summers, 2015-2017 (Georgia Power 2016b, 2017b). DO depressions occurred daily during periods in May, June, July, and/or August, with instantaneous values occasionally falling below 2.0 mg/L. Although most sport fishes found in the project reservoir and tailrace are warmwater, habitat-generalist species capable of tolerating high water temperatures and DO levels below 4.0 mg/L for short periods, prolonged exposure to low DO concentrations leads to stress and may result in avoidance or compromise growth and survival of some species and life stages (Georgia Power, 2016c, and references cited therein). Nevertheless, resident fishes in upper Lake Sinclair are likely to use tailrace habitats in the summer despite warm temperatures and daily DO depressions below 4.0 mg/L. Channel catfish, bluegill, threadfin shad, redbreast sunfish, largemouth bass, and other species likely find suitable summer habitat

within the tailrace area. Based on historical Georgia WRD electrofishing data, collected annually in September, sportfish abundance (e.g., largemouth bass, bluegill, redbreast sunfish, and black crappie) immediately below the Wallace Dam tailrace area does not differ considerably from other locations in Lake Sinclair. In addition, native mussel species inhabit the reach. The tailrace mussel survey in August 2016 found four native species of mussels, with the greatest numbers occurring a short distance downstream of the powerhouse (Section 4.3.3.1, Freshwater Mussels). Thus, the tailrace area supports self-sustaining populations of aquatic species indicative of a balanced community. In addition, it offers recreational fishing opportunities below Wallace Dam.

Continuous tailrace monitoring data indicate that the tailrace is unlikely to provide suitable adult striped bass habitat for much of the summer due to water temperatures exceeding 29°C (Georgia Power, 2016b, 2017b). Georgia Power's proposal to install and operate a forebay oxygen line diffuser system to enhance summer DO concentrations in the tailrace (see below) would improve overall summer sport-fish habitat in the tailrace area (and in the forebay) by supporting applicable water quality standards throughout the hottest months of the year. However, naturally high water temperatures would continue to limit the availability of suitable summer habitat for striped bass both in Lake Oconee and the tailrace area.

Proposed Forebay Oxygen Line Diffuser System to Enhance Summer DO

Georgia Power proposes to install and operate a forebay oxygen line diffuser system to enhance summer DO concentrations in the Wallace Dam tailrace area (Section 4.3.2.2). The conceptual design includes two sets of diffuser lines extending about 0.7-mile long in the Lake Oconee forebay (Figure 8). The longer upstream set of diffuser lines would inject a low level of oxygen continuously to maintain an oxygenated forebay volume during non-generation, while the shorter downstream set of diffuser lines would boost oxygen output during generation. Operation of the system would be optimized to the extent practical to achieve tailrace DO concentration targets in the tailrace of 4.0 mg/L instantaneous and 5.0 mg/L daily average. The system would operate in the months May through August, when needed.

Operation of the proposed forebay oxygen line diffuser system would enhance summer DO concentrations in the Wallace Dam tailrace area and benefit downstream water quality, fisheries, aquatic resources, and recreation opportunities by supporting applicable water quality standards throughout the hottest months of the year. Habitat in the tailrace area would be enhanced for the fish community, including sport fishes, freshwater mussels, and other aquatic species by reducing the potential for chronic stress from low DO, which otherwise could result in avoidance of the tailrace area and/or reduced feeding, growth, and survival. Summer recreational fishing prospects would also be improved by increased activity and feeding levels of sport fishes. Although summer DO conditions would be enhanced, water temperature would not be affected, and therefore, naturally warm temperatures would continue to limit summer habitat availability for adult striped bass.

Operation of the oxygen line diffuser system would also increase summer DO levels in the forebay withdrawal zone of Lake Oconee. Based on the conceptual design, the area of DO improvement would extend about 0.7-mile upstream of the dam (Ruane et al., 2017; Georgia Power, 2017c). This zone has a surface area on the order of 275 acres, or about 1.5 percent of the surface area of the lake. Rising bubbles from diffuser lines near the bottom would increase DO levels in the water column, thereby enhancing conditions for species occupying open waters of the forebay. Although the Lake Oconee fishery is balanced and healthy and no evidence was found of summer DO stress (Georgia Power, 2016c), the increased DO levels would improve water quality in the forebay and likely contribute favorably to feeding, growth, and survival. The fish most likely to benefit from increased DO would be schooling forage fish (threadfin shad, gizzard shad, and stocked American shad), the pelagic sport fish hybrid bass and striped bass (when temperatures are suitable), and larger catfish and bass that feed in the lower mainstem reservoir. Native freshwater mussels in benthic habitats near the forebay could also benefit from increased DO levels, although the diffuser lines would be placed at various levels above the bottom. The summer 2016 mussel survey found the largest number of live mussels at a main-channel site with boulders about 1.2 miles upstream of the dam (Section 4.3.3.1, Freshwater Mussels).

Fish Passage

Georgia Power's proposed operation of the Wallace Dam Project would have little or no additional effect on upstream passage of highly migratory or diadromous fish species. The Project is located 310 river miles upstream of the Atlantic Ocean and 29.7 miles upstream of Sinclair Dam on the Oconee River (Figures 1 and 2). Sinclair Dam impedes upstream migration of highly migratory and diadromous fish species into the project area.

Striped bass and American shad stocked into Lake Oconee would continue to have the ability to pass downstream through the Wallace Dam powerhouse into Lake Sinclair, and most of these fish would be expected to survive turbine passage (see below). However, there is no evidence that either species can successfully reproduce upstream of Wallace Dam or that spawning and rearing habitats are available, and therefore, upstream passage at Wallace Dam currently is not a factor in their ability to complete their life cycles in the Altamaha River basin. Moreover, coastal runs of shortnose sturgeon, Atlantic sturgeon, American shad, blueback herring, hickory shad, striped bass, and American eel would all be limited in the upstream extent of their natural migrations in the Oconee River by Sinclair Dam.

Fish Entrainment and Turbine-Induced Mortality

Fish approaching the powerhouse intake in Lake Oconee during generation, and the draft tubes on the downstream side of the powerhouse during pumpback, may become entrained and subjected to the risks of turbine-induced injury or mortality. Georgia Power (2016c) analyzed the potential for fish entrainment and turbine-induced mortality at the Wallace Dam Project using an approved desktop approach, drawing upon entrainment field studies completed at

numerous other hydroelectric projects, including other pumped storage facilities. Common trends and data from other studied sites were applied with consideration of the site-specific physical, operational, and fisheries characteristics of the Wallace Dam Project. The fish entrainment analysis described the likely size distribution, species composition, and seasonal distribution of fish entrainment occurring at the Project, with emphasis on applying data from 11 other southeastern sites, including the Richard B. Russell and Jocassee pumped storage sites in the nearby Savannah River basin. Potential differences in the magnitude of entrainment between generation and pumpback were evaluated based on sampling trends from the Richard B. Russell and Jocassee sites. The likely mortality rates of entrained fish passing through the Wallace Dam turbines were assessed based on detailed examination of the turbine passage survival database prepared by the Electric Power Research Institute (EPRI, 1997). In addition, to address interests expressed by WRD during pre-filing consultation, the fish entrainment evaluation reviewed turbine passage survival study data for American shad and assessed the potential implications of entrainment to striped bass and hybrid bass management.

In its comments on Georgia Power's fish entrainment evaluation (Georgia Power, 2016c), WRD requested additional information and analysis, including an estimate of the total number of fish entrained, hourly operational data, bar spacing for the draft tube trashracks, and how these factors affect entrainment (J. Biagi, GDNR, January 20, 2017 letter to K.D. Bose, FERC). Based upon FERC's subsequent approval of WRD's requested modifications to the Fish Entrainment Evaluation (T. L. Turpin, FERC, March 17, 2017 letter to C.R. O'Mara, Southern Company Generation), the analysis below incorporates additional hourly operational information, the bar spacing of the intake trash racks and the draft tube trash racks as provided in Section 2.1.1, and estimates the total number of fish entrained annually.

Entrainment Size Distribution

Common trends and data from other studied hydroelectric sites, including nine sites in South Carolina and Georgia, indicate that small and/or young-of-year (YOY) fish less than 6 inches long likely comprise the vast majority of fish entrained by the Wallace Dam Project during generation and pumpback (Georgia Power, 2016c). Based on size-class composition of entrainment samples from 42 hydroelectric developments, fish less than 4 inches long averaged 68.4 percent of entrainment, and fish less than or equal to 6 inches long averaged 85 percent of entrainment (EPRI, 1997). At Richard B. Russell, fish less than or equal to 6 inches long comprised 89 percent of entrainment during conventional generation, with fish under 4 inches long comprising 71 percent of total entrainment.

Sampling of pumpback entrainment at Jocassee and Richard B. Russell reported similar findings with respect to the numerical dominance of small fish (Georgia Power, 2016c, and included references). At Jocassee, 71 percent of fish entrained by generation were under 6 inches, and 86 percent of fish entrained by pumpback were under 6 inches (Degan and Mueller, 2013). Ninety-four percent of the pumpback sample at Richard B. Russell was less

than 5.4 inches long. Wallace Dam entrainment is likely to be similar to these sites in being proportionally dominated by small and YOY fish less than 6 inches long.

Existing studies reviewed in the fish entrainment evaluation found no consistent associations or apparent relationships between trash rack bar sizing and the size of entrained fish (FERC, 1995; Winchell, 2000). The steel trash racks in front of the Wallace Dam powerhouse intake consist of vertical bars with clear spacing between bars ranging from 9.5 to 10.5 inches. The steel trash racks in front of the downstream draft tubes consist of vertical bars with clear spacing between bars of 10.5 inches, with openings at each end being 16.5 inches. Virtually all species and size classes of fish residing in Lake Oconee could pass through the racks. Nevertheless, field studies across a wide range of trash rack spacing indicate that the majority of entrained fish are small, the vast majority are much smaller than the length of fish that could pass through the trash racks, and the size of entrained fish tends to be similar among sites in spite of differing trash rack spacing (FERC, 1995; EPRI, 1997). For instance, the Youghiogheny site in Pennsylvania has 10-inch clear spacing between bars, comparable to that of Wallace Dam, yet 99.2 percent of the entrained fish were less than 4 inches long. The Richard B. Russell site has trash rack spacing of 8 inches, yet fish smaller than 6 inches comprised 89 percent of entrainment (conventional generation). Thus, reducing trash rack bar spacing at the Wallace Dam Project would not be expected to substantially affect the size distribution of entrained fish; small fish would continue to be the most susceptible.

Entrainment Species Composition

Entrainment studies at other southeastern hydroelectric sites indicate that entrainment at Wallace Dam is likely to be numerically dominated by species of shad, sunfishes, and/or catfishes (Georgia Power, 2016c). At sites with higher densities of shad as forage fish, shad may strongly dominate entrainment composition, especially where over-winter survival of threadfin shad populations is variable due to cold-weather conditions. As sites where shad densities are lower, or in years following severe winter kill of threadfin shad when standing stocks of shad are low, sunfishes, catfishes, and other species may comprise a larger proportion. Minnows and suckers also may be commonly entrained. Species of all of these families are well represented in Lake Oconee and Lake Sinclair. Entrainment during generation and pumpback at Richard B. Russell is numerically dominated by threadfin shad and blueback herring, reflecting the tremendous abundance of these forage species in large impoundments on the Savannah River. The entrainment sampling conducted at the Jocassee site used hydroacoustic monitoring to estimate entrainment numbers and sizes of fish, while reservoir fish collections indicated that threadfin shad and blueback herring were the dominant forage species and corresponded in size with the entrained fish (Degan and Mueller, 2013).

A substantial proportion of entrained fish at the Wallace Dam Project likely consists of small or YOY sport-fish species, including bluegill, black crappie, other sunfishes, and catfishes. The sunfish, catfish, and perch families commonly comprised over 50 percent of entrainment of sites in the EPRI database. Notably, largemouth bass, one of the region's premier sport fish,

was absent from the top five entrained species at southeastern projects (Georgia Power, 2016c). Similarly, striped bass and hybrid bass were absent from the top entrained species. The relative abundance of sport fish species in pumpback entrainment at Richard B. Russell was low, only 0.03 percent for largemouth bass, 0.02 percent for striped bass, and 0.01 percent for hybrid bass. Ninety-seven percent of the entrained striped bass and 84 percent of the entrained hybrid bass were less than 15 inches long (Nestler et al., 1999). While these popular sport fishes are likely to occasionally be entrained at Wallace Dam, they do not appear to be especially susceptible to entrainment.

The potential for striped bass, hybrid bass, and white bass to become entrained by Wallace Dam generation flows may be highest in early summer, as the water column warms and fish actively seek cooler water deeper in the forebay. Lake Sinclair populations may become more susceptible to entrainment by pumpback operations in early spring, when upstream migrant adults tend to congregate in the Wallace Dam tailrace area; however, these fish are also larger and thus more capable of escaping intake velocities near the draft tubes.

Entrainment Seasonal Distribution and Pumpback Operations

Peak entrainment rates during generation at Wallace Dam likely occur in the spring and summer for most species, when young fish are most abundant and tend to be dispersing between habitats, but entrainment rates for shad may peak in the fall and winter (Georgia Power, 2016c). Based on studies conducted at the Richard B. Russell and Jocassee pumped storage sites, where the majority of entrained fish are threadfin shad and blueback herring, more fish are likely to be entrained during pumpback than generation. Factors likely contributing to higher entrainment rates during pumping include the shallower depth and narrower width of the tailrace area, closer proximity of shallow-water habitats, and the seasonal behavior and diurnal activity of some fish. In contrast, the open forebay and deep-water location of the Lake Oconee intake is relatively distant from shoreline and littoral-zone habitats.

Table 5 summarizes monthly total generation at the Wallace Dam Project for the past 20 years (1997-2016). These data show that total generation is usually highest during the summer months, when energy demand is high. Pumpback duration would also be highest during these summer months to meet the generation demand and because mean monthly inflow is lower during summer months, requiring extended pumpback to refill Lake Oconee.

Tables 6 and 7 summarize Wallace Dam hourly generation and hourly pumpback, respectively, by month for the water years 2016 and 2017[6]. Generation occurs primarily in the afternoon and early evening hours. Pumpback occurs primarily between midnight and the early daylight hours.

[6] A water year is the 12-month period October 1 – September 30. Water years 2016 and 2017 correspond closely with the first and second seasons of water quality monitoring in the Wallace Dam tailrace area (Georgia Power, 2016b, 2017a).

Tables 8 and 9 summarize Wallace Dam generation hours by unit for the water years 2016 and 2017. Units 3 and 4 tend to be used most frequently for generation. They are the modified propeller turbines that are not reversible (Table 2). Pumpback typically uses three or four of the reversible units (Units 1, 2, 5, and 6) each month. Pumpback hours are spread relatively evenly among all four units in many months.

Hydroacoustic sampling at the Jocassee site estimated that annual pumpback entrainment was about 2.7 times higher than generation entrainment (Table 10). Monthly entrainment rates during generation ranged from a low of 55 fish per hour in June to a high of 189 fish per hour in January. Monthly pumpback entrainment exhibited much more pronounced seasonal variation, ranging from 61 fish per hour in February to 468 fish per hour in July.

Wallace Dam Entrainment Extrapolation

To estimate the order of magnitude of annual and seasonal entrainment potentially occurring at the Wallace Dam Project, monthly entrainment rates from the Jocassee site in South Carolina were applied to Wallace Dam monthly operations data for the water years 2016 and 2017. Table 11 compares the operational and physical characteristics of the two hydropower developments. The Jocassee site was selected as the basis of extrapolation because it shares similar operational characteristics with Wallace Dam, it is also located in a southeast Atlantic Coast river basin and therefore overlaps in fish species composition, and quality monthly operational and entrainment data are readily available for use. The Jocassee site is part of the Duke Energy Carolinas, LLC (Duke Energy) Keowee-Toxaway Hydroelectric Project (FERC No. 2503). The turbine hydraulic capacities for generation and pumpback are similar between the two sites. The mean unit hydraulic capacities are 9,050 cfs for Jocassee and 8,424 cfs for Wallace Dam. Both projects use four pumpback units. Mean pumpback hydraulic capacities are 7,930 cfs for Jocassee and 6,700 cfs for Wallace. In addition, the Francis reversible turbines at each site are large in diameter and have relatively low operating speeds (120 rpm or less) (Normandeau Associates, Inc., 2013). The entrainment extrapolation assumes that the pelagic fish community at Wallace Dam is dominated by shad, and is similar in density and susceptibility to entrainment as the pelagic fish community at the Jocassee site, and that seasonal variation in entrainment is similar. The fact that the Jocassee reservoir supports a large population of blueback herring and Lake Oconee does not (shad species in Lake Oconee include threadfin shad and gizzard shad) suggests that the entrainment estimate extrapolated to the Wallace Dam Project is conservatively high. While entrainment estimates are extrapolated by month, it is not possible to extrapolate species and size class data from the Jocassee site because the species detected passing through the turbines were not identified and size-class estimates by month were not presented (Degan and Mueller, 2013).

Table 12 provides monthly hours of generation and pumping for the Wallace Dam Project for water years 2016 and 2017. The average monthly operations data for both years were applied to the monthly Jocassee entrainment rates from Table 10 to derive estimates of monthly entrainment at the Wallace Dam Project (Table 13). Based on this extrapolation and its

assumptions, total annual entrainment at the Wallace Dam Project is estimated to be on the order of 2,453,631 fish. Based on actual Wallace Dam generation and pumping hours for 2016-2017, the estimate includes 787,057 fish entrained during generation and 1,666,574 entrained during pumpback. Pumpback entrainment is estimated to be about 2.1 times higher than generation entrainment.

Turbine Passage Mortality

The results of turbine passage survival studies conducted at other hydroelectric sites indicate that the mostly small fish entrained by the Wallace Dam Project are likely to survive turbine passage. Trends in turbine passage survival studies at numerous hydroelectric sites predict average immediate survival rates at Wallace Dam in the range of 91 to 95 percent for small fish and 83 to 88 percent for moderate-sized and large fish, depending on the unit type.

GDNR has expressed interest in striped bass and hybrid bass regarding turbine passage because of their migratory behavior and the resources expended on their management. Stocked fingerlings and small juveniles may be the size classes of striped bass and hybrid bass most susceptible to entrainment at Wallace Dam during generation because fingerlings are stocked annually at a rate of about 20 total fish per acre in Lake Oconee. These young fish likely school in open waters and may exhibit downstream migratory behavior as juveniles. They become vulnerable to entrainment as they approach the dam; however, because of their small body size, the vast majority would be expected to survive turbine passage. Adult striped bass and hybrid bass, while large and potentially subject to higher turbine mortality rates if entrained, are facultative in their downstream migratory behavior and may not be as strongly inclined to migrate downstream, as evidenced by low numbers of striped bass in entrainment samples at other sites (Georgia Power, 2016c). In addition, adult striped bass have strong swimming capabilities and would be much more capable of escaping intake velocities. Furthermore, the striped bass habitat analysis indicates that summer habitat conditions are sub-optimal for adult fish, especially in the lower end of the reservoir near the dam. By late August in most years, temperatures throughout the water column become unsuitably warm for adult striped bass.

Assuming that annual entrainment at Wallace Dam is on the order of 2,453,631 fish, that 75 percent of all entrained fish are small fish (less than or equal to 6 inches), that turbine-passage survival rates are 93 percent for small fish and 85 percent for larger fish, then total annual entrainment mortality could be on the order of 220,827 fish.

Entrainment losses of young fish, which typically exhibit high rates of natural mortality due to density-dependent factors (e.g., limited habitat space or food), may tend to be offset by increased survival of the young fish remaining in the reservoir due to reduced competition for limiting resources. Compensatory density-dependence operates to offset the loss of individuals in populations, allowing populations to persist under conditions of increased mortality. Increased mortality in fish populations may occur from natural causes (food availability, predation, disease, etc.) or from anthropogenic activities, such as fishing, introductions of non-

native species (e.g., blue catfish), or power plant operations. Compensatory density-dependence, which is a major underlying assumption in the management of fish populations, may be an important factor in offsetting losses of young fish due to entrainment mortality.

The fact that entrainment occurs does not necessarily equate with high potential for adverse impacts of entrainment to resident fish population. Entrainment may be higher at some sites simply because the resident fish populations are healthy and produce high relative abundance of juvenile fish that may become susceptible to entrainment as they disperse between habitats or approach the dam.

Overall, Lake Oconee supports a healthy fishery and evidence is lacking to suggest that current levels of fish entrainment and turbine mortality may be adversely affecting the fish community of Lake Oconee and the Oconee River. Continued operation of the Wallace Dam Project is likely to have only minor effects on fish populations and recreational fishing opportunities as a result of fish entrainment and turbine-induced mortality.

Cumulative Effects

Continued operation of the Wallace Dam Project would likely contribute to cumulative effects on fisheries and aquatic resources to a relatively small extent due to the Project's location and physical attributes. The project dam is located upstream of the Fall Line Hills District that posed a natural obstacle to the upstream migration of some diadromous and other highly migratory species. The Fall Line area delimits the historic distribution of many species or life stages of fish and mussels preferring either Piedmont or Coastal Plain habitats. Sinclair Dam downstream of the Project would continue to regulate the river flow, and it and Barnett Shoals Dam upstream of Lake Oconee would impede fish migration and limit tributary connectivity irrespective of the continued operation of the Project.

Georgia Power's proposal to continue operating the Project to supplement flows during drought to support the downstream Sinclair Project minimum flows would continue to enhance aquatic resources in the Oconee River. These minimum flows provide for the maintenance of flow regimes in the free-flowing reach of river downstream of Sinclair Dam. The Oconee River downstream of Sinclair Dam provides habitat for the Georgia endangered robust redhorse, hosts spawning runs of diadromous fishes, and recently was designated as critical habitat for the federally endangered Atlantic sturgeon.

The cumulative effects of Georgia Power's licensing proposal on diadromous fish migrations would be minor, if any. There are no fish passage facilities at Lake Sinclair downstream or Barnett Shoals Dam upstream. The striped bass and American shad stocked upstream of Wallace Dam, although part of restoration efforts for each species, are not expected to result in the establishment of reproducing populations upstream of Wallace Dam for lack of sufficient length of free-flowing river upstream for drifting early stages.

Cumulative entrainment mortality effects for the fish species inhabiting the Oconee River are likely to be relatively minor. Only a small proportion of the fish entrained during generation and pumpback would likely be killed by turbine passage, and the losses of these mostly small and YOY fish would be of minor significance to the existing fisheries resources. Moreover, Lake Oconee sustains a healthy and highly popular recreational fishery with numerous public access points that would not exist without the Project. In this regard, the Project contributes beneficially to cumulative effects in the Oconee River basin. These benefits far outweigh the mostly minor effects of entrainment mortality.

Unavoidable Adverse Impacts

Unavoidable fish losses resulting from entrainment mortality would continue to occur with continued project operation. These losses, however, would not significantly affect fish populations and recreational fishing opportunities in the Oconee River.

4.3.4 Terrestrial Resources

This section evaluates the effects of the proposed action on terrestrial wildlife and botanical resources as well as wetlands, riparian, and littoral habitats.

4.3.4.1 Affected Environment

Georgia Power (2016e) conducted a terrestrial resources study to describe terrestrial wildlife and botanical resources occurring in the project area that use representative upland habitats and to describe floodplain, wetlands, and riparian habitats occurring in the project area. Field reconnaissance surveys were conducted in April, May, and June 2016 to observe representative terrestrial communities and associated wildlife habitat, to characterize wetland, riparian, and littoral habitats, and to search potentially suitable habitat for rare, threatened, and endangered (RTE) species of plants and wildlife. The survey areas included the project recreation facilities and the 15.67-mile project transmission line ROW.

In response to FERC staff questions from the Initial Study Results Meeting, Georgia Power provided additional information on terrestrial resources at the Project (C.R. O'Mara, Southern Company Generation, February 20, 2017 letter to K.D. Bose, FERC). The additional information pertained to vegetation management activities in the transmission line ROW, the waterfowl impoundments downstream of Wallace Dam, exotic invasive plant species occurrences, invasive vegetation monitoring and management activities, vegetative community evaluation forms, and the wetland survey methods.

Terrestrial Vegetative Communities

The dominant terrestrial vegetative community types in the project area include mixed pine-hardwood forest, pine plantation/pine forest, and floodplain and riparian forest (Georgia

Power, 2016e).[7] Collectively, these three community types cover about 65.3 percent of the project area. Developed land covers 19.5 percent of the project area, while agricultural land covers 11.5 percent. The remaining 3.7 percent of the project area includes the transmission line easement, which consists mostly of herbaceous habitat types; mesic slope forest and dry oak/pine forest; scrub-shrub and emergent wetlands; and granite outcrops. Although small in area of coverage, granite outcrops provide unique habitats that often harbor sensitive plant species.

Mixed pine-hardwood forest is the most common community type within the project boundary, occupying about 34 percent. It occurs on much of the narrow strip of land between Lake Oconee and the project boundary, and on recreation facilities and adjacent public lands. The overstory is dominated by loblolly pine, mockernut and pignut hickories, southern red oak, sweetgum, and tuliptree. Understory species include blackgum, flowering dogwood, southern sugar maple, eastern redbud, hawthorn, sparkleberry, and black cherry. Dominant herbaceous species include Christmas fern, woodoats, partridge berry, violets, and greenbriers.

Floodplain and riparian forest occurs along streams and rivers, occupying 13.7 percent of lands within the project boundary. Canopy species include sweetgum, American sycamore, sugarberry, red maple, black willow, black walnut, green ash, box elder, and water oak. Pine plantations and pine forests occupy only 6 percent of the land within the project boundary but occupy 17.7 percent within 2,000 ft of the project boundary. This community type is dominated by loblolly pine in the overstory and various oaks and hickories, sweetgum, and tuliptree in the understory. Pine plantations managed with prescribed burns, such as those in the Oconee NF and Redlands WMA, provide a relatively open understory.

Granite outcrops occupy about 17 acres (0.23 percent) of the lands within the project boundary. They contain smooth, exposed granite and rocks with widely scattered patches of vegetation. Vegetation varies from moss and lichens to herbs, shrubs, and trees. Microhabitats occur within shallow depressions, which may retain ephemeral pools and support sensitive plant species adapted to this unique environment. Depressions were found to harbor stitchwort, elf orpine, toadflax, Piedmont quillwort, as well as pool sprite, a federally endangered plant species (Section 4.3.5). The largest granite outcrop within the project boundary is Eatonton Outcrop located within the Oconee WMA adjacent to Lawrence Shoals Park. The property is managed by GDNR and protected from foot traffic and recreational activity.

The project transmission line ROW is maintained as predominantly herbaceous and shrub vegetation under Southern Company's Transmission Vegetation Management Program. The program involves mowing on a 6-year cycle, applying herbicides to control re-sprouting of cut stems, spot-treating with herbicide within the mowing cycle, and pruning limbs along the edge of the ROW on a 10-year cycle. The transmission ROW habitat is dominated by herbaceous plant species. The corridor consists mainly of uplands and occasional perennial and

[7] For the purposes of the Terrestrial Resources Study, the project area (or study area) was defined to include a zone extending 2,000 ft beyond the project boundary to encompass a conservatively large area for characterizing the existing environment.

intermittent stream crossings. Herbaceous wetlands occur at some stream crossings. Upland vegetation includes grasses, goldenrods, thoroughworts, goundsel/ragworts, plantains, clovers, tick-trefoils and other early successional species. Herbaceous wetland vegetation includes arrow arum, devil's beggartick, stiff marsh bedstraw, and sedges.

Vegetated Wetlands

Forested, herbaceous/emergent, and scrub-shrub wetlands cover approximately 911 acres within the project boundary (Georgia Power, 2016e). Forested wetlands are the dominant vegetated wetland type, occupying about 651 acres, or 8.9 percent of the lands within the project boundary. They occur primarily along the rivers and larger tributary streams to Lake Oconee, particularly within the floodplains of the Oconee and Apalachee Rivers and larger tributary streams, including Richland Creek, Sugar Creek, Beaverdam Creek, and Lick Creek. Downstream of Wallace Dam, forested wetlands occur within the project boundary along Shoulderbone Creek, Sikes Creek, and Herndon Branch. Dominant overstory vegetation in forested wetlands includes sugarberry, water hickory, green ash, willow oak, blackgum, red maple, box elder, and American sycamore. Understory species include persimmon, rusty blackhaw, switchcane, black willow, and ironwood. The herbaceous layer may contain broadbeech fern, netted chainfern, common lady-fern, sensitive fern, and lizard's tail.

Emergent/herbaceous wetlands and scrub-shrub wetlands cover 143 acres (1.9 percent) and 117 acres (1.6 percent) of lands within the project boundary, respectively (Georgia Power, 2016e). Emergent and herbaceous wetlands are scattered around the reservoir in shallow coves, on shallow sediment-deposition flats in the upper reaches of the reservoir, in the Dyar Pasture Recreation Area waterfowl pond/wetland, in areas flooded by beaver dams, and in small areas along the fringe of the reservoir. Common vegetation in emergent and herbaceous wetlands include lizard's tail, parrotfeather, marshpepper knotweed, rice cutgrass, false nettle, alligatorweed, sedges, devil's beggartick, softrush, and pennywort.

Scrub-shrub wetlands occur in areas between forested wetlands and emergent wetlands or open water. They also occur on small islands formed from sediment deposition in the upper reaches of the reservoir and along the edges of beaver ponds. Dominant woody vegetation in scrub-shrub include buttonbush, alder, silky dogwood, black willow, and Virginia willow.

Aquatic and Wetland Plants

The April-June 2016 field reconnaissance surveys documented 53 species of aquatic and wetlands plants from Lake Oconee and its surrounding wetland, riparian, and littoral habitats (Georgia Power, 2016e). Aquatic and wetland plants were those species classified as obligate or facultative-wetland species by the U.S. Department of Agriculture (USDA) PLANTS Database (USDA Natural Resources Conservation Service, 2017). True aquatic plants, those requiring the presence of standing water for support, included alligatorweed, parrotfeather, and duckweed. Alligatorweed and parrotfeather are classified as Category 1 and Category 2

invasive plants, respectively, in Georgia (Georgia Exotic Pest Plant Council [GEPPC], 2017).[8] The other wetland plants consisted primarily of native species adapted to hydric conditions.

Exotic Invasive Plant Species

Scattered occurrences of exotic invasive plant species are present throughout the project boundary, but the majority of the area is notably absent of invasive plant species that dominate a particular stratum within the community (Georgia Power, 2016e). The project recreation facilities within the project boundary do not contain dominant stands of invasive species. However, exceptions include the following areas that contain dominant stands of exotic invasive plant species (Georgia Power, 2016e):

- Alligatorweed (*Alternanthera philoxeroides*) – An estimated 51 acres of emergent and herbaceous wetlands within the project boundary are dominated by alligatorweed. Alligatorweed roots in wet soils or shallow water and grows out into waterways. The largest population occurs within the Dyar Pasture Recreation Area waterfowl pond/wetland, which includes over 30 acres of emergent, scrub-shrub, and forested wetlands. Alligatorweed is the dominant emergent wetland species present within the open area of the pond/wetland. Smaller, scattered patches of alligatorweed occur along the edges of sediment-deposition islands in the upstream end of Lake Oconee. Georgia Power spot-treated this area of the lake with herbicide in summer 2016 to control alligatorweed.

- Chinese privet (*Ligustrum sinense*) – An estimated 122 acres of land within the project boundary are dominated by Chinese privet, a Category 1 invasive (GEPPC, 2017). The vast majority of this land is in the floodplain of the Oconee River at the upstream end of the Project. Chinese privet is a woody shrub that has been widely used as ornamental hedging. One small population was also documented within the floodplain of the upper reaches of Richland Creek within the project boundary. Chinese privet primarily spreads via root suckers and seed dispersal by birds.

- Japanese stiltgrass (= Nepalese browntop) (*Microstegium vimineum*) – An estimated 6 acres of land within the project boundary are dominated by Japanese stiltgrass, a Category 1 invasive plant (GEPPC, 2017). The species is a delicate, sprawling, annual grass that invades forested floodplains as well as ditches, forest edges, fields, and trails. Japanese stiltgrass was documented in five small floodplain locations around Lake Oconee.

Georgia Power monitors invasive aquatic plants within Lake Oconee by visual observations made by shoreline management specialists during their routine reservoir inspections.

[8] Category 1 species pose serious problems because they extensively invade native plant communities and displace native species (GEPPC, 2017). Category 2 species pose a moderate problem by invading native plant communities and displacing native species, but to a lesser degree than Category 1 species.

Depending on the plant species and conditions observed, licensed herbicide specialists have chemically treated small areas within the project boundary to manage nuisance conditions or help prevent further infestation, as warranted. Since 2000, the need for herbicide treatments in Lake Oconee have been infrequent, small-scale (<1 acre), and in each instance specifically targeted to certain species, including alligator weed, floating primrose willow, American lotus, parrotfeather, Egeria, or Lyngbya.

In addition, Georgia Power administers a shoreline residential aquatic vegetation management program through its website (http://georgiapowerlakes.com/oconeesinclair/). This program allows property owners to apply for an Individual Aquatic Herbicide Treatment Permit for nuisance aquatic vegetation. If approved by Georgia Power, the permit allows the homeowner to contract the work using a state-certified aquatic pesticide commercial applicator.

Wildlife Resources

Lake Oconee, the adjoining Oconee WMA and Oconee NF, and the project transmission line ROW provide quality habitat for a diverse wildlife community (Georgia Power, 2016e). Common mammals include white-tailed deer, northern raccoon, gray squirrel, eastern chipmunk, nine-banded armadillo, striped skunk, eastern cottontail, gray fox, fox squirrel, hispid cotton rat, and coyote. Mammals in wetland, littoral, and open-water habitats include American beaver, muskrat, and northern river otter.

At least 115 bird species use diverse wetland and upland habitats in the project area, (Georgia Power, 2016e). Numerous species seasonally migrate through the area while many others reside locally and breed in the area. Neotropical migrant songbirds include over 20 species of warblers observed during the reconnaissance survey. Common resident breeding birds include northern cardinal, American crow, blue jay, Carolina chickadee, Carolina wren, mourning dove, and red-bellied woodpecker. Raptors include red-tailed hawk, red-shouldered hawk, broad-winged hawk, turkey vulture, black vulture, Mississippi kite, osprey, bald eagle, great horned owl, and barred owl. Waterfowl include wood duck, blue-winged teal, mallard, red-breasted merganser, and Canada goose. Wading bird observations included great blue heron, great egret, green heron, and little blue heron, but no wading bird rookeries were observed. One island in the Richland Creek embayment contained four great blue heron nests.

Waterfowl habitat within the project boundary includes the waterfowl pond/wetland at Dyar Pasture Recreation Area near the upstream end of Lake Oconee (Figure 3) and three smaller waterfowl impoundments downstream of Wallace Dam in the Oconee WMA (Ponds 2, 3, and 4; see Figure 5). The Dyar Pasture pond, with over 30 acres of wetlands, is controlled by a dike and outlet structure. GDNR manages the pond for FS as a waterfowl conservation area and bird sanctuary.

GDNR manages waterfowl Ponds 2 and 3 downstream of Wallace Dam but no longer actively manages Pond 4. The Pond 2 control structure is currently non-operational because of erosion of the dike and other maintenance issues. Pond 2 encompasses about 13 acres and is vegetated

by mid-successional stands of green ash, red maple, river birch, and blackgum. It is managed as a waterfowl refuge area, with no hunting allowed. Pond 3 is actively managed as a seasonally flooded agricultural field covering about 25 acres. Black willow, box elder, and red maple occupy higher elevations around the pond. Pond 3 is available for public wildlife viewing, bird observations, and educational purposes; hunting is allowed by quota only. Pond 4 includes about 54 acres and is comprised for scrub-shrub and emergent wetlands with areas of open water. Common vegetation includes black willow, silky dogwood, and alder. Hunting is allowed on Pond 4. Recent GDNR annual aerial surveys of the ponds have recorded an average of 400 ducks (G. Balkcom, GDNR, January 31, 2017 email communication with W. Greene, Georgia Power). Common species observed include ring-necked duck, green-winged teal, mallard, wood duck, gadwall, and northern shoveler.

Common amphibian and reptile species in the project area include southern leopard frog, Cope's gray treefrog, southern cricket frog, southern toad, American bullfrog, green anole, five-lined skink, black racer, northern water snake, eastern copperhead, and eastern kingsnake (Georgia Power, 2016e). The turtle species pond slider and river cooter commonly occur within Lake Oconee and tributary streams.

The wildlife community occurring along the project transmission line ROW is comprised of typical species that utilize the same types of habitat found throughout the project area.

State Protected Plant Species

Georgia Power (2016d) identified and evaluated federally and state protected species, and other species of interest, with known records of occurrence in the four-county project vicinity. Five federally threatened and endangered plant species potentially occur within the project vicinity, as evaluated in Section 4.3.5 (Threatened and Endangered Species). Pool sprite (*Amphianthus pusillus*), a federally threatened species, presently occurs on granite outcrop habitat within the project boundary (Section 4.3.5).

Ten other Georgia protected plant species potentially occur in the project vicinity (Table 14) (Georgia Power, 2016d). State protected species in Georgia are listed as endangered, threatened, rare, or unusual, in descending order of rarity.

None of these ten Georgia protected plant species were observed within the project boundary during the field reconnaissance surveys (Georgia Power, 2016d) (Table 14):

- Carolina trefoil (*Acmispon helleri*) – Georgia endangered;
- Sun-loving draba (*Draba aprica*) – Georgia endangered;
- Dwarf hatpins (*Eriocaulon koernickianum*) – Georgia endangered;
- Oglethorpe oak (*Quercus oglethorpensis*) – Georgia threatened;

- Bay star-vine (*Schisandra glabra*) – Georgia threatened;
- Granite stonecrop (*Sedum pusillum*) – Georgia threatened;
- Ovate catchfly (*Silene ovata*) – Georgia rare;
- Silky camelia (*Stewartia malacodendron*) – Georgia rare;
- Piedmont barren strawberry (*Waldsteinia lobata*) – Georgia rare; and
- Pink ladyslipper (*Cypripedium acaule*) – Georgia unusual.

Sun-loving draba is a perennial herb that inhabits shallow soils on and around granite outcrops, usually under red cedar trees (Chafin, 2007). GDNR data include records of occurrence of sun-loving draba on the granite outcrop in the Oconee WMA within the project boundary and next to Lawrence Shoals Park; however, none were observed there during the field reconnaissance surveys (Georgia Power, 2016d).

Oglethorpe oak grows up to 80-ft tall and inhabits wet, clayey soils, particularly along seepages, stream terraces, and most hardwood forests (Chafin, 2007). GDNR data indicate that Oglethorpe oak occurs in limited areas on both sides of Lake Oconee in Green and Putnam Counties (Georgia Power, 2016d). None were observed during the field surveys.

State Protected Wildlife Species

One federally endangered wildlife species, the red-cockaded woodpecker (*Lueconotopicus borealis*, formerly genus *Picoides*), is known to occur in the project vicinity. It is evaluated in Section 4.3.5 (Threatened and Endangered Species).

Four Georgia protected terrestrial wildlife species (two reptiles and two birds) potentially occur in the project vicinity (Table 14) (Georgia Power, 2016d). The two birds presently occur within the project boundary, including:

- Bald eagle (*Haliaeetus leucocephalus*) (Georgia threatened) – eagles currently reside year-round within and adjacent to the Wallace Dam Project boundary. Bald eagles were observed in scattered locations around Lake Oconee during the reconnaissance survey (Georgia Power, 2016d, 2016e). Based on data from GDNR for 2016, at least two active bald eagle nests were located within the project boundary and five others were either abandoned or of undetermined status. A total of five eaglets successfully fledged during 2016 from nests surrounding Lake Oconee.
- Bachman's sparrow (*Peucaea aestivalis*) (Georgia rare) – a large, secretive sparrow with a whistled song, Bachman's sparrow prefers open and mature pinewoods but also occurs in clearcuts, utility ROWs, and early stages of old field succession with dense

ground cover (NatureServe, 2017). Historically, the species inhabited longleaf pine woodlands. During the field reconnaissance survey, the calls of Bachman's sparrows were identified at six locations along the project transmission line ROW.

The two state protected reptiles, southern hognose snake (*Heterodon simus*) and spotted turtle (*Clemmys guttata*), are not presently known to occur within the project boundary. In Georgia, both species historically occurred primarily south of the Project in the Coastal Plain (NatureServe, 2017).

Avian Protection Program

Georgia Power implements an Avian Protection Program (APP) in accordance with an agreement between the FWS, Edison Electric Institute, and Avian Power Line Interaction Committee. The APP specifies procedures to be followed by all Georgia Power employees to maintain compliance with the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Endangered Species Act as it applies to avian species. The APP establishes a company policy of not disturbing wildlife and includes guidance pertaining to: (1) active nests; (2) injured birds; (3) handling live or dead birds or their nests only in accordance with permits issued by the FWS; (4) not disturbing live or dead birds, or nests of threatened and endangered avian species; (5) appropriate remedial actions for avian interactions; (6) reporting to Georgia Power Environmental and Natural Resources (ENR) any protected, threatened, endangered, or migratory species (including eggs or chicks) suspected to be in an area that company operations will impact; and (7) reporting immediately to ENR any woodpecker nest cavities found in live pine trees that are subject to company operations.

In addition, Georgia Power's Forestry Policy Manual covers the protection and management of rare, threatened, and endangered species. With respect to bald eagles, Georgia Power forest managers communicate regularly with ENR and GDNR personnel regarding eagle nest locations on Georgia Power lands within and adjacent to the Wallace Dam project boundary. WRD conducts annual monitoring of bald eagles at Lake Oconee as part of its statewide monitoring program. Georgia Power forest managers and ENR biologists document any sightings of new potential bald eagle nests and coordinate those through ENR biologists, who check their records and contact WRD for confirmation as appropriate. Georgia Power's timber harvesting management on project lands results in long rotations of mature and over-mature pine trees, which are the preferred nest sites for bald eagles.

Wildlife Management on Georgia Power Lands

Georgia Power has a forestry and timber management program that is managed by a certified forester. Much of the forested land within the project boundary is managed primarily to provide a shoreline buffer for water quality protection, visual aesthetics, and wildlife habitat. Where deemed appropriate, the forester, using best professional judgment, practices more active forestry management in the following areas within the project boundary: the Oconee WMA, Area A-2, Area B-3, and Area B-5 (Figure 5). On these tracts, Georgia Power practices

long rotation management of natural pine, both loblolly and shortleaf, on the uplands and mixed species hardwood management in the streamside management zones. A few upland stands have been regenerated to improved loblolly pine (selectively bred for improved productivity). The shoreline timber is infrequently thinned to improve regeneration, especially of shade-tolerant species. Georgia Power follows the GDNR Forestry Wildlife Partnership guidelines and GFC best management practices for blending timber management and wildlife management on these lands.

Georgia Power also manages the areas designated as future recreation sites (Areas A-2, B-3, and B-5) with public recreation in mind. This includes removing some mature pines to foster the growth of hardwoods and subcanopy trees such as dogwoods, with consideration for visual aesthetics and safety, in addition to timber and wildlife management.

4.3.4.2 Environmental Impacts and Recommendations

Georgia Power's proposal to continue operating the Project in a pumped-storage mode for the generation of peaking power would not involve activities directly affecting upland terrestrial, wetland, riparian, or littoral habitats for wildlife and botanical resources. Continued project operation also would not adversely affect any state protected plant and wildlife species. Vegetation and wildlife would be preserved and enhanced by Georgia Power's proposed land management measures to continue to manage shorelines in accordance with Shoreline Management Guidelines for Georgia Power Lakes and to promote and maintain vegetative buffers around Lake Oconee.

Bald Eagle

Although the bald eagle has been removed from the federally threatened species list, it remains protected under the federal Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). To conserve and protect habitat for bald eagles within the project boundary in compliance with MBTA and BGEPA, Georgia Power would continue to implement its existing APP and Forestry Policy Manual. Because nesting bald eagles are known to occur within the project boundary, protection and management activities would continue to be focused on land management activities that avoid disturbance to active nest sites. Under the APP, Georgia Power implements current FWS national guidance (FWS, 2007a) pertaining to prescribed distance buffers, natural or landscape buffers, and activity-specific guidelines where applicable. In addition, Georgia Power forest managers and natural resource specialists would continue to communicate regularly with GDNR personnel regarding eagle nest locations within and adjacent to the project boundary, and cooperate with GDNR's annual monitoring of bald eagles at Lake Oconee.

Exotic Invasive Plant Species

Although several exotic invasive terrestrial plant species are relatively common (but rarely dominant) in the project area, operation of the Wallace Dam Project has not been a major factor

contributing to the occurrence or spread of these species (Georgia Power, 2016e). The occurrence of exotic invasive plant species has resulted mainly from surrounding residential development and anthropogenic disturbance along roadways and in riparian habitats in watersheds upstream of the Project. Exotic invasive species such as Chinese privet, Japanese stiltgrass, and Japanese honeysuckle are now widespread and common throughout Georgia and the eastern and southern U.S., typically in floodplains (Merriam and Feil, 2002; Loewenstein and Loewenstein, 2005), and irrespective of the location of impoundments. Chinese privet has achieved an especially widespread distribution, occupying up to 59 percent of the floodplain of the upper Oconee River upstream of Lake Oconee (Ward, 2002).

The project recreation facilities do not contain dominant stands of invasive species, and therefore, public use of these facilities is not being adversely impacted. Chinese privet and Japanese stiltgrass are common in areas along the upper reach of Lake Oconee and along undeveloped floodplains near major tributary channels entering the reservoir. Where dominant stands of these species occur in the project boundary, they often extend onto neighboring lands outside of the project boundary (Georgia Power, 2016e). Control of these species throughout the project boundary would not be feasible given the adjoining private land holdings and upstream sources of propagules (seeds, rhizomes, etc.). The spread of invasive plants is often linked to urbanization, residential development, and anthropogenic disturbance of riparian habitats (Loewenstein and Loewenstein, 2005; Burton et al., 2005).

Alligatorweed is the dominant emergent wetland species present in the Dyar Pasture pond/wetland. GDNR manages the wetland for FS as a waterfowl conservation area and bird sanctuary. Alligatorweed spreads naturally by animals or water (Madsen, 2017). Stem fragments float and can disperse and become rooted to form new colonies. Stems may also be transported on boats and boat trailers. Drawdown increases the abundance of alligatorweed by stimulating seed germination on damp soil (Madsen, 2017), and this could be a factor contributing to the species' dominance in the Dyar Pasture pond. Water levels in Dyar Pasture are controlled by the pond management practices of WRD.

Georgia Power would continue to monitor invasive aquatic plants within Lake Oconee during routine reservoir inspections. Nuisance invasive aquatic plants would be treated periodically within the project boundary, as warranted, to reduce infestations that could affect public access to the reservoir or Wallace Dam hydropower operations. In addition, Georgia Power would continue to administer its existing shoreline residential aquatic vegetation management program through its website. Property owners could apply for an Individual Aquatic Herbicide Treatment Permit, and if approved by Georgia Power, contract the treatment of nuisance aquatic vegetation using a state-certified aquatic pesticide commercial applicator.

Construction of Proposed Enhancement Measures

Installation of the proposed forebay oxygen line diffuser system in Lake Oconee (Section 4.3.2) would require the construction of an onshore liquid oxygen facility. The facility would

include a driveway, liquid oxygen tanks, a vaporizer system, oxygen flow control valves, and piping leading to the reservoir. At the proposed site, facility construction would permanently remove approximately 3 acres of mixed pine-hardwood forest on the northeast side of Wallace Dam in Hancock County (Figure 9). No wetlands or streams would be directly impacted.

Wildlife would be displaced from the construction area and immediately adjacent lands during construction. The animals displaced would move into adjacent mixed-pine hardwood forest and pine forest that would remain contiguous to the impact area. Displaced animals would be able to relocate to suitable habitat because the surrounding forest would provide dispersal corridors. Sufficient suitable habitat is expected to be available for assimilation of displaced animals, and therefore, secondary impacts to animal populations would likely be negligible.

There is an active bald eagle nest about 4,300 ft northeast of the proposed site. Under its existing APP, Georgia Power would implement current FWS (2007a) national guidance for avoiding disturbance to nesting activity during construction. Terrain and forest vegetation would shield construction activity from the view of the nest. If an additional or alternate nest is found nearby prior to or during construction, the nest management guidelines would be applied to it as well.

Once the liquid oxygen facility becomes operational, animals would be expected to adjust to the disturbance and resume use of adjacent habitats. Operational noise would be limited to the summer and generated by vehicle traffic to and from the facility, the offloading of liquid oxygen from trucks using valves and pipes, and expansion and contraction of the vaporizer system. Noise levels would be minor, and therefore, operation of the facility would be unlikely to adversely affect wildlife. Moreover, forested vegetation around the site would buffer visual and noise disturbance from operational activity.

Construction of the proposed shoreline structural stabilization (Section 4.3.1) and recreational improvements (Section 4.3.6) would temporarily disturb upland and riparian vegetation and associated wildlife in the vicinity of the construction site. However, these disturbances would be short in duration and the sites would be restored, including reseeding as necessary following construction.

Unavoidable Adverse Impacts

Construction of the liquid oxygen facility for the forebay oxygen line diffuser system would result in the permanent removal of approximately 3 acres of upland, mixed pine-hardwood forest and displacement of its associated wildlife to adjacent habitats.

Some minor land disturbances would occur in upland and riparian areas during construction of shoreline structural stabilization and new recreation facilities. These disturbances would be temporary, and all sites would be revegetated following construction.

4.3.5 Threatened and Endangered Species

4.3.5.1 Affected Environment

Georgia Power (2016c, 2016d) identified and evaluated federally listed species and species under review for federal listing with known records of occurrence in the project vicinity. Seven federally protected species of plants and wildlife and one fish species under federal status review potentially occur in the project vicinity (Table 14). No federal candidate species for listing presently occur in the project vicinity.

Federally Protected Species

Seven federally threatened and endangered species potentially occur within the project vicinity, including five plants and two birds (Table 14). They include:

- Pool sprite (*Amphianthus pusillus*) – threatened;
- Black-spored quillwort (*Isoetes melanospora*) – endangered;
- Mat-forming quillwort (*Isoetes tegetiformans*) – endangered;
- Harperella (*Ptilimnium nodosum*) – endangered;
- Michaux's sumac (*Rhus michauxii*) – endangered;
- Red-cockaded woodpecker (*Lueconotopicus* [= *Picoides*] *borealis*) – endangered; and
- Wood stork (*Mycteria americana*) – threatened.

Two of the plant species, pool sprite and mat-forming quillwort, presently occur (or recently have been planted) in vernal pools on a granite outcrop in the Oconee WMA (Eatonton Outcrop). This outcrop is within the project boundary near Lawrence Shoals Park, Putnam County[9]. Acquired from Georgia Power, the property is managed by GDNR. Signs placed in the area warn visitors to stay away from the outcrop's sensitive areas.

None of the other federally protected species are known to occur within the project boundary. All seven federally listed species are described below.

[9] The PAD (Georgia Power, 2015a) identified known occurrences of these species as being just outside of the project boundary. The RTE Species Study Report (Georgia Power, 2016e) states that pool sprite was found inside the project boundary within Lawrence Shoals Park. Closer examination of the occurrence information relative to the project boundary indicates that the known occurrences are within the project boundary but outside of Lawrence Shoals Park.

Pool Sprite

Pool sprite (or little amphianthus) is a diminutive, annual herb that occurs in the Piedmont exclusively in shallow, flat-bottomed depressions on granite outcrops, where vernal pools form after rainfall (Patrick et al., 1995; Chafin, 2007). Pool sprite begins flowering in February or March and continues until the habitat becomes desiccated later in the spring. The seeds remain dormant until suitable moisture and light conditions for germination occur in late autumn. In Georgia, pool sprite is found on about seven preserves and parks, with the pools containing the species totaling less than 1 acre (Chafin, 2007). One or two large populations (15 to 20 pools) exist in Greene and Hancock Counties (FWS, 2008). Pool sprite has been documented as inhabiting the Eatonton Outcrop in the Oconee WMA in Putnam County (FWS, 2008, GDNR, 2010); this site is within the project boundary. The outcrop has many pools occupied by pool sprite (FWS, 2008). Pool sprite were observed in two depressions at this outcrop site during the field reconnaissance survey in spring 2016 (Georgia Power, 2016d).

Black-spored quillwort

Black-spored quillwort is an inconspicuous perennial herb and fern ally that is restricted to shallow, seasonally flooded, flat-bottomed pools on granite outcrops (Patrick et al., 1995; Chafin, 2007). These vernal pools are entirely rock-rimmed, generally occur near the summit, and typically have a depth less than 1 ft. The plants produce spores in early May to June. The species is endemic to the Piedmont of Georgia. Historically known from 15 sites in central Georgia including Greene County, black-spored quillwort currently exists at only 8 sites in Georgia, none of which are occupied by the Wallace Dam Project (FWS, 2008). The species was not detected during the spring 2016 field surveys (Georgia Power, 2016d).

Mat-forming Quillwort

Mat-forming quillwort is an obscure perennial herb and fern ally that is restricted to shallow, flat-bottomed vernal pools on granite outcrops, where it forms dense mats (Patrick et al., 1995; Chafin, 2007). These depressions are less than 1-ft deep, entirely rock-rimmed, and contain gravelly soil. Plants are usually visible in October to May. Historically known from 13 populations in Georgia, populations are confined to porphyritic granite outcrops in Columbia, Hancock, Putnam, and Greene Counties (FWS, 2008). The majority of these sites contain only one or two pools with mat-forming quillwort. In 2010, WRD and FWS biologists planted four plugs of mat-forming quillwort (raised off-site) in rainwater pools at the Eatonton Outcrop in the Oconee WMA (GDNR, 2010), within the project boundary. The species was not detected during the spring 2016 field surveys (Georgia Power, 2016d).

Harperella

Harperella is an annual herb with erect stems to 3-ft tall that occurs in wet savannas or on the edge of cypress ponds in the Coastal Plain, and in seeps on granite outcrops in the Piedmont (Patrick et al., 1995; Chafin, 2007). Plants flower in late May to early July and fruit from July

to August. Only two sites with small populations of harperella are currently known in Georgia, including one in Greene County (Chafin, 2007). The species is not presently known to occur within the Wallace Dam project boundary. Harperella was not detected during the spring 2016 field surveys (Georgia Power, 2016d).

Michaux's Sumac

Michaux's sumac (or dwarf sumac) is a low-growing, colonial shrub that occurs on dry, open, rock, or sandy woodlands over bedrock rich in calcium, magnesium, or iron (Chafin, 2007). Fire or some other form of disturbance may be essential for maintaining the open habitat preferred by the species (NatureServe, 2017). Lacking periodic disturbance, this type of habitat is gradually overtaken and eliminated by shrubs and trees. Historically, Michaux's sumac occurred in the lower Piedmont and upper Coastal Plain. Of the four known extant occurrences of the species in Georgia, none are within the four counties occupied by the Project (FWS, 2014). The nearest occurrence is in Newton County about 30 miles west of the Project. Michaux's sumac was not detected during the 2016 field surveys (Georgia Power, 2016d).

Red-cockaded Woodpecker

The red-cockaded woodpecker is a small woodpecker that is endemic to open, mature and old-growth pine ecosystems in the southeastern U.S. (Ozier and Schneider, 2010; FWS, 2003). Red-cockaded woodpeckers excavate roosting and nesting cavities almost exclusively in old, living pines. Cavity trees are usually infected with red-heart disease, which softens the heartwood. The birds typically nest and roost in longleaf, slash, or loblolly pine trees; the excavation may take several years. Red-cockaded woodpeckers are cooperative breeders that live in family groups consisting of a breeding pair and often one to three helper male offspring from previous years. Georgia has five remaining population centers. One of these is the Piedmont Recovery Unit (FWS, 2003), which includes a population on Oconee NF in Putnam County located over 8 miles west of Lake Oconee. FS manages 8.3 acres in the Sugar Creek Watershed Management Area specifically for red-cockaded woodpecker habitat (FS, 2004). The species does not currently inhabit pine forests within the project boundary and is not expected to colonize there because stands of large pines are relatively small and isolated and have low probability of being used.

Wood Stork

The wood stork is a large, long-legged wading bird that uses a variety of freshwater and estuarine wetlands in the Coastal Plain for breeding, feeding, and roosting (Harris et al., 2010; FWS, 2007b). The breeding range of the wood stork in the U.S. includes peninsular Florida, the Coastal Plain and large river systems of Georgia and South Carolina, and southeastern North Carolina. The current breeding range and known distribution of wood storks in Georgia is limited to the Coastal Plain (FWS, 2007b); breeding does not occur in the Piedmont. After the breeding season, wood storks disperse widely throughout the Coastal Plain. Transient occurrences of wood storks have been reported across Georgia, and a few individuals have

been sighted in the Piedmont near the project area between June and October, particularly in shallow freshwater areas (D. Imm, FWS, Field Supervisor, January 20, 2017 letter to K.D. Bose, FERC). Wood storks reportedly have been sighted previously at the Dyar Pasture Recreation Area waterfowl pond/wetland within the project boundary. Nevertheless, the species does not breed in the Piedmont and the most heavily used habitat during the fall is the coastal marshes (Harris et al., 2010).

Species Under Review

The robust redhorse, a Georgia endangered species, is currently undergoing a status review by FWS to determine if listing as a threatened or endangered species is warranted (FWS, 2011). The robust redhorse is a migratory riverine sucker that occurs in large rivers of the Atlantic slope in Georgia, South Carolina, and North Carolina (Freeman et al., 2016; Rhode et al., 2009). It occurs in the Oconee and Ocmulgee Rivers in the Altamaha River basin. The species typically inhabits main-channel, free-flowing rivers in riffles, runs, and pools (Freeman et al., 2016; Rohde et al., 2009).

A population currently exists in the Oconee River downstream of Sinclair Dam, but the species is not known to occur upstream of Wallace Dam (Albanese et al., 2015b). Recent occurrences of robust redhorse in a tributary to Lake Sinclair (Little River) and the upper end of Lake Sinclair appear to have resulted from escaped hatchery fish in the tributary (Zelko, 2012). Focused survey efforts in the Wallace Dam tailrace in 2014 and 2015 did not detect any robust redhorse (Robust Redhorse Conservation Committee's Oconee Technical Working Group, 2014 and 2015). Electrofishing status surveys in spring 2012 and spring 2013 upstream of Lake Oconee, including segments of the Oconee River and Apalachee River, did not collect or observe any robust redhorse upstream of Wallace Dam (Zelko, 2012, 2013).

4.3.5.2 Environmental Impacts and Recommendations

Continued project operation as proposed by Georgia Power would not be expected to adversely affect any federally threatened and endangered species or species under review. There is no designated critical habitat for federally protected species within the project boundary. Pool sprite is the only federally protected species presently known to reside within the project boundary. Mat-forming quillwort was raised off-site and planted in the wild at Eatonton Rock, but it is unknown whether a viable population exists. Nevertheless, the Eatonton Outcrop is the largest granite outcrop within the project boundary and is the only habitat known to support federally listed plant species. There is potential that other rare plant species restricted to granite outcrop habitats could also occur there. GDNR's current management of the outcrop serves to protect and maintain this important habitat within the project boundary. Moreover, the spring 2016 field survey did not identify any dominant stands of terrestrial exotic invasive plants that threaten the native plant populations.

Wood storks do not breed or normally reside in the Piedmont, but transient individuals may occasionally disperse into the area after the breeding season and forage in the Dyar Pasture

waterfowl pond and other shallow wetlands. If sightings of wood storks or any other federally protected bird species are reported within the project boundary, Georgia Power would implement applicable guidance of the existing APP to avoid harassment or harm to the birds.

4.3.6 Recreation and Land Use

4.3.6.1 Affected Environment

Project Area Recreational Facilities

Georgia Power owns and operates seven project recreation facilities that provide for a variety of recreational opportunities (Figure 3, Table 15). Six of the facilities are located on Lake Oconee, and one is on the west shoreline of the tailrace area. All seven facilities include a day-use area; six provide boat ramps, picnic tables, and restrooms; and three provide full-service campgrounds and swimming beaches.

Lawrence Shoals Park

Lawrence Shoals Park is an 83.6-acre facility located just west of Wallace Dam, a short distance from Georgia Hwy 16 in Putnam County. The park is located entirely within the project boundary and consists of a campground and day-use area. The park is open from March 1 through Labor Day. It offers a full-service campground, including recreational vehicle (RV) parking slots, picnic tables, playgrounds, and restrooms. The park has about 62 total campsites. Additionally, the park has day-use areas that include large-capacity overlook picnic pavilions, a two-lane boat ramp, three boat docks, picnic tables, a swimming beach, restrooms, and nature trails. The park has 68 parking slots (30 slots at the boat ramp) including one handicapped accessible slot at the boat ramp. Parking fees charged at the park entrance, which is staffed by a Georgia Power park host, are $25 per night for RV camping, $20 per night for tent camping, and $5 per vehicle for day-use activities.

Old Salem Park

Old Salem Park is an 83.3-acre facility located in the middle section of Lake Oconee, south of Georgia Hwy 44 in Greene County. The park is located entirely within the project boundary and consists of a campground and day-use area that are open from March 1 through October 30. Old Salem Park offers a full-service campground, including RV parking slots, restrooms, and a playground. The park has about 92 total campsites. The day-use amenities also include a large-capacity picnic pavilion, a two-lane boat ramp, three boat docks, picnic tables, a swimming beach, and restrooms. Old Salem Park includes 123 parking slots including one handicapped accessible slot at the boat ramp. Parking fees charged at the entrance by the Georgia Power park host are $25 per night for RV camping, $20 per night for tent camping, and $5 per vehicle for day-use activities.

Parks Ferry Park

Parks Ferry Park is a 91.0-acre facility located toward the upper section of Lake Oconee just south of I-20 in Greene County. The park is located entirely within the project boundary. It consists of a campground and day-use area that are open from late April through Labor Day. Parks Ferry Park provides a full-service campground, including RV parking slots, restrooms, and a playground. The park has about 53 total campsites. Other day-use amenities include a large-capacity overlook picnic pavilion, a two-lane boat ramp, one boat dock, picnic tables, a swimming beach, an outdoor sports area, and restrooms. Parks Ferry Park includes 74 parking slots including one handicapped accessible slot at the boat ramp. Parking fees charged at the entrance by the Georgia Power park host are $25 per night for RV camping, $20 per night for tent camping, and $5 per vehicle for day-use activities.

Sugar Creek Boat Ramp

Sugar Creek Boat Ramp is a 10.4-acre facility located on the Sugar Creek embayment in Putnam County. The facility is located entirely within the project boundary. Open year-round, Georgia Power charges a day-use fee of $5 per vehicle using an honor box payment system at the park entrance. Sugar Creek Boat Ramp provides a two-lane boat ramp, one boat dock, shoreline access for fishing, picnic tables, a restroom, and 37 parking slots for vehicles with boat trailers, including one handicapped accessible slot.

Armour Bridge

Armour Bridge is a 10.7-acre boat-ramp facility located on the Richland Creek embayment within Reynolds Lake Oconee, a gated resort community, in Greene County. The entire facility is located within the project boundary. Open year-round, Georgia Power charges a day-use fee of $5 per vehicle at the Lake Club Guard House, which controls public access to this part of the resort community. Armour Bridge provides a two-lane boat ramp, one boat dock, shoreline access for fishing, picnic tables, a restroom, and 40 parking slots for vehicles with boat trailers.

Long Shoals Boat Ramp

Long Shoals Boat Ramp is a 12.1-acre facility located on the southern main-stem portion of Lake Oconee in Putnam County. The site is located entirely within the project boundary. Open year-round, Georgia Power charges a day-use fee of $5 per vehicle using an honor box payment system at the park entrance. Long Shoals Boat Ramp provides a two-lane boat ramp, one boat dock, shoreline access for fishing, picnic tables, a restroom, and 34 parking slots for vehicles with boat trailers, including one handicapped accessible slot.

Tailrace Fishing Area

The Tailrace Fishing Area is located in the vicinity of the Georgia Hwy 16 bridge over the Oconee River about 0.4 mile downstream of Wallace Dam. The site is on the west shoreline of the Wallace Dam tailrace in the headwaters of Lake Sinclair. The facility offers tailrace fishing access from the bank. It includes an unpaved road and parking area and a shoreline fishing platform. Only the shoreline platform is located within the project boundary, which in this area includes a thin strip of land along the shoreline.

Project Lands Reserved for Future Recreational Use

Georgia Power's Recreation Plan for the Wallace Dam Project currently includes the following ten areas within the project boundary reserved for future recreation development (Figure 4):

- Area A-1: a heavily forested 138-acre tract located on a peninsula formed by the confluence of Richland Creek and the Oconee River in Greene County.

- Area A-2: a heavily forested 465-acre tract located at the confluence of Sugar Creek and the Oconee River in Putnam and Morgan Counties.

- Tract B: a 561-acre area next to Lawrence Shoals Park in Putnam County that Georgia Power conveyed to the State of Georgia. The area includes undeveloped shoreline and associated buffer and a unique granite outcropping (Eatonton Outcrop) that supports two federally protected plant species. It also contains several miles of multi-use and foot trails that connect with Lawrence Shoals Park and the Rock Hawk Effigy and trail system located outside of, and partly inside of, the project boundary.

- Area B-3: a heavily forested 107-acre tract located on the Apalachee River in Greene County approximately 0.5 river mile below U.S. Hwy 278.

- Area B-5: a heavily forested 106-acre tract located on a peninsula formed by the confluence of Richland Creek and Rocky Creek tributaries in Greene County.

- Area C-2: a 9-acre tract located on Lick Creek at Georgia Hwy 44 in Putnam County.

- Area C-4: a moderately forested 8-acre tract located on the Apalachee River in Greene County.

- Area C-5: a moderately forested 10-acre tract located on the Oconee River at Hwy 44 in Greene County.

- Area C-6: a 5-acre tract located on Richland Creek at Georgia Hwy 44 in Greene County.

- Area C-7: a 9-acre site located on Beaverdam Creek approximately 2 miles above its confluence with Richland Creek in Greene County.

Forest Service Recreation Areas

The FS Oconee Ranger District owns and operates three recreation areas located on Oconee NF lands north of I-20 (Figure 3; Table 15). They are located within the Redlands WMA and provide direct access to the northern-most reaches of Lake Oconee. They offer motorized boating access at eight boat lanes and extensive parking facilities including over 100 parking slots at each of the larger facilities.

Dyar Pasture Recreation Area

Dyar Pasture Recreation Area is a 241.1-acre area located off of Copeland Road in Greene County. The recreation area provides access to the upper reaches of Lake Oconee and the Oconee River upstream. The recreation area charges a user fee and provides an unimproved parking area, two-lane boat ramp, boat dock, picnic facilities, shoreline access for fishing, nature trails, and restroom. Additionally, Dyar Pasture Recreation Area includes a 60-acre waterfowl conservation wetland within the Wallace Dam project boundary, offering opportunities for wildlife viewing. Approximately 100 acres of the recreation area are located within the project boundary. The boat ramp, boat dock, and shoreline are within the project boundary, while the parking and additional recreation amenities are outside.

Redlands Recreation Area

Redlands Recreation Area is a 1,393.7-acre site located off of U.S. Hwy 278 in Greene County. The recreation area provides access to the upper reaches of Lake Oconee north of I-20. The recreation area charges a user fee and provides a parking area, three-lane boat ramp, boat dock, picnic facilities, shoreline access for fishing, and restroom. Only a portion of the recreation area, 23.3 acres, is located within the project boundary. The boat ramp, boat dock, and shoreline are within the project boundary, while the parking and additional recreation amenities are outside the project boundary. Redlands Recreation Area provides 100 parking slots for vehicles with boat trailers.

Swords Recreation Area

Swords Recreation Area is a 314.9-acre park located off of Blue Springs Road in Morgan County. The recreation area provides access to Lake Oconee north of I-20 including the Apalachee River embayment. The recreation area charges a user fee and provides a parking area, three-lane boat ramp, boat dock, picnic facilities, shoreline access for fishing, and restroom. Only 2.4 acres are located within the project boundary. The boat ramp, boat dock, and shoreline are within the project boundary, while the parking and additional recreation amenities are outside. Swords Recreation Area provides 100 parking slots for vehicles with boat trailers.

Project Area Recreational Use

Georgia Power (2016f) assessed recreational use at the Project using a combination of recreational use sampling conducted for recent Form 80 submittal; customer satisfaction surveys of campground customers; user surveys at Georgia Power boat ramps and popular bank fishing areas; and written, phone, and in-person surveys with various user groups.

Recreation surveys were administered to 166 users at the three Georgia Power boat ramps within the project boundary (Sugar Creek, Armour Bridge, Long Shoals) during five survey events between March and June 2016 (Georgia Power, 2016f). Over 23 percent of those visiting these boat ramps were from the four counties occupied by the Project (Greene, Hancock, Morgan, and Putnam). The highest proportion of users surveyed was from Putnam County (10 percent) followed by Dekalb (8 percent) and Morgan (8 percent) Counties. The five most common reasons cited by users for vising Lake Oconee were boat fishing (47 percent), pleasure boating (13 percent), tournament fishing (9 percent), bank fishing (8 percent), and jet skiing (4 percent). The average length of visit to Georgia Power boat ramps was 6.5 hours for an average party size of 3.08. User suggestions for facility improvements indicated that facilities are aging and in need of replacement/remodeling and there are opportunities for beneficial amenities at existing sites. Frequently noted improvements desired included improved boat docks, restrooms, boat ramps, parking, trash pickup, and lighting.

Recreation surveys also were administered to 77 users at 14 popular bank fishing locations on Lake Oconee during the same survey events in 2016 (Georgia Power, 2016f). Thirty-six percent of those visiting Lake Oconee primarily for bank fishing were from Hancock, Morgan, Newton, and Putnam Counties. Bank anglers averaged 5.6 hours per visit and 3.1 visits per month, with the highest visitation in the spring. The mostly commonly noted improvements desired by bank anglers were additional bank fishing access/piers, installation or improvement of restrooms, improved lighting, and additional trash cans.

Of 398 campground users surveyed in 2014, the majority noted that the registration process is easy, the park and restrooms are clean, park hosts are courteous and respectful, and camping facilities meet their needs at the Wallace Dam Project. The primary user recommendations related to improving the cleanliness of the restroom facilities at Lawrence Shoals and Parks Ferry Parks and keeping the parks open later in the year (October/November).

Estimated annual recreation use was approximately 605,000 total visits to Lake Oconee in 2015, of which 471,900 were for day use and 133,100 were for night use (Georgia Power, 2016f). An estimated 169,247 of these visits (28 percent) occurred at the seven project recreation facilities. Future recreational use is projected to be approximately 805,369 in 2050 after applying the corresponding percent population growth from the 24-county area representing 89 percent of the Project's recreation users. Overall recreation use at the Project is forecasted to increase by a third (33 percent) between 2015 and 2050. Analysis of future

demand indicates that the existing parking facilities at the Project have adequate capacity for current and future average use (Georgia Power, 2016f).

Regional Recreation Opportunities

Extensive recreational opportunities exist within a 60-mile radius of the Wallace Dam Project. Three other Georgia Power reservoirs (Lakes Sinclair, Jackson, and Juliette), ranging in size from 3,600 to 15,330 acres, provide opportunities for fishing, boating, picnicking, camping, and viewing natural scenery. J. Strom Thurmond Lake, operated by USACE on the Savannah River, covers 71,000 acres and has 1,200 miles of shoreline with 61 access points, including 35 operated by USACE. Oconee NF offers premier opportunities for hunting, wildlife viewing, and warmwater fishing experiences on streams and lakes. The Oconee, Redlands, Cedar Creek, and B.F. Grant WMAs provide opportunities for hunting, camping, bird watching, fishing, hiking, picnicking, canoeing, horseback riding, and bicycling. Nine state parks offer a variety of water-based and non-water based recreation activities. In addition, the Piedmont Wildlife Refuge provides numerous sites for hiking, fishing, and wildlife observation.

Land Use and Relevant Resource Management Plans

The predominant land uses in this portion of the upper Oconee River basin historically have been suburban or rural residential mix composed of low-intensity urban, forested lands, and row crop and pasture lands. With the exception of limited pockets of urban land around Eatonton and Milledgeville, most of the lands around the Project contain forest, row crop/pasture, or clearcut/sparse vegetation. Land use for the project boundary is primarily undeveloped and is either deciduous or pine forest (12 percent of the total area) or forested wetlands (5 percent of the total area). Less than 2 percent of the project lands are being used for low- or high-intensity urban purposes. Sixty-three percent of the lands within 2,000-ft of the Project are forested, while approximately 811 acres (1 percent) are on low- or high-intensity urban uses. The majority of these urban uses are clustered near the central portion of the reservoir along Lake Oconee Parkway (Georgia Hwy 44).

Land use in the vicinity of the Wallace Dam transmission line is predominantly undeveloped, forested/timberlands or agricultural land used for dairy or poultry farming. The remaining areas are occupied by aquatic or wetland features, a few residential properties, and small roads. The only urban area near the transmission line ROW is Eatonton.

Georgia Power manages the shoreline of Lake Oconee in accordance with its Shoreline Management Guidelines. No residential structures are allowed on project lands within the project boundary. Landowners adjacent to the project boundary must sign a valid access lease agreement before applying to Georgia Power for a permit. A permit must be obtained before beginning any construction, renovation, tree removal, or land disturbance on Georgia Power land, as well as dredging activities. The guidelines list specific Lake Oconee requirements and restrictions for constructing seawalls, docks, wharves, boatslips, and boat lifts and personal

watercraft lifts. The requirements minimize shoreline disturbance from tree removal, mechanical clearing, and other activities to protect the 25-ft vegetative buffer surrounding the lake; the project license requires wider buffers in some areas of the reservoir. The guidelines also include a shoreline use section with information about protecting and enhancing the scenic, recreational, and environmental values of the reservoir, as well as maintaining compatibility with the overall reservoir recreational use.

FERC-Approved Comprehensive Waterway Plans

Section 10(a)(2)(A) of the Federal Power Act, 16 U.S.C. § 803(a)(2)(A), requires FERC to consider the extent to which a project is consistent with Federal or State comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the Project. FERC (2017b) currently lists 33 comprehensive plans for the State of Georgia. Table 16 lists the 15 plans potentially relevant to recreation and land use. The following section discusses the most recent and directly relevant comprehensive plan, Georgia's Statewide Comprehensive Outdoor Recreation Plan (SCORP).

Statewide Comprehensive Outdoor Recreation Plan

The Georgia SCORP for 2017-2021 (Georgia State Parks, 2016) reports on the state of parks and greenspaces and offers guidance to state and local decision-makers and citizens on ways to promote healthy communities, enhance economic vitality, and conserve natural resources. A public parks inventory shows that Putnam and Greene Counties have between 10 and 20 percent of their areas available for outdoor recreation, while Morgan and Hancock Counties have less than 5 percent available. For many recreators, the quality of their experience depends in large part on the quality of the facilities they use. In recognition of this importance, about 60 percent of Land and Water Conservation Fund awards to local governments between 2006 and 2015 were targeted toward the rehabilitation of existing facilities.

Public survey results, focus groups, and public comments underscore the popularity and importance of trails. Trails support a wide range of outdoor recreation activities and are relatively inexpensive to design, construct, and maintain when strategically placed and supported by local communities. About 63 percent of survey respondents self-identified as being outdoor recreators, enjoying such activities as walking, jogging, running, picnicking, swimming, and observing wildlife and nature. About 20 to 30 percent of recreators indicate that physical limitations can be a barrier, indicating the continuing importance of addressing this challenge in the planning, development, and rehabilitation of parks.

Northeast Georgia Plan 2035

The Northeast Georgia Plan 2035, applicable to Greene and Morgan Counties, describes Lake Oconee and the Apalachee River as Regionally Important Resources (RIRs) with potential for development conflicts due to their overlap with potential "Developed" and "Developing" Character Areas (Northeast Georgia Regional Commission [NEGRC], 2011). The plan notes

that the region's Desired Development Patterns include facilities for bicycles, including bikeways or bike lanes, parking racks as well as the preservation of environmentally sensitive areas by setting them aside as public parks, trail corridors, or greenbelts (NEGRC, 2012).

Regionally Important Resources Plan, Middle Georgia

The Middle Georgia Regionally Important Resources Plan (Middle Georgia Regional Commission, 2010), applicable to Putnam County, describes Lake Oconee and the Oconee River as RIRs with potential for development conflicts. The plan notes that the area surrounding Lake Oconee is becoming increasingly covered by impervious surfaces from rapid residential and commercial development, threatening the water quality of Lake Oconee. In addition, the Oconee River is vulnerable to both urban runoff and rapid growth and development upstream. The plan notes that the region's General Policies and Protection Measures include development of new land development ordinances designed to protect RIRs as well as the preservation of environmentally sensitive areas by setting them aside as public parks, trails, or greenbelts.

Central Savannah River Area Plan 2035

The Central Savannah River Area Plan 2035, applicable to Hancock County, describes the Oconee WMA and Lake Sinclair as RIRs with potential for development conflicts. The Plan notes that Hancock County has areas of significant disinvestment, levels of poverty, and/or unemployment substantially higher than average levels for the region as a whole. It emphasizes the importance of timber to Hancock County with forest lands representing just over 90 percent (267,000 acres) of the County's total area (Central Savannah River Area Regional Commission, 2011).

4.3.6.2 Environmental Impacts and Recommendations

Recreation Improvements

Georgia Power identified potential recreation enhancements throughout the relicensing process in agency and stakeholder meetings during scoping, study planning, study results meetings, and the PLP meeting. The proposed improvements were also informed by campground customer satisfaction surveys in 2011 and 2014, recreation user surveys at boat ramps and bank fishing areas in 2016, and user group and law enforcement surveys in 2016. Georgia Power proposes to further improve recreational access and facilities by working with GDNR and local stakeholders to implement the following measures, several of which are illustrated conceptually in Figures 10 through 18:

- Lawrence Shoals Park – enhance recreation amenities by constructing new facilities to replace two campground restrooms, a beach house, a boat ramp restroom, a courtesy dock at the boat ramp, a pavilion and dedicated pavilion restroom, and a guest relations gate house. In addition, upgrade the current well system that supplies water to park

facilities and customers. These improvements would continue to support quality recreation opportunities.

- Enhance recreation amenities at Old Salem Park by constructing new facilities to replace two group docks (and add a third group dock), a pavilion and dedicated pavilion restroom, a boat ramp restroom, a courtesy dock at the boat ramp, a beach house, and a guest relations gate house. In addition, upgrade the current well system that supplies water to park facilities and customers, and reconfigure the park entrance and gate house to reduce single-lane traffic congestion and allow for year-round operation of the boat ramp. These improvements would continue to support quality recreation opportunities and enhance year-round boat-fishing and tournament-fishing access to Lake Oconee.

- Enhance recreation amenities at Parks Ferry Park by constructing new facilities to replace two campground restrooms, a beach house, a courtesy dock at the boat ramp, and a pavilion and dedicated pavilion restroom. In addition, upgrade the current well system that supplies water to park facilities and customers; replace the underground water and electrical service; and reconfigure the entrance gate and gate house to reduce single-lane traffic congestion and allow for year-round operation of the boat ramp. These improvements would continue to support quality recreation opportunities and enhance year-round boat-fishing and tournament-fishing access to Lake Oconee.

- Increase bank fishing access on Lake Oconee by providing a new bank fishing access development at the Area C-5 tract to include a pier and gravel parking.

- Increase bank fishing access on Lake Oconee by providing a new bank fishing access development at Jerry's Hwy 44 to include a pier and gravel parking.

- Enhance recreation amenities and increase bank fishing access at Sugar Creek Boat Ramp by adding a new fishing pier, upgrading the vault toilet with a flush toilet, and upgrading the courtesy dock.

- Enhance recreation amenities at Armour Bridge Boat Ramp by upgrading the courtesy dock and replacing the vault toilet with a flush toilet.

- Enhance recreation amenities and improve bank fishing access at Long Shoals Boat Ramp by upgrading the courtesy dock and trimming vegetation to provide additional bank fishing access.

- Enhance recreation amenities and improve tailrace bank fishing access at the Georgia Hwy 16 Bridge Boat Ramp downstream of the dam by providing a new tailrace fishing pier and a vault toilet. The new fishing pier would replace the bank fishing access provided at the Tailrace Fishing Area, which would be closed due to its limited public use and for security of Wallace Dam's adjacent equipment yard.

- Enhance recreational access at Georgia Power boat launch facilities by installing improved lighting at Lawrence Shoals Park, Old Salem Park, Parks Ferry Park, Sugar Creek Boat Ramp, Armour Bridge Boat Ramp, Long Shoals Boat Ramp, Area C-5 tract, Jerry's Hwy 44, and Hwy 16 Bridge Boat Ramp.

The proposed enhancement measures at Lawrence Shoals Park, Old Salem Park, and Parks Ferry Park would replace and upgrade aging facilities to improve the diverse recreational opportunities at Lake Oconee. The measures respond to primary user recommendations at these full-service campgrounds and would improve the quality of experience using restrooms, beach houses, pavilions, and entering and leaving the facility. As emphasized in the Georgia SCORP (Georgia State Parks, 2016), the quality of experience for many recreators depends in large part on the quality of the facilities they use.

Existing recreation amenities would also be upgraded at Georgia Power's three day-use facilities on Lake Oconee (Sugar Creek, Armour Bridge, and Long Shoals). Upgrades include new courtesy docks at all three boat ramps, and upgrading vault toilets to flush toilets at Sugar Creek and Armour Bridge.

WRD has expressed interest in expanding fishing tournament access to Lake Oconee and ensuring that accommodations are available to tournament anglers year-round (J. Biagi, GDNR, January 20, 2017 letter to K.D. Bose, FERC). The proposed reconfiguration of the park entrances and gate houses at Old Salem and Parks Ferry would allow boating access to be expanded to year-round at these facilities, which would enhance public boating access available for year-round boat fishing and tournament-fishing.

WRD would also like to see additional and/or improved access for bank fishing at the Project. Georgia Power's proposed enhancement measures for Area C-5 and Jerry's Hwy 44 would add new bank fishing piers at these locations, along with parking. Bank fishing opportunities would also be improved at the Sugar Creek Boat Ramp by adding a new fishing pier and at the Long Shoals Boat Ramp by trimming existing vegetation to provide additional shoreline access to bank fishing sites. In addition, lighting would be added or improved at each of these bank fishing locations.

Finally, Georgia Power proposes to close the Tailrace Fishing Area on the west side of the Wallace Dam tailrace area and relocate tailrace bank fishing access to the existing Georgia Hwy 16 Bridge Boat Ramp on the east side of the tailrace area (Figure 3). The existing Tailrace Fishing Area would be closed because of its current limited public use and for security of Wallace Dam's adjacent equipment yard. Tailrace bank fishing access would be enhanced at the Georgia Hwy 16 Bridge Boat Ramp by installing a new fishing pier, a vault toilet, and improving the lighting.

Reservoir Shoreline Management

Georgia Power proposes to continue to manage the Lake Oconee shorelines in accordance with its current Shoreline Management Guidelines for Georgia Power Lakes and to promote the maintenance of vegetative buffers around the reservoir to protect water quality, aquatic habitat, and cultural and aesthetic resources. The guidelines provide guidance to adjacent residents on permitting and constructing shoreline structures in a manner that preserves and enhances the scenic, recreational, and environmental values of the reservoir, as well as maintaining compatibility with overall recreational uses of the reservoir.

The guidelines list specific Lake Oconee requirements and restrictions for constructing seawalls, docks, wharves, boatslips, and boat lifts and personal watercraft lifts. The requirements minimize shoreline disturbance from tree removal, mechanical clearing, and other activities to protect the 25-ft vegetative buffer surrounding the lake; the project license requires wider vegetative buffers in some areas of the reservoir. The guidelines also include a shoreline use section with information about protecting and enhancing the scenic, recreational, and environmental values of the reservoir, as well as maintaining compatibility with the overall reservoir project recreational use.

Georgia Power's Oconee/Sinclair Land Management Office staff manages the Wallace Dam project boundary shoreline. The Lake Resources Manager is responsible for the shoreline management program. Two full-time shoreline management staff are responsible for permitting and inspections. One and one-half administrative staff administer the legal documents required by Georgia Power in order to obtain a shoreline permit. Georgia Power undeveloped land is managed by one Georgia Power forester certified as a Professional Forester in Georgia. In addition, two trucks and two boats are dedicated to shoreline management at the Wallace Dam Project. Georgia Power maintains GIS maps of the shoreline and a database of all adjacent property owners.

Construction of Proposed Enhancement Measures

Construction of the proposed recreation enhancements and construction of the proposed shoreline stabilization measures (Section 4.3.1.2) could cause temporary disturbances due to noise and limited recreation access at the project recreation facilities; however, to the extent practical, construction would occur during the fall and winter when recreation use is lowest. Georgia Power proposes to perform all construction work in accordance with its Shoreline Management Program, described above, to minimize impacts to environmental resources, including water quality and historic properties, near the construction projects. These minor, temporary disturbances, particularly the infrastructure improvements and installation of new restrooms, beach houses, and gate houses, could affect existing vegetation and local water quality; however, implementation of proper erosion control and restoration practices during and immediately following construction would minimize these impacts.

Construction of the proposed forebay oxygen line diffuser system in Lake Oconee, including the onshore liquid oxygen facility (Section 4.3.3.2), could also cause temporary disturbances to public recreation activities on Lake Oconee near the Wallace Dam forebay. All construction work at the shoreline would be performed in accordance with the Shoreline Management Program to minimize impacts. Once the liquid oxygen facility is completed, operational noise would be limited to the summer months and would be expected to be minor. Forested vegetation around the site would buffer visual and noise disturbance from operational activity. For these reasons, construction of the forebay oxygen line diffuser system is expected to have minimal impacts on project recreation and land use.

Unavoidable Adverse Impacts

Construction of the proposed bank fishing recreation enhancements at Area C-5, Jerry's Hwy 44, and the Hwy 16 Bridge Boat Ramp would permanently change the use of minor amounts of land within the project boundary.

4.3.7 Aesthetic Resources

4.3.7.1 Affected Environment

Lake Oconee's public access points offer diverse views of the project impoundment, shorelines, and tailrace areas. Georgia Power's Shoreline Management Guidelines help to protect the vegetative buffer surrounding Lake Oconee and preserve and enhance the aesthetic value of the reservoir.

Generally, the central and southern portions of Lake Oconee provide the most developed views, including low intensity residential, golf courses, resorts, marinas, campgrounds, commercial areas along Georgia Highway 44, and various public and private recreation access areas (Figure 3). The shoreline vegetative buffer zone in these parts of the reservoir includes a mix of landscaped, landscaped-natural, and natural conditions. Significant stretches of undeveloped, forested shoreline occur in the southern end of the reservoir in association with Georgia Power's Lawrence Shoals Park, Oconee WMA, and other areas reserved as natural areas or future recreation development. Viewsheds include Wallace Dam, boat ramps, public beach areas, golf courses, and public marinas (Figure 20).

The northern portions of Lake Oconee upstream of I-20 and surrounded by tracts of the Oconee NF provide the most rural and undeveloped views. Viewsheds in these parts of the reservoir include forested, agricultural, and low intensity residential land uses beyond the shoreline, as well as public recreation access areas, highway and railroad crossings, and small undeveloped islands within the reservoir.

The Wallace Dam transmission line traverses a mostly rural landscape. Vegetative density near the ROW is high and visibility of the line is restricted in many areas. No major highways travel near the line for most of its length. Generally, the east and west ends of the ROW provide

the most open views. The east end of the line near Wallace Dam is visible where it intersects Georgia Highway 16 and Lawrence Shoals Park.

4.3.7.2 Potential Resource Impacts

Georgia Power's proposed operation and proposed shoreline protection and recreational enhancement measures would not adversely affect aesthetic resources within the project boundary. Construction of the liquid oxygen facility for the forebay oxygen line diffuser system would result in some temporary unavoidable adverse impacts upon aesthetic. However, once the system is installed, the impact would be minimal. The liquid oxygen facility would be mostly shielded from view by vegetation in the area from both the reservoir and from land.

Unavoidable Adverse Impacts

No unavoidable adverse impacts are anticipated.

4.3.8 Cultural Resources

4.3.8.1 Affected Environment

Georgia Power assessed the historic hydro-engineering resources of the Wallace Dam Project to document the existing conditions of the hydropower facility and its support buildings (TRC, 2016a). Although the Project is not yet 50 years old, it will become so during the next license term in 2029. The assessment was performed to develop a historic context and engineering analysis for future eligibility determination of the Wallace Dam Project for listing in the National Register of Historic Places (NRHP).

Wallace Dam is the newest and largest of the 18 hydroelectric plants in Georgia Power's generating system. The Project was completed in three construction periods between 1970 and 1979 under the design and engineering authority of Georgia Power. The dam, powerhouse, control building, administration building, and other support buildings are located in Hancock and Putnam counties (Figures 3 and 5). Wallace Dam possesses several unique engineering features (TRC, 2016a). It was Georgia Power's first pumped storage hydroelectric project. At the time of construction, the Project's pump turbines were the largest ever manufactured by Allis-Chalmers (now Voith Hydro). The turbines feature innovative individual servomotors for each wicket gate, which provided economy and simplicity in design and were reported to be the first used in the U.S. The powerhouse control building and administration building express a standardized version of the Brutalist architectural style that was common among public utility facilities across the nation during the 1970s. Other support buildings include a sewage lift station and maintenance buildings. Wallace Dam has not undergone any major structural or mechanical alterations since it was constructed in 1979 and it retains excellent physical integrity.

Georgia Power also tested and evaluated certain archaeological sites within the area of potential effects (TRC, 2016b). The cultural resources of the Wallace Dam project area have been well-studied, as summarized in the PAD (Georgia Power, 2015a). Since 1996, Georgia Power has annually monitored seven archaeological sites. Phase II testing was conducted in 2016 at three of these sites (9GE751, 9GE952, and 9HK23) to assist in determining their NRHP eligibility and to aid in evaluating the need for continued cultural resources monitoring. Sites 9GE751 and 9HK23 were previously recommended eligible for the NRHP, while the eligibility of 9GE952 was unknown.

Based on the results of the Phase II testing, sites 9GE751 and 9HK23 were recommended not eligible for inclusion in the NRHP (TRC, 2016b). Accordingly, Georgia Power believes that further monitoring of these two sites is not warranted under the new FERC license. The investigation of site 9GE952 found that the site extends outside of the project boundary and may yet yield significant information. Until such time, TRC (2016b) recommends that the NRHP eligibility status of this site remain unassessed, that monitoring continue, and that stabilization measures be considered given the reservoir's proximity to the densest portion of the site. In addition, based on the results of previous investigations, the study recommended that site 9PM990 be added to the list of sites for monitoring under the new FERC license.

The Rock Hawk effigy is located in uplands adjacent to Lake Oconee and serves as the centerpiece of the Rock Hawk Effigy and Trails system (Georgia Power, 2015a). Although the trails and interpretive signage are maintained by Georgia Power, the effigy itself is not within the Wallace Dam project boundary.

No historic or archaeological sites listed or recommended for inclusion in the NRHP are known to occur along the Wallace Dam-Eatonton transmission line in Putnam County. An intensive archaeological survey conducted along the proposed route in 1979, prior to construction, documented three historic-period archaeological sites and four isolated finds within the impact corridor (SSI Earth Systems Division, 1979). However, none of the sites were recommended for nomination to the NRHP and none of the finds warranted further research.

4.3.8.2 Environmental Impacts and Recommendations

Georgia Power proposes to implement a Historic Properties Management Plan (HPMP) through a Programmatic Agreement to assure the preservation and long-term management of archaeological sites and historic buildings and structures within the project boundary. The HPMP would be implemented through a Programmatic Agreement between FERC, the Georgia State Historic Preservation Officer, the Advisory Council on Historic Preservation, and the Tribes and would provide specific protocols and procedures for monitoring recorded resources, as well as dealing with any future discoveries on project lands. The HPMP would also provide a list of categorical exclusions for certain safety and maintenance procedures that area a necessary component of operating a power generating facility.

Unavoidable Adverse Impacts

No unavoidable adverse impacts are anticipated.

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TABLES

TABLE 1
Nameplate Generating Capacity and Hydraulic Capacity of the Wallace Dam Turbine Units

Unit	Nameplate Capacity of Turbines (hp)	Nameplate Capacity of Generators (MW)	Maximum Hydraulic Capacity (cfs)	Best Gate Hydraulic Capacity (cfs)	Commercial Operation Date
1[a]	73,000	52.20	8,390	7,200	1980
2[a]	73,000	52.20	8,825	7,250	1980
3	78,000	56.25	8,600	7,900	1980
4	78,000	56.25	8,600	7,900	1980
5[a]	73,000	52.20	8,210	7,250	1980
6[a]	73,000	52.20	7,920	7,250	1979
Total		**321.3**	**50,545**		NA

[a] Pumped storage units

TABLE 2
Design Characteristics of the Wallace Dam Turbine Units

Unit	Turbine Type	Turbine Arrangement	Turbine Operating Speed (rpm)	Unit Hydraulic Capacity (cfs)[a]	Number of Runners per Turbine	Runner Inlet Diameter (inches)	Number of Runner Buckets/ Blades	Bucket Spacing at Inlet (inches)	Peripheral Runner Velocity (fps)
1	Francis (reversible)	Vertical	85.8	8,390 (6,700)	1	253	6	132	95
2	Francis (reversible)	Vertical	85.8	8,825 (6,700)	1	253	6	132	95
3	Modified Propeller	Vertical	120	8,600	1	202	8	80	106
4	Modified Propeller	Vertical	120	8,600	1	202	8	80	106
5	Francis (reversible)	Vertical	85.8	8,210 (6,700)	1	253	6	132	95
6	Francis (reversible)	Vertical	85.8	7,920 (6,700)	1	253	6	132	95
			Total – Generation	**50,545**					
			Total – Pumpback	**26,800**					

Source: Southern Company Generation Hydro Services

[a] Hydraulic capacity of the pump-turbines in pumping mode is shown in parentheses.

TABLE 3
Monthly Minimum, Mean, and Maximum Flow by Month at Wallace Dam, 1997-2016

Month	Minimum Flow (cfs)	Mean Flow (cfs)	Maximum Flow (cfs)
January	1,046	2,829	6,527
February	1,048	3,447	9,586
March	1,627	3,577	7,240
April	764	2,731	7,318
May	523	1,932	5,202
June	386	1,495	4,299
July	263	1,476	6,100
August	180	1,003	3,122
September	179	1,151	5,052
October	146	1,316	5,693
November	288	1,924	7,982
December	673	2,700	8,054

TABLE 4

Fishes Known to Occur in the Vicinity of the Wallace Dam Project Based on Historical and Recent Records

Family/Scientific Name	Common Name	Project Boundary	Tributaries to Lake Oconee Upstream of Project Boundary							Lake Sinclair
		Lake Oconee	Oconee River	Greenbriar Creek	Apalachee River	Hard Labor Creek	Sugar Creek	Richland Creek	Town Creek	
GARS:										
Lepisosteus osseus	longnose gar	X	X	X	X	X	X	X	X	X
BOWFIN:										
Amia calva	bowfin							X	X	
FRESHWATER EELS:										
Anguilla rostrata	American eel					X				
HERRINGS AND SHADS:										
Dorosoma cepedianum	gizzard shad	X	X	X	X	X	X	X	X	X
Dorosoma petenense	threadfin shad[a]	X	X	X	X		X	X	X	X
MINNOWS:										
Campostoma pauciradii	bluefin stoneroller		X							
Cyprinella callisema	Ocmulgee shiner		X		X	X	X			X
Cyprinella xaenura	Altamaha shiner[b]		X		X	X		X		
Cyprinus carpio	common carp[a]	X	X	X	X	X	X	X	X	X
Hybognathus regius	Eastern silvery minnow		X		X	X	X			
Hybopsis rubrifrons	rosyface chub		X	X	X	X	X	X	X	
Nocomis leptocephalus	bluehead chub		X	X	X	X	X	X	X	
Notemigonus crysoleucas	golden shiner	X	X	X	X		X	X	X	X
Notropis hudsonius	spottail shiner		X		X	X	X	X		X
Notropis longirostrus	longnose shiner					X				
Notropis lutipinnis	yellowfin shiner		X	X	X	X	X	X	X	
Opsopoeodus emiliae	pugnose minnow									X
SUCKERS:										
Erimyzon oblongus	creek chubsucker		X	X	X	X		X	X	

TABLE 4

Fishes Known to Occur in the Vicinity of the Wallace Dam Project Based on Historical and Recent Records

Family/Scientific Name	Common Name	Project Boundary	Tributaries to Lake Oconee Upstream of Project Boundary							Lake Sinclair
		Lake Oconee	Oconee River	Greenbriar Creek	Apalachee River	Hard Labor Creek	Sugar Creek	Richland Creek	Town Creek	
Minytrema melanops	spotted sucker	X			X	X	X			X
Moxostoma anisurum	silver redhorse	X								X
Moxostoma collapsum	notchlip redhorse		X		X	X	X			X
Moxostoma rupiscartes	striped jumprock	X	X	X	X	X	X	X	X	
Moxostoma sp. cf. lachneri	brassy jumprock	X	X		X	X	X			
NORTH AMERICAN CATFISHES:										
Ameiurus brunneus	snail bullhead	X	X	X	X	X	X	X	X	X
Ameiurus catus	white catfish	X	X	X	X	X	X	X	X	X
Ameiurus natalis	yellow bullhead	X	X	X	X		X	X	X	
Ameiurus nebulosus	brown bullhead	X					X	X		X
Ameiurus platycephalus	flat bullhead	X								X
Ictalurus furcatus	blue catfish[a]	X	X	X	X		X			X
Ictalurus punctatus	channel catfish	X	X	X	X	X	X	X	X	X
Noturus gyrinus	tadpole madtom		X	X		X		X	X	
Noturus insignis	margined madtom		X		X	X				
Noturus leptacanthus	speckled madtom				X	X				
Pylodictus olivaris	flathead catfish[a]	X			X		X			X
PIKES:										
Esox americanus	redfin pickerel		X	X	X	X			X	X
Esox niger	chain pickerel		X		X			X		
PIRATE PERCHES:										
Aphredoderus sayanus	pirate perch		X	X	X	X		X	X	
SILVERSIDES:										
Labidesthes sicculus	brook silverside				X	X				X

TABLE 4

Fishes Known to Occur in the Vicinity of the Wallace Dam Project Based on Historical and Recent Records

Family/Scientific Name	Common Name	Project Boundary	Tributaries to Lake Oconee Upstream of Project Boundary							Lake Sinclair
		Lake Oconee	Oconee River	Greenbriar Creek	Apalachee River	Hard Labor Creek	Sugar Creek	Richland Creek	Town Creek	
LIVEBEARERS:										
Gambusia holbrooki	eastern mosquitofish[c]		X	X	X	X		X	X	X
TEMPERATE BASSES:										
Morone chrysops	white bass[a]	X	X	X	X		X	X	X	X
Morone saxatilis	striped bass	X	X	X	X		X	X	X	X
Morone chrysops x *M. saxatilis*	hybrid bass	X	X	X	X		X	X	X	X
SUNFISHES:										
Centrarchus macropterus	flier		X	X					X	
Lepomis auritus	redbreast sunfish	X	X	X	X	X	X	X	X	X
Lepomis cyanellus	green sunfish[a]	X	X	X	X	X	X	X	X	X
Lepomis gulosus	warmouth	X	X	X	X	X	X	X	X	X
Lepomis macrochirus	bluegill	X	X	X	X	X	X	X	X	X
Lepomis microlophus	redear sunfish	X	X	X	X	X	X	X	X	X
Micropterus punctulatus	spotted bass[a]	X								
Micropterus salmoides	largemouth bass	X	X	X	X	X	X	X	X	X
Micropterus sp. cf. coosae	redeye bass		X		X	X		X		
Pomoxis annularis	white crappie[a]				X					
Pomoxis nigromaculatus	black crappie	X	X	X	X	X	X	X	X	X
PERCHES:										
Perca flavescens	yellow perch[a]	X	X	X	X	X	X	X	X	X
Percina nigrofasciata	blackbanded darter				X					
Etheostoma hopkinsi	Christmas darter		X	X		X	X	X	X	
Etheostoma inscriptum	turquoise darter		X	X	X	X			X	

TABLE 4

Fishes Known to Occur in the Vicinity of the Wallace Dam Project Based on Historical and Recent Records

Family/Scientific Name	Common Name	Project Boundary	Tributaries to Lake Oconee Upstream of Project Boundary							Lake Sinclair
		Lake Oconee	Oconee River	Greenbriar Creek	Apalachee River	Hard Labor Creek	Sugar Creek	Richland Creek	Town Creek	
Etheostoma olmstedi	tessellated darter		X	X	X	X			X	X
Estimated Number of Taxa[d]		28	43	33	45	39	33	34	33	32
Data Sources[e]		1, 2	3, 4	3	3, 5	3	3	3	3	6, 7

[a] Introduced, non-native to the Altamaha River basin (Lee et al., 1980).

[b] Altamaha shiner is Georgia state-listed as “threatened.”

[c] Western mosquitofish (*Gambusia affinis*) may also have been introduced in the basin.

[d] Total excludes hybrids.

[e] Data sources: Georgia Power (2015a) and sources listed therein

TABLE 5

Monthly Total Generation (Megawatt-Hours) for the Wallace Dam Project for Years 1997-2016[a]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1997	32,169	28,573	26,200	27,431	21,793	26,819	42,052	37,352	31,077	32,939	36,386	41,208	383,999
1998	29,059	40,544	39,901	35,002	43,008	45,556	48,437	52,516	53,852	38,400	14,441	27,456	468,172
1999	28,562	32,923	34,472	32,209	28,147	35,567	46,963	46,421	41,990	37,166	34,076	34,908	433,404
2000	39,294	42,862	33,951	25,220	37,512	38,246	42,252	42,619	37,575	28,867	30,874	32,525	431,797
2001	11,679	17,519	33,361	24,610	35,508	37,921	32,897	34,156	22,830	16,123	13,542	18,617	298,763
2002	29,207	18,323	31,837	32,078	39,451	40,362	42,136	44,417	41,187	36,606	23,454	32,395	411,453
2003	36,418	25,961	44,400	30,459	38,789	32,894	48,182	46,972	43,818	34,933	38,479	35,626	456,931
2004	33,457	30,180	34,092	28,715	37,988	42,151	41,283	41,976	42,732	32,375	32,871	34,993	432,813
2005	35,232	28,360	29,654	28,216	32,443	33,242	37,982	38,335	29,466	32,221	27,274	19,814	372,239
2006	34,716	27,836	27,447	31,586	35,130	36,052	36,679	42,842	30,615	31,204	31,408	34,015	399,530
2007	36,782	29,065	37,003	33,407	31,724	28,590	28,831	31,726	34,299	37,462	29,842	35,530	394,261
2008	30,009	22,871	24,361	28,610	28,011	27,400	29,603	33,083	30,729	22,964	18,151	20,675	316,467
2009	20,888	14,967	33,477	30,565	40,983	39,651	41,906	42,673	35,380	39,083	36,656	37,217	413,446
2010	37,498	38,212	27,597	25,390	34,477	35,313	41,532	40,741	41,582	37,913	25,422	22,681	408,358
2011	21,472	21,837	32,877	29,678	28,478	29,965	30,944	34,827	34,267	30,218	27,598	26,796	348,957
2012	26,632	20,411	30,823	32,346	33,545	36,550	32,713	35,109	34,247	29,446	24,096	20,446	356,364
2013	19,595	23,019	22,204	24,571	22,612	26,895	30,728	32,411	29,605	27,126	17,672	27,538	303,976
2014	23,736	20,174	18,569	28,714	24,062	23,135	34,129	33,854	32,591	33,444	20,048	25,055	317,511
2015	20,662	15,666	27,813	28,287	25,175	22,408	29,721	35,087	26,432	26,231	34,474	50,155	342,111
2016	30,603	23,374	21,645	21,451	22,799	27,139	27,336	38,230	47,924	40,666	30,903	29,157	361,227
Average	**28,884**	**26,134**	**30,584**	**28,927**	**32,082**	**33,293**	**37,315**	**39,267**	**36,110**	**32,269**	**27,383**	**30,340**	**382,589**

Source: Southern Company Generation Hydro Services

[a] Values color-coded to show highs (blue) and lows (red).

TABLE 6

Summary of Wallace Dam Hourly Generation by Month for Water Years 2016 and 2017

	Number of Days of Generation at a Given Hour during a Given Month (max=60-62) for WY2016 and WY2017																							
MONTH	**12AM**	**1AM**	**2AM**	**3AM**	**4AM**	**5AM**	**6AM**	**7AM**	**8AM**	**9AM**	**10AM**	**11AM**	**12PM**	**1PM**	**2PM**	**3PM**	**4PM**	**5PM**	**6PM**	**7PM**	**8PM**	**9PM**	**10PM**	**11PM**
Jan	10	6	6	6	3	4	4	15	27	21	17	17	16	15	16	16	16	16	19	36	41	40	33	14
Feb	7	5	5	3	2	2	2	12	20	19	16	6	11	12	11	12	14	14	21	40	42	35	28	13
Mar	3						1	13	18	10	15	17	18	15	17	15	10	13	12	23	34	44	37	13
Apr	12	7	4	4	4	2	3	8	11	11	11	9	13	12	13	20	24	27	25	29	31	46	36	24
May	1											1	2	6	16	24	30	41	45	46	48	48	32	14
Jun	6	5	5	5	4	4	3	2	1	1	1	1	8	11	21	34	39	42	45	46	46	42	31	15
Jul	4						1	1	1	2	2	3	11	20	38	43	47	57	53	51	47	36	22	9
Aug		1	1	1	1	1	1				1	1	15	31	41	49	52	56	50	53	44	38	24	4
Sep												1	5	11	25	36	51	55	57	57	54	47	30	8
Oct	2	2	1	1	1	1	1	1	4	4	5	11	16	17	29	32	34	37	39	37	50	47	33	16
Nov	5	4	4	4	4	4	6	13	18	21	19	19	18	19	21	23	25	28	40	54	51	42	24	11
Dec	9	9	9	9	10	9	10	19	27	31	28	24	20	16	13	12	14	15	38	49	45	40	32	13

Source: Southern Company Generation Hydro Services

[a] Values color-coded to show highs (blue) and lows (red).

TABLE 7

Summary of Wallace Dam Hourly Pumpback by Month for Water Years 2016 and 2017

	Number of Days of Pumpback at a Given Hour during a Given Month (max=60-62) for WY2016 and WY2017[a]																							
MONTH	**12AM**	**1AM**	**2AM**	**3AM**	**4AM**	**5AM**	**6AM**	**7AM**	**8AM**	**9AM**	**10AM**	**11AM**	**12PM**	**1PM**	**2PM**	**3PM**	**4PM**	**5PM**	**6PM**	**7PM**	**8PM**	**9PM**	**10PM**	**11PM**
Jan		8	24	26	24	19	9	6	1						1	1	1							
Feb	2	10	28	34	32	26	13	9	4	4	3	3	2	5	5	5	6	6	2	1	1	1	1	1
Mar	4	12	41	50	52	44	21	8	2	1	1	1	1	1	5	5	5	2	2	1	1	1	1	1
Apr	6	10	34	38	37	35	25	16	8	6	6	5	3	3	3	3	3	3	3	3	3	3	3	3
May	1	8	38	48	54	53	41	22	11	2														
Jun	1	8	38	48	50	50	44	22	13	4														
Jul	3	12	42	57	58	57	49	34	21	3														
Aug	10	20	58	60	60	60	58	47	29	17	5	2												1
Sep	16	30	50	57	59	59	58	49	39	28	14	2												3
Oct	15	32	49	54	55	55	48	39	27	15	7	1												
Nov	13	21	32	37	38	38	25	11	4	3	2	1	1		1	2	1						1	3
Dec	13	28	43	41	41	38	27	13	6	3	2					1	3	3	1				1	3

Source: Southern Company Generation Hydro Services

[a] Values color-coded to show highs (blue) and lows (red).

TABLE 8

Summary of Wallace Dam Generation and Pumpback Hours by Unit and Month for Water Year 2016[a]

Month	Generation (Total Hours)						Pumpback (Total Hours)[b]						Total Generation	Total Pumpback
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6		
Jan	26	128	110	212	47	15	8	28	--	--	42	34	538	112
Feb	17	58	154	137	46	0	34	35	--	--	52	0	412	121
Mar	48	71	144	98	28	0	88	92	--	--	56	0	387	235
Apr	25	52	127	124	49	0	86	87	--	--	88	0	377	261
May	45	74	136	104	29	15	137	108	--	--	131	66	403	441
Jun	44	72	174	152	22	21	162	149	--	--	145	135	485	591
Jul	91	100	124	133	29	12	149	152	--	--	156	139	488	597
Aug	79	94	198	196	95	34	211	218	--	--	221	202	696	851
Sep	148	68	217	222	156	69	279	271	--	--	279	276	879	1104
Oct	22	77	143	157	35	29	0	163	--	--	114	112	463	388
Nov	43	73	240	218	17	5	0	55	--	--	50	22	596	126
Dec	45	113	321	278	81	27	0	89	--	--	89	21	866	199
												Total	**6,587**	**5,023**

Source: Southern Company Generation Hydro Services

[a] Values color-coded to show highs (blue) and lows (red).

[b] Units 3 and 4 are not reversible units.

TABLE 9

Summary of Wallace Dam Generation and Pumpback Hours by Unit and Month for Water Year 2017[a]

Month	Generation						Pumpback[b]						Total Generation	Total Pumpback
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6		
Jan	35	50	106	94	11	22	57	66	--	--	58	48	318	229
Feb	44	63	75	86	43	35	110	93	--	--	128	108	346	439
Mar	97	132	46	89	67	51	155	164	--	--	166	119	481	605
Apr	171	178	138	77	54	26	173	182	--	--	181	90	644	626
May	55	103	152	98	31	20	112	117	--	--	122	70	457	421
Jun	29	105	206	84	52	11	100	102	--	--	99	79	486	381
Jul	54	76	188	180	56	44	170	168	--	--	145	132	597	614
Aug	47	66	190	184	113	71	195	190	--	--	212	188	670	785
Sep	107	15	170	125	74	34	194	30	--	--	185	176	525	584
Oct	155	123	212	198	39	25	236	235	--	--	228	221	752	920
Nov	114	132	78	150	74	40	179	189	--	--	171	175	587	714
Dec	49	58	140	137	90	50	181	175	--	--	183	182	524	721
												Total	**6,387**	**7,039**

Source: Southern Company Generation Hydro Services

[a] Values color-coded to show highs (blue) and lows (red).

[b] Units 3 and 4 are not reversible units.

TABLE 10

Jocassee Site Monthly Operations, Acoustic-Sampled Entrainment Estimates, and Entrainment Rates

Month	Jocassee Operation (Hours)		Jocassee Total Entrainment (Number of fish)		Jocassee Entrainment Rate (Fish per hour)	
	Generation	**Pumping**	**Generation**	**Pumping**	**Generation**	**Pumping**
January	325	397	61,529	74,033	189	187
February	282	236	45,733	14,489	162	61
March	287	391	32,652	53,053	102	121
April	433	542	57,751	44,553	133	82
May	363	591	56,898	47,139	157	80
June	483	695	26,586	111,044	55	160
July	514	741	49,332	346,820	96	468
August	437	641	47,640	272,317	109	425
September	421	503	44,797	165,355	106	329
October	446	483	39,582	193,481	89	400
November	331	365	61,780	120,928	187	331
December	274	320	28,615	75,891	105	237
Total	**4,595**	**5,904**	**552,894**	**1,519,102**		

Source: Degan and Mueller (2013)

TABLE 11

Comparison of Jocassee and Wallace Dam Site and Operational Characteristics for Entrainment Data Extrapolation

	Jocassee Site[a]	**Wallace Dam Project**
Site Characteristics:		
Location	Savannah River basin, SC	Altamaha River basin, GA
Physiographic province	Piedmont and Blue Ridge	Piedmont
Drainage area	145 sq mi	1,830 sq mi
Reservoir area (upper)	7,980 acres (Lake Jocassee)	19,050 acres (Lake Oconee)
Reservoir area (lower)	17,660 acres (Lake Keowee)	15,330 acres (Lake Sinclair)
Operational Characteristics:		
Installed generating capacity	710.1 MW	321.3 MW
Head	316 ft	89 ft
Number of generating units	4	6
Generation hydraulic capacity	36,200 cfs	50,545 cfs
Number of pumpback units	4	4
Pumpback hydraulic capacity	31,720 cfs	26,800 cfs

a Source: Duke Energy (2014)

TABLE 12

Wallace Dam Project Monthly Operations for Water Years 2016 and 2017

Month	Wallace Dam Operation 2016 (Hours)		Wallace Dam Operation 2017 (Hours)		Wallace Dam Average Operation, 2016-2017 (Hours)	
	Generation	**Pumping**	**Generation**	**Pumping**	**Generation**	**Pumping**
January	538	112	318	229	428	171
February	412	121	346	439	379	280
March	387	235	481	605	434	420
April	377	261	644	626	510	443
May	403	441	457	421	430	431
June	485	591	486	381	485	486
July	488	597	597	614	543	606
August	696	851	670	785	683	818
September	879	1104	525	584	702	844
October	463	388	752	920	608	654
November	596	126	587	714	592	420
December	866	199	524	721	695	460
Total	**6,587**	**5,023**	**6,387**	**7,039**	**6,487**	**6,031**

Source: Southern Company Generation Hydro Services

TABLE 13

Extrapolated Wallace Dam Entrainment Estimates using Jocassee Monthly Entrainment Rates and Wallace Dam Average Monthly Operations

	Jocassee Entrainment Rate (Fish per hour)[a]		**Wallace Dam Average Operation, 2016-2017 (Hours)[b]**		**Wallace Dam Entrainment Extrapolation (Number of fish)**	
Month	**Generation**	**Pumping**	**Generation**	**Pumping**	**Generation**	**Pumping**
January	189	187	428	171	80,821	31,907
February	162	61	379	280	61,378	17,072
March	102	121	434	420	44,294	50,790
April	133	82	510	443	67,847	36,357
May	157	80	430	431	67,530	34,460
June	55	160	485	486	26,682	77,720
July	96	468	543	606	52,104	283,374
August	109	425	683	818	74,406	347,650
September	106	329	702	844	74,359	277,635
October	89	400	608	654	54,068	261,700
November	187	331	592	420	110,634	138,979
December	105	237	695	460	72,936	108,931
Total			**6,487**	**6,031**	**787,057**	**1,666,574**

[a] Source: Degan and Mueller (2013)

[b] Source: Southern Company Generation Hydro Services

TABLE 14

Federally and State Protected Plant and Wildlife Species with Known Records of Occurrence in the Wallace Dam Project Vicinity[a]

Scientific Name	Common Name	Federal Status[b]	Georgia Status[c]	Habitat[d]	County
PLANTS:					
Acmispon helleri	Carolina trefoil		E	Clayey soil over ultramafic rock; post oak-blackjack oak savannas	Greene
Amphianthus pusillus	Pool sprite	LT	T	Shallow, flat-bottomed depressions (solution pits, vernal pools) on granite outcrops, with thin gravelly soils and winter-spring inundation.	Greene Putnam Hancock
Cypripedium acaule	Pink ladyslipper		U	Upland oak-hickory-pine forests; piney woods.	Greene Morgan
Draba aprica	Sun-loving draba		E	Granite and amphibolite outcrops, usually in red cedar litter	Putnam
Eriocaulon koernickianum	Dwarf hatpins		E	Seepage areas and wet depressions on granite outcrops, often with horned bladderwort.	Greene Hancock
Isoetes melanospora	Black-spored quillwort	LE	E	Shallow, temporarily flooded, flat-bottomed pools formed by natural erosion on granite outcrops.	Greene
Isoetes tegetiformans	Mat-forming quillwort	LE	E	Shallow pools formed by natural erosion on granite outcrops.	Greene Putnam Hancock
Ptilimnium nodosum	Harperella	LE	E	Granite outcrop seeps; shallow seasonal ponds in limestone depressions.	Greene Putnam Hancock
Quercus oglethorpensis	Oglethorpe oak		T	Wet clay soils of upland seepage swamps, stream terraces, and moist hardwood forests.	Greene Putnam
Rhus michauxii	Michaux's sumac	LE	E	Dry open, rocky, or sandy woodlands over mafic bedrock; on ridges and river bluffs.	Newton[e]
Schisandra glabra	Bay star-vine		T	Moist, deciduous hardwood forests on lower slopes, stream terraces, and floodplains.	Morgan
Sedum pusillum	Granite stonecrop		T	Granite outcrops, usually in mats of moss beneath red cedar trees.	Greene

TABLE 14

Federally and State Protected Plant and Wildlife Species with Known Records of Occurrence in the Wallace Dam Project Vicinity[a]

Scientific Name	Common Name	Federal Status[b]	Georgia Status[c]	Habitat[d]	County
Silene ovata	Ovate catchfly		R	Mesic deciduous or beech-magnolia forests over limestone; bouldery, high-elevation oak forests	Hancock
Stewartia malacodendron	Silky camellia		R	Rich ravine and slope forests; lower slopes of sandhills above bogs and creek swamps.	Hancock
Waldsteinia lobata	Piedmont barren strawberry		R	Stream terraces, floodplain forests, and rocky, lower slopes with oak-hickory-pine forest.	Morgan
MUSSELS:					
Fusconaia masoni	Atlantic pigtoe		E	Sand and gravel in large creeks and rivers; occurs in Ogeechee River but not Oconee River.	Hancock
FISH:					
Cyprinella xaenura	Altamaha shiner		T	Small tributaries and rivers; often found in small pools with rocky to sandy substrates.	Greene Morgan Putnam
Etheostoma parvipinne	Goldstripe darter		R	Small streams, spring seeps, and runs with aquatic vegetation; occurs below the Fall Line.	Hancock
Moxostoma robustum	Robust redhorse	UR	E	Medium to large rivers, shallow riffles to deep flowing water; moderately swift current.	Putnam
REPTILE:					
Clemmys guttata	Spotted turtle		U	Heavily vegetated swamps, marshes, bogs, and small ponds in soft, mucky substrates.	Hancock
Heterodon simus	Southern hognose snake		T	Sandhills; fallow fields; longleaf pine-turkey oak	Hancock
BIRDS:					
Haliaeetus leucocephalus	Bald eagle		T	Almost always nest near open water (rivers, lakes, coastal waters, wetlands). Usually found in large, open-topped pines near open water.	Greene Morgan Hancock Putnam

TABLE 14

Federally and State Protected Plant and Wildlife Species with Known Records of Occurrence in the Wallace Dam Project Vicinity[a]

Scientific Name	Common Name	Federal Status[b]	Georgia Status[c]	Habitat[d]	County
Leuconotopicus borealis (= *Picoides borealis*)	Red-cockaded woodpecker	LE	E	Large expanses of mature, open pine forest, particularly longleaf, slash, or loblolly pine. Nests in old living pines.	Putnam
Mycteria americana	Wood stork	LT	E	Freshwater and estuarine wetlands in the Coastal Plain; transient individuals occasionally disperse into Piedmont after breeding season	Greene
Peucaea aestivalis	Bachman's sparrow		R	Open pine or oak woods, clear-cuts, utility rights-of-way, old fields, and brushy areas.	Hancock

[a] This list is for rare species with known element of occurrence records in Hancock, Greene, Morgan, and/or Putnam Counties, Georgia.

[b] Federal status: **LE** = listed endangered; **LT** = listed threatened; **UR** = under review to determine if listing may be warranted.

[c] Georgia state status: **E** = Georgia endangered; **T** = Georgia threatened; **R** = Georgia Rare; **U** = Georgia unusual.

[d] Habitat descriptions from GDNR (2017a), Chafin (2007), NatureServe (2017).

[e] Species included at request of USFWS; nearest known element of occurrence record in Newton County, Georgia, outside the four-county project vicinity.

TABLE 15
Recreation Facilities Providing Access to the Wallace Dam Project

Park/Facility	County	Total Acreage	Acreage within Project Boundary	Address	Amenities
Georgia Power Owned and Operated Facilities (located within Project Boundary):					
Armour Bridge	Greene	10.72	10.72	Brown's Ford Road, Greensboro	Boat ramp (2 lanes), 40 parking slots, dock, picnic tables, fishing, restroom, public access within Reynolds Lake Oconee
Lawrence Shoals Park	Putnam	83.58	83.58	123 Wallace Dam Road, Eatonton	Boat ramp (2 lanes), 68 parking slots, 3 docks, full-service campground, nature trails, swimming beach, restrooms, picnic tables, picnic pavilion, barrier-free access, playground
Long Shoals Boat Ramp	Putnam	12.06	12.06	Long Shoals Road, Eatonton	Boat ramp (2 lanes), 34 parking slots, dock, picnic tables, fishing, restroom, barrier-free access
Old Salem Park	Greene	83.34	83.34	1530 Old Salem Road, Greensboro	Boat ramp (2 lanes), 123 parking slots, 3 docks, full-service campground, swimming beach, restrooms, picnic tables, picnic pavilion, playground
Parks Ferry Park	Greene	90.98	90.98	1491 Parks Mill Road NE, Greensboro	Boat ramp (2 lanes), 74 parking slots, dock, full-service campground, swimming beach, restrooms, picnic pavilion, playground
Sugar Creek Boat Ramp	Putnam	10.39	10.39	Parks Mill Road, Buckhead	Boat ramp (2 lanes), 37 parking slots, dock, picnic tables, fishing, restroom, barrier-free access
Tailrace Fishing Area	Putnam	NA[a]	<0.1	Wallace Dam Road West	Fishing platform, parking.
FS Owned and Operated Facilities:					
Dyar Pasture Recreation Area	Greene	241.08	100[b]	USFS Road 1276 at Copeland Road, Greensboro	Boat ramp (2 lanes), fishing, nature trail, picnic facilities, restroom
Redlands Recreation Area	Greene	1,393.69	23.27	USFS Road 1255 at US Hwy 278, Greensboro	Paved boat ramp (3 lanes), 2 picnic tables and grill, restroom (no water), 100 parking slots
Swords Recreation Area	Morgan	314.87	2.35	Blue Springs Road, Buckhead	Paved boat ramp (3 lanes), boat dock, restroom, 100 parking slots
Privately Owned and Operated Facilities:					
Apalachee Bait Shop & Fish Camp	Morgan	10.98	0.10	1010 Apalachee River Rd, Madison	Boat launch, primitive campsites, restrooms
Blue Springs Marina	Morgan	6.21	1.18	1291 Blue Springs Drive, Buckhead	Food, gas, restaurant, marina, restrooms

TABLE 15
Recreation Facilities Providing Access to the Wallace Dam Project

Park/Facility	County	Total Acreage	Acreage within Project Boundary	Address	Amenities
Boathouse at Harbor Club	Greene	6.40	0.64	3991 Walker Church Road, Greensboro	Food, full-service campground, gas, marina, picnic, restrooms
Greene County Boat Ramp	Greene	0.55	0.06	SE End of Howard Lewis Road, White Plains	
Great Waters Marina	Putnam	1.86	0.22	154 Oakton South, Eatonton	Reynolds Lake Oconee – dry-slip boat storage, pontoon boat rentals, on-demand launching, marina stores, fuel
Hwy 44 Public Fishing (Tract C-5)	Greene	10.30	10.09	136 Clack Cir, Eatonton	Shoreline fishing
Hwy 44 Public Fishing (Jerry's)	Putnam	3.06	0.69	1054 Greensboro Rd, Eatonton	Gas, store
Lake Club Marina	Greene	4.77	0.04	Brown's Ford Road, Greensboro	Reynolds Lake Oconee – indoor/outdoor pools, food, children's area, beach access, boat ramps and docks
The Landing Marina	Greene	2.65	0.01	1021 Long Cove Drive, Greensboro	Reynolds Lake Oconee – dry-slip boat storage, pontoon boat rentals, on-demand launching, marina stores, fuel
North Shore Resort	Greene	53.46	0.12	2541 Carey Station Road, Greensboro	Full RV accommodations, rental units, picnic pavilions, 2 swimming pools, fishing, swimming, boat ramp, game courts, playground, RV storage
Oconee Outdoors and Marina	Putnam	2.80	0.08	891 Greensboro Road, Eatonton	Full-service marina with dry storage, fishing, boat ramps
Reynolds Plantation Marina	Greene	7.88	0.03	100 Linger Longer Road, Greensboro	Reynolds Lake Oconee – dry-slip boat storage, pontoon boat rentals, on-demand launching, marina stores, fuel
Sugar Creek Marina	Putnam	11.42	1.74	353 Parks Mill Road, Buckhead	Gas, marina, picnic, restrooms
Waterfront Marina	Putnam	8.12	1.32	144 Collis Marina Road, Eatonton	Food, full-service campground, gas, marina, picnic, restrooms

[a] Area outside of project boundary is part of Sinclair Project (FERC No. 1951).

[b] Provisional estimate based on elevation contour.

TABLE 16
Federal or State Comprehensive Waterway Plans Potentially Applicable to Project Recreation or Land Use

Comprehensive Plan	Potentially Applicable to Recreation or Land Use (Yes or No)
Atlantic States Marine Fisheries Commission. 1998. Amendment 1 to the Interstate Fishery Management Plan for Atlantic sturgeon (*Acipenser oxyrhynchus oxyrhynchus*). (Report No. 31). July 1998.	Yes
Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January 1998.	Yes
Atlantic States Marine Fisheries Commission. 1999. Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.	Yes
Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000.	Yes
Atlantic States Marine Fisheries Commission. 2009. Amendment 2 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. May 2009.	Yes
Atlantic States Marine Fisheries Commission. 2010. Amendment 3 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. February 2010.	Yes
Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). (Report No. 36). April 2000.	Yes
Georgia Department of Natural Resources. 1985. Water availability and use - Oconee River Basin. Atlanta	Yes
Georgia Department of Natural Resources. Georgia Statewide Comprehensive Outdoor Recreation Plan (SCORP): 2008-2013. Atlanta	Yes
Georgia Department of Natural Resources. 1986. Water availability and use report - Altamaha River Basin. Atlanta	Yes
National Marine Fisheries Service. 1998. Final Recovery Plan for the shortnose sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. December 1998.	Yes
National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.	Yes
State of Georgia. Office of the Governor. 1987. Water resources management strategy-summary document. Atlanta, Georgia. January 12, 1987.	Yes
U.S. Fish and Wildlife Service. National Marine Fisheries Service. Georgia Department of Natural Resources. 2013. Priority restoration and management actions for the American Shad in the Altamaha River Basin, Georgia. Athens, Georgia. 2013.	Yes
U.S. Fish and Wildlife Service. No date. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.	Yes

Source: FERC (2017b)

FIGURES

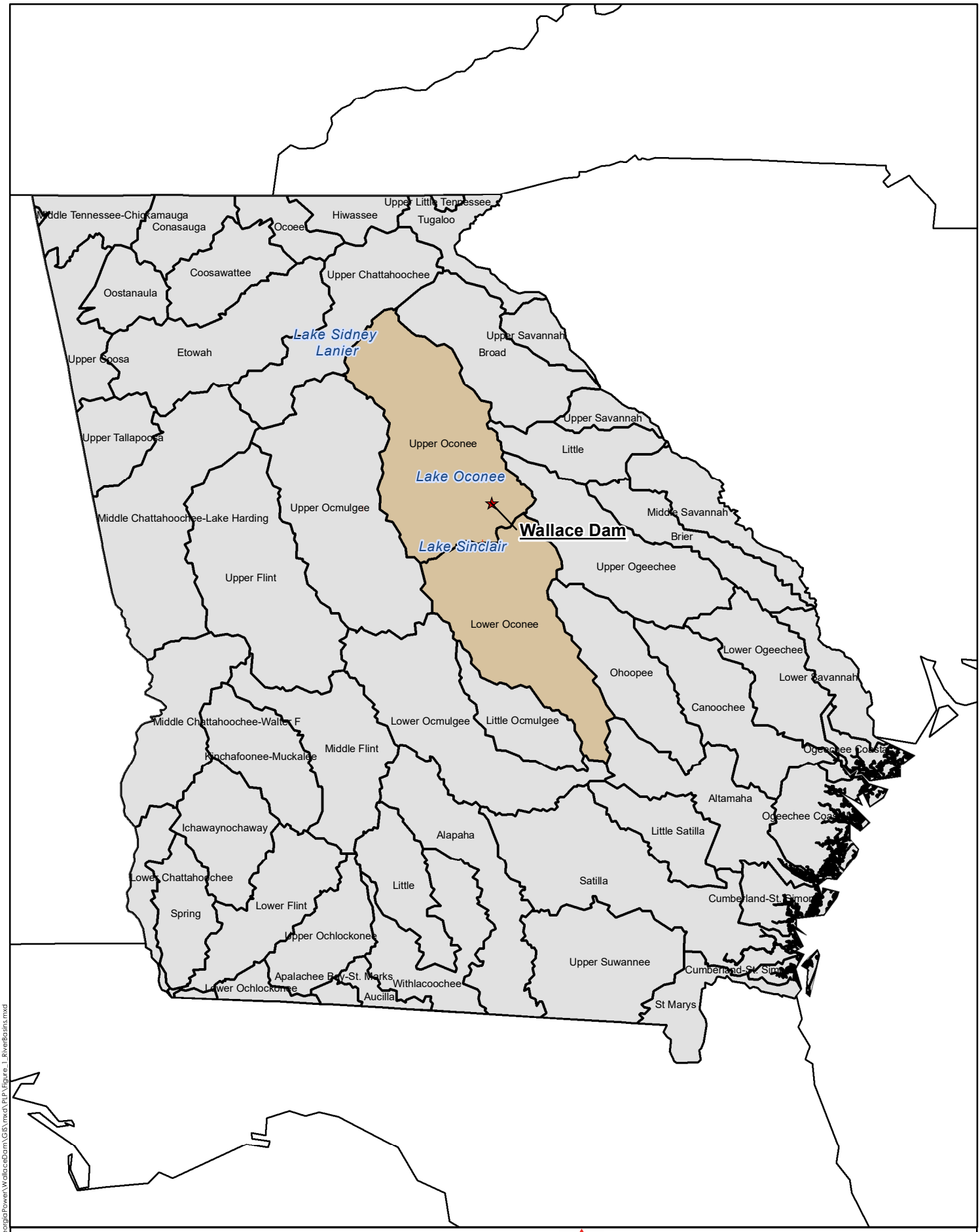

Figure 1
Project Location in the Oconee River Basin

Wallace Dam Project
(FERC No. 2413)

Georgia Power
Geosyntec consultants

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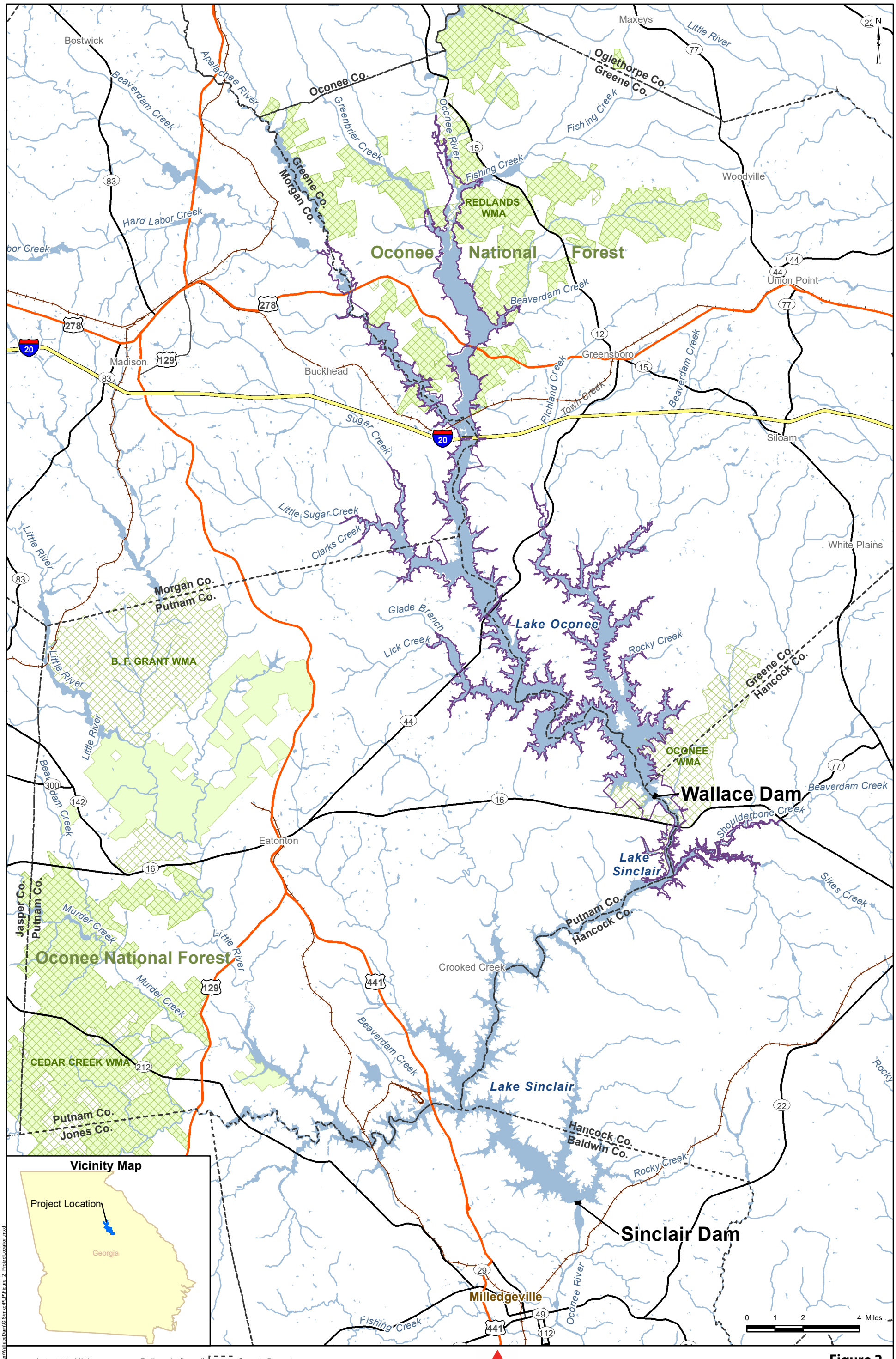


Figure 2
Project Location on the Oconee River

Wallace Dam Project
(FERC No. 2413)

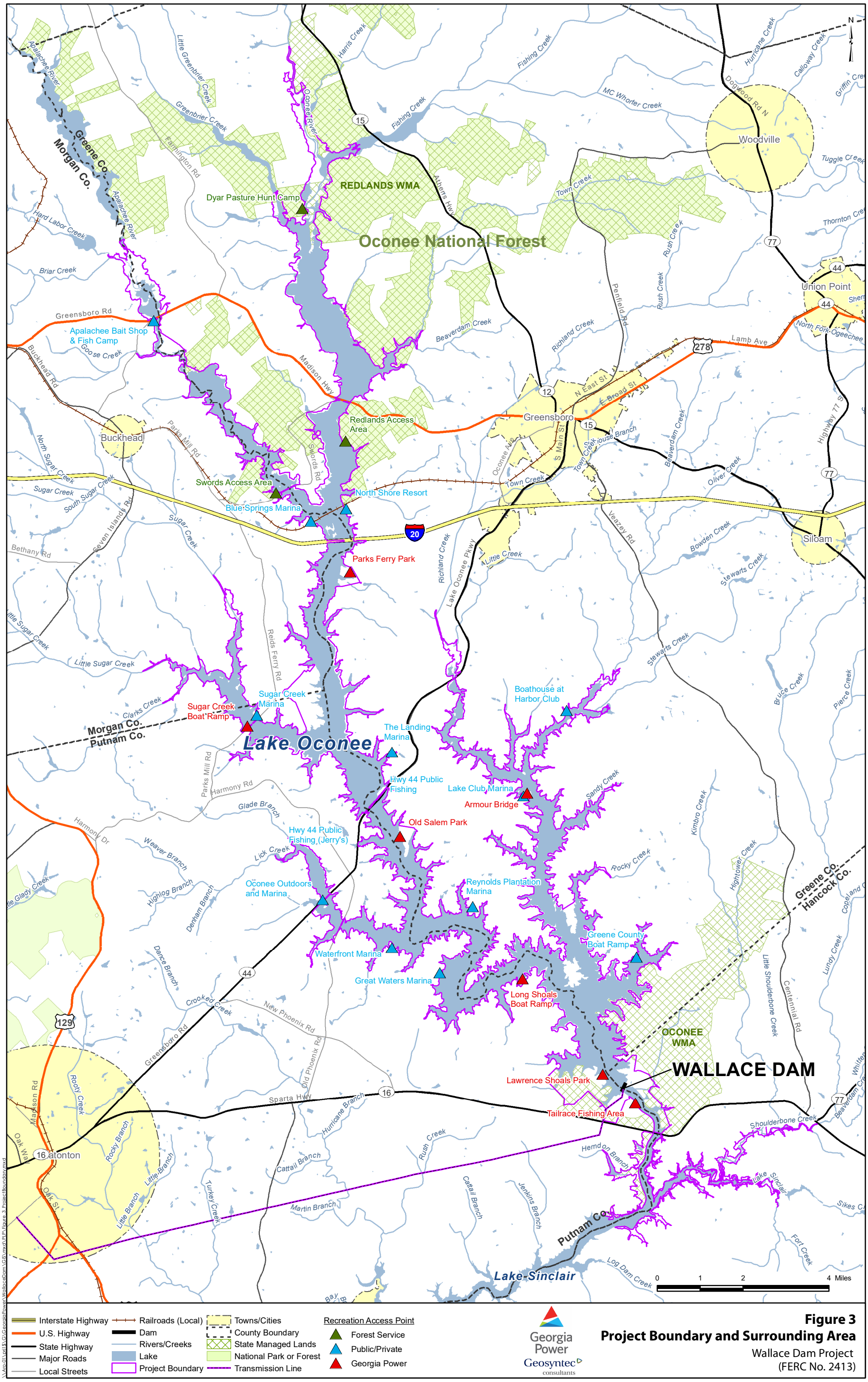
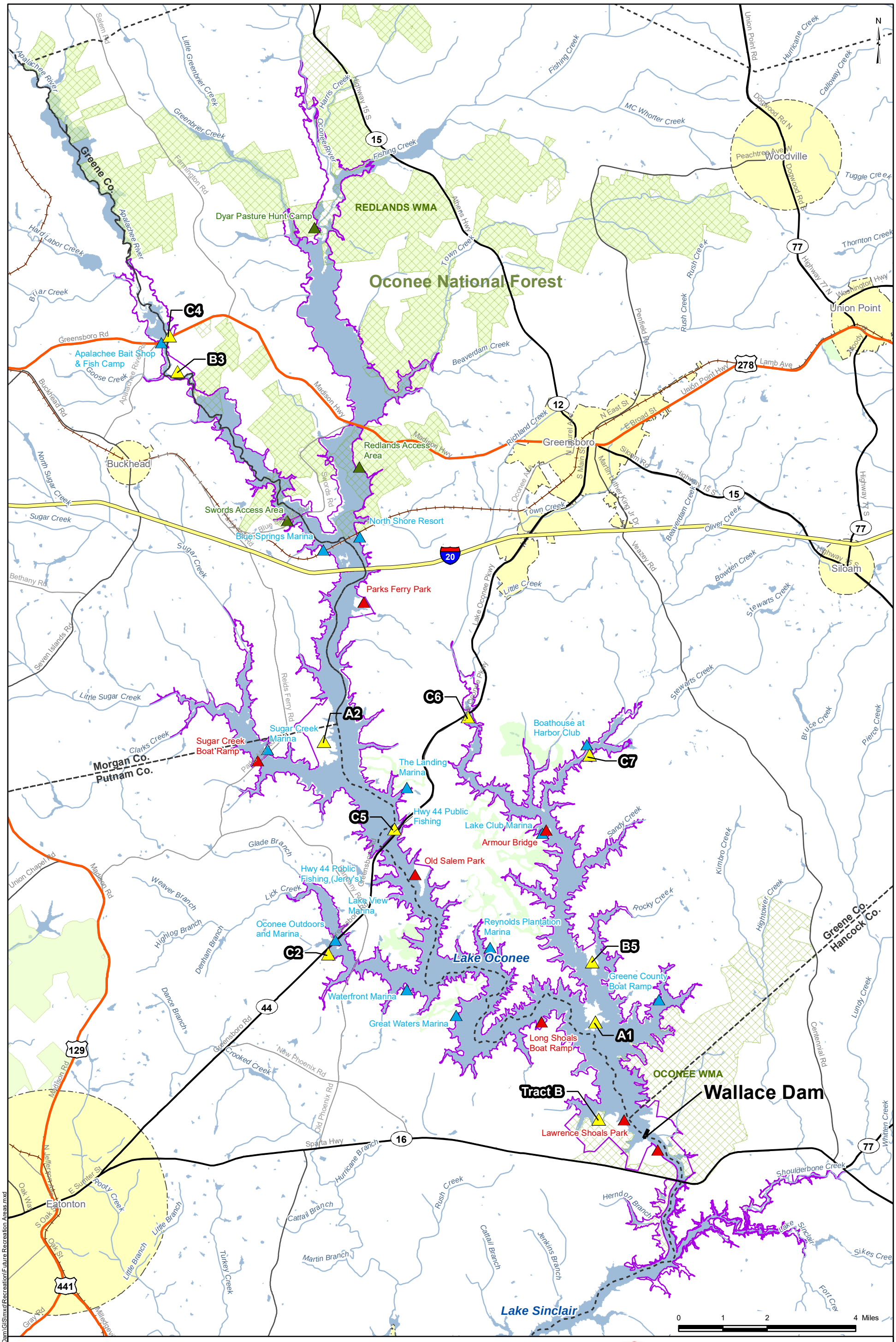


Figure 3
Project Boundary and Surrounding Area
Wallace Dam Project
(FERC No. 2413)



Interstate Highway
U.S. Highway
State Highway
Major Roads
Local Streets
Railroads (Local)
Dam
Rivers/Creeks
Project Boundary
Towns/Cities
State Managed Lands
National Park or Forest
County Boundary

Recreation Access Point
Forest Service
Georgia Power
Public/Private
Future Recreation Areas

Georgia Power
Geosyntec consultants

Figure 4
Project Lands Reserved for Future Recreational Use

Wallace Dam Project
(FERC No. 2413)

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Project Boundary

Georgia Power
Geosyntec consultants

Figure 5
Project Facilities
Wallace Dam Project
(FERC No. 2413)

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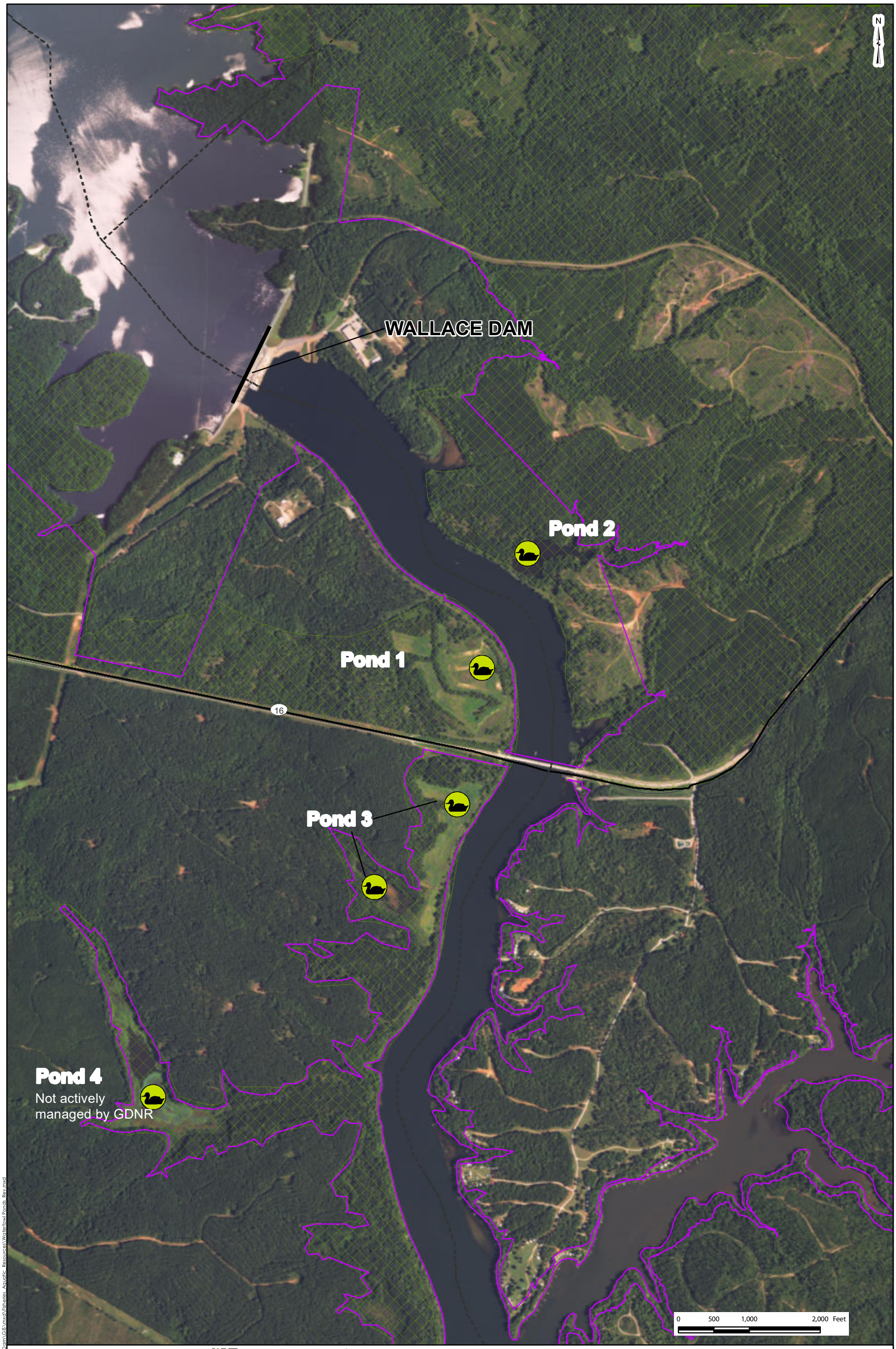

Interstate Highway
U.S. Highway
State Highway
Major Roads
Local Streets
Railroads (Local)
Dam
Towns/Cities
County Boundary
National Park or Forest
State Managed Lands
National Park or Forest
Golf Course
Waterfowl Ponds

Georgia Power
Geosyntec consultants

Figure 6
Waterfowl Impoundments in Oconee WMA
Wallace Dam Project
(FERC No. 2413)

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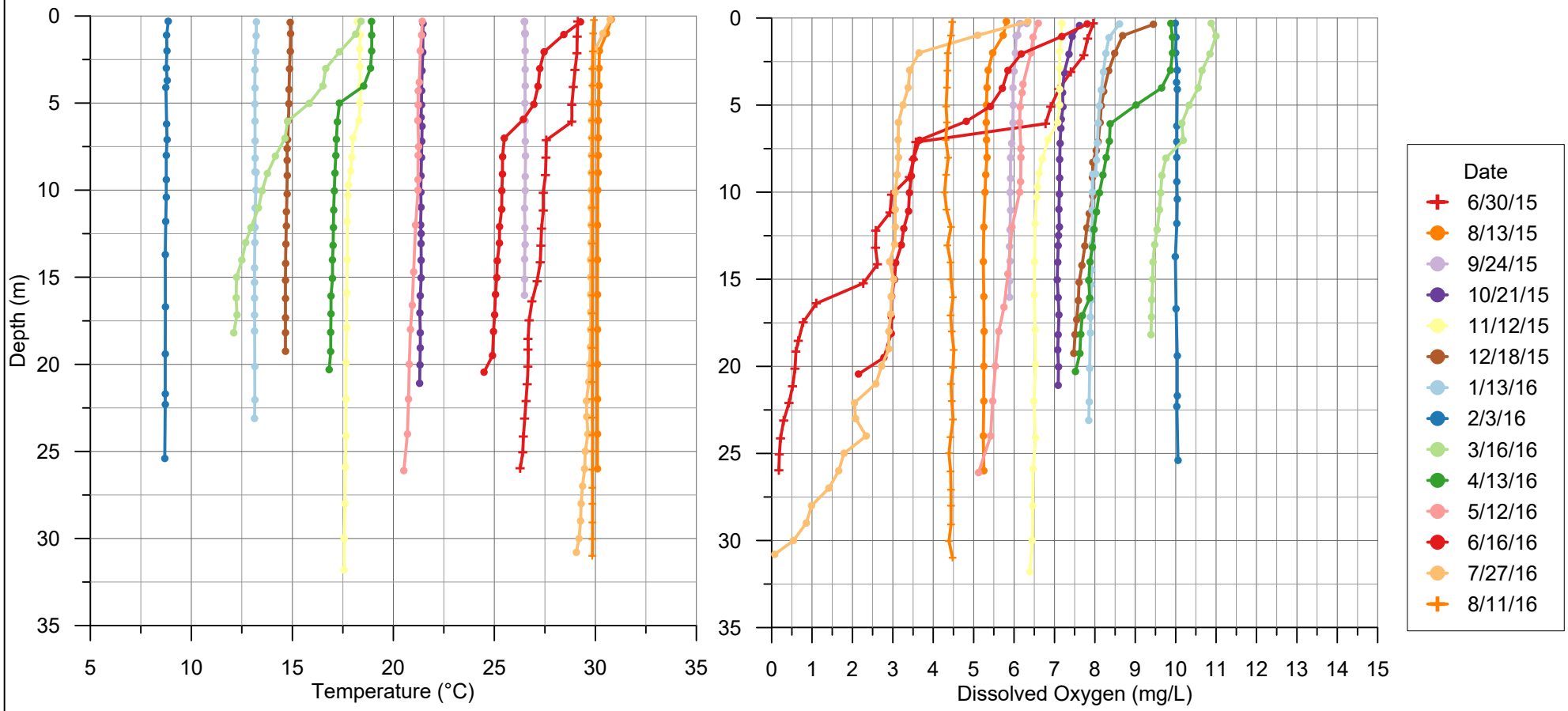
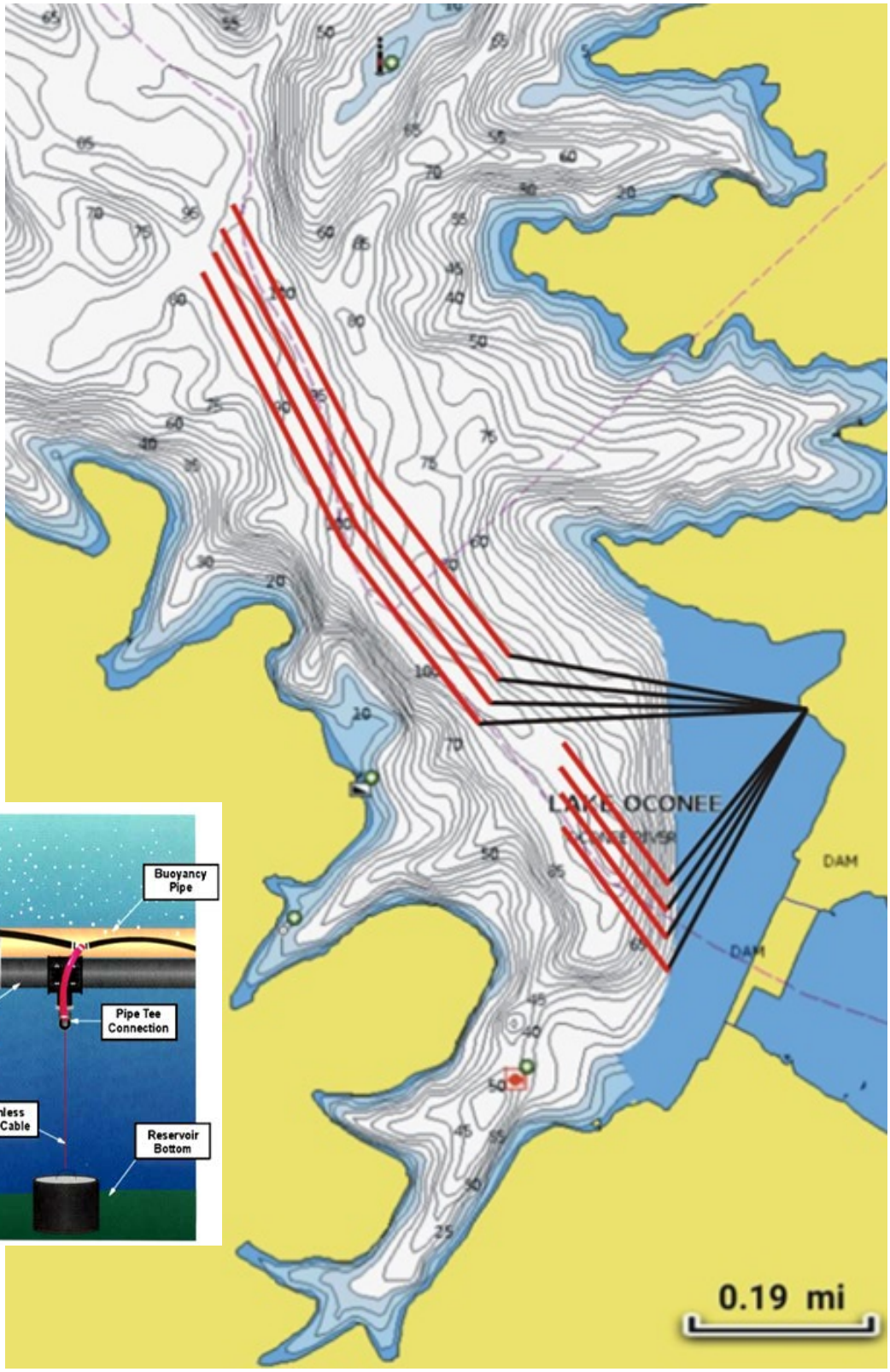
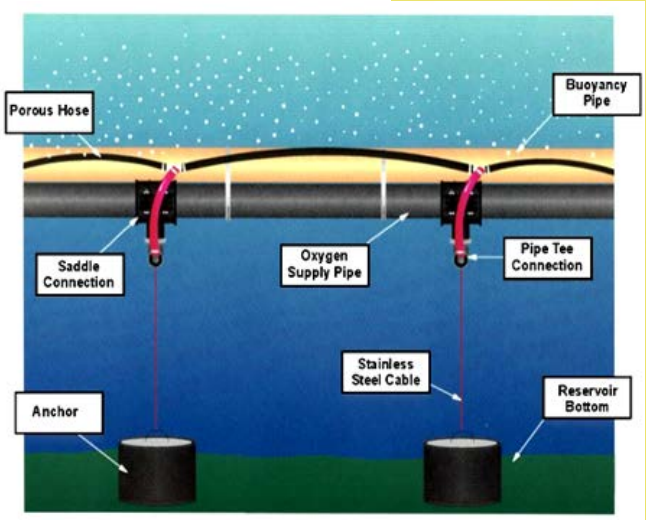


Georgia Power

Geosyntec consultants

Figure 7
Monthly Vertical Temperature and DO Profiles at Lake Oconee Station OC1
Wallace Dam Project
(FERC No. 2413)





Source: Ruane, Mobley, and Wolff (2017)

Figure 8
Conceptual Design of Forebay Oxygen Line Diffuser System
Wallace Dam Project
(FERC No. 2413)

Liquid Oxygen Facility
Project Boundary

Georgia Power
Geosyntec consultants

Figure 9
Liquid Oxygen Facility
Wallace Dam Project
(FERC No. 2413)

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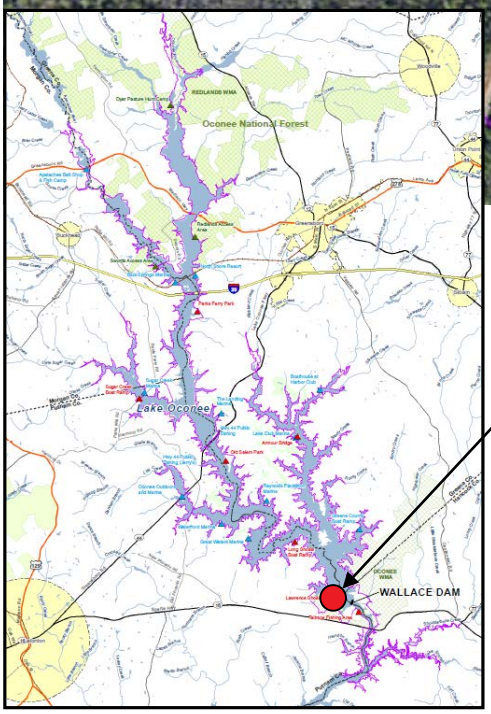

Location of project facility

Figure 10
Conceptual Layout of Recreational Improvements
Lawrence Shoals Park
Wallace Dam Project
(FERC No. 2413)

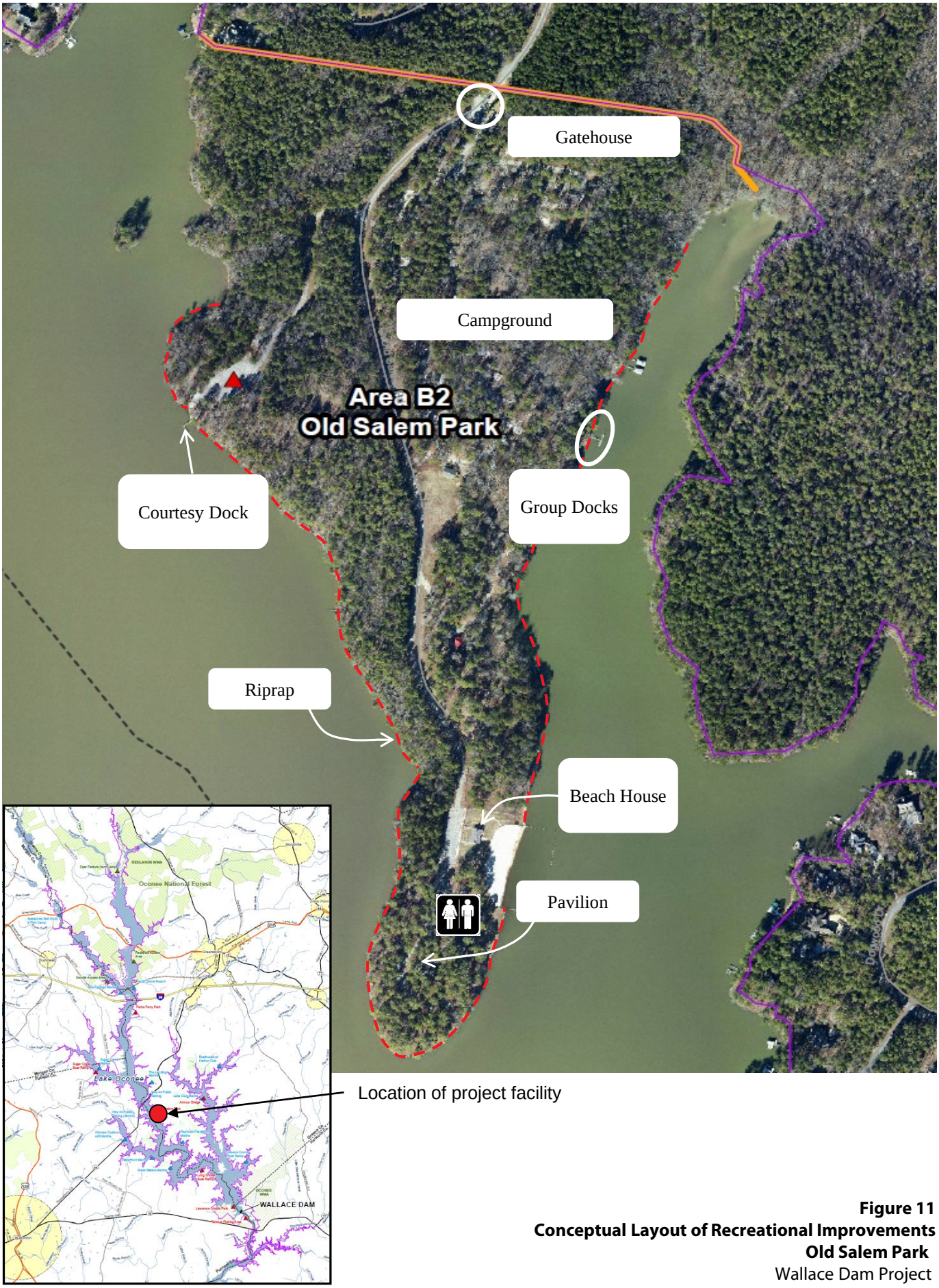

Figure 11
Conceptual Layout of Recreational Improvements
Old Salem Park
Wallace Dam Project
(FERC No. 2413)

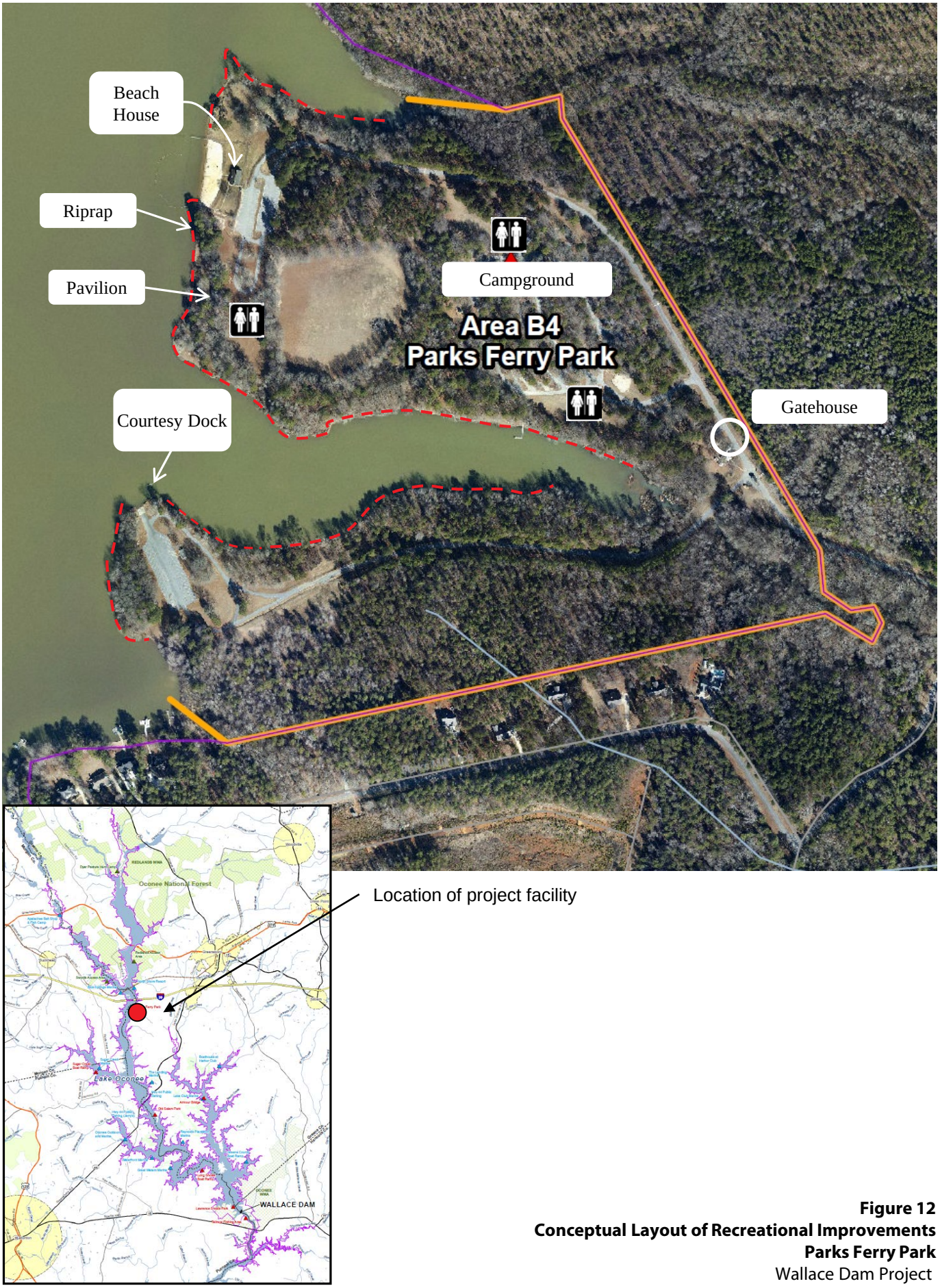

Figure 12
Conceptual Layout of Recreational Improvements
Parks Ferry Park
Wallace Dam Project
(FERC No. 2413)

Figure 13
Conceptual Layout of Recreational Improvements
Sugar Creek Boat Ramp
Wallace Dam Project
(FERC No. 2413)

Figure 14
Conceptual Layout of Recreational Improvements
Armour Bridge Boat Ramp
Wallace Dam Project
(FERC No. 2413)

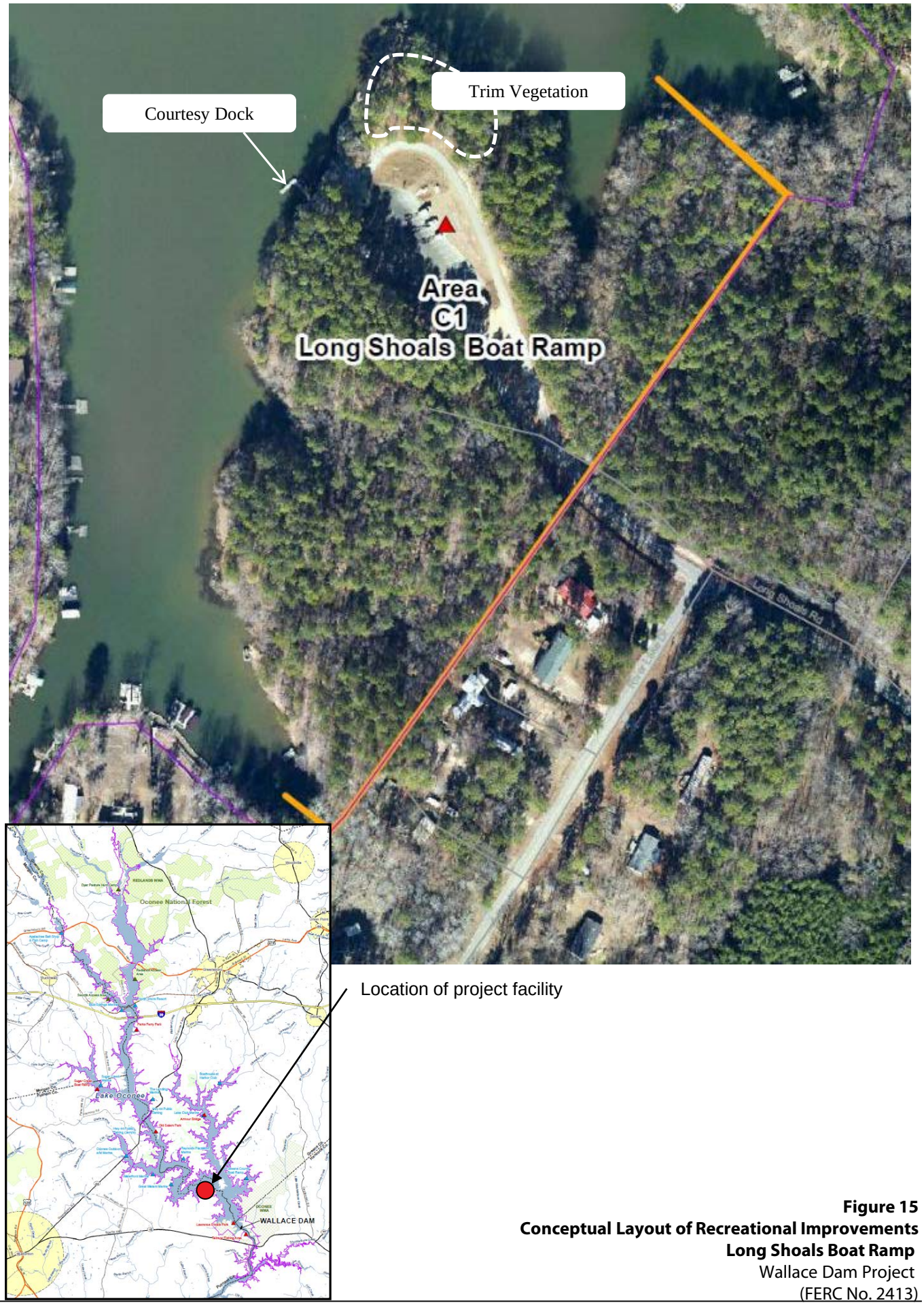

Figure 15
Conceptual Layout of Recreational Improvements
Long Shoals Boat Ramp
Wallace Dam Project
(FERC No. 2413)

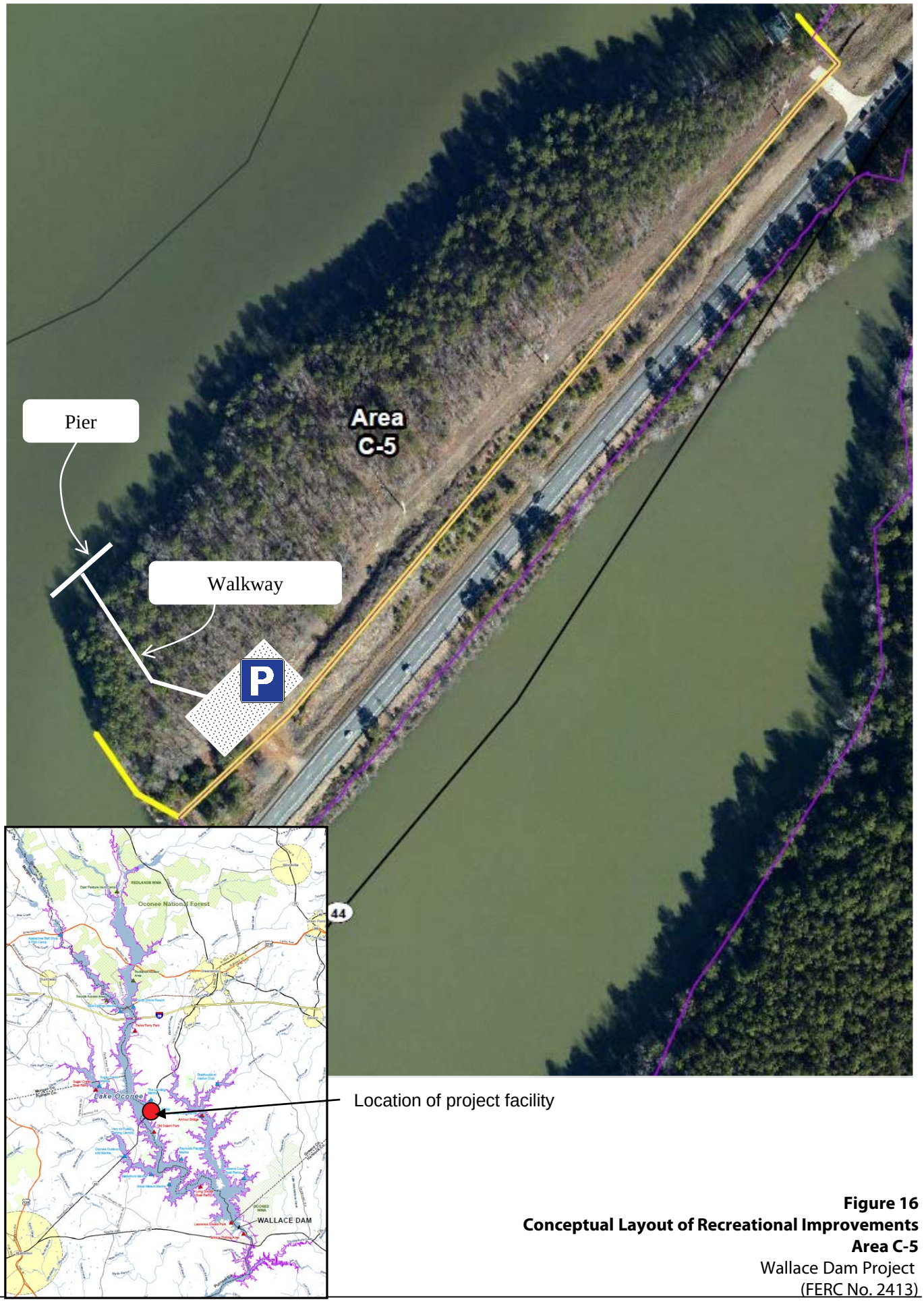

Figure 16
Conceptual Layout of Recreational Improvements
Area C-5
Wallace Dam Project
(FERC No. 2413)

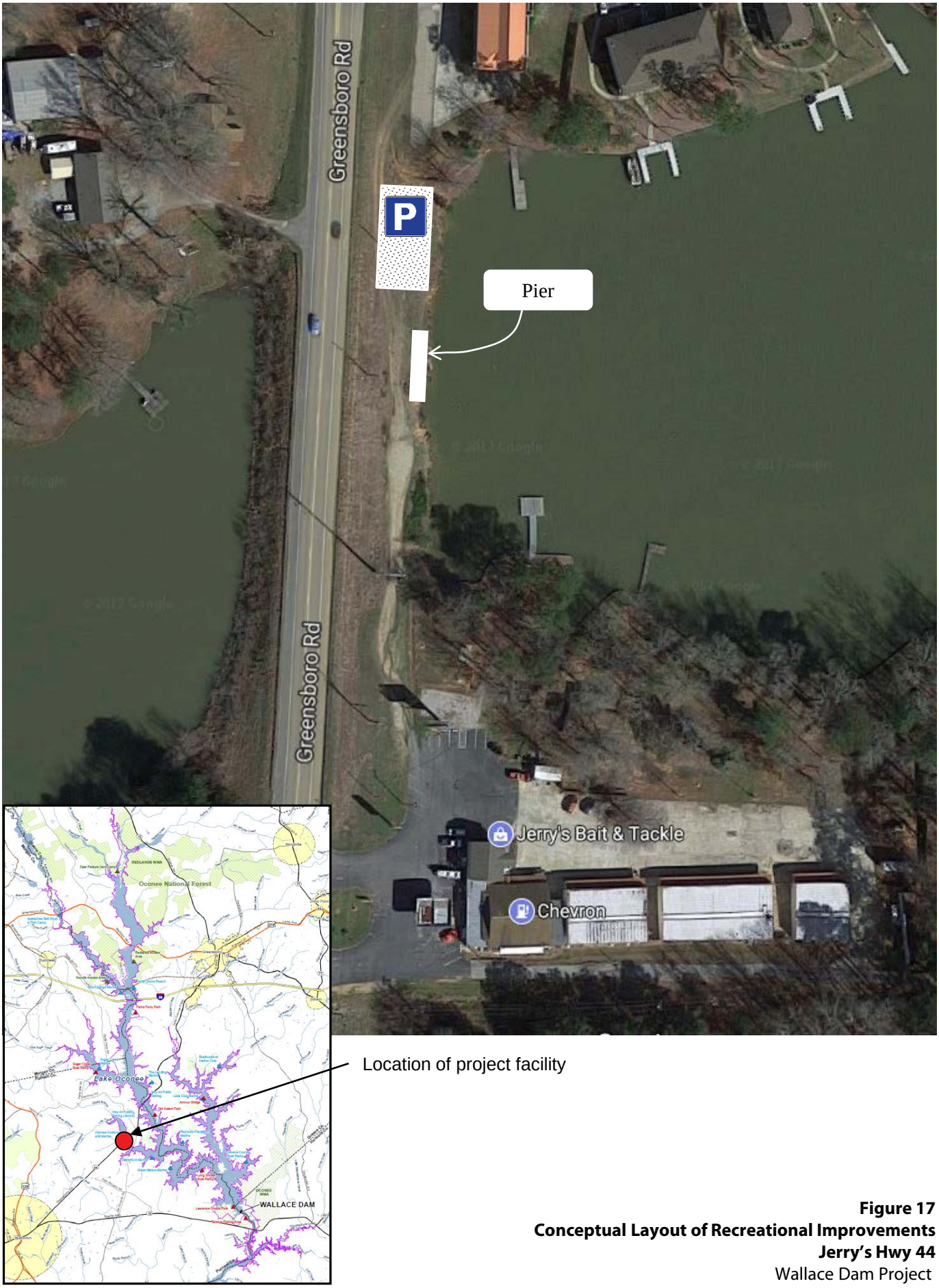

Figure 17
Conceptual Layout of Recreational Improvements
Jerry's Hwy 44
Wallace Dam Project
(FERC No. 2413)

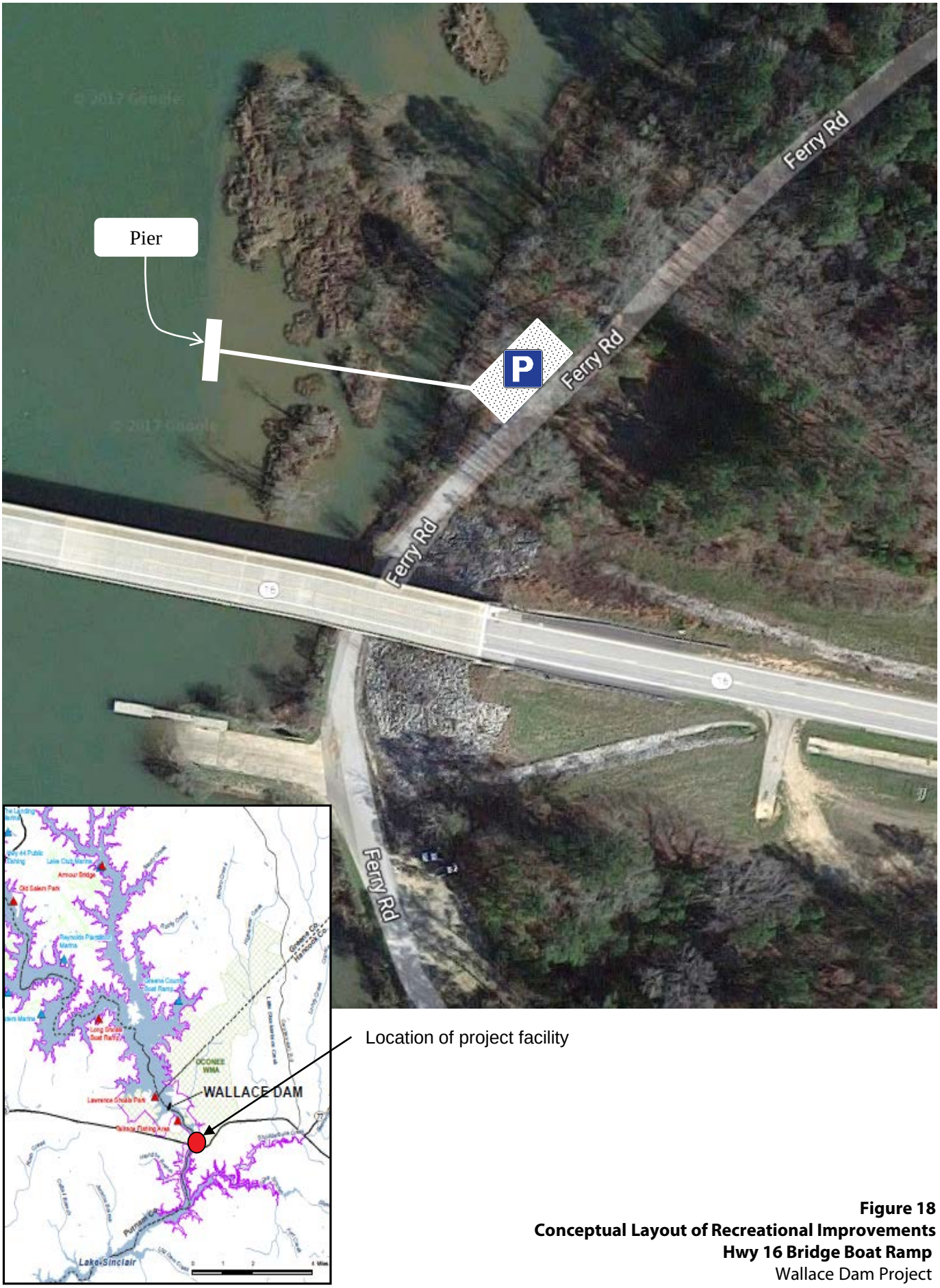

Figure 18
Conceptual Layout of Recreational Improvements
Hwy 16 Bridge Boat Ramp
Wallace Dam Project
(FERC No. 2413)