FINAL ENVIRONMENTAL ASSESSMENT
FOR
HYDROPOWER LICENSE

Demopolis Lock and Dam Hydroelectric Project

FERC Project No. 13102-003

Alabama

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

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ACRONYMS AND ABBREVIATIONS

Advisory Council	Advisory Council on Historic Preservation
Alabama DCNR	Alabama Department of Conservation and Natural Resources
Alabama DEM	Alabama Department of Environmental Management
Alabama SHPO	Alabama State Historic Preservation Officer
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
ASL	above sea level
Birch Power	Birch Power Company
BMP	best management practices
BO	biological opinion
BOD	biological oxygen demand
Certification	water quality certification
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission or FERC
Corps	U.S. Army Corps of Engineers
Demopolis Project	Demopolis Lock and Dam Hydroelectric Project
DO	dissolved oxygen
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
fps	feet per second
FWS	U.S. Fish and Wildlife Service
Georgia-Pacific	Georgia-Pacific Consumer Products, LP
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
mg/L	milligram per liter
MOA	memorandum of agreement
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
PA	Programmatic Agreement
PM&E	protection, mitigation, and enhancement
RM	river mile
RMP	recreation management plan
Rock-Tenn	Rock-Tenn Mill Company, LLC

ROW	right-of-way
SERC	Southeastern sub-region of the SERC Reliability Corporation
USGS	U.S. Geological Survey
Water Quality Settlement	Water Quality Licensing Settlement Agreement
WestRock	WestRock Mill Company, LLC

EXECUTIVE SUMMARY

Proposed Action

On July 2, 2013, Birch Power Company (Birch Power) filed an application for a license to construct and operate its proposed 48-megawatt (MW) Demopolis Lock and Dam Hydroelectric Project (Demopolis Project or project). The project would be located at the U.S. Army Corps of Engineers' (Corps) Demopolis Lock and Dam facility on the Tombigbee River, near the city of Demopolis, in Marengo and Sumter Counties, Alabama. The project would occupy 23 acres of federal land owned by the Corps.

Existing Corps Facilities

The Corps' Demopolis Lock and Dam is located in West Central Alabama at river mile (RM) 213.4 on the Tombigbee River about 3.5 miles downstream of the mouth of the Black Warrior River. It is the second lock and dam on the Tombigbee River (Coffeeville Lock and Dam is the first). It also is the first lock and dam downstream of a system of ten navigational structures on the Tombigbee River which are collectively known as the Corps' Tennessee-Tombigbee Waterway. The Tennessee-Tombigbee Waterway provides year-round navigation between the Tombigbee River in West Central Alabama, and the Tennessee River in Northeast Mississippi. The Demopolis Lock and Dam is also the first lock and dam downstream of four navigational structures on the Black Warrior River that provide access to the Birmingham, Alabama area.

Demopolis Lock and Dam includes a 600-foot-long, 100-foot-wide lock, a 1,485-foot-long fixed crest spillway, and an earthen dam that extends beyond the spillway for about 200 feet to tie the dam into higher ground. The spillway is divided into a 590-foot-long section that extends across the main river channel (on the side closest to the lock) and an 895-foot-long section that extends to the north side of the river. Both sections of the spillway have fixed ogee crests at elevation 73 feet above sea level (ASL). The entire length of the dam crest functions as an uncontrolled spillway. The normal water surface elevation of the pool upstream of the dam fluctuates between 73 feet ASL and 76 feet ASL depending on inflow.

Proposed Hydropower Facilities

The Demopolis Project would consist of a new, 900-foot-long, excavated intake channel about 400 feet wide at the opening that would narrow to about 100 feet wide at the entry to the powerhouse. Flow would pass through two, 60-foot-long by 32-foot-wide trash racks with 2.5-inch open bar spacing into a new 201-foot-long, 80-foot-wide powerhouse along the north bank of the river, housing two equally-sized Kaplan turbine generator units with a combined installed capacity of 48 MW. Flows would exit the powerhouse into a new, 1,880-foot-long excavated tailrace channel that would be 80 feet wide at the powerhouse discharge and widen to 250 feet where it enters the river, creating a 45-acre flow affected area between the dam and the tailrace channel. A new 1,700-foot-long retaining wall would be constructed along the north side of the tailrace channel to contain 571,000 cubic yards of spoil material that would be excavated to construct the intake channel, tailrace channel, and powerhouse foundation.

On the north side of the river, the project would include a 1.2-mile-long, 25-foot-wide access road, a parking area at the powerhouse, a parking area along the access road for recreation access, and an angler access trail. On the south side of the river, the project would include a fishing platform.

Project power would be transmitted from the powerhouse to an electrical substation located on top of the powerhouse, and from there through a new, 4.4-mile-long, 115-kilovolt transmission line to an existing distribution line.

Project Operation

The project would operate in run-of-release mode, using flows made available by the Corps that would normally spill over the existing spillway.[1] The project would operate at flows between 5,000 cubic feet per second (cfs) and 110,000 cfs. When flows are less than 5,000 cfs, the project would shut down and all inflow would pass over the existing spillway. At river flows between 5,000 cfs and 20,000 cfs (maximum hydraulic capacity), all water would pass through the turbines and no water would flow over the spillway. In this flow range, the project would automatically adjust to changing flow conditions using a head level sensor, or flow would be set and held as directed by the Corps. As a result, at those flows, the reservoir behind the dam would be maintained at a constant elevation equal to the elevation of the spillway (73 feet ASL). For flows between 20,000 cfs and about 110,000 cfs, the project would operate at full hydraulic capacity and all water in excess of 20,000 cfs would flow over the spillway. The project would shut down and all flow would be released over the spillway at about 110,000 cfs.[2]

As proposed, the Demopolis project would produce an annual average of 173,000 megawatt-hours of electricity.

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[1] Although the applicant describes its proposed operating mode as run-of-reservoir, we define it as run-of-release because the project would generate from flows "released" (i.e., made available) to the project by the Corps.

[2] At 110,000 cfs, the rising tailwater elevation would cause head to drop below 15 feet, which is the minimum head needed for efficient turbine operation.

Proposed Environmental Measures

Birch Power proposes to construct and operate the project with the environmental protection, mitigation, and enhancement measures described below. Among the environmental measures proposed for water quality, three were exclusively in a Water Quality Licensing Settlement Agreement (Water Quality Settlement) signed by Birch Power and WestRock Mill Company, LLC (WestRock), the owner and operator of Demopolis Mill,[3] and filed on August 15, 2016. In the Water Quality Settlement, Birch Power proposed to implement several measures that are included in Alabama Department of Environmental Management's (DEM) water quality certificate. In the Water Quality Settlement, Birch Power also proposed three general and administrative articles that are not discussed further in this document. The general and administrative articles include a proposal to: (1) provide reports and data to the operator of Demopolis Mill; (2) consult with the operator of the Demopolis Mill prior to operational changes that may affect water quality; and (3) provide reports specifically required by Alabama DEM's water quality certification to Demopolis Mill.

Geology and Soil Resources

- Develop an erosion[4] control plan that includes best management practices (BMPs) to: (1) minimize erosion and sedimentation during construction; and (2) monitor turbidity to assess impacts during construction.

- Implement a spoils disposal plan that includes: (1) using the excavated spoils to upgrade the existing access road and construct a powerhouse parking area; (2) depositing spoils on the north side of the river channel downstream of Demopolis Lock and Dam; (3) constructing a retaining wall along the north side of the tailrace channel to stabilize the spoils pile on the north side of the river channel; and (4) re-vegetating the spoils pile in order to develop a 20.2-acre forested wetland on top of the spoils site.

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[3] Demopolis Mill is a paper mill located about 8 miles downstream of the proposed project.

[4] In this final environmental assessment, erosion refers to a process in which upland soil, rock, or other surface material is removed from one location and transported to another by water or wind.

Aquatic Resources

- Develop an oil and hazardous substances plan that would include measures to prevent the release of oil and hazardous substances during project construction and operation, and actions to take in the event of accidental oil or hazardous spills during construction and operation.

- Develop, as part of the Water Quality Settlement, a plan to completely shut off the project intake works to ensure that no flow passes through the powerhouse when the hourly mean flow upstream of the project falls below 5,000 cfs, and resume operation when the hourly mean flow is at least 5,000 cfs to protect water quality downstream of the project.[5]

- Install, operate, and maintain, as part of the Water Quality Settlement, one or more permanent flow gauges meeting United States Geological Survey (USGS) standards to estimate hourly mean flows upstream of the project.

- Implement the following measures required in Alabama DEM's water quality certificate to protect water quality in the tailrace and downstream of the tailrace: (1) maintain dissolved oxygen (DO) in the project discharge at a concentration no less than 5.0 milligrams per liter (mg/L) at all times, and a daily average DO concentration at RM 206 not be less than 6.5 mg/L when the project is operating;[6] (2) develop and implement measures to comply with the DO limitations through structural and/or operational modifications at the project;[7] (3) install and maintain a tailrace DO monitoring device, and at the initiation of power generation, continuously record DO concentrations and water temperatures at 15-minute intervals during periods of generation following one continuous hour of generation

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[5] The proposed plan would include steps to shut-down and resume operation, operating parameters and quality assurance and control measures for flow gauges, procedures for reporting data, and protocols for notifying the Commission and WestRock of shut-down and resumption of operations.

[6] River mile 206 is about 8 miles downstream of the proposed project and the location of WestRock's Demopolis Mill paper mill effluent discharge.

[7] Birch Power specifically proposes, in the Water Quality Settlement (proposed license article 2), to develop and implement a plan to install, operate, and maintain an oxygenation system designed to meet the DO standards required under Alabama DEM's certification condition 1.

all year long, to determine compliance with the requirement to maintain no less than 5.0 mg/L of DO in the tailrace; and (4) install and maintain a DO monitoring device at RM 206, and at the initiation of power generation, continuously record DO and temperature at no less than 15-minute intervals at all times throughout the year, to determine compliance with the requirement to maintain no less than a 6.5 mg/L mean daily average DO concentration at RM 206.

- Monitor DO, water temperature, pH, and biological oxygen demand (BOD),[8] as part of the Water Quality Settlement, from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam, as required in WestRock's National Pollutant Discharge Elimination System (NPDES) permit for the Demopolis Mill.[9]

- Install a trash rack at the project intake with 2.5-inch clear bar spacing, to reduce entrainment of large fish and avoid impingement of small fish.

Terrestrial Resources

- Construct the project transmission line primarily within an existing transmission line right-of-way to minimize disturbances to botanical and wildlife resources.

- Selectively place transmission line poles to avoid small, isolated wetland areas.

- Implement a revegetation plan to re-establish native vegetation on land disturbed by project construction and reduce the spread and introduction of nonnative, invasive species.

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[8] BOD is a measure of the quantity of oxygen consumed by microorganisms during the decomposition of organic matter.

[9] As stated in the Water Quality Settlement, the intent of this article is for Birch Power to assume complete pecuniary responsibility for all ambient water quality sampling in the Tombigbee River during the period May 1 through November 30 each year, as required in WestRock's NPDES permit for the Demopolis Mill (also clarified in a letter filed by Birch Power on September 12, 2016).

Threatened and Endangered Species

- Implement a mussel relocation plan that includes: (1) conducting pre-construction mussel surveys at habitats disturbed by construction, prior to any sandbar disturbing activities and relocating any federally threatened inflated heelsplitter mussels found in those habitats; (2) removing the minimum amount of sandbar habitat during construction; (3) redistributing sandbar material dredged during tailrace construction to develop new sandbar habitat (sandbar development area); (4) developing additional sandbar habitat using appropriate excavation spoils from project construction; (5) dredging any portions of the sandbar development area that may spread out and fill the tailrace channel, impede navigation, or affect use of the Demopolis lock, and add appropriate dredged material back to the sandbar development area; (6) conducting post-construction mussel surveys annually for the first 3 years after tailrace construction; and (7) developing alternative mitigation measures if the measures described above are unable to maintain the sandbar development area, or if inflated heelsplitters do not use the new habitat.

Recreation and Land Use

- Improve an existing 1.2-mile-long access road to provide access to a new public parking area and angler access trail.

- Install a fishing platform on the south bank of the Tombigbee River based on observable, post-operational hydraulics to determine the best site location.

- Construct a new parking area on the north side of the Tombigbee River to provide access to a new 2,600-foot-long angler access trail.

- Construct a 2,600-foot-long angler access trail connecting the parking area to the north bank of the Tombigbee River for bank fishing access.

Aesthetics

- Design the powerhouse and retaining wall to be visually compatible with the Corps' existing facilities.

Public Involvement

Before filing its license application, Birch Power conducted pre-filing consultation under the traditional licensing process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission.

After the application was filed, we conducted scoping to determine what issues and alternatives should be addressed. We issued a scoping document for the Demopolis Project on February 11, 2015, and conducted an environmental site review and scoping meetings on March 26, 2015. Based on discussions during the site review and scoping meetings and written comments received during the comment period, we issued a revised scoping document on June 19, 2015. On June 15, 2016, we issued notice that the application was ready for environmental analysis and requested terms and conditions, comments, and recommendations for the project.

The Commission issued a draft EA on June 29, 2017, and requested that comments be filed by July 31, 2017. Birch Power Company, the U.S. Environmental Protection Agency (EPA), WestRock Mill, Alabama Historical Commission/Alabama State Historic Preservation Officer (Alabama SHPO), Choctaw Nation of Oklahoma, and U.S. Fish and Wildlife Service (FWS) filed comments on the draft EA.

The primary issues associated with licensing the project are spoils disposal, the potential effects of the project on erosion and sedimentation, DO concentrations and aquatic habitat downstream of the proposed project, and federally listed species.

Alternatives Considered

This final environmental assessment (final EA) considers the following alternatives: (1) Birch Power's proposal, as outlined above, that includes the measures in Alabama DEM's water quality certificate and the Water Quality Settlement; (2) a staff alternative that includes some of Birch Power's proposed measures with staff-recommended modifications (staff alternative); and (3) no action or license denial, meaning the project would not be constructed and there would be no change to the existing environment.

Staff Alternative

Under the staff alternative, the project would be operated and maintained as proposed by Birch Power except for the following six measures: (1) installation, operation, and maintenance of an oxygenation system; (2) the water quality monitoring specified in WestRock's NPDES permit; (3) the mussel relocation plan; (4) construction of the fishing platform on the south bank of the Tombigbee River; (5) construction of a new parking area on the north side of the Tombigbee River to provide access to an angler access trail; and (6) construction of the angler access trail. The staff alternative also includes the following modifications of and additions to Birch Power's proposed measures:

- Modify Birch Power's proposed erosion control plan for project construction by adding: (1) draft an annual summary report until erosion control measures are removed and include details of land disturbance, success of erosion control measures, and the need for maintenance and/or monitoring of permanent erosion control measures; (2) provide a draft of each annual report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; and (3) file annual reports with the Commission, including agency comments and recommendations.
- Develop a riverbed scour[10] and shoreline stability plan that includes provisions to: (1) document the existing bathymetric and topographic conditions in the Tombigbee River and along the shorelines immediately downstream of and adjacent to the project's tailrace; (2) monitor for any bed scour and shoreline instability in the Tombigbee River immediately downstream of and adjacent to the project's tailrace for 3 years after the commencement of operations; (3) draft annual monitoring reports during the 3-year monitoring period indicating whether or not any bed scour or shoreline instability was documented during the prior year along with proposals for any measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion, should they be needed based on monitoring results; (4) provide a draft of each annual monitoring report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; (5) file the annual reports with the Commission, including agency comments and recommendations; and (6) include any proposals for additional monitoring in the third annual report.
- Develop a plan to monitor and remedy project-caused aggradation[11] in the Tombigbee River immediately downstream of and adjacent to the project's tailrace.
- Modify Birch Power's proposed spoils disposal plan such that all spoils, including sandbar material dredged during tailrace construction, not otherwise used for improving the access road and constructing the powerhouse parking area: (1) are transported to an offsite disposal area;

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[10] Scour refers to the removal and transport of sediment along a riverbed by swiftly moving water.

[11] Aggradation is the process by which riverbeds are raised in elevation by the deposition of material eroded and transported from other areas.

and (2) are tested for contaminants if the offsite disposal area would occur in, or discharge to waters of the U.S.

- Develop an operation compliance monitoring plan to document compliance with the operational requirements of any license issued for the project.

- Modify Birch Power's proposed oil and hazardous substances plan to include: (1) more detail of how hazardous substances would be transported, stored, handled and disposed of in a safe and environmentally protective manner; (2) procedures to be implemented in the event of a spill to ensure the proper containment and cleanup of any hazardous substances to minimize adverse effects on water quality and aquatic resources in the project area; (3) a provision to provide notification to the Commission, Corps, and Alabama DEM as soon as possible after discovering an accidental spill of hazardous substances; and (4) a provision to file a report with the Commission within 10 days of a hazardous substance spill.

- Develop a water quality and flow monitoring and management plan with provisions for: (1) monitoring DO and water temperature in the flow affected area[12] from May through September for the first 3 years of operation to determine whether or not project operation causes the DO concentration to fall below 5.0 mg/L and water temperature to increase to above 90° F; (2) estimating flows in the flow affected area from May through September for the first 3 years of operation using inflow and operations data; (3) reporting water quality and estimated flow data; and (4) additional measures if the 3 years of monitoring show that project operation causes the DO concentration to fall below 5.0 mg/L and water temperature to increase to above 90° F.

- Modify Birch Power's proposal to include the installation of a trash rack with 2.5-inch clear bar spacing at the project intake, by instead using 5-inch clear bar spacing to reduce entrainment of large fish and avoid impingement of most fish.

- Develop a mussel relocation plan that includes the provisions in condition 2 of FWS's biological opinion (BO) and a provision to conduct four post-

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[12] The flow affected area would be a 45-acre section of riverine habitat located between the dam and all points along the south side of tailrace channel. This area also includes riverine habitat that extends from the dam to a hypothetical line that would cross from the mouth of the tailrace to the south side of the river, perpendicular to the flow of water.

construction mussel surveys in the flow affected area that begin 1 year post-construction, and then every 3 years thereafter.

- Modify Birch Power's proposed revegetation plan to include: (1) revegetation of all areas disturbed by project construction; (2) criteria for measuring the success of revegetation efforts; (3) reference lists of invasive species applicable to the project area (i.e., Sumter and Marengo Counties); and (4) invasive species control techniques and BMPs to minimize effects on native plants and wood stork habitat.

- Restrict mowing, to the extent feasible, in the transmission line corridor to occur outside of the mid-spring to mid-fall timeframe when sensitive wildlife species are reproducing and rearing young.

- Develop an avian protection plan that includes site-specific measures and practices to reduce bird mortality (i.e., collision and/or electrocution) associated with the project transmission line and substation.

- Develop a species protection plan for the threatened wood stork and northern long-eared bat that: (1) limits tree removal[13] to November 1 through March 31, which is outside of the northern long-eared bat pup season (June 1 to July 31), and the broader active season (April 1 to October 31); (2) includes surveys for wood storks prior to construction; (3) adjusts to wood storks foraging in the project area by delaying construction and requiring that construction occur no closer than between 300 feet to 750 feet from wood storks; and (4) requires educational signage regarding the potential presence of federally protected wood storks in the project area.

- Develop a wetlands mitigation plan in consultation with the Corps and Alabama Department of Conservation and Natural Resources (Alabama DCNR) to mitigate project effects on wetlands and associated wildlife in the project boundary.

- Develop a recreation management plan (RMP) in consultation with the Corps and Alabama DCNR that includes the proposed recreation improvements, including the results of a completed feasibility assessment

[13] FWS defines tree removal as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats.

for a north bank recreational fishing facility, and the on-going management of the project recreation facilities.

- Develop a Historic Properties Management Plan (HPMP) in accordance with the programmatic agreement executed by the Commission and Alabama State Historic Preservation Officer (Alabama SHPO) on October 17, 2017, to address the management of historic properties and unevaluated cultural resources within the Demopolis Project's area of potential effects.

No-action Alternative

The no-action alternative is license denial. Under the no-action alternative, the project would not be built, and the environmental resources in the project area would not be affected by the project.

Environmental Effects of the Staff Alternative

Geology and Soil Resources

Ground-disturbing activities associated with constructing the proposed project would involve excavation of the riverbed, disturbance to shorelines, and installation/removal of cofferdams, which could cause erosion and a temporary increase in suspended sediment and turbidity in the Tombigbee River. The staff-recommended erosion control plan would minimize soil erosion and sedimentation and protect water quality, fish, and freshwater mussels.

Currently, most inflow passes over the spillway and some passes through the lock. During operation, Birch Power would divert water through the powerhouse and tailrace, which would modify hydrodynamics[14] downstream of the dam, especially when most or all inflow would be discharged through the powerhouse (from 5,000 cfs to 40,000 cfs). These changes in hydrodynamics could lead to riverbed scour and shoreline erosion, which could displace or modify existing sandbar habitat for the federally threatened inflated heelsplitter mussel, and cause sedimentation of the river, respectively. Implementation of our recommended riverbed scour and shoreline stability plan would minimize scour and shoreline erosion.

The altered hydrodynamics caused by project operation could also change aggradation patterns downstream of the dam. New aggradation patterns could develop in

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[14] In this final EA, hydrodynamics refers to the motion and forces of water as it flows in the river channel.

the flow affected area, which could lead to sediment deposition over existing freshwater mussel habitat and negatively affect mussel populations. In addition, new aggradation patterns could alter the navigation channel and disrupt navigation traffic moving to and from the lock. The staff-recommended aggradation monitoring and mitigation plan would provide a means for detecting and remedying any project-caused aggradation, which would reduce project effects on aquatic habitat and navigation.

Transporting spoils to an offsite disposal area, as recommended in the staff-modified spoils disposal plan, would minimize project construction effects on wetlands, riparian habitat, and wildlife in the Damsite Management Unit of the David K. Nelson Wildlife Management Area.

Aquatic Resources

Operating the project in a run-of-release mode would minimize effects on flow and water levels upstream and downstream of the dam and protect water quality and aquatic habitat.

Construction of the proposed project would require the use of an assortment of heavy equipment. This equipment would require gasoline or diesel fuel, motor oil, hydraulic fluid, and other lubricants, which would be stored on site at a total estimated volume of 1,600 gallons. Our recommended oil and hazardous substances plan would include specific measures to protect water quality and aquatic organisms from the effects of spilled substances.

Implementation of the following measures would protect water quality in the tailrace and downstream of the tailrace: (1) maintain DO in the project tailrace at no less than 5.0 mg/L at all times, and daily average DO not less than 6.5 mg/L at river mile 206, when the project is operating, to protect fish, mussels, and other aquatic biota; (2) maintain DO within the limitations through structural and/or operational modifications; and (3) install DO and temperature monitors in the tailrace and downstream of the tailrace to determine whether project operation causes DO to fall below the protective limits. Under the staff alternative, Birch Power would also shut down project operations when inflow falls below 5,000 cfs, which would reduce the potential for DO to fall below the levels discussed above. Further, under the staff alternative, Birch Power would install inflow gauges that meet USGS standards to ensure accurate inflow measurements and timely operational shutdown when inflow falls below 5,000 cfs. The measures above are needed to protect fish, mussels (including the federally threatened inflated heelsplitter), and other aquatic organisms from operational effects on DO concentrations in the tailrace and downstream of the tailrace.

Operation of the project would increase the frequency of no-spill events into the flow affected area, and which could cause water quality to degrade. Water quality monitoring in the flow affected area during the first 3 years of operation would help identify whether water quality degrades during operation, and the need for additional measures to protect the mussels and fish currently present in the flow affected area, by ensuring that DO concentrations would likely remain above 5.0 mg/L. Estimating flows in the flow affected area using inflow data and operational data during the first 3 years of operation would provide flow data collected concurrently with water quality data that together could be used to identify whether the water that passes over the spillway and into the flow affected area are protective of water quality and/or flow conditions needed for mussels, and if not, the data could be used to guide flow mitigation.

Operation of the project would result in some fish impingement and entrainment-related mortality as some fish pass through the trash racks and turbines. However, entrainment is unlikely to negatively affect most fish populations in Demopolis Lake because of their high reproductive rates, which make them resilient to population declines, and because primary habitat is located off the main river channel away from the proposed project. In addition, under the staff alternative, fish impingement would be minimized by installing trash racks with 5-inch clear bar spacing.

Terrestrial Resources

Construction of the project's intake channel, powerhouse, tailrace channel, transmission line, parking area, access road, and spoils disposal site would permanently displace or temporarily disturb about 67.9 acres of terrestrial habitat in the proposed project boundary and potentially lead to the spread of invasive plants. The additional measures in the staff-modified revegetation plan would reduce project effects on botanical resources by providing for revegetation in all disturbed areas, measurable criteria to gauge the success of revegetation efforts, and BMPs that minimize the subsequent reintroduction and spread of invasive species in the project area. In addition, the majority of the existing littoral wetlands on the north side of the project area would be preserved with the staff modification to the spoils disposal plan. The staff-recommended wetland mitigation plan would mitigate the permanent loss of 13.95 acres of wetlands within the Damsite Management Unit of the David K. Nelson Wildlife Management Area that are existing mitigation land and minimize project effects on associated wildlife, including the threatened wood stork.

Project construction would permanently displace wildlife habitat, including habitat used by raptors and other large birds, through the clearing of trees within the Damsite Management Unit of the David K. Nelson Wildlife Management Area. The construction of an electrical substation and transmission line would also increase the probability of avian collision and electrocution during flight and foraging, but implementation of an avian protection plan would minimize the potential for bird mortality associated with the project's electrical facilities.

Threatened and Endangered Species

One federally listed fish (Alabama sturgeon), three federally listed freshwater mussel species (inflated heelsplitter, ovate clubshell, and southern clubshell) and four federally listed terrestrial species (wood stork, northern long-eared bat, gopher tortoise, and Georgia rockcress) are known to occur or have the potential to occur in the vicinity of the project.

Inflated heelsplitters currently occur in habitat immediately downstream of the proposed project, and have the potential to occur upstream. Project construction could directly affect inflated heelsplitters by removing existing habitat (i.e., tailrace), and by crushing, or displacing to project spoils, inflated heelsplitters present within the construction area. Project operation would also reduce or eliminate flows in the flow affected area located downstream of the dam. As discussed above, water quality and flow monitoring are recommended in the flow affected area to determine whether specific measures are needed to protect water quality and mussels. Under the staff alternative, mussels potentially affected by construction or operation would be relocated to existing suitable habitat, and post-construction surveys would be conducted in the relocation habitat to determine the success of the mussel relocations, and the potential need for additional protective measures. Post-construction surveys would also be conducted in the tailrace and intake channels, and the flow affected area to determine whether mussels are recolonizing those habitats, and if so, identify whether the populations are healthy, or require additional protective measures. In spite of the benefits of the measures discussed above, project construction and operation would likely result in the take[15] of some inflated heelsplitters. However, by implementing the measures above, FWS has indicated in its BO that the level of expected take is not likely to jeopardize the continued existence of the inflated heelsplitter.

The FWS list[16] does not identify the federally endangered Alabama sturgeon as potentially occurring in the project area. However, FWS staff provided information indicating the potential presence of Alabama sturgeon downstream of Coffeeville Lock and Dam (97 miles downstream of the proposed project). Nevertheless, it is unlikely that Alabama sturgeon would migrate upstream of Coffeeville Lock and Dam, which does not

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[15] Section 3 of the Endangered Species Act defines "take" to mean harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.

[16] See FWS's official list of threatened and endangered species accessed by staff using the IPaC website (https://ecos.fws.gov/ipac/) on April 12, 2018 and filed on April 13, 2018.

have fish passage facilities. Consequently, construction and operation of the proposed project would not be likely to adversely affect the Alabama sturgeon.

The FWS lists the federally endangered ovate clubshell and southern clubshell as potentially occurring in the project boundary. However, based on 2011 survey results, the two species are not present in the proposed Demopolis Project boundary. No critical habitat is present in the project boundary or within the mainstem of the Tombigbee River. Given that ovate clubshell and southern clubshell have not been documented in the project area and the project site does not provide suitable habitat for these species (i.e., stable channels and banks), the proposed project is not likely to adversely affect the ovate clubshell and southern clubshell.

The FWS lists the federally threatened wood stork as potentially occurring in the project area. While there are no documented occurrences of wood stork breeding or nesting in Alabama, wood storks are known to disperse from breeding areas to Alabama for foraging during the summer months. Alabama DCNR has observed wood storks throughout an approximately 600-acre area of the Damsite Management Unit, between June and the first of October. The Damsite Management Unit is one of nine wildlife management units that comprise the 8,308-acre David K. Nelson Wildlife Management Area. The powerhouse, intake channel, and tailrace channel would permanently displace about 13.95 acres of wetlands, 9 acres of which were identified as wood stork foraging habitat located at the southeast corner of the David K. Nelson Wildlife Management Area. In addition, the project transmission line would cross the Tombigbee River, thereby presenting a collision hazard for wood storks flying along the river. The project facilities would, however, be located at the Demopolis Lock and Dam in a disturbed area that is currently used by the Corps for lock operations and open to the public for recreation, including hunting and fishing. Our recommendation to modify the spoils disposal plan and develop a wetlands mitigation plan, establish a species protection plan, and establish an avian protection plan would reduce project effects on wood stork habitat, minimize human disturbances to wood storks foraging in the project boundary, and minimize the risk of electrocution hazards from the project transmission line, respectively. Considering the abundance of wildlife habitat throughout the David K. Nelson Wildlife Management Area, the disturbances and habitat quality of the Demopolis Lock and Dam area, and our recommended measures to minimize project effects on the wood stork, we conclude that construction, operation, and maintenance of the project under the staff-recommended alternative would have insignificant effects on the wood stork and would therefore not be likely to adversely affect the wood stork.

The FWS list of threatened and endangered species includes the northern long-eared bat as potentially occurring in the project area. Project construction would be located inside the white-nose syndrome zone of the northern long-eared bat, would involve tree removal, and would be located in an area that contains a potential maternal roost tree. However, the staff-recommended species protection plan would limit tree removal to November 1 through March 31, which is outside of the northern long-eared bat pup season (June 1 – July 31), as well as the broader active season (April 1 – October 31) and therefore, would not be likely to adversely affect the northern long-eared bat (FWS, 2016a).

FWS's Environmental Conservation Online System indicates that the federally threatened gopher tortoise and Georgia rockcress may occur in Marengo and Sumter Counties. However, the FWS list does not include these species as potentially occurring in the project area. There appears to be no suitable habitat available within the project boundary for the gopher tortoise, which requires areas of dry, sandy soil for burrowing and nesting. Surveys for Georgia rockcress did not document the occurrence of any individuals within the project boundary. Therefore, we conclude that construction and operation of the project would have no effect on gopher tortoise or Georgia rockcress.

Recreation and Land Use

Construction activity would cause a temporary, localized disruption of existing land use in the immediate vicinity of the project. Recreationists at Spillway Falls Park on the south bank of the Tombigbee River could be affected by construction activity, but this would be a temporary disruption. Boaters using the lock at Demopolis Dam should not be affected by construction. Hunters at the Damsite Management Unit on the north bank of the Tombigbee River would be affected during construction, as some areas would be inaccessible during construction. However, the construction areas are small in size relative to the size of the Damsite Management Unit, and hunters could choose other, comparable areas for hunting. A feasibility assessment would determine the need and benefits of north bank recreational fishing access at the project. Access for south bank fishing at Spillway Falls Park would be unaffected.

Aesthetic Resources

Short-term, unavoidable effects during construction would include increased traffic, noise, and activity. Restoring areas after construction by clearing construction debris and revegetating the landscape would protect aesthetics at construction-affected areas. The proposed hydropower facilities would blend with the existing dam infrastructure to maintain the existing aesthetics in the project vicinity.

Views of the chalk shelf from both sides of the Tombigbee River would be affected because of excavation of the chalk shelf during project construction. Flows over the chalk shelf would also change because of excavation of the chalk shelf, and modifications to flow during operation, causing a permanent, long-term change in the visual characteristics of the Tombigbee River, particularly from the Corps' Spillway Falls Park.

Cultural Resources

Construction, operation, and maintenance of the proposed Demopolis Project may result in adverse effects on historic properties, including an archeological site in the transmission line corridor that is eligible for listing in the National Register of Historic Places. Implementation of a HPMP, in consultation with the Alabama SHPO and affected tribes, would prevent or mitigate for any adverse effects caused by project construction, operation, and maintenance. Provisions in a HPMP describing a protocol for treatment of any unknown cultural resources discovered during construction, operation, or maintenance would protect previously unidentified resources over the term of a license.

Conclusions

Based on our analysis, we recommend licensing the project under the staff alternative.

In section 4.2 of the final EA, we estimate the likely cost of alternative power for the three alternatives identified above. For the Demopolis Project, our analysis shows that, during the first year of operation under the proposed action, project power would cost $1,870,130, or $10.81/MWh, less than the likely alternative cost of power. Under the staff alternative, project power would cost $2,055,240 or $11.88/MWh, less than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative for the project because: (1) the project would provide a dependable source of electrical energy for the region (173,000 MWh annually); (2) the 48 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the recommended environmental measures.

We conclude that issuing an original license for the project with the environmental measures we recommend would not be a major federal action significantly affecting the quality of the human environment.

FINAL ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

Demopolis Lock and Dam Hydroelectric Project, FERC Project No. 13102-003

Alabama

1.0 INTRODUCTION

1.1 APPLICATION

On July 2, 2013, Birch Power Company (Birch Power) filed an application for an original license to construct and operate its proposed 48-megawatt (MW) Demopolis Lock and Dam Hydroelectric Project (project or Demopolis Project). The project would utilize the hydraulic head of the existing United States Army Corps of Engineers' (Corps') Demopolis Lock and Dam, which is located at river mile (RM) 213.4 of the Tombigbee River, in Marengo and Sumter counties, Alabama (figure 1-1). The proposed project includes the construction of a powerhouse containing two turbine and generator units, an excavated intake channel, trash racks, oxygen equipment pad, excavated tailrace channel, and a transmission line. The project would occupy 23 acres of federal land managed by the Corps. The average annual generation of the Demopolis Project would be approximately 173,000 megawatt-hours (MWh).

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the proposed Demopolis Project is to provide a new source of hydroelectric power. Therefore, the Commission must decide whether to issue a license for the project and what conditions should be placed in any license issued. In deciding whether to issue a license for any hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, such as flood control, irrigation, navigation, or water supply, the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection, mitigation of damage to, and enhancement of fish and wildlife resources (including related spawning grounds and habitat); (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing an original license for the Demopolis Project would allow Birch Power to construct the project and generate electricity for the term of the license, making electric power from a renewable resource for sales to its customers. This final Environmental Assessment (final EA) assesses the environmental and economic effects associated with the construction and operation of the Demopolis Project and alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a license for the project, and if so, recommends terms and conditions to become a part of any license issued for the project.

In this final EA, we assess the environmental and economic effects of constructing, operating, and maintaining the Demopolis Project: (1) as proposed by Birch Power (proposed action) and (2) with our recommended measures (staff alternative). We also consider the effects of the no-action alternative. Important issues that are addressed include construction and operation effects on geology and soils, aquatic resources, terrestrial resources, threatened and endangered species, recreation and land use, and cultural resources.

1.2.2 Need for Power

The Demopolis Project would provide hydroelectric generation to meet part of Alabama's power requirements, resource diversity, and capacity needs. The project would have an installed capacity of 48 MW and over the term of the license would generate an average of about 173,000 MWh per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Demopolis Project is in the Southeastern sub-region of the SERC Reliability Corporation (SERC), which is one of eight regional entities of NERC. According to NERC's 2016 forecast, the SERC Southeastern sub-region is projected to grow at a compound annual rate of 0.97 percent, from 2017 through 2026 (NERC, December 2016).

We conclude that the project would help meet a need for power in the SERC's Southeastern sub-region in both the short and long term. The project would provide low-cost power and displace generation from non-renewable sources.

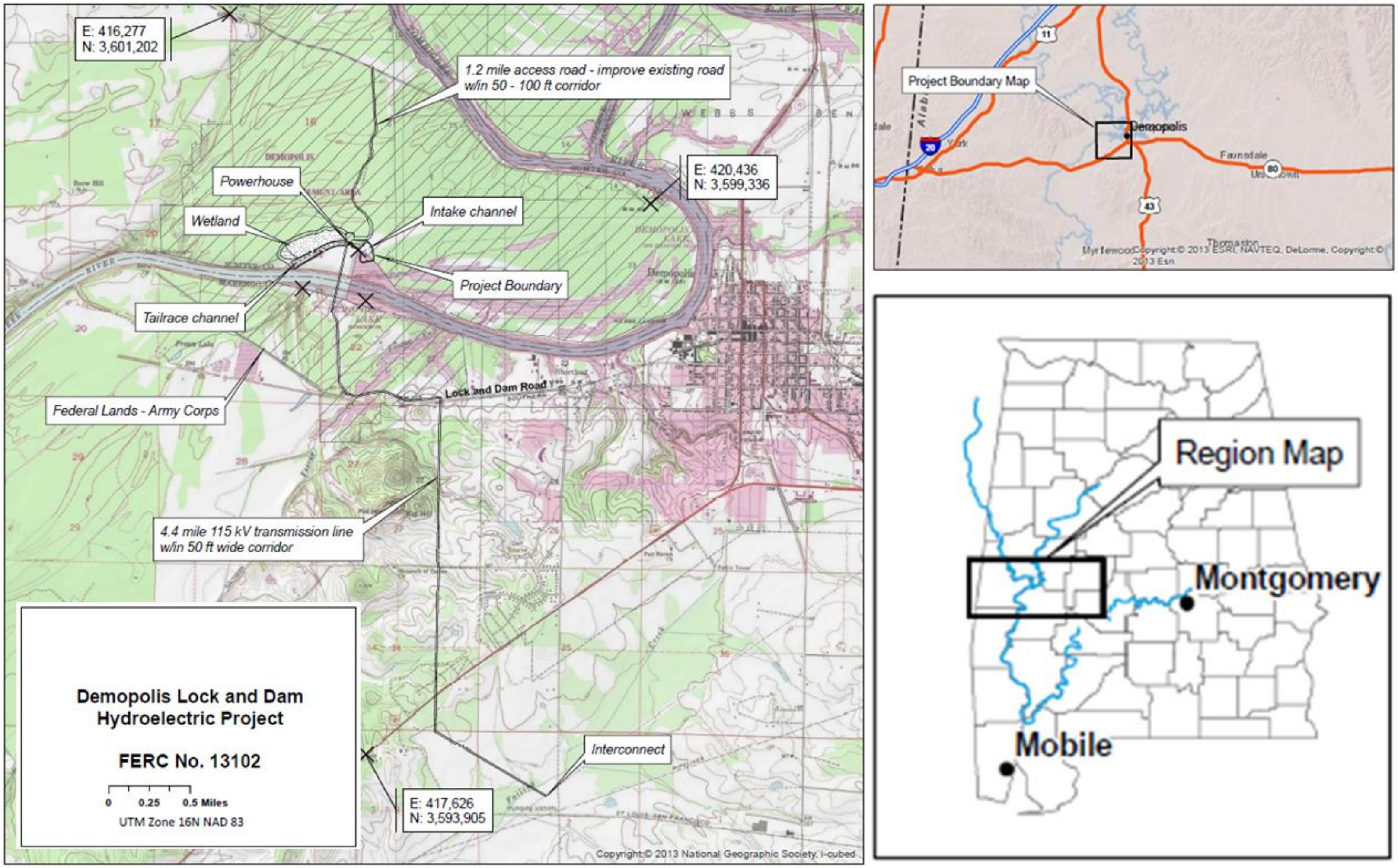

Figure 1-1. Location of the proposed Demopolis Project (Source: Birch Power, as modified by staff).

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the proposed project would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described in the following sections.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the U.S. Department of Commerce or the U.S. Department of the Interior (Interior). No fishway prescription or reservation of authority to prescribe fishways was filed under section 18.

1.3.1.2 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. No agency submitted fish and wildlife recommendations pursuant to section 10(j) of the FPA.

1.3.2 Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA), a license applicant must obtain either water quality certification (WQC or certification) from the appropriate state pollution control agency verifying that any discharge from a project would comply with applicable provisions of the CWA or a waiver of certification by the appropriate state agency. The failure to act on a request for certification within a reasonable period of time, not to exceed one year, after receipt of such request constitutes a waiver.

On March 17, 2016, Birch Power applied to the Alabama Department of Environmental Management (Alabama DEM) for section 401 WQC for the Demopolis Project. The Alabama DEM timely issued the section 401 WQC on September 29, 2016.[17] The conditions of the certification are described under section 2.2.7, *Modifications to Applicant's Proposal – Mandatory Conditions*.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

Based on information provided in the license application, U.S. Fish and Wildlife Service's (FWS) official threatened and endangered species list, and FWS's Environmental Conservation Online System,[18] the following threatened or endangered species are known to occur, or could potentially occur, in the project area: inflated heelsplitter (*Potamilus inflatus*), ovate clubshell (*Pleurobema perovatum*), southern clubshell (*Pleurobema decisum*), wood stork (*Mycteria americana*), northern long-eared bat (*Myotis septentrionalis*), gopher tortoise (*Gopherus polyphemus*), and Georgia rockcress (*Arabis georgiana*). The FWS list does not include the federally endangered Alabama sturgeon (*Scaphirhynchus suttkusi*) as potentially occurring in the project area. However, FWS staff provided information indicating the potential presence of Alabama sturgeon downstream of Coffeeville Lock and Dam (97 miles downstream of the proposed project).[19] No designated or proposed critical habitat for these species is presently found within the proposed project boundary.

Our analysis of project impacts on threatened and endangered species is presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations are in section 5.1, *Comprehensive Development and Recommended Alternative*. We conclude that licensing the project, as proposed with our recommended measures and mandatory conditions, would have no effect on Georgia rockcress, because surveys did not detect

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[17] Alabama DEM issued the WQC to Birch Power on September 29, 2016. Birch Power filed a copy of the WQC with the Commission on September 30, 2016, and Alabama DEM filed a copy on October 17, 2016.

[18] We obtained FWS's official list of threatened and endangered species that may occur in the proposed project location by using the FWS Environmental Conservation Online System and filed to the record on April 13, 2018.

[19] A telephone conversation memo was filed to the record on August 24, 2017 describing the information provided by FWS.

these species in the project area, and no effect on gopher tortoise because there is no suitable habitat available in the project area.

In the draft EA, we concluded that licensing the project as proposed with our recommended measures and implementation of the mandatory conditions would likely adversely affect the inflated heelsplitter because of habitat removal during construction and the need to relocate mussels. We requested formal consultation with FWS on June 30, 2017. In the biological opinion (BO) filed on February 16, 2018, FWS indicated that incidental take for the inflated heelsplitter is limited to the action area (approximately 140 acres of water bottoms in the project area),[20] and determined that the level of expected take is not likely to result in jeopardy to the species. Further, FWS determined that incidental take would not be considered prohibited taking under ESA provided that such taking is in compliance with the terms and conditions of the Incidental Take Statement (see Appendix B). The terms and conditions of FWS's BO are below.

Condition 1 specifies that Birch Power:

- Conduct construction/dredge activities as proposed and implement best management practices during all proposed construction/dredge activities;

- Provide to the FWS for review and approval, the erosion control plan, spoils disposal plan, revegetation plan, recreation management plan, riverbed and scour stability plan, oil and hazardous substances plan, water quality monitoring and management plan, and a plan to monitor and remedy project caused aggradation in the project area, a minimum of 60 days prior to construction activities;[21] and

- Hold annual coordination meetings for the first 5 years after construction is complete to review the effectiveness of the erosion control plan, and the

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[20] The action area is defined in the BO (see Appendix B).

[21] This provision of FWS's condition 1 is administrative in nature and not an environmental measure. Accordingly, we do not analyze this provision in the final EA, but we do provide comments on the provision in Appendix A.

riverbed scour and shoreline stability plan to assess if changes are necessary.[22]

Condition 2 specifies that Birch Power include the following provisions in the mussel relocation plan:

- Provide a copy of the plan to the FWS for review and concurrence, and to the Commission and the Corps, 2 weeks prior to the mussel collection and relocation;[23]

- Conduct pre-construction surveys in the action area to locate mussels for relocation;[24]

- Conduct habitat suitability surveys for the mussel relocations that would occur below the dam and outside the action area;[25]

- Begin all pre-construction surveys no more than 30 days prior to the construction/dredging activities, and if construction/dredging is not initiated

[22] In the BO, the FWS states that the post-construction meetings would occur for 5 years. We assume that these meetings would occur during the first 5 years post-construction.

[23] This provision of FWS's condition 2 is administrative in nature and not an environmental measure. Accordingly, we do not analyze this provision in the final EA.

[24] In the BO, the FWS states that surveys would be conducted no more than 30 days prior to construction for federally listed threatened or endangered species. The FWS does not specifically state that the pre-construction surveys would occur in the action area, or that the survey would target all mussels. However, the FWS does state in a subsequent paragraph of the BO that *all mussels* found within the *action area* would be collected and relocated. Thus, we assume that FWS is requiring that pre-construction surveys be conducted to locate *all mussels* in the *action area*.

[25] In the BO, the FWS does not state where the habitat suitability surveys would occur. However, we are assuming that the surveys would occur in potential relocation habitat for mussels. In a subsequent paragraph of the BO, FWS states that all mussels within the action area would be relocated to areas of suitable habitat just below the dam. Thus, we assume that the habitat suitability surveys would occur below the dam and outside the action area, where mussels would be relocated.

within the required 30 days, the action area[26] must be resurveyed and mussels relocated prior to any of the permitted instream construction;

- Identify the survey methods and the proposed relocation site;

- Collect all mussels found within the action area and relocate them to areas of suitable habitat just below the dam;[27]

- Conduct mussel relocation efforts with divers that have valid state and federal permits, and are qualified and experienced in handling mussels;[28]

- Identify, count, inventory, and photograph all mussels collected for relocation;

- Minimize stress to mussels at all times during relocation, by: (1) keeping mussels in mesh bags in site water prior to removal, or in a moist and cool environment by covering with a wet blanket or sack, and out of direct sunlight; and (2) never allowing mussels to be removed from a moist, cool environment for more than 10 minutes;

- Hand-place all relocated mussels within relocation sites in suitable habitat and in a natural position, and precautions should be taken to ensure each mussel is firmly embedded and stabilized in the substrate;

- Prepare a report and file with the FWS within 90 days following the completion of all mussel relocation work to include: (1) a description of the efforts, habitat, problems and solutions, results, and conclusions of the relocation effort; and (2) maps with coordinates should be included, showing the work and relocation areas; and

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[26] In the BO, the FWS states that the *project area* must be resurveyed. However, based on our assumptions in previous footnotes, we interpret that FWS as referring to the *action area* and not the *project area*.

[27] As indicated above, we assume that FWS is requiring that areas of suitable relocation habitat be identified outside the action area.

[28] FWS's terms and conditions also require that copies of the permits be attached to the mussel relocation plan.

- Conduct post-construction surveys of the relocation area and the construction/dredge area one year post construction and then every three years thereafter for ten years (for a total of 4 post construction surveys).

The FWS's terms and conditions, which would minimize the effects of construction and operation on inflated heelsplitters, are included in the staff alternative.[29] The BO from FWS concludes formal consultation on the staff alternative.

In the draft EA, we included the best available information regarding Alabama sturgeon, but we did not include Alabama sturgeon in our analysis of effects to threatened and endangered species because: (1) this species was not included on the FWS's official species list of threatened and endangered species known to occur, or potentially occurring, within the Demopolis Project boundary;[30] and (2) the species had not been reported near the project area since the early 1970s. On August 2 and 17, 2017, we were informed by telephone conversation[31] with FWS staff that the Alabama Division of Wildlife and Freshwater Fisheries (Alabama DWFF) conducted surveys for Alabama sturgeon in the Tombigbee River and preliminary analysis of eDNA[32] samples indicated that Alabama sturgeon may be present downstream of Coffeeville Lock and Dam[33] (i.e., at river miles 64, 77.5, and 116). On January 31, 2018 we issued a supplemental EA to account for new information on the Alabama sturgeon. In the supplemental EA we concluded that the Alabama sturgeon is unlikely to successfully pass upstream of the

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[29] The FWS terms and conditions also include a non-enumerated condition regarding how FWS should be notified when dead, injured, or sick individuals of an endangered or threatened species are encountered at the project (see Appendix B). This provision is administrative in nature and is not an environmental measure. Accordingly, we do not analyze this condition in the final EA, but we do comment on this condition in Appendix A.

[30] The official species list for the draft EA was filed to the Commission's record for the Demopolis Project on December 5, 2016.

[31] A telephone conversation memo was filed to the Commission's record for the Demopolis Project on August 24, 2017.

[32] Environmental DNA, or eDNA refers to the genetic information emitted from organisms as they interact with their environment (e.g., DNA within shed tissues, excrement, etc.), which can be collected from soil, water, or air samples, rather than sampled directly from an individual organism.

[33] Coffeeville Lock and Dam is located at river mile 117, which is about 96 miles downstream of Demopolis Lock and Dam.

Coffeeville Lock and Dam, and requested concurrence on our determination that the construction and operation of the Demopolis Project would not be likely to adversely affect the Alabama sturgeon. By letter filed on February 13, 2018, FWS concurred with our determination for Alabama sturgeon.

In the draft EA, we also concluded that licensing the project may affect, but is not likely to adversely affect the ovate clubshell and southern clubshell because the two species have not been documented in the project area and the project site does not provide suitable habitat for these species. We also concluded that licensing the project may affect, but is not likely to adversely affect the wood stork and northern long-eared bat with the implementation of measures (including a modified spoils disposal plan, a revegetation plan, an avian protection plan, and a species protection plan) under the staff alternative. We requested concurrence with FWS on June 30, 2017. By letter filed on August 18, 2017, FWS concurred with our determinations for all four species.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 United States Code (U.S.C.) § 1456(c)(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

In a letter filed by Birch Power on May 21, 2014 (letter dated January 30, 2014), Alabama DEM indicates that the proposed Demopolis Project would be located outside Alabama's designated coastal zone. Therefore, the project is not subject to the Alabama coastal zone program review, and no consistency certification is needed for the action.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA)[34] requires that every federal agency "take into account" how its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

On May 5, 2011, the Commission designated Birch Power as its non-federal representative for the purposes of conducting section 106 consultation under the NHPA.

[34] 54 U.S.C. § 306108 (2014).

Pursuant to section 106, and as the Commission's designated non-federal representative, Birch Power consulted with the Alabama Historical Commission (Alabama SHPO) to identify historic properties, determine National Register-eligibility, and assess potential adverse effects on historic properties within the project's area of potential effects (APE). This consultation and other investigations concluded that one archeological site within the APE, 1MO232, was eligible for listing on the National Register. In a letter filed with the final cultural resource survey for the project on April 3, 2016, the SHPO recommended that Birch Power take measures to avoid the site or provide proposals for mitigation, including data recovery, if the site could not be avoided during project construction.

To meet the requirements of section 106 of the NHPA, we intend to execute a Programmatic Agreement (PA) with the Alabama SHPO for the protection of historic properties from the effects of construction, operation, and maintenance of the Demopolis Project. The terms of the PA would ensure that Birch Power addresses and treats all historic properties identified within the project's APE through the finalization of a Historic Properties Management Plan (HPMP).

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 Code of Federal Regulations [CFR], section 4.38) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this final EA, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested agencies and others on February 11, 2015. The document was noticed in the Federal Register on February 18, 2015. An environmental site review was held at the project on March 26, 2015. Scoping meetings were held in Demopolis, Alabama, on March 26, 2015, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
Alabama Department of Conservation and Natural Resources (Alabama DCNR)	April 24, 2015
Rock-Tenn Mill Company, LLC (Rock-Tenn)[35]	April 27, 2015
U.S. Fish and Wildlife Service (FWS)	May 1, 2015

A revised scoping document was issued on June 19, 2015.

1.4.2 Interventions

On October 28, 2014, the Commission issued a notice accepting the application. The notice set December 27, 2014, as the deadline for filing motions to intervene and protests and requests for cooperating agency status. On December 23, 2014, Georgia-Pacific Consumer Products LP (Georgia-Pacific) and Rock-Tenn intervened in the licensing proceedings for the Demopolis Project.

1.4.3 Comments on the License Applications

The Commission issued a Ready for Environmental Analysis notice for the project on June 15, 2016, and requested comments, recommendations, terms and conditions, and fishway prescriptions. Georgia-Pacific was the only entity to file (August 15, 2016) comments and recommendations.[36]

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[35] Rock-Tenn Mill Company, LLC is the predecessor of WestRock Mill Company, LLC, which owns a paper mill that discharges effluent about 8 miles downstream of the proposed Demopolis Project.

[36] On August 15, 2016, Birch Power filed a Water Quality Licensing Settlement Agreement signed by Birch Power and WestRock Mill Company, LLC (owner and operator of Demopolis Mill, which is a paper mill located about 8 miles downstream of the proposed project), which included six proposed license articles. Thus, WestRock also recommends the proposed license articles in the Water Quality Settlement, and did not file separate recommendations in response to the Commission's notice that the proposed project was ready for environmental analysis.

1.4.4 U.S. Army Corps of Engineers – Terms and Conditions

Pursuant to the Memorandum of Understanding between the Commission and the Department of the Army,[37] licensed hydropower facilities that would be an integral part of or that could affect the structural integrity or operation of Corps' projects shall be designed and constructed in consultation with and subject to the review and approval of the appropriate Corps' District Engineer. Consistent with the Memorandum of Understanding, the Commission routinely includes special license articles that do the following:

(1) require the licensee to submit final plans and specifications for cofferdams and deep excavations to the Corps and Commission for review and approval;

(2) require the licensee to enter into a comprehensive agreement with the Corps within 90 days after a license is issued to coordinate its plans for access to and site activities on lands and property administered by the Corps, so that the authorized purposes, including operation of the federal facilities, are protected;

(3) authorize the Corps to (a) inspect the construction, operation, and maintenance of any licensed facilities that may affect the structural integrity or operation of the Corps' project, and (b) order the licensee to stop any activity that may endanger the structural integrity or safety of the Corps' project;

(4) require the licensee to submit a regulating (or operating) plan to the Corps for approval at least 60 days prior to the start of construction, and to enter into an operating Memorandum of Agreement (MOA) with the Corps describing the detailed operation of the power facilities acceptable to the Corps;

(5) provide that the licensee shall have no claim under the license against the United States arising from the effect of any changes made in the operation or reservoir levels of the Corps' project; and

(6) require the licensee to provide the Commission's Regional Director two copies of all correspondence between the licensee and the Corps and provide that the Commission's Regional Director shall not authorize construction until the Corps provides final written approval of the project.

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[37] See *Memorandum of Understanding between the United States Army Corps of Engineers and The Federal Energy Regulatory Commission on Non-federal Hydropower Projects*, July 2016. https://www.ferc.gov/legal/mou/2016/07-21-16.pdf.

1.4.5 Comments on the Draft EA

On June 29, 2017, the Commission issued a draft EA. Comments on the draft EA were due July 29, 2017.[38] The following entities filed comments:

Commenting Entity	Date Filed
Birch Power Company	July 25, 2017
U.S. Environmental Protection Agency (EPA)	July 28, 2017
WestRock Mill Company, LLC	July 31, 2017
Alabama Historical Commission (Alabama SHPO)	July 31, 2017
Choctaw Nation of Oklahoma	August 14, 2017
U.S. Fish and Wildlife Service (FWS)	August 18, 2017

[38] The notice issuing the draft EA established a 30-day comment period for the draft EA. Because July 29, 2017, fell on a weekend, comments received by the close of the following business day, July 31, 2017, were considered timely.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the project would not be built, and the environmental resources in the project area would not be affected.

2.2 APPLICANT'S PROPOSAL

2.2.1 Existing Corps Facilities

The Corps' Demopolis Lock and Dam is located at RM 213.4 on the Tombigbee River within Marengo and Sumter Counties in West Central Alabama.[39] Demopolis Lock and Dam is downstream of Howell Heflin Lock and Dam, which is the first lock and dam in a system of ten navigational structures, collectively known as the Corps' Tennessee-Tombigbee Waterway (figure 2-1). The Demopolis Lock and Dam also is the first lock and dam downstream of the mouth of the Black Warrior River, which has four Corps navigational structures (figure 2-1).

Demopolis Lock and Dam consists of a 600-foot-long, 100-foot-wide lock, a 1,485-foot-long fixed crest spillway, and an earthen dam that extends beyond the spillway for about 200 feet to tie the dam into higher ground. The spillway is divided into a 590-foot-long section across the river channel and an 895-foot-long overbank section across the side opposite the lock. Both sections of the spillway have fixed ogee crests at elevation 73 feet above sea level (ASL) (figure 2-2). The top of the lock walls are at elevation 84 feet ASL, and the upper and lower sills[40] are at elevations 56 feet ASL and 20 feet ASL. Nominal inside dimensions of the lock are 110 feet by 600 feet. The reservoir formed by the Demopolis Lock and Dam covers an area of about 10,000 acres at elevation 73 feet ASL.

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[39] Construction of the Demopolis Lock and Dam began in 1949 and was completed in 1955.

[40] A sill is a raised portion of the floor of a lock chamber, forming a stop against which the lock gates bear when they are shut.

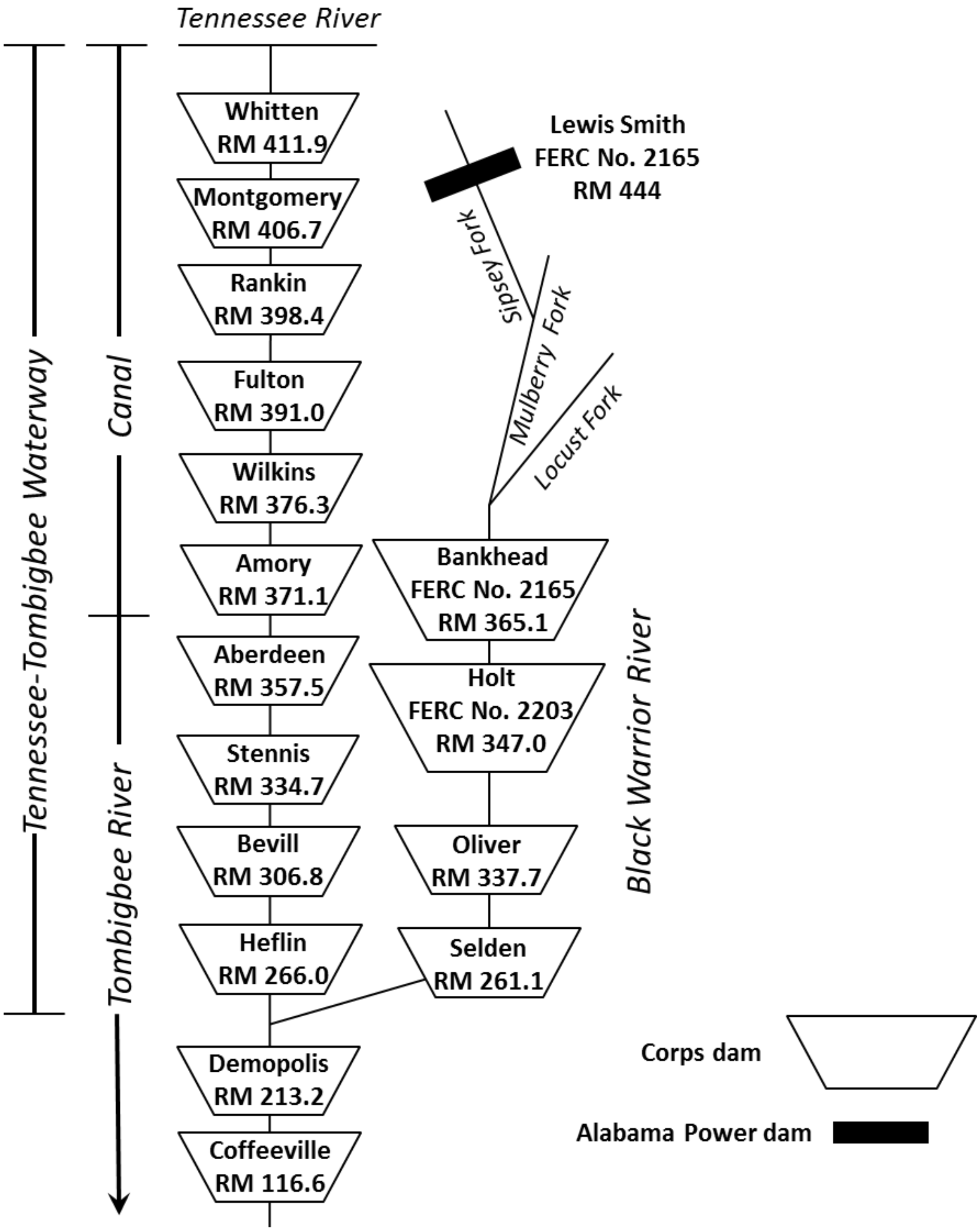

Figure 2-1. Schematic of the Tombigbee River, Black Warrior River, and Tennessee-Tombigbee Waterway. Navigation miles are from Bankhead Tunnel (U.S. Highway 90), Mobile, Alabama (Source: staff).

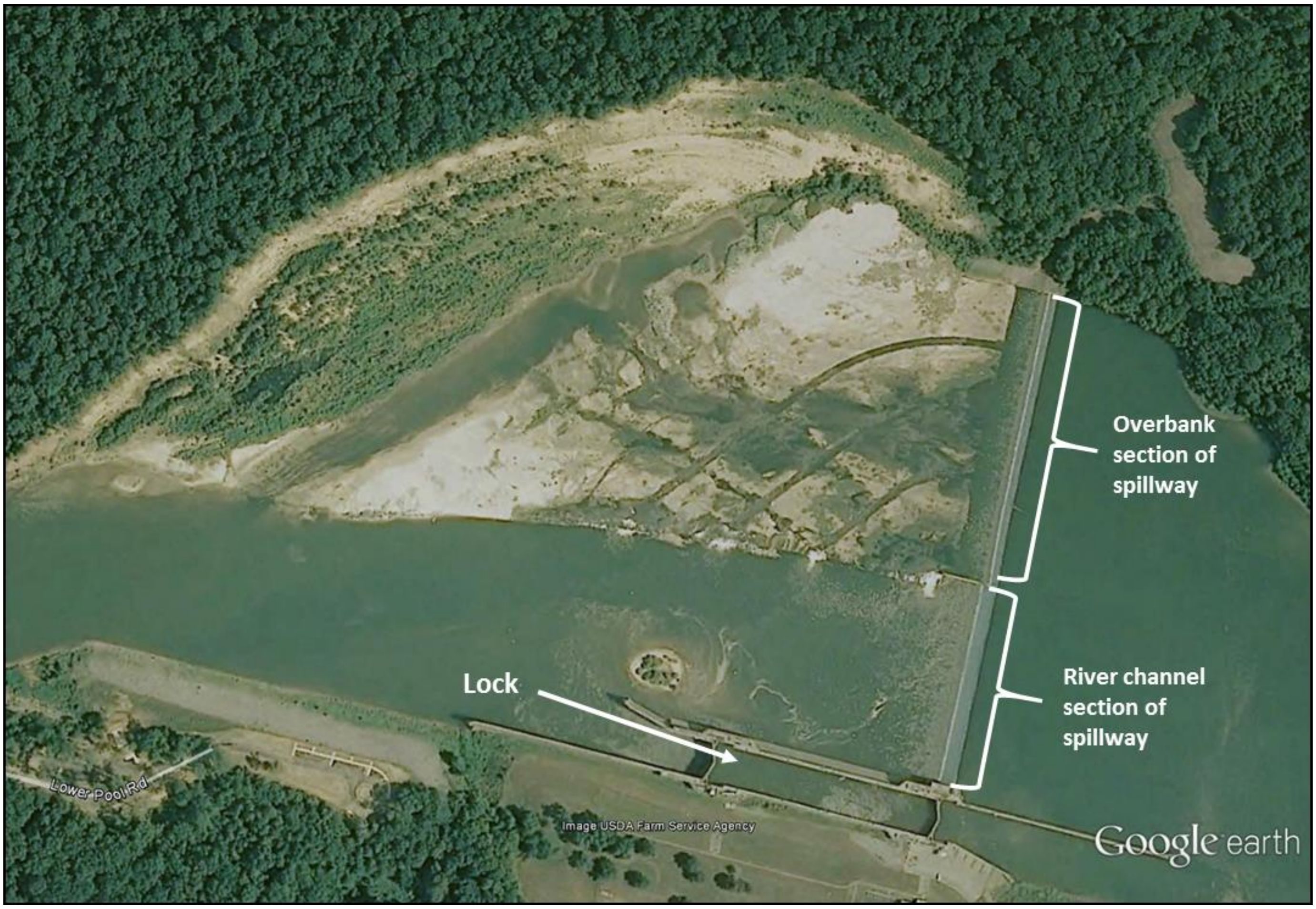

Figure 2-2. The Corps' Demopolis Lock and Dam (Source: Google Earth, 2014; as modified by staff).

2.2.2 Existing Corps Operations

The Corps operates the Demopolis Lock and Dam primarily for commercial navigation purposes (Corps, 1979). The entire length of the dam crest functions as an uncontrolled spillway, without gates to regulate flow or control upstream water elevations. Thus, outflow generally equals inflow, and the normal water surface elevation of the pool upstream of the dam fluctuates between 73 feet ASL (crest elevation) and 76 feet ASL depending on inflow (Corps, 1979).

The lock provides a maximum lift of 41 feet from a minimum tailwater of 32.5 feet ASL to an upper pool of 73.5 feet ASL. The lock will become inoperative when the upper pool reaches elevation 83 feet ASL, at which time traffic will navigate over the fixed crest spillway. The lock emptying and filling system consists of intake ports in the upper sill, which connect to culverts and discharge through a bottom lateral system located in the chamber floor. The lock is emptied through the same ports and discharges through bottom-lateral diffusers. Flow in the culvert is controlled by two reverse tainter valves in each chamber wall.

2.2.3 Proposed Project Facilities

The proposed hydroelectric facility would include an intake channel, intake structure, powerhouse, tailrace, substation, transmission line, and access road. The transmission line would connect to existing distribution lines of nearby local utilities. The proposed project boundary, shown in figure 1-1, would enclose the facilities described below, including the transmission line right-of-way (ROW).

The proposed Demopolis Project would be located on the north end of Demopolis Lock and Dam and would consist of the following new facilities: (1) a 900-foot-long excavated intake channel excavated into the riverbed; (2) two 60-foot-long by 32-foot-wide trash racks with 2.5-inch bar spacing; (3) a 201-foot-long by 80-foot-wide powerhouse along the north side of the river, containing two 24 MW Kaplan turbines and having a total installed capacity of 48 MW; (4) a substation located on top of the powerhouse; (5) an oxygenation system to enhance dissolved oxygen in the project discharge; (6) a 1,880-foot-long tailrace channel excavated into the riverbed to discharge water from the powerhouse, which would create a 45-acre flow affected area between the dam and the tailrace channel; (7) a 1,700-foot-long retaining wall along the north side of tailrace channel to contain 571,000 cubic yards of spoils; (8) a 20.2 acre wetland constructed on top of the project spoils; (9) a 4.4-mile-long, 115-kilovolt (kV) transmission line to connect the project substation to an existing distribution line; and (10) an 850-foot-long, 28-foot-wide access road with a parking area (figure 2-3).

The project would also include the following new recreational facilities: a fishing platform on the south bank of the Tombigbee River downstream from the lock, a recreation parking area for 2-3 vehicles on the north side of the river, and a 2,600-foot-long angler access trail connecting the recreation parking area to the north bank of the Tombigbee River.

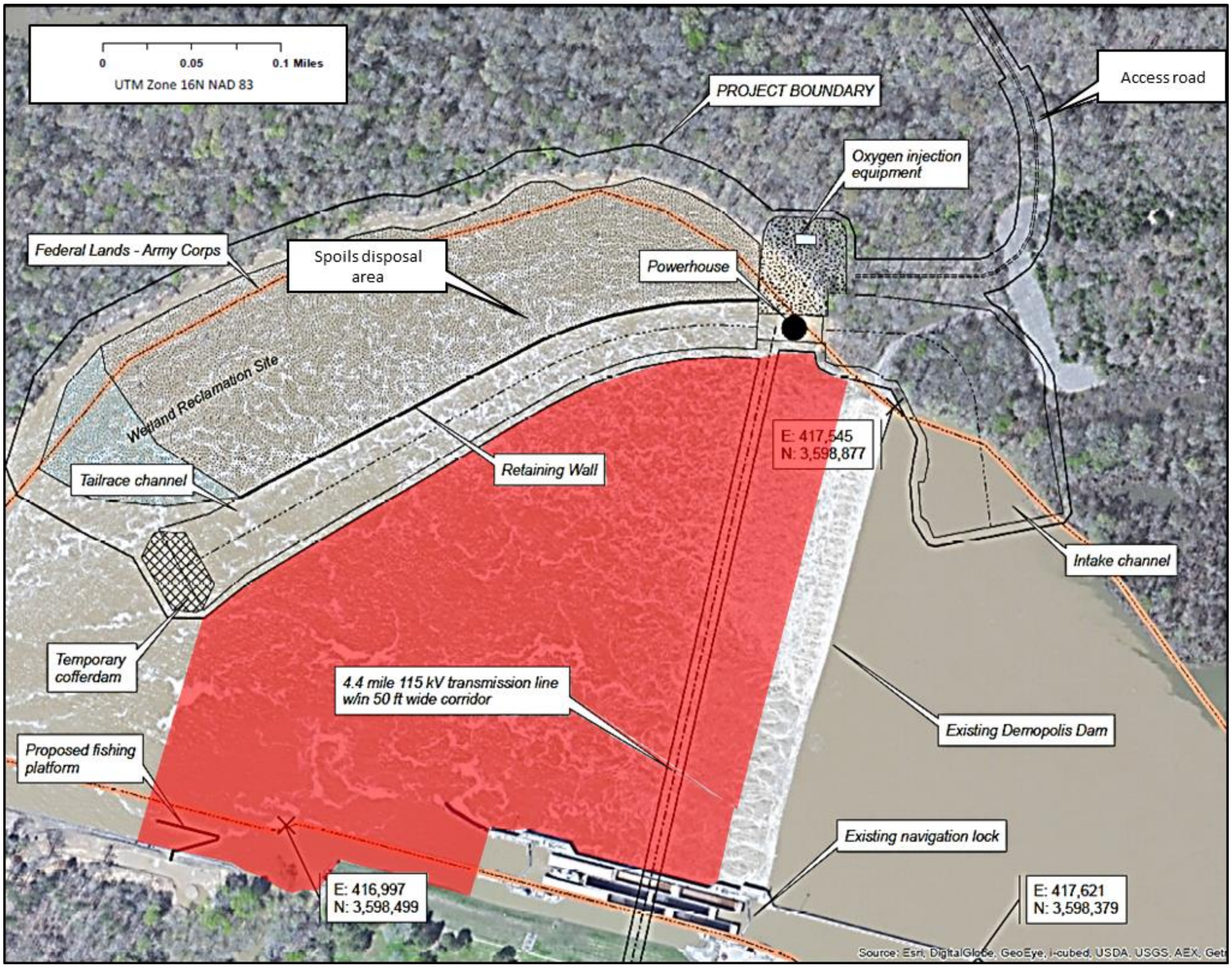

Figure 2-3. Proposed project facilities. Region shaded in red is the flow affected area (Source: Birch Power as modified by staff).

2.2.4 Project Safety

Under an original hydropower license, the proposed project would be subject to the Commission's project safety requirements. As part of the licensing process, Commission staff would evaluate the adequacy of the proposed project facilities. Special articles would be included in any license issued, as appropriate. Before the project is constructed, engineers from the Commission's Atlanta Regional Office would review the designs, plans, and specifications of the proposed generating structures. During construction, engineers from the Commission would frequently inspect the project to ensure adherence to approved plans and specifications; special license articles relating to construction, operation, and maintenance; and accepted engineering practices and procedures. Once construction is complete and the project enters the operation phase, Commission engineers would inspect it on a regular basis. Because the Corps maintains and operates the lock and dam, the Commission would coordinate with the Corps to fulfill its obligation to ensure that project safety requirements are met.

2.2.5 Proposed Project Operation

The project would operate in run-of-release mode, within the guidelines set by the Corps for navigation purposes.[41] The project would operate at flows between 5,000 cubic feet per second (cfs) and 110,000 cfs.[42] When flows are less than 5,000 cfs, the project would shut down using an automatic control system and all inflow would pass over the existing spillway. Also, when head drops below the minimum value for efficient turbine operation (15 feet at about 110,000 cfs) the project would shut down and all flow would be released over the spillway.

At river flows between 5,000 cfs and 20,000 cfs (maximum hydraulic capacity), all water would be routed through the turbines and no water would flow over the spillway. When all flow is routed through the turbines, a constant upstream elevation, equal to the elevation of the spillway (73 feet ASL), would be maintained through automatic adjustments of flow releases in response to a signal from an elevation (or head) sensor. For flows between 20,000 cfs and about 110,000 cfs, the project would operate at full hydraulic capacity and all water in excess of 20,000 cfs would flow over the spillway.

2.2.6 Proposed Environmental Measures

In addition to the project design and operational measures described in the previous section, Birch Power proposes the following protection, mitigation, and enhancement (PM&E) measures to protect or enhance environmental resources and improve recreational opportunities.

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[41] Although the applicant describes its proposed operating mode as run-of-reservoir, it is better defined as run-of-release because the project would generate from flows “released” (i.e., made available) to the project by the Corps.

[42] The minimum hydraulic capacity of the project is 3,000 cfs; however, the project would not operate below 5,000 cfs to protect downstream water quality, as proposed in the Water Quality Settlement filed on August 15, 2016.

Geology and Soil Resources

- Develop an erosion control plan that includes best management practices (BMPs) to: (1) minimize erosion and sedimentation during construction; and (2) monitor turbidity to assess impacts during construction.

- Implement a spoils disposal plan[43] that includes: (1) using the excavated spoils to upgrade the existing access road and construct a powerhouse parking area; (2) depositing spoils on the north side of the river channel downstream of Demopolis Lock and Dam; (3) constructing a retaining wall along the north side of the tailrace channel to stabilize the spoils pile on the north side of the river channel; and (4) re-vegetating the spoils pile in order to develop a 20.2-acre forested wetland on top of the spoils site.

Aquatic Resources

- Develop an oil and hazardous substances plan that would include measures to prevent the release of oil and hazardous substances during project construction and operation, and actions to take in the event of accidental oil or hazardous spills during construction and operation.

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[43] Birch Power's spoils disposal plan was filed on May 21, 2014 in replacement of its proposed spoils disposal included in the final application filed on July 2, 2013. In the final license application, Birch Power proposed to transport all spoils not otherwise used for improving the access road and constructing the powerhouse parking area to an offsite disposal area.

- Develop, as part of the Water Quality Settlement, [44] a plan to completely shut off the project intake works to ensure that no flow passes through the powerhouse when the hourly mean flow upstream of the project falls below 5,000 cfs, and resume operation when the hourly mean flow is at least 5,000 cfs to protect water quality downstream of the project.

- Install, operate, and maintain, as part of the Water Quality Settlement, one or more permanent flow gauges meeting United States Geological Survey (USGS) standards to estimate hourly mean flows upstream of the project.

- Implement the following measures required in Alabama DEM's water quality certificate to protect water quality in the tailrace and downstream of the tailrace: (1) maintain DO in the project discharge at a concentration no less than 5.0 milligrams per liter (mg/L) at all times, and a daily average DO concentration at RM 206 not be less than 6.5 mg/L when the project is operating;[45] (2) develop and implement measures to comply with the DO limitations through structural and/or operational modifications at the

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[44] On August 15, 2016, Birch Power filed a Water Quality Licensing Settlement Agreement signed by Birch Power and WestRock Mill Company, LLC, which included six proposed license articles. Three of the proposed license articles would require environmental measures. In the Water Quality Settlement, Birch Power also proposed three general and administrative articles that are not discussed further in this document. The general and administrative articles include proposals to: (1) provide to the operator of the Demopolis Mill downstream of the project, any water quality, or other reports and data collected by the gauges, monitors, and sampling efforts; (2) consult with the operator of the Demopolis Mill prior to filing for approval by the Commission any project operational change or any project-related activity that may affect water quality in the Tombigbee River downstream of the project; and (3) provide to the operator of the Demopolis Mill all water quality reports required by Alabama DEM's water quality certification.

[45] In an amendment to the Settlement filed by WestRock on July 31, 2017 and signed by Birch Power, the daily average DO at RM 206 would be calculated by totaling the DO value of all individual measurements during each calendar day (i.e., 12:00am through 11:59pm), and then dividing by the number of individual measurements during the calendar day.

project;[46] (3) install and maintain a tailrace DO monitoring device, and at the initiation of power generation, continuously record DO concentrations and water temperatures at 15-minute intervals during periods of generation following one continuous hour of generation all year long, to determine compliance with the requirement to maintain no less than 5.0 mg/L of DO in the tailrace; and (4) install and maintain a DO monitoring device at RM 206, and at the initiation of power generation, continuously record DO and temperature at no less than 15-minute intervals at all times throughout the year, to determine compliance with the requirement to maintain no less than a 6.5 mg/L mean daily average DO concentration at RM 206.

- Monitor DO, water temperature, pH, and biological oxygen demand (BOD), as part of the Water Quality Settlement, from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam, as required in WestRock's National Pollutant Discharge Elimination System (NPDES) permit for the Demopolis Mill.[47]

- Install a trash rack at the project intake with 2.5-inch clear bar spacing, to reduce entrainment of large fish and avoid impingement of small fish.

Terrestrial Resources

- Construct the project transmission line primarily within an existing transmission line right-of-way to minimize disturbances to botanical and wildlife resources.

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[46] Birch Power specifically proposes, in the Water Quality Settlement (proposed license article 2), to develop and implement a plan to install, operate, and maintain an oxygenation system designed to meet the DO standards required under Alabama DEM's certification condition 1. Although Birch Power's proposal is more specific than Alabama DEM's requirements in condition 2, both aim to provide measures that would allow the project to meet the DO limits required in condition 1. Therefore, both Alabama DEM's condition 2 and Birch Power's proposed license article 2 are considered analogous measures that would be equally protective of aquatic resources.

[47] As stated in the Water Quality Settlement, this article is for Birch Power to assume complete pecuniary responsibility for all ambient water quality sampling in the Tombigbee River during the period May 1 through November 30 each year, as required in WestRock's National Pollutant Discharge Elimination System Permit for the Demopolis Mill (also clarified in a letter filed by Birch Power on September 12, 2016).

- Selectively place transmission line poles to avoid small, isolated wetland areas.

- Implement a revegetation plan, filed on May 21, 2014, to re-establish native vegetation on land disturbed by project construction and reduce the spread and introduction of nonnative, invasive species.

Threatened and Endangered Species

- Implement a mussel relocation plan that includes: (1) conducting pre-construction mussel surveys at habitats disturbed by construction, prior to any sandbar disturbing activities and relocating any federally threatened inflated heelsplitter mussels found in those habitats; (2) removing the minimum amount of sandbar habitat during construction; (3) redistributing sandbar material dredged during tailrace construction to develop new sandbar habitat (sandbar development area); (4) developing additional sandbar habitat using appropriate excavation spoils from project construction; (5) dredging any portions of the sandbar development area that may spread out and fill the tailrace channel, impede navigation, or affect use of the Demopolis lock, and add appropriate dredged material back to the sandbar development area; (6) conducting post-construction mussel surveys annually for the first 3 years after tailrace construction; and (7) developing alternative mitigation measures if the measures described above are unable to maintain the sandbar development area, or if inflated heelsplitters do not use the new habitat.

Recreation and Land Use

- Improve an existing 1.2-mile-long access road to provide access to a new public parking area and angler access trail.

- Install a fishing platform on the south bank of the Tombigbee River based on observable, post-operational hydraulics to determine the best site location.

- Construct a new parking area on the north side of the Tombigbee River to provide access to a new 2,600-foot-long angler access trail.

- Construct a 2,600-foot-long angler access trail connecting the parking area to the north bank of the Tombigbee River for bank fishing access.

Aesthetics

- Design the powerhouse and retaining wall to be aesthetically compatible with the Corps' existing facilities.

2.2.7 Modifications to Applicant's Proposal – Mandatory Conditions

The following mandatory conditions have been provided and are evaluated as part of Birch Power's proposal.

2.2.7.1 Water Quality Certification Conditions

The Alabama DEM certification includes 8 conditions. Conditions 1 through 6 are environmental measures that are evaluated in the final EA. Conditions 7 and 8 are administrative or legal in nature and not environmental measures. Accordingly, we do not analyze conditions 7 and 8 in the final EA.

Condition 7 specifies that DO and temperature monitoring reports shall be submitted with appropriate certifications to Alabama DEM within 60 days following the end of the annual monitoring period. In addition to DO and temperature data, the monitoring reports shall specify whether turbines were in operation at the time of the Demopolis tailrace DO and temperature measurements, and provide the discharge rate of water flowing through each turbine at the time of each DO and temperature measurement. For the RM 206 monitoring location, the total river flow (turbine discharge plus flow over the spillway) shall be reported with each DO and temperature measurement. The annual reports shall also include an assessment of the effects of the operation of the Demopolis Lock and Dam Hydroelectric Project on the State of Alabama's water quality standards using the results of the monitoring as described in the previous paragraphs. If the monitoring results do not indicate substantial compliance with the State of Alabama water quality standards (maintenance of a DO concentration of 5.0 mg/L or greater) and/or other requirements as established in the 401 Certification, Birch Power Company shall develop and implement measures to ensure compliance with the DO criterion through structural and/or operational modifications at the project as prescribed in paragraph 2.[48] Annual monitoring reports shall be submitted in an electronic form compatible with the Microsoft Excel and Word software.

Condition 8 specifies that Birch Power shall coordinate with USGS and Alabama DEM to relocate the existing USGS flow/stage gauging station from Demopolis Dam to a location satisfactory to Alabama DEM and USGS. Birch Power shall fund the

[48] Paragraph 2 refers to condition 2 of the certification.

installation, operation and maintenance of the newly relocated gauge for the lifetime of the project.

Environmental measures included in Alabama DEM’s certification conditions 1 through 6 that are analyzed in this final EA are as follows.

- Condition 1 stipulates that the operation of the Demopolis Project, including the operation of the turbines, shall be managed such that no less than 5.0 mg/L of DO shall be maintained at all times in the discharge from the turbines and such that ambient DO shall not be less than 6.5 mg/L, as a daily average, at RM 206 due to the discharge from the turbines. Management required to maintain the 5.0 mg/L instantaneous DO criterion in the tailrace discharge from the turbines and the 6.5 mg/L daily average DO concentration at RM 206 shall be implemented.
- Condition 2 stipulates that Birch Power shall develop and implement measures to maintain the DO downstream of project discharges to comply with the limitations herein through structural and/or operational modifications at the project beginning with the initial turbine startup following completion of the powerhouse.
- Condition 3 stipulates that the tailrace monitor used to determine compliance with condition 1 above shall be placed in the tailrace of Demopolis Dam powerhouse near the north bank of the Tombigbee River at a location to be determined by Alabama DEM, in consultation with Birch Power, following completion of the new powerhouse and prior to initiation of power generation. The monitor in the Demopolis Dam tailrace shall record DO and temperature continuously at 15-minute intervals during periods of generation following one continuous hour of generation at all times from January 1 through December 31. The monitoring depth shall be at a depth of 5 feet below the water surface if total depth is 10 feet or greater, or at mid-depth if total depth is less than 10 feet.
- Condition 4 stipulates that the monitoring device at RM 206, used to determine compliance with condition 1 above, shall be placed at a location to be determined by Alabama DEM in consultation with Birch Power and the USGS. The monitor at RM 206 shall record DO and temperature continuously at 15-minute intervals at all times from January 1 through December 31. The monitoring depth shall be at a depth of 5 feet below the water surface if total depth is 10 feet or greater, or at mid-depth if total depth is less than 10 feet.
- Condition 5 stipulates that the monitoring program shall begin at the initiation of power generation and shall continue for the duration of the FERC license.
- Condition 6 stipulates that the monitoring equipment shall receive adequate and frequent maintenance and calibration to assure proper operation. The DO monitoring equipment will be calibrated at an acceptable frequency using the manufacturer's recommendations, the Winkler Method, Method 360.2 of Environmental Protection Agency's Methods for Chemical Analysis of Water and Wastes, latest edition, or other equivalent methods.

2.3 STAFF ALTERNATIVE

The staff alternative includes all but six of the measures proposed by Birch Power (described below), the environmental measures in Alabama DEM's water quality certificate, as proposed by Birch Power, and the following modifications of and additions to Birch Power's proposed measures:

- Modify Birch Power's proposed erosion control plan for project construction by adding: (1) draft an annual summary report until erosion control measures are removed and include details of land disturbance, success of erosion control measures, and the need for maintenance and/or monitoring of permanent erosion control measures; (2) provide a draft of each annual report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; and (3) file annual reports with the Commission, including agency comments and recommendations.
- Develop a riverbed scour and shoreline stability plan that includes provisions to: (1) document the existing bathymetric and topographic conditions in the Tombigbee River and along the shorelines immediately downstream of and adjacent to the project's tailrace; (2) monitor for any bed scour and shoreline instability in the Tombigbee River immediately downstream of and adjacent to the project's tailrace for 3 years after the commencement of operations; (3) draft annual monitoring reports during the 3-year monitoring period indicating whether or not any bed scour or shoreline instability was documented during the prior year along with proposals for any measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion, should they be needed based on monitoring results; (4) provide a draft of each annual monitoring report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; (5) file the annual reports with the Commission, including agency comments and recommendations; and (6) include any proposals for additional monitoring in the third annual report.

- Develop a plan to monitor and remedy project-caused aggradation in the Tombigbee River immediately downstream of and adjacent to the project's tailrace.

- Modify Birch Power's proposed spoils disposal plan such that all spoils, including sandbar material dredged during tailrace construction, not otherwise used for improving the access road and constructing the powerhouse parking area: (1) are transported to an offsite disposal area;

and (2) are tested for contaminants if the offsite disposal area would occur in, or discharge to waters of the U.S.

- Develop an operation compliance monitoring plan to document compliance with the operational requirements of any license issued for the project.

- Modify Birch Power's proposed oil and hazardous substances plan to include: (1) more detail of how hazardous substances would be transported, stored, handled and disposed of in a safe and environmentally protective manner; (2) procedures to be implemented in the event of a spill to ensure the proper containment and cleanup of any hazardous substances to minimize adverse effects on water quality and aquatic resources in the project area; (3) a provision to provide notification to the Commission, Corps, and Alabama DEM as soon as possible after discovering an accidental spill of hazardous substances; and (4) a provision to file a report with the Commission within 10 days of a hazardous substance spill.

- Develop a water quality and flow monitoring and management plan with provisions for: (1) monitoring DO and water temperature in the flow affected area from May through September for the first 3 years of operation to determine whether or not project operation causes the DO concentration to fall below 5.0 mg/L and water temperature to increase to above 90° F; (2) estimating flows in the flow affected area from May through September for the first 3 years of operation using inflow and operations data; (3) reporting water quality and estimated flow data; and (4) additional measures if the 3 years of monitoring show that project operation causes the DO concentration to fall below 5.0 mg/L and water temperature to increase to above 90° F.

- Modify Birch Power's proposal to include the installation of a trash rack with 2.5-inch clear bar spacing at the project intake, by instead using 5-inch clear bar spacing to reduce entrainment of large fish and avoid impingement of most fish.

- Develop a mussel relocation plan that includes the provisions in condition 2 of FWS's BO and a provision to conduct four post-construction mussel surveys in the flow affected area that begin 1 year post-construction, and then every 3 years thereafter.

- Modify Birch Power's proposed revegetation plan to include: (1) revegetation of all areas disturbed by project construction; (2) criteria for measuring the success of revegetation efforts; (3) reference lists of invasive species applicable to the project area (i.e., Sumter and Marengo

Counties); and (4) invasive species control techniques and BMPs to minimize effects on native plants and wood stork habitat.

- Restrict mowing, to the extent feasible, in the transmission line corridor to occur outside of the mid-spring to mid-fall timeframe when sensitive wildlife species are reproducing and rearing young.

- Develop an avian protection plan that includes site-specific measures and practices to reduce bird mortality (i.e., collision and/or electrocution) associated with the project transmission line and substation.

- Develop a species protection plan for the threatened wood stork and northern long-eared bat that: (1) limits tree removal[49] to November 1 through March 31, which is outside of the northern long-eared bat pup season (June 1 to July 31), and the broader active season (April 1 to October 31); (2) includes surveys for wood storks prior to construction; (3) adjusts to wood storks foraging in the project area by delaying construction and requiring that construction occur no closer than between 300 feet to 750 feet from wood storks; and (4) requires educational signage regarding the potential presence of federally protected wood storks in the project area.

- Develop a wetlands mitigation plan in consultation with the Corps and Alabama DCNR to mitigate project effects on wetlands and associated wildlife in the project boundary.

- Develop a recreation management plan (RMP) in consultation with the Corps and Alabama DCNR that includes the proposed recreation improvements, including the results of a completed feasibility assessment for a north bank recreational fishing facility, and the on-going management of the project recreation facilities.

- Develop a Historic Properties Management Plan (HPMP) in accordance with the programmatic agreement executed by the Commission and Alabama State Historic Preservation Officer (Alabama SHPO) on October 17, 2017, to address the management of historic properties and

[49] FWS defines tree removal as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats.

unevaluated cultural resources within the Demopolis Project's area of potential effects.

Staff does not recommend Birch Power's proposed measure to develop and implement a plan to install, operate, and maintain an oxygenation system designed to meet the DO standards required under Alabama DEM's certification condition 1. Staff does not recommend this measure because Alabama DEM's condition 2 to develop and implement measures to comply with the DO limitations in condition 1 through structural and/or operational modifications at the project, would provide greater flexibility in meeting the DO limits, and would be equally protective. Staff does not recommend Birch Power's proposed measure to monitor water quality, as part of the Water Quality Settlement, between Demopolis Lock and Dam and Coffeeville Lock and Dam, as required in WestRock's NPDES permit for the Demopolis Mill. Staff does not recommend this measure because the monitoring of the tailrace and downstream of the tailrace, as required in Alabama DEM's certification, would be adequate for determining whether Birch Power is maintaining DO concentrations at or above the required limits. Staff also does not recommend Birch Power's mussel relocation plan, because most of the provisions in Birch Power's plan are based on survey, relocation, or dredging actions related to relocating mussels to the sandbar development area, which would not adequately protect mussels from project construction and operation. Instead, staff recommends that Birch Power develop a new mussel relocation plan based on the provisions in condition 2 of FWS's BO (see section 1.3.3, *Endangered Species Act*). Staff also does not recommend Birch Power's proposed measure to install a fishing platform on the south bank of the Tombigbee River. Instead, staff recommends that Birch Power prepare a RMP with a measure for north bank recreation access designed to address the need for continued public access to the north bank of the Tombigbee River. In addition, staff does not recommend Birch Power's proposed measures to construct an angler access trail and an associated parking area to the north bank of the Tombigbee River for bank fishing access. Instead, staff recommends that Birch Power implement the RMP discussed above, which would include the results of a feasibility assessment for providing angler access on the north bank of the Tombigbee River.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

We did not identify any other reasonable alternatives to Birch Power's proposal.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area. Under each resource area, historic and existing conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed PM&E measures, and any potential cumulative effects of the proposed action and alternatives. Our conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative,* of this final EA.[50]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The proposed Demopolis Project would be located on the Tombigbee River, and would receive waters from both the upper Tombigbee River Subbasin and the Black Warrior River Basin. The Tombigbee River flows from the Fall Line Hills District[51] and into the Black Prairie Belt District[52] of the East Gulf Coastal Plain Physiographic Province[53] of Alabama and Mississippi. The Black Warrior River forms in the

[50] Unless otherwise indicated, our information is taken from the final license application for the project (Birch Power, 2013).

[51] The Fall Line Hills District is a curved area of low hills extending from Colbert and Franklin counties in northwest Alabama through parts of Chilton and Autauga counties in the central portion of the state to parts of Lee and Russell counties in the east (Shell, 2013).

[52] The Black Prairie Belt District covers an area of about 4,000 square miles and can be described as a narrow, elongate, generally flattened crescent-shaped, shallow trough, that lies across central Alabama from Pickens and Sumter counties in the west through Lowndes and Dallas counties in the central part of the state to Macon and Russell counties in the east (Shell, 2013).

[53] The East Gulf Coastal Plan is a gently dissected plain with nearly level to gently rolling valleys with some uplands with steep slopes and narrow valleys (Shell, 2013).

Cumberland Plateau Physiographic Province[54] above the Fall Line, and joins the Tombigbee River about 3.5 river miles upstream of the proposed Demopolis Project in the Alluvial-deltaic Plain of Alabama.

The drainage area of the basin above the Demopolis Lock and Dam is 15,300 square miles, of which 6,274 square miles is contributed by the Black Warrior River. The average annual flow at the project is 24,215 cfs (for the years 1984 to 2016). The temperate to subtropical climate in the East Gulf Coastal Plain has an average annual temperature that ranges between 52 degrees Fahrenheit (°F) to 75°F.

The Tombigbee River Basin is predominantly forested (about 62 percent) or used for agricultural purposes (about 22 percent). The remaining land is characterized as wetlands (about 11 percent), clearcut/barren (about 3 percent), urban/suburban (about 1 percent), and open water/lakes (about 1 percent). Most agricultural lands are in the Upper Tombigbee River Basin, and primarily consist of soybean, corn, hay, and cotton, as well as livestock (hogs, cattle, and poultry).

Forestry (for lumber, pulp, poles, and pilings), agriculture (for crops discussed above), and aquaculture (for catfish) are the primary industries in the Tombigbee River Basin. Forestry and agriculture are the dominant industries in Marengo and Sumter counties, where the proposed project is located.

The major consumptive water use for the Tombigbee River is for industrial and commercial activities. Public water supply is a secondary consumptive use of the river.

The primary non-consumptive uses of the Tombigbee River include navigation and recreation. Sixteen navigation locks and dams owned and operated by the Corps, including Demopolis, are located in the Tombigbee River Basin (figure 2-1). Fourteen of the locks and dams are located upstream of the Demopolis Project; four of the fourteen are on the Black Warrior River and ten of the fourteen are part of the Tennessee-Tombigbee Waterway (figure 2-1).[55] Coffeeville is the only lock and dam located

[54] The Cumberland Plateau can generally be described as a series of submaturely to maturely dissected sandstone and shale plateaus of moderate relief. This area is divided into three distinct regions: a region of high relief in the northeastern portion; a region of somewhat less relief in the southeastern portion; and the western half of the district that includes the Warrior Basin (Shell, 2013).

[55] The Tennessee-Tombigbee Waterway is a 234 mile navigation system constructed by the Corps, which begins at Pickwick Lake on the Tennessee River, flows through northeast Mississippi and western Alabama, and finally connects with the Warrior-Tombigbee navigation system at Demopolis, Alabama.

downstream of the Demopolis Project. Other non-consumptive uses include recreational activities, such as boating and fishing.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

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

Based on our review of the license application and agency and public comments, we identified aquatic resources (water quality) as having the potential to be cumulatively affected by the proposed project, in combination with other past, present, and foreseeable future activities. Water quality was selected because construction and operation of the project may affect water quality, especially DO concentrations, within and downstream of the project area. Other activities, in combination with the proposed action, such as additional hydropower development, water withdrawals, wastewater discharges, and existing management of flows and water levels, may collectively affect aquatic resources in the Tombigbee River and adjacent waterways.

3.2.1 Geographic Scope

Our geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of the proposed action's effect on the resources, and contributing effects from other hydropower and non-hydropower activities within the Tombigbee River Basin and Black Warrior River Basin.

We have identified the geographic scope of analysis for water quality as the head waters of the Tombigbee River and Black Warrior River to the confluence of the Tombigbee River and Alabama River. The Demopolis Lock and Dam is one of 17 dams in the Tombigbee and Black Warrior River Basin. The Black Warrior River Basin has five dams, four of which are Corps dams (four Corps dams shown in figure 2-1). Beginning from the headwaters of the Black Warrior River, the dams are Alabama Power's Lewis Smith dam at RM 444 (which includes the first development of the Warrior River Project [FERC No. 2165]); the Corps' Bankhead Lock and Dam at RM 365.5 (which includes the second development of the Warrior River Project); the Corps' Holt Lock and Dam at RM 347 (which includes Alabama Power's Holt Project [FERC No. 2203]); the Corps' Oliver Lock and Dam at RM 338.1; and the Corps' Selden Lock and Dam at RM 261.2. The Corps operates the remaining 12 dams in the Tombigbee River Basin (figure 2-1). Our preliminary analysis indicates that these dams have resulted in the conversion of a substantial amount of lotic (river-type) habitats to lentic (lake-type) habitats, which may have led to higher summer water temperatures and lower DO levels. We chose this geographic scope because the proposed Demopolis Lock and Dam Project, in combination with other developmental and non-developmental uses of the Tombigbee River and Black Warrior River, would contribute to a cumulative effect on water quality.

3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis in the final EA will include a discussion of past, present, and reasonably foreseeable future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of an original license issued at a federal dam, the temporal scope will look 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource. The quality and quantity of information, however, diminishes as we analyze resources further away in time from the present.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effect of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this final EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geology and Soil Resources

3.3.1.1 Affected Environment

Geology

The Demopolis Project would be located within the East Gulf Coastal Plain Physiographic Province, which encompasses most of Alabama, and stretches west into Mississippi and northeast into Georgia. This province is flat and relatively featureless in some areas, but elsewhere consists of rounded and eroded hills, topographic features known as cuestas[56] and flatwoods,[57] and the floodplains of large rivers, including the Tombigbee, Alabama, and Black Warrior Rivers.

Demopolis Lake stretches across two physiographic districts within the East Gulf Coastal Plain Physiographic Province, which include the Fall Line Hills District to the north and the Black Prairie District to the south, where the proposed project would be constructed. The boundary of the Fall Line Hills District corresponds to the southernmost extent of the Appalachian uplift of the eastern United States, and is characterized by rounded hills cut by valleys with local relief of between 200 and 250 feet. The Black Prairie District is characterized by low and rolling topography, underlain by chalk rocks, and covered in thick black top soil and vegetation typical of a prairie ecosystem. Elevations in the Black Prairie District range from 250 feet at the Fall Line Hills boundary to more than 400 feet at the southern end of the district.

The floodplain of the Tombigbee and Black Warrior Rivers generally consists of Quaternary sand and gravel terrace deposits. The proposed project would be in an outcrop belt of upper Cretaceous age Demopolis chalk (Selma group[58]). The Demopolis chalk is a massive, soft argillaceous limestone[59] that is relatively uniform both horizontally and vertically. The chalk is brittle and overlain by various combinations of clay and chalk (Szabo et al., 1988). Holocene sand and clay alluvium blanket the chalk bedrock to depths of about 15 to 25 feet. At the project, most of the alluvial material has been eroded immediately downstream of the dam. Downstream of the overbank section of the dam, the chalk forms a chalk shelf that is exposed during low flow conditions (see figure 3-1).

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[56] A cuesta is a term used to describe a hill or ridge with a gentle slope on one side, and a steep slope on the other.

[57] A flatwood is a woodland (often pine) in a low-lying region having little drainage.

[58] Geologists divide sedimentary rocks into manageable units. The main unit is a formation. A series of formations can be classified to define a group. The Selma group includes the Demopolis Chalk Formation, as well as the Mooreville Chalk Formation, the Ripley Chalk Formation, and the Prairie Bluff Chalk Formation.

[59] Argillaceous limestones consist predominantly of calcium carbonate, but also include clay minerals.

Soils

The predominant soil type at the proposed project location is the Alamuchee-Mooreville complex. Alamuchee-Mooreville soils are deep, well-drained soils with moderate permeability. This soil type is unsuitable for agriculture and commercial forestry because of frequent flooding, but is suitable for woodland and wildlife habitat (NRCS, 2008). Other soil types on the north bank of the Tombigbee River that might be encountered during construction of the access road include the Annemaine sandy loam and the Cahaba fine sandy loam. Annemaine and Cahaba soils are found on terraces slightly elevated above the floodplain. These soil types are less flood prone than Alamuchee-Mooreville soils and more suitable for agriculture, especially hay production and pasture land (NRCS, 2008). The Alamuchee-Mooreville, Annemaine, and Cahaba soil types are all unsuitable for residential and industrial use because of flooding risk (NRCS, 2008).

3.3.1.2 Environmental Effects

Construction Effects on Geology and Soils

Construction activities at the proposed project would generally consist of constructing an intake channel, powerhouse, tailrace channel, access road/parking lot, and transmission line. Construction of the project would require excavation and disturbance of instream sediment and upland soils and would likely cause localized soil erosion, sedimentation, and streambed material transport. Sediment from the river bottom and upland construction sites could adversely affect water quality, resident aquatic species, and instream habitats and these effects are discussed below in section 3.3.2.2, *Construction Effects on Water Quality* and section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*.

To reduce potential erosion and sedimentation impacts, Birch Power proposes to develop and implement an erosion control plan[60] that includes measures to: (1) construct a temporary earth cofferdam adjacent to the north end of the existing Demopolis Dam for construction of the powerhouse; (2) construct a temporary earth cofferdam at the end of the proposed tailrace; (3) construct and remove cofferdams during the dry season when flows are low; (4) use Demopolis chalk as the main component of the earthen cofferdams; (5) filter any water pumped from the excavation sites before discharging to the river; (6) construct a silt fence along the banks of the river that lie below ground disturbing activities or temporary spoils areas and on the downslope end of the main staging area at any location where ground disturbance or temporary vegetation loss could

[60] Because Birch Power's final project design is not complete, the proposed erosion control plan is preliminary (Birch Power, 2013).

occur; (7) construct a concrete washout station to contain washout from concrete truck clean-up; and (8) install one turbidity meter upstream of the Demopolis Dam to record background turbidity and one downstream of the dam to assess potential impacts from project construction.

In the spoils disposal plan, Birch Power proposes to retain all excavation spoils on site to improve the access road and develop the powerhouse parking area using 35,000 cubic yards and 50,000 cubic yards of Demopolis chalk rock spoils, respectively. Birch Power also proposes to dispose of 571,000 cubic yards of excavated rock, soil, and alluvium spoils immediately downstream of the dam on the north side of the river channel, and adjacent to the proposed tailrace channel (figures 3-6 and 3-7). To minimize the potential negative effects of disposing spoils on site, Birch Power proposes to stabilize the spoils area by constructing a retaining wall along the north side of the tailrace channel, and vegetating the top of the spoils area with native, wetland, vegetation.

In the draft EA, we recommended that 571,000 cubic yards of spoils that Birch Power proposed to dispose of immediately downstream of the dam, instead be placed at an offsite disposal facility. EPA recommends that spoils be evaluated for the potential to contain contaminants in accordance with 40 C.F.R. 230.60 and 230.61, if any dredged material would be placed in waters of the U.S. or sent to a confined disposal facility that discharges to waters of the U.S.

Birch Power also proposes, as part of the revegetation plan (discussed fully in section 3.3.3.2, *Project Effects on Botanical Resources*), to re-vegetate other disturbed areas at the end of construction.

Condition 1 of FWS's BO[61] would require Birch Power to conduct construction/dredge activities as proposed and implement BMPs during all proposed construction/dredge activities. The BO would also require Birch Power to hold annual

[61] Condition 1 of FWS's BO would also require Birch Power to provide for review and approval, the erosion control plan, spoil disposal plan, revegetation plan, recreation management plan, riverbed and scour stability plan, oil and hazardous substances plan, water quality monitoring and management plan, and a plan to monitor and remedy project caused aggradation in the project area, a minimum of 60 days prior to construction activities. This provision of FWS's condition 1 is administrative in nature and not an environmental measure. Accordingly, we do not analyze this provision in the final EA, but we do provide comments on the provision in Appendix A.

coordination meetings for the first 5 years after construction is complete to review the effectiveness of the erosion control plan.[62]

Our Analysis

The volume of material that would be excavated during construction of the intake channel and structure, powerhouse, and tailrace channel would be 240,000, 46,000, and 370,000 cubic yards, respectively. Excavation of the riverbed, disturbance to shorelines, and installation/removal of cofferdams would likely cause erosion, resulting in a temporary increase in suspended sediment and turbidity in the Tombigbee River. High-flow events during construction could result in additional scour and suspended sediment in and downstream of the construction area. In addition, construction of the parking area, access road, and transmission line would disturb upland areas and potentially lead to erosion and additional sediment inputs to the river. Potential effects of suspended sediment and turbidity on aquatic resources and measures to address the prevention and cleanup of spills of hazardous substances are also discussed in section 3.3.2.2, *Construction Effects on Water Quality*.

Use of BMPs, such as the installation of cofferdams and silt fencing, as proposed by Birch Power and required in condition 1 of FWS's BO, would greatly reduce turbidity and sediment transport caused by in-river excavation activities. These structures would isolate the construction area from the river and minimize sediment and turbidity impacts throughout the construction phase. Further, re-vegetating all disturbed areas at the end of construction, as proposed by Birch Power, would reduce erosion and sedimentation.

In upland and wetland areas, Birch Power's proposed project design incorporates the use of existing access roads and transmission line corridors to the extent possible. However, land-clearing and disturbance of upland and wetland soils would occur during construction of the powerhouse facilities, parking area, access road, and transmission line corridor. Developing and implementing an erosion control plan with Birch Power's proposed provisions would minimize erosion and sedimentation during in-water and upland construction activities. Nevertheless, it would be beneficial to include additional measures in the erosion control plan to help verify and document that the proposed provisions are helping to minimize erosion and sedimentation. Specifically, Birch Power could establish a record of land disturbance events, and a record of the installation, maintenance, and removal of any erosion control measures. Birch Power could also file a summary report detailing land disturbance events, the success of erosion control

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[62] In the BO, FWS requires that the post-construction meetings occur for 5 years. We assume the requirement is for the meetings to occur during the first 5 years post-construction.

measures, and the need for maintenance and/or monitoring of permanent erosion control measures.

FWS's BO requires Birch Power to hold annual coordination meetings for the first 5 years after construction is complete to review the effectiveness of the erosion control plan and to determine if changes are necessary. Meeting annually would provide no specific and direct benefit to resources affected by erosion. However, Birch Power could document the ability of the of the erosion control plan to protect potentially affected resources by drafting annual reports, providing the draft reports to the resource agencies for review, comments, and recommendations, and filing the final reports with any agency comments and recommendations.

Developing and implementing a revegetation plan with Birch Power's proposed provisions would also minimize erosion and sedimentation caused by upland construction activities. An analysis of Birch Power's proposed revegetation plan is located in section 3.3.3.2, *Project Effects on Botanical Resources*.

The use of excavation spoils on site to improve the access road and develop the parking area, would disturb upland areas and potentially lead to erosion and additional sediment inputs to the river over time. Birch Power proposes to use Demopolis chalk rock spoils to improve the access road and develop the parking area. Demopolis chalk is considered a brittle chalk, and thus there is the potential for erosion of these spoils after they are in place. Erosion could lead to sedimentation of surrounding terrestrial and aquatic habitats, including the Tombigbee River. However, in the erosion control plan, Birch Power proposes to use silt fencing at locations where ground disturbance or temporary vegetation loss occurs (such as the access road and parking area), as well as along the banks of the Tombigbee River that lie below ground disturbing activities. Thus, erosion and sedimentation associated with the use of Demopolis chalk rock spoils to improve the access road and develop the parking area would likely be minimal.

In the draft EA, we recommended that the 571,000 cubic yards of spoils not used to improve the access road and develop the parking area be placed at an offsite disposal facility, as opposed to Birch Power's proposal to place the spoils immediately downstream of the project. EPA recommends that spoils be evaluated for the potential to contain contaminants, if any dredged material would be placed in waters of the U.S. or sent to a confined disposal facility that discharges to waters of the U.S. Project spoils could contain contaminated sediments, which have the potential to negatively affect aquatic resources, if they are not disposed of properly. Birch Power could minimize the possible negative of effects of offsite spoils disposal, by testing the spoils for contaminants, if the offsite disposal would occur in, or discharge to waters of the U.S.

Operational Effects on Geology and Soils

Operational Effects on Riverbed Scour, Shoreline Erosion, and Aggradation Patterns

Under existing conditions, inflow to the Corps' facility is released over the dam or through the lock. Flows over the dam are uncontrolled. Under the proposed project operation, water would be diverted through the powerhouse located downstream of the dam at the end opposite the existing lock.[63] This proposed operation would modify discharge patterns and hydrodynamics of the Tombigbee River upstream and downstream of the dam. Operation of the proposed project could cause scour in the streambed immediately upstream of the intake and downstream from the proposed tailrace, change existing sediment patterns by redistributing lateral water velocities both upstream and downstream of the dam, and redistribute streambed materials to new locations. Birch Power does not propose any measures to monitor the project for scour and aggradation after operation begins. However, in the draft EA, we recommended that Birch Power develop a riverbed scour and shoreline stability plan that describes how the licensee would identify bathymetric and topographic conditions, report any bed scour and shoreline instability, and, if needed, identify measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion. Condition 1 of FWS's BO would require Birch Power to hold annual coordination meetings for the first 5 years after construction is complete to review the effectiveness of the riverbed scour and shoreline stability plan to assess if changes are necessary.

Our Analysis

Under existing conditions, most scouring of the riverbed likely occurs immediately downstream of the dam in the main river channel and on the chalk shelf (figure 3-1). Most alluvial material has been scoured from the chalk shelf portion of the project area, but is still present on the north bank of the Tombigbee River above the high water mark (figure 3-1; Birch Power, 2013). The current sandbar distribution downstream of the dam suggests that existing flow patterns carry sand across the chalk shelf and deposit it in the river channel at the base of the shelf as water energy dissipates (figure 3-1; Birch Power, 2013). Energy from flow also appears to dissipate along the exterior wall of the lock entrance, where another sandbar is located.

[63] A detailed description of the project's proposed operation is provided in section 2.2.5, *Proposed Project Operation*.

During proposed operation, the greatest change in scour patterns, relative to existing conditions, would likely occur when most or all river flow is discharged through the powerhouse (i.e., 5,000 cfs to 40,000 cfs).[64] At flows between 5,000 cfs and 20,000 cfs (flows that occur about 36 percent of the time; figure 3-22), all flow would pass through the powerhouse and tailrace, and new riverbed scouring would likely occur in the flow path outside the mouth of the tailrace (figure 3-2). The scouring effects at this location have the potential to extend from the mouth of the tailrace to the opposite shore on south bank of the Tombigbee River, with maximum scour occurring at 20,000 cfs (figure 3-2).

As inflows increase above 20,000 cfs to 40,000 cfs (flows occur about 17.4 percent of the time; figure 3-22), water would be spilling over the dam, across the chalk shelf and through the main channel of the proposed flow affected area, but flow through the tailrace would remain dominant (figure 3-3). Under these conditions, scouring from flow exiting the mouth of the tailrace would still occur. In addition, because flows spilling into the flow affected area would be lower than under existing conditions, there is the potential for increased aggradation of sediments in the flow affected area. Aggradation would likely occur at the base of the chalk shelf and on the north side of the lock entrance, as occurs under existing conditions because of flow dissipation at these locations (figure 3-3). However, new aggradation may also develop where flows exiting the tailrace and flows passing through the flow affected area converge. At this convergence, energy from the lower discharge water passing through the flow affected area could dissipate further as it meets the higher volume of water exiting the tailrace (figure 3-3).

As flows increase above 40,000 cfs to 110,000 cfs (flows occur about 15.6 percent of the time; figure 3-22), flows passing over the dam, across the chalk shelf, and through the flow affected area would become the dominant flows (figure 3-4). At these flows, scour and aggradation patterns downstream of the dam should be similar to existing conditions. However, at these flows, there is the potential for energy in the high flowing water to dissipate as it meets the lower flowing water passing through the excavated tailrace channel. Flow dissipation at the tailrace channel could result in sediment aggradation and filling of the tailrace channel, which could affect project operation (figure 3-4).

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[64] During operation, when flows exceed 40,000 cfs, 20,000 cfs would pass through the powerhouse and greater than 20,000 cfs would spill over the dam. When flows are less than 40,000 cfs, 20,000 cfs would pass through the powerhouse and less than 20,000 cfs would spill over the dam.

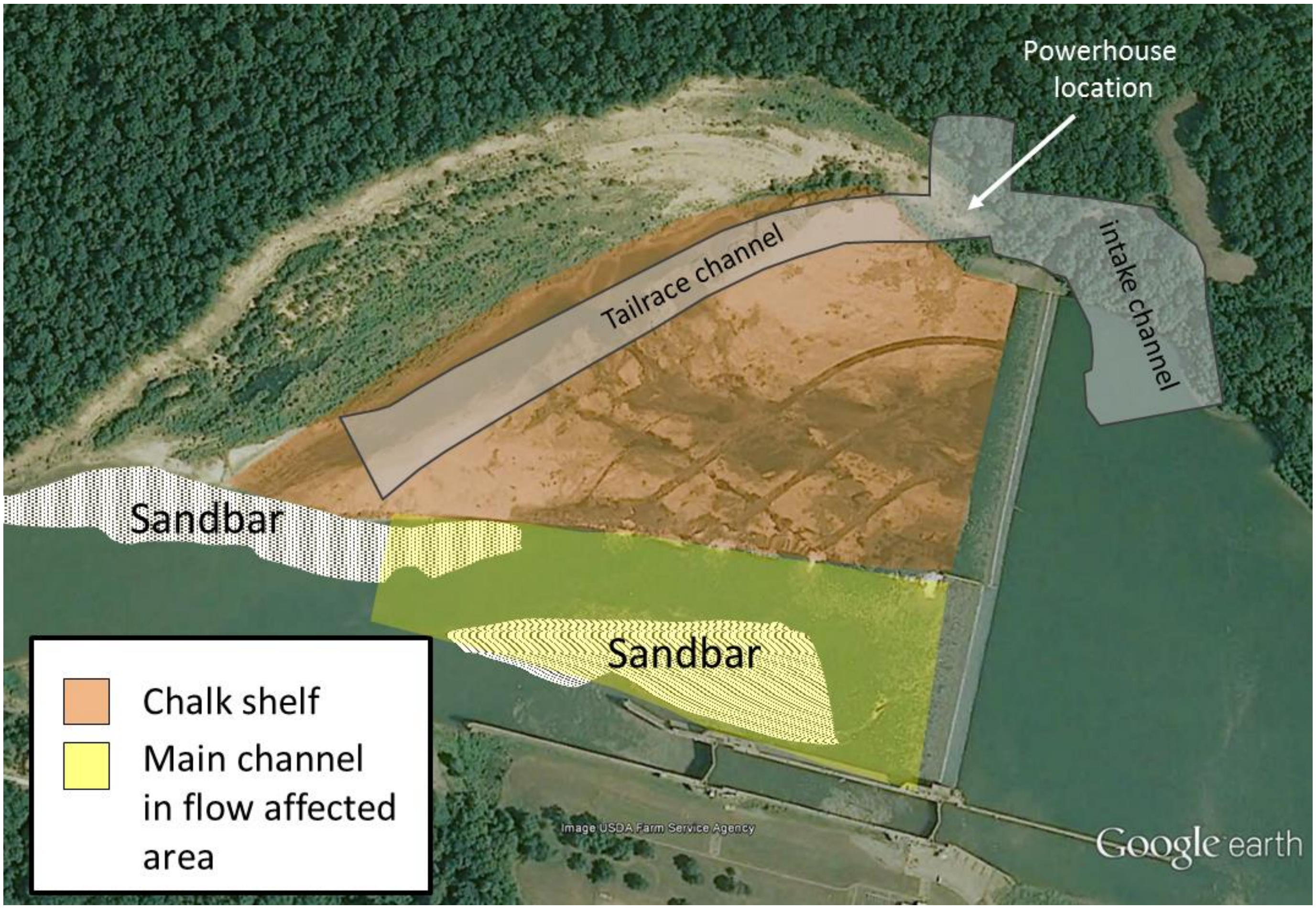

Figure 3-1. Riverbed characteristics downstream of Demopolis Lock and Dam (Source: Google Earth, 2014; as modified by staff).

The scour area that would potentially develop outside the mouth of the tailrace (as discussed above) might also become an area of aggradation, when inflows are between 40,000 cfs and 110,000 cfs. At these inflows, energy from the higher flowing water passing through the flow affected area could dissipate as it passes over the scoured riverbed located outside the mouth of the tailrace. If energy dissipation occurs, the scoured area shown in figure 3-2, could become an area of aggradation at flows between 40,000 cfs and 110,000 cfs, and this area could refill with sediment (figure 3-4).

Sediment aggradation also has the potential to occur in the tailrace channel and the scour area outside the mouth of the tailrace when the project is not operating at flows greater than 110,000 cfs. At flows greater than 110,000 cfs, all flows would pass over the chalk shelf and through the main channel in the flow affected area. Energy from these flows could dissipate as flows pass over the tailrace channel and the scour area outside of the mouth of the tailrace channel, causing sediment aggradation at these locations (figure 3-5).

Sediments scoured in the immediate vicinity of the project intake and tailrace, as well as in the main channel during a peak flow event, are not expected to be transported for long distances in the river considering that most of the alluvial material (which is still present above the high water mark) has been previously eroded from the river channel and overbank shelf portion of the project area, and is underlain by the Demopolis chalk bedrock, as described in section 3.3.1.1, *Affected Environment, Geology*. However, changes to the existing scour and aggradation patterns associated with operation of the project have the potential to be problematic for existing freshwater mussel populations (see section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*). In addition, flows exiting the tailrace could cause extensive scouring of the riverbed when inflows are less than 20,000 cfs. The effects of the tailrace discharge could reach the south bank of the Tombigbee River and cause erosion of the shoreline, and potentially disrupt navigation traffic. Given the uncertainty regarding the hydrodynamics that would occur at the project after construction, there is a need to determine how existing conditions along the riverbed would change immediately downstream of the dam and adjacent to the mouth of the proposed tailrace. Evaluating existing conditions and monitoring changes in scour, shoreline stability, and aggradation would help determine whether changes cause problems, and thus, whether there is a need to implement measures to minimize project effects. The need to implement measures to minimize scour and shoreline erosion would be best determined in consultation with the resource agencies, and with final approval from the Commission. FWS's requirement to conduct annual technical meetings during the first 5 years after construction is complete would provide no specific and direct benefit to resources affected by scour and shoreline erosion. However, Birch Power could document the ability of the of the riverbed scour and shoreline stability plan to protect potentially affected resources by drafting annual reports, providing the draft reports to the resource agencies for review, comments, and recommendations, and filing the final reports with any agency comments and recommendations.

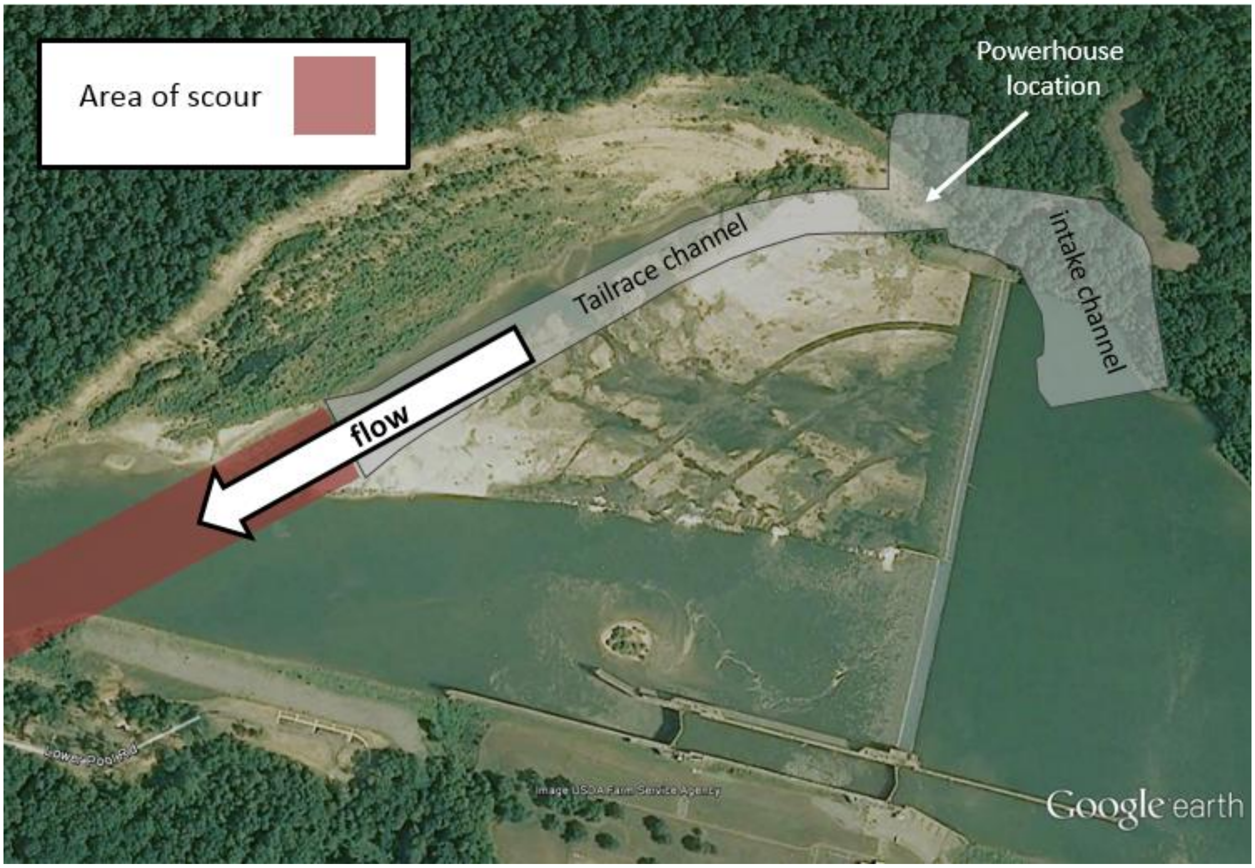

Figure 3-2. Downstream flows at the project during operation when inflows are 5,000 cfs to 20,000 cfs (Source: Google Earth, 2014, as modified by staff).

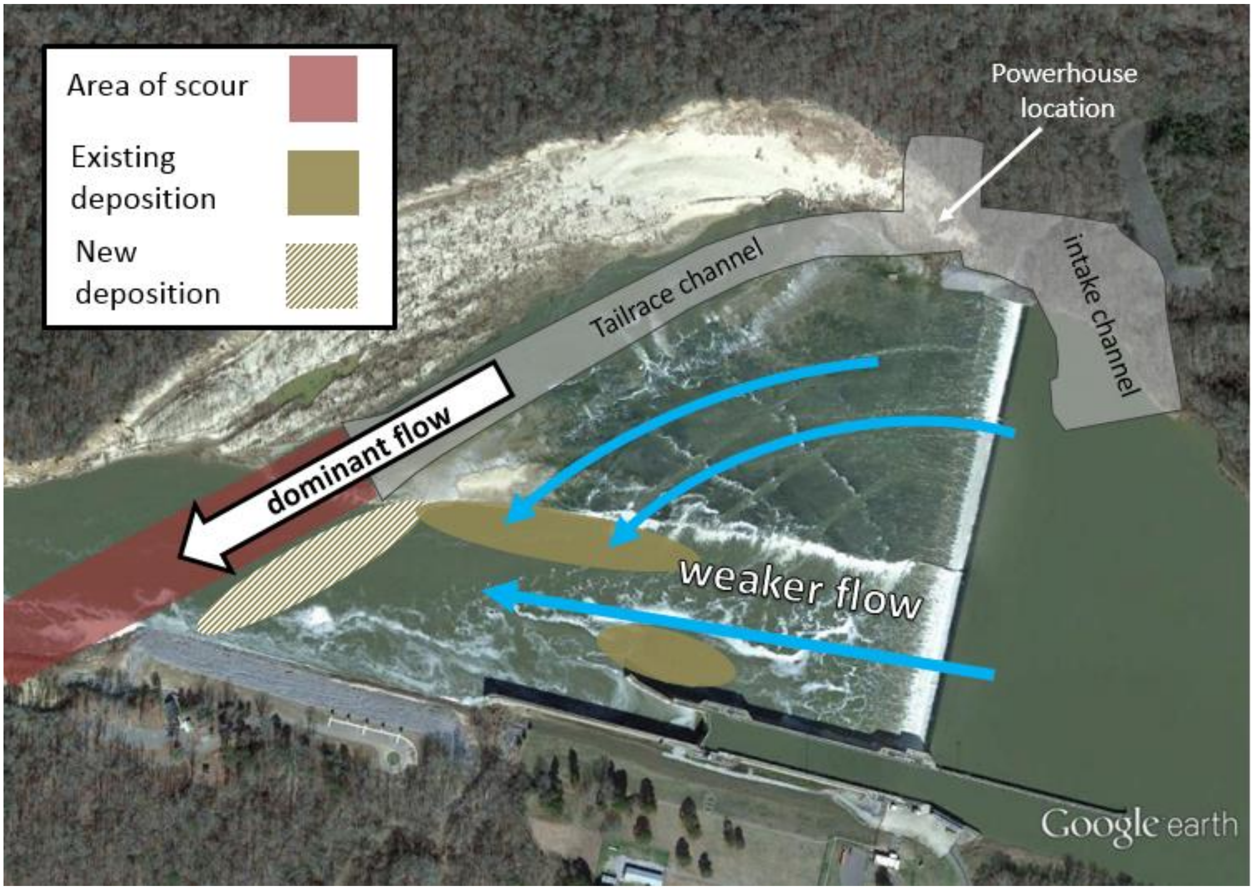

Figure 3-3. Downstream flows at the project during operation when inflows are 20,000 cfs to 40,000 cfs (Source: Google Earth, 2014, as modified by staff).

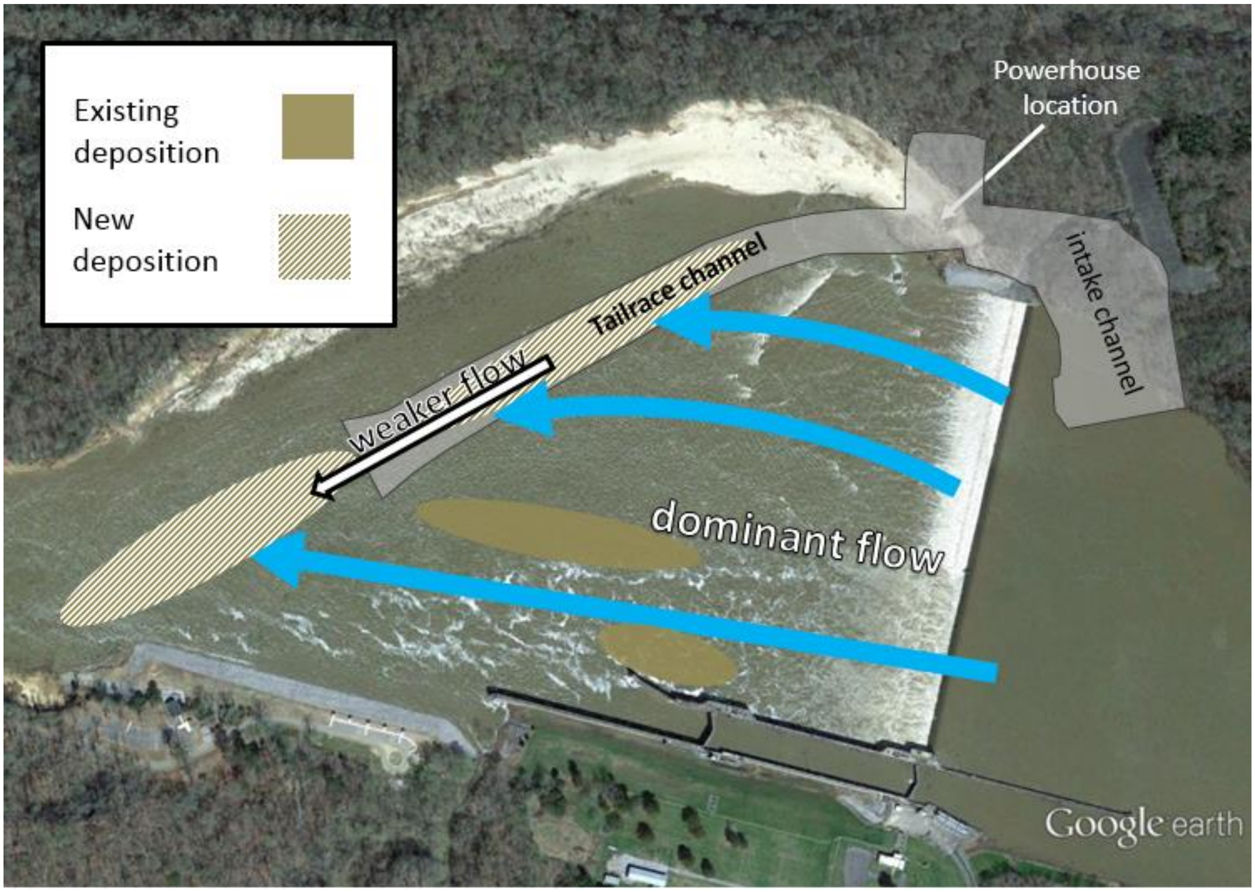

Figure 3-4. Downstream flows at the project during operation when inflows are 40,000 cfs to 110,000 cfs (Source: Google Earth, 2014, as modified by staff).

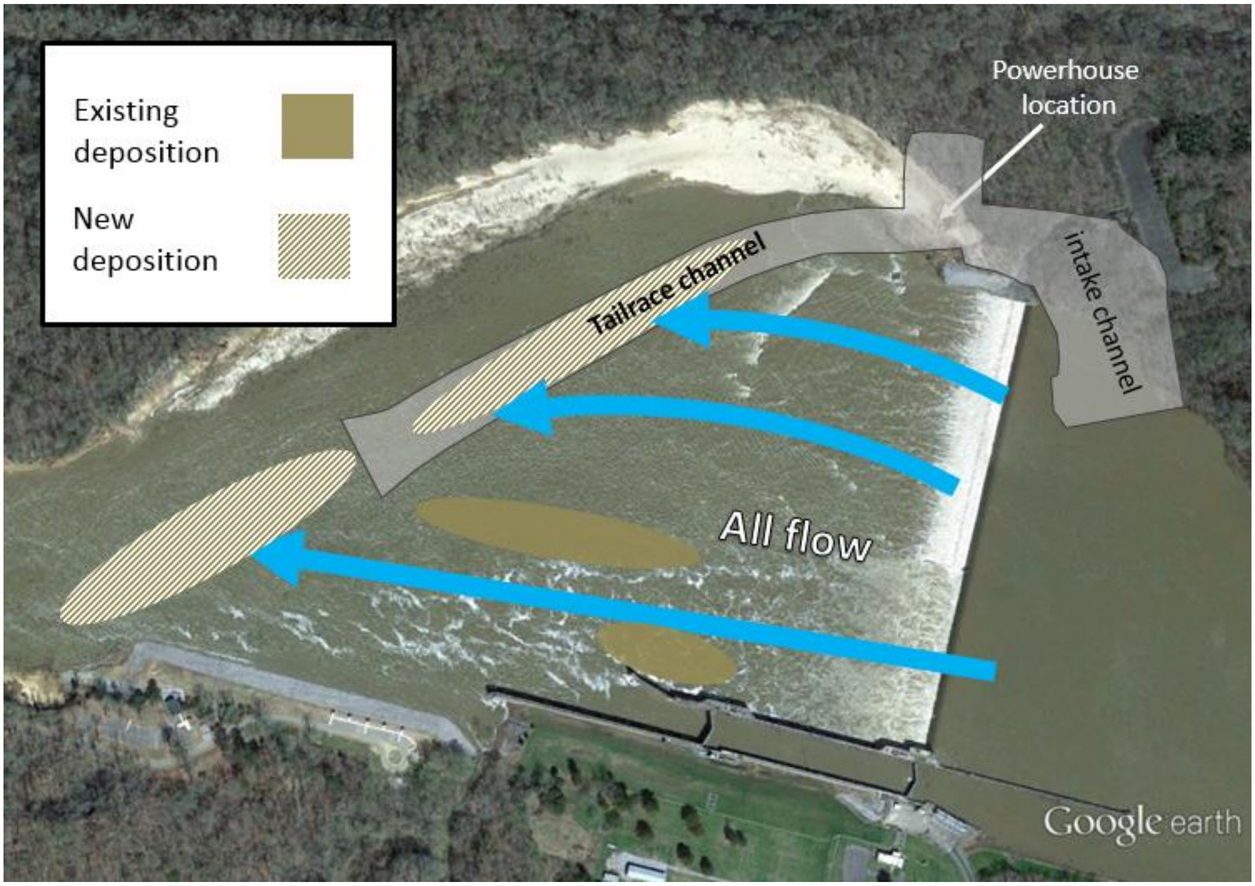

Figure 3-5. Downstream flows at the project after construction when the project is shutdown at flows greater than 110,000 cfs (Source: Google Earth, 2014, as modified by staff).

Effects of On-Site Spoils Disposal

Birch Power proposes, in the spoils disposal plan, to dispose of 571,000 cubic yards of excavated Demopolis chalk (rock), topsoil,[65] and alluvium[66] spoils immediately downstream of the dam on the north side of the river channel, and adjacent to the proposed tailrace channel (figures 3-6 and 3-7). The placement of spoils within the river channel has the potential to increase sedimentation and turbidity of adjacent aquatic

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[65] Topsoil is the uppermost layer of a soil layer, which usually has high concentrations of organic material.

[66] Alluvium is a general term for clay, silt, sand or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water.

habitats. To minimize the potential negative effects of disposing spoils on site and within the river channel, Birch Power proposes, in the spoils disposal plan, to stabilize the spoils area by constructing a retaining wall along the north side of the tailrace channel, and vegetating the top of the spoils area with native, wetland vegetation.

Our Analysis

Project spoils, consisting almost entirely of Demopolis chalk, would be compacted into a low to moderate permeability mass and hauled to the spoils disposal site along the north side of the tailrace channel.[67] A 1,700-foot-long retaining wall would be constructed in stages, to dispose of, and stabilize the spoils as they accumulate during project excavations. Any silt, alluvium, or topsoil encountered during excavations would be used to provide a 2 to 3 feet deep soil cap over the spoils disposal area and would serve as substrate for vegetation in a proposed wetland development (see section 3.3.3.2, *Project Effects on Wetlands and Riparian Habitat*, for additional discussion).

The construction of a retaining wall along the north side of the tailrace channel and revegetation of the top of the spoils, as proposed by Birch Power, would help to stabilize the spoils disposal site, and minimize erosion and sedimentation into the tailrace and downstream reaches. However, based on the current retaining wall design and spoils disposal area configuration, there is still the potential for erosion and sedimentation to occur during operation.

Erodibility can be viewed as the susceptibility of an earth material to erosion. The headcut erodibility index is one method of measuring the resistance of an earth material to erosion, and can be evaluated for soils and rock (NRCS, 2001). As indicated above, the spoils placed behind the retaining wall would be composed primarily of Demopolis chalk, which as described in section 3.3.1.1, *Affected Environment, Geology*, is a soft argillaceous limestone, composed predominantly of calcium carbonate, but also includes clay minerals. Based on the headcut erodibility index, soft argillaceous limestone, which is a soft rock (USGS, 1917), would be more resistant to erosion than soils composed of clay, sand, or silt, but would be less resistant to erosion than hard rock material, like granite (table 3-1). However, accurately indexing the erodibility of the Demopolis chalk would depend on measurements of material strength, block or particle size, discontinuity or inter-particle bond shear strength number (i.e., how well particles are bound together), and relative ground structure (i.e., how easy it is to break pieces of the material apart) (NRCS, 2001). Further, the actual rate of chalk erosion will depend on the flows occurring at the spoils pile. Thus, although it is evident that Demopolis chalk would be

[67] In a letter filed on March 7, 2017, Birch Power indicated that they expected that the Selma chalk would break-up readily during excavation and would compact into a low to moderate permeability mass using standard compaction equipment.

more erosion resistant than soils, and likely less erosion resistant than hard rock, there is insufficient information for us to determine the actual amount of Demopolis chalk erosion that would occur during project operation. Consequently, if Birch Power's spoils disposal plan were to be implemented, it would be important to adequately assess the erodibility of the Demopolis chalk, and use appropriate management practices to ensure that the Demopolis chalk erosion and sedimentation into the river is minimized during operation.

As indicated above, the soil cap placed on top of the Demopolis chalk spoils would likely be composed of clay, sand, silt, and organic material. The relative erodibility of different types of soils is most often quantified using the soil erodibility factor (K), and K is generally known for a wide range of soil compositions (Rosewell and Loch, 2002).[68] Soils that are high in clay tend to have low K values (0.05 to 0.15), because they are resistant to detachment (IWR, 2002). Sandy soils have low K values (0.05 to 0.2), because of low runoff potential (i.e., because of higher infiltration capacity), even though these soils easily detach (IWR, 2002). Silt loam soils have moderate K values (0.25 to 0.4), because they are moderately susceptible to detachment and have moderate runoff potential (IWR, 2002). Soils with a high silt composition are the most erodible of soils (K values greater than 0.4), because they easily detach and tend to crust over and produce high rates of runoff (IWR, 2002). Any addition of organic material to a soil would reduce the susceptibility of the soil to detachment, and increase infiltration, which would reduce runoff and erosion (IWR, 2002). In addition, the growth of vegetation on top of the soil would reduce the potential for erosion. Thus, the composition of the soil cap and the addition of vegetation could influence the susceptibility of the soil cap/wetland to erosion.

The soil cap/wetland would be susceptible to erosion when water begins overtopping the retaining wall, which would occur when flows exceed about 130,000 cfs

Table 3-1. Headcut erodibility for soils and rock (Source: NRCS, 2001).

Material description	Headcut erodibility index range
Noncohesive soils (e.g., loose sand and gravel)	0.01 - 0.1

[68] Headcut erodibility could also be calculated for different types of soils using field data, but the headcut erodibility for soils of various composition is not available in the literature. Thus, for the purposes of our analysis, we refer to the soil erodibility factor to compare the relative erodibility of different soils.

Material description	Headcut erodibility index range
Cohesive soils (e.g., silt and clay)	0.05 - 0.20
Weathered bedrock	0.2 - 2
Soft rock (e.g., argillaceous limestone)	2 - 5
Hard rock (e.g., granite)	greater than 5

(figures 3-6 and 3-7). Although flows exceeded 130,000 cfs only about 2 percent of the time during the period from 1985 to 2016, there were 47 days when flows reached 130,000 cfs during the most recent 10-year period of record from 2007 to 2016, and these events occurred in 7 out of the 10 years.

Flow (or discharge) relates to erosion through the water velocity component of the equation used to calculate flow at a specific location.[69] Erosion will occur when water velocities exceed specific values. For soils with erodibility factors less than 0.35 on channel slopes that are less than 5 percent, the threshold above which erosion will occur ranges between water velocities of 2.5 fps to 5 fps, depending on the type of vegetative cover (Schwab et al., 1992). The slope on top of the spoils pile is estimated to be about 0.4 percent.[70] Thus, under the assumption that the soil cap on top of the spoils would be composed mostly of sand, clay, and organic matter, the erodibility factor would be less than 0.35, and the threshold for erosion of the soil cap/wetland could range between water velocities of 2.5 fps and 5 fps. However, if the soil cap is composed mostly of silt, which is highly erodible, the threshold for erosion would be between water velocities of 1.88 fps and 3.75 fps (Schwab et al., 1992).

The water velocities that could occur on top of the spoils when flows exceed 130,000 cfs are not known. Therefore there is insufficient information for us to estimate the actual amount of soil cap erosion that would occur during project operation. Given the frequency and volume of water that would flow over the proposed soil cap, water velocities could exceed the critical thresholds and cause erosion.

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[69] Discharge is calculated by multiplying the area of water in a channel cross section by the average velocity of the water in that cross section.

[70] The spoils pile decreases in elevation by 2 feet over a 500 foot span from the forest edge to the retaining wall (see figure 3-7).

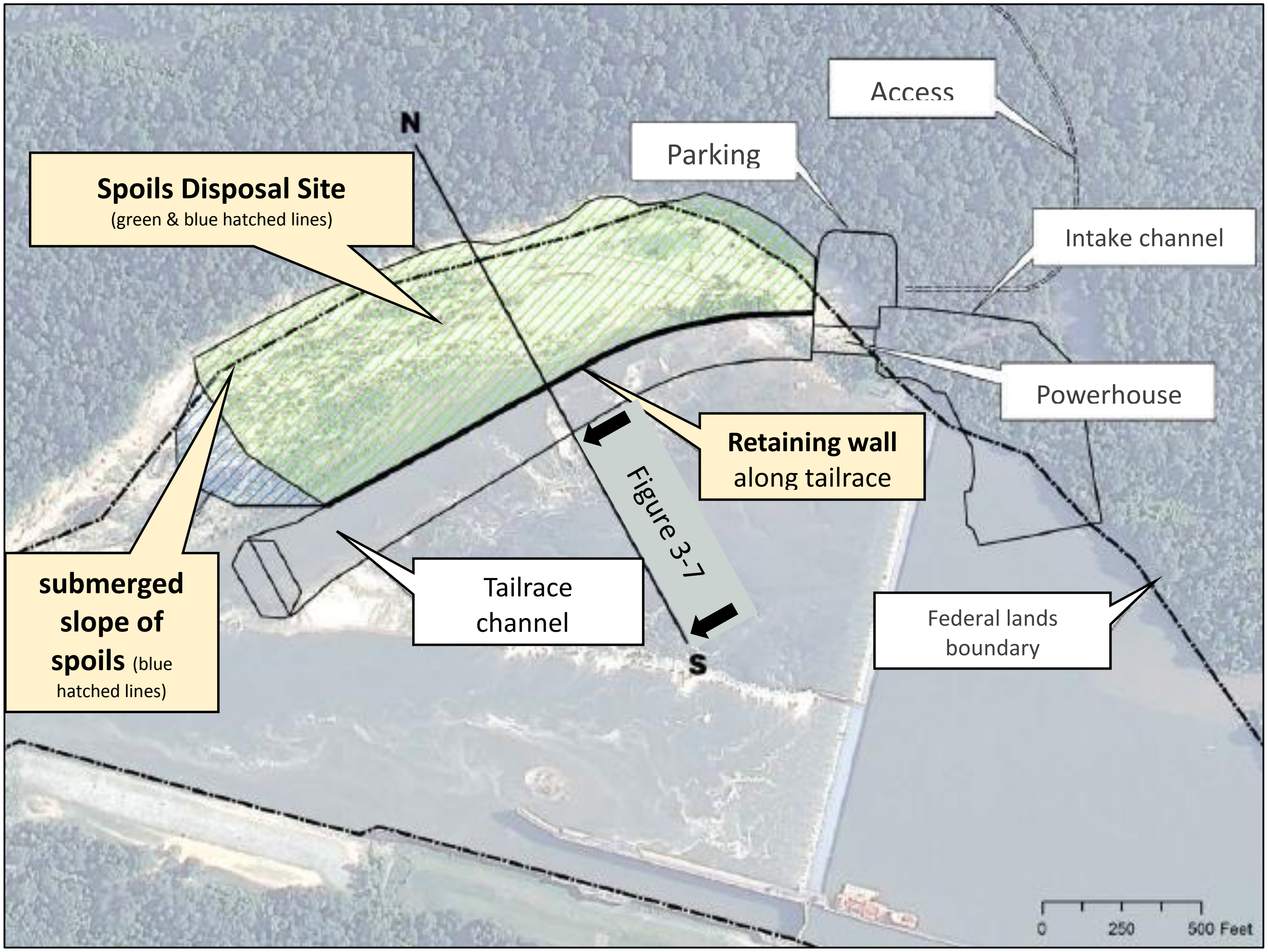

Figure 3-6. Project area map showing the spoils disposal site (Source: Attachment B of Birch Power's letter filed on May 21, 2014, as modified by staff).

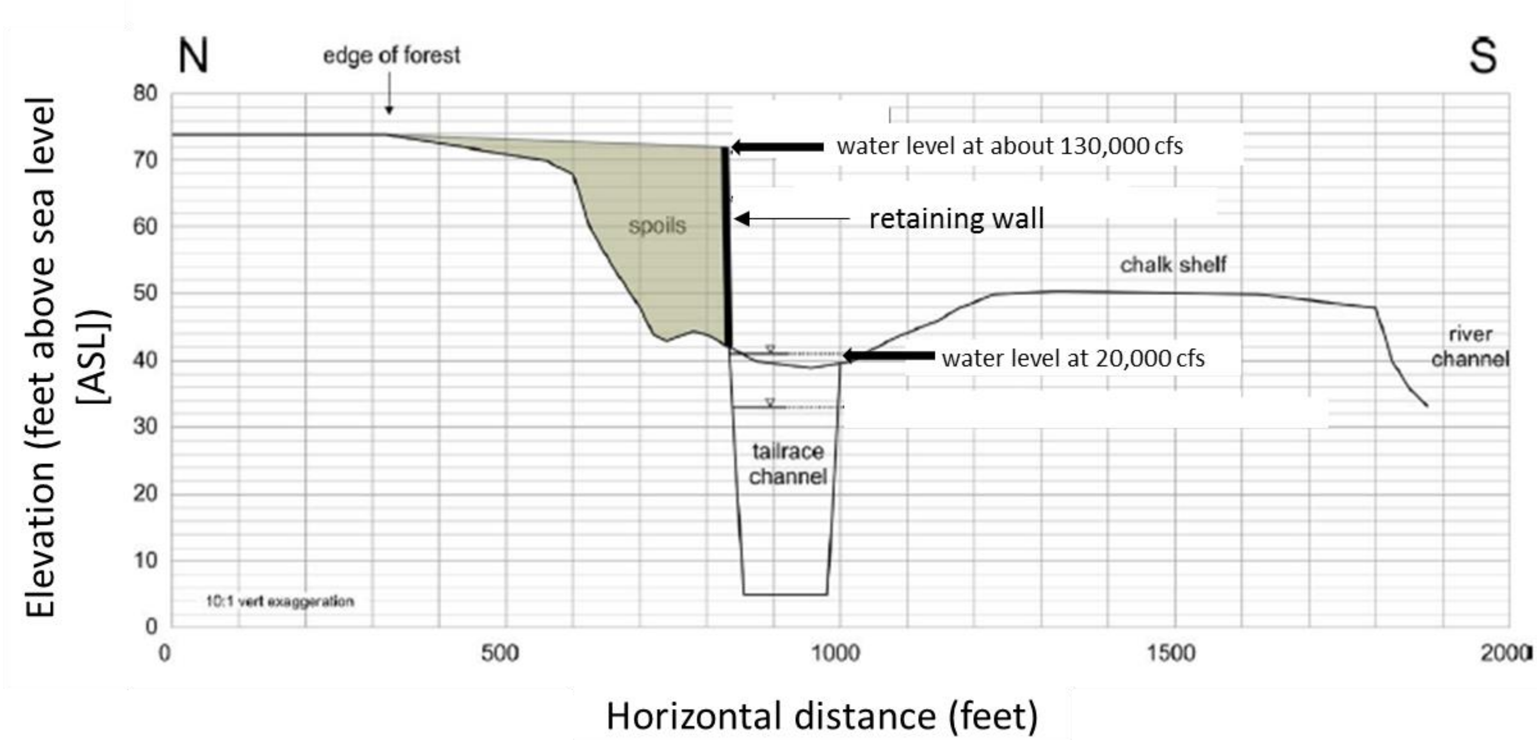

Figure 3-7. The north-south cross-section from figure 3-6, showing the spoils disposal site, tailrace channel, and chalk shelf.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity

Tombigbee River

The Demopolis Lock and Dam Project would use the waters of the Tombigbee River and Black Warrior River to generate power at the dam. The Tombigbee River basin drains parts of northeast Mississippi and western Alabama and the Black Warrior River drains parts of west central Alabama. The total drainage area at the project dam is about 15,300 square miles (Corps, 1979). The Corps operates several other dams on the Tombigbee and Black Warrior rivers (figures 2-1). Table 3-2 provides operation, drainage area, surface area, and storage volume data for the only Corps project downstream (Coffeeville) and the first Corps projects upstream on the Tombigbee (Heflin) and Black Warrior (Seldin) rivers.

The USGS has a stream gauge at Demopolis Lock and Dam that collects daily flow (1928-present) and gauge height data (1973-present), and a gauge immediately below Demopolis Lock and Dam that collects gauge height data (1971-present). Table 3-3 shows monthly mean, maximum, and minimum flow statistics, as well as 10, 25, 75, and 90 percent exceedence flows for the gauge at Demopolis Lock and Dam.

Above Demopolis Lock and Dam – Demopolis Lake

Demopolis Lake extends 48 miles up the Black Warrior River and 53 miles up the Tombigbee River. Although the primary purpose of Demopolis Lock and Dam is navigation, the reservoir is used for recreation. Demopolis Lake has a surface area of 10,000 acres and a shoreline of about 500 miles at normal pool elevation of 73 feet (Corps, 1974). It receives inflows from both the Black Warrior and Tombigbee rivers, representing 6,274 square miles and 9,026 square miles of drainage, respectively. The active storage capacity of Demopolis Lake at minimum pool is 120,800 acre-feet. The Demopolis Lock and Dam is a fixed crest structure, with no control over outflow, and generally outflow equals inflow, with water passing downstream over the spillway or through the lock.

Below Demopolis Lock and Dam – Coffeeville Lake

Water spilling over the river channel portion of the spillway enters directly into the main river channel. Water spilling over the overbank portion of the spillway flows onto the chalk shelf located on the north side of the main river channel (figure 2-2). Water on the chalk shelf generally flows south and west toward the main river channel.

Coffeeville Lake is 96.8 miles long and extends from Coffeeville Lock at river mile 116.6 to Demopolis Lock and Dam. Although the primary purpose of Coffeeville Lock and Dam is navigation, the reservoir also is used for recreation. Coffeeville Lake has a surface area of 8,500 acres and a shoreline of about 300 miles at normal pool elevation of 32.5 feet (Corps, 1974). It receives inflows from the Tombigbee River, representing 18,500 square miles of drainage (Ruddy and Hitt, 1990). The active storage capacity of Coffeeville Lake is 190,800 acre-feet.

Table 3-2. Corps developments at, and immediately upstream and downstream of the Demopolis Project.

Reservoir	Lock and Dam	River	Construction date	River mile	Drainage area (miles^2)	Surface area (acres)	Total storage (acre-feet)	Operation
Warrior	Selden	Black Warrior	1962 [3]	264 [1]	5,828 [3]	7,800 [3]	58,650 [3]	Run-of-reservoir; Navigation[3]
Gainesville	John C. Heflin	Tombigbee	1978 [3]	239 [1]	7,220 [3]	6,400 [3]	45,290 [3]	Run-of-reservoir; Navigation and recreation[3]
Demopolis	Demopolis	Tombigbee	1955 [2]	213 [2]	15,385 [2]	10,000 [2]	120,800 [2]	Run-of-reservoir; Navigation[3]
Coffeeville	Coffeeville	Tombigbee	1962 [3]	117 [1]	18,500 [3]	8,500 [1]	190,800 [3]	Run-of-reservoir; Navigation[3]

[1] Source: Corps, 2013
[2] Source: Birch Power, 2013
[3] Source: Ruddy and Hitt, 1990

Table 3-3. Monthly flow data for USGS gauge number 02467000 Tombigbee River at Demopolis Lock and Dam near Coatopa, Alabama from 1984-2013.

Month	Minimum	90 percent exceedance	75 percent exceedance	Mean	25 percent exceedance	10 percent exceedance	Maximum
Jan	2,470	10,000	16,000	42,706	56,400	99,200	183,000
Feb	4,650	12,700	21,200	48,185	61,500	100,000	213,000
Mar	5,050	12,400	22,000	47,964	64,400	104,000	194,000
Apr	2,770	7,520	12,100	34,474	41,800	83,600	221,000
May	1,150	3,360	5,680	25,302	28,800	66,700	186,000
Jun	925	2,620	4,290	15,095	16,300	37,300	165,000
Jul	1,310	2,540	3,490	11,129	12,000	25,000	109,000
Aug	860	1,990	2,970	6,716	8,510	13,200	58,700
Sep	680	1,660	2,440	8,234	7,000	14,600	129,000
Oct	705	1,180	1,980	9,106	8,190	24,300	139,000
Nov	853	2,030	3,270	14,527	17,700	34,400	147,000
Dec	1,800	4,360	9,390	29,670	39,400	64,700	177,000

Water Quality

Alabama DEM (2016) classified Demopolis Lake as eutrophic meaning that nutrient levels and primary productivity are high. Alabama DEM classified Demopolis Lake as supporting the swimming, fish and wildlife, or public water supply classifications depending on the location within the lake (Alabama DEM, 2014). All areas in Demopolis Lake currently meet their use classifications (table 3-4; Alabama DEM, 2016), and Alabama DEM did not include Demopolis Lake in its 2016 303(d) list as impaired.

Alabama DEM (2016) classified Coffeeville Lake as eutrophic. Alabama DEM classified Coffeeville Lake as supporting swimming, fish and wildlife, or public water supply classifications depending on the location within the lake (Alabama DEM, 2016). Coffeeville Lake was included in the 2016 303(d) list as impaired because of concerns with mercury levels in the reach of the Tombigbee River between Demopolis Lock and Dam and the confluence of the Tombigbee River with the Sucarnoochee River (about 13 miles downstream from Demopolis Lock and Dam) (Alabama DEM, 2016). Fish consumption advisories exist for largemouth bass and spotted bass between river mile 200 and 202 (11 to 13 miles downstream of Demopolis Lock and Dam) of the Coffeeville Lake due to mercury.

Table 3-4. Water quality standards applicable to the Demopolis Lake and Coffeeville Lake.

Variable	**Standard for Fish, Wildlife, Swimming, and Public Water Supply**
pH	Not less than 6.0 nor greater than 8.5
DO	Not less than 5.0 mg/L at all times. May range between 5.0 mg/L and 4.0 mg/L, provided other water quality parameters are favorable. Not less than 5.0 mg/L for new hydroelectric turbine discharges.
Water temperature	Not greater than 90°F (32.2 degrees Celsius [°C])

Variable	Standard for Fish, Wildlife, Swimming, and Public Water Supply
Turbidity	Not greater than 50 nephelometric turbidity units (NTUs)

Dissolved Oxygen

During July and August of 2012, Birch Power measured water temperature and DO at continuous monitoring stations located upstream (one station located in the forebay) and downstream (one station[71] located just downstream of the dam [tailwater] and a second station[72] located 8 miles downstream immediately upstream of the WestRock discharge site) of Demopolis Dam. At each station, temperature and DO were measured in shallow (1 to 2 feet below the surface) and deep water (about 10 feet below the surface). In addition, from 1992 to 2014 Alabama DEM also collected dissolved oxygen and water temperature data at the Demopolis Dam forebay along a depth profile (from just below the surface to about 60 feet).[73]

Dam forebay

Birch Power's monitoring indicated that DO stratification occurred in the dam forebay, with higher DO in the surface water compared to the deep water (figures 3-8, 3-9, 3-10, and 3-11). DO concentrations were sometimes more than 2 mg/L lower in deep water, as evident in the 15-minute interval data, and frequently more than 1 mg/L lower, as evident in the 7-day average data (figures 3-8, 3-9, 3-10, and 3-11). Alabama DEM's monitoring between 1992 and 2014 also indicated that DO stratification appears to occur

[71] The station immediately downstream was operated at 15-minute intervals from July 1, 2012 to June 23, 2012.

[72] The station immediately upstream of the WestRock discharge site was operated at 15-minute intervals from July 26, 2012 to August 31, 2012.

[73] The Alabama DEM water quality data were collected at the Demopolis Dam forebay once per month from April through October in 1992, 1995, 1997, 1999, 2001, 2003, 2004, 2006, 2008, 2009, 2011, and 2014. Data are available online at the National Water Quality Monitoring Council's Water Quality Portal (https://www.waterqualitydata.us/).

during the summer months (figures 3-12 and 3-13). Alabama DEM's monitoring also indicated that from June through August, the average DO concentration among all years was at least 2 mg/L lower in deep water (i.e., between 46 and 59 feet) compared to surface water (figure 3-12).

Birch Power's monitoring also indicated that DO concentrations in the forebay dropped below the 5.0 mg/L state standard during July and August of 2012. Fifteen-minute DO and 7-day average measurements indicated that DO occasionally dropped below the 5.0 mg/L standard in shallow water, but in deep water the 7-day average DO was below 5.0 mg/L most of the time (figures 3-8, 3-9, 3-10 and 3-11). Alabama DEM's monitoring indicated that in deeper water (i.e., depths greater than 40 feet) the average DO during July and August was less than 5.0 mg/L and 4.0 mg/L, respectively (figure 3-12). Alabama DEM's monitoring also indicated that during June through August, deep water DO has the potential to drop below 1.0 mg/L (figure 3-13).

Tailwater

Tailwater DO, as measured by Birch Power in both shallow and deep water, was frequently 2 to 3 mg/L higher than DO in the shallow and deep portions of the forebay during the summer of 2012 (figure 3-8 and 3-10). Fifteen-minute interval data indicated that shallow and deep tailwater DO was high and often exceeded 8 mg/L, while 7-day average DO indicated that the tailwaters were regularly above 7 mg/L (figures 3-8 and 3-10). These high DO concentrations were evident even at low inflows around 5,000 cfs (figure 3-8). At no time during July and August of 2012 did DO drop below the 5.0 mg/L state standard. The higher DO in the tailwaters compared to the forebay indicates that the forebay water is aerated as it spills over the dam and into the tailwaters.

Immediately Upstream of the WestRock Discharge

Birch Power's monitoring indicated that DO concentrations immediately upstream of the WestRock discharge were similar to those measured in the tailwaters during the summer of 2012 (figures 3-8, 3-9, 3-10, and 3-11). Seven-day average DO in shallow and deep water upstream of the WestRock discharge was frequently greater than 7.0 mg/L and occasionally exceeded 8 mg/L (figure 3-10). Fifteen-minute interval data collected upstream of the WestRock discharge indicated that DO in shallow and deep water was regularly above 7.0 mg/L, and exceeded 8.0 mg/L for several hours on a near-daily basis (figure 3-9). Like the tailwaters, at no time during July and August of 2012 did DO drop below the 5.0 mg/L standard.

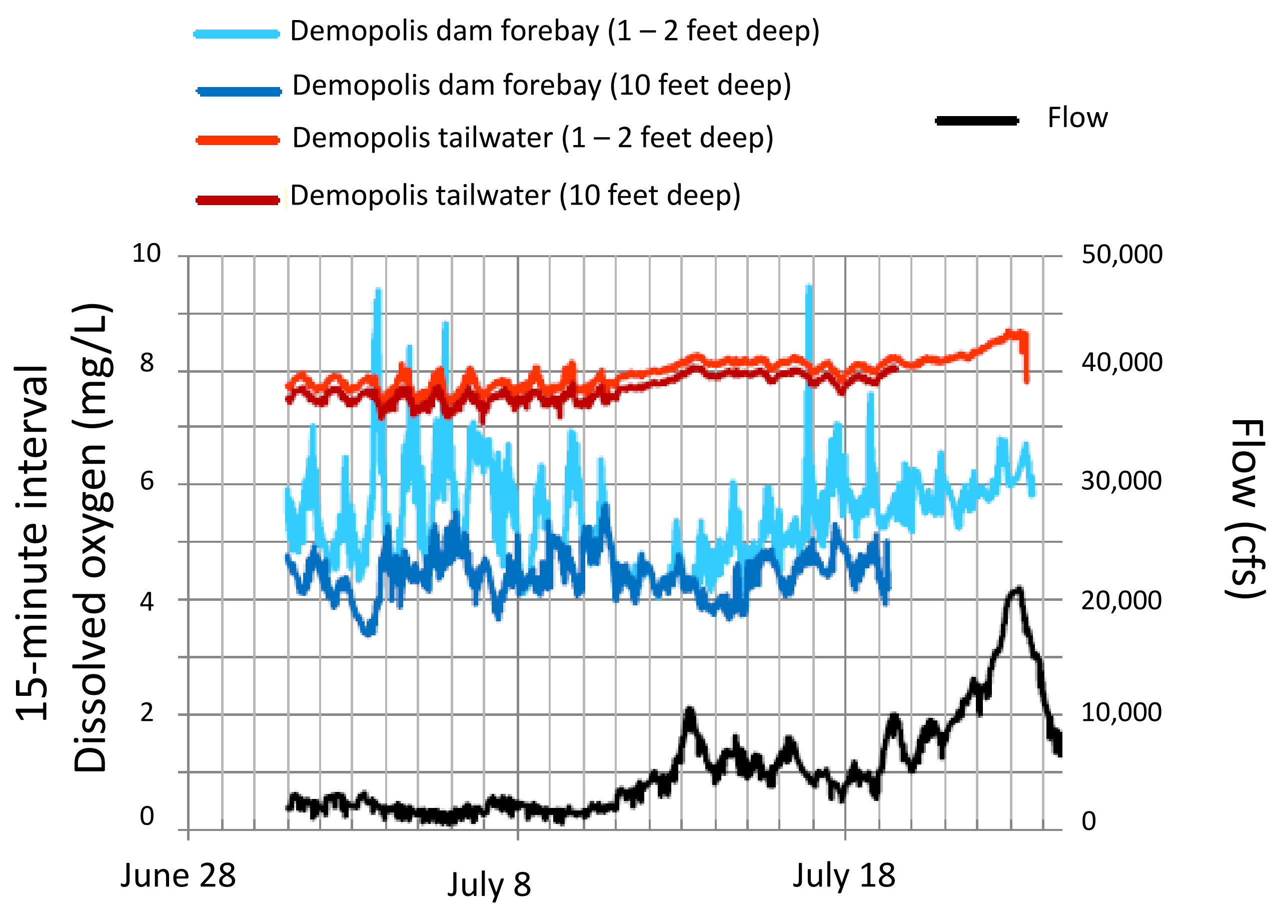

Figure 3-8. Dissolved oxygen concentrations (15-minute intervals) at the Demopolis Dam forebay and immediately downstream of Demopolis Dam in the tailwaters in 2012 (Source: Birch Power, 2013, as modified by staff).

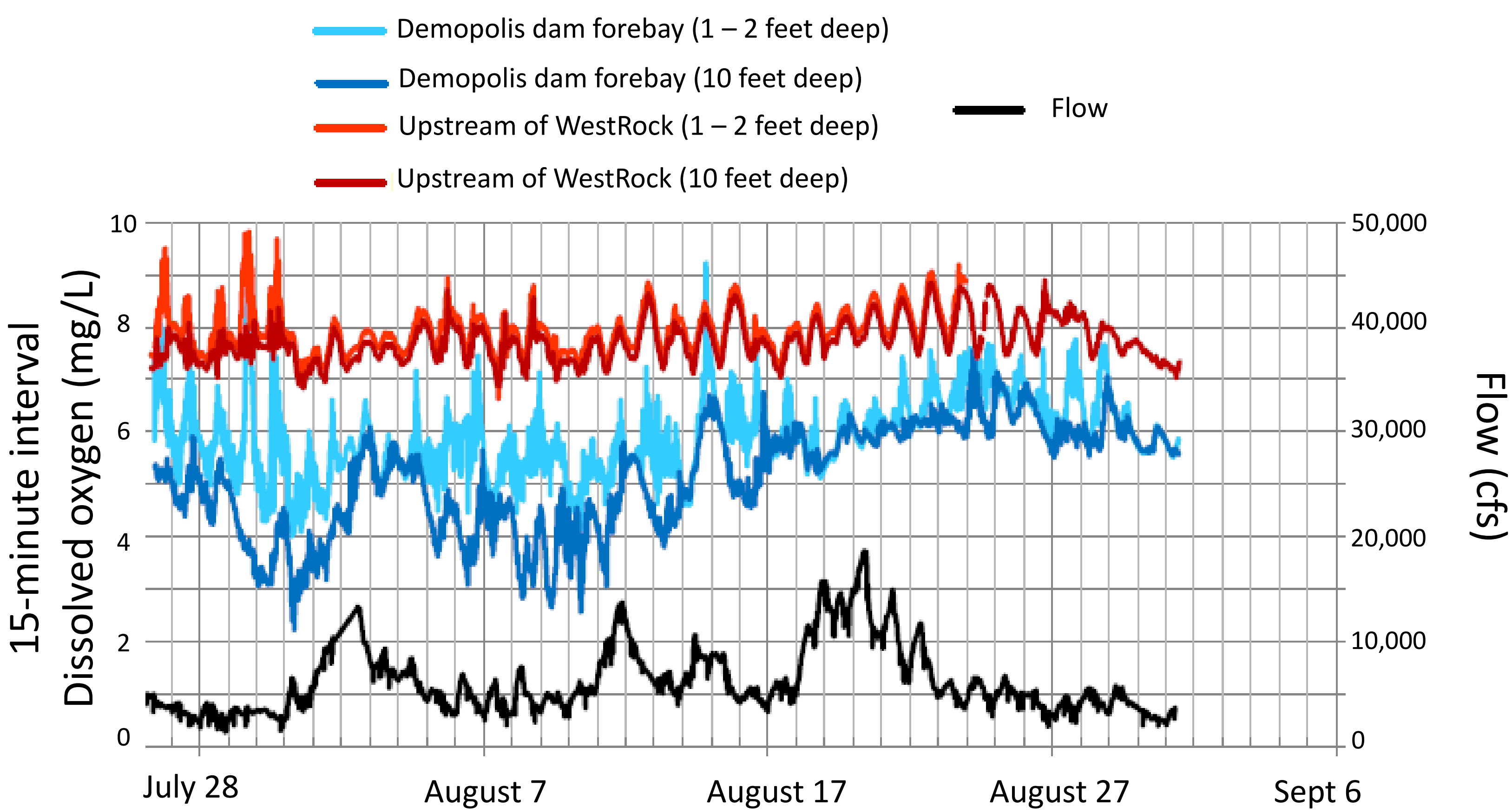

Figure 3-9. Dissolved oxygen concentrations (15-minute intervals) at the Demopolis Dam forebay and immediately upstream of the WestRock discharge in 2012 (Source: Birch Power, 2013, as modified by staff).

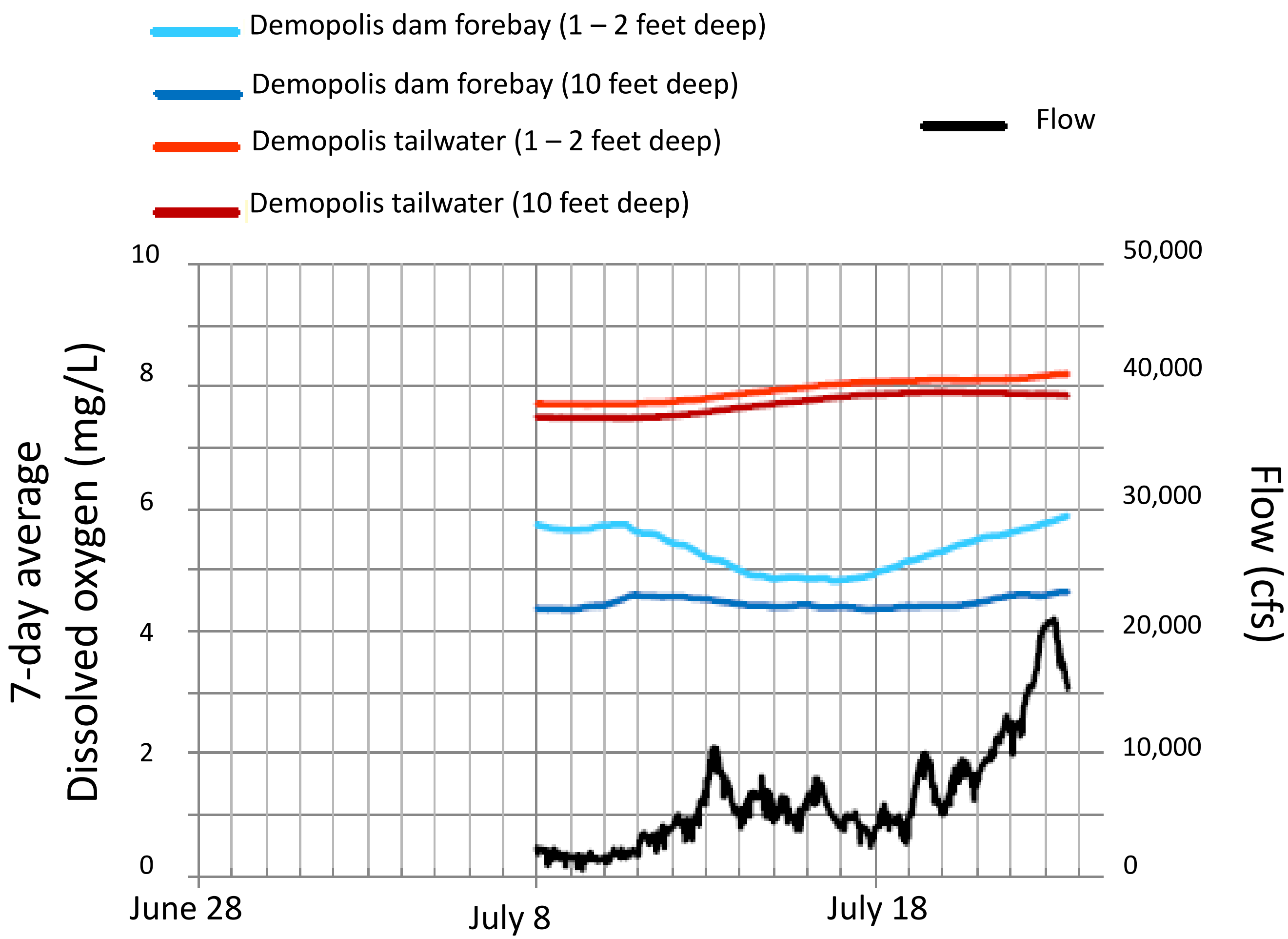

Figure 3-10. Dissolved oxygen concentrations (7-day average) at the Demopolis Dam forebay and immediately downstream of Demopolis Dam in the tailwaters in 2012 (Source: Birch Power, 2013, as modified by staff).

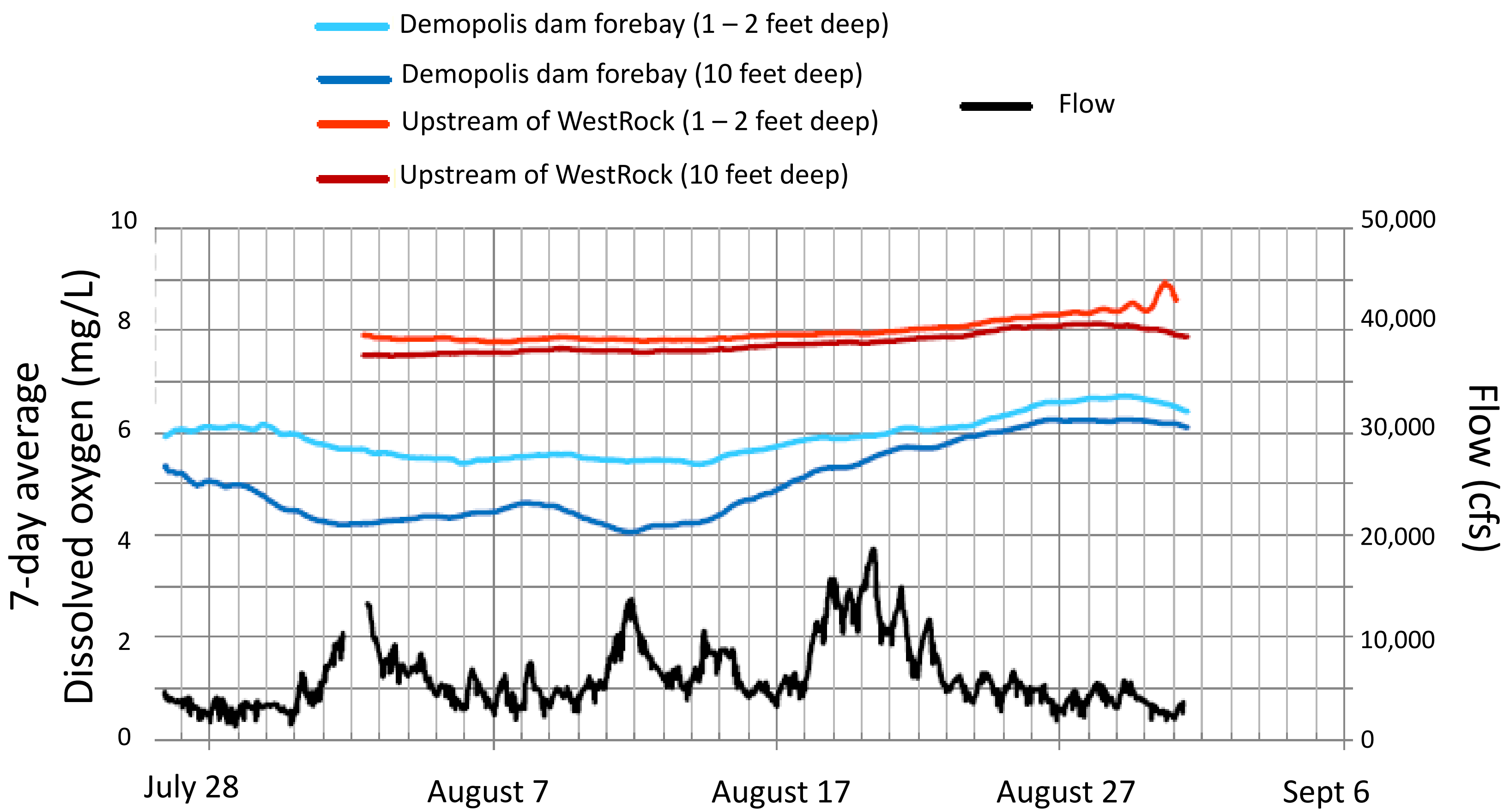

Figure 3-11. Dissolved oxygen concentrations (7-day average) at the Demopolis Dam forebay and immediately upstream of the WestRock discharge in 2012 (Source: Birch Power, 2013, as modified by staff).

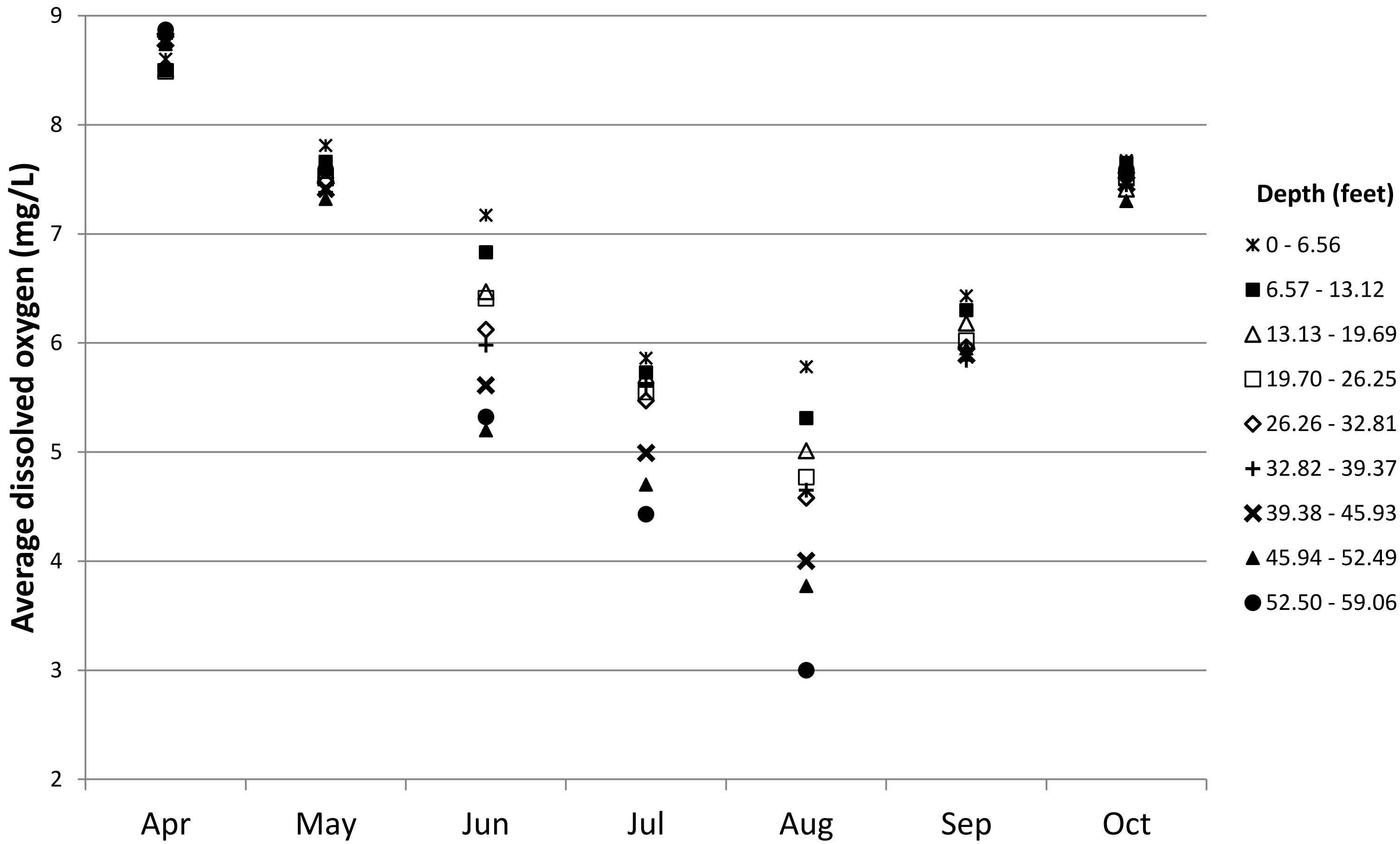

Figure 3-12. Average dissolved oxygen concentrations along a depth profile in the Demopolis Dam forebay collected by Alabama DEM from 1992 to 2014 (Source: staff).

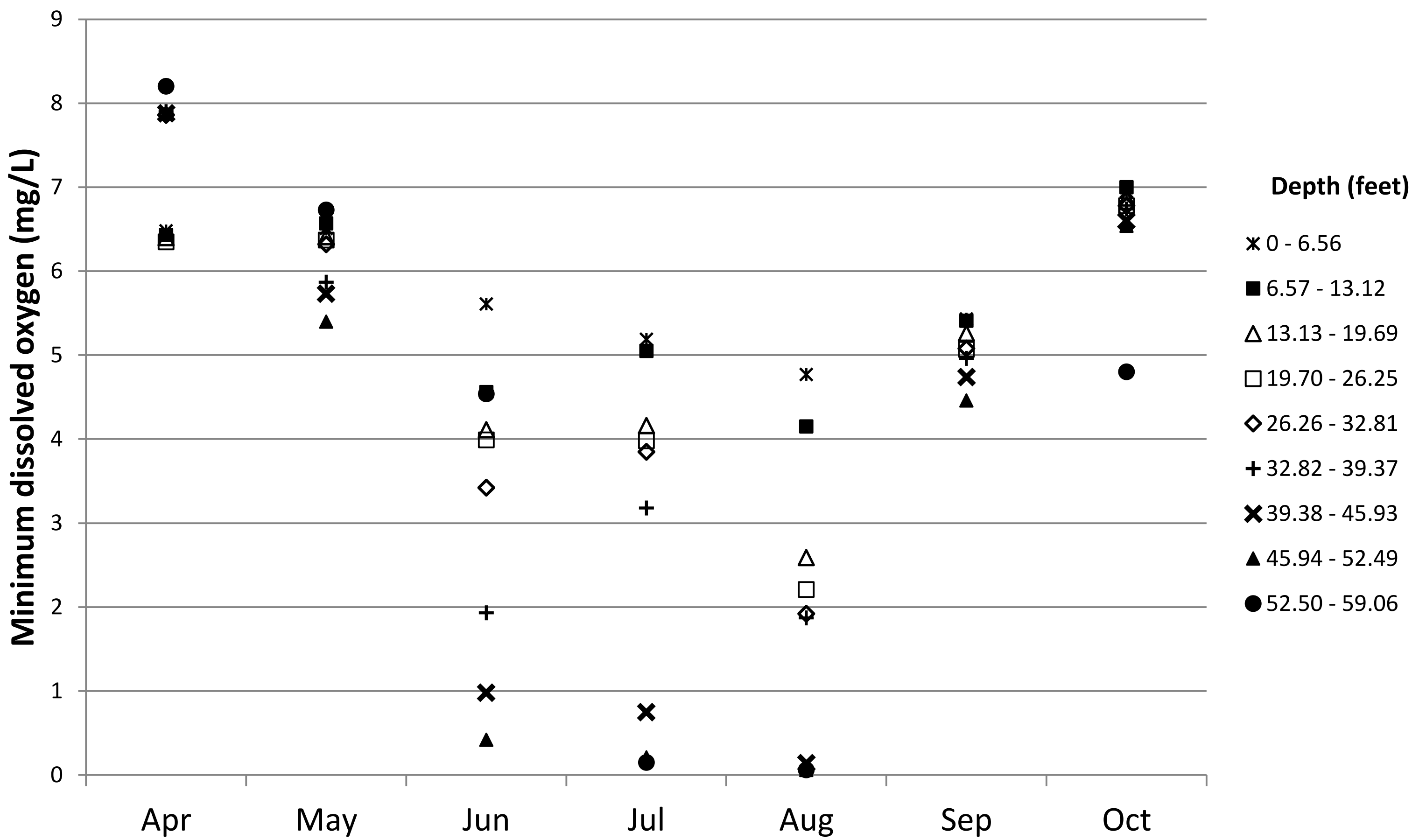

Figure 3-13. Minimum dissolved oxygen concentrations along a depth profile in the Demopolis Dam forebay from 1992 to 2014 collected by Alabama DEM (Source: staff).

Water temperature

Forebay

Birch Power's continuous monitoring of the dam forebay in July and August of 2012 indicated that 7-day average water temperature at the surface generally ranged between 86° F and about the 90° F, the standard threshold for maximum temperature (figures 3-16 and 3-17). Deep water at the forebay was about 1.0° F cooler. Instantaneous, 15-minute interval data indicated that water temperature occasionally reached about 93° F (likely during daytime surface warming) when flow was less than 5,000 cfs (figure 3-14). These data also suggested that slight temperature stratification of the water column occurred (figures 3-14, 3-15, 3-16, and 3-17).

The data collected by Alabama DEM over a 22 year period showed that average water temperature in the dam forebay never exceeded 90° F standard (figure 3-18); however, maximum water temperatures observed during the 22 year period did occasionally exceed 90° F near the surface in June, July, and August (figure 3-19). Like the results observed by Birch Power, the water temperature data collected by Alabama DEM indicate that the water temperature occasionally exceeded 90° F at the surface during the summer months.

Tailwater

Birch Power's 2012 summer monitoring of the dam tailwaters indicated that the 7-day average temperature was similar in deep and shallow water, ranging from about 88° F to about 89.5° F throughout the water column (figure 3-16). The 7-day average water temperature also indicated that the tailwaters were slightly cooler (by less than 1° F) than the forebay surface waters and slightly warmer (by less than 1° F) than deep water in the forebay (figure 3-16). Instantaneous, 15-minute interval data indicated that water temperature in the tailwaters occasionally increased above the 90° F standard for maximum temperature both at the surface and in deep water during daytime warming when flow was less than 5,000 cfs (figure 3-14).

Immediately Upstream of the WestRock Discharge

Birch Power's 2012 summer monitoring of the site immediately upstream of the WestRock discharge indicated similarities with water temperature in the tailwaters. Like the tailwaters, the 7-day average water temperature immediately upstream of the WestRock discharge was similar in deep and shallow water, ranging between about 86°F and about 88.5° F throughout the water column (figure 3-17). Instantaneous 15-minute interval data indicated that water temperature near the surface at this site occasionally increased above the 90° F standard for maximum temperature during daytime surface warming when flow was less than 5,000 cfs (figure 3-15).

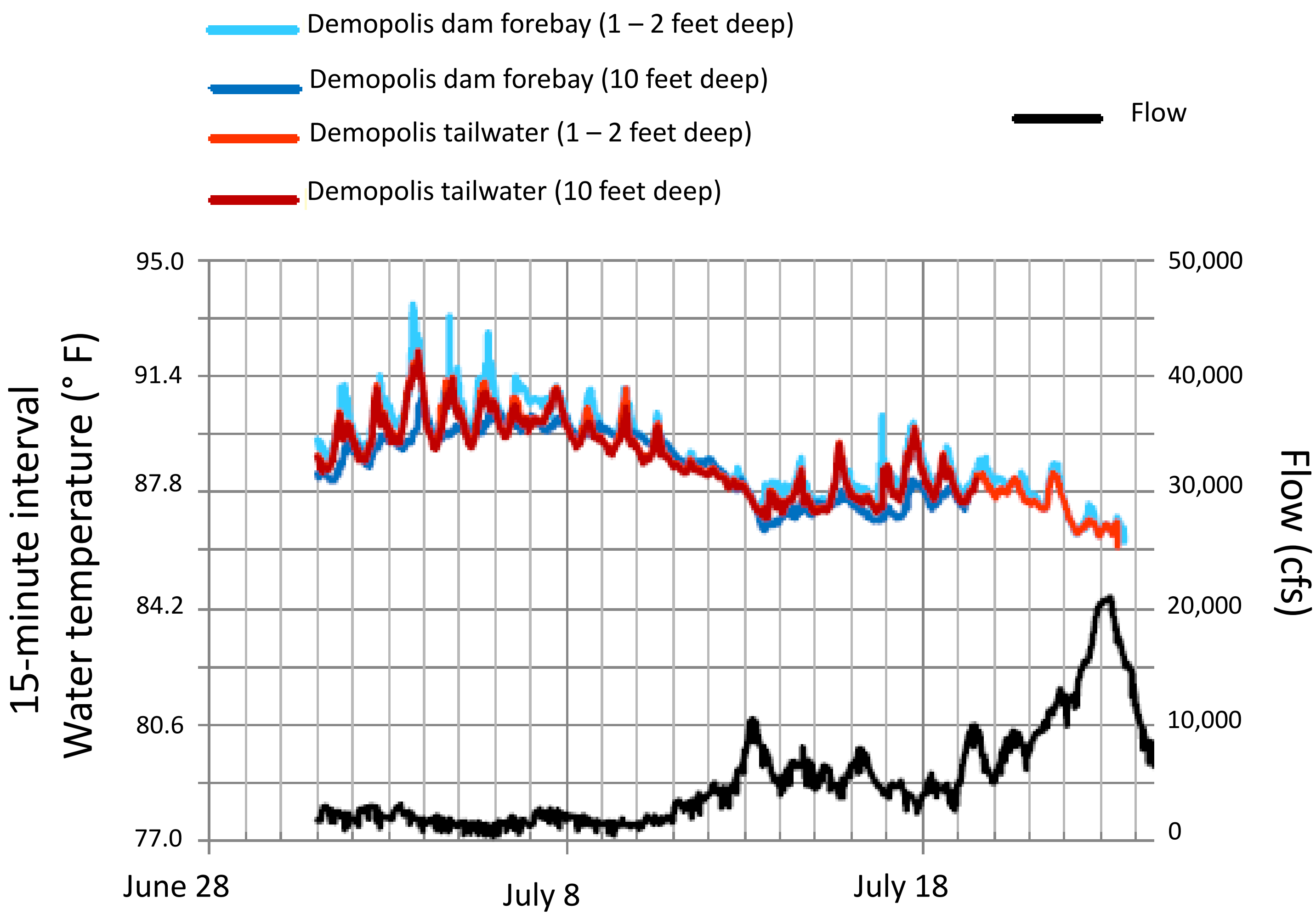

Figure 3-14. Water temperature (15-minute intervals) at the Demopolis Dam forebay and immediately downstream of Demopolis Dam in the tailwaters in 2012 (Source: Birch Power, 2013, as modified by staff).

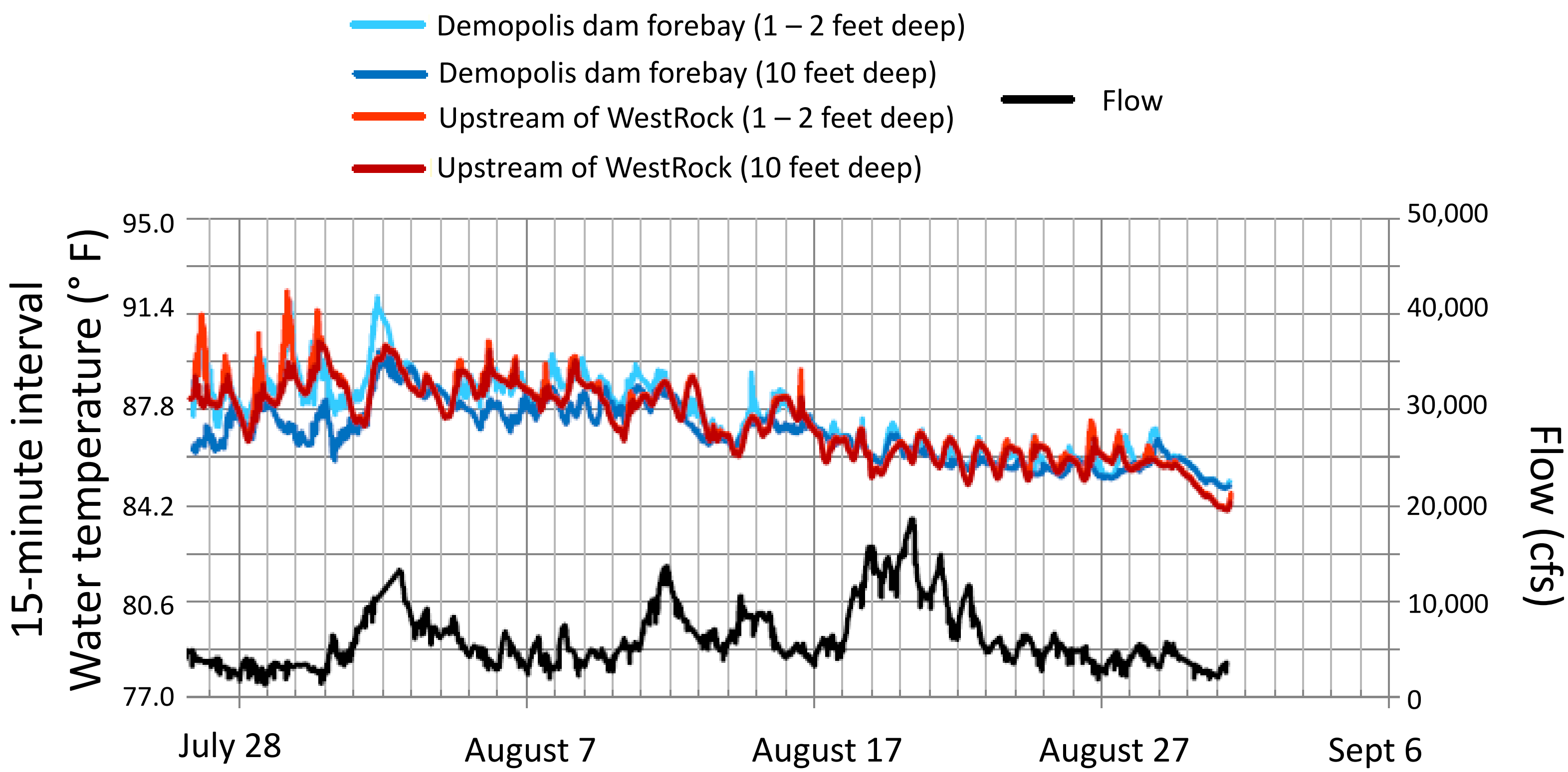

Figure 3-15. Water temperature (15-minute intervals) at the Demopolis Dam forebay and immediately upstream of the WestRock discharge in 2012 (Source: Birch Power, 2013, as modified by staff).

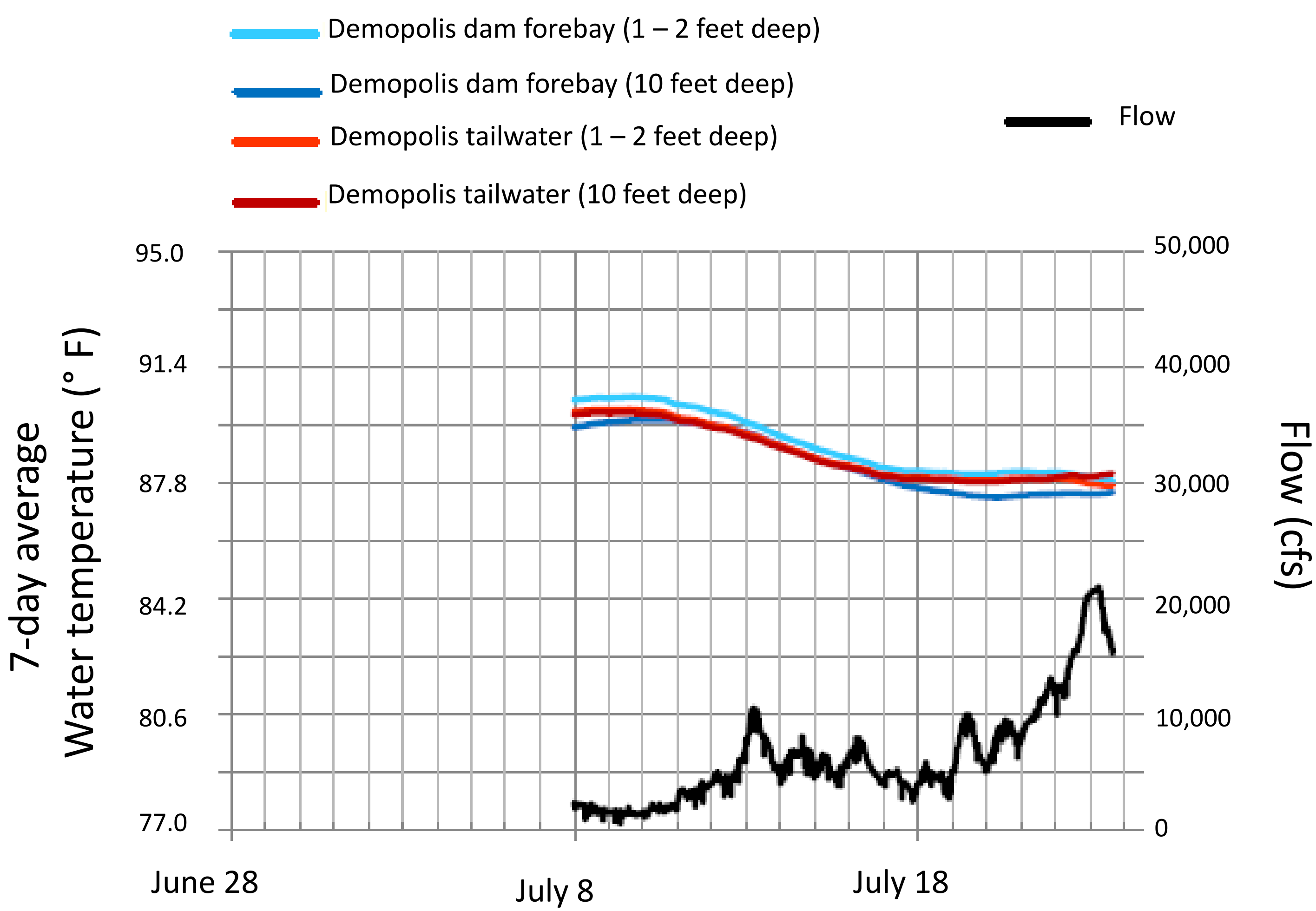

Figure 3-16. Water temperature (7-day average) at the Demopolis Dam forebay and immediately downstream of Demopolis Dam in the tailwaters in 2012 (Source: Birch Power, 2013, as modified by staff).

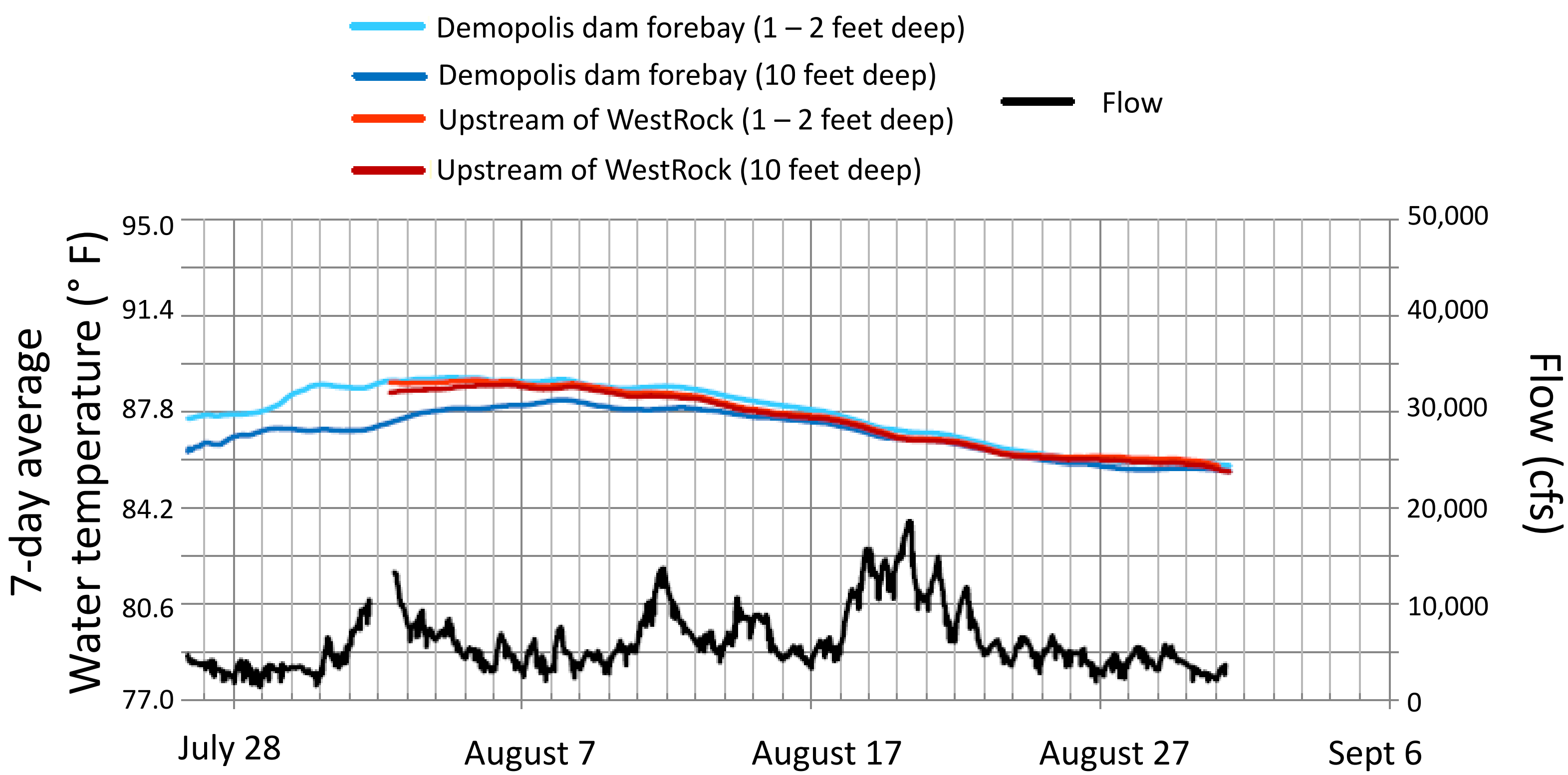

Figure 3-17. Water temperature (7-day average) at the Demopolis Dam forebay and immediately upstream of the WestRock discharge in 2012 (Source: Birch Power, 2013, as modified by staff).

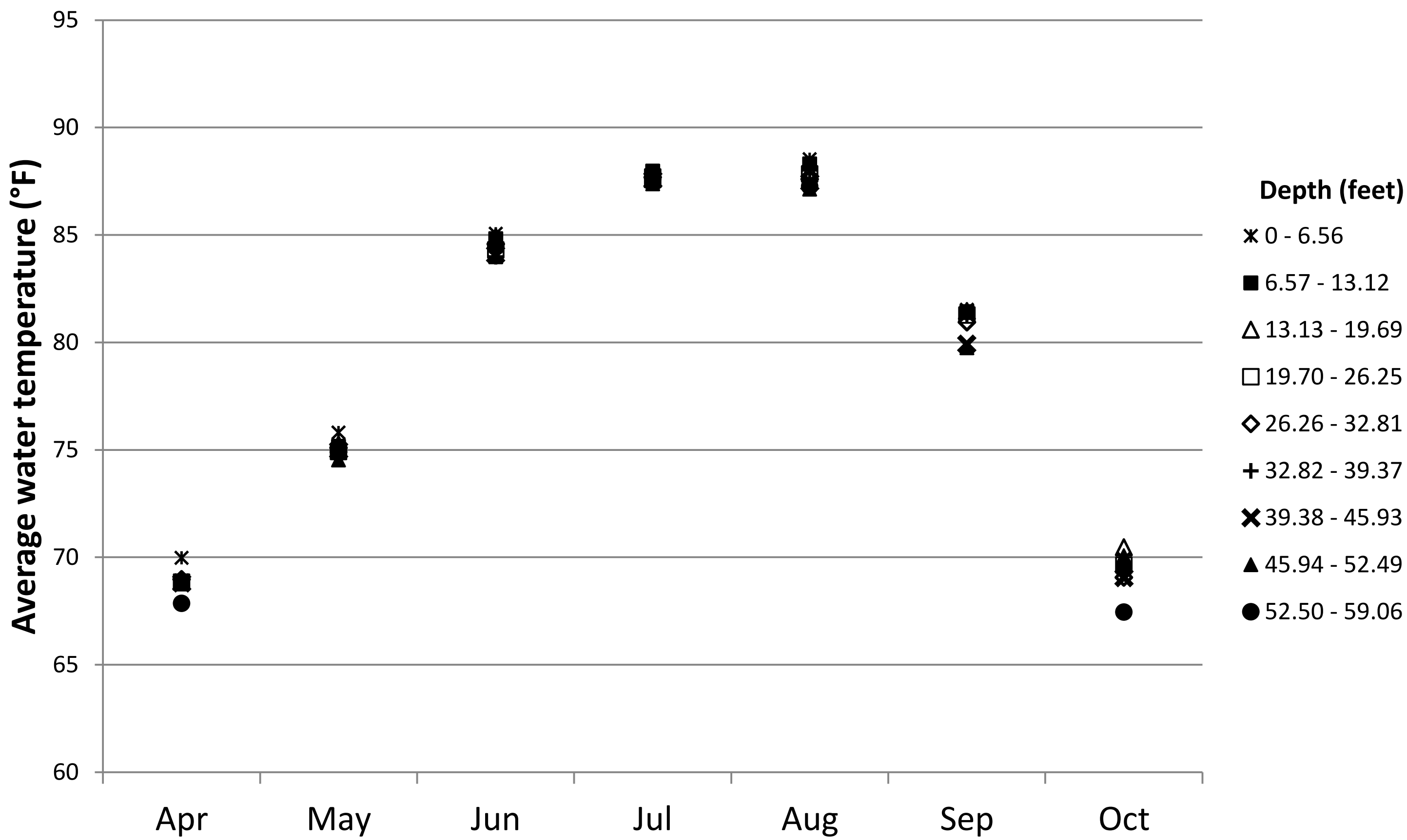

Figure 3-18. Average water temperature along a depth profile in the Demopolis Dam forebay from 1992 to 2014 collected by Alabama DEM (Source: staff).

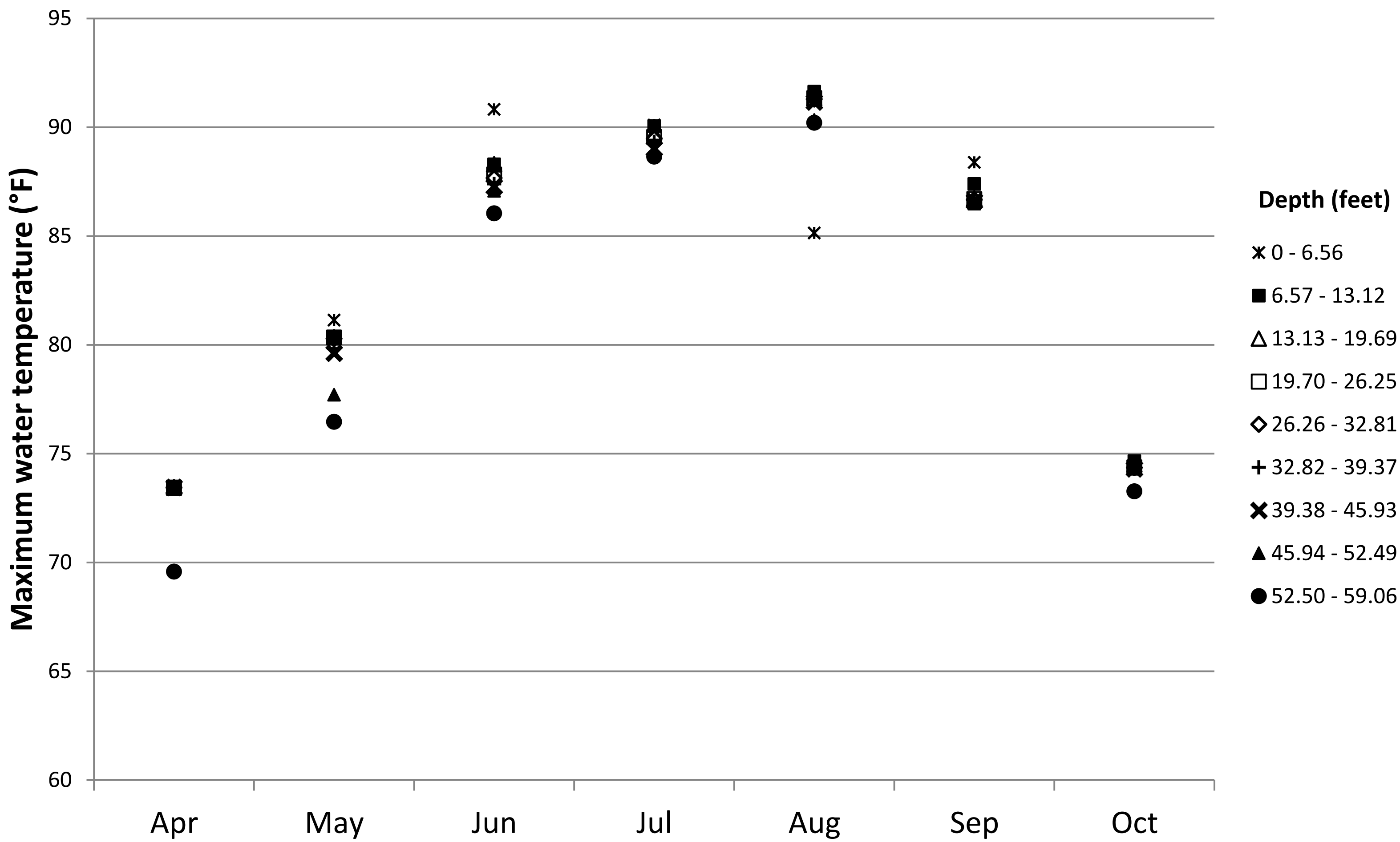

Figure 3-19. Maximum water temperature along a depth profile in the Demopolis Dam forebay from 1992 to 2014 collected by Alabama DEM (Source: staff).

Turbidity and Suspended Solids

Alabama DEM measured turbidity at the Demopolis Dam and Coffeeville Dam forebays from 1992 to 2014. In the Demopolis Dam forebay, turbidity occasionally exceeded the 50 NTU state standard (figure 3-20), but the average turbidity from 1992 to 2014 was 17.3 NTU, well below the standard. The temporal trends in total suspended solids[74] (TSS) at the Demopolis Dam forebay were similar to the temporal trends in turbidity, suggesting that TSS are potentially the primary factor driving trends in turbidity (figure 3-21). Data from the Coffeeville Dam forebay indicate that turbidity exceeded the 50 NTU state standard on occasion (figure 3-20), but the average turbidity from 1992 to 2014 was 22.6 NTU, also well below the standard.

[74] Total suspended solids are solids in water that can be trapped by a filter. Total suspended solids can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage.

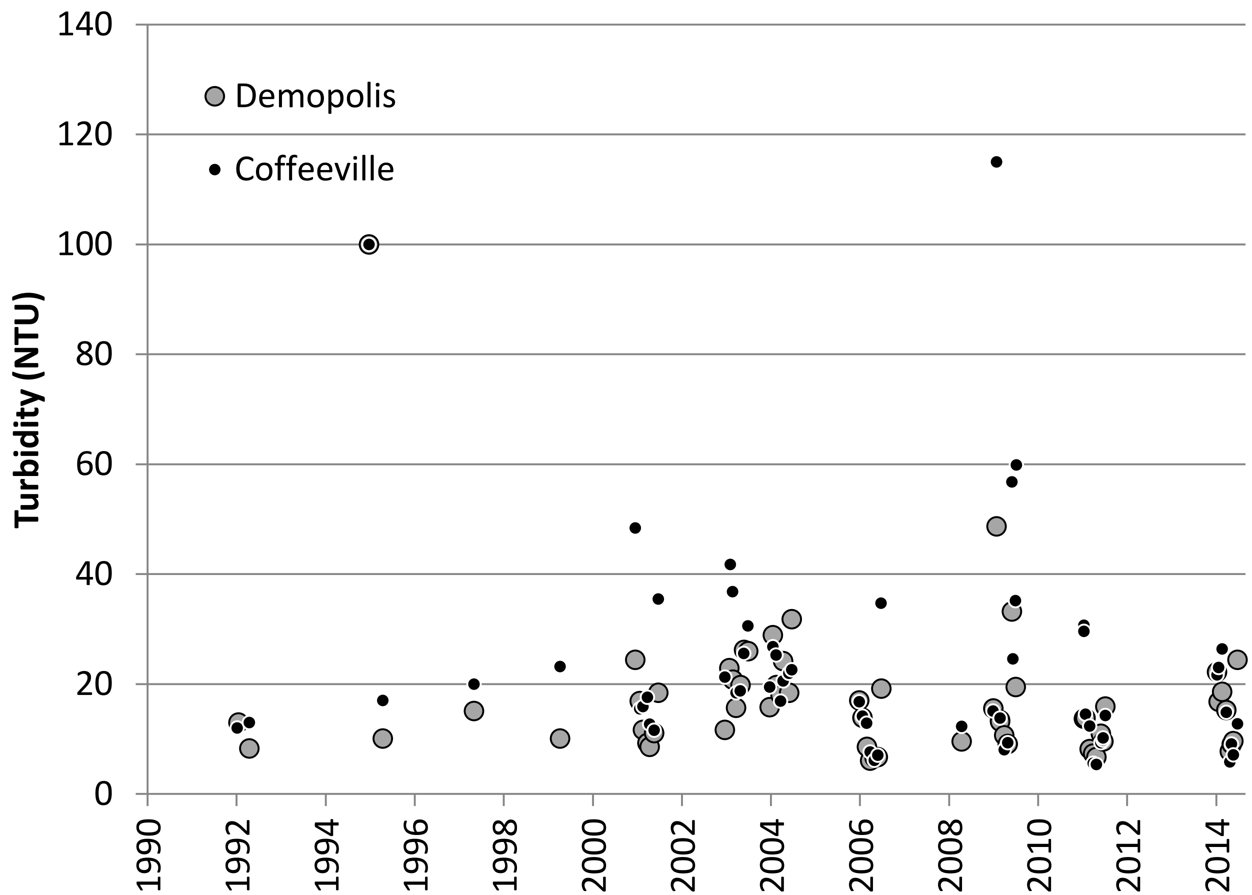

Figure 3-20. Turbidity at the Demopolis Dam forebay and Coffeeville Dam forebay from 1992 to 2014 collected by Alabama DEM (Source: staff).

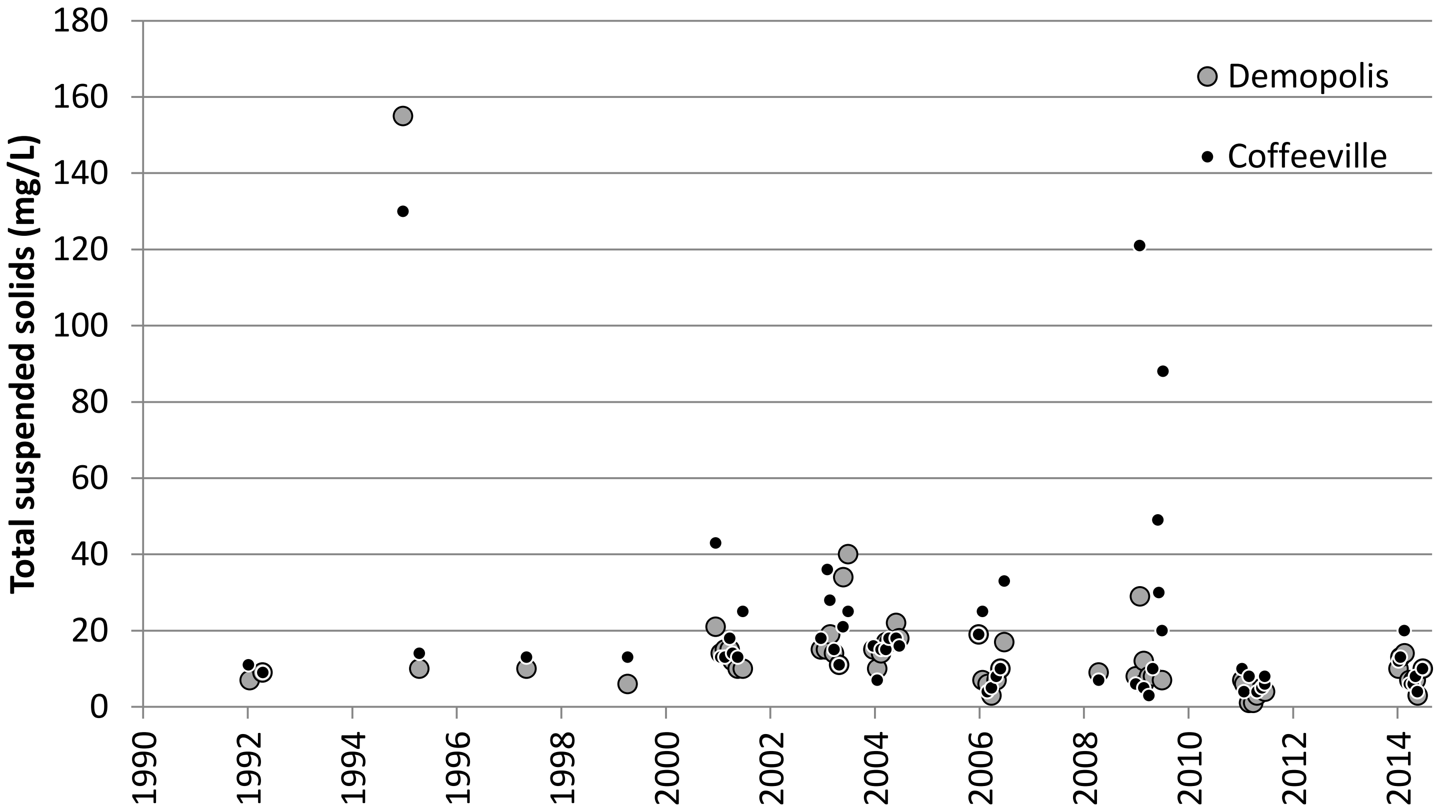

Figure 3-21. Total suspended solids at the Demopolis Dam forebay and Coffeeville Dam forebay collected by Alabama DEM (Source: staff).

Aquatic Habitat

Demopolis Lake has moderately productive waters with generally good water quality. The reservoir has a retention time of about 3 days and annual regulated water level fluctuation of about 1 foot (Slipke and Maceina, 2006). Demopolis Lake is shallow, averaging only 12 feet in depth, which inhibits extreme temperature and dissolved oxygen stratification. Numerous backwater areas are connected, and in some cases, separated from the mainstem of the reservoir, creating multiple habitat types suitable for a diverse warmwater fish community that is dominated by centrarchids (sunfish and basses) and clupeids (shads). According to Alabama DCNR (2015), there are no strategic habitat units or strategic river reach units for conservation in Demopolis Lake, or anywhere close to the project vicinity, either upstream or downstream.[75]

Water in Demopolis Lake flows over Demopolis Dam, into Coffeeville Lake, which is an impoundment formed by Coffeeville Lock and Dam located about 97 miles downstream of Demopolis Dam. Coffeeville Lake exhibits several similar characteristics to Demopolis Lake. The reservoir has moderately productive waters, good water quality, a retention time of 3.7 days, and a relatively shallow average depth. There also is no evidence to indicate that thermal or dissolved oxygen stratification consistently develops in the main channel (Corps, 1974). However, unlike Demopolis Lake, Coffeeville has few creeks and backwater areas (Ricks et al., 2006).

Habitat downstream of the dam was characterized at three sites during a mussel survey conducted from August 30 to September 2, 2011 (AST Environmental, 2011). The three sites were located: (1) on the chalk shelf (figure 3-1); (2) 246 feet to 1,722 feet downstream of the dam (proposed flow affected area; figure 2-3); and (3) 1.2 miles downstream of the dam (downstream of tailrace).[76] Additional characteristics of the chalk shelf were characterized in a separate analysis conducted in 2011 (table 3-5; Sorenson Engineering, 2011). The chalk shelf lies to the north of the river channel and abuts the Demopolis Dam and is mostly exposed bedrock; however, a sandy slough is present to the far north and west area of the shelf. Four 20-feet-wide excavated channels

[75] Strategic habitat units and river reach units are areas selected by FWS, Alabama DCNR, and the Geological Survey of Alabama to focus conservation activities for managing, restoring, and recovering populations of rare fishes, mussels, snails, and crayfishes. The closest strategic habitat unit is upstream of the proposed project in the Sucarnoochee River, which is a tributary of the Tombigbee River. The closest strategic river reach unit is downstream of Coffeeville Lock and Dam.

[76] In the mussel survey report, AST Environmental (2011) called the proposed flow affected area the upstream site and the site downstream of the tailrace was called the downstream site.

in the chalk shelf route water south and west to the main river channel (figure 3-1). At lower flows (less than 10,000 cfs) the channels convey the majority of the overbank flow and the chalk shelf between the channels is dry (Sorensen Engineering, 2011). At flows greater than 10,000 cfs, turbulent flow develops over inundated areas of the shelf. For flows less than 30,000 cfs, more than 50 percent of the shelf remains dry. At about 44,000 cfs the shelf is about 78 percent inundated and the area of turbulent flow is restricted to the area immediately below the spillway.

Table 3-5. Chalk shelf inundation under existing conditions as analyzed by Sorensen Engineering (2011) (Source: staff).

Flow (cfs)	Tailwater elevation	Chalk shelf dry surface area (acres)	Chalk shelf inundated surface area (acres)	Percent of chalk shelf inundated
3,000	33	38.4	1.3	3
5,400	34	38.4	1.3	3
9,600	36	38.4	1.4	4
14,000	38	36.8	3.0	8
18,000	40	31.4	8.4	21
22,000	42	27.2	12.5	31
26,000	44	23.1	16.6	42
30,000	46	20.5	19.2	48
35,000	48	17.9	21.8	55
39,000	50	15.3	24.5	62
44,000	52	8.7	31.1	78
49,000	54	6.8	33.0	83
70,000	64	0.0	39.7	100

In the proposed flow affected area, shifting sand and bedrock is present along the southern portion of the site. Along the northern bank, boulders and bedrock are present, with a wide seam of mixed sand and gravel running parallel and to the south of the boulders and bedrock. A 5.6 acre sandbar (sandbar 1) is present north of the entrance to the lock. The sandbar is comprised of a consolidated clay/sand mixture that provides high quality mussel habitat.[77] Habitat closest to the dam consists mostly of clean swept bedrock with pockets of sandy gravel. Another 6.1 acre sandbar (sandbar 2) is located at the downstream end of the flow affected area on the north side, and is composed of mixed sand and gravel. These sandbars are formed by the flow regime created by the dam and are not considered natural features of the river.[78]

At the site furthest downstream of the dam, the shoreline is composed of sloping stable sandy banks. The substrate composition transitions from firm muddy sand at the base of the slope to more consolidated sand, and eventually clean swept bedrock at mid-channel.

Fish Community

Demopolis Lake has a healthy fishery that is extremely popular with anglers. A total of 162 species has been reported by Boschung and Mayden (2004) to occur in the upper Tombigbee, lower Tombigbee, and Black Warrior basins; however, surveys by Slipke and Maceina (2006) indicated that the Demopolis Lake fish community is predominantly composed of 49 warmwater species (table 3-6). Bluegill was the most abundant species and represented 33 percent of all fish collected. Largemouth bass represented 14 percent of the total catch, followed by threadfin shad (11 percent), gizzard shad (8 percent), white crappie (6 percent), redear sunfish (5 percent), and spotted gar (5 percent). Hybrid striped bass (and potentially stocked native strain striped bass)[79] are also likely present in Demopolis Lake, although they were not documented by Slipke and Maceina (2006).

Coffeeville Lake supports a warmwater fish assemblage with fewer centrarchids and proportionately more gizzard shad and threadfin shad than that found in Demopolis Lake (table 3-7; Ricks et al., 2006). Coffeeville Lake has fewer creeks and back water

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[77] In a letter filed on January 21, 2014, Birch Power indicated that 1.4 acres of sandbar 2 would be removed during tailrace construction, and that 1.4 acres corresponds to about 23 percent of sandbar 2 and 12 percent of sandbars 1 and 2.

[78] In a letter filed on May 1, 2015, FWS stated that sandbars 1 and 2 are formed by the flow regime created by the dam and are not natural features. The letter filed with the Commission on May 1, 2015 by FWS was originally issued to Birch Power on February 26, 2014.

[79] Hybrid striped bass and Gulf strain striped bass have been stocked in Coffeeville Lake, as recently as 2004 and 2008, respectively, and could be present in Demopolis Lake (Ricks et al., 2006; Ricks et al., 2008).

areas than Demopolis Lake, and thus less nearshore habitat, favored by centrarchids, and more open water habitat, favored by species such as gizzard shad and threadfin shad.

Like Demopolis Lake, in Coffeeville Lake, bluegill has the highest relative abundance and represented 21 percent of all fish collected. Threadfin shad represented 14 percent of the total catch, followed by largemouth bass (11 percent), spotted gar (11 percent), and gizzard shad (10 percent). Like Demopolis Lake, hybrid striped bass and striped bass are likely present, although they were not documented by Ricks et al. (2006).

Table 3-6. Numbers of fish species collected by Slipke and Maceina (2006) using electrofishing from three major habitat types in Demopolis Lake, from February 2002 through August 2003 (Source: staff).

Family	Common name	Closed-access backwater habitat	Open-access backwater habitat	Riverine habitat	Total catch among all habitats	Percent of total catch
Amiidae	Bowfin	59	38	5	102	0.83
Aphredoderidae	Pirate perch	1	0	0	1	0.01
Atherinidae	Brook silverside	27	32	1	60	0.49
	Inland silverside	21	5	30	56	0.46
Belonidae	Atlantic needlefish	1	3	8	12	0.10
Catostomidae	Blacktail redhorse	0	23	0	23	0.19
	Quillback	12	44	2	58	0.47
	Smallmouth buffalo	14	88	12	114	0.93
	Spotted sucker	1	22	0	23	0.19
Centrarchidae	Black crappie	174	149	52	375	3.05
	Bluegill	1,600	1,667	826	4093	33.30
	Flier	0	1	0	1	0.01
	Green sunfish	0	0	1	1	0.01
	Longear sunfish	6	22	45	73	0.59
	Largemouth bass	379	1,125	226	1730	14.07
	Orangespotted sunfish	6	9	3	18	0.15
	Redear sunfish	401	213	57	671	5.46
	Red spotted sunfish	1	3	0	4	0.03
	Spotted bass	1	8	44	53	0.43
	Warmouth	16	19	1	36	0.29

Family	Common name	Closed-access backwater habitat	Open-access backwater habitat	Riverine habitat	Total catch among all habitats	Percent of total catch
	White crappie	162	526	35	723	5.88
Clupeidae	Gizzard shad	418	498	136	1052	8.56
	Skipjack herring	1	8	3	12	0.10
	Threadfin shad	518	479	315	1312	10.67
Cyprinidae	Bullhead minnow	1	0	33	34	0.28
	Blacktail shiner	0	3	77	80	0.65
	Common carp	58	5	3	66	0.54
	Emerald shiner	4	0	250	254	2.07
	Golden shiner	8	0	1	9	0.07
	Mississippi silvery minnow	0	1	0	1	0.01
	Pugnose minnow	5	13	5	23	0.19
	Silverside shiner	39	131	111	281	2.29
	Striped shiner	0	0	9	9	0.07
	Weed shiner	16	1		17	0.14
Esocidae	Chain pickerel	0	3	0	3	0.02
Fundulidae	Blackspotted topminnow	1	0	0	1	0.01
	Northern starhead topminnow	1	0	2	3	0.02
	Southern starhead topminnow	1	0	0	1	0.01
Ictaluridae	Brown bullhead	2	0	0	2	0.02

Family	Common name	Closed-access backwater habitat	Open-access backwater habitat	Riverine habitat	Total catch among all habitats	Percent of total catch
	Channel catfish	26	30	30	86	0.70
	Flathead catfish	0	0	2	2	0.02
Lepisosteidae	Spotted gar	284	239	67	590	4.80
Moronidae	White bass	0	4	12	16	0.13
	Yellow bass	0	2	3	5	0.04
Mugilidae	Striped mullet	1	6	17	24	0.20
Percidae	Mobile logperch	1	6	1	8	0.07
Poeciliidae	Western mosquitofish	2	0	1	3	0.02
Polyodontidae	Paddlefish	0	1	1	2	0.02
Sciaenidae	Freshwater drum	46	65	58	169	1.37

Table 3-7. Fish species collected using electrofishing in Coffeeville Lake in 2006 as reported by Ricks et al. (2006) (Source: staff).

Family	Common name	Number caught	Total electrofishing effort (hours)	Relative abundance (number caught per unit of electrofishing effort)	Percent of relative abundance
Amiidae	Bowfin	12	1.1	10.9	3.35
Anguillidae	American eel	1	1.1	0.9	0.28
Atherinidae	Silverside species	1	1.1	0.9	0.28
Catostomidae	Blacktail redhorse	18	1.1	16.4	5.05
	Smallmouth buffalo	12	1.1	10.9	3.35
	Spotted sucker	7	1.1	6.4	1.97
Centrarchidae	Black crappie	2	1.1	1.8	0.55
	Bluegill	114	1.7	67.1	20.65
	Longear sunfish	2	1.1	1.8	0.55
	Largemouth bass	160	4.5	35.6	10.96
	Redear sunfish	12	1.1	10.9	3.35
	Spotted sunfish	1	1.1	0.9	0.28
	Warmouth	1	1.1	0.9	0.28
	White crappie	15	1.1	13.6	4.19
Clupeidae	Gizzard shad	101	3.0	33.7	10.37
	Threadfin shad	108	2.4	45.0	13.85
Cyprinidae	Shiner species	11	1.1	10.0	3.08

Family	Common name	Number caught	Total electrofishing effort (hours)	Relative abundance (number caught per unit of electrofishing effort)	Percent of relative abundance
Esocidae	Chain pickerel	2	1.1	1.8	0.55
Fundulidae	Bayou topminnow	1	1.1	0.9	0.28
	Topminnow species	1	1.1	0.9	0.28
Ictaluridae	Channel catfish	2	1.1	1.8	0.55
	Flathead catfish	2	1.1	1.8	0.55
Lepisosteidae	Spotted gar	40	1.1	36.4	11.20
	Longnose gar	1	1.1	0.9	0.28
Mugilidae	Striped mullet	12	1.1	10.9	3.35
Sciaenidae	Freshwater drum	2	1.1	1.8	0.55

Migratory Fish Species

Historically, the Tombigbee River provided habitat to fish species that migrated to and from the ocean to complete their life-cycle (known as diadromous species), which included Alabama sturgeon, Gulf sturgeon, Alabama shad, and migratory striped bass populations. Alabama sturgeon and Gulf sturgeon are federally listed as endangered and threatened, respectively. Alabama shad is listed as an Alabama Species of Greatest Conservation Need.

Alabama sturgeon may occur downstream of Coffeeville Lock and Dam (see section 3.3.4, *Threatened and Endangered Species* for additional discussion). Gulf sturgeon has not been reported near the project area since the 1970s (Boschung and Mayden, 2004), and Alabama Shad is considered extirpated from the Tombigbee River (Mettee et al., 1989). Gulf sturgeon are currently only found in the lower Tombigbee River downstream of Coffeeville Lock and Dam and in the lower Alabama River (Boschung and Mayden, 2004). Alabama shad is rare in the Mobile Basin, and its primary range is in short coastal rivers, which flow south from Alabama into Florida and then into the Gulf of Mexico (Boschung and Mayden, 2004).

The striped bass and hybrid striped bass populations in Demopolis Lake and Coffeeville Lake are stocked and do not migrate out to sea to spawn. Migratory populations of striped bass are not present because of the existence of multiple dams on the Tombigbee River that are without structures designed to pass fish.

American eels are the only diadromous species known to be present in the project area (table 3-7). American eels migrate out to sea to spawn. Although dams on the Tombigbee likely inhibit passage of eels upstream and downstream, American eels are remarkably adept at passing obstructions, and likely use lock systems to access habitats upstream and downstream of dams on the Tombigbee River.

Potadromous species, which migrate between freshwater habitats (i.e., spawning, wintering, nursery) are also currently present or were historically present in the project area. The list of potadromous species that may have historically been present, but have not recently been observed in the project area include mooneye (*Hiodon tergisus*) and chestnut lamprey. Boschung and Mayden (2004) suggest that mooneye is now extirpated throughout most of the Mobile Basin, and Mettee et al. (1996) provide no indication that chestnut lamprey have been recently observed near the project.

Skipjack herring is a potadromous species that currently occurs in Demopolis Lake (table 3-6), and potentially occurs downstream of the Demopolis Lock and Dam. This species will migrate to the tailwaters of dams to spawn in the spring (Mettee et al., 1996); and thus is capable of completing its life-cycle without passing upstream or downstream of dams.

Paddlefish is another potadromous species in the project vicinity. Paddlefish were not observed at high density in the habitats sampled by Slipke and Maceina (2006) (table 3-6).[80] However, a healthy, self-sustaining paddlefish population estimated at 3,541 individuals (95 percent confidence interval = 1,581 – 8,851) is present in Demopolis Lake (O'Keefe and Jackson, 2009). Based on the collection of larger (mostly greater than 31 inches) and older (mostly older than 6 years) paddlefish collected in gill nets, O'Keefe and Jackson (2009) determined that paddlefish in the Demopolis Lake population primarily use two bendways[81] (i.e., Twelvemile Bend and the lotic bendway) in the river that are separated by 41 miles.[82] Twelvemile Bend is about 9 miles upstream of Demopolis Lock and Dam and appears to primarily serve as wintering habitat for juveniles and females (O'Keefe and Jackson, 2009). The lotic bendway, which is a riverine environment, is about 50 miles upstream of Demopolis Lock and Dam and provides wintering habitat primarily for adult males. It also appears to serve as the primary spawning habitat for the population (O'Keefe and Jackson, 2009). Paddlefish in Demopolis Lake exhibit limited movement and site fidelity (O'Keefe and Jackson, 2009). Specifically, use of the main channel habitat is limited to high water periods during the spring spawning season, at which time paddlefish move between wintering and spawning habitats (O'Keefe, 2006).[83] Thus, evidence indicates that the paddlefish population in Demopolis Lake rarely uses the main channel habitat, primarily uses bendway habitat located at least 9 miles upstream of Demopolis Lake, and is sustained without the need to migrate upstream or downstream of Demopolis Lock and Dam.

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[80] Slipke and Maceina (2006) used electrofishing techniques to collect fish primarily in shallow water coves, thus paddlefish, which prefer deeper water, were an unlikely target in their sampling design.

[81] A bendway is a river meander created during the construction of the Tennessee-Tombigbee Waterway to shorten the travel distance for shipping traffic. Bendways are bypassed by shipping traffic.

[82] O'Keefe and Jackson (2009) used gill nets with mesh openings that were wide enough to capture larger and older paddlefish, but not designed to capture smaller and younger paddlefish. Thus, O'Keefe and Jackson's (2009) study was not designed, or able to determine the habitat use of smaller and younger paddlefish.

[83] Paddlefish in the Alabama River also rarely use main channel habitats except during spawning migrations, and primarily use backwater and oxbows (U-shaped river bends cut-off from the main channel during low flow) during the remainder of the year (Hoxmeier and DeVries, 1997).

Mussels

The freshwater mussel assemblage in the Tombigbee River was historically robust, and consisted of more than 40 species (Williams, 1982). However, following the construction of the Tennessee-Tombigbee Waterway, populations began to decline because of decreased flow, and increased water depth and sedimentation (Watters, 1999).

At the Demopolis Lock and Dam, freshwater mussels are currently present, as evident in recent surveys. In 2011, Birch Power conducted a qualitative[84] and quantitative[85] mussel survey downstream of the Demopolis Dam and located mussels on the chalk shelf below the dam, in the river channel 246 feet to 1,722 feet below the dam (proposed flow affected area), and 1.2 miles below the dam (downstream of tailrace) (AST Environmental, 2011).[86] A total of 13 species were identified during the survey, including the federally threatened inflated heelsplitter (discussed in section 3.3.4, *Threatened and Endangered Species*) (table 3-8). The vast majority of mussels were located in the proposed flow affected area, where sandbar 1 and part of sandbar 2 are located (tables 3-8 and 3-9), and where high quality mussel habitat (i.e., sand and gravel) is present. A total of eight mussel species occurred on sandbar 1, and ten mussel species occurred on sandbar 2, with the inflated heelsplitter occurring on both.[87] The Alabama orb and ebony shell had the highest densities among all mussels observed (table 3-9). Both the chalk shelf and the site downstream of the tailrace had little sand and gravel present, and thus limited habitat for mussels (AST Environmental, 2011). Nevertheless,

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[84] During the qualitative survey, divers completed tactile and visual searches in transects ranging from 164 to 656 feet in length.

[85] The quantitative survey required divers to examine a 29.5 foot by 39 foot grid in the vicinity of each inflated heelsplitter (federally threatened species) siting that occurred during the qualitative survey.

[86] For AST Environmental's (2011) qualitative survey, transects 1 through 4 correspond to the habitat downstream of the tailrace, transects 5 through 11 correspond to habitat in the proposed flow affected area, and transect 12 corresponds to habitat on the chalk shelf. For the quantitative survey, transects 1 and 2 correspond to the habitat downstream of the tailrace, transects 3 through 7 correspond to habitat in the proposed flow affected area, and transect 8 corresponds to habitat on the chalk shelf.

[87] Based on survey maps in AST Environmental's (2011) report, we assume that transects 8 and 9 of the qualitative survey, and 6 and 7 of the quantitative survey occurred on all or part of sandbar 1. We also assume that transects 5 and 6 of the qualitative survey, and 3 and 4 of the quantitative survey occurred on all or part of sandbar 2.

one inflated heelsplitter was observed on a sandbar located in a slough on the north side of the chalk shelf, where the tailrace channel would be constructed.

Table 3-8. Mussel species observed by AST Environmental (2011) during a qualitative survey below Demopolis Dam (Source: staff).

		Numbers observed		
Common name	Species name	Proposed flow affected area	Chalk shelf	Downstream of tailrace
Threeridge	*Amblema plicata*	7	0	0
Butterfly	*Ellipsaria lineolata*	2	0	0
Elephant-ear	*Elliptio crassidens*	1	0	0
Gulf pigtoe	*Fusconaia cerina*	25	0	0
Ebonyshell	*Fusconaia ebena*	94	0	0
Washboard	*Megalonaias nervosa*	12	0	0
Threehorn wartyback	*Obliquaria reflexa*	62	0	0
Bankclimber	*Plectomerus dombeyanus*	80	0	0
Bleufer	*Potamilus purpuratus*	1	0	0
Inflated heelsplitter	*Potamilus inflatus*	5	1	2
Southern mapleleaf	*Quadrula apiculata*	29	0	0
Alabama orb	*Quadrula asperata*	404	0	0
Fawnsfoot	*Truncilla donaciformis*	1	0	0

Table 3-9. Mussel species density determined during a quantitative survey below Demopolis Dam (Source: AST Environmental (2011) with staff modifications).

		Density (number per square meter)		
Common name	Species name	Proposed flow affected area	Chalk shelf	Downstream of tailrace
Gulf pigtoe	*Fusconaia cerina*	0.2	0	0
Ebonyshell	*Fusconaia ebena*	1.92	0	0
Washboard	*Megalonaias nervosa*	0.12	0	0
Threehorn wartyback	*Obliquaria reflexa*	0.84	0	0
Bankclimber	*Plectomerus dombeyanus*	0.28	0	0
Inflated heelsplitter	*Potamilus inflatus*	0.2	0	0
Southern mapleleaf	*Quadrula apiculata*	0.12	0	0
Alabama orb	*Quadrula asperata*	7.84	0	0

3.3.2.2 Environmental Effects

Water Quantity

Operational Effects on Water Quantity

Birch Power proposes to operate the project in run-of-release mode, which would not alter the quantity or timing of flows that pass the dam. However, when the project is operating in run-of-release mode, some (i.e., at inflows greater than 20,000 cfs and less than 110,000) or all (i.e., at inflows between 5,000 cfs and 20,000 cfs) inflow would pass through the powerhouse and into the tailrace, rather than spill into the proposed flow affected area. Thus, the project has the potential to alter hydraulic conditions downstream of the dam (e.g., discharge location, and flow velocity and direction).

Our Analysis

Following project construction, flows over the spillway and into the flow affected area and chalk shelf would be the same as under existing conditions when the project is not operating under Birch Power's proposal (i.e., at flows less than 5,000 cfs and greater than 110,000 cfs). Flows less than 5,000 cfs and greater than 110,000 cfs would occur about 31 percent of the time (figure 3-22).

No water would flow over the spillway and into the flow affected area or over the chalk shelf about 35.8 percent of the time based on historical flow data (i.e., inflows between 5,000 cfs and 20,000 cfs; figure 3-22). Under these conditions, water passing through the tailrace would bypass about 45 acres of riverine habitat (i.e., chalk shelf and main river channel), and bisect sandbar 2 at the tailrace outlet. Based on historical flow data from 1984 to 2015, the frequency of a no flow condition in the flow affected area is likely to occur most often during the period from May through August, when flows between 5,000 cfs and 20,000 cfs occur most frequently (between 41.9 and 48 percent of the time; figure 3-23). Further, the same historical data indicate that greater than 46 percent of no flow events (i.e., flows between 5,000 cfs and 20,000 cfs) during the months from May to October could last more than 2 days, and some events could last up to 28 days if the project operates continuously during those periods (figure 3-24 and 3-25).

When there is zero flow over the spillway, water depth in the flow affected area would be unchanged compared to existing conditions because depth in the flow affected area is controlled by downstream river hydraulics, including the relatively large 190,800 acre Coffeeville Lake. Thus, there would be no impact on the ability to navigate upstream.

However, when no water is flowing over the spillway, the proposed flow affected area would exhibit little or no water movement and would function as a pool about 35.8 percent of the time based on historical inflow data, and may only mix with tailrace discharge at its downstream end.[88] In contrast, under existing conditions, water flows nearly continuously[89] into the proposed flow affected area section of river.

As flows increase above 20,000 cfs during operation, water would begin to flow over the spillway and into the flow affected area. However, flow over the spillway and into the flow affected area would be 20,000 cfs less than inflow when the project is operating at an inflow between 20,000 cfs and 110,000 cfs, because 20,000 cfs of project inflow would pass through the powerhouse directly into the tailrace. Thus, under proposed operations, flow in the flow affected area would be greater than zero, but

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[88] No hydraulic modeling was conducted as part of Birch Power's application, thus there are no data available to analyze the potential for tailrace water to mix with water in the flow affected area. However, water exiting the tailrace is likely to continue moving downstream, and very little mixing is likely to occur with water in the flow affected area.

[89] When inflows are less than the maximum flow into the lock chamber (i.e., 10,000 to 11,000 cfs), filling the lock could cause no flow to pass over the spillway temporarily. However, because the lock can fill in about 8 to 9 minutes, the period of no flow over the spillway is likely minimal under existing conditions.

20,000 cfs less than under existing conditions, about 33.3 percent of the time (figure 3-22).

As discussed in section 3.3.2.1, *Aquatic Resources*, *Affected Environment*, under existing conditions, the chalk shelf between the excavated channels is dry until flows are 10,000 cfs or greater. During project operation, inflow would need to exceed 30,000 cfs before flow over the spillway would exceed the 10,000 cfs needed to create wetted conditions on the chalk shelf. During project operation, the chalk shelf would be dry about 75 percent of the time (i.e., flows less than 30,000 cfs; figure 3-22). Under existing conditions, the shelf is dry when flows are less than 10,000 cfs, which occurs 46 percent of the time. Thus, the probability of the shelf being dry would increase by 29 percent with hydropower operations. The changes discussed above could affect water quality, aquatic habitat, and aquatic organisms. These potential effects are discussed below in section 3.3.2.2, *Operational Effects on Water Quality* and section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*.

Generally, a Commission license for a non-federal project at a Corps dam requires a licensee to develop an operating plan and Memorandum of Agreement (MOA) with the Corps. Such an operating plan would describe the mode of hydropower operation, pool and flow regulation requirements for the Corps' project, and integration of operation of the hydroelectric facility into the Corps' emergency action plan. The MOA would describe the detailed operation of the project acceptable to the Corps and any restrictions needed to protect the purposes of the Corps' project for navigation. Development of an operation compliance monitoring plan would incorporate this MOA and include provisions for documenting compliance with any Corps' operating requirements. It would also establish a schedule for reporting project compliance/non-compliance during normal operation and emergencies. Operation of the Demopolis Project in accordance with an MOA with the Corps, and implementing an operation compliance monitoring plan would ensure run-of-release operation and minimize impacts on water levels, navigation, water quality, and aquatic resources.

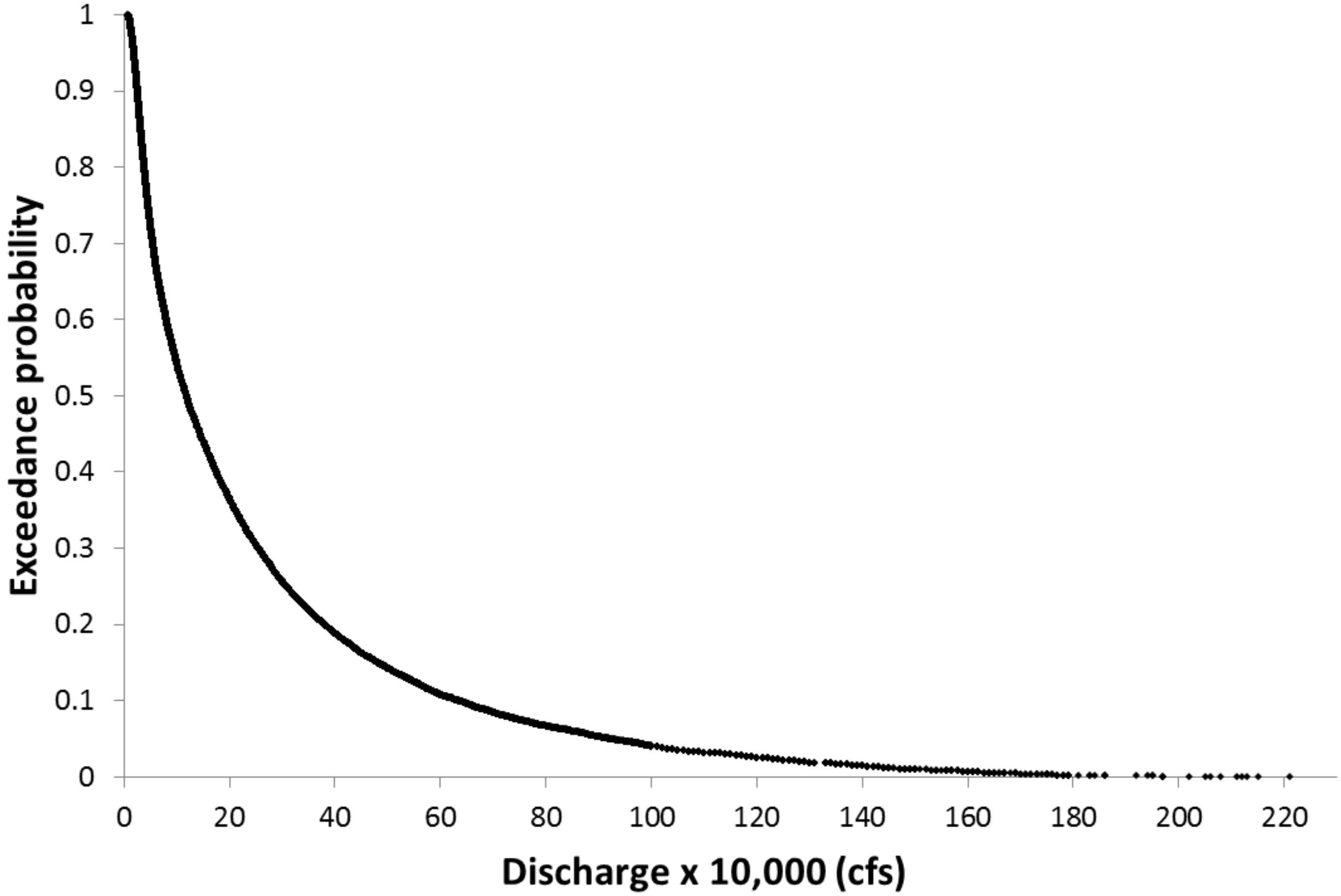

Figure 3-22. Flow duration curve for inflows at the Demopolis Dam USGS gauge number 02467000 from 1984 to 2016 (Source: staff).

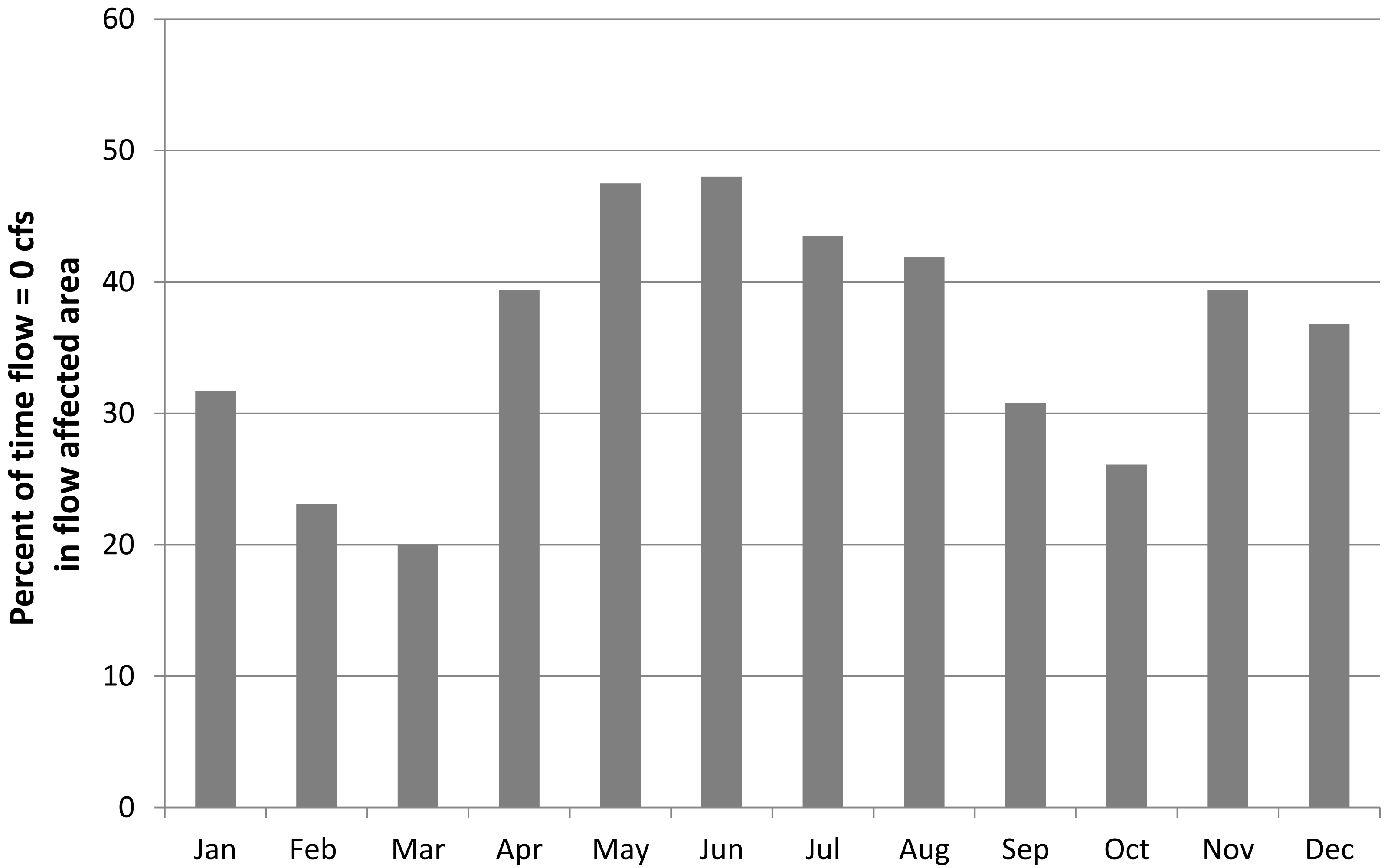

Figure 3-23. Percent of time there would be no flow in the proposed flow affected area (i.e., flow is between 5,000 cfs and 20,000 cfs) based on historical inflow at USGS gauge number 02467000 during project operation (Source: staff).

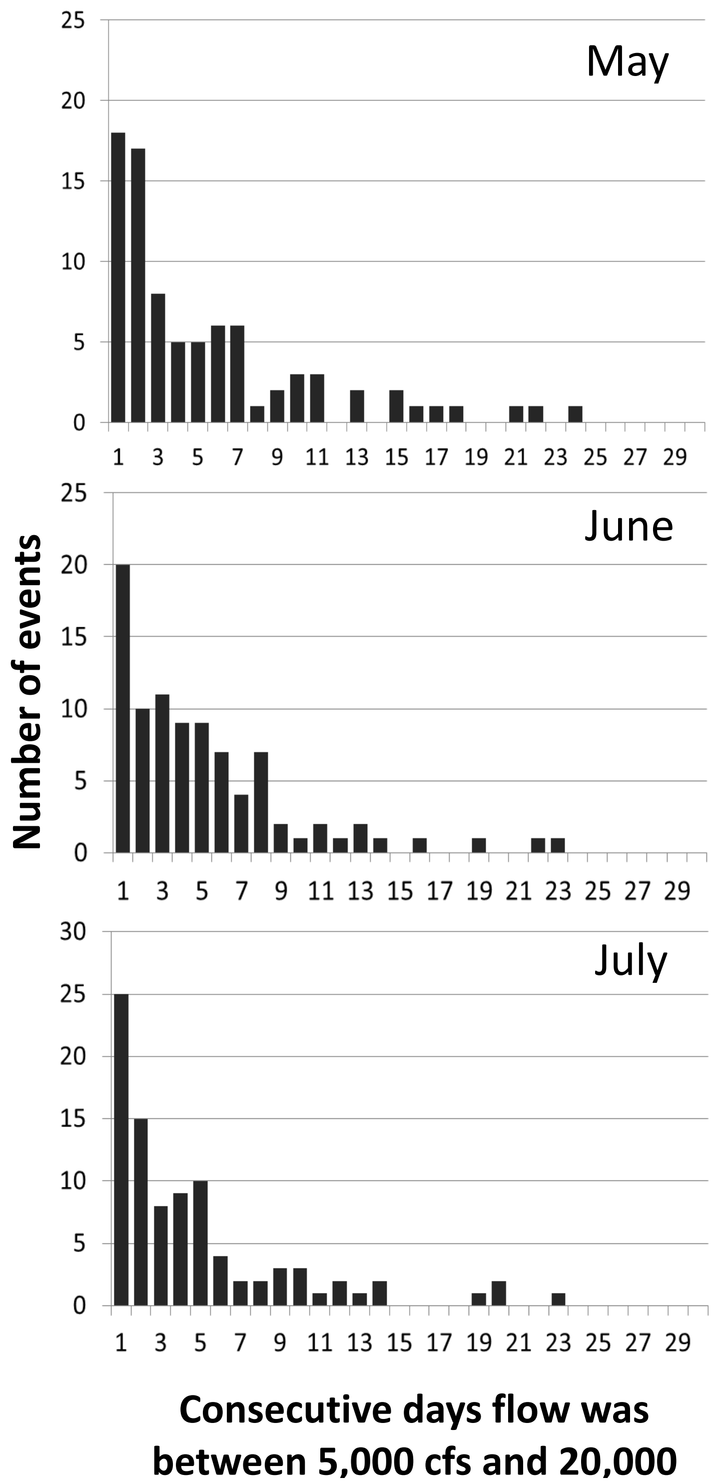

Figure 3-24. The frequency of consecutive day events that flow was between 5,000 cfs and 20,000 cfs (i.e., zero flow in the flow affected area under proposed operation) at Demopolis Dam based on historical flow at USGS gauge number 02467000 from 1984 to 2015 (Source: staff).

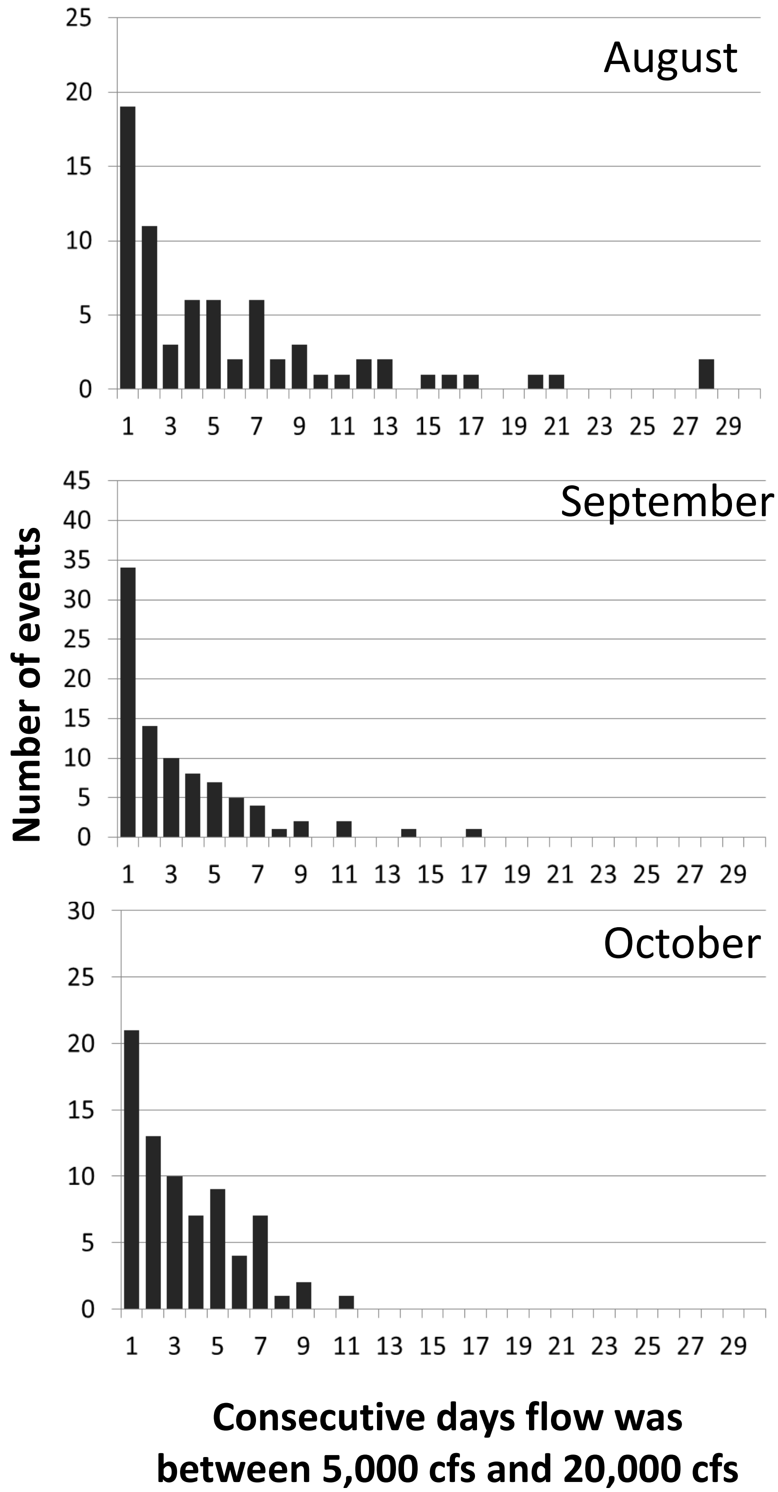

Figure 3-25. The frequency of consecutive day events that flow was between 5,000 cfs and 20,000 cfs (i.e., zero flow in the flow affected area under proposed operation) at Demopolis Dam based on historical inflow at USGS gauge number 02467000 from 1984 to 2015 (Source: staff).

Water Quality

Construction Effects on Water Quality

Proposed project facilities would require both in-water construction (cofferdam installation and removal, the placement of fill or other materials, retaining wall construction, and excavation of an intake channel and tailrace) associated with powerhouse construction, and some land disturbance (construction of the project access road, parking lot, and transmission line). Both in-water and ground (near water) construction activities may increase turbidity levels near the proposed project, depending on the effectiveness of proposed erosion and sedimentation control measures.

As discussed in section 3.3.1.2, *Construction Effects on Geology and Soils*, to minimize sedimentation and turbidity during construction, Birch Power proposes to develop and implement an erosion control plan that includes procedures and best management practices (BMPs) to minimize erosion, contain sediment, stabilize soils after construction is complete, and minimize and monitor turbidity. Birch Power also proposes, as part of the revegetation plan discussed in section 3.3.1.2, *Construction Effects on Geology and Soils*, to revegetate all disturbed areas at the end of construction. In addition, and as discussed in section 3.3.1.2, *Operational Effects on Geology and Soils*, Birch Power proposes, in the spoils disposal plan, to stabilize the spoils disposal area by constructing a retaining wall along the north side of the tailrace channel, and vegetating the top of the spoils area with native vegetation.

Construction of the proposed project would also require the use of an assortment of heavy equipment (e.g., bulldozers, dump trucks, and tractors). This equipment would require the use of diesel fuel and other hydrocarbons[90] (i.e., motor oil, hydraulic fluid, engine starting fluid, and other lubricants), which would be stored on site at a total volume estimated at over 1,600 gallons (Birch Power, 2013). The presence of these materials would create a risk of accidental release into the Tombigbee River, which could impair water quality and negatively affect aquatic organisms.

To minimize the potential accidental release of oil and hazardous substances into the Tombigbee River, Birch Power proposes to develop and implement an oil and hazardous substances plan that includes measures to prevent the accidental release of oil and hazardous substances during project construction and actions to take in the event that oil or hazardous substances are accidentally released during construction.

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[90] Hydrocarbons are chemical compounds made up of hydrogen and carbon and are the principal constituents of petroleum based products (i.e., crude oil, natural gas).

EPA recommends that diesel controls, cleaner fuel and cleaner construction practices be used for transportation, soil movement, or other construction activities, including: (1) strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and (2) use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, engine replacement, or newer, cleaner equipment.

Our Analysis

Excavation of the intake channel, tailrace channel, and powerhouse foundation will produce about 656,000 cubic yards of rock spoils that could enter the Tombigbee River and temporarily increase turbidity. Birch Power proposes to construct two temporary earth cofferdams downstream of Demopolis Dam, which would minimize sedimentation and turbidity associated with excavation of the intake channel, tailrace channel, and powerhouse foundation. Birch Power also proposes to construct a silt fence along any banks of the Tombigbee River that lie below ground disturbing activities, which would provide additional protection against increases in sedimentation and turbidity associated with excavation activities.

Turbidity could also temporarily increase during cofferdam installation and removal, as well as dewatering of the excavation site. However, these effects would be minimized by Birch Power's proposal to construct and remove cofferdams during the dry season when flows are low. Construction and removal of cofferdams during low flow would reduce sedimentation and associated turbidity. Birch Power also proposes to construct the cofferdams using Demopolis chalk located at the project site, which would minimize turbidity because it lacks fine sediments that can remain suspended in the water column for long periods. Further, Birch Power's proposal to filter any water pumped from the excavation sites before discharging to the river would minimize the potential release of sediments and increase in turbidity that might otherwise result from this activity.

Disturbance to adjacent lands along the shoreline, including road and parking lot construction, could also result in increased runoff, and lead to increased sedimentation and turbidity of the river. BMPs and measures such as silt fencing, and final site stabilization and revegetation (i.e., revegetation plan, as discussed more fully in section 3.3.3.2, *Project Effects on Botanical Resources*), as proposed by Birch Power, would minimize these effects.

As described previously in section 3.3.1.2, *Construction Effects on Geology and Soils*, an erosion control plan, would minimize construction-related effects on water quality. In addition, installing a turbidity meter upstream to record background turbidity, and downstream to record any turbidity increases associated with construction, would allow for immediate identification of turbidity deviations and would inform any actions needed to minimize effects on water quality.

As described previously in section 3.3.1.2, *Construction Effects on Geology and Soils*, and above, developing and implementing an erosion control plan, that at minimum, includes the measures proposed by Birch Power, would minimize erosion and sedimentation during in-water and upland construction activities, which would, in turn, minimize any increases in turbidity. Additionally, the development of the erosion control plan in consultation with resource agencies, would ensure that Birch Power would implement appropriate measures to protect water quality. Although some sedimentation and turbidity could still occur, implementing an erosion control plan, developed in consultation with resource agencies, would reduce any negative impacts on water quality.

Construction and the use of construction equipment could result in the release of hydrocarbons or other toxic substances into the Tombigbee River and air, which if released in substantial quantities, over a broad area, could adversely affect water quality, aquatic and terrestrial resources, and air quality. There is the potential for large quantities of liquid hydrocarbons to be spilled during construction, and thus protective measures to prevent spills from entering the Tombigbee River would be beneficial. However, given the relatively small construction footprint and short-term nature of proposed project construction, the benefits of requiring emission controls on construction equipment used at the project would be insignificant.

Birch Power proposes to develop and implement an oil and hazardous substances plan to prevent the release of hydrocarbons and other toxic substances into the Tombigbee River during construction. However, Birch Power's proposed plan does not include any specific measures. The use of commonly accepted and approved BMPs during construction would likely minimize risks to these resources.

For example, these BMPs could include: (1) intercepting and controlling accidental oil, gas, or electrical component releases through daily inspections and placing barriers around all mechanical and electrical equipment when not mobile; (2) removing and disposing of any spilled material in accordance with appropriate regulations; (3) storing fuel and other hydrocarbons in areas away from waterways; (4) appropriate primary and secondary containment for all fuel and hydrocarbons stored on site to reduce the likelihood of accidental releases that would directly or indirectly contaminate drainage ways; (5) treatment and infiltration of construction-associated wastewater back into the Tombigbee River only if adequate pretreatment results in water quality consistent with existing state water quality standards; and (6) provisions for emergency response, agency notification procedures, and the availability of onsite equipment to contain spills.

While there still would be some risk for accidental introduction of hydrocarbons into the Tombigbee River during the construction of the proposed project, the potential adverse effects of spills would be greatly reduced by implementing an appropriate oil and hazardous substances plan. The plan could also serve as a reference for procedures to be followed in the event of a hazardous materials spill, further minimizing the effects on water quality.

<u>Operational Effects on Water Quality in the Tailrace and Downstream from the Tailrace</u>

Currently all flow passes over the spillway, which aerates the water, contributing to high concentrations of DO downstream of the dam (see section 3.3.2.1, *Affected Environment, Water Quality*). Birch Power proposes to divert some (at inflows greater than 20,000 cfs and less than 110,000 cfs) or all (at inflows between 5,000 cfs and 20,000 cfs) inflow through the proposed powerhouse intakes and into a tailrace that would bypass about 1,750 foot-long section of river. Redirecting flow into the powerhouse could reduce the concentration of DO in the tailwaters and downstream of the project in two ways. First, less water would pass over the spillway. Under existing conditions all flow passes over the spillway, which aerates the water as it spills into the plunge pool at the base of the dam, contributing to high DO concentrations (of 7.0 mg/L to over 8.0 mg/L) in water downstream. Second, in order to direct water through the powerhouse, Birch Power would draw water from the forebay at a depth up to about 74 feet below the surface at normal pool (i.e., bottom of the intake; Birch Power, 2013). The DO concentration at that depth could be relatively low. Releasing this water to the tailrace could potentially reduce the downstream DO concentration. A combined, overall reduction in DO concentration downstream of the project could adversely affect aquatic species, including fish and freshwater mussels (e.g., reduced growth and spawning success), as well as the ability of downstream water users to protect water quality and aquatic resources.

Further, because the powerhouse intakes would be located in cooler and deeper water at the bottom of the intake channel, redirecting flow into the powerhouse could reduce or eliminate the amount of warm surface water that currently spills into the tailwaters (and proposed flow affected area) and downstream, and increase the amount cooler deeper water passing through the powerhouse, into the tailrace and downstream of the tailrace.

To reduce project effects on downstream water quality, Birch Power proposes the following measures which are included in the Water Quality Settlement,[91] but not in Alabama DEM's water quality certificate: (1) develop and implement a plan to completely shut off the project intake works to ensure that no flows run through the powerhouse when the hourly mean flow falls below 5,000 cfs, and resume operations only when the hourly mean flow of the Tombigbee River is at least 5,000 cfs (proposed license article 1); (2) install, operate, and maintain one or more permanent flow gauges meeting USGS standards to measure hourly mean flows upstream of the project (proposed license article 1);[92] and (3) monitor DO, water temperature, pH, and BOD from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam (proposed license article 3).[93] Birch Power would also implement the following measures required in Alabama DEM's water

[91] Birch Power filed the Water Quality Settlement with the Commission on August 15, 2016. WestRock was the only other signatory to the Water Quality Settlement, and recommends the same measures as proposed by Birch Power. Georgia-Pacific was not a party to the Water Quality Settlement; however, in comments filed August 15, 2016, it stated that it supported the Agreement in Principle to Develop a Water Quality Licensing Settlement Agreement for the Demopolis Lock and Dam Hydroelectric Project (Agreement in Principle), filed by Birch Power on April 14, 2016. Because the measures included in the Agreement in Principle are identical to those included in the Water Quality Settlement filed on August 15, 2016, we assume that Georgia-Pacific also supports the measures included in the Water Quality Settlement.

[92] Birch Power, in the Water Quality Settlement, does not specify the location of the flow gauges; however, Birch Power does specify that the plan to install gauges would include the location of USGS standard gauges, which by necessity, would need to be located upstream of the project. Therefore, we assume that the flow gauges proposed by Birch Power would be located upstream of the project.

[93] The water quality monitoring in Birch Power's proposed license article 3 would occur at up to 26 sampling sites at a frequency of once per two weeks, twice per week, or once every day, depending on the minimum DO concentration observed during sampling. Monitoring would occur on a once per two week basis between May 1 and November 30, downstream from the WestRock Demopolis Mill discharge point. The stream monitoring frequency would be increased to twice per week when the minimum DO concentration is less than 5.9 mg/L. The monitoring frequency would be increased to once every day when the minimum DO concentration is less than 5.2 mg/L.

quality certificate,[94] and proposed in the Water Quality Settlement, to protect water quality in the tailrace and downstream of the tailrace: (1) maintain DO in the project discharge at a concentration no less than 5.0 mg/L at all times, and a daily average DO concentration at RM 206 not be less than 6.5 mg/L, when the project is operating (condition 1);[95] (2) develop and implement measures to comply with the DO limitations through structural and/or operational modifications at the project, beginning at the initial turbine startup (condition 2);[96] (3) install and maintain a tailrace DO and water temperature monitoring device, and at the initiation of power generation, continuously record DO concentrations and water temperatures at 15-minute intervals during periods of generation following one continuous hour of generation all year long, to determine compliance with the requirement to maintain no less than 5.0 mg/L of DO in the tailrace (conditions 3, 5, 6); and (4) install and maintain the DO and water temperature monitoring device, and starting at the initiation of power generation, continuously record DO and temperature at no less than 15-minute intervals at all times throughout the year,

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[94] On September 29, 2016, Alabama DEM issued to Birch Power a water quality certification that included eight conditions to provide reasonable assurance that the discharge resulting from proposed project operations would not violate water quality standards. Conditions 1 through 6 of the certification are considered environmental measures and are described fully in section 2.2.7, *Modifications to Applicant's Proposal – Mandatory Conditions*.

[95] In an amendment to the Water Quality Settlement filed by WestRock on July 31, 2017 and signed by Birch Power, the daily average DO at RM 206 would be calculated by totaling the DO value of all individual measurements during each calendar day (i.e., 12:00am through 11:59pm), and then dividing by the number of individual measurements during the calendar day.

[96] Birch Power specifically proposes, in the Water Quality Settlement (proposed license article 2), to develop and implement a plan to install, operate, and maintain an oxygenation system designed to meet the DO standards required under Alabama DEM's certification 1. Although Birch Power's proposal is more specific than Alabama DEM's requirements in condition 2, both aim to provide measures that would allow the project to meet the DO limits required in condition 1. Therefore, both Alabama DEM's condition 2 and Birch Power's proposed license article 2 are considered analogous measures that would be equally protective of aquatic resources. Consequently, we will analyze condition 2 both as Alabama DEM's certification condition and Birch Power's proposed measure, and will not analyze Birch Power's proposed license article 2 as a separate proposed measure.

to determine compliance with the proposed requirement to maintain no less than a 6.5 mg/L mean daily average DO concentration at RM 206 (conditions 4, 5, 6).

In comments on the draft EA, EPA recommends that DO in the tailrace and downstream of the tailrace (RM 206) meet the Alabama water quality criteria of 5.0 mg/L at all times. EPA interprets the language "at all times" to mean all times from January 1 through December 31, including during periods of generation and non-generation. EPA also recommends that Birch Power monitor DO and temperature in the tailrace and downstream of the tailrace at RM 206, during generation and non-generation.

Our Analysis

<u>Operational Effects on DO in the Tailrace and Downstream of the Tailrace</u>

Project operation could reduce the DO concentration downstream below existing levels, possibly below state standards. As discussed above, the shift from releasing water over the dam to releasing water through the powerhouse and tailrace could lead to a lower DO concentration downstream of the project.

Based on the studies discussed in section 3.3.2.2, *Fish and Mussel Habitat in the Flow Affected Area*, DO concentrations no less than 5.0 mg/L are optimal for both fish and mussels. Thus, Alabama DEM's certification condition 1, which would require Birch Power to maintain DO at no less than 5.0 mg/L at all times in the project discharge, and maintain daily average DO of no less than 6.5 mg/L downstream of the tailrace,[97] would be protective of aquatic resources in the tailrace and downstream of the tailrace. In addition, calculating the daily average DO at RM 206, as proposed by Birch Power, would provide an appropriate estimation of the daily average DO. Further, Alabama DEM's certification condition 2 would require Birch Power to develop and implement measures to comply with the DO limitations in condition 1, through structural and/or operational modifications at the project. Because project operation would be likely cause DO concentrations downstream of the project to decline below existing levels and possibly to levels that would be stressful to aquatic organisms, condition 2 would be beneficial.

EPA recommends that DO in the tailrace and at RM 206 meet the Alabama water quality criteria of 5.0 mg/L at all times during generation and non-generation. The water

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[97] Condition 1 states that Birch Power is required to maintain a daily average DO of no less than 6.5 mg/L at RM 206 when the project is operating. Thus, Birch Power would not be required to maintain a daily average DO at RM 206 when water is not passing through the turbines.

quality criteria state that DO concentrations shall not be less than 5.0 mg/L at all times. However, with respect to new hydropower projects, such as the proposed Demopolis Project, the criteria are more specific and state that "All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5.0 mg/L dissolved oxygen where practicable and technologically possible."[98] This language indicates that Birch Power would need to maintain DO at 5.0 mg/L in the project's discharge. Because the project would only be discharging during periods of generation, the criteria only applies to periods of generation, and not periods of non-generation. This water quality criteria requirement is consistent with Birch Power's proposal and Alabama DEM's certification requirement in condition 1. Further, when the project is not operating, all inflow would spill over the dam, as it does under existing conditions. Because no water would pass through the powerhouse, any changes in DO, including declines in DO below 5.0 mg/L, would not be attributable to project operation. Thus, there is no clear justification for requiring Birch Power to meet a DO concentration criteria of 5.0 mg/L for causes not attributable to project generation.

Finally, Alabama DEM's requirements, in conditions 3, 4, and 5, for Birch Power to install monitoring devices to record DO concentration and temperature in the tailrace and downstream of the tailrace all year long at the initiation of power generation, would provide the data to determine whether the project, from the beginning of operation, is maintaining DO at the protective limits required by the certification. Further, maintenance and calibration of the monitoring devices, as required in condition 6, would ensure accurate data collection, which is necessary to determine whether DO is being maintained at protective levels. Thus, monitoring DO through the use of properly maintained and calibrated devices, as required in Alabama DEM's certification, would be beneficial, especially during project operation.

Alabama DEM's condition 3 would require monitoring during generation following one continuous hour of generation, but would not require monitoring in the tailrace when the project is not operating, as recommended by EPA. As discussed above, when the project stops generating, all inflow would pass over the spillway and oxygenate the water in the tailwaters to DO concentrations at or above state standards. Thus, any project effects on DO in the tailrace would be quickly reversed by the oxygenated water spilling over the dam, and the benefit of a monitor in the tailrace during non-generation would be negligible. Further, the primary purpose of the monitor in the tailrace, would be to determine whether the project is discharging water with a DO concentration of no

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[98] Alabama DEM Administrative Code r. 335-6-10-.09.

less than 5.0 mg/L during generation.[99] Thus, there would be no benefit to monitoring during non-generation, because the project would not affect DO during non-generation.

In contrast to condition 3, condition 4 would require monitoring even when the project is not operating. Lower DO downstream of the tailrace during operation could last for an unknown period of time after generation stops. While oxygenation would occur immediately upon the initiation of spill over the dam, the time that it would require to reach habitat further downstream, including river mile 206, where the WestRock mill discharges effluent is not known. Thus, the project could affect DO downstream of the tailrace after generation stops, and for an unknown period of time. Alabama DEM's requirement in condition 4 to continuously record DO at all times at river mile 206 would ensure identification and mitigation (if necessary) of project effects on DO that could occur after generation stops.

Alabama DEM's certification conditions 3 and 4 would provide needed monitoring adequate for determining whether the project is maintaining DO concentrations at or above the required limits in the tailrace and downstream of the tailrace. Consequently, Birch Power's proposal to monitor water quality (i.e., DO, water temperature, pH, and BOD) from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam is not needed for the purpose of determining whether Birch Power is maintaining DO concentrations at or above the required limits. Further, as stated in the Water Quality Settlement, the purpose of this measure is for Birch Power to assume complete pecuniary responsibility for all ambient water quality sampling in the Tombigbee River during the period of May 1 through November 30 each year, as required in WestRock's NPDES permit for the Demopolis Mill (also clarified in a letter filed by Birch Power on September 12, 2016). Birch Power has agreed to assume this responsibility because project operation could reduce DO below existing conditions downstream of the project and require additional water quality sampling under the NPDES permit.[100] Nevertheless, the sampling would not be needed to determine whether the project is in compliance with the DO requirements in Alabama DEM's condition 1, and therefore, would not be needed to help protect aquatic resources downstream of the project. In addition, because the project would not contribute organic matter that would affect BOD, and because there is no indication that the project would alter water temperature or pH in a way that would negatively affect aquatic resources during operation, there is no need to monitor these variables.

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[99] Alabama DEM's certification condition 3 states that the tailrace monitor would be used to determine compliance with condition 1.

[100] See letter filed by Birch Power on September 12, 2016.

During low flow conditions, Birch Power may have difficulty maintaining required DO concentrations because, during low flow periods, which usually occur during warm summer months, water temperature can increase rapidly, which reduces the oxygen solubility in water, and increases the biological consumption of oxygen. Low flows also result in reduced aeration. Under these conditions, Birch Power may not be able to maintain DO at the proposed and required limits, even with an oxygenation system. Birch Power proposes to shut down project operations when hourly mean flow falls below 5,000 cfs. Flows less than 5,000 cfs are exceeded 72 percent of the time in the Tombigbee River at Demopolis Lock and Dam. Thus, flows less than 5,000 cfs could represent the type of low flows that would produce DO concentrations that Birch Power would have difficulty managing even with an oxygenation system. Consequently, Birch Power's proposal to shut the project down when hourly mean flow falls below 5,000 cfs would reduce the potential for DO concentrations to fall below Alabama DEM's requirements in certification condition 1, and would protect aquatic resources in the tailrace and downstream from the tailrace. Further, determining when hourly mean flow falls below 5,000 cfs would require the installation of at least one flow gauge at the project, as proposed by Birch Power, because there are no existing flow gauges at the project. In addition, Birch Power's proposal to install flow gauges that meet USGS standards would be appropriate for ensuring accurate inflow measurements and timely operational shutdown when hourly mean flow declines below 5,000 cfs.

Operational Effects on Water Temperature in Tailrace and Downstream of Tailrace

Under existing conditions, warm surface water spills over the dam to downstream waters, which leads to the tailwater temperature being very similar, to slightly cooler than the surface waters upstream of the dam (see section 3.3.2.1, *Affected Environment, Water Quality*). During project operation, some (at inflows greater than 20,000 cfs and up to 110,000 cfs) or all (at inflows between 5,000 cfs and 20,000 cfs) inflow would stop spilling over the dam as warmer surface waters. Instead, the warmer surface water would be replaced by deep, cool water that would be drawn through the powerhouse and into tailrace and downstream of the tailrace. As discussed in section 3.3.2.2, *Affected Environment, Water Quality*, the deeper water in the forebay is about 1.0° F cooler (7-day average) than surface water in the forebay and 0.5° F cooler (7-day average) than surface and deep water in the tailwaters. Thus, during project operation, the discharge of cooler water from the powerhouse is likely to cause water temperatures in the tailrace and downstream of the tailrace to be slightly cooler than under existing conditions. Because the 7-day average water temperatures are below the 90° F state standard in the tailwaters and just upstream of the WestRock discharge under existing conditions, the discharge of cooler water during project operation would help to keep the waters in the tailrace and downstream of the tailrace within state standards for water temperature, which would be beneficial to aquatic resources in the tailrace and downstream of the tailrace. Although project operation is unlikely to have any negative effects on water temperature in the tailrace and downstream of the tailrace, Alabama DEM's certification conditions 3 and 4 require Birch Power to monitor water temperature in the tailrace and downstream of the tailrace, and this would help to determine any potential negative project effects of operation.

Operational Effects on Water Quality in the Flow Affected Area

As discussed above, the majority of inflow currently spills over the dam most of the time,[101] creating water quality conditions (i.e., DO concentration and water temperature) in the tailwater that meet state standards, even at low flows (around 5,000 cfs) during the summer. However, during proposed project operations, there would be no water, or a reduction in water flowing over the dam to the flow affected area and chalk shelf. Unlike the water passing over the spillway, the water passing through the powerhouse and tailrace would be discharged downstream of the flow affected area and chalk shelf. The reduction or elimination of flow over the dam could negatively affect water quality in these areas. Birch Power does not propose any measures to mitigate the changes in water quality that could occur in the flow affected area and chalk shelf resulting from project operation.

In comments filed on July 28, 2017, EPA recommends that Birch Power collect other information, such as gauge records, or visual observations of no flow or pools to provide information on the physical condition of the flow affected area and demonstrate whether the designated use[102] is impaired.

Our Analysis

Project operation could reduce DO in the flow affected area and chalk shelf below existing concentrations (7.0 mg/L to over 8.0 mg/L) and possibly below the 5.0 mg/L state standard. Specifically, when no water is flowing over the spillway during project operation, the proposed flow affected area would exhibit little or no water movement and would function as a pool about 35.8 percent of the time, and only mix with tailrace discharge at its downstream end (see section 3.3.2.2, *Operational Effects on Water Quantity*). Without water spilling over the dam, there would be no aeration caused by plunging water or flow through the flow affected area. Both aeration and flow contribute

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[101] Inflow is also used to fill the lock when it is needed for navigation.

[102] The waters in the flow affected area have a designated use classification of "fish and wildlife". The best usage of waters in with a "fish and wildlife" classification include fishing, propagation of fish, aquatic life, and wildlife, and any usage except swimming and water-contact sports or as a source of water supply for drinking or food processing purposes (Alabama DEM Administrative Code r. 335-6-11-.09).

to the high DO concentrations that currently exist in the tailwaters. The removal of spill and associated aeration under proposed operations would most certainly result in reduced DO in the proposed flow affected area and chalk shelf. Further, the absence of flowing water in the flow affected area would likely lead to stagnation, and additional loss of aeration that would otherwise be driven by the motion of the flowing water. In addition, stagnation in the flow affected area combined with solar heating, could cause water temperatures in the flow affected area to increase above current levels and state standards. Warmer temperatures decrease oxygen solubility in water, while at the same time increasing the rate at which DO is removed from the water column during decomposition of organic matter present in riverbed sediments and the open water.

As discussed in section 3.3.2.2, *Operational Effects on Water Quantity*, under proposed operations, no flow conditions could occur in the flow affected area between 41.9 and 48 percent of the time during warm summer months (May through August; figure 3-23), and no flow events lasting more than 1 day could occur, on average, at least once per month during the period from May through October.[103] Although the extent to which DO would decline in the flow affected area would not be known without post-operation monitoring, it is highly likely that DO concentrations in the proposed flow affected area would be lower than under existing conditions, and there is a possibility that DO could decline below state standards, which would create stressful conditions for aquatic resources.

As flows increase above 20,000 cfs during proposed operation, water would begin to flow over the spillway and into the flow affected area. However, flow over the spillway and into the flow affected area would be 20,000 cfs less than inflow (and existing conditions) when the project is operating at inflows greater 20,000 cfs and less than 110,000 cfs (project shuts down). Under these conditions, flows in the flow affected area would be greater than zero, but 20,000 cfs less than under existing conditions about 33.3 percent of the time (figure 3-22). With some water spilling over the dam at flows between 20,000 cfs and 110,000 cfs, there would some aeration caused by plunging water and some flow through the flow affected area. The resumption of some flow into the flow affected area would introduce some aeration and prevent stagnation in the flow affected area. Therefore, DO concentrations would likely increase and water temperatures would likely decrease relative to those occurring when there is no spill.

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[103] The total number of events lasting more than 1 day during the month of October from 1984 to 2015 was 54 events (figure 3-25). In other words, there were 54 events in the month of October during a 32 year time period (1984 to 2015), which equals an average of 1.7 events during the month of October. The number of events lasting more than 1 day was greater than 54 for all other months during the same time period (1984 to 2015; figure 3-24 and 3-25).

However, DO is still likely to be lower and water temperature is likely to be higher than under existing conditions.

At flows greater than 110,000 cfs, the project would shut down and the amount of water flowing over the dam and into the flow affected area would be the same as existing conditions. Therefore, there would no changes to water quality.

Under proposed operation, at flows between 5,000 and 110,000 cfs, flows in the flow affected area would either be eliminated or reduced relative to existing conditions, causing a reduction of DO and an increase in water temperature in the flow affected area. As discussed in more fully below in section 3.3.2.2, *Fish and Mussel Habitat in the Flow Affected Area*, these conditions could have negative consequences for fish and especially less mobile mussels that occur in this habitat. Birch Power does not propose any measures to minimize operational effects on water quality in the flow affected area. Although Birch Power does propose to maintain DO concentrations of no less than 5.0 mg/L in the project's tailrace all year during operation and ensure that the mean daily DO levels downstream of the tailrace are no less than 6.5 mg/L, there is no certainty that these oxygenated waters present in the tailrace and downstream of the flow affected area, would mix with water in the flow affected area. Post-licensing water quality monitoring in the flow affected area during warm and low flow months (i.e., May to September) would help determine whether project operations negatively affect water quality in the flow affected area, and would inform the need for additional measures to reduce project effects on water quality, if necessary.

As indicated above, reduced flows in the flow affected area could cause water quality to degrade compared to existing conditions. In addition, and as discussed in more detail below in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*, reduced flows alone, and independent of water quality, could negatively affect the dispersal of mussel glochidia (i.e., mussel larvae), and thereby reduce mussel reproduction for those mussels located in the flow affected area. Thus, flow mitigation may be necessary to improve water quality and flow conditions for mussels. Birch Power could estimate flows in the flow affected area concurrent (i.e., May to September) with the water quality monitoring discussed above to provide a time-series of data in the flow affected area. The data could be used to determine an appropriate level of flow, should it be determined that flow mitigation is needed to protect water quality and/or flow conditions for mussels. Birch Power could estimate flows in the flow affected area by using operational records of flows that discharge to the tailrace and data from the proposed flow gauge located upstream of the project to determine inflows to the project. The difference between inflows and flows discharging to the tailrace would provide an estimate of flows (i.e., spill) passing through the flow affected area.

Construction Effects on Aquatic Organisms and Habitat

Construction and Excavation

Construction activities could adversely affect resident fish, mussels, and macroinvertebrates through temporary displacement and mortality associated with cofferdam construction and dewatering, excavation in the river channel, and erosion and runoff from adjacent disturbed areas. Increases in suspended sediment could reduce aquatic habitat suitability downstream of the construction area, clog the gills of freshwater mussels, and bury juvenile mussels.

As described in detail in section 3.3.1.2, *Construction Effects on Geology and Soils*, Birch Power proposes to develop an erosion control plan to minimize effects of in-water excavation and runoff from adjacent lands. Cofferdams would isolate the section of the river to be dewatered to facilitate excavation of the intake and tailrace as well as construction of the powerhouse.

In addition, during tailrace construction, Birch Power would permanently remove about 1.4 acres of sandbar 2 (figure 3-26), which currently exists along the north side of the main river channel where the tailrace would merge with the river. Sandbar 2 provides habitat for the federally threatened inflated heelsplitter mussel, as well as at least nine other mussel species. To mitigate the loss of this habitat, Birch Power proposes to implement a mussel relocation plan that includes measures to: (1) conduct pre-construction mussel surveys at habitats disturbed by construction, prior to any sandbar disturbing activities (i.e., intake channel, tailrace channel and fishing platform construction, post-license tailrace dredging) and relocate any inflated heelsplitters discovered during the surveys to the sandbar development area, or existing habitat unaffected by project construction; (2) remove the minimum amount (about 1.4 acres) of inflated heelsplitter mussel sandbar habitat during tailrace construction; (3) redistribute sandbar material dredged during tailrace construction to the northwest side of the tailrace channel to develop about 1.4 acres of new sandbar habitat (the sandbar development area); (4) develop additional sandbar habitat to the north of the sandbar development area using appropriate excavation spoils from project construction;[104] (5) dredge any portions of the sandbar development area that constrict powerhouse discharges during maintenance of the tailrace channel, and add appropriate dredged material to the sandbar development area; (6) conduct post-construction mussel surveys annually for the first 3

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[104] Birch Power states in the mussel relocation plan that the amount of additional sandbar habitat that could be developed is unknown because the composition of the excavation spoils is unknown, but the area available for additional habitat is about 1.7 acres.

years after tailrace construction to determine relocation success, identify areas for future relocations, document use of the sandbar development area by inflated heelsplitters, and document physical changes in the sandbar development area;[105] and (7) develop alternative mitigation measures, in consultation with FWS, if the measures described above are unable to maintain the sandbar development area, or if inflated heelsplitters do not use the new habitat.

In condition 2 of the BO for the inflated heelsplitter mussel, FWS requires that Birch Power:

- Provide a copy of the plan to the FWS for review and concurrence, and to the Commission and the Corps, 2 weeks prior to the mussel collection and relocation;[106]
- Conduct pre-construction surveys in the action area (figure 3-27)[107] to locate mussels for relocation;[108]

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[105] In the mussel relocation plan, Birch Power states that the mussel surveys would occur on sandbar 1, sandbar 2, the new sandbar development area, and any habitat that might be found in the immediate vicinity of the proposed fishing platform location. Although sandbar 1 would not be directly affected by project construction, some mussels relocated from sandbar 2 could be placed on sandbar 1. Thus, there is a potential need to survey sandbar 1 after project construction.

[106] This provision of FWS's condition 2 is administrative in nature and not an environmental measure. Accordingly, we do not analyze this provision in the final EA, but we do comment on this provision in Appendix A.

[107] The action area is defined in the BO (see Appendix B).

[108] In the BO, FWS states that surveys would be conducted no more than 30 days prior to construction for federally listed threatened or endangered species. FWS does not specifically state that the pre-construction surveys would occur in the action area, or that the survey would target all mussels. However, FWS does state in a subsequent paragraph of the BO that *all mussels* found within the *action area* would be collected and relocated. Thus, we assume that FWS is requiring that pre-construction surveys be conducted to locate *all mussels* in the *action area*.

- Conduct habitat suitability surveys for the mussel relocations that would occur below the dam and outside the action area;[109]
- Begin all pre-construction surveys and relocations no more than 30 days prior to the construction/dredging activities, and if construction/dredging is not initiated within the required 30 days, the action area[110] must be resurveyed and mussels relocated prior to any of the permitted instream construction;
- Identify the survey methods and the proposed relocation site;
- Collect all mussels found within the action area and relocate them to areas of suitable habitat just below the dam;[111]
- Conduct mussel relocation efforts with divers that have valid state and federal permits, and are qualified and experienced in handling mussels;[112]
- Identify, count, inventory, and photograph all mussels collected for relocation;
- Minimize stress to mussels at all times during relocation, by: (1) keeping mussels in mesh bags in site water prior to removal, or in a moist and cool environment by covering with a wet blanket or sack, and out of direct sunlight; and (2) never allowing mussels to be removed from a moist, cool environment for more than 10 minutes;
- Hand-place all relocated mussels within relocation sites in suitable habitat and in a natural position, and precautions should be taken to ensure each mussel is firmly embedded and stabilized in the substrate;

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[109] In the BO, FWS does not state where the habitat suitability surveys would occur. However, we assume that the surveys would occur in potential relocation habitat for mussels. In a subsequent paragraph of the BO, FWS states that all mussels within the action area would be relocated to areas of suitable habitat just below the dam. Thus, we assume that the habitat suitability surveys would occur below the dam and outside the action area, where mussels would be relocated.

[110] In the BO, FWS states that the *project area* must be resurveyed. However, based on our assumptions in previous footnotes, we interpret FWS as referring to the *action area* and not the *project area*.

[111] As indicated above, we assume that FWS is requiring that areas of suitable relocation habitat be identified outside the action area.

[112] FWS's terms and conditions also require that copies of the permits be attached to the mussel relocation plan.

- Prepare a report and file with the FWS within 90 days following the completion of all mussel relocation work to include: (1) a description of the efforts, habitat, problems and solutions, results, and conclusions of the relocation effort; and (2) maps with coordinates should be included, showing the work and relocation areas; and
- Conduct four post-construction surveys of the relocation area and the construction/dredge area (to document re-establishment of mussels) that begin 1 year post construction and then every 3 years thereafter.

Our Analysis

As discussed in section 3.3.1.2, *Construction Effects on Geology and Soils*, most of the alluvial material (which is still present above the high water mark) has been previously eroded from the river channel and overbank shelf portion of the project area, and is underlain by the Demopolis chalk bedrock. As a result, and because the construction footprint would be close to the dam, there is little potential for in-river construction to suspend and redistribute large amounts of sediment. Furthermore, cofferdams would isolate and dewater the in-river areas where the intake channel, powerhouse, and tailrace would be constructed. Therefore, while some sediment may be suspended during cofferdam installation and removal, the cofferdams themselves would isolate much of the excavation activity and potentially contaminated sediment from the river. As discussed previously in section 3.3.2.2 *Construction Effects on Water Quality*, installing a turbidity meter upstream to record background turbidity, and downstream to record any turbidity increases associated with construction, as part of the proposed erosion control plan, would allow for immediate identification of turbidity deviations and would inform any actions needed to minimize effects on water quality.

Fish species in the construction areas may be displaced by cofferdam construction; boat and barge traffic associated with construction; and/or increased turbidity associated with cofferdam installation, dewatering of the construction area, and excavation of the riverbed. However, any displacement would be temporary and unlikely to have long-term effects on aquatic organisms. Some fish stranding and mortality within the cofferdam construction area is possible, but would be minimal because most fish would likely avoid the affected area during cofferdam installation and prior to cofferdam closure, because of noise and vibrations associated with in-water construction activities.

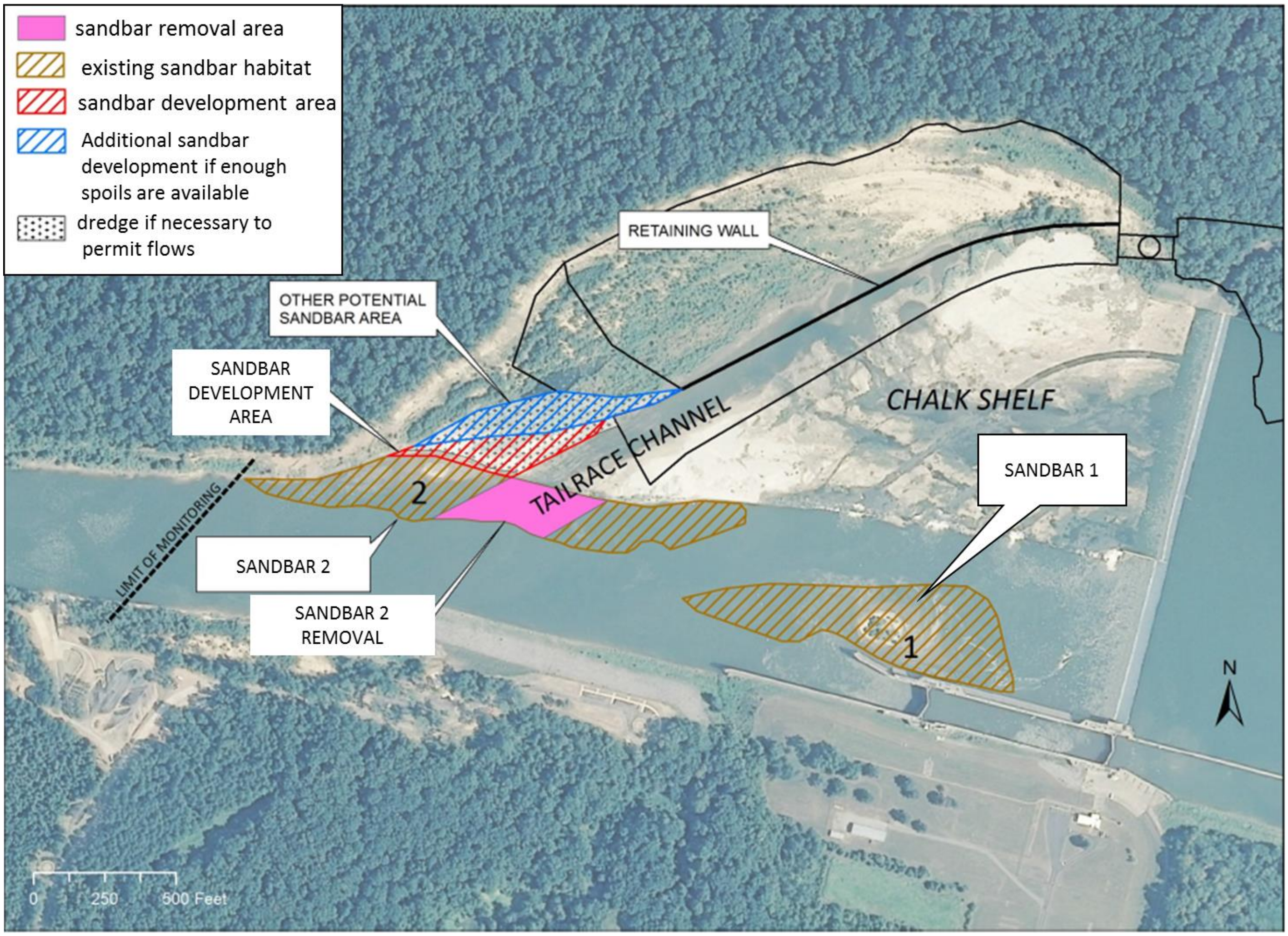

Figure 3-26. Demopolis Project area map showing the sandbar development area relative to existing sandbars and the tailrace.

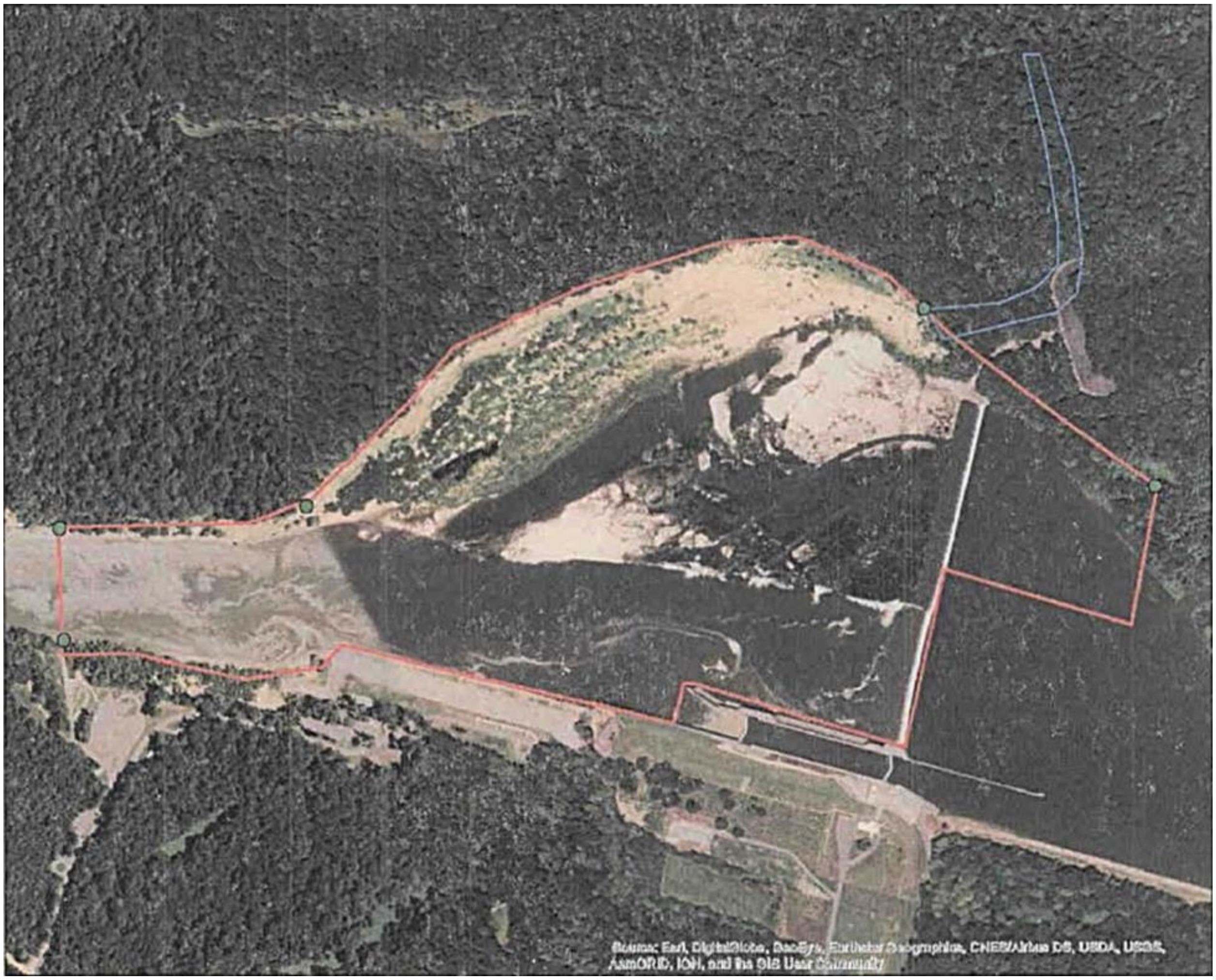

Figure 3-27. The approximately 140 acres the FWS identified as the action area (outlined in red) for the proposed Demopolis Lock and Dam Hydroelectric Project (Source: FWS).

During mussel surveys conducted downstream of Demopolis Dam in 2011, Birch Power documented several mussels inside or immediately adjacent to the proposed construction area footprint downstream of the dam. As discussed in section 3.3.2.1, *Affected Environment, Mussels,* most mussels occurred in the flow affected area on sand and gravel habitat, where two large sandbars exist (tables 3-8 and 3-9). Sandbar 1 is located outside the construction footprint, and would be protected from dredged sediments through the use of cofferdams. However, during construction, about 1.4 acres or 23 percent[113] of sandbar 2 would be removed to provide an unobstructed flow path at the end of the tailrace channel consistent with hydraulic requirements. In addition, excavation of the project intake and tailrace would involve the use of heavy machinery that would crush, or displace to the project spoils, any mussels in the construction footprint. Mussels adjacent to the construction footprint would also likely be affected by excavation machinery, and by the installation and removal of cofferdams, which could bury mussels and cause temporary increases in suspended sediment and turbidity. To minimize the effects of project construction described above, Birch Power proposes and FWS's BO would require[114] conducting mussel surveys in areas that would be affected by construction activity and relocating mussels identified in these areas to more suitable habitat. This pre-construction survey and relocation approach would minimize the effects of construction on mussels by removing them from the direct effects of project construction. Nevertheless, there are aspects of Birch Power's proposed approach (i.e., mussel relocation plan) to relocating mussels that would provide less benefit than the requirements in FWS's BO.

One reason Birch Power's proposed mussel relocation plan would provide less benefit is inadequate is because it does not include a provision designating when pre-construction mussel surveys should be conducted. In contrast, FWS's BO requires that Birch Power begin all pre-construction surveys and relocations no more than 30 days prior to the construction/dredging activities, and if construction/dredging is not initiated within the required 30 days, the action area must be resurveyed and mussels relocated prior to any instream construction. Conducting surveys and relocations within this timeframe would minimize the time period between mussel relocation and construction, and thereby minimize the amount of time that mussels would have to recolonize the construction area before the area is closed off by cofferdams. Thus, mussels are less likely to be impacted by construction if the pre-construction surveys are conducted within the timeframe required by FWS's BO.

Another reason Birch Power's proposed mussel relocation plan would provide less benefit is because it does not include a provision to collect and relocate unlisted mussel species (i.e., not federally or state-listed for protection) that might be found during the

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[113] In a letter filed on January 21, 2014, Birch Power indicated that the removal of 1.4 acres of sandbar 2 would correspond to about 23 percent of the sandbar, based on Corps bathymetry data.

[114] FWS specifically requires surveying for and relocating mussels from the action area. The action area would include the areas disturbed by construction activity and the areas that would be affected by project operations (discussed in detail in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat* and section 3.3.4.2, *Inflated Heelsplitter*.

proposed pre-construction mussel surveys. As discussed in section 3.3.2.1, *Mussels*, 11 unlisted mussel species were observed in habitat immediately downstream of the dam, and any of these species or others would likely be affected by project construction if they are present in areas that would be disturbed by construction. Relocating all mussel species from areas that would be disturbed by construction activities would help to minimize the effects of project construction on the affected mussel community.

Birch Power's mussel relocation plan also does not include any specific provisions regarding how mussels would be handled during collection and relocation. Improper handling and/or unnecessary increases in handling time can stress mussels and limit the success of a relocation effort (Cope and Waller, 1995; Blevins et al., 2017). FWS's BO would require several measures that would help to minimize stress during mussel collection and relocation. Those measures include: (1) using divers that are qualified and experienced in handling mussels; (2) keeping mussels in a moist and cool environment subsequent to collection and prior to positioning in new habitat; and (3) hand-placing mussels in a natural position firmly embedded and stabilized in the substrate.

Even with proper handling, mussel relocations are not always successful, and the survival of relocated mussels is not always high. Cope and Waller (1995), who evaluated the success of 37 mussel relocations conducted between 1967 and 1994 at multiple locations throughout the U.S., found that the average rates of survival were relatively low (51 percent). More recent evaluations of relocation success have demonstrated 95 percent survival after 3 years of monitoring (Cope et al., 2003) and 99 percent after 1 year of monitoring (Dunn and Sietman, 1997). Dunn et al. (2000) indicate that the most important factor in ensuring high survival of relocated mussels is the selection of a suitable relocation site. In particular, it has been recommended that relocation sites: (1) contain similar mussel species and habitat to the habitat of removal; (2) contain sufficient unoccupied habitat;[115] (3) remain wetted during low flows; and (4) remain stable during high flows (Luzier and Miller, 2009; Hart et al., 2016).

Birch Power proposes to relocate mussels to the sandbar development area and/or undisturbed areas of sandbar 1 and 2. The sandbar development area would be newly created habitat formed by the sandbar deposits dredged from sandbar 2 during tailrace construction. The sandbar development area would be located on the northwest side of the tailrace channel, which does not currently have sandbar habitat or mussels present.

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[115] Cope et al. (2003) observed that doubling or tripling the density of mussels on an existing bed already occupied by mussels did not negatively affect the survival of existing or relocated mussels. Havlik (1997) observed similar results when tripling the density of mussels.

Based on satellite imagery in figure 3-26 (also see figures 3-2 and 3-3), the sandbar development area also would not remain wetted during low flows. Further, there is no certainty that the sandbar development area would remain stable during high flows, especially considering that there is currently no sandbar in that location. Thus, there is no indication that the sandbar development area would be suitable habitat for relocating mussels affected by project construction.[116] Thus, there would be no benefit to creating or relocating mussels to the proposed sandbar development area. As discussed below in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*, project operation could negatively affect mussels located on sandbar 1 and sandbar 2. Consequently, there would be no benefit to relocating mussels to sandbar 1 and/or sandbar 2, which might not support a healthy mussel community.

In contrast to Birch Power's proposed relocation sites, FWS's BO would require Birch Power to conduct habitat suitability surveys to identify suitable habitat below the dam and outside the action area where mussels affected by project construction and operation can be relocated. Relocating mussels to habitat outside the action area would allow relocated mussels to establish themselves on habitat that would be minimally affected by project construction and operation (see below), providing the best opportunity for the relocated mussels to survive, grow, and reproduce. As discussed in section 3.3.2.1, *Mussels*, surveys conducted in 2011 indicated that mussel habitat was present below the dam and outside the action area (about 1.2 miles downstream), and was occupied by inflated heelsplitters. This habitat may still be present and may be suitable for mussel relocations. In addition, other suitable habitat may exist. Habitat suitability surveys would allow Birch Power to identify which habitat(s) would provide the best opportunity for mussel relocations to be successful. To limit the amount of potential habitat that would need to be surveyed, Birch Power could include in the mussel relocation plan potential relocation sites, as required by FWS's BO. Potential relocation sites could be based on available information such as the 2011 mussel survey (i.e., AST Environmental, 2011), which included habitat data.

FWS's BO would require Birch Power to prepare a report and file it with the FWS within 90 days following the completion of all mussel relocation work to include: (1) a description of the efforts, habitat, problems and solutions, results, and conclusions of the relocation effort; and (2) maps with coordinates showing the work and relocation areas. Preparing and filing a report would provide documentation of the relocation effort,

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[116] Birch Power also proposes to develop additional sandbar habitat to the north side of the proposed sandbar development area (see figure 3-26) if excavation spoils from project construction (exclusive of the sand removed from sandbar 2) are adequate. This habitat also would not be suitable for the same reasons discussed for the sandbar development area.

which could be used to guide post-construction surveys (see below) and future measures, if the relocations are not successful.

The success of a relocation effort could be determined by surveying the relocation habitat after mussels are well established to verify whether or not mussels are still present and surviving. Birch Power proposes to conduct post-construction surveys for the first 3 years after tailrace construction is complete to determine the success of mussel relocations. In contrast, FWS's BO would require Birch Power to conduct four post-construction surveys that begin during the first year post-construction and then occur every 3 years thereafter. Compared to Birch Power's proposal, the survey strategy required by FWS's BO would allow for a longer-term determination (10 years compared to 3 years) of the relocation success. Conducting surveys over a longer time period would allow for a determination of whether the relocated mussels are able to reproduce over a sustained period, which can provide a better determination of true relocation success compared to short-term survey results (Cope and Waller, 1995).

To summarize, Birch Power's proposed use of cofferdams would minimize effects of sediment suspension and redistribution during construction. In addition, Birch Power's proposal to implement an erosion control plan, which includes turbidity monitoring, as described previously, would further ensure waters remain suitable for aquatic biota during construction. If monitoring identifies potential adverse effects on water quality, construction activities could be stopped or adjusted to ensure the protection of aquatic resources. As such, use of cofferdams, and turbidity monitoring during project construction should provide adequate protection to the local aquatic community.

Overall, Birch Power's proposed construction activities would only affect a few individual fish and would not adversely affect local populations. Birch Power's proposed construction activities and mussel relocation strategy would result in the loss of a larger number of unlisted mussels from (but not the federally threatened inflated heelsplitter) that would not be relocated to suitable habitat. However, Birch Power could minimize the impacts of construction on all unlisted and listed mussels by implementing the requirement in FWS's BO to relocate all mussels from the action area to suitable habitat downstream of the dam and outside the action area.

Alteration of Flow Distribution During Construction

Installation of cofferdams could cause some hydraulic changes downstream of the dam, including a change in flow patterns and potential increases in velocity because of constriction in river channel width.

Our Analysis

Any temporary changes in flow patterns and velocities immediately upstream and downstream of the dam would not be unusual; current flow patterns change depending on the river hydrology and amount of spillage. Effects on flow during operation, discussed below, would have a greater effect on hydraulic conditions than construction effects.

While these hydraulic changes during construction could create unsuitable conditions for certain life stages of some fish, most fish would be able to move to more preferred habitat. Fish habitat below the dam is already somewhat dynamic under existing conditions, so temporary changes in hydraulic conditions should not have a measurable effect on fish populations. If fish spawning habitat occurs downstream of the proposed cofferdams, spawning adults or incubating eggs could be disturbed by a reduction in flow velocity. If Birch Power could commence construction after the spring spawning and incubation period is complete for most species, this would minimize effects on any spawning habitat downstream of the dam.

Mussels would likely not be affected by minor changes in depths during construction. While velocity increases would be more of a concern, if they even occurred, these changes would be relatively localized, and would not result in a major adverse effect on the mussel population near the project. The majority of mussels are not in the proposed construction footprint. Any mussels present on sandbar 2 downstream of the proposed cofferdam located at the tailrace outlet could be affected by changes in flow. Low velocities in these areas may lead to unsuitable conditions for mussels downstream of this cofferdam because sediment may settle out of suspension, smothering any mussels that are present. In addition, success of spawning or release of glochidia (i.e., mussel larvae) could be affected by decreases in velocity and increases in sedimentation. However, these effects would likely be limited to a small area, directly downstream of the cofferdam, and would attenuate downstream as flow patterns normalize. Mussels typically spawn and release glochidia in spring through early-summer; therefore, limiting construction activities during this time could provide some benefits to the mussel community.

In summary, expected hydraulic changes during construction would likely have a minor and temporary effect on individual fish and mussels, but would not likely have a discernable effect on these populations. Coordinating the timing of construction to minimize impacts on spawning fish and other organisms, would likely provide some benefit to aquatic species. We note that coordination with the Corps would be required per the standard special articles described in the 2016 MOU between the Commission and the Corps. As such, the Corps would retain control of flow distribution at the dam and would ultimately determine when construction would begin.

Operational Effects on Aquatic Organisms and Habitat

Modification of river flows by hydropower operations can negatively affect aquatic organisms and their habitats. Diverting a portion of the river flow through the project powerhouse, instead of over the dam crest, would alter the existing discharge patterns and the hydrodynamics downstream of the dam. These changes may affect existing aquatic habitat by changing hydraulic conditions, associated scour and deposition patterns, and DO concentrations.

Fish and Mussel Habitat Downstream from the Tailrace

To monitor post-construction effects of the project on the inflated heelsplitter habitat, Birch Power includes provisions in the mussel relocation plan (previously described in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*) to conduct post-construction mussel surveys annually for the first 3 years after tailrace construction. The purpose of the surveys is to determine the success of inflated heelsplitter relocations, identify areas for future relocations, document use of the sandbar development area by inflated heelsplitters, and document physical changes in the sandbar development area. Surveys would be conducted at the sandbar development area, sandbar 1, and sandbar 2. Part of sandbar 2 would be located downstream of the mouth of the tailrace, and could be affected by changes in hydrodynamics. Birch Power does not propose any measures to determine or to mitigate the effects of project operation on fish or non-inflated heelsplitter mussels located downstream of the tailrace.

As discussed in detail in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*, condition 2 of FWS's BO would require Birch Power to conduct pre-construction mussel surveys throughout the action area (including the area outside the mouth and immediately downstream of the tailrace) and relocate all mussels, using specific handling and relocation procedures, to areas of suitable habitat downstream of the dam and outside the action area, and identified by conducting habitat suitability surveys. FWS's BO would also require Birch Power to report on the relocation effort, and subsequently conduct four mussel surveys that begin 1 year post-construction and then every 3 years thereafter at the relocation habitat and construction areas (i.e., tailrace and intake channels).

Our Analysis

Under Birch Power's proposal, the volume of downstream flow releases would not change because the project would operate in a run-of-release mode. However, project operations would cause flow patterns to change immediately downstream of the dam because more flow would be discharged through the proposed powerhouse instead of over the dam crest.

Changes in flow release patterns and velocities could also affect fish habitat conditions through changes in benthic scour and depositional patterns (discussed in section 3.3.1.2, *Operational Effects on Scour and Deposition Patterns*). The current distribution of the sandbars suggests that sand is carried across the chalk shelf by turbulent flow and deposited in the river channel at the base of the shelf as water energy dissipates (Birch Power, 2013). During project operation, flows up to 20,000 cfs would be conveyed through the tailrace, and as discussed in section 3.3.2.2, *Operational Effects on Water Quantity*, flows over the dam and across the shelf would not occur until inflow exceeds 20,000 cfs. When most flows are passing through the tailrace and little or no flow is passing over the dam and chalk shelf, the flow distribution would alter scour and depositional patterns, and any benthic fish habitat that might occur in this area. However, these changes would likely be relatively localized to the tailrace outlet and immediately downstream. Further, the physical habitat immediately downstream of the dam is variable under existing conditions because of the changing river flows throughout the year, and presence of the chalk shelf, which during low flows under existing conditions (i.e., less than 10,000 cfs) has no flow moving across it. Consequently, fish, which are highly mobile, and likely acclimated to the changing conditions downstream of the dam, are unlikely to be affected by the type of habitat changes that would occur downstream from the mouth of the tailrace during operation.

Changes in flow release patterns and velocities could also affect mussels located immediately downstream of the tailrace. As discussed in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*, during operation, water flowing from the tailrace would bisect the existing sandbar 2. Mussels on sandbar 2, and any other mussels that potentially occur in habitat outside of, and downstream from the mouth of proposed tailrace would experience a new flow distribution and velocities. Mussels are known to occupy areas of hydraulic refuge where substrates are stable during high flow events (Strayer, 1999). Thus, any changes in flow or depositional patterns outside of, and immediately downstream from the proposed tailrace, have the potential to create unsuitable conditions for maintaining mussel habitat and mussel populations.

Birch Power does not propose any specific measures to minimize the effects of project operation on mussels located in areas that could be affected by the discharge from the tailrace. However, Birch Power does propose to conduct post-construction inflated heelsplitter surveys at sandbar 2, which could be used to determine the effects of project operation on these mussels. FWS's BO would require more specific measures that could address and mitigate the effects of the project discharge on mussels, which would involve conducting a mussel survey in the action area and relocating all mussels found in the action area to suitable habitat downstream of the dam and outside the action area. Implementation of FWS's BO would require Birch Power to relocate to suitable habitat, any mussels that could be affected by discharge from the project tailrace, which would reduce the effects of project operation on the mussel community. As discussed above in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*, mussel relocation efforts are not always 100 percent successful. However, by implementing proper mussel handling procedures and by conducting surveys to identify suitable habitat downstream, relocations can very highly successful.

FWS's BO would also require Birch Power to conduct four post-construction surveys that would begin during the first year post-construction and then occur every 3 years thereafter (i.e., a 10-year period from first to last survey) to document whether mussels are reestablishing in the construction area (i.e., intake channel and tailrace channel). A mussel survey conducted in the tailrace and intake channels over a 10-year period would help determine whether mussels are colonizing or recolonizing the habitat created by the excavation of those areas, whether mussels are being adequately supported by that habitat, and if not, whether additional measures may need to be identified in consultation with the FWS, to protect mussels that colonize the tailrace and intake channel. Conducting four surveys over a 10-year period would help determine whether mussels that colonize the tailrace and intake channels are able to successfully maintain their populations over a sustained period, which would provide the information needed to determine whether additional measures are necessary to protect the mussels.

After the project becomes operational, Birch Power proposes to maintain the tailrace through periodic dredging. Like the construction activities, dredging would crush, or displace to spoils, any mussels that are in the path of the dredging activities. To minimize the negative effects of maintenance dredging, Birch Power could conduct mussel surveys where dredging would occur and relocate any identified mussels to suitable habitat. In order to reduce or prevent mussels from recolonizing the dredging area and being impacted by dredging activity, it would be beneficial for the surveys and relocations to occur no more than 30 days prior to any maintenance dredging activities.

In addition to the physical changes in fish and mussel habitat discussed above, the proposed project could also influence water quality downstream of the tailrace as described previously in section 3.3.2.2, *Operational Effects on Water Quality*. However, Birch Power's Water Quality Settlement would ensure that the project's tailrace waters are no less than 5.0 mg/L all year during operation and that mean daily DO concentrations downstream of the tailrace are no less than 6.5 mg/L all year during operation. As discussed in more detail below, these DO concentrations would be adequate to sustain a healthy aquatic community. As discussed in section 3.3.2.2, *Operational Effects on Water Quality*, Birch Power also proposes to position the powerhouse intakes in deeper water, which would lead to cooler water being released into the tailrace and downstream. However, as discussed in section 3.3.2.1, *Affected Environment, Water Quality*, existing water in the tailrace is generally less than 1° F warmer than the deep water in the forebay, as observed by Birch Power during the summer of 2012. Thus, the release of deeper, cooler water is unlikely to cause substantial changes in water temperature downstream of the tailrace, and the impacts to the aquatic community would be minimal.

Fish and Mussel Habitat in the Flow Affected Area

As discussed in section 3.3.2.2, *Operational Effects on Water Quantity*, project operation will reduce or eliminate water spilling over the dam and into the proposed flow affected area. When flows are eliminated or reduced in an aquatic habitat, the physical and chemical changes that occur can reduce water quality, and negatively affect aquatic organisms.

Birch Power does not propose any measures to determine or mitigate the potential negative effects of reduced flow in the flow affected area. As discussed above in previous sections, FWS's BO would require Birch Power to conduct pre-construction mussel surveys throughout the action area (including the flow affected area) and relocate all mussels, using specific handling and relocation procedures, to areas of suitable habitat downstream of the dam and outside the action area, and identified by conducting habitat suitability surveys.

Our Analysis

As noted above, during operation, the project would divert flow through a tailrace that would bypass about 45 acres of riverine habitat (i.e., proposed flow affected area, which includes the chalk shelf and main river channel), where freshwater mussels, including the federally threatened inflated heelsplitter, are located on sandbars 1 and 2. At inflows between 5,000 cfs and 20,000 cfs, all water would pass through the tailrace and there would be no flow passing over the spillway and into the flow affected area. As discussed in section 3.3.2.2, *Operational Effects on Water Quantity*, when there is no flow over the spillway, water depth in the flow affected area would be unchanged compared to existing conditions; however, the proposed flow affected area would exhibit little or no water movement and would function as a pool about 35.8 percent of the time. In contrast, under existing conditions, water flows nearly continuously into the proposed flow affected area section of river.

Although the total volume of river flow passing downstream of Demopolis Lock and Dam would remain the same, project operation may influence water quality in the flow affected area as described previously in section 3.3.2.2, *Operational Effects on Water Quality*. In general, reduced DO concentrations are likely to occur in the flow affected area when the project is operating at flows between 5,000 cfs and 20,000 cfs, because there would be no aeration caused by water plunging over the spillway or flow moving through the flow affected area. As discussed in section 3.3.2.2, *Operational Effects on Water Quality*, these conditions could cause DO to rapidly decline within hours after flow over the spillway stops, and this could lead to DO dropping to concentrations that could negatively affect the ability of aquatic organisms to grow, reproduce, and survive.

The effects of low DO on fishes depends on the species, life stage, water temperature, and exposure time. However, an evaluation of several studies indicates that exposure to DO less than 5.0 mg/L, but greater than 3.0 mg/L often has non-lethal effects on non-salmonid fish species, such as behavioral avoidance, reduced growth, reduced reproduction, reduced swimming performance (EPRI, 1990). As DO declines below 3.0 mg/L, the probability of mortality increases substantially (EPRI, 1990). There have also been indications that freshwater systems that do not drop below 5.0 mg/L had more diverse warm water fish communities and populations that were more abundant (EPRI, 1990). Less research has been conducted on DO requirements for freshwater mussels. It is known, however, that low DO can impair respiration, slow growth, reduce energy stores, and inhibit reproduction (Fuller, 1974). Further, one study conducted in the Southeastern U.S. (i.e., Flint River, Georgia), indicated that most mussel species had higher mortality when DO was less than 5.0 mg/L (Gagnon et al., 2004). Thus, if DO in the flow affected area decreases below 5.0 mg/L (i.e., more than 2 to 3 mg/L lower than existing conditions), fish and mussels that are present could be negatively affected.

In addition to the water quality effects described above, some have observed that reduced flows, such as those that occur during droughts, can prevent glochidia from becoming suspended in the water column, which could result in reproductive failure for mussels (M. Freeman, University of Georgia, personal communication, as cited within Golladay et al., 2004). We assume that the absence of flow that could occur in the flow affected area during operation could have similar effects on mussels found in this habitat.

As discussed above, the absence of flow or reduction of flow that would occur in the flow affected area at inflows between 5,000 cfs and 110,000 cfs (see section 3.3.2.2, *Operational Effects on Water Quantity*) could have negative effects on fish and mussels because of reduced DO concentrations, especially during warm summer months. Any fish present in the flow affected area would likely move into areas with more suitable flows, DO, and temperature. Mussels are less mobile, and thus those present on sandbar 1 or other areas of the flow affected area could experience suboptimal conditions that could lead to increased mortality, or decreased growth and reproduction.

FWS's BO would require measures that could address and minimize the effects of poor water quality on mussels located in the flow affected area. Specifically, FWS's BO would require Birch Power to conduct a pre-construction mussel survey in the action area (including the flow affected area) and relocating all mussels found in the action area to suitable habitat downstream of the dam and outside the action area. As discussed in previous sections, FWS's BO requirement for Birch Power to relocate mussels that would be affected by project construction and operation, would reduce the effects of the project on the mussel community downstream of the dam. The same conclusion can be made for those mussels present in the flow affected area.

Relocating mussels from the flow affected area would protect those mussels from any negative effects that project operation might have on water quality in the flow affected area. However, mussels could recolonize habitat in the flow affected area, and fish and other aquatic organisms would likely continue to use the area after project operation begins. Thus, additional measures may be needed to minimize the effects of project operation on these aquatic resources. As discussed in section 3.3.2.2, *Operational Effects on Water Quality in the Flow Affected Area*, post-licensing water quality monitoring in the flow affected area would help determine whether project operations negatively affect water quality in the flow affected area, and would inform the need for additional measures to reduce project effects on water quality, if necessary. Birch Power could estimate flows in the flow affected area concurrent with the water quality monitoring discussed above to provide a time-series of data in the flow affected area. The data could be used to determine an appropriate level of flow, should it be determined that flow mitigation is needed to protect water quality and/or flow conditions for mussels.

Although the measures above would help to ensure that water quality in the flow affected area would be maintained at levels that can support a healthy mussel community, reduced flows would occur in this area and could negatively affect mussels. As discussed above, FWS's BO would require Birch Power to conduct four post-construction surveys that begin during the first year post-construction and then occur every 3 years thereafter to document whether mussels are reestablishing in the construction area (i.e., intake channel and tailrace channel). However, no entity has proposed or recommended conducting post-operational mussel surveys in the flow affected area. Such surveys would help to determine whether mussels are recolonizing habitat in the flow affected area, whether mussels are being adequately supported by that habitat, and if not, whether additional measures are needed to protect mussels that recolonize the flow affected area. Conducting four surveys over a 10-year period (i.e., the same frequency that would be required by FWS's BO for the post-construction surveys in the tailrace and intake) would allow for a determination of whether mussels are recolonizing the flow affected area and able to successfully maintain their populations over a sustained period. This information would help to determine whether additional measures (e.g., supplemental flows to the flow affected area) are necessary to protect mussels in the flow affected area.

Attraction Flows for Upstream Migration

Flow velocity is one of the cues used by fish for selecting a route upstream during migration. At the Demopolis Lock and Dam, under existing conditions, upstream passage is only possible through the navigation lock or when flows exceed about 150,000 cfs and the spillway is submerged. Because flows are less than 150,000 cfs 99 percent of the time, the likelihood of successful upstream passage, under existing conditions and proposed operation, largely depends on the ability of a migrating species to find the navigation lock, which depends in part on the attraction flows that come from the lock. Under proposed operations, any migratory fish species that might be motivated to swim upstream of the dam could be attracted by the flows discharged from the tailrace and thereby disrupt any potential attraction provided by the lock. Thus, project operation could disrupt a potential upstream passage route, which is through the lock.

Our Analysis

The ability to find the navigation lock under both existing and proposed operations depends on attraction flows. During low water conditions attraction flows guide most migrating fish to the spillway where they cannot pass (figure 3-28). Nonetheless, it is likely that some fish manage to enter the navigation lock from below. However, the lock is operated for navigational purposes only and is not operated to pass fish upstream. Because one gate is always closed, there is little or no flow through the lock. As a result, fish that enter the lock moving upstream, are as likely to exit the lock again moving back downstream as they are to find the opening through the upstream gate. During low flow conditions, any upstream migrating fish would be attracted to the shelf area on the north side of the river and/or the north side of the main channel (north of sandbar 1 at the downstream end of the lock). No attraction flows would be apparent to migrating fish to guide them directly to the downstream end of the lock. Further, water emptied from the lock during lock operations are unlikely to provide flows that are high enough or consistent enough to serve as a reliable attraction flow.

During high flow conditions (i.e., near or greater than median exceedance flows of 25,000 cfs) fish seeking the main current would likely be attracted along the three general paths shown by the arrows, all which lead to the spillway (figure 3-29). The southernmost flow-line runs along the north side of the lock and is deflected away from the lock channel by the angled concrete wall at the downstream end. There are no apparent attraction flows present that would guide migrating directly fish into the downstream end of the lock. Water emptied from the lock during lock operations would not be ample or consistent enough to serve as a reliable attraction flow.

Overall, existing conditions at Demopolis Dam are somewhat better for upstream fish passage at high water than at low water. During high water conditions attraction flows guide most migrating fish directly to the spillway where they can pass if flows are high enough so that the spillway is submerged. If the spillway is not submerged, the high water flow pattern likely would cause more fish to move past the lock entrance and toward the spillway. It is possible that some fish would leave the higher flow pathway to enter the lock. However, as in the low flow case, these fish are as likely to exit the lock again downstream as they are to find the opening through the upstream gate. The likelihood of successful passage through the lock depends on the ability of a migrating species to find this limited passage route during high and low flow.

Figure 3-28. The likely location of attraction flows (red arrows) under existing conditions at low flow. Flows in the image are about 4,000 cfs (Source: Birch Power, 2013).

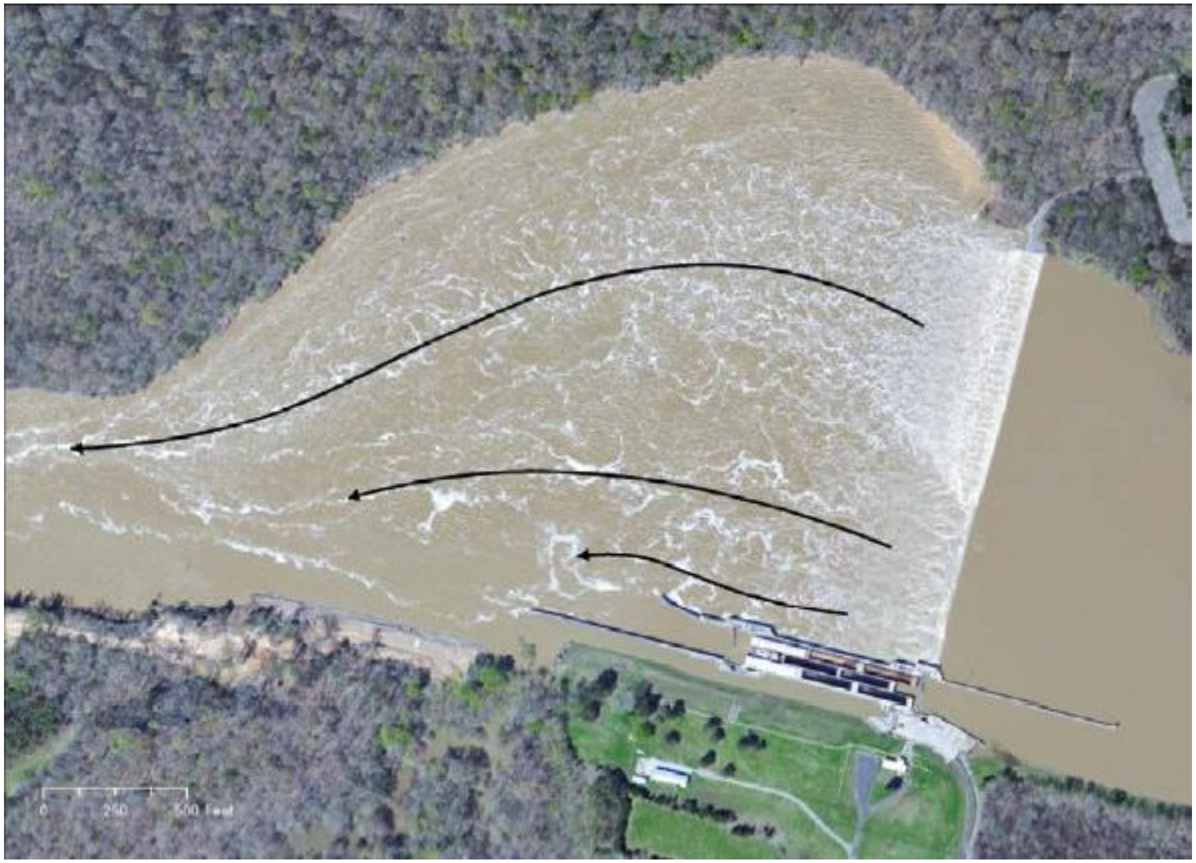

Figure 3-29. The likely location of attraction flows (black arrows) under existing conditions at high flow. Flows in the image are greater than 25,000 cfs (Source: Birch Power, 2013).

During project operation, discharge from the tailrace would serve as the dominant attraction flow until inflow exceeds 40,000 cfs.[117] Figure 3-30 illustrates the predicted flow velocity maxima during project operation when inflow is less than 40,000 cfs. Under these conditions, flow from the tailrace would guide fish to the powerhouse discharge where they would be unable to pass upstream. As inflows become greater than 20,000 cfs the dominance of the tailrace flow would progressively diminish as additional attraction flows over the spillway develop. When inflow reaches 40,000 cfs, 20,000 cfs would pass through the powerhouse and tailrace, 20,000 cfs would pass over the spillway, creating similar attraction flows coming from the tailrace and spillway. When inflows exceed 40,000 cfs, flows passing over the spillway would exceed flows passing through the tailrace, and there would be greater attraction toward the spillway. Thus, at inflows of 40,000 cfs and greater, attraction flows and fish passage potential through the lock would be similar to existing conditions.

Under proposed operations, any attraction to the lock would decrease compared to existing conditions when flows are less than 40,000 cfs. However, under existing conditions fish passage success is likely low under all flow regimes, because the lock is not designed to pass fish upstream.[118] Further, as discussed in section 3.3.2.1, *Affected Environment, Fish Community*, the migratory species that are potentially present downstream of the dam and that would also require passage upstream to complete their life-cycle are paddlefish, skipjack herring, and American eel.[119] However, the known migration route for the paddlefish population in the project vicinity is located between 9 and 50 miles upstream of the proposed project (O'Keefe and Jackson, 2009), and thus paddlefish are unlikely to use the lock for passage. Skipjack herring, which are known to be present in Demopolis Lake, could also be present downstream of the Demopolis Lock

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[117] During project operation, flows over the spillway would not exceed flows through the tailrace until inflow exceeds 40,000 cfs. When inflow is greater than 40,000 cfs, 20,000 cfs would pass through the powerhouse and tailrace and greater than 20,000 cfs would pass over the spillway (see section 3.3.2.2, *Operational Effects on Water Quantity*).

[118] Navigation locks are not designed to accommodate fish passage; however, lock operations can be adapted to provide fish passage for many species. Adaptations include changes to the lock operation schedule and the addition of attraction flow (Brownell et al., 2012).

[119] The federally endangered Alabama sturgeon also may be present downstream of Coffeeville Lock and Dam. We discuss the effects of project operation on Alabama sturgeon in section 3.3.4.2, *Environmental Effects*.

and Dam. However, they are known to spawn in dam tailwaters and can complete their life-cycle without passing upstream or downstream of dams. Thus, skipjack herring would not necessarily be motivated to migrate upstream of the proposed project if they are present downstream. American eels are present in Coffeeville Lake and potentially use the lock to migrate upstream; however, given the ability of eels to pass obstructions not designed for passage, the ability of American eels to migrate upstream likely would not change between existing conditions and proposed operations.

Because upstream fish passage opportunities would not change substantially between existing and proposed operation and because there are no migratory species that have populations that are dependent on migration upstream of the dam, the change in attraction flows caused by proposed operations would have minimal effect on fishery resources in the project vicinity.

Figure 3-30. Estimated location of flow maxima (black arrows) during operation when flows are less than 40,000 cfs (Source: letter from Birch Power filed on May 21, 2014).

Fish Impingement, Entrainment, and Turbine Mortality

Operation of the proposed project has the potential to cause impingement or entrainment of fish resulting in potential injury or death. Birch Power has proposed to install two Kaplan (bulb type) turbines with adjustable runner blades. Each turbine would be 17 feet in diameter and have a runner speed of 100 rounds per minute. Maximum calculated project intake velocities would be approximately 5.5 feet per second (fps), with the proposed 2.5-inch clear trash rack spacing.

No agency provided recommendations related to fish entrainment or impingement at the project.

Our Analysis

Currently some fish pass downstream over the dam or through the lock. Construction of the project would create a new downstream passage route through the powerhouse, which would introduce the additional risks of injury or death if fish are unable to overcome power plant intake velocities and are entrained in the flow passing through the trash racks and turbines. Birch Power conducted a desktop analysis of these issues, which staff considered, along with other information, in estimating the effect of project entrainment and impingement on fish populations.

While fish can be injured or killed going over the dam, survival rates generally are high. At the existing dam, fish can pass downstream over the spillway or through the lock chambers. Fish can suffer injury or mortality while passing over surface spillways. In general, surface spillway passage is considered to be more benign than turbine passage, although spillway height, plunge pool configuration and other features can cause mortality and a variety of injuries (Muir et al., 2001; Schilt, 2007). Studies that provide estimates of fish survival over spillways are limited in number and almost entirely focused on salmon species. Among studies conducted on this topic, all provide a general consensus that passage survival over spillways is high relative to other passage routes, such as turbines and even bypasses (Muir et al., 2001). Spillway survival estimates can range between 73 and 100 percent, but most survival estimates are greater than 95 percent (Schoeneman et al., 1961; Whitney et al., 1997; Ruggles and Murray, 2001; Muir et al., 2001; Amaral et al., ND). In fact, in a review of measures that can be used to protect fish as they move past hydropower projects, Schilt (2007) indicated that the only negative aspect of surface passage over spillways seems to be that too few fish use that route. Further, the spillway at Demopolis Dam has a flow deflector, which can reduce gas supersaturation at spillways and increases survival of fish, relative to spillways without flow deflectors (Ruggles and Murray, 1983). Thus, although there are no data on survival rates for fish that move past the Demopolis Dam, the available information on fish passage survival at spillways indicates that the existing mortality incurred at the dam is minimal. Also, although we do not know how many fish pass over the dam currently, we do know that the existing fish community has developed with the lock and dam in place for over 70 years.

During project operation, flow over the spillway would be reduced, or eliminated, and any water not spilling would be directed through the intake channel and powerhouse. Flows directed to the powerhouse intakes would introduce the potential for mortality or injury by entrainment or impingement. As discussed in section 3.3.2.1, *Affected Environment, Fish Community*, the only species that would potentially require passage downstream of the dam to complete its life cycle would be American eel. However, other species may still enter the intake channel as well, making them vulnerable to entrainment and impingement. Entrainment would occur when fish are unable to overcome the approach velocity at the trash rack and pass through the turbines during project operation, or if they choose to pass downstream through the trash rack.

Fish entering the hydropower intake would be subject to a 5.5 fps maximum intake velocity at the project's trash rack and those with burst swimming speeds less than the intake velocities would be susceptible to entrainment. Burst swim speed data for twelve of the most common fish species in Demopolis Lake (see section 3.3.2.1, *Affected Environment, Fish Community*)[120] show that all centrarchids (sunfish and black bass) and the smaller individuals of all other species in table 3-11 have burst swim speeds less than 5.5 fps, and would thus be susceptible to entrainment. The larger catostomids (suckers), clupeids (shad), and paddlefish can swim faster than the maximum intake velocity, and could avoid being swept through the trash racks (table 3-11).

In addition to their burst swim speed, the health and survival of fish approaching the intake would depend on the trash rack bar spacing and the size and shape of the fish. The proposed 2.5-inch trash rack clear bar spacing would allow all but the largest fish to pass through the trash rack (table 3-10).[121] Based on body width information available

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[120] Catostomids (suckers) were not particularly common in Demopolis Lake based on studies conducted by Slipke and Maceina (2006); however, the entrainment and turbine mortality analysis conducted by Birch Power (2014a) indicated that catostomids were a family that could experience some of the highest entrainment. Thus, the catostomid species observed by Slipke and Maceina (2006) in Demopolis Lake were included in tables 3-10 and 3-11.

[121] This analysis is based on the most common species and more important species (i.e., paddlefish) observed in Demopolis Lake (table 3-6) and the most common fish families that were predicted to be entrained in Birch Power's desktop entrainment analysis (Birch Power, 2014a; Birch Power 2014b).

for common fish in Demopolis Lake, the fish that would not pass through the trash racks would be the biggest largemouth bass and channel catfish, and nearly all paddlefish except those less than age-1 (age-1 paddlefish are about 22 inches [O'Keefe and Jackson, 2009]).[122] All other fish in Demopolis Lake have the potential to be entrained.

To evaluate the effects of the proposed project on entrainment and turbine mortality, Birch Power conducted a desktop study (Birch Power, 2014a) to estimate the number of fish that would be entrained and suffer mortality during project operations. The entrainment analysis indicated that approximately 1,741,848 fish would become entrained annually, and that entrainment rates would likely be highest in the spring (751,484 fish entrained) and winter months (452,073 fish entrained). Smaller size groups (less than 6 inches), which would be the juvenile life stages for many species, would account for the vast majority of fish entrained (72 percent). Annual entrainment was highest for shads (706,359) and accounted for 41 percent of all fish. Sunfish (328,153), catfish (290,002), and suckers (123,593) accounted for 19 percent, 17 percent, and 7 percent of all fish entrained, respectively. Only 22 American eels were estimated to be entrained annually. Birch Power (2014a) estimated that turbine mortality resulting from entrainment to be about 176,373 fish (or 10 percent of all fish entrained), with about 53 percent being smaller fish that are less than 6 inches, which most likely would be juveniles.

The accuracy of Birch Power's desktop entrainment study is limited by a lack of projects in the analysis with similar intake velocities to that proposed. The intake velocity at the proposed project would be 5.5 fps, much higher than the velocities used in the analysis, which range up to 3.67 fps, but are mostly below 0.7 fps. An intake velocity of 5.5 fps would likely increase fish entrainment and turbine mortality over what was estimated with lower intake velocities. In addition, because a higher intake velocity could lead to entrainment of larger fish with faster swim speeds, Birch Power (2014a) also potentially underestimated the size range of fish that could be entrained. If larger fish become entrained, this could result in the mortality of spawning capable fish, which could reduce the reproductive potential of a population. Although an intake velocity of 5.5 fps would only occur at inflows of 20,000 cfs and higher, flows of 20,000 cfs are exceeded 36 percent of the time annually, and could be exceeded 56 to 80 percent of the time during March and April, when many fish become more active as water temperatures rise and spawning activities begin. Thus, an intake velocity of 5.5 fps could result in greater entrainment than estimated by Birch Power (2014a).

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[122] Paddlefish less than 21. 6 inches (measured from the eye to the fork in the tail) would be susceptible to entrainment (table 3-10). Age-1 paddlefish are about 22 inches (O'Keefe and Jackson, 2009), and thus those less than age-1 would be susceptible to entrainment.

While Birch Power's desktop analysis indicates the potential for entrainment mortality, and our assessment of the analysis suggests that mortality rates might be higher than those in the analysis results, most of the fish species potentially affected by entrainment have characteristics that limit the impact of entrainment on their populations. As discussed above, most of the fish entrained by the project would be smaller juvenile members of the fish community, which even in the absence of hydropower operation, would experience high natural mortality rates. Further, the species most likely to be entrained (i.e., shads, sunfish, catfish, suckers) also exhibit relatively high reproductive rates because of their ability to spawn early in life and often throughout life. High reproductive rates provide these populations with a natural mechanism to buffer against any instance (natural or man-made) of high mortality, which makes these species resilient to population declines. In addition, the species most likely to be entrained, also have equal or greater population densities in backwater habitats than in riverine habitat, which is the habitat type closest to the dam and intake channel (table 3-6). The large number of fish present in backwater habitats are unlikely to leave these protective environments, and thus are not likely to be at risk of entrainment. Further, these backwater habitats are where most spawning and juvenile fish production occurs in Demopolis Lake (Slipke et al., 2005), and could serve as source of individuals that could sustain the populations in Demopolis Lake in the presence of the project. Therefore, the number of fish estimated by Birch Power (2014a) to be killed as a result of entrainment is unlikely to negatively affect the majority of populations present in Demopolis Lake.

Paddlefish are unique, and possess traits that make their populations less resilient to population declines compared to the species discussed above. In a separate analysis, Birch Power (2014b)[123] estimated that about 1,611 paddlefish could be entrained, and that up to 143 paddlefish could be killed annually. However, these estimates for paddlefish entrainment and turbine mortality are likely high because most paddlefish in Demopolis Lake use habitats well upstream of the project. As discussed in section 3.3.2.1, *Affected Environment, Aquatic Community*, paddlefish in Demopolis Lake exhibit very limited movements, spending most of their time in bendways, and entering the main channel of the Tombigbee River primarily to migrate to and from spawning and wintering

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[123] Birch Power's (2014b) analysis also discussed the potential entrainment and turbine mortality of gulf sturgeon, Alabama sturgeon, and mooneye. However, the available information, which was cited by Birch Power (2014b) indicates that these species are no longer present in Demopolis Lake or the project vicinity. Alabama sturgeon may be present downstream of Coffeeville Lock and Dam, but there is no evidence that they are present upstream of Demopolis Lock and Dam (see section 3.3.4.1, *Alabama Sturgeon*).

grounds.[124] In addition, these movements primarily occur between Twelvemile Bend, which is 9 miles upstream of the project, and the lotic bendway, which is 50 miles upstream of the project. Thus, the potential for paddlefish to enter the project intake channel located 9 miles downstream of their primary movement range is low. In addition, based on available information on burst swim speeds for paddlefish, most paddlefish would have burst swim speeds that exceed intake velocities of 5.5 fps, although juvenile paddlefish may not be able to overcome these velocities (table 3-11). However, based on a study conducted in the Alabama River, juvenile paddlefish would be more likely to use bendways and backwater habitats (Hoxmeier and DeVries, 1997), and thus would not be susceptible to entrainment. Thus, the available information suggests that few paddlefish are likely to be entrained and even fewer would likely succumb to turbine mortality.

In addition to entrainment, fish can become impinged on the trash racks if they are unable to overcome the approach velocity and are too large to pass through the trash racks. Impingement could result in additional mortality at the project. Only very large fish would be susceptible to impingement on the proposed trash racks with 2.5-inch bar spacing, and would include bigger largemouth bass and channel catfish, and most paddlefish (table 3-10). The larger paddlefish that would be susceptible to impingement have swim speeds capable of overcoming the proposed intake velocities of 5.5 fps, and thus the likelihood of paddlefish impingement is low (table 3-11). Largemouth bass have slow swim speeds and would be vulnerable to impingement; however, they primarily use shallow, nearshore habitat, and would be unlikely to encounter the deep turbine intakes (i.e., top of the trash racks would be about 18 feet below the normal forebay water level). Channel catfish also have slow swim speeds, but may use deep water habitat and thus impingement would be more likely for catfish if they did not avoid the low DO that would likely be present during the summer months (see section 3.3.2.1, *Affected Environment, Water Quality and section 3.3.2.2, Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*). Impingement of catfish at trash racks with 2.5-inch bar spacing would be limited to larger individuals, which would represent a small proportion of the population.[125] However, larger fish also have greater reproductive potential than smaller fish, and the loss of these larger fish could reduce the reproductive rate of the population. Further, with intake velocities of 5.5 fps, impinged

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[124] Paddlefish in the Alabama River also primarily use backwater and oxbow habitats during most of the year, and only use main channel habitats during spawning migrations (Hoxmeier and DeVries, 1997), suggesting that main channel habitats are not preferred by paddlefish when not needed for spawning migrations.

[125] Because of natural and fishing mortality, and the greater cumulative mortality experienced by older age-classes, fish population demographics generally exhibit declining abundance at each successive age-class.

catfish (or other slow swimming fish like largemouth bass) would not be capable of escaping, and would not survive. Therefore, impingement on Birch Power's proposed trash racks with 2.5-inch bar spacing could have a localized adverse impact on channel catfish. We expect that the impacts to fish populations other than channel catfish and, possibly paddlefish, would be minimal.

Increasing trash rack bar spacing from 2.5 inches to 5 inches could reduce impingement mortality for largemouth bass, catfish, and paddlefish. If the trash rack bar spacing is increased to 5 inches, then no fish species would be susceptible to impingement except paddlefish larger than 43 inches (table 3-10). As discussed above, large paddlefish have burst swim speeds that exceed intake velocities. Thus, installation of trash racks with 5-inch bar spacing could eliminate fish impingement mortality at the project. Installing trash racks with 5-inch bar spacing would increase the risk of entraining largemouth bass, catfish, and paddlefish. However, if larger fish become impinged on the proposed trash racks with 2.5-inch bar spacing, only paddlefish would be able to escape and survive with intake velocities of 5.5 fps. In contrast, entrainment of larger fish through trash racks with 5-inch bar spacing could result in mortality or injury, but there is a small probability that they could survive passage through the powerhouse without injury. Thus, trash racks with 5-inch bar spacing are likely to result in lower project-induced mortality of larger fish compared to trash racks with 2.5-inch bar spacing.

Table 3-10. Minimum fish total lengths excluded by 2.5-inch and 5-inch trash racks, based on trash rack bar spacing and fish width-at-length relationships (i.e., width = α × total lengthβ) alone and exclusive of burst swim speeds (Source: staff).

Species	Family	Surrogate species used in calculation[a]	Parameters in length-width equation		Scaling factor for body width[d]	Maximum total length (inches)	Minimum fish total length (inches) excluded by trash rack clear bar spacing of:	
			alpha (α)[b]	beta (β)[c]			2.5 inches	5 inches
Blacktail redhorse	Catostomidae	Golden redhorse	0.00387	1.5947	NA[e]	16	NE[f]	NE
Quillback	Catostomidae	Golden redhorse	0.00387	1.5947	NA	20	NE	NE
Smallmouth buffalo	Catostomidae	Golden redhorse	0.00387	1.5947	NA	35	NE	NE
Spotted sucker	Catostomidae	Golden redhorse	0.00387	1.5947	NA	18	NE	NE
Bluegill	Centrarchidae	none	0.1317	0.997	NA	9	NE	NE
Largemouth bass	Centrarchidae	Smallmouth bass	0.10095	1.0394	NA	30	21.9	NE
Redear sunfish	Centrarchidae	Bluegill	0.1317	0.997	NA	9	NE	NE
White crappie	Centrarchidae	Black crappie	0.04159	1.1824	NA	20	NE	NE

Gizzard shad	Clupeidae	none	0.00022	2.042	NA	12	NE	NE
Threadfin shad	Clupeidae	Gizzard shad	0.00022	2.042	NA	7	NE	NE
Channel catfish	Ictaluridae	none	0.2267	0.9148	NA	24	13.8	NE
Paddlefish	Polyodontidae	Shortnose sturgeon	NA	NA	0.116	60	21.6	43.1

[a] Length-width equations were not available for all species included in our analysis. Surrogate species are fish in the same family and with similar body morphometry to the species included in our analysis.

[b,c] The alpha and beta parameters for equations are from Lawler, Matucky, and Skelly Engineers (1991).

[d] Alpha and beta parameters were not available for paddlefish or good surrogates for paddlefish. Thus, a scaling factor was used, which expresses body width as a proportion of total length (TL) based on proportional measurements for the surrogate species in Smith (1985).

[e] NA means not applicable. These parameters or scaling factors were not used to calculate the minimum total length excluded by trash rack clear bar spacing of 2.5 inches.

[f] NE means not excluded (i.e., all sizes could physically pass through the trash racks).

Table 3-11. Burst swim speeds of common or important fish species in Demopolis Lake (Source: staff).

Species	Family	Surrogate Species[a]	Total length (inches)	Burst swim speed (fps, feet per second)
Blacktail redhorse	Catostomidae	Longnose sucker[b]	4.0-16.0	4.0-8.0
Quillback	Catostomidae	Longnose sucker	4.0-16.0	4.0-8.0
Smallmouth buffalo	Catostomidae	Longnose sucker	4.0-16.0	4.0-8.0
Spotted sucker	Catostomidae	Longnose sucker	4.0-16.0	4.0-8.0
Bluegill[c]	Centrarchidae	none	2 4-6 6	1.8 2.4 4.3
Largemouth bass[c]	Centrarchidae	none	2-4 5.9-10.6	3.2 4.3
Redear sunfish	Centrarchidae	Bluegill	2 4-6 6	1.8 2.4 4.3
White crappie[d]	Centrarchidae		3.03	0.36-1.04
Gizzard shad[c]	Clupeidae	none	9.8-13.8	8.0
Threadfin shad	Clupeidae	Gizzard shad	9.8-13.8	8.0
Channel catfish[e]	Ictaluridae	none	6.3-8.3	1.3
Paddlefish[d]	Polyodontidae	none	3.54 47.2	1.87-2.46 32.8

[a] Burst swim speeds were not available for the species included in our analysis. Surrogate species used were fish in the same family and with similar body morphometry to the species included in our analysis.

[b] Source: HDR (2014)

[c] Appalachian Power Company (2009)

[d] Source: HDR (2013)

[e] Venn Beecham et al. (2007)

3.3.2.3 Cumulative Effects

Water Quality

Beginning in the early 1900s, a series of low navigation locks and dams was constructed along the Black Warrior and Tombigbee rivers. The original low structures were replaced by larger dams to produce hydropower and increase the navigation channel depth (Williams et al., 1992). These changes, which included the construction of the Tennessee-Tombigbee Waterway, discussed above, converted a free-flowing system to a series of shallow in-stream impoundments, and resulted in decreased flow and increased water depth and sedimentation (Pennington and Baker, 1982; Watters, 1999).

Maintaining navigation channels requires maintenance dredging. Most navigation dredging consists of removing seasonally accumulated sediments in previously dredged reaches to maintain developed channels. Dredging may initiate or perpetuate channel instability and erosion, dredge spoil disposal may cover benthic species and their habitats and/or contribute to temporary downstream turbidity (FWS, 2000).

As discussed in section 3.3.1.2, *Construction Effects on Geology and Soils*, construction of the proposed project may disturb and suspend sediments, potentially resulting in increased turbidity levels within in the Tombigbee River, which could contribute to cumulative effects on sedimentation and turbidity. Further, high flow events during construction could result in additional scour and suspended sediment in and downstream of the construction area. However, as discussed in section 3.3.1.2, *Construction Effects on Geology and Soils*, the measures included in Birch Power's erosion control plan would help minimize sediment and turbidity impacts throughout the construction phase. Further, the development of a final plan in consultation with resource agencies would limit the project's construction contribution to cumulative effects on turbidity levels in the Tombigbee River Basin.

In addition to erosion, sedimentation, and turbidity issues in the basin, are point and non-point sources of pollution that can lead to decreased DO in the system. As discussed, in section 3.3.5.1, *Land Use*, important land uses in the area include pasture and cropland. Land surface run-off from these types of activities can result in periodic low DO levels that can be detrimental to aquatic resources. Large industrial plants such as the two paper mills located downstream of the proposed project also release effluents into the Tombigbee River, which can increase BOD and decrease DO. Although pollution control standards established by state and federal water quality laws minimize the impacts that industrial discharges have on aquatic systems, the contribution of multiple sources could have a cumulative effect in the system.

Operation of the proposed project could contribute to degradation of water quality in the basin by reducing DO. Under existing conditions, all flow passes over the spillway, which aerates the water as it spills, creating high DO concentrations (7.0 mg/L to over 8.0 mg/L) in water downstream of the dam. As discussed in section 3.3.2.2, *Operational Effects on Dissolved Oxygen in the Tailrace and Downstream of the Tailrace*, operation of the proposed hydroelectric project would reduce aeration by reducing the volume of water that passes over the dam crest, and would pass deeper, water with less oxygen (i.e., below 4 to 5 mg/L during July and August) through the powerhouse and tailrace, which could reduce DO levels below state standards downstream of the project and contribute to cumulative effects on DO levels in the Tombigbee River. However, the conditions in Alabama DEM's water quality certification, as discussed in section 3.3.2.2, *Operational Effects on Dissolved Oxygen in the Tailrace and Downstream of the Tailrace* would require Birch Power to maintain DO in the tailrace and downstream of the tailrace at or above state standards through structural and/or operational modifications, and conduct monitoring to ensure compliance with the requirements of the certification. Specifically, condition 1 would require that DO in the project discharge is not less than 5.0 mg/L at all times, and the daily average DO at river mile 206, which is where WestRock's Demopolis Mill paper mill effluent is discharged. Although monitoring during July and August 2012 (see section 3.3.2.1, *Water Quality*) indicated that DO immediately upstream of the WestRock discharge is frequently higher than 6.5 mg/L (7-day average DO was always greater than 7.0 mg/L and occasionally exceeded 8 mg/L), the requirements in Alabama DEM's certification would minimize the degree to which project operation could reduce DO downstream of the dam. As such, cumulative effects on DO concentrations in the Tombigbee River as a result of the proposed project, would be minimal.

Fish Resources

Along the main stems of the Tombigbee and Black Warrior rivers, there are 15 Corps lock and dams upstream of the proposed project and one lock and dam downstream of the project (figure 2-1). In addition, there are at least two non-Corps dams located on tributaries of the Black Warrior River (i.e., Lewis Smith Dam on the Sipsey River and Lake Tuscaloosa Dam on the North River). Three of the dams in the Black Warrior system include hydropower projects (i.e., Lewis Smith dam [first development of the Warrior River Project (FERC No. 2165)], the Corps' Bankhead Lock and Dam [second development of the Warrior River Project], and the Corps' Holt Lock and Dam [Alabama Power's Holt Project (FERC No. 2203)] (figure 2-1). On the Tombigbee River, the Commission has issued preliminary permits for hydropower projects at the Corps' Tom Bevil Lock and Dam and Coffeeville Lock and Dam. In the Black Warrior River system, the Commission has also issued preliminary permits for hydropower projects at the Corps' William Bacon Oliver Lock and Dam (FERC No. 14615) and Selden Lock and Dam (FERC No. 14672), as well as Lake Tuscaloosa Dam (FERC No. 14750; located on the North River, which flows into the Black Warrior River). These dams and their impoundments exert cumulative effects on fisheries and aquatic resources in the Tombigbee River system in a variety of ways, including: modifying and regulating the natural flow regime; impeding upstream passage, and in some instances downstream passage, of resident and migratory fishes; influencing water quality characteristics; and subjecting downstream-moving fish to turbine entrainment and the risk of turbine-induced mortality (i.e., at the Black Warrior River Project developments and the Holt Project).

The construction of dams, including Demopolis Dam, has fragmented and altered riverine habitats for native species of fish and freshwater mussels, such as the paddlefish and the inflated heelsplitter mussel, as well as reduced the connectivity of main stem riverine habitats to tributary habitats. Main stem impoundments may impede the ability of tributary populations of fish and mussels to recolonize from neighboring tributary systems after local disturbances. Cumulative effects of these past actions combined with other anthropogenic disturbances within tributary watersheds (e.g., point and nonpoint sources) may threaten the persistence of some native species, such as ovate clubshell and southern clubshell mussels, which are both federally listed as endangered, and are present in tributaries of the Tombigbee River. In the Tombigbee River, dam construction also fragmented and eliminated much historic spawning habitat for some diadromous species, such as Alabama sturgeon, Gulf sturgeon, Alabama shad, and Gulf strain striped bass.

The cumulative effects of Birch Power's licensing proposal on diadromous fish migrations would be negligible, if any. As discussed fully in section 3.3.4, *Threatened and Endangered Species*, Alabama sturgeon may be present downstream of Coffeeville Lock and Dam, but they are unlikely to migrate upstream, because there is no dedicated fish passage at Coffeeville Lock and Dam. Gulf sturgeon occur in the lower reaches of the Mobile River Basin, and are no longer present upstream of Coffeeville Lock and Dam. In addition, Alabama shad and anadromous Gulf strain striped bass are extirpated from the Tombigbee River. Although the historical distribution of these species extended to the project, there are currently no known plans to provide upstream fish passage at Coffeeville Lock and Dam, immediately downstream of the project.

Cumulative impingement or entrainment mortality effects for the fish species inhabiting the Tombigbee River system are likely to be relatively minor. Only a small proportion of the fish entrained at the Demopolis Project would likely not survive turbine passage, and the losses of these mostly small and young-of-year fish would be of minor significance to most of the existing fisheries resources (see section 3.3.2.2, *Fish Impingement, Entrainment, and Turbine Mortality*).

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

The proposed project spans multiple ecosystem types, including southeastern floodplain and blackland prairie ecoregions (Griffith, et al., 2001). The northern portion of the project area, including the hydropower facilities and access road, would be located on the outer edge of a swampy oxbow of the Tombigbee River, near the confluence of the

Tombigbee and Black Warrior Rivers. This area is part of the southeastern floodplain ecoregion, which is characterized by large rivers and backwaters that form ponds, swamps, and oxbow lakes. In this ecoregion, cypress/tupelo swamp forests and oak-dominated bottomland hardwood forests provide important wildlife corridors and habitat.

The proposed transmission line route extends southward from the Tombigbee River into upland habitat that is part of the blackland prairie ecoregion. Today, this ecoregion is generally characterized by cropland and pasture, with small patches of mixed hardwood trees. The upland terrain is relatively flat, with no significant hills or valleys.

Dominant land uses in the vicinity of the project include municipal, residential, agricultural, Corps operations, wildlife conservation, and public recreation. The Demopolis Lock and Dam impounds the 53-mile-long Demopolis Lake, and influences water elevation and flooding in the project area. On the north side of the Tombigbee River, project facilities would be constructed within the 2,534-acre Damsite Management Unit of the David K. Nelson Wildlife Management Area. The land in this area is owned by the Corps and managed by Alabama DCNR. The 4.4-mile project transmission line would run southward from the powerhouse, first crossing the Tombigbee River and then traversing Corps land and private agricultural land on the south side of the river. About 1.2 miles of the transmission line would be located within an existing powerline corridor on Corps land that is used for lock and dam operation facilities and public recreation. An additional 2.9 miles of transmission line would occur within an existing powerline corridor located on private forests and pastures.

Botanical Resources

The predominant terrestrial land cover types within the 85.1-acre project boundary are emergent herbaceous wetlands (25.2 acres), developed open space (19.4 acres), woody wetlands (17.4 acres), and open water (16.7 acres), altogether accounting for about 92 percent of the total land cover within the project boundary.[126] Wetlands within the project boundary predominantly occur on the north side of the Tombigbee River, within the Damsite Management Unit of the David K. Nelson Wildlife Management

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[126] Additional land cover types include: pasture/hay (4.7 acres); developed, medium intensity (1.0 acres); developed, low intensity (0.5 acres); and deciduous forest (0.2 acres). Developed areas are composed of a mixture of constructed materials and vegetation, including “developed, open space” (with less than 20 percent impervious surfaces), “developed, low intensity” (with 20 – 49 percent impervious surfaces), and “developed, medium intensity” (with 50 – 79 percent impervious surfaces) (USGS, 2006).

Area. The environmental survey report filed by Birch Power on May 25, 2016, divides the vegetation within the Damsite Management Unit into three zones: river scour, mixed deciduous riparian woods, and bottomland mixed hardwoods (Birch Power, 2016).

The river scour zone occurs immediately downstream of the Demopolis Lock and Dam, on the north side of the river channel. It is situated between the mainstem of the Tombigbee River and an elevated river bank area. The area is impacted by periods of inundation and sandy alluvial deposits. A closed vegetative canopy does not exist across the area, but sparse vegetation occurs in the form of small trees and shrubs. The most common plants in the river scour zone include very young examples of sycamore, black willow, and green ash.

The mixed deciduous riparian woods zone is found along the elevated river bank area, adjacent to and immediately downstream of the Demopolis Lock and Dam. This area is inundated less often than the river scour zone, and is characterized by relatively thick vegetation, including common woody vines, various shrubs and smaller trees, and larger trees (e.g., willow oak, mockernut hickory, sweet gum, and black cherry).

The bottomland mixed hardwoods zone is located in the forested area further inland from the mixed deciduous riparian woods zone. Vegetation in this area includes a relatively dense herbaceous layer, shrubs, woody vines, and a forested canopy. The forested canopy consists of trees ranging from 50 to 60 years in age, with dominant members suited to wetland conditions, including water hickory, overcup oak, swamp chestnut oak, and bald cypress. Hardwood species make up more than 70 percent of the vegetation in this zone.

About 25 percent of the project area consists of land that has been developed to varying degrees, including open space, low intensity, and medium intensity developments. Most of the developed land within the project boundary occurs along the proposed transmission line corridor. Other terrestrial habitat types within the transmission corridor include hickory/oak deciduous forest, pine coniferous forests, and pasture.

Sensitive Botanical Species

The Alabama Natural Heritage Program[127] provides a list of rare, threatened, and endangered species of Alabama (Alabama Natural Heritage Program, 2016), including 30 botanical species that potentially occur in Marengo and Sumter Counties (table 3-12). Over half of the species listed by the Alabama Natural Heritage Program are defined as critically imperiled because of extreme rarity or other factors making them especially vulnerable to extirpation from Alabama. One such species, Georgia rockcress, is federally threatened under the ESA and discussed further in section 3.3.4.1, *Threatened and Endangered Species, Affected Environment*.

Table 3-12. Sensitive botanical species documented in Marengo and Sumter Counties, Alabama (Source: Alabama Natural Heritage Program, 2016, as modified by staff).

Common Name (*Scientific Name*)	**State Rank[1]**	**County Occurrence**
Arkansas oak (*Quercus arkansana*)	2	Sumter
Bur oak (*Quercus macrocarpa*)	2	Sumter
Canadian milkvetch (*Astragalus canadensis*)	1	Sumter
Carolina crownbeard (*Verbesina walteri*)	1	Sumter
Clustered poppy-mallow (Callirhoe triangulata)	1	Sumter
Cream-flowered tick-trefoil (*Desmodium ochroleucum*)	1	Sumter
Drummond's pennyroyal (*Hedeoma drummondii*)	2	Marengo, Sumter
Ebony sedge (*Carex eburnea*)	2	Sumter
Georgia rockcress (*Arabis georgiana*)[2]	1	Sumter
Harper's grooved-yellow flax (*Linum sulcatum var. harperi*)	1	Marengo, Sumter
Heath aster (*Symphyotrichum ericoides*)	1	Sumter
Lance-leaved buckthorn (Rhamnus lanceolata)	2	Sumter
Narrow-leaved trillium (*Trillium lancifolium*)	2	Marengo
Oglethorpe's oak (*Quercus oglethorpensis*)	1	Marengo, Sumter
Ovate catchfly (*Silene ovata*)	2	Marengo
Pale umbrella-wort (*Mirabilis albida*)	2	Sumter
Pale-purple coneflower (*Echinacea pallida*)	2	Sumter

[127] The Alabama Natural Heritage Program is an ecological inventory administered through the Auburn University Environmental Institute. The purpose of the Alabama Natural Heritage Program is to provide scientific information on the biological diversity of Alabama to guide conservation actions and promote sound stewardship practices.

Common Name (*Scientific Name*)	State Rank[1]	County Occurrence
Prairie false-foxglove (*Agalinis heterophylla*)	2	Marengo, Sumter
Prairie pleatleaf (*Nemastylis geminiflora*)	1	Sumter
Prairie scorpion-weed (*Phacelia strictiflora var. robbinsii*)	1	Sumter
Ridgestem false foxglove (*Agalinis oligophylla*)	1	Sumter
Southern lady's-slipper (*Cypripedium kentuckiense*)	1	Sumter
Southern lepuropetalon (*Lepuropetalon spathulatum*)	1	Sumter
Southern meadowrue (*Thalictrum debile*)	2	Sumter
Spreading rockcress (*Arabis patens*)	1	Marengo
Stiff greenthread (*Thelesperma filifolium*)	1	Sumter
Three-flowered hawthorn (*Crataegus triflora*)	2	Sumter
Vari-leaf evening-primrose (*Oenothera heterophylla*)	H	Sumter
Yellow sunnybell (*Schoenolirion croceum*)	2	Sumter
Yellow water-crowfoot (*Ranunculus flabellaris*)	1	Sumter
[1] State Rank classifications: 1 - critically imperiled (5 or fewer occurrences of very few remaining individuals or acres); 2 - imperiled (6 to 20 occurrences or few remaining individuals or acres); 3 - rare or uncommon in Alabama (on the order of 21 to 100 occurrences); and H - species occurred historically in Alabama, and there is some possibility that it may be rediscovered.		
[2] Georgia rockcress is listed as a federally threatened species under the ESA.		

Invasive Plant Species

Nonnative, invasive plant species can disrupt the natural ecological balance of native ecosystems, out-compete native species, and adversely impact the quality of outdoor recreation experiences. The Alabama Invasive Plant Council[128] has identified the ten most problematic invasive species in Alabama as tallowtree, Chinese privet, multiflora rose, tropical soda apple, Japanese climbing fern, kudzu, cogongrass, alligatorweed, hydrilla, and Eurasian water milfoil (table 3-13). According to the University of Georgia's Early Detection & Distribution Mapping System, each of these species occurs in the vicinity of the project area, except tropical soda apple (University of Georgia, 2013). Tallowtree, Chinese privet, and cogongrass were identified in the project area during site surveys conducted in 2016 (Birch Power, 2016).

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[128] The Alabama Invasive Plant Council is a non-profit organization that serves as an educational, advisory, and technical support council on all aspects of invasive plant issues in Alabama. Council partners include non-profit organizations within Alabama, and federal and state agencies.

Table 3-13. List of Alabama's ten most problematic nonnative, invasive plant species, and the severity of the species' infestations according to habitat type (Source: Alabama Invasive Plant Council, 2012; Birch Power, 2016, as modified by staff).

Common Name (*Scientific Name*)	**Natural Areas and Parks**	**Wildlife Habitat/ Food Plots**	**Rights-of-Way**	**Wetland/ Riparian**	**Identified in Surveys**
Trees					
Tallowtree (*Triadica sebifera*)	1	1	1	1	Yes
Shrubs					
Chinese privet (*Ligustrum sinense*)	1	1	1	1	Yes
Multiflora rose (*Rosa multiflora*)	1	1	2	N/A	No
Tropical soda apple (*Solanum viarum*)	2	W	W	N/A	No
Vines					
Japanese climbing fern (*Lygodium japonicum*)	1	2	N/A	1	No
Kudzu (*Pueraria montana var. lobata*)	1	1	1	N/A	No
Grasses					
Cogongrass (*Imperata cylindrica*)	1	1	1	1	Yes
Aquatic plants					
Alligatorweed (*Alternanthera philoxeroides*)	N/A	1	N/A	1	No
Hydrilla (*Hydrilla verticillata*)	N/A	N/A	N/A	1	No
Eurasian water milfoil (*Myriophyllum spicatum*)	N/A	N/A	N/A	1	No
Key: 1 – Extensive and dense infestations in Alabama; 2 – Scattered and localized infestations in Alabama; W – Watch; N/A – Not commonly found in habitat					

Of the invasive species identified in table 3-13, Alabama DCNR references cogongrass as being particularly problematic in the project area. According to pre-filing consultation documents filed with the license application, during a public meeting held on May 5, 2011, Alabama DCNR referenced an infestation of cogongrass on the bank of the Tombigbee River just downstream of Demopolis Lock and Dam, and stated that the infestation should be dealt with before placing any new soils in the area. Cogongrass is an aggressive, colony-forming perennial grass that can invade a range of sites, including rights-of-way, open forests, old fields and pastures (Alabama Forestry Commission, 2010). According to Alabama Forestry Commission, cogongrass forms a dense mat that enables it to exclude most other vegetation, and permanently alter wildlife habitat in the area of the infestation.

Wetlands and Riparian Habitat

Birch Power used FWS's National Wetlands Inventory (NWI) system,[129] aerial imagery, and on-site vegetation inventories to identify 56.5 acres of wetland habitat within the project boundary (table 3-14).[130] The majority of the wetland habitat in the project area occurs within the Damsite Management Unit of the David K. Nelson Wildlife Management Area. The Damsite Management Unit is located in a swampy oxbow of the Tombigbee River, which is influenced by the confluence of the Black Warrior River just upriver of Demopolis Lock and Dam, and the Corps' operation of the Demopolis Lock and Dam for river navigation. Outside of this immediate floodplain area, the terrain is relatively flat and primarily characterized by upland habitat, although wetlands do occur in lower lying areas.

Table 3-14. Acreage by wetland type within the project boundary (Source: Birch Power's March 7, 2016 filing, as modified by staff).

NWI Wetland Type	Description	Acres
L2USAs[1]	Littoral, temporarily flooded, spoils	39.1
PFO1A; PFO1C; PFO6Fh	Forested, deciduous, periodically flooded	12.1
L1UBHh[2]	Limnetic, open water, diked	3.3
PFO1; PSS4A; PSS1A	Shrub/scrub, temporarily flooded	1.6

[129] FWS's NWI digital mapping system provides information on wetland habitats using remote sensing and aerial photo interpretation techniques (FWS, 2016c).

[130] Birch Power Company's March 7, 2017 response to staff's February 7, 2017 additional information request.

PFO1;PFO4A	Forested, deciduous/coniferous, temporarily flooded	0.4
Total Acres within Project Boundary		56.5
[1] Birch Power includes a wetland type labeled "L2BBAs" in its filings. NWI maps indicate that the appropriate wetland code is "L2USAs" (FWS, 2016c).		
[2] Birch Power includes a wetland type labeled "L1OWHh" in its filings. NWI maps indicate that the appropriate wetland code is "L1UBHh" (FWS, 2016c).		

As described in the environmental survey report filed by Birch Power on May 25, 2016, there are three vegetative zones within the Damsite Management Unit: a bottomland mixed hardwoods, a mixed deciduous riparian woods, and a river scour area. These vegetative zones correspond with distinct wetland areas. On the far north end of the project boundary, a bottomland hardwood forest includes a canopy of oak, hickory, and cypress trees, and a diverse understory of shrubs, woody vines, and herbaceous species. To the south of the bottomland forest area, an elevated river bank supports a mixed deciduous forest and scrub-shrub habitat. Although the elevated river bank area is classified as forested wetland in the FWS's NWI system, it appears to serve as a transitional zone between the river channel and the bottomland forest; and is characterized by frequent disturbances, including tree falls along the ridge resulting from erosion. Below the river bank on the north side of the Tombigbee River, an emergent herbaceous wetland occurs on a sandy alluvium and sediment deposit downstream of the Demopolis Lock and Dam. This emergent wetland is sparsely vegetated due to extended periods of inundation and the deposition of sandy alluvium from the Tombigbee River.

To the south and east of the Damsite Management Unit, the Tombigbee River contains deepwater habitat (i.e., "limnetic") and shoreline, wetland habitat (i.e., "littoral"). Further south, outside of the Tombigbee River floodplain, the project area primarily consists of upland habitat. However, forested wetland and riverine habitats, including perennial and intermittent streams, occur in certain low-lying areas.[131]

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[131] Although not identified by Birch Power, FWS's NWI system indicates that the project boundary crosses four streams that are located: (1) immediately west of the Demopolis Country Club; (2) immediately south of Powe Road; (3) about midway between Powe Road and U.S. Route 80/Alabama Highway 8; and (4) near Birch Power's proposed interconnection of the project transmission line with the existing substation. These stream crossings include about 0.04 acre of wetland classified as "R5UBH" (permanently flooded streambed); and 0.03 acre of wetland classified as "R4SBC" (seasonally flooded streambed) by FWS's NWI system. These wetland types are not shown in table 3-14.

Wildlife Resources

Demopolis Lake and the surrounding wetland, woodland, and agricultural areas provide habitat for a variety of terrestrial and semi-aquatic wildlife species. According to Birch Power's March 7, 2017 filing, the majority of the 85.1-acre project boundary includes lands and waters that can be utilized by wildlife, including 25.2 acres of emergent herbaceous wetlands; 19.4 acres of developed, open space; 17.4 acres of woody wetlands; 16.7 acres of open water; 4.7 acres of pasture; and 0.2 acres of deciduous forest.

Approximately 430 wildlife species are known to occur on Corps projects in the Black Warrior and Tombigbee Lake region, including 49 mammal species and 277 bird species (Birch Power, 2017). The more common mammal species include swamp and eastern cottontail rabbit, gray and fox squirrel, muskrat, red and gray fox, raccoon, bobcat, beaver, white-tailed deer, striped and spotted skunk, nine-banded armadillo, coyote, and various shrews, rats, and mice. Roughly 120 species of native birds are known to occur at Corps projects in the region, such as the northern cardinal, northern mockingbird, Carolina wren, northern flicker, blue jay, and various warblers, sparrows, hawks, owls, and shorebirds.

Project facilities would be located within the Damsite Management Unit of the David K. Nelson Wildlife Management Area. The David K. Nelson Wildlife Management Area is a collection of nine separate wildlife management units encompassing 8,308 acres of habitat for game and non-game wildlife species in the surrounding area.[132] Several waterfowl and game species use the David K. Nelson Wildlife Management Area, including deer, turkey, squirrel, rabbit, dove, duck, raccoon, opossum, feral swine, beaver, and otter (Alabama DCNR, 2016c).[133]

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[132] The David K. Nelson Wildlife Management Area was established under section 601 of the Water Resources Development Act of 1986, as part of an authorization to the Secretary of the Army to acquire 88,000 acres of floodplain/bottomland forest for mitigation of wildlife losses resulting from the construction and operation of the Tennessee-Tombigbee Waterway in Alabama and Mississippi. Section 601 of the Water Resources Development Act provides the states of Alabama and Mississippi with the authority to manage the acquired lands for wildlife purposes. (*See* Water Resources Development Act of 1986. Pub. L. No. 99-662. 100 stat. 4183. November 1986).

[133] Game birds and fur bearing animals are subject to regulatory oversight through annually published state regulations (Alabama DCNR, 2016a).

Wildlife management in the Damsite Management Unit is overseen by the Wildlife and Freshwater Fisheries Division of the Alabama Department of Conservation and Natural Resources (Alabama DCNR). The predominance of palustrine forested wetland in the Damsite Management Unit provides diverse and productive wildlife habitat within and around the project area. These forested wetland areas are potentially valuable as stopover habitat for migrating songbirds and cavity nesting species. The emergent and lacustrine littoral habitats in the vicinity of the project also provide potential breeding habitat for a number of aquatic and semi-aquatic amphibian species, snakes, turtles, river otter, mink, muskrat, and beaver; and refuge and feeding areas for resident and migratory waterfowl and wading birds.

Wildlife Species of Conservation Concern

Alabama does not have a state law equivalent to the ESA, so species do not have regulatory protection as state threatened or endangered species. The Alabama Natural Heritage Program provides a list of rare, threatened, and endangered species of Alabama (Alabama Natural Heritage Program, 2016), including 20 species that potentially occur in Marengo and Sumter counties (table 3-15). Out of the 20 species listed in table 3-15, two are listed as critically imperiled under the state ranking system, 18 are protected as non-game species by state regulations, and four are listed as species of highest conservation concern in the Alabama state wildlife action plan (Alabama DCNR, 2015).

Table 3-15. Sensitive wildlife species documented in Marengo and Sumter Counties, Alabama (Source: Alabama Natural Heritage Program, 2016, as modified by staff).

Common Name (*Scientific Name*)	**State Rank**	**State Status**	**SWAP Status**	**Preferred Habitat**[134]	**County Occurrence**
Amphibians					
Crawfish frog (*Rana areolata*)	S1	SP	P1	Wet woodlands, pastures, prairies, and river floodplains (University of California, ND)	Sumter
Small-mouthed salamander (*Ambystoma texanum*)	S3	N/A	P2	Mesic[135] forest floors, near seasonal and semi-permanent wetlands (University of California, ND)	Sumter
Three-toed amphiuma (*Amphiuma tridactylum*)	S3	N/A	N/A	Bottomland swamps, bayous, cypress swamps, and streams (University of California, ND)	Sumter
Birds					
American kestrel (*Falco sparverius*)	S3B, S5N	SP	P2	Open country, farmland, cities, wood edges (Audubon, ND)	Marengo
Bewick's wren (*Thryomanes bewickii*)	SHB, S1N	SP	P1	Thickets, underbrush, gardens, especially brushy areas around the edges of woods (Audubon, ND)	Sumter
Common ground-dove (*Columbina passerina*)	S3	SP	N/A	Typically found in brushy fields, understory of open pine woods, and forest edges (Audubon, ND)	Marengo, Sumter
Lark sparrow (*Chondestes grammacus*)	S3B	SP	N/A	Open country with bushes, trees, pastures, farms, and roadsides (Audubon, ND)	Sumter

[134] We obtained descriptions of preferred habitat from sources other than the Alabama Natural Heritage Program, as referenced below.

[135] Mesic habitats provide a "moderate" amount of moisture compared to xeric (dry) and hydric (wet/inundated) habitats.

Common Name (*Scientific Name*)	State Rank	State Status	SWAP Status	Preferred Habitat[134]	County Occurrence
Painted bunting (*Passerina ciris*)	S2B	SP	N/A	Semi-open areas with dense low growth, including woodland edges and clearings, roadsides, brush, and thickets (Audubon, ND)	Marengo, Sumter
Red-cockaded woodpecker (*Picoides borealis*)	S2	SP	P1	Mature pine woods with open understory, preferring mature longleaf pine trees greater than 80 years old (Audubon, ND)	Marengo
Scissor-tailed flycatcher (*Tyrannus forficatus*)	S2	SP	N/A	Typically grassland or farmland with scattered trees or isolated groves, and open grassland where utility poles provide artificial nest sites (Audubon, ND)	Marengo, Sumter
Swallow-tailed kite (*Elanoides forficatus*)	S2	SP	P2	Wooded river swamps with tall trees for nesting and nearby open country with abundant prey (Audubon, ND)	Marengo, Sumter
White ibis (*Eudocimus albus*)	S2B, S3N	SP	N/A	Foraging in marshes, mudflats, flooded pastures, lake edges, mangrove lagoons, and grassy fields; nesting in mangroves, swamps, dense thickets, or marshes (Audubon, ND)	Sumter
Wood stork (*Mycteria americana*)	S2N	SP	P2	Typically fresh water, including shallow marshes, flooded farm fields, ponds, and ditches with falling water levels likely to concentrate prey; nesting mainly in stands of tall cypress, and less often in mangroves, and dead trees in flooded impoundments (Audubon, ND)	Marengo, Sumter
Mammals					
Black bear (*Ursus americanus*)	S2	GANOS	P1	Ranging diverse habitats, including deciduous and coniferous forests with a source of fall mast, such as oak acorns and beechnuts; denning in caves, tree cavities, and brush piles, except in areas prone to flooding (Garshelis et al., 2016)	Marengo

Common Name (*Scientific Name*)	**State Rank**	**State Status**	**SWAP Status**	**Preferred Habitat**[134]	**County Occurrence**
Reptiles					
Alabama map turtle (*Graptemys pulchra*)	S3	SP	N/A	Large, swift-flowing creeks and rivers, preferably with abundant basking sites in the form of fallen trees and brush piles (van Dijk, 2011b)	Marengo, Sumter
Alligator snapping turtle (*Macrochelys temminckii*)	S3	SP	N/A	Rivers, streams, and oxbow lakes (University of Georgia, ND)	Sumter
Coachwhip (*Masticophis flagellum*)	S3	SP	N/A	Open habitats with sandy soils, including open pine forests, sandhill scrub habitats, and prairies; occasionally in modified habitats such as transmission line rights-of-way and agricultural areas (University of Georgia, ND)	Sumter
Eastern speckled kingsnake (*Lampropeltis nigra holbrooki*)	S3	SP	P2	Diverse terrestrial habitats, including hardwood and pine forests, bottomlands and swamps, hammocks, and farmlands. This species is strongly terrestrial, but inhabits areas close to water such as stream banks and swamp borders. (University of Georgia, ND)	Marengo, Sumter
Northern black-knobbed map turtle (*Graptemys nigrinoda*)	S3	SP	N/A	Rivers and streams with moderate current, and logs and other basking sites; hatchlings and juveniles prefer adjoining sloughs and bayous (van Dijk, 2011a)	Marengo, Sumter
Southeastern five-lined skink (*Plestiodon inexpectatus*)	S3	SP	P2	On the ground or in trees, and common in dry, wooded habitats with abundant cover, such as fallen trees and tree stumps (University of Georgia, ND)	Marengo
State Ranking System: S1 – critically imperiled (5 or fewer occurrences of very few remaining individuals or acres); S2 – imperiled (6 to 20 occurrences or few remaining individuals or acres); S3 – rare or uncommon in Alabama (on the order of 21 to 100 occurrences); S4 – apparently secure, with many occurrences; S5 – demonstrably secure in Alabama; SH - species or community occurred historically in Alabama, and there is some possibility that it may be rediscovered.					

Common Name (*Scientific Name*)	**State Rank**	**State Status**	**SWAP Status**	**Preferred Habitat**[134]	**County Occurrence**
Breeding Status Qualifiers for State Ranking System: B - conservation status refers to the breeding population of the species in the state; N - conservation status refers to the nonbreeding population of the species in the state. Regularly occurring, usually migratory and may not breed in Alabama; this category includes migratory birds, bats, sea turtles, and cetaceans.					
State Status Code: SP – nongame species protected by state regulation; GANOS – species designated a game animal, but for which there is no open season					
SWAP (Alabama state wildlife action plan) Status Code: P1 - highest conservation concern, with taxa critically imperiled and at risk of extinction/extirpation; P2 - high conservation concern, with taxa considered imperiled					

The Alabama Natural Heritage Program lists two federally listed species as potentially occurring in Marengo and Sumter Counties: the threatened wood stork and the endangered red-cockaded woodpecker (table 3-15). The official FWS threatened and endangered species list for the project area includes wood stork (FWS, 2016g), as discussed further in section 3.3.4.1, *Threatened and Endangered Species, Affected Environment, Terrestrial Species.* Red-cockaded woodpecker is not listed by FWS as potentially occurring in the project area (FWS, 2016g); and is not otherwise known to occur in Marengo and Sumter Counties (FWS, NDd). Red-cockaded woodpecker requires open, mature, old growth pine ecosystems (FWS, 2003), which are not present in the project area (Birch Power, 2016). Separately, Birch Power identified the federally threatened gopher tortoise as potentially occurring in the vicinity of the project. The gopher tortoise is discussed further in section 3.3.4.1, *Threatened and Endangered Species, Affected Environment, Terrestrial Species*.

Out of the 24 migratory bird species listed by the FWS's Information for Planning and Conservation system as potentially occurring in the project area (FWS, 2017), the Alabama Natural Heritage Program lists the American kestrel and swallow-tailed kite as rare/uncommon and imperiled in the state of Alabama, respectively (table 3-15). FWS also lists the bald eagle (*Haliaeetus leucocephalus*) as potentially occurring in Marengo and Sumter Counties (FWS, NDa). The bald eagle was delisted from the ESA in 2007, but remains federally protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (FWS, 2007a). Bald eagles forage near large bodies of water (such as lakes, reservoirs, rivers, and marshes), and nests are typically located below the crowns of large trees, close to foraging areas (Cornell University, 2016). According to Birch Power, no bald eagle nests are known to occur in the project area.

3.3.3.2 Environmental Effects

Wildlife resources and their habitats in the project area have been influenced by the operation and maintenance of Demopolis Lock and Dam since its construction in 1955. The Corps operates Demopolis Lake for navigation, and public recreation in the immediate area consists of hunting, fishing, camping, picnicking, hiking, water sports, sightseeing, and various other activities. The 2,534-acre Damsite Management Unit of the David K. Nelson Wildlife Management Area is accessible by road and managed by Alabama DCNR for public hunting of several game species, including deer, turkey, squirrel, rabbit, dove, duck, raccoon, opossum, feral swine, beaver, and otter (Alabama DCNR, 2016c).

The project would not alter the Corps' operation of the Demopolis Lock and Dam or Alabama DCNR's regulations pertaining to wildlife management within the Damsite Management Unit. However, construction of project facilities would result in removal of existing vegetation and disturbance to wildlife habitat. Birch Power proposes to construct the following project facilities that have the potential to affect terrestrial resources: (1) a 900-foot-long excavated intake channel on the north bank of the Tombigbee River; (2) a 201-foot-long, 80-foot-wide powerhouse; (3) an 1,880-foot-long excavated tailrace channel; (4) a 4.4-mile-long, 115-kV transmission line; (5) a 1.2-mile-long, 25-foot-wide access road with a powerhouse parking area; (6); a 23-acre spoils disposal site on the north side of the river channel, below Demopolis Lock and Dam, to be supported by a 1,700-foot-long retaining wall adjacent to the tailrace; (7) a fishing platform on the south bank of the Tombigbee River; and (8) a 2,600-foot-long hiking trail and 2-3 car recreation parking area within the Damsite Management Unit.

Project Effects on Wetlands and Riparian Habitat

The project would operate as a run-of-release facility consistent with the Corps' operation of the Demopolis Lock and Dam for navigation purposes. Birch Power is not proposing to change the operating rules for Demopolis Lake, or increase reservoir storage for hydropower operations. However, construction of project facilities would result in disturbance to wetland habitat, primarily within the Damsite Management Unit of the David K. Nelson Wildlife Management Area, on the northern end of the project boundary.

To mitigate project effects on wetlands, Birch Power proposes to construct the project transmission line primarily within an existing right-of-way; selectively place transmission line poles to avoid wetlands; implement a proposed revegetation plan involving the revegetation of areas disturbed by construction of project facilities; and implement a spoils disposal plan involving the creation of a forested wetland within a spoils disposal site.

According to consultation records filed by Birch Power on May 21, 2014, Alabama DCNR does not oppose Birch Power's proposal to create a forested wetland on the spoils disposal site. Alabama DCNR states that the utilization of spoils to develop a forested wetland habitat is appropriate; and that revegetating disturbed sites is critical and should be done with species appropriate for the soils, hydrology, and site index. During a January 23, 2017 technical meeting on the spoils disposal plan, Corps also provided comments pertaining to the hydrology of Birch Power's proposed forested wetland.[136]

In its July 28, 2017 comments on the draft EA, EPA states that Birch Power's proposal to create a forested wetland using construction spoils would constitute disposal of waste and a discharge to existing wetlands that is regulated by section 404 of the

[136] Commission staff February 7, 2017, Technical Meeting Summary.

CWA[137] and would require compensatory mitigation. EPA agrees with Commission staff that Birch Power's proposed wetland would be unlikely to have a hydrologic regime supportive of wetland vegetation and wildlife, including the wood stork. EPA also concurs with staff's recommendation to avoid disposal of spoil material in the wetlands on the north side of the project site, and instead to transport all spoils not otherwise used for improving the access road and constructing the powerhouse parking area to an offsite disposal area.[138] In addition, EPA observes that the draft EA did not account for the costs of compensatory mitigation for project impacts to wetlands (i.e., in table 4-3, which includes the cost of environmental mitigation and enhancement measures). EPA recommends that Birch Power purchase credits from a mitigation bank, if available, or demonstrate that the ecological "lift" of any proposed (applicant-responsible) wetland mitigation is comparable to that of a mitigation bank.

Our Analysis

Construction of proposed project facilities would affect 53.1 acres of wetland habitat, including the permanent loss of 37.05 acres and temporary disturbance of 16.05 acres (table 3-16).[139] Permanent wetland losses would be associated with construction of the proposed access road (3.55 acres), proposed spoils disposal site (23.1 acres), powerhouse (0.4 acre), intake channel (1.0 acre), powerhouse parking area (1.6 acres), and tailrace channel (7.4 acres).[140] Bottomland hardwood forest in the Damsite Management Unit would be displaced by the powerhouse parking area, powerhouse, access road, and portions of the intake channel (Birch Power, 2016). Temporary disturbances would also be associated with construction of the access road (3.55 acres);

[137] EPA also notes that the draft EA did not mention section 404 of the CWA, which restricts discharges to aquatic resources such as wetlands. The Corps is responsible for permitting under section 404 of the CWA and staff anticipates that regulatory process will occur after the Commission's licensing process is complete.

[138] In section 3.3.1.2 *Geology and Soils Resources* we discuss EPA's recommendation to test spoils for potential contaminants if any dredged materials would be placed in waters of the U.S. or sent to a confined disposal facility that discharges to waters of the U.S.

[139] These totals do not consider 1.5 acres of permanent losses and temporary disturbances associated with limnetic, open water habitat.

[140] Birch Power estimates that about half of the land affected by the access road would be permanently lost and the other half would be temporarily disturbed.

project transmission line (2.8 acres);[141] and other project facilities, including the spoils disposal site, powerhouse, intake channel, parking area, and tailrace channel (9.7 acres, as shown under “buffer lands” in table 3-16). This land would be revegetated following construction, as described in the final license application and Birch Power’s March 7, 2017 filing.

[141] According to FWS’s NWI system, the project transmission line would also cross about 0.07 acre of riverine wetland habitat not shown in table 3-16, including two intermittent streams and two perennial streams. *See* note 103 for additional information on these stream crossings.

Table 3-16. Effects of project facilities on wetland habitats (in acres) (Source: Birch Power, 2013 and Birch Power's March 7, 2016 filing, as modified by staff).

NWI Wetland Type	Wetland Description	Access Road	Transmission Line	Spoils Disposal	Power -house	Intake Channel	Parking Area	Tailrace Channel	Buffer Lands[1]
L2USAs[2]	Littoral, temporarily flooded, spoils	0.0	1.9	23.1	0.4	0.0	0.6	7.4	5.6
PFO1A; PFO1C; PFO6Fh	Forested, deciduous, periodically flooded	5.1	0.9	0.0	0.0	1.0	1.0	0.0	4.1
L1UBHh[3]	Limnetic, open water, diked	0.0	0.8	0.0	0.0	2.0	0.0	0.0	0.5
PFO1; PSS4A; PSS1A	Shrub/scrub, temporarily flooded	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PFO1; PFO4A	Forested, deciduous/coniferous, temporarily flooded	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Acres		7.1	3.6	23.1	0.4	3.0	1.6	7.4	10.2

[1] Birch Power includes a 25-foot wide buffer around all project facilities except for the road and transmission corridors, to account for temporary effects associated with land that would be revegetated following construction.

[2] Birch Power includes a wetland type labeled "L2BBAs" in its filings. NWI maps indicate that the appropriate wetland code is "L2USAs" (FWS, 2016c).

[3] Birch Power includes a wetland type labeled "L1OWHh" in its filings. NWI maps indicate that the appropriate wetland code is "L1UBHh" (FWS, 2016c).

Birch Power proposes to construct recreation facilities that would disturb additional wetland habitat not shown in table 3-16.[142] The recreation facilities include a publicly accessible 2- to 3-car parking area in the Damsite Management Unit (about 0.01 acre, assuming 24 feet by 10 feet dimensions), and a 2,600-foot-long angler access trail on the northern end of the project boundary (about 0.18 acre, assuming a 3-foot wide trail) (figure 3-31).

Birch Power proposes several measures that would minimize project effects on wetlands and riparian habitat in the project area, including: (1) utilizing an existing transmission line right-of-way to construct 4.1 miles of the 4.4-mile project transmission line, which avoids construction of a new project transmission line in the forested wetlands of the Damsite Management Unit; (2) operating the project in run-of-release mode consistent with existing Corps' operation of Demopolis Lock and Dam, which maintains hydrologic conditions for wetland habitat upriver from Demopolis Lock and Dam; (3) selectively placing transmission line poles to avoid small, isolated wetland areas; and (4) revegetating areas disturbed by project construction, including wetland areas. Further analysis of Birch Power's revegetation plan is located below, in the analysis of *Project Effects on Botanical Resources*.

Spoils Disposal Plan

On May 21, 2014, Birch Power filed a spoils disposal plan that includes measures for disposing of spoils produced by excavation of project land and construction of the hydroelectric project. According to the spoils disposal plan, Birch Power would place approximately 571,000 cubic yards of Demopolis chalk, soil, and alluvium spoils on the north side of the river channel, downstream of Demopolis Lock and Dam (figure 3-6). Birch Power would also construct a 1,700-foot engineered retaining wall along the north side of the tailrace channel to stabilize the spoils pile.

Placing spoils on the north side of the river channel would permanently displace 23.1 acres of existing littoral wetlands, and temporarily disturb 5.4 acres of littoral and

[142] Birch Power's September 13, 2016 response to staff's August 24, 2016 request for additional information.

palustrine wetlands.[143] Birch Power's spoils disposal plan would also indirectly affect hydrologic inputs to the elevated river bank area that is classified as a palustrine wetland. According to the spoils disposal plan, Birch Power would construct an approximately 28-foot-high, 23.1-acre spoils pile, and a 1,700-foot-long retaining wall between the Tombigbee River and the palustrine wetlands in the Damsite Management Unit (figure 3-7). The spoils pile would be constructed with 505,000 cubic yards[144] of compacted chalk spoils[145] that would largely impede floodwater from reaching the existing river bank and the palustrine wetlands. Direct hydrologic inputs from the Tombigbee River would likely be limited to overbank flooding at elevations of 72 feet ASL or greater. Depending on the frequency of overbank flooding in the future, the local environment could transition to a mesic habitat[146] that would be susceptible to increased competition from upland vegetation. Such disturbances to the existing forested wetland and native streambank vegetation would be inconsistent with the Alabama Wildlife Action Plan (Alabama DCNR, 2015).

Proposed Forested Wetland

To mitigate wetland habitat loss in the Damsite Management Unit, Birch Power proposes in its spoils disposal plan to create a 20.2-acre forested wetland on top of the spoils disposal site. Birch Power would stockpile excavated silt, alluvium, and topsoil to establish a 2 – 3-foot deep soil substrate for native tree species adapted to wetland

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[143] Birch Power's March 7, 2017 response to staff's February 7, 2017 request for additional information. We quantified temporary disturbances by subtracting: (a) the total acres of buffer lands that would be revegetated if the spoils disposal plan measures are included as part of the proposed project (10.8 acres, as shown in Table 8 of Birch Power's March 7, 2017 filing); and (b) the total acres of buffer lands that would be revegetated if the spoils disposal plan measures are not included as part of the project (5.4 acres, as shown in Table 29 of the final license application).

[144] *See* Birch Power's May 21, 2014 response to staff's October 22, 2013 request for additional information.

[145] *See* Birch Power's March 7, 2017 response to staff's February 7, 2017 request for additional information.

[146] *See supra* at note 107.

conditions.[147] The remainder of the 28-foot-high spoils pile would be composed of compacted chalk and other residual spoils material. In its March 7, 2017 filing, Birch Power explains that the spoils pile would be built up to the same elevation, and subject to the same hydrology, as the adjacent forested wetlands in the Damsite Management Unit. Birch Power states that it would consult with the Alabama DCNR and the Corps on methods for revegetating the site, and would plant native plants after the soil substrate is in place. Monitoring and maintenance of the forested wetland would continue for 2 years following construction. With a new forested wetland in the project area, the dominant wetland type would change from littoral to palustrine.[148]

During the January 23, 2017 meeting, Corps commented on Birch Power's proposal to establish a forested wetland on the spoils disposal site.[149] Corps stated that sufficient hydrology would be needed to support the forested wetland created on top of the spoils. Corps stated that it would be incorrect to assume that, because the forested wetland would have the same grade as the existing adjacent habitat, it would exhibit the same hydrology.

We find that the hydrologic conditions of the area and the proposed wetland design are not sufficient for the successful establishment of a forested wetland as proposed in the spoils disposal plan. First, Birch Power's proposal would not provide a soil substrate conducive to the establishment of a 20.2-acre forested wetland. The spoils disposal plan states that any silt, alluvium, or topsoil encountered during excavations would be used to create a 2 – 3-foot layer of soil substrate. Birch Power estimates in the spoils disposal plan that 66,000 cubic yards of soil substrate would be excavated from the project area. However, 66,000 cubic yards of material spread across 20.2 acres only provides a soil substrate depth of 24.3 inches.[150] At just over 2 feet, the soil substrate is not deep enough to promote good growth of most native tree species discussed in Birch

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[147] In its March 7, 2017 filing, Birch Power proposes to utilize the following tree species: overcup oak (*Quercus lyrata*), swamp chestnut oak (*Quercus michauxii*), water oak (*Quercus nigra*), cherrybark oak (*Quercus pagoda*), shagbark hickory (*Carya ovata*), southern sugar maple (*Acer floridanum*), silver maple (*Acer saccharinum*), and water tupelo (*Nyssa aquatica*).

[148] Birch Power Company's March 7, 2017 response to staff's February 7, 2017 request for additional information.

[149] Commission staff's February 7, 2017, Technical Meeting Summary.

[150] To obtain a depth of 3 feet across the 20.2-acre area, Birch Power would need 97,768 cubic yards of material, which is almost 50 percent more soil substrate than estimated in the spoils disposal plan.

Power's March 7, 2017 filing, including swamp chestnut oak (minimum root depth of 28 inches), water oak (minimum root depth of 40 inches), cherrybark oak (minimum root depth of 36 inches), shagbark hickory (minimum root depth of 48 inches), silver maple (minimum root depth of 32 inches), and water tupelo (minimum root depth of 28 inches) (NRCS, 2017b). Moreover, if Birch Power uses all 66,000 cubic yards of silt, alluvium, and topsoil on the top layer of the spoils pile, then the underlying spoils would be composed entirely of compacted chalk. These conditions would be unsuitable for swamp chestnut oak, water oak, cherrybark oak, and water tupelo, as these species do not have a tolerance to calcareous substrates such as chalk (NRCS, 2017b).

As to the hydrology of the 20.2-acre area, Birch Power's proposal to place the soil substrate at an elevation of approximately 70-foot ASL would limit water availability for wetland plants. Stream gauge data show multiple years in recent history where the Tombigbee River has not reached an elevation of 70 feet ASL, including the years 1993-1997, 2006-2008, and 2012 (USGS, 2017). Also, unlike the existing plant community located on the adjacent river bank area, new saplings planted in the 20.2-acre area would not be equipped with root systems that could access groundwater at depths much lower than 70 feet ASL. Under these hydrologic conditions, the wetland plants in the 20.2-acre area could be exposed to increased competition from upland vegetation.

Based on the hydrologic conditions of the area and the proposed wetland design (including the use of chalk spoils to construct the wetland, the limited availability of soil substrate, the elevation of the spoils pile, and the habitat characteristics of the native tree species that would be planted in the area), we conclude that the 20.2-acre area would not support the establishment of a successful forested wetland. Instead, the spoils disposal site would most likely revert to a scrub-shrub mesic habitat composed of species that could tolerate a relatively thin layer of soil, the underlying calcareous substrate, and the hydrologic conditions of the area.

As described in section 3.3.3.1 above, the Damsite Management Unit is one of nine units within the David K. Nelson Wildlife Management Area which includes primarily floodplain/bottomland forest. This Wildlife Management Area was established to mitigate for wildlife losses resulting from the construction and operation of the Tennessee-Tombigbee Waterway in Alabama and Mississippi.[151] In other words, this portion of the proposed Demopolis Project boundary already serves to mitigate previous environmental effects of water resource development projects in the project area. Birch Power has not established the need to fill and replace the existing project wetlands that are also mitigation lands, or demonstrated the ecological benefit that would be provided by the proposed spoils disposal plan and forested wetland design. To avoid and minimize

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[151] See section 601 of the Water Resources Development Act of 1986.

project effects on existing wetlands/mitigation lands, staff recommended in the draft EA that Birch Power place the 571,000 cubic yards of spoils at an offsite disposal facility. Disposing spoils offsite would preserve the majority of wetlands (i.e., 23.1 acres of littoral wetlands) and mitigation land within the proposed project boundary. Permanent loss of wetlands would be reduced to approximately 13.95 acres within the Wildlife Management Area, for the footprints of the proposed access road (3.55 acres), powerhouse (0.4 acre), intake channel (1.0 acre), powerhouse parking area (1.6 acres), and tailrace channel (7.4 acres). As discussed further in section 3.3.4.1, *Threatened and Endangered Species, Affected Environment, Terrestrial Species,* the majority of the 13.95 acre-area of wetlands that would be permanently lost was also identified by the Alabama DCNR as foraging habitat for wood storks between June and the first of October.

In its comments on the draft EA, EPA states that permitted impacts to wetlands would require compensatory mitigation.[152] In addition, EPA recommends the purchase of credits from a mitigation bank in accordance with the 2008 Mitigation Rule, which states that such credits should be considered before permittee-responsible mitigation if the project is located within the service area of an approved mitigation bank with available credits. However, EPA's recommendation to contribute to a wetland mitigation bank would not be consistent with Commission guidelines for environmental measures.[153] According to these guidelines, environmental measures should be: (a) within the scope of the Commission's jurisdiction; (b) specific, rather than general, in nature; and (c) physically or geographically as close to the project as possible.

Other forms of mitigation should be considered given that the project would result in the permanent loss of 13.95 acres of existing mitigation wetlands in the David K. Nelson Wildlife Management Area that also serve as foraging habitat for the threatened wood stork. Birch Power could develop a wetlands mitigation plan to restore, establish, enhance, and/or preserve wetlands within or adjacent to the project boundary at a similar quantity and quality to that which would be lost to mitigate for the unavoidable loss of the existing wetlands. The wetlands mitigation plan could be finalized as part of final project design to ensure an accurate calculation of mitigation wetland acreage based on the actual acreage of wetlands within the David K. Nelson Wildlife Management Area and wood stork habitat that would be permanently lost. The plan could include provisions to: 1) identify proposed mitigation wetlands adjacent to, or in close proximity

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[152] Compensatory mitigation, is the replacement of wetlands to offset unavoidable adverse impacts and losses of wetlands and can be in the form of restoration, establishment, enhancement, or preservation of wetlands.

[153] Policy statement on hydropower licensing settlements. Docket No. PL06-5-000. September 21, 2006.

to the project, that would be acquired to mitigate unavoidable loss of wetlands within the David K. Nelson Wildlife Management Area; 2) assess the condition of the proposed mitigation wetland structure and function (e.g., type(s) of wetlands, species composition, water quantity and quality, flood water retention, wildlife habitat); 3) describe the condition of the proposed mitigation wetland and the restoration and/or enhancement measures that could improve the structure and function of the proposed mitigation wetland; 4) describe any ongoing monitoring and/or management activities that would be necessary to maintain the improved structure and function of the proposed mitigation wetland; 5) verify, after the proposed mitigation wetland is approved by the Commission, existing wetland types and quality by conducting a wetland delineation survey and file the survey results, any adjustments to the proposed restoration and/or enhancement measures, and ongoing monitoring and/or management activities with the Commission for approval; and 6) provide an implementation and reporting schedule. Based on the condition of the acquired mitigation wetlands, examples of wetland restoration or enhancement measures could include installing and/or removing structures to improve water quantity and/or quality, removing non-native invasive vegetation, and/or planting native vegetation. Birch Power could use the Corps and EPA's Model Compensatory Mitigation Plan Checklist as guidance in the development of the plan in the interest of facilitating the Corps' regulatory review under section 404 of the CWA.[154] Consulting with the Corps and Alabama DCNR during development of the plan, would also facilitate coordination of wetland mitigation requirements and consistency with the state's management objectives for wetlands in the David K. Nelson Wildlife Management Area. Implementing these measures within and/or near the project boundary would maintain important wetland functions and values at the proposed Demopolis Project during the period of any license that may be issued.

Project Effects on Botanical Resources

Construction of project facilities would result in the permanent displacement of botanical resources. Some vegetated areas within the vicinity of project facilities would also be temporarily disturbed by the staging of materials and equipment, as well as from construction activities such as excavation and road construction. Disturbance to existing vegetation would also create conditions conducive to the spread and introduction of

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[154] *See* Model Compensatory Mitigation Plan Checklist for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act (Corps-EPA, 2003). We reiterate that the Corps is responsible for permitting under section 404 of the CWA. We anticipate that the Corps' regulatory process for the project will occur after the Commission's licensing process is complete.

invasive plant species, which could out-compete and displace native species, thereby reducing biodiversity and altering compositions of existing native communities.

To minimize project effects on existing botanical resources, Birch Power proposes to revegetate areas disturbed by construction of project facilities; construct the project transmission line primarily within an existing right-of-way; selectively place transmission line poles to avoid vegetation located in small, isolated wetland areas; and plant native tree species to create a forested wetland within a spoils disposal site.

Our Analysis

Project development would result in disturbance of herbaceous wetlands, woody wetlands, deciduous forest, pasture, and developed, open space areas. Approximately 32 acres of botanical resources would be permanently displaced by the proposed construction of the access road (4.0 acres),[155] spoils disposal facilities (20.3 acres), powerhouse (0.5 acres), intake channel (5.0 acres), parking area (2.0 acres), and tailrace channel (0.2 acres) (table 3-17).[156] The majority of permanent botanical losses would occur in wetland habitat within the Damsite Management Unit of the David K. Nelson Wildlife Management Area. About 35.9 acres of vegetation would also be temporarily disturbed by construction of the access road, project transmission line, spoils disposal site, powerhouse, intake channel, powerhouse parking area, and tailrace channel.

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[155] Birch Power estimates that about half of the land affected by the access road would be permanently lost and the other half would be temporarily disturbed.

[156] See table 3-17 for additional project effects on "developed, low intensity" and "developed, medium intensity" land cover types. Due to the relatively high percentage of impervious surfaces located within the developed, low intensity land cover type (20 – 49 percent impervious surfaces) and the developed, medium intensity land cover type (50 – 79 percent impervious surfaces), project effects in these areas do not necessarily correlate with project effects on botanical resources.

Table 3-17. Effects of project facilities on terrestrial land cover types (acres) (Source: Birch Power's March 7, 2016 filing, and January 21, 2014 filing, as modified by staff).

Land Cover Type[1]	**Access Road**	**Transmission Line**	**Spoils Disposal**	**Power-house**	**Intake Channel**	**Parking Area**	**Tailrace Channel**	**Buffer Lands[2]**	**Total Acres**
Emergent, herbaceous wetlands	0.0	0.0	20.3	0.4	0.0	0.6	0.2	3.6	25.1
Developed, open space	0.0	19.4	0.0	0.0	0.0	0.0	0.0	0.0	19.4
Woody wetlands	7.5	0.0	0.0	0.1[3]	5.0[3]	1.4[3]	0.0	4.5[3]	18.5
Pasture/hay	0.3	4.4	0.0	0.0	0.0	0.0	0.0	0.0	4.7
Developed, medium intensity	0.4	0.2	0.0	0.0	0.3	0.0	0.0	0.1	1.0
Developed, low intensity	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Deciduous forest	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Total Acres	8.4	24.5	20.3	0.5	5.3	2.0	0.2	8.2	69.4

[1] Birch Power used the U.S. Geological Survey's National Land Cover Database to classify land within the project area (USGS, 2006).

[2] Birch Power includes a 25-foot wide buffer around all project facilities except for the road and transmission corridors, to account for temporary effects associated with land that would be revegetated following construction.

[3] Acreage reflects updates provided by Birch Power in its January 21, 2014 filing, in response to question 36 of staff's October 22, 2013 additional information request.

Birch Power proposes a spoils disposal plan that includes measures for disposing of spoils produced by excavation of project land and construction of the hydroelectric project.[157] According to the spoils disposal plan, Birch Power would place approximately 571,000 cubic yards of Demopolis chalk, soil, and alluvium spoils on the north side of the river channel, downstream of Demopolis Lock and Dam. The spoils disposal plan would result in the permanent loss of 20.3 acres of wetland vegetation. However, Birch Power proposes to offset project effects by planting native trees and creating a 20.2-acre forested wetland on top of the spoils pile. In the analysis of *Project Effects on Wetlands and Riparian Habitat* (section 3.3.3.2), we conclude that Birch Power's proposed wetland design would not likely support the majority of the native tree species that Birch Power proposes to plant on the spoils disposal site. Instead, the 20.2-acre area would likely revert to early successional, mesic herbaceous/shrub species that could tolerate a relatively thin soil layer and compacted chalk substrate. The establishment of 20.2 acres of vegetation on the spoils pile would reduce permanent losses of vegetated land from 32 acres to 11.8 acres.

Birch Power also proposes to construct recreation facilities that would disturb additional botanical resources not shown in table 3-17.[158] On the north side of the Tombigbee River, Birch Power proposes to install a publicly accessible parking area that would accommodate 2 to 3 cars (about 0.01 acre, assuming 24 feet by 10 feet dimensions), and a 2,600-foot-long angler access trail (about 0.18 acre, assuming a 3-foot wide trail). Birch Power also proposes to install a fishing platform on the south bank of the Tombigbee River. The fishing platform would have *de minimis* effects on botanical resources, as construction would primarily occur along a non-vegetated shoreline of the Tombigbee River.

Birch Power proposes several measures that would minimize project effects on botanical resources in the project area, including: (1) utilizing an existing transmission line right-of-way to construct 4.1 miles of the 4.4-mile project transmission line, which will avoid vegetation clearing that would otherwise be associated with construction of a new 4.4-mile transmission line right-of-way; (2) selectively placing transmission line poles to avoid vegetation located in small, isolated wetland areas; and (3) implementing a proposed revegetation plan to revegetate areas disturbed by project construction.

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[157] Birch Power's May 21, 2014 response to staff's October 22, 2013 request for additional information.

[158] Birch Power's September 13, 2016 response to staff's August 24, 2016 request for additional information.

Revegetation Plan

In its May 21, 2014 response to our request for additional information, Birch Power filed a revised revegetation plan that includes a long-term goal of establishing native vegetation on all disturbed sites using adaptive management principles. The purpose of the plan is to recover 5.0 acres of disturbed land within a 25-foot buffer area around the permanent powerhouse facilities and the portion of the access road corridor not occupied by the permanent road bed.

The revegetation plan includes the following measures: (1) minimize ground disturbance during construction of the Demopolis Project by using existing roads and designated buffer areas for access to construction sites; (2) wash all construction equipment to remove weed seeds prior to entering the construction areas; (3) preserve areas of native vegetation adjacent to the construction area by identifying and marking areas of native vegetation prior to beginning construction; (4) prior to revegetating disturbed areas, eliminate any nonnative, invasive species[159] that develop within disturbed areas through the use of approved noxious weed treatments; (5) establish a certified weed-free seed mix and planting density for reseeding disturbed areas with botanical species appropriate for the soils, hydrology, and site index of the location, as determined through consultation with Alabama DCNR; (6) plant disturbed areas as soon as possible after construction, in the spring or early summer following completion of all major construction activities that disturb habitat; (7) monitor areas of revegetation to assess revegetation efforts, to be performed immediately after initial revegetation, and at the peak of the growing season (mid-summer) for the next 2 years; (8) where monitoring shows that revegetation has been unsuccessful, Birch Power would: (a) eliminate invasive species in disturbed zones through localized use of approved herbicides; (b) reseed the area with an appropriate native seed mixture; and (c) use other adaptive measures as determined through consultation with Alabama DCNR; and (9) within 6 months following the end of the 2 year monitoring period, submit a final report on the effectiveness of the reseeding program to Alabama DCNR and FERC.

Implementation of Birch Power's proposed revegetation plan would reduce the effects of the project on botanical resources. The revegetation plan would promote the establishment of native vegetation on disturbed sites, and reduce the potential spread and introduction of invasive species in the project area. Revegetation would also assist with soil stability in low-lying wetland areas susceptible to erosion following inundation. The specific measures proposed in the revegetation plan are also consistent with BMPs

[159] In Appendix A of the revegetation plan, Birch Power provides a list of invasive species that are found in the vicinity of the project. This list includes species found in Marengo and Green counties.

recommended by the Alabama Cooperative Extension System, including minimizing soil disturbance, minimizing transport of invasive plants into infested areas by cleaning vehicles and equipment, and revegetating and monitoring disturbed areas (Alabama Cooperative Extension System, ND).

Although the revegetation plan describes revegetation of 5.0 acres of land around powerhouse facilities and the access road, the final license application and Birch Power's March 7, 2017 filing state that areas disturbed in the transmission line right-of-way would also be revegetated.[160] In consultation records filed with the revised revegetation plan, Alabama DCNR states that revegetation of all disturbed sites is critical and should be done with species appropriate for the soils, hydrology, and site index. Birch Power's plan would be more effective at minimizing impacts on botanical resources if the plan was applied to all areas disturbed by project construction, including areas adjacent to the intake channel, powerhouse, transmission line, access road, parking areas, and recreation facilities (including the hiking trail and parking area).

The proposed revegetation plan includes two years of monitoring following completion of construction, and corrective measures in the event reseeding has been unsuccessful in any disturbed areas. However, Birch Power does not discuss how it would measure the success of revegetation efforts or when corrective measures would be appropriate (e.g., through the use of threshold indicators, such as percent coverage of native vegetation on disturbed areas). Revising the revegetation plan to include specific criteria for measuring success, and thresholds for implementing corrective measures, would provide greater certainty when implementing the revegetation plan and further reduce project effects on plants.

The proposed revegetation plan includes a list of invasive species that would be used to assess the success of revegetation efforts during monitoring. The list includes invasive species found in Marengo and Green counties, which does not coincide with the project area that is located in Sumter and Marengo counties. The list of invasive species also excludes multiflora rose, which is known to occur in the vicinity of the project (University of Georgia, 2013), and is classified as one of the ten most problematic invasive species in Alabama (Alabama Invasive Plant Council, 2012). To ensure proper identification of invasive species in disturbed areas following construction, Birch Power

[160] Birch Power Company's March 7, 2017 response to staff's February 7, 2017 request for additional information.

could update the list of invasive species to include the most current species applicable to the project area.[161]

The proposed revegetation plan provides for the localized use of approved herbicides to eliminate invasive species found in disturbed areas, but does not describe the methodology that would be used to minimize the effects of herbicides on native plants and wetland habitat. As discussed in section 3.3.4.2 (*Threatened and Endangered Species, Environmental Effects, Terrestrial Species, Wood Stork*), the use of herbicides could affect wetland habitat used by the federally threatened wood stork. To minimize the effects of the project on wood stork habitat, Birch Power could develop and implement, in consultation with FWS and Alabama DCNR: (1) techniques to control invasive species, including the use of selective chemical application methods that target invasive species, as opposed to broadcast treatments of herbicide sprays; and (2) best management practices that minimize the subsequent reintroduction and spread of invasive species in the project area.[162]

Project Effects on Wildlife Resources

Construction of the project would result in the permanent loss of wildlife habitat, primarily within the Damsite Management Unit of the David K. Nelson Wildlife Management Area. The project would constitute a new development within the Damsite Management Unit, and would result in more human disturbance in an area that currently experiences relatively little human activity outside of wildlife management. Temporary wildlife disturbances could also occur during construction of project facilities, including temporary loss of habitat, and increased levels of noise and artificial lighting.

To mitigate project effects on wildlife habitat, Birch Power proposes to revegetate areas disturbed by construction of project facilities; construct the project transmission

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[161] The University of Georgia's Early Detection & Distribution Mapping System provides a list of nonnative, invasive species per county (University of Georgia, 2013). A county-by-county search can be performed at the following website: http://www.eddmaps.org/tools/recordsbysubject.cfm.

[162] Birch Power could use the following guides for identifying nonnative invasive species in the project area and evaluating potential herbicide application methods: (1) U.S. Forest Service's 2006 technical report, entitled *Nonnative Invasive Plants of Southern Forests; A Field Guide for Identification and Control* (Forest Service, 2006); and (2) National Park Service's and FWS's publication, entitled *Plant Invaders of Mid-Atlantic Natural Areas* (Swearingen, et al., 2002).

line primarily within an existing right-of-way; selectively place transmission line poles to avoid wetland habitat; and create a forested wetland on the spoils disposal site.

Our Analysis

Development of project facilities would affect about 67.9 acres of terrestrial wildlife habitat, including the permanent loss of about 32 acres of habitat located within the Damsite Management Unit, and the temporary loss of about 35.9 acres of habitat in the Damsite Management Unit and the transmission line right-of-way (table 3-17).[163] About 37.05 acres of wetland habitat would be permanently lost by project construction (table 3-16). Relatively minor habitat losses in the Damsite Management Unit would also be associated with construction of project recreation facilities, including the recreation parking area (about 0.01 acre, assuming 24 feet by 10 feet), and a 2,600-foot-long angler access trail (about 0.18 acre, assuming a 3-foot wide trail). Birch Power also proposes to install a fishing platform immediately downstream of Demopolis Lock and Dam, which would cover mostly non-vegetated land (i.e., about 20 feet of mowed grassland and existing rip-rap) in the riparian zone on the south side of the Tombigbee River.

Increased human activity associated with construction, operation, and maintenance of the project could result in the displacement of wildlife from the immediate project area, and could increase the risk of nest and den abandonment for birds and small mammals. Upgrade of the access road could also lead to increased recreation use and hunting pressure in the Damsite Management Unit.

Birch Power proposes several measures that would minimize project effects on wildlife and habitat in the project area, including: (1) utilizing an existing transmission line right-of-way to construct 4.1 miles of the 4.4-mile project transmission line, which avoids construction of a new project transmission line in wetland habitat located in the Damsite Management Unit; (2) operating the project in run-of-release mode consistent with existing Corps' operation of Demopolis Lock and Dam, which maintains hydrologic conditions for wetland habitat upriver from Demopolis Lock and Dam; (3) selectively placing transmission line poles to avoid small, isolated wetland habitat; and (4) revegetating habitat disturbed by project construction. Further discussion on Birch

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[163] Estimates do not account for potential project effects of wildlife species located on certain developed lands. Specifically land identified as "developed, low intensity" and "developed, medium intensity" includes 20 – 49 percent and 50 – 79 percent impervious surfaces, respectively. These land cover types are assumed to be low quality habitat for wildlife species, due to the high percentages of impervious surfaces.

Power's revegetation plan is located above, in the analysis of *Project Effects on Botanical Resources*.

Birch Power also proposes a spoils disposal plan that includes measures for disposing of spoils produced by excavation of project land and construction of the project.[164] According to the spoils disposal plan, Birch Power would place approximately 571,000 cubic yards of Demopolis chalk, soil, and alluvium spoils on the north side of the river channel, downstream of Demopolis Lock and Dam. The north side of the river channel is also part of the Damsite Management Unit of the David K. Nelson Wildlife Management Area (figure 3-31). Placing spoils in this area would permanently displace about 20.3 acres of emergent, herbaceous wetland vegetation that currently serves as terrestrial wildlife habitat in the Damsite Management Unit (table 3-17).

To mitigate the loss of wildlife habitat in the Damsite Management Unit, Birch Power proposes to create a 20.2-acre forested wetland on top of the spoils pile. Constructing a 20.2-acre forested wetland habitat would reduce project-related habitat losses from 32 acres to 11.8 acres. However, as discussed above in the analysis of *Project Effects on Wetlands and Riparian Habitat*, the proposed wetland design in the spoils disposal plan would not likely support the establishment of a 20.2-acre forested wetland. Instead, the 20.2-acre area would likely be capable of supporting a scrub-shrub habitat for wildlife species. The habitat quality for wildlife would also likely be degraded relative to current environmental conditions, particularly due to the area's proximity to the proposed powerhouse, transmission line, recreation facilities, and project maintenance activities.

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[164] Birch Power's September 13, 2016 response to staff's August 24, 2016 request for additional information.

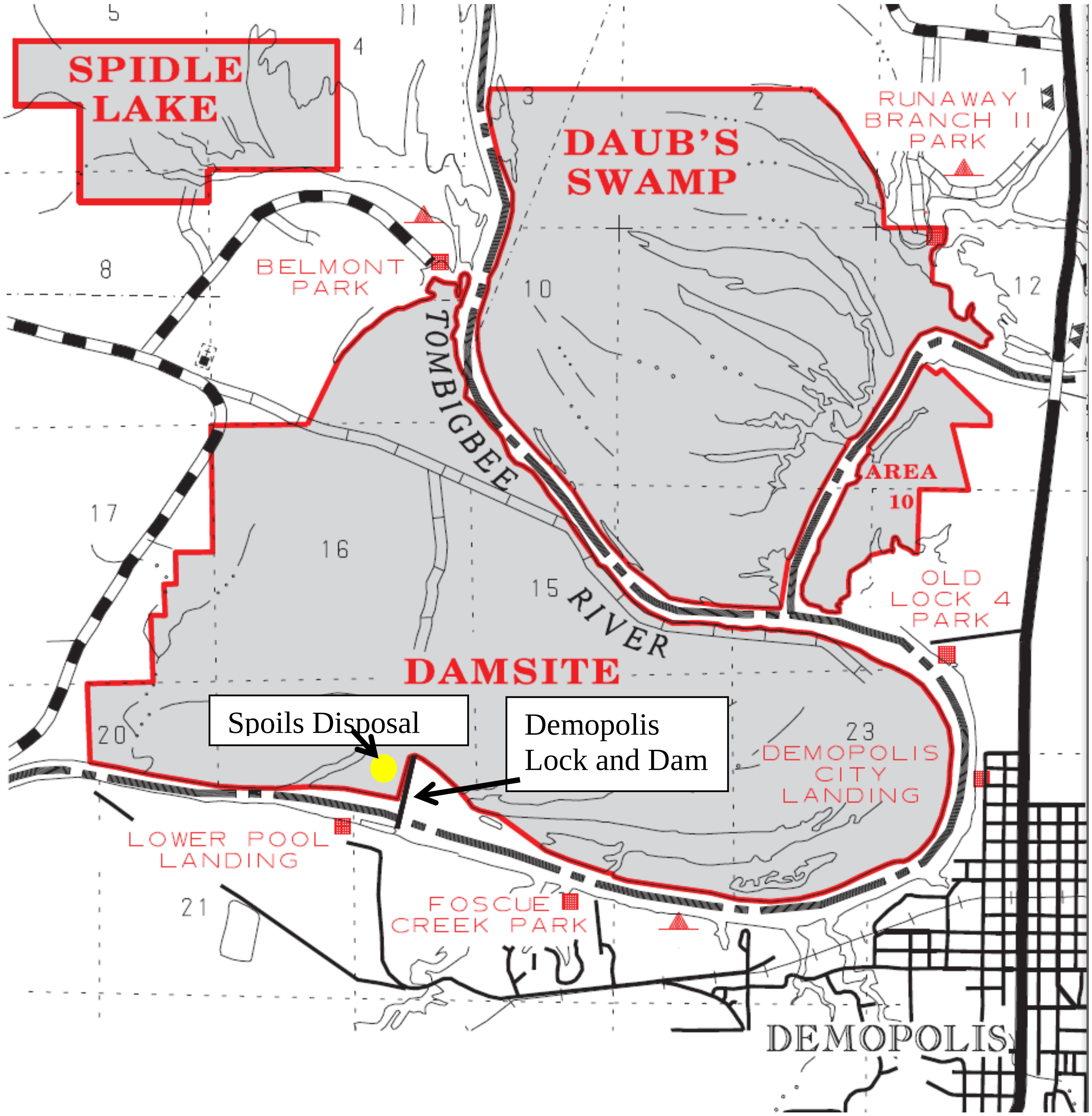

Figure 3-31. Diagram showing approximate location of proposed spoils disposal area within the Damsite Management Unit of the David K. Nelson Wildlife Management Area (Source: Alabama DCNR, 2016b, as modified by staff).

Avian Protection Plan

Birch Power did not propose specific measures to reduce the effects of project construction, operation, and maintenance on avian species. However, the federally threatened wood stork is known to forage in the project area, and sensitive species such as American kestrel, swallow-tailed kite, and bald eagle potentially occur in the project area. Project facilities would affect forested wetland and riparian habitat in the Damsite

Management Unit of the David K. Nelson Wildlife Management Area, which could serve as nesting and/or foraging habitat for these species.

The Bald and Golden Eagle Protection Act provides for the protection of the bald eagle and the golden eagle by prohibiting the take,[165] possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export, or import of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. § 668; 50 C.F.R. § 22). The Migratory Bird Treaty Act also prohibits the take,[166] possession, import, export, transport, sale, purchase, barter, or offer for sale, purchase, or barter, of any migratory bird, or the parts, nests, or eggs of such bird, except as authorized under a valid permit (16 U.S.C. § 703(a); 50 C.F.R. § 21.11).[167]

In its guidelines addressing avian electrocution and collision, the Avian Power Line Interaction Committee (APLIC)[168] recommends measures for large-bodied birds, including: (1) providing a minimum separation of 60 inches between phase conductors or a phase conductor and grounded hardware/conductor; (2) insulating or covering phases/grounds; (3) using perch discouragers; (4) using transmission line-marking

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[165] According to the Bald and Golden Eagle Protection Act, the term "take" means to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." (16 U.S.C. § 668c). The term "disturb" includes agitating or bothering an eagle to a degree that the action is likely to cause injury, decreased productivity, or nest abandonment (50 C.F.R. § 22.3).

[166] As relevant to the Migratory Bird Treaty Act, FWS's regulations define the term "take" as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 C.F.R. § 10.12).

[167] FWS's May 2007 National Bald Eagle Management Guidelines recommend the following measures to avoid disturbing bald eagles: (1) keeping a minimum distance between the activity and the nest (distance buffers); (2) maintaining natural areas between the activity and nest trees (landscape buffers); and (3) avoiding certain activities, including loud and disruptive activities, during the breeding season (FWS, 2007b). If the activity would be visible from the nest, FWS recommends conducting activities no closer than 660 feet from the nest. Also, FWS recommends avoiding blasting and other activities that produce extremely loud noises within 1/2 mile of active nests.

[168] APLIC is a collaboration among numerous electrical utilities, research groups, and FWS that was formed to identify the causes of, and develop methods and designs to minimize, avian electrocutions and collisions at power lines.

devices; and (5) assessing bird mortalities and problem nests, and applying remedial measures as appropriate (APLIC, 2006; APLIC, 2012).

Our Analysis

The Damsite Management Unit and the existing transmission corridor provide wildlife habitat for migratory bird species, including raptors, waterfowl, and wading birds. Construction of project facilities would displace this habitat, primarily through the clearing of trees within the Damsite Management Unit.[169] Construction of an electrical substation[170] and transmission line would also increase the risk of avian collision and electrocution during flight and foraging. Migratory birds can come into contact with transmission lines and associated structures during flight, foraging, roosting, and nesting. Avian mortality due to interaction with transmission lines and associated structures has been noted since the 1900s. Raptors and other large-bodied birds may be at higher risk for collision or electrocution due to their large size, hunting strategies, and nesting preferences (APLIC, 2006).

An avian protection plan, developed in consultation with Alabama DCNR, FWS, and Corps, could include the following measures to minimize the potential for bird mortality associated with the transmission line and substation: (1) design and install power poles to provide adequate separation of energized conductors, groundwires, and other metal hardware; (2) insulate or cover transmission line wires to protect raptors and other large-bodied birds from electrocution hazards; (3) install and maintain line-marking devices to protect birds from colliding with the transmission line; (4) train staff to identify, document, and report instances of avian mortality due to electrocution by, or collision with the project's electrical facilities; and (5) develop and implement site-specific measures and practices to reduce bird mortality reported under item 3, as

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[169] Separately, Birch Power's proposal to construct a fishing platform on the south bank of the Tombigbee River would not adversely affect avian species. While shorebirds might forage and nest in the shoreline area where the fishing platform would be located, the shoreline is part of an active recreational area – the Corps' Spillway Falls Park, which is used for subsistence and sport fishing. The shoreline is also lined with rip-rap and largely devoid of vegetation. *See* Birch Power's July 2, 2013 final license application at Appendix A, p. A-245.

[170] Birch Power proposes to construct switch gear, ancillary equipment, and a step-up transformer on the top of the powerhouse to increase voltage to 115 kV.

necessary, including modifications to structures or line arrangement.[171] The implementation of these measures would reduce adverse impacts on federally protected avian species potentially located in the project area, including the federally listed wood stork, bald eagle, and other migratory birds.

Sensitive Wildlife Species Protection

In the Alabama Wildlife Action Plan, the Alabama DCNR recommends – as a high priority conservation action – that land managers avoid mowing wetlands, shorelines, and ditches in transmission line rights-of-way during the mid-spring to mid-fall timeframe (Alabama DCNR, 2015). Alabama DCNR states in its state wildlife action plan that these areas may serve as natural habitats for wildlife species, and that the mid-spring through mid-fall timeframe is usually a critical time of reproduction and rearing for most vertebrate taxa.

Birch Power's proposed 4.4-mile transmission line would traverse wetlands, shorelines, and ditches that could serve as natural habitat for wildlife species. Several sensitive wildlife species listed in table 3-15 could occur in these habitats, including amphibian, bird, and reptile species. Restricting mowing within the transmission line right-of-way to occur outside of the mid-spring to mid-fall timeframe (i.e., May 1st to November 1st of each year) would be consistent with the high priority conservation action recommended by Alabama DCNR in the state wildlife action plan and would protect sensitive wildlife species that may occur in the project area.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

In the official Endangered Species Act Species List filed on April 13, 2018, FWS indicates that there are two freshwater mussel species federally listed as endangered—the ovate clubshell (*Pleurobema perovatum)* and the southern clubshell (*Pleurobema decisum)*—and one federally listed as threatened, the inflated heelsplitter (*Potamilus inflatus*) that may occur in the proposed project boundary, and/or may be affected by the proposed project. In addition, there is one bird and one mammal federally listed as threatened—the wood stork (*Mycteria americana*) and the northern long-eared bat (*Myotis septentrionalis*), respectively, which may also occur in the proposed project boundary, and/or may be affected by the proposed project. In its license application, Birch Power also listed the federally threatened gopher tortoise (*Gopherus polyphemus*) as potentially occurring in the counties surrounding the project area. In addition, we

[171] Birch Power could consider APLIC's avian protection guidelines in the development of the design specifications for the transmission line and substation.

identified the federally threatened Georgia rockcress (*Arabis georgiana*) as potentially occurring in the project area, based on data gathered from FWS's Environmental Conservation Online System (FWS, NDb).

Additionally, on August 2 and 17, 2017, we were informed by telephone conversation[172] with FWS staff that Alabama DWFF conducted surveys for Alabama sturgeon in the Tombigbee River and preliminary analysis of eDNA[173] samples indicated that Alabama sturgeon may be present downstream of Coffeeville Lock and Dam[174] (i.e., at river miles 64, 77.5, and 116).[175] Thus, we identify the Alabama sturgeon as potentially occurring in the project area.

No critical habitat has been designated in the project area.

Below we provide information regarding the above-listed species' habitat and occurrence.

Aquatic Resources

Alabama Sturgeon

Alabama sturgeon was federally listed as endangered wherever found on May 5, 2000,[176] and is included in the Final Recovery Plan for the Alabama Sturgeon (FWS, 2013).[177] Final critical habitat was designated on June 2, 2009, and includes portions of the Alabama and Cahaba Rivers in Autauga, Baldwin, Bibb, Clarke, Dallas, Lowndes,

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[172] A telephone conversation memo was filed to the Commission's record for the Demopolis Project on August 24, 2017.

[173] Environmental DNA, or eDNA refers to the genetic information emitted from organisms as they interact with their environment (e.g., DNA within shed tissues, excrement, etc.), which can be collected from soil, water, or air samples, rather than sampled directly from an individual organism.

[174] Coffeeville Lock and Dam is located at river mile 117.

[175] The Demopolis Lock and Dam Hydroelectric Project would be located at river mile 213.

[176] 65 Fed. Reg. 26,438-26,461 (May 5, 2000).

[177] Notice of Availability of the Recovery Plan for Alabama Sturgeon (78 Fed. Reg. 47,722-47,723 [August 6, 2013]).

Monroe, Perry, and Wilcox Counties, in Alabama.[178] No critical habitat is designated in the Tombigbee River, and therefore the proposed Demopolis Project would not occur in critical habitat.

Alabama sturgeon is a small freshwater sturgeon that requires riverine habitat to complete its life-cycle. All riverine sturgeons are migratory and may migrate hundreds of kilometers to spawn, and newly hatched larvae may drift hundreds of kilometers before settling to the river bottom substrate.[179] Generally, sturgeons migrate to optimize feeding and reproductive success. Downstream migrations are associated with feeding and upstream migrations are usually associated with spawning (Auer, 1996; Bemis and Kynard, 1997). While no critical habitat occurs near the proposed Demopolis Project, within the geographical area occupied by the Alabama sturgeon there are known physical and biological features (i.e., primary constituent elements [PCEs]) that are essential to the conservation of the species based on the critical habitat designation. The PCEs for Alabama sturgeon are:

- PCE 1: A range of flows with a minimum 7-day flow of 4,640 cfs during normal hydrologic conditions, measured in the Alabama River at Montgomery.
- PCE 2: River channel with stable sand and gravel river bottoms, and bedrock walls, including associated mussel beds.
- PCE 3: Limestone outcrops and cut limestone banks, large gravel or cobble such as that found around channel training devices, and bedrock channel walls that provide riverine spawning sites with substrates suitable for egg deposition and development.
- PCE 4: Long sections of free-flowing water to allow spawning migrations and development of eggs and larvae.
- PCE 5: Water temperature not exceeding 90° F, DO concentrations greater than 4.0 mg/L, and pH within the range of 6.0 to 8.5.

Alabama sturgeon was historically found throughout much of the Mobile River Basin of Alabama and Mississippi. However, since 1985, the Alabama sturgeon has only been observed in a free-flowing reach of the Alabama River below Millers Ferry and Claiborne Locks and Dams. This species was last reported from the Demopolis area around 1975 (Boschung and Mayden, 2004), and is not currently known to be present within the project vicinity, or upstream in the Tombigbee River Basin. The nearest

[178] 74 Fed. Reg. 26,488-26,510 (June 2, 2009).

[179] *Id.*

potential occurrence is more than 97 miles downstream of Demopolis Lock and Dam, where surveys conducted in 2016 collected DNA evidence that Alabama sturgeon may be present downstream of Coffeeville Lock and Dam.[180] The decline of the Alabama sturgeon is attributed to over-fishing, loss and fragmentation of habitat as a result of historical navigation-related development, and water quality degradation.[181] Current threats primarily result from its reduced range and its small population numbers.[182]

Inflated Heelsplitter

The inflated heelsplitter was federally listed as threatened throughout its range on September 28, 1990,[183] and FWS finalized a recovery plan on April 13, 1993. No critical habitat has been designated for this species. The life history of the inflated heelsplitter is largely unknown, but is likely similar to other unionids. Fertilized eggs are held in the female's gills where they develop into glochidia (i.e., larvae). The glochidia are discharged into the water where they attach to a fish host, become encysted, and metamorphose into juvenile mussels that are capable of surviving if they fall to suitable substrate. Although not all species of unionids are host-specific, the inflated heelsplitter genus (i.e., *Potamilus*) parasitizes the freshwater drum almost exclusively (Surber, 1913; Wilson, 1916; Cummings et al., 1990). Timing of spawning and glochidia discharge are not known for inflated heelsplitter; however, patterns may be similar to their congener,[184] the pink heelsplitter (*Potamilus alatus*), which is a long-term brooder. Long-term brooders spawn in late spring and early summer, the glochidia overwinter in the gills, and then are released in spring (Jirka and Neves, 1992).

In general, this species is found in sand, mud, silt, and sandy-gravel substrates in slow to moderate currents and is usually collected on the protected side of bars in water as deep as 20 feet (Stern, 1976 as cited by Miller et al., 1996). Mussel surveys of the Black Warrior – Tombigbee River conducted in 1994 indicate that inflated heelsplitters were the dominant species at sites with substrate consisting of greater than 90 percent silt

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[180] Mr. Mathias Laschet (FWS) in a telephone conversation (memo filed on August 24, 2017) stated that Alabama Division of Wildlife and Freshwater Fisheries detected Alabama sturgeon DNA in water collected downstream of Coffeeville Lock and Dam; however, the results have not been published.

[181] 65 Fed. Reg. 26438 (May 5, 2000).

[182] *Id*.

[183] 55 Fed. Reg. 39,868-39872 (September 28, 1990).

[184] Congeners are organisms within the same genus.

and fine sand; however, their densities were greatest on stable gravel bars (Miller et al., 1996).

As discussed in section 3.3.2.1, *Affected Environment*, *Mussels*, the Birch Power conducted mussel surveys in 2011, during which the federally threatened inflated heelsplitter was observed. The highest densities of inflated heelsplitters observed during the survey were found in the area of the proposed flow affected area, which includes all of sandbar 1 and a portion of sandbar 2 (table 3-8 and 3-9). The substrate on the sandbar provides good habitat for inflated heelsplitters. Only one inflated heelsplitter was observed on the chalk shelf, and no inflated heelsplitters were found at the site furthest downstream (tables 3-8 and 3-9).

<u>Ovate Clubshell</u>

Ovate clubshell was federally listed as endangered wherever found on March 17, 1993,[185] and is included in the Final Recovery Plan for the Mobile Basin Aquatic Ecosystem (FWS, 2000). Final critical habitat was designated on July 1, 2004, and includes some tributaries of the Tombigbee River (including the Sucarnoochee River, Sumter County, Alabama), but no critical habitat in the mainstem of the river, including the project vicinity.[186] Ovate clubshell typically inhabit sand and fine gravel substrates under moderate current in shoals and runs of large streams and small rivers (Parmalee and Bogan, 1998). The primary constituent elements essential for the conservation of this species includes: (1) geomorphically stable stream and river channels and banks; (2) a flow regime (i.e., the magnitude, frequency, duration, and seasonality of discharge over time) necessary for normal behavior, growth, and survival of all life stages of mussels and their fish hosts in the river environment; (3) water quality, including temperature, pH, hardness, turbidity, oxygen content, and other chemical characteristics necessary for normal behavior, growth, and viability of all life stages; (4) sand, gravel, and/or cobble substrates with low to moderate amounts of fine sediment, low amounts of attached filamentous algae, and other physical and chemical characteristics necessary for normal behavior, growth, and viability of all life stages; (5) fish hosts with adequate living, foraging, and spawning areas for them; and, (6) few or no competitive or predaceous nonnative species present.[187]

The ovate clubshell was historically distributed in the Tombigbee, Black Warrior, Alabama, Cahaba, and Coosa Rivers and their tributaries in Mississippi, Alabama,

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[185] 58 Fed. Reg. 14,330-14340 (March 17, 1993).

[186] 69 Fed. Reg. 40,084-40,171 (July 1, 2004).

[187] 69 Fed. Reg. 40,097 (July 1, 2004).

Georgia, and Tennessee; and in Chewacla, Uphapee and Opintlocco Creeks in the Tallapoosa River drainage, Alabama. The ovate clubshell has disappeared from the Black Warrior, Cahaba, and Alabama River drainages, as well as the mainstem Tombigbee River and Uphapee and Opintlocco Creeks. Currently, the species is known to survive in several Tombigbee River tributaries, including Sipsey River (Greene/Pickens/Tuscaloosa County, Alabama), and Sucarnoochee River (Sumter County, Alabama). No ovate clubshell were collected downstream of the proposed project during the mussel surveys previously described in section 3.3.2.1, *Affected Environment, Mussels*. In addition, no ovate clubshell were observed in 1994 during a survey conducted downstream of Demopolis Lock and Dam at river mile 211.9 (Miller et al., 1996).

Southern Clubshell

Southern clubshell was federally listed as endangered wherever found on March 17, 1993,[188] and is included in the Final Recovery Plan for the Mobile Basin Aquatic Ecosystem (FWS, 2000). Final critical habitat was designated on July 1, 2004, and includes some tributaries of the Tombigbee River (including the Sucarnoochee River, Sumter County, Alabama), but no critical habitat in the mainstem of the river, including the project vicinity.[189] The only extant population is in the Lower Buttahatchee River (a Tombigbee River tributary), although there is a reintroduction effort in the Cahaba River (a tributary of the Alabama River) (Alabama DCNR, 2015). Southern clubshell is usually found in highly oxygenated streams with sand and gravel substrate in shoals of large rivers to small streams, but may be found in sand and gravel in the center of the stream or in sand along the margins of the stream. The primary constituent elements essential for the conservation of the southern clubshell are the same as those described above for ovate clubshell.

Southern clubshell was formerly widespread throughout the Mobile River Basin, known historically from the Alabama River, Tombigbee River and tributaries, Black Warrior River; Cahaba and Little Cahaba Rivers, two Tallapoosa River tributaries, and the Coosa River and tributaries in Mississippi, Alabama, Georgia, and Tennessee. Large populations remain only in the Tombigbee River system with smaller, scattered populations found in the Alabama, Coosa, and Tallapoosa rivers. No ovate clubshell were collected downstream of the proposed project during the mussel surveys previously described in section 3.3.2.1, *Affected Environment, Mussels*. In addition, no southern

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188 58 Fed. Reg. 14,330-14340 (March 17, 1993).

189 69 Fed. Reg. 40,084-40,171 (July 1, 2004).

clubshell were observed in 1994 during a survey conducted downstream of Demopolis Lock and Dam at river mile 211.9 (Miller et al., 1996).

Terrestrial Species

Wood Stork

The wood stork is a large, long-legged wading bird, with a head-to-tail length of 33 – 45 inches and a wingspread of 59 – 65 inches. The plumage is white, except for iridescent black primary and secondary wing feathers and a short black tail (FWS, 1997). The U.S. breeding population of wood stork was listed as endangered in 1984,[190] but in reaction to an increasing breeding population and breeding range, FWS reclassified the population from endangered to threatened on July 30, 2014 (FWS, 2014b). Currently, the range of the U.S. breeding population includes Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina, with breeding and nesting documented in Florida, Georgia, North Carolina, and South Carolina.

Wood storks are colonial nesters and feeders, and often breed in rookeries with other species of wading birds. Generally, wood storks disperse from colony sites following the breeding season. As the rainy season begins in May in south Florida and the Everglades, post-breeding wood storks, fledglings, and juveniles may disperse throughout peninsular Florida; the coast of Georgia, South Carolina, North Carolina; and westward along large river basins in Alabama and eastern Mississippi. Individuals from colonies in northern Florida, Georgia, and South Carolina also disperse after the breeding season (from July to August), across the coastal plain and coastal marshes in the southeastern United States.

Wood storks use a wide variety of freshwater and estuarine wetlands for nesting, feeding, and roosting throughout their range. Foraging sites occur in shallow, open water where prey concentrations are high enough to ensure successful feeding (FWS, 1997). Almost any shallow wetland depression where fish become concentrated, either through local reproduction or the consequences of area drying, may be used as feeding habitat. Feeding occurs in water 6-10 inches deep using a probing, sweeping sideways motion with the bill partly open. Storks feed primarily (often almost exclusively) on small fish

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[190] The wood stork occurs in South America, Central America, Mexico, Cuba, Hispaniola, and the southern United States. Based on genetic information, satellite-telemetry studies, and other marking studies, FWS concluded that the U.S. breeding population of the wood stork is markedly separated from the wood stork populations in the Caribbean, Mexico, Central America, and South America.

between 1 and 8 inches in length (FWS, 1997). Limiting factors for wood stork include loss of feeding habitat, water level manipulations affecting drainage, predation, and human disturbance. No critical habitat has been designated for wood stork (FWS, 2014b).

Alabama DCNR identified wood storks in the project area, including within the wetlands and sloughs of the Damsite Management Unit of the David K. Nelson Wildlife Management Area.[191] According to Alabama DCNR, wood storks forage in the area between June and the first of October. Specifically, beginning in June, when river levels drop and sloughs begin drying up, wood storks use the sloughs to forage for small fish, which become concentrated in the summer as sloughs dry and shrink. While no known wood stork surveys have been conducted in the project area, Birch Power reports that wood storks are occasionally present in large numbers in shallow slack water bays and sloughs downstream of Demopolis Lock and Dam (Birch Power, 2012).

FWS's recovery plan for the U.S. breeding population of wood stork identifies four primary recovery actions for the U.S. breeding population of the wood stork: (1) protect currently occupied habitat, (2) restore and enhance habitat, (3) conduct applied research necessary to accomplish recovery goals, and (4) increase public awareness (FWS, 1997).

Northern Long-eared Bat

FWS listed the northern long-eared bat as threatened on May 4, 2015 (FWS, 2015), and determined on April 27, 2016 that designating critical habitat is not prudent (FWS, 2016b).

The northern long-eared bat is a medium-sized bat species (3 to 3.7 inches in length) with longer ears than other species in the *Myotis* genus (FWS, 2015). The species' range includes 37 states, including most of the central and eastern United States, as well as the southern and central provinces of Canada, coinciding with the greatest abundance of forested areas.

The northern long-eared bat is found in a variety of forested habitats in the summer season. During this time, bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. In the fall season, northern long-eared bats leave their forested habitat to hibernate in caves, mines, and other similar habitat.

[191] Birch Power's August 11, 2015 response to staff's June 17, 2015 request for additional information.

The bats arrive at hibernacula between August and September, enter hibernation between October and November, and emerge from hibernacula between March and April. Hibernacula and surrounding forest habitats play important roles in the bat's life cycle beyond the time when bats are overwintering, including for fall-swarming[192] and spring-staging[193] activities. Reproduction is limited to one pup per year in late spring. As such, bat populations can be slow to rebound from anthropogenic and naturally occurring mortality events.

On January 14, 2016, FWS issued a final 4(d) rule that prohibits the following activities in areas of the country impacted by white-nose syndrome:[194] incidental take within a hibernation site; tree removal within 0.25 mile of a known, occupied hibernaculum; and cutting or destroying known occupied maternity roost trees, or any other trees within 150 feet of that maternity roost tree, during the pup-rearing season (June 1 through July 31) (FWS, 2016a). On January 5, 2016, FWS developed an optional streamlined consultation framework that allows federal agencies to rely on a

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[192] Fall-swarming fills the time between summer and winter hibernation. The purpose of swarming behavior may include: introduction of juveniles to potential hibernacula; copulation; and gathering at stop-over sites on migratory pathways between summer and winter regions.

[193] Spring-staging is the time period between winter hibernation and migration to summer habitat. During this time, bats begin to gradually emerge from hibernation and exit the hibernacula to feed, but re-enter the same or alternative hibernacula to resume daily bouts of torpor (i.e., a state of mental or physical inactivity).

[194] White-nose syndrome is the main threat to the northern long-eared bat species, and has caused a precipitous decline in bat numbers (in many cases, 90 – 100 percent) where the disease occurs.

programmatic biological opinion on FWS's final 4(d) rule to fulfill section 7(a)(2) consultation requirements for northern long-eared bat (FWS, 2016h).[195]

Project facilities located in Sumter County are within the white-nose syndrome zone and the northern long-eared bat species range (FWS, 2016d; FWS, 2016e). However, during a visual survey of the project area in May 2016, live bats were not observed, no hibernacula were found, and evidence of roost activity was not present (Birch Power, 2016). No occupied maternal roost trees were found at the project site, but a total of four trees were identified in the project area that could potentially harbor bats, including three oak trees (genus *Quercus*) that had developed slight cavities, and one shagbark hickory (*Carya ovata*) that was mature enough to potentially serve as a maternal roosting site.

<u>Gopher Tortoise</u>

Gopher tortoise occurs in the coastal plain of the U.S. from southeastern South Carolina to southeastern Louisiana. On August 6, 1987, FWS listed the gopher tortoise as federally threatened in the western portion of its range,[196] based primarily on the loss of more than 80 percent of its habitat in this area (FWS, 1987). Throughout the remainder of its range, in areas east of the Mobile and Tombigbee Rivers, the gopher tortoise is listed as a candidate species (FWS, 2011). Based on the location of the Tombigbee River in the project area, the gopher tortoise is listed as federally threatened in Sumter County, and a candidate species for listing in Marengo County.

The gopher tortoise is a large, terrestrial herbivorous turtle that reaches almost 15 inches in length, and typically inhabits sandhills, pine/oak uplands, and pine flatwoods of

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[195] FWS developed a key to help federal agencies determine if they can rely on the streamlined section 7 consultation in the 4(d) rule, or if their actions may cause prohibited incidental take that requires separate section 7 consultation (FWS, 2016f). FWS's key considers whether the federal action: (1) may affect the northern long-eared bat; (2) involves the purposeful take of northern long-eared bats; (3) is located inside the white-nose syndrome zone; (4) will occur within a hibernaculum or alter the entrance/environment of a hibernaculum; (5) involves tree removal; (6) involves the removal of hazardous trees; and (7) includes (a) the removal of an occupied maternity roost trees or any trees within 150 feet of a known occupied roost tree from June 1 through July 31, or (b) the removal of any trees within 0.25 mile of a hibernaculum at any time of year.

[196] The western portion of the gopher tortoises range includes areas west of the Mobile and Tombigbee Rivers, in Mississippi, Louisiana, and portions of Alabama.

the longleaf pine ecosystem (FWS, 2011). Gopher tortoises are dark-brown to grayish-black, with elephantine hind feet, shovel-like forefeet, and a yellow plastron (undershell). A gular projection is evident on the plastron where the head projects from the shell.

Gopher tortoise habitat requirements include: well-drained, sandy soils for burrowing and nest construction; an abundance of herbaceous ground cover for food; and a generally open canopy that allows sunlight to reach the forest floor (FWS, 2011). Adult burrows average about 15 feet in length and 6 feet in depth (FWS, 1990a). Sand depth is an important factor for burrowing because soil layers underlying it, such as clay, can impede digging and influence burrow depth (FWS, 2011). Clay soils may also adversely affect nest success because these soils reduce exchange of oxygen and carbon dioxide. The primary threats to gopher tortoise are: habitat destruction associated with urban development and the conversion of native pine forests to intensively managed silvicultural pine forests; and habitat degradation as a result of a lack of fire management. Additional threats include disease, exploitation, predation, and vehicular mortality.

No critical habitat has been designated for gopher tortoise. FWS published a recovery plan for the gopher tortoise in the western part of its range on December 26, 1990 (FWS, 1990a). Recovery actions include, *inter alia*: (1) surveying, monitoring, and assessing the status of populations occurring on public and private lands; (2) protecting and managing habitat on federal land, especially land with existing gopher tortoise colonies; (3) encouraging protection and management on private lands; (4) developing law enforcement strategies to curb illegal taking of gopher tortoises; (5) conducting research on population viability; (6) conducting telemetry studies and genetic studies; and (7) relocating reproductively isolated individuals to existing protected and managed colonies.

Georgia Rockcress

On October 14, 2014, FWS listed Georgia rockcress as a threatened species (FWS, 2014c), and designated 732 acres of riparian habitat in Georgia and Alabama as critical habitat for the species (FWS, 2014a).

Georgia rockcress is a perennial herb that reaches a height of 35 inches (FWS, 2013a). Individuals have lance-shaped basal leaves that form a basal rosette, and stem leaves ranging from lance-shaped to narrowly elliptic. Flowering occurs from March to April, and fruiting occurs from May to early July. Georgia rockcress inhabits river bluffs with steep slopes and/or shallow soils that are subject to localized disturbances that limit competition for light, minerals, and water resources (FWS, 2014a). Populations of Georgia rockcress are healthiest in areas receiving full or partial sunlight. The species thrives on well-drained soils that are buffered or circumneutral, and generally within regions underlain by granite, sandstone, or limestone.

Georgia rockcress is not a strong competitor and is usually found in areas where growth of other plants is restrained by the shallowness of the soils or the dynamic status of the site. Habitat degradation is the most serious threat to the species' continued existence, including human-induced development and disturbance that fragments river bluff habitats and creates conditions receptive to the invasion of nonnative species.

FWS has designated 17 critical habitat units for Georgia rockcress, none of which are in the project boundary. The 14-acre Fort Tombecbee unit occurs in Sumter County, about 0.3 mile northeast of the city of Epes, Alabama (FWS, 2014a), and about 35 river miles upriver of Demopolis Lock and Dam. The Fort Tombecbee unit is located on the crest and steep slopes of a deeply incised, tributary stream bank, approximately 300 feet upstream of the Tombigbee River.

No individual Georgia rockcress plants were found during site surveys conducted in the project area in 2016 (Birch Power, 2016).

3.3.4.2 Environmental Effects

Aquatic Resources

<u>Alabama Sturgeon</u>

As discussed in section 3.3.2.2, *Aquatic Resources*, *Environmental Effects*, the construction and operation of the proposed project have the potential to affect freshwater fishes (like Alabama sturgeon) and their habitat within the project area through changes in water quality, flow distribution, and flow velocity. No Alabama sturgeon are known to occur in the project area, and Birch Power does not propose any specific measures to mitigate potential project effects on Alabama sturgeon.

Our Analysis

The FWS lists the Alabama sturgeon as potentially occurring in Marengo County, Alabama. However, to date, there is no evidence that Alabama sturgeon occurs upstream of the Coffeeville Lock and Dam, including within the proposed Demopolis Project boundary. No critical habitat is present in the proposed project boundary or within the mainstem of the Tombigbee River. As discussed in *Affected Environment*, Alabama sturgeon require riverine habitat to complete their life-cycle. However, while suitable habitat is currently present within the proposed project boundary, the Alabama sturgeon has not been observed in the vicinity of the project since about 1975. Although Alabama sturgeon are present in the Alabama River, and may potentially occur in the Tombigbee River downstream of Coffeeville Lock and Dam (as discussed in section 3.3.4.1, *Affected Environment*), 97 river miles downstream of the proposed project, there is no indication that Alabama sturgeon have been able to successfully migrate upstream of Coffeeville Lock and Dam – which does not have fish passage facilities.

Although the lock at Coffeeville Lock and Dam lacks fish passage facilities, Alabama sturgeon could theoretically pass upstream of Coffeeville Lock and Dam by moving over the spillway during high flow conditions, or by passing upstream through the navigation lock. If upstream passage at Coffeeville Lock and Dam were to occur, Alabama sturgeon could enter the project boundary and be affected by project construction and operations. The potential effects of project construction are discussed fully in section 3.3.1.2, *Construction Effects on Geology and Soils*, and include ground disturbing activities, which could cause erosion and temporarily increase suspended sediment and turbidity in the Tombigbee River. Alabama sturgeon may respond to these types of activities by avoiding the dredging areas (Hatin et al., 2007) or be unaffected, depending on the movement options available (Parsely et al., 2011). In addition, any potential effects would be minimized through implementation of an erosion control plan.

As discussed in section 3.3.2.2, *Water Quality*, at times project operation could also reduce DO concentrations downstream of the dam. However, the water quality measures discussed in section 3.3.2.2, *Water Quality*, would ensure that DO does not drop below 5.0 mg/L downstream of the dam. Based on extensive research on the effects of DO concentration on Atlantic sturgeon (a related species within the same scientific family [i.e., Acipenseridae] as the Alabama sturgeon), maintaining DO concentrations at a minimum of 5.0 mg/L would support all life-stages of Alabama sturgeon (EPA, 2003; Greene et al., 2009), and based on the critical habitat designation, would provide the DO concentrations considered essential to the conservation of the species (i.e., PCE 5, see *Affected Environment* above).

Despite the theoretical potential for Alabama sturgeon to enter the project boundary, they are unlikely to pass upstream of Coffeeville Lock and Dam by either of the only two routes. Upstream passage over the spillway during high flow is unlikely because of the general swimming behavior and ability of sturgeons. Sturgeons prefer to swim straight upstream along the bottom against a steady flow (McElroy et al., 2012). To migrate over the spillway, Alabama sturgeon would have to demonstrate uncommon behavior and swim into the water column. In addition, sturgeon are generally poor swimmers, in part because they generate greater drag than strong swimmers like salmon (Webb, 1986). Sturgeon also have a less efficient tail than strong swimmers, resulting in greater energy expenditure while swimming in high velocity water (Parsley et al., 2007). Based on these physical limitations and behaviors, Alabama sturgeon would likely stay close to the bottom during high flows, and most likely avoid passage over the spillway.

Upstream passage through the navigation lock at Coffeeville Lock and Dam also is unlikely because navigation locks are generally not effective at passing fish upstream or downstream of dams (Cooke et al., 2002; Zigler et al., 2004).[197] In part, the lack of effectiveness is caused by the intermittent opening and closing of a lock on a schedule that is determined by navigation traffic and not the needs of migratory fish. In addition, flows through most navigation locks are relatively low and intermittent, and fish attraction is usually limited (NOAA, 2015). Navigation locks are also usually sited some distance from the dominant attraction flows at a dam (i.e., tailrace or spillway), leading to reduced guidance and attraction to navigation locks (NOAA, 2015). These types of conditions exist at Coffeeville Lock and Dam, where the spillway would represent the dominant attraction flow guiding Alabama sturgeon away from the lock. Further, as discussed above, sturgeon generally swim straight upstream along the bottom against a steady flow (McElroy et al., 2012), and thus would be unlikely to divert their swimming trajectory toward a lower flow coming from the Coffeeville lock.

Even if Alabama sturgeon do enter the lock at Coffeeville, available information indicates that the fish are unlikely to exit the lock into Coffeeville Lake. Cooke et al. (2002) monitored the movement patterns of the shortnose sturgeon (another species in the same scientific family as Alabama sturgeon) downstream of Pinopolis Lock and Dam on the Cooper River, in South Carolina and in the Pinopolis Lock. During the study, Cooke et al. (2002) observed that among 27 individuals that entered the lock from the tailrace, none exited the lock and entered the lake upstream of the dam. Tripp et al. (2014) observed similar inefficiency at the lock at Dam 26 on the Mississippi River, with just 1 of 75 shovelnose sturgeon passing upriver after entering the lock. Thus, it is unlikely that Alabama sturgeon would migrate upstream of Coffeeville Lock and Dam. Further, if Alabama sturgeon were to successfully pass upstream, the measures discussed above would minimize project effects on Alabama sturgeon. Consequently, we conclude that the construction and operation of the proposed project would not be likely to adversely affect the Alabama sturgeon. In a letter filed on February 13, 2018, FWS concurred with our determination for Alabama sturgeon.

Inflated Heelsplitter

As discussed in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*, construction activities could adversely affect freshwater mussels through temporary displacement and mortality associated with cofferdam construction and dewatering, and through reduced habitat quality, clogging of gills, and burying of

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[197] Some navigation locks can become more effective at passing certain species upstream of dams with the implementation of specialized non-navigational lock operations designed to improve fish passage (Moser et al., 2000; Tripp et al., 2014).

juveniles associated with erosion and sediment suspension, and sedimentation. In addition, excavation in the river channel, can cause displacement and mortality of mussels. Specifically excavation of the tailrace, as proposed by Birch Power, would permanently remove about 1.4 acres of mussel habitat located on sandbar 2 (figure 3-26), where the inflated heelsplitter occurs.

As discussed in section 3.3.2.2, *Operational Effects on Water Quantity*, under proposed operations, some (i.e., at inflows greater than 20,000 cfs and less than 110,000) or all (i.e., at inflows between 5,000 cfs and 20,000 cfs) inflow would pass through powerhouse and into the tailrace, and not spill into the proposed flow affected area. Thus, the project has the potential to alter hydraulic conditions downstream of the dam (e.g., discharge location, and flow velocity and direction). Further, as discussed in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*, redirecting flow into the powerhouse would reduce the amount of aeration that occurs in the tailwaters, and would draw deep, and potentially low DO water from the forebay into the powerhouse and out through the tailrace. These changes could potentially reduce downstream DO concentrations, which could adversely affect freshwater mussels

Excavation in the river channel, and erosion and runoff from adjacent disturbed areas during construction could cause sedimentation. Increases in suspended sediment could reduce aquatic habitat suitability downstream of the construction area, clog the gills of freshwater mussels, and bury juvenile mussels. As described fully in section 3.3.1.2, *Construction Effects on Geology and Soils*, Birch Power proposes to develop an erosion control plan, which would minimize effects of in-water excavation and runoff.

As discussed in section 3.3.1.2, *Operational Effects on Geology and Soils*, operation of the proposed project could cause scour in the streambed downstream from the proposed tailrace, change existing sediment patterns by redistributing lateral water velocities downstream of the dam, and redistribute streambed materials to new locations causing aggradation. As discussed in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*, scour and aggradation could alter existing mussel habitat and create unsuitable conditions for maintaining mussel populations. Birch Power does not propose any measures to monitor the project for scour and aggradation after operation begins. Therefore, in the draft EA, we recommended that Birch Power develop a riverbed scour and shoreline stability plan that describes how the licensee would identify bathymetric and topographic conditions, report any bed scour and shoreline instability, and, if needed, identify measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion.

To mitigate the loss of sandbar habitat during tailrace construction, and to monitor post-construction effects of the project on inflated heelsplitters, Birch Power proposes to implement a mussel relocation plan that is described fully in section 3.3.2.2, *Construction*

Effects on Aquatic Organisms and Habitat, and includes measures to relocate inflated heelsplitters that would be affected by removal of sandbar 2 and monitor inflated heelsplitters to determine the success of the relocations.

To reduce project effects on water quality in the tailrace and downstream of the tailrace, Birch Power proposes four measures that are included in the Water Quality Settlement, and discussed fully in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace.*

Condition 1 of FWS's BO would require Birch Power to implement best management practices during all proposed construction/dredge activities. FWS's BO would also require that Birch Power hold annual coordination meetings for the first 5 years after construction is complete to review the effectiveness of the erosion control plan, and the riverbed scour and shoreline stability plan and to assess if changes are necessary.

Condition 2 of FWS's BO would require Birch Power to conduct pre-construction mussel surveys throughout the action area[198] [see figure 3-27] and relocate all mussels, using specific handling and relocation procedures, to areas of suitable habitat downstream of the dam and outside the action area, and identified by conducting habitat suitability surveys. FWS's BO would also require Birch Power to report on the relocation effort, and subsequently conduct four mussel surveys that begin 1 year post-construction and then every 3 years thereafter (the details of FWS's BO requirements in condition 2 are presented in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*).

Our Analysis

<u>Construction Effects on Inflated Heelsplitters</u>

Project construction and operation have the potential to negatively affect inflated heelsplitters. During mussel surveys conducted downstream of Demopolis Dam in 2011, Birch Power documented the presence of inflated heelsplitters, inside and immediately adjacent to the proposed construction area footprint, as discussed in section 3.3.2.1, *Mussels*. Most inflated heelsplitters occurred in sand substrate located in the proposed flow affected area (sandbar 1) and at the mouth of the proposed tailrace (sandbar 2) (figure 3-26). Sandbar 1 occurs outside the construction footprint, and would be protected from dredged sediments through the use of cofferdams. However, during

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[198] FWS states in its BO that it believes that any inflated heelsplitter mussels located within the action area would be incidentally taken as a result of project construction and operation.

construction, about 1.4 acres or 23 percent[199] of sandbar 2 would be removed to provide an unobstructed flow path at the end of the tailrace channel consistent with hydraulic requirements.

Excavation of the project intake and tailrace would involve the use of heavy machinery that would crush, or displace to the project spoils, any mussels in the construction footprint. Mussels adjacent to the construction footprint would also likely be affected by excavation machinery, and by the installation and removal of cofferdams, which could bury mussels and cause temporary increases in suspended sediment and turbidity. To minimize the effects of project construction described above, Birch Power proposes and FWS's BO would require[200] conducting pre- and post-construction mussel surveys in areas that would be affected by construction activity and relocating mussels identified in these areas to more suitable habitat.[201] However, as discussed in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat and section 3.3.2.2, Operational Effects on Aquatic Organisms and Habitat,* compared to Birch Power's proposal, the survey and relocation provisions required by FWS would provide a more comprehensive approach to minimizing the effects of project construction on the mussel community and better protect inflated heelsplitters from the effects of project construction.

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[199] In a letter filed on January 21, 2014, Birch Power indicated that the removal of 1.4 acres of sandbar 2 would correspond to about 23 percent of the sandbar based on Corps bathymetry data.

[200] FWS's BO specifically requires surveying for and relocating mussels from the action area. The action area would include the areas disturbed by construction activity and the areas that would be affected by project operations (discussed in detail in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat* and section 3.3.4.2, *Inflated Heelsplitter*.

[201] Among other details, FWS's BO would require Birch Power to begin all pre-construction surveys and relocations no more than 30 days prior to the construction/dredging activities, and if construction/dredging is not initiated within the required 30 days, the action area must be resurveyed and mussels relocated prior to any of the permitted instream construction. Conducting surveys and relocations within this timeframe would minimize the time period between mussel relocation and construction, and thereby minimize the amount of time that mussels would have to recolonize the construction area before the area is closed off by cofferdams. This strategy would reduce or prevent mussels from recolonizing the construction area and being impacted by construction activity.

After mussels are relocated, and prior to project construction, Birch Power proposes to begin implementing the erosion control plan to reduce potential erosion and sedimentation impacts that could occur during project construction. Freshwater mussels can be sensitive to the effects of erosion (including increased suspended solids and sediment deposition), which can affect feeding, respiration, and reproduction (Gascho Landis and Stoeckel, 2016; Tuttle-Raycraft et al., 2017). Use of BMPs, such as the installation of silt fencing along the banks of the river, as part of the plan, would isolate the upland construction area from the river and minimize sediment and turbidity impacts throughout the construction phase, and thereby minimize the effects of project construction on mussels, including the inflated heelsplitter.

In river construction activities also have the potential to negatively affect mussels. As discussed in section 3.3.1.2, *Construction Effects on Geology and Soils*, most of the alluvial material (which is still present above the high water mark) has been previously eroded from the river channel and overbank shelf portion of the project area, and is underlain by the Demopolis chalk bedrock. As a result, and because the construction footprint would be close to the dam, there is little potential for in-river construction to suspend and redistribute large amounts of sediment. Furthermore, Birch Power would install cofferdams, as part of the erosion control, which would isolate the in-river areas where the intake channel, powerhouse, and tailrace would be constructed. Therefore, while some sediment may be suspended during cofferdam installation and removal, the cofferdams themselves would minimize the effects of sediment suspension and redistribution during construction. As discussed previously in section 3.3.2.2 *Construction Effects on Water Quality*, installing a turbidity meter upstream to record background turbidity, and downstream to record any turbidity increases associated with construction, as part of the proposed erosion control plan, would allow for immediate identification of turbidity deviations and would inform any actions needed to minimize effects on water quality. If monitoring identifies potential adverse effects on water quality, construction activities could be stopped or adjusted to ensure the protection of aquatic resources. Use of BMPs, such as cofferdams, and turbidity monitoring during project construction would provide adequate protection to the local mussel community, including inflated heelsplitters.

The presence of cofferdams during construction could cause some hydraulic changes downstream of the dam, including a change in flow patterns and potential increases in velocity because of constriction in river channel width. In general, the effects of these changes in hydraulics on inflated heelsplitters would be the same as those described for the unlisted freshwater mussels as discussed in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*. As discussed in this section, expected hydraulic changes during construction would likely have a minor and temporary effect on mussels, including inflated heelsplitters, but would not likely have a discernable effect on these populations.

Operational Effects on Inflated Heelsplitters

As discussed in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*, during operation, water flowing from the tailrace would bisect the existing sandbar 2. Inflated heelsplitters on the portion of sandbar 2 located on the downstream side of the tailrace would experience a new flow distribution and velocities, which could destabilize any remaining sandbar habitat. Mussels are known to occupy areas of hydraulic refuge where substrates are stable during high flow events (Strayer, 1999). Thus, any changes in flow or depositional patterns outside of, and immediately downstream from the proposed tailrace, would have the potential to create unsuitable conditions for mussels in this area.

Birch Power does not propose any specific measures to minimize the effects of project operation on mussels located in areas that could be affected by the discharge from the tailrace. Birch Power does propose to conduct post-construction inflated heelsplitter surveys at sandbar 2, which could be used to determine the effects of project operation on these mussels. However, as summarized above, FWS's BO would require more specific measures that could address and mitigate the effects of the project discharge on mussels, including the inflated heelsplitter, which would involve conducting a mussel survey in the action area and relocating all mussels found in the action area to suitable habitat downstream of the dam and outside the action area. Through implementation of FWS's BO requirements, mussels that could be affected by discharge from the project tailrace would be relocated to suitable habitat downstream, which would reduce the effects of project operation on the mussel community downstream of the dam. Although mussel relocations would minimize the effects of project operation, as discussed in detail in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat*, mussel relocation efforts are not always 100 percent successful. However, by implementing FWS's BO requirements for proper mussel handling procedures, and by conducting surveys to identify suitable habitat downstream, relocations could be successful.

In addition to the physical changes in mussel habitat discussed above, the proposed project could also influence water quality downstream of the tailrace as described previously in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*. Implementation of Birch Power's proposed measures in the Water Quality Settlement and Alabama DEM's certification requirements would ensure that the project's tailrace waters are no less than 5.0 mg/L all year during operation, and that mean daily DO concentrations downstream of the tailrace are no less than 6.5 mg/L all year during operation (see 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*). As discussed in section 3.3.2.2, *Fish and Mussel Habitat Downstream from the Tailrace*, these DO concentrations would be adequate to sustain inflated heelsplitters. The release of deeper, cooler water from Demopolis Lake through the powerhouse and tailrace would have minimal effects on water temperature downstream of the tailrace, and the impacts to inflated heelsplitters would also be minimal (see 3.3.2.2, *Fish and Mussel Habitat Downstream from the Tailrace*).

As discussed in section 3.3.2.2, *Operational Effects on Water Quantity*, project operation would also result in no flow, or a reduction in flow spilling over the dam and flowing through the proposed flow affected area. In general, the effects of these changes in flow on inflated heelsplitters would be the same as those described for all freshwater mussels in section 3.3.2.2, *Fish and Mussel Habitat in the Flow Affected Area.* These effects include potential reductions in growth, reproduction, and survival, caused by reduced flow, as well as, the potential for reduced flows to cause DO to decrease below 5.0 mg/L, and water temperature to increase above 90° F. Reductions in growth, reproduction, and survival could negatively affect the ability of the local inflated heelsplitter population to sustain itself.

The measures that FWS requires in the BO could address and minimize the effects of poor water quality on any inflated heelsplitters located in the flow affected area. Specifically, FWS requires that Birch Power conduct a pre-construction mussel survey in the action area (including the flow affected area) and relocate all mussels found in the action area to suitable habitat downstream of the dam and outside the action area. As discussed in previous sections, FWS's BO requirement to relocate mussels that would be affected by project construction and operation, would reduce the effects of the project on inflated heelsplitters located downstream of the dam. The same conclusion can be made for those inflated heelsplitters present in the flow affected area.

Relocating inflated heelsplitters from the flow affected area would protect those mussels from any negative effects that project operation might have on water quality in the flow affected area. However, inflated heelsplitters and other mussels could recolonize habitat in the flow affected area, and fish and other aquatic organisms would likely continue to use the area after project operation begins. Thus, additional measures may be needed to minimize the effects of project operation on inflated heelsplitters and other aquatic resources. As discussed in section 3.3.2.2, *Operational Effects on Water Quality in the Flow Affected Area*, post-licensing water quality monitoring in the flow affected area would help determine whether project operations negatively affect water quality in the flow affected area, and would inform the need for additional measures to reduce project effects on water quality, if necessary. Birch Power could estimate flows in the flow affected area concurrent with the water quality monitoring discussed above to provide a time-series of data in the flow affected area. The data could be used to determine an appropriate level of flow, if flow mitigation is needed to protect water quality and/or flow conditions for mussels.

Although the measures above would help to ensure that water quality in the flow affected area would be maintained at levels that can support a healthy mussel community, reduced flows would still occur in this area and could negatively affect mussels. As discussed above, FWS's BO would require Birch Power to conduct four post-construction surveys that begin during the first year post-construction and then occur every 3 years thereafter to document whether mussels are reestablishing in the construction area (i.e., intake channel and tailrace channel). However, no entity has proposed or recommended conducting post-operational mussel surveys in the flow affected area. Such surveys would help to determine whether inflated heelsplitters and other mussels are recolonizing habitat in the flow affected area, whether mussels are being adequately supported by that habitat, and if not, whether additional measures may need to be identified in consultation with the FWS, to protect mussels that recolonize the flow affected area. Conducting four surveys over a 10-year period (i.e., the same frequency required by FWS for the post-construction surveys in the tailrace and intake) would help determine whether inflated heelsplitters are recolonizing the flow affected area and whether they are able to successfully maintain their populations over a sustained period. This information would help determine the need for additional measures (e.g., supplemental flows to the flow affected area) to protect inflated heelsplitters and other mussels in the flow affected area.

Based on the above analysis, Birch Power's proposed measures in the Water Quality Settlement, as well as Alabama DEM's certification requirements, would minimize some adverse effects of the project on inflated heelsplitters located downstream of the tailrace and in the sandbar development area. In addition, the development and implementation of a water quality monitoring and management plan for the flow affected area, would minimize some adverse effects of the project on inflated heelsplitters located in the flow affected area. Further, FWS's requirements in condition 2 for surveying and relocating mussels would minimize the effects of project operation on mussels located throughout the action area.

Ovate Clubshell and Southern Clubshell

As discussed in section 3.3.2.2, *Aquatic Resources*, *Environmental Effects*, the construction and operation of the proposed project has the potential to adversely affect freshwater mussels and mussel habitat within the project area through changes in water quality, flow distribution, flow velocity, and loss of sandbar habitat. No ovate clubshell or southern clubshell populations are known to occur in the project area, and Birch Power does not propose any specific measures to mitigate project effects on these species.

Our Analysis

The FWS lists ovate clubshell as occurring in Sumter County, Alabama. However, based on survey results, the species is not known to occur in the proposed Demopolis Project boundary. No critical habitat is present in the project boundary or within the mainstem of the Tombigbee River. The species does prefer sand and fine gravel substrates which occur in the project vicinity downstream of the dam. The species also prefers moderate current in shoals and runs of large streams and small rivers, which does not characterize habitat downstream of the dam. Flows at the project can exceed 200,000 cfs, and during the spring will exceed 50,000 cfs up to 34 percent of the time. Further, one of the primary constituent elements for the conservation of the species is geomorphically stable stream and river channels and banks. However, habitat downstream of the dam is highly dynamic because of the variability in flow that can occur and because of the presence of the existing dam and chalk shelf, which can lead to varying degrees of plunging water, and turbulent flows that could alter benthic habitat. Given that ovate clubshell have not been documented in the project area and the project site does not provide suitable habitat for the species, we conclude that licensing the project is not likely to adversely affect the ovate clubshell. In a letter filed on August 18, 2017, FWS concurred with our determination.

The FWS lists southern clubshell as occurring in Sumter County, Alabama. However, based on survey results, the species is not known to occur in the proposed Demopolis Project boundary. No critical habitat is present in the project boundary or within the mainstem of the Tombigbee River, and the only extant population occurs in the Lower Buttahatchee River, which enters the Tombigbee River over 125 river miles upstream of the proposed Demopolis Project. Southern clubshell prefers highly oxygenated water with sand and gravel substrate, which currently occurs at the project. However, like the ovate clubshell, one of the primary constituent elements for the conservation of the species is geomorphically stable stream and river channels and banks. As discussed above, habitat downstream of the dam is highly dynamic. Thus, the habitat downstream of the proposed project likely is not suitable for southern clubshell. Given that southern clubshell have not been documented in the project area and the project site does not provide suitable habitat for the species, we conclude that licensing the project is not likely to adversely affect the ovate clubshell. In a letter filed on August 18, 2017, FWS concurred with our determination.

Terrestrial Species

Federally listed species in the project area have been influenced by the operation and maintenance of Demopolis Lock and Dam since its construction in 1955. The Corps operates Demopolis Lake for navigation, and public recreation in the immediate area consists of hunting, fishing, camping, picnicking, hiking, water sports, sightseeing, and various other activities. The 2,534-acre Damsite Management Unit of the David K. Nelson Wildlife Management Area is accessible by road and managed by Alabama DCNR for public hunting of several game species (Alabama DCNR, 2016c).

The project would not alter the Corps' operation of the Demopolis Lock and Dam or Alabama DCNR's regulations pertaining to wildlife management within the Damsite Management Unit. However, construction of project facilities would result in removal of existing vegetation and disturbance to wildlife habitat, primarily within the Damsite

Management Unit. Temporary disturbances would also occur during installation of the project transmission line within an existing transmission line right-of-way. Human disturbances during construction, operation, and maintenance could also result in the dispersal of wildlife from the immediate project area. In addition, upgrading the access road and constructing an angler access trail could lead to increased disturbance associated with recreation in the project area.

Wood Stork

Wood stork is known to use the Damsite Management Unit of the David K. Nelson Wildlife Management Area for foraging during the summer months (June – October 1),[202] including wetland habitat adjacent to, and downstream of the Demopolis Lock and Dam. Construction of project facilities would displace and degrade wood stork foraging habitat around the Demopolis Lock and Dam. Project construction, operation, and maintenance could also temporarily disturb wood storks, and result in dispersion to higher quality wetland habitat in the local area. Birch Power has not proposed specific measures for reducing project effects on wood stork.

In its July 25, 2017 comments on the draft EA, Birch Power stated that the seasonal time constraints on project construction in the staff-recommended species protection plan would render the project infeasible because it would increase the overall construction time, the cost for cofferdams and other dewatering measures, and the risk of cofferdam failure. Birch Power requested that the species protection plan be modified to substitute an alternative wood stork (and northern long-eared bat) conservation measure that is commensurate with the impacts and would allow continuous construction through the summer months to take advantage of low water conditions. Birch Power also suggested that the $5,000 estimated capital cost of this measure (draft EA, p. 216) could be contributed to habitat improvement projects for these species through the Alabama DCNR or FWS.

Birch Power consulted with FWS after the draft EA issuance regarding the time constraints for construction contemplated in the species protection plan. FWS recommended that Birch Power contact the Corps to obtain any records of wood stork sightings in the project area near the dam. In a letter filed on November 30, 2017, FWS stated that it subsequently received additional site specific information from the Corps' Demopolis Lock and Dam project manager, indicating that no wood storks had been

[202] As of 2014, there were no documented occurrences of wood stork breeding or nesting in Alabama (FWS, 2014b).

documented in the project area during the last eleven years.[203] FWS also stated that it agreed with the staff recommended protection measures for wood storks as described in the draft EA, but clarified that implementing the measures would be necessary only when/if wood storks were present.

Our Analysis

Although there are no documented occurrences of wood stork breeding or nesting in Alabama, wood storks are known to disperse from breeding areas in other states to Alabama for foraging during the summer months. Wood storks forage in freshwater wetlands with shallow, open water, where prey concentrations are high enough to ensure successful feeding (FWS, 1997). According to information provided by Alabama DCNR, wood storks occur throughout an approximately 600-acre area of the Damsite Management Unit.[204] The Damsite Management Unit is one of nine wildlife management units that comprise the David K. Nelson Wildlife Management Area, which offers a total of 8,308 acres of habitat for wildlife species within a 10 mile radius of the project, all within close proximity to the Tombigbee and Black Warrior Rivers.

Wood stork habitat would be affected by the construction, operation, and maintenance of project facilities on the north side of the Tombigbee River. The habitat quality of this area is already somewhat diminished by the Corps' Demopolis Lock and Dam facilities and associated property on the south side of the Tombigbee River, the Corps' operation of the lock for navigation purposes, game hunting in the Damsite Management Unit adjacent to the known wood stork area, and public fishing and other recreation on the south side of the Tombigbee River, at the Corps' Spillway Falls Park.

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[203] No other details were provided about the documentation of wood stork's use of the project area. Therefore, staff assumes that the Corps refers to anecdotal observations of Corps staff working at the Demopolis Project and not wood stork surveys.

[204] Our estimates are derived from consultation records between Alabama DCNR and Birch Power, as shown in Birch Power's August 11, 2015 response to staff's June 17, 2015 request for additional information.

Under Birch Power's proposal, about 31.9 acres[205] of known wood stork habitat in the Damsite Management Unit would be permanently lost to construction of the powerhouse (about 0.4 acre), intake channel (about 1.0 acre), tailrace channel (about 7.4 acres), and spoils disposal facilities (23.1 acres).[206] An additional 9.7 acres of habitat would be temporarily disturbed by construction of project facilities, but subsequently replanted with native vegetation.

Construction and operation of project facilities could decrease wood stork foraging success in the area downstream of Demopolis Lock and Dam. According to the license application and Birch Power's January 21, 2014 filing, construction of the 2,000-foot-long excavated tailrace would create about 7.5 acres of permanent deep water habitat within the new tailrace channel and would reduce flooding of the chalk shelf area by about 26 percent. Because wood stork foraging occurs in shallow areas with depths between 6-10 inches, construction of the excavated tailrace and discharges into the tailrace during hydropower operations would likely decrease the abundance of suitable foraging sites in the downstream area.

Birch Power's proposal to construct the project transmission line across the Tombigbee River, through wood stork habitat identified by Alabama DCNR, would increase the risk of transmission line collision and electrocution of wood storks. Electrocution mortalities of wood storks from power lines have been documented and reported by power companies and wildlife law enforcement (FWS, 2014b). Separately, human disturbances (including increased human activity and noise associated with project construction, operation, maintenance, and recreation) could cause wood storks that have historically used the project area to use other sections of the David K. Nelson Wildlife Management Area.

In its spoils disposal plan, Birch Power proposes to place approximately 571,000 cubic yards of Demopolis chalk, soil, and alluvium spoils on the north side of the river

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[205] Our estimates are based on wood stork habitat descriptions provided by Alabama DCNR in the license proceeding and wetland data submitted by Birch Power in the license application and the March 7, 2017 response to staff's February 7, 2017 additional information request (see table 3-16). Based on wood stork habitat preference of shallow, open water, our estimates do not include project effects on limnetic, open water habitat.

[206] Birch Power's proposal to construct a fishing platform on the south bank of the Tombigbee River would not affect the wood stork. The proposed location for the fishing platform is already used for subsistence and sport fishing, and would be located downstream of the wood stork habitat identified by Alabama DCNR.

channel, downstream of Demopolis Lock and Dam. The north side of the river channel is part of the Damsite Management Unit of the David K. Nelson Wildlife Management Area (figure 3-30), and was identified as wood stork habitat by Alabama DCNR. Placing spoils in this area would permanently displace about 23.1 acres of wetland habitat (table 3-16).

To mitigate the loss of wildlife habitat in the Damsite Management Unit, Birch Power proposes to create a 20.2-acre forested wetland on top of the spoils pile on the north side of the river channel. However, this habitat would not be suitable for wood stork foraging. Wood storks feed in shallow, open water areas that provide habitat for concentrated fish populations that serve as prey. As discussed in our analysis of *Project Effects on Wetlands and Riparian Habitat*, section 3.3.3.2, the 20.2-acre area would most likely not support the establishment of a forested wetland. Birch Power's proposed forested wetland would be located on top of the spoils pile, about 28 feet higher than the existing wetland area used by the wood storks. At this heightened elevation, the area would be less likely to become inundated with water to support fish as prey for the wood stork. In addition, Birch Power's proposal to establish a forested wetland with native tree species would not provide open water habitat for wood stork foraging, especially considering the likelihood of early successional plant species colonizing the area.[207]

Permanent effects on wood stork habitat would be reduced by 23.1 acres if Birch Power transports the 571,000 cubic yards of spoils to an offsite disposal area. Absent Birch Power's proposal to place spoils on the north side of the river, about 8.8 acres of the 600-acre wood stork habitat would be permanently displaced by construction of the powerhouse facilities. Birch Power could implement specific measures in the project area to further reduce project effects on the wood stork.

In habitat management guidelines published in 1990, FWS recommends the implementation of specific protection measures for wood stork feeding sites, with an emphasis on avoiding and minimizing detrimental human-related impacts on wood storks (FWS, 1990b). FWS recommends avoiding: (1) human intrusion into feeding sites when storks are present;[208] (2) water management practices that alter traditional water levels or

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[207] For further analysis of the environmental effects of the spoils disposal plan, see section 3.3.3.2, *Terrestrial Resources, Environmental Effects, Project Effects on Wetlands and Riparian Habitat*.

[208] FWS's habitat management guidelines state that, depending upon the amount of screening vegetation, human activity should be no closer than between 300 feet (where solid vegetation screens exist) and 750 feet (no vegetation screen).

seasonal drying patterns/rates; (3) introduction of contaminants, fertilizers, or herbicides into wetlands that contain stork feeding sites, especially those compounds that could adversely alter the diversity and numbers of native fishes or that could substantially change the characteristics of aquatic vegetation; and (4) construction of tall towers (especially with guy wires) within three miles of wood stork sites, or high power lines (especially across long stretches of open country) within one mile of major feeding sites.

In the draft EA staff recommended a species protection plan which would include measures consistent with FWS's habitat management guidelines for wood storks. To avoid human intrusion into feeding sites when wood storks are present and minimize project-related effects to this species,[209] the plan would have limited construction activities to the October 15 to May 15 time period, when wood storks are not expected to be foraging in the area. However, Birch Power stated that this measure would render the project infeasible because it would limit construction to seasons that tend to have higher flows, which would significantly extend the project construction time frame and increase costs.

Birch Power requested that the $5,000 estimated capital cost of the species protection plan be used instead as a contribution to habitat improvement projects for endangered species through the Alabama DCNR or FWS. However, without additional details regarding specific habitat improvement projects, including the target species, types of improvements, and location(s) for implementation, this alternative is inconsistent with Commission guidelines for environmental measures. As discussed in section 3.3.3.2 *Terrestrial Resources* regarding EPA's recommendation to contribute to a wetland mitigation bank, Commission guidelines require environmental measures to be: (a) within the scope of the Commission's jurisdiction; (b) specific, rather than general, in nature; and (c) physically or geographically as close to the project as possible. In contrast, the species protection plan includes specific measures to protect wood storks that may occur within the project boundary during project construction.

FWS's November 30, 2017 comments indicated that the staff recommended species protection plan would be consistent with habitat management guidelines for wood stork without a strict seasonal restriction for project construction. FWS agreed that the staff measures to minimize potential effects of project construction on wood storks were appropriate when this species is present in the project area. Accordingly, the measures related to wood storks in the species protection plan could be modified to include the following provisions: (1) survey construction areas for wood storks prior to commencing

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[209] Alabama DCNR estimates that wood storks forage in the project area between June and the first of October. *See* Birch Power's August 11, 2015 response to staff's June 17, 2015 request for additional information.

construction; (2) to the extent wood storks are actively foraging in the project area, either (a) delay construction activities until wood storks disperse, or (b) conduct construction activities no closer than between 300 feet to 750 feet from wood storks, depending on the presence or lack of solid vegetation screens, respectively; and (3) at the proposed recreation parking area within the Demopolis Management Unit, provide educational signage regarding the potential presence and protected status of wood storks. This modification to the species protection plan would address potential project effects to the wood stork while allowing more flexibility in the timing of construction throughout the year, including during the summer months when inflow and water levels tend to be lower.

As to FWS's second recommendation in the habitat management guidelines, Birch Power's proposal to operate the power plant in a run-of-release mode would reduce the effects of the project on traditional water levels and seasonal drying (section 2.2.5, *Proposed Project Operation*).

As to FWS's third recommendation in the habitat management guidelines, Birch Power's proposed oil and hazardous substances plan, with certain modifications, would reduce the risk of introducing contaminants into wood stork foraging areas (section 3.3.2.2, *Construction Effects on Water Quality*). Also, Birch Power's revegetation plan could be modified to include invasive species control techniques that minimize effects on native plants and wood stork habitat, including the use of selective chemical application methods that target invasive species, as opposed to broadcast treatments of herbicide sprays (section 3.3.3.2, *Project Effects on Botanical Resources*).

Finally, Birch Power could develop and implement, in consultation with Alabama DCNR, FWS, and Corps, an avian protection plan that includes the following measures to minimize the potential for bird mortality associated with the project transmission line and substation: (1) design and install power poles to provide adequate separation of energized conductors, groundwires, and other metal hardware; (2) insulate or cover transmission line wires to protect raptors and other large-bodied birds from electrocution hazards; (3) install line-marking devices to protect birds from colliding with the transmission line; (4) train staff to identify, document, and report instances of avian mortality associated with the project's electrical facilities; and (5) implement site-specific measures and practices to reduce bird mortality, as necessary, including modifications to structures or line arrangement (section 3.3.3.2, *Project Effects on Wildlife Resources*).

Considering the abundance of wildlife habitat available throughout the David K. Nelson Wildlife Management Area, the existing disturbances and habitat quality of the Demopolis Lock and Dam area, and the measures that could be implemented to minimize project effects on wood stork, we conclude that construction, operation, and maintenance of the project would have insignificant effects on the wood stork and would therefore not be likely to adversely affect the wood stork. In a letter filed on August 18, 2017, FWS concurred with our determination on the wood stork.

Northern Long-eared Bat

The northern long-eared bat is found in a variety of forested habitats in the summer season. Project facilities located in Sumter County are within the northern long-eared bat species range and the white-nose syndrome buffer zone (FWS, 2016d; FWS, 2016e). While project construction includes tree removal and vegetation clearing, no northern long-eared bat activity was detected during surveys.

As described above, Birch Power's July 25, 2017 comments on the draft EA stated that the seasonal time constraints on project construction in the staff-recommended species protection plan would render the project infeasible because it would significantly increase the time frame and costs of project construction. Birch Power requested that the species protection plan be modified to substitute an alternative northern long-eared bat (and wood stork) conservation measure that would be commensurate with the impacts and allow continuous construction through the summer months to take advantage of low water conditions. Birch Power also suggested that the $5,000 estimated capital cost of this measure (EA, p. 216) could be contributed to habitat improvement projects for these species through the Alabama DCNR or FWS.

On August 18, 2017, FWS concurred with sour determination on the northern long-eared bat in the draft EA. Subsequently, Birch Power consulted with FWS regarding the time constraints for project construction contemplated in the species protection plan. In an email filed on October 25, 2017, FWS clarified that it typically allows tree removal during the inactive period for northern long-eared bats (i.e., October 15 through March 31), and that "…once the trees are removed there would no longer be any impacts[210] to this species." In a letter filed on November 30, 2017, FWS also stated that based on the 4(d) rule and the biological opinion associated with the listing of the northern long-eared bat, as long as the trees were removed during this species' inactive season of October 15 through March 31, the project "may affect, [but is] not likely to adversely affect" this species.

Our Analysis

Project construction would affect approximately 18.7 acres of wooded wetland

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[210] We assume that FWS refers to the direct impacts of tree removal here, and not the indirect impacts to northern long-eared bats associated with the loss of potentially suitable habitat. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the proposed action and are later in time but still are reasonably certain to occur.

and deciduous forest habitat, including the permanent loss of about 10.35 acres and the temporary disturbance of about 8.35 acres. Also, according to the environmental survey report submitted by Birch Power, four trees in the project area could potentially harbor bats, including one shagbark hickory that is mature enough to potentially serve as a maternal roosting site.

FWS's Alabama Ecological Services Field Office has published a map identifying known maternity roost trees and hibernaculum, and counties located within the white-nose syndrome zone (FWS, 2016e). Sumter County is in the white-nose syndrome zone, while Marengo County is not in the zone. The closest known hibernacula are located about 60 and 100 miles northeast of the project area, in Bibb and Shelby Counties, respectively. According to consultation records filed by Birch Power on May 25, 2016, FWS confirmed that there are no known occupied hibernacula or roosts of northern long-eared bat in Sumter County (Birch Power, 2016).

Northern long-eared bat was not detected in the project area during surveys conducted in May 2016, and no hibernacula, occupied maternity roost trees, or evidence of roost activity was found in the immediate vicinity of the project (Birch Power, 2016).

Since the project would be located inside the white-nose syndrome zone, would require tree removal, and would be located in an area that contains a potential maternal roost tree, additional protection measures are necessary to avoid prohibited incidental take of northern long-eared bat. According to the 4(d) rule, removing occupied maternity roost trees or any trees within 150 feet of an occupied roost tree is prohibited during the northern long-eared bat pup season (i.e., June 1 – July 31). In addition, FWS's recommendation to allow tree removal only during the northern long-eared bats' inactive period, which is November 1 through March 31, is a discretionary conservation measure to minimize or avoid adverse effects on this species (FWS, 2016h). As noted above, there are no known occupied hibernacula or maternity roosts of northern long-eared bat in Sumter County and Birch Power did not detect any hibernacula, occupied maternity roost trees, or evidence of roost activity in the immediate vicinity of the project. Nevertheless, avoiding tree removal during the pup season and the broader active period would protect northern long-eared bats potentially using the project area and would be consistent with FWS's determination of effects to this species.

To avoid prohibited incidental take and disturbance of northern long-eared bats potentially roosting in trees in the project area, Birch Power could establish a species protection plan that restricts tree removal (i.e., including cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats) to the period of November 1 through March 31, which would be outside of the pup season and the broader active season. The species protection plan would not include limitations on the timing of other construction activities related to the protection of northern long-eared bats. This modification to the species protection plan would address the potential direct project effects to northern long-eared during the time when pups are most vulnerable as well as during the broader active season. The plan would also allow flexibility in the timing of construction activities (with the exception of tree removal) throughout the year, including during the summer months when inflow and water levels tend to be lower. With this measure in place, the plan is consistent with FWS's recommendations and we conclude that the project would not be likely to adversely affect the northern long-eared bat. As noted above, FWS concurred with our determination for the northern long-eared bat on August 18, 2017.

<u>Gopher Tortoise</u>

The FWS's species report does not list the gopher tortoise as occurring in the project area (FWS, 2016g), and in its final license application, Birch Power states that the project boundary does not contain any of the dry, sandy habitat preferred by the gopher tortoise. However, FWS's Environmental Conservation Online System lists the gopher tortoise as potentially occurring in Sumter and Marengo Counties (FWS, NDc), and Alabama's Wildlife Action Plan states that gopher tortoises thrive in open transmission line rights-of-way adjacent to fire-suppressed pine forests (Alabama DCNR, 2015). Birch Power proposes to construct the project transmission line primarily within an existing right-of-way, which requires the operation of heavy machinery and the placement of transmission line poles. To the extent gopher tortoise habitat exists in the transmission line right-of-way or in other portions of the project area, construction and maintenance of the project could affect the gopher tortoise.

Our Analysis

Taking into account gopher tortoise habitat requirements, we conclude that land within the project boundary does not provide suitable habitat for gopher tortoise. Gopher tortoises require well drained, sandy soils for burrowing and nest construction (FWS, 2011). These soils are not found within undisturbed areas in the project boundary.

The powerhouse facilities and access road would be located to the north of the Tombigbee River, within the Damsite Management Unit of the David K. Nelson Wildlife Management Area. The Damsite Management Unit primarily consists of bottomland hardwood forest and riparian areas that are too saturated for gopher tortoise burrowing and nesting habitat.[211]

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[211] See section 3.3.3.1 (*Affected Environment, Wetlands and Riparian Habitat*) for a complete description of the wetlands and riparian habitat in the Damsite Management Unit.

The remaining land within the project boundary would be located within the proposed transmission line right-of-way, to the south of the Tombigbee River. While the project transmission line would cross drier, upland habitat, existing land uses and soil characteristics render the land unsuitable for gopher tortoise. As documented by FWS, most gopher tortoise burrows are found on loam and sandy loam soils (FWS, 2011), and average about 6 feet in depth (FWS, 1990a). In contrast, the greatest depth of any loam or sandy loam soils in the proposed transmission line corridor is 9 inches.[212] These loam and sandy loam soils are also located in land that has already been developed for municipal use or agricultural production, which is uninhabitable for gopher tortoise. Further, at the 6-foot average burrowing depth, soils in the transmission line corridor are composed almost entirely of bedrock or clay, both of which impede digging, and the latter of which may adversely affect nest success due to reduced oxygen-carbon dioxide exchange (FWS, 2011). Accordingly, the transmission line corridor would not provide suitable habitat for the gopher tortoise.

Because FWS's species report does not list the gopher tortoise as occurring in the project area, and no suitable habitat exists in the project boundary, we conclude that the project would have no effect on the gopher tortoise.

Georgia Rockcress

Birch Power did not locate any occurrences of Georgia rockcress during a survey conducted in May of 2016 (Birch Power, 2016), and FWS's species report does not list the Georgia rockcress as occurring in the project area (FWS, 2016g). Moreover, the closest known occurrence of the species, the Fort Tombecbee critical habitat unit, is located approximately 35 river miles upriver of Demopolis Lock and Dam (FWS, 2014a).

Our Analysis

Because the species does not occur in the project boundary, we conclude that the project would have no effect on Georgia rockcress.

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[212] The soil profile for the Chrysler-Lenoir soil complex includes loam from 0 – 9 inches, and the soil profile for the Freest soil includes fine sandy loam from 0 to 8 inches (NRCS, 2017a). The Chrysler-Lenoir soil complex and the Freest soil are designated as "ChB" and "FsB," respectively, in the Natural Resources Conservation Service's soil map, which is included in the custom soil resource report for the counties surrounding the project.

3.3.5 Recreation and Land Use Resources

3.3.5.1 Affected Environment

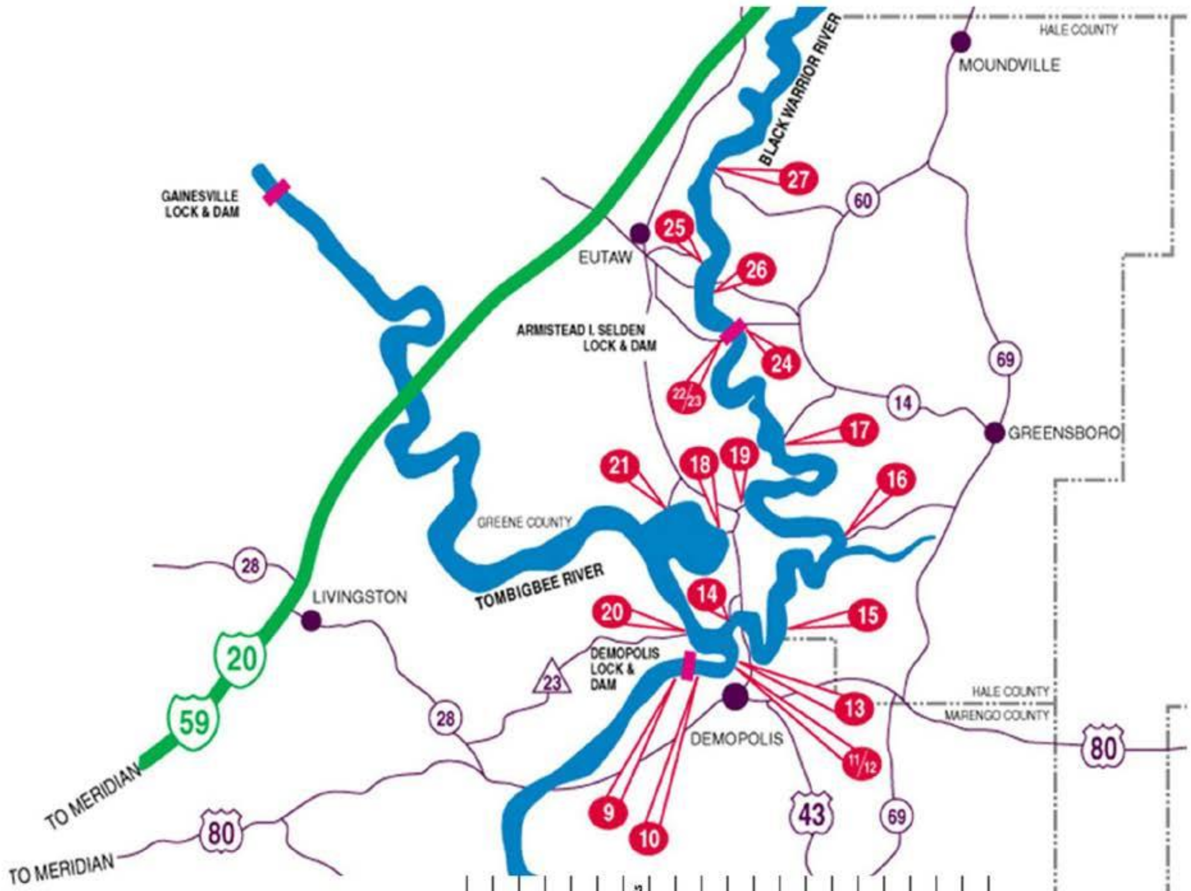
Recreation

Regional Water-Based Recreation Opportunities

The region is home to many water-based recreation opportunities, including camping, boating, and fishing. Tributaries and nearby lakes provide additional water-based opportunities at four state parks, two national forests, two state forests, and seven wildlife management areas located in the southwestern Alabama region (Alabama DCNR, 2016c; Alabama DCNR, 2016d; Google Maps, ND). The Tombigbee River and its tributaries offer a wide range of recreation opportunities. The impoundments of the Tombigbee River provide abundant fishing opportunities for species such as catfish, largemouth bass, crappie, and sunfish (Alabama DCNR, 2016e).

Recreation Facilities in the Project Vicinity

Demopolis Lake is the second-largest lake in the Black Warrior-Tombigbee river system. It extends 48 miles upriver on the Black Warrior River and 53 miles upriver on the Tombigbee River and has along its shoreline modern campgrounds, day-use facilities, primitive camping areas, and numerous public access areas are available on the lake (Alabama DCNR, 2016d). Corps recreation facilities in the project vicinity include a visitor center, Foscue Creek Park and Foscue Creek Campground, Spillway Falls Park, Lower Pool Park day use area, and boat ramps above and below Demopolis Dam. The facilities are all located on the south bank of the Tombigbee River across the river from the proposed powerhouse and retaining wall. Figure 3-32 shows public recreation facilities located in the vicinity on the Black Warrior and Tombigbee Rivers.



RECREATIONAL FACILITIES

	#	Site	Boat Launching Ramp	Camping	Camper Wash House	Elec. & Water Hookups	Dump Station	Restrooms	Pit/Aerobic/Compost Toilets	Picnic Area	Group Shelter	Drinking Water	Playground	Trail	Swimming Beach	Fishing Pier	Information	Visitor Center	Overlook	Boat Fuel/Docking	Motel/Restaurant	Bank Fishing	Courtesy Dock
COFFEEVILLE	1	Lock 1	●	●				●		●	●	●				●						●	
COFFEEVILLE	2	Service	●	●	●	●	●	●		●		●	●				●					●	
COFFEEVILLE	3	Choctaw N.W. R.	●																			●	●
COFFEEVILLE	4	Lenoir	●	●					●	●		●										●	
COFFEEVILLE	5	McCarty Ferry	●						●	●												●	
COFFEEVILLE	6	Bashi	●						●	●												●	●
COFFEEVILLE	7	Lock 2	●	●					●	●		●										●	
COFFEEVILLE	8	Lock 3 - Closed																				●	
DEMOPOLIS	9	Lower Pool	●																			●	
DEMOPOLIS	10	Foscue	●	●	●	●	●	●		●	●	●	●	●			●					●	●
DEMOPOLIS	11	Demopolis City Landing	●					●		●	●	●	●									●	●
DEMOPOLIS	12	Demopolis Yacht Basin						●				●					●			●	●		●
DEMOPOLIS	13	Lock 4	●																			●	
DEMOPOLIS	14	Runaway 2	●	●					●			●										●	
DEMOPOLIS	15	Arcola	●																			●	
DEMOPOLIS	16	Lock 5	●	●				●		●												●	
DEMOPOLIS	17	Lock 6	●						●			●										●	
DEMOPOLIS	18	Birdeye	●																			●	
DEMOPOLIS	19	Backbone	●																			●	
DEMOPOLIS	20	Belmont	●	●					●	●	●	●										●	
DEMOPOLIS	21	Forkland	●	●	●	●	●	●	●		●	●	●				●					●	●

Figure 3-32. Location of recreation facilities in the project area.

The David K. Nelson (Demopolis) Wildlife Management Area (WMA), owned and operated by Alabama DCNR is located on the north side of the Tombigbee River, and includes 8,308 acres of land within a 10 mile radius of the proposed project (figure 3-33). The Damsite Management Unit, which is part of the Demopolis WMA, contains 2,534 acres of land and includes the location of the proposed project access road and construction staging/powerhouse parking area. The Damsite Management Unit is owned by the Corps and managed by the Alabama DCNR. It is the only portion of the Demopolis WMA that is accessible by road.

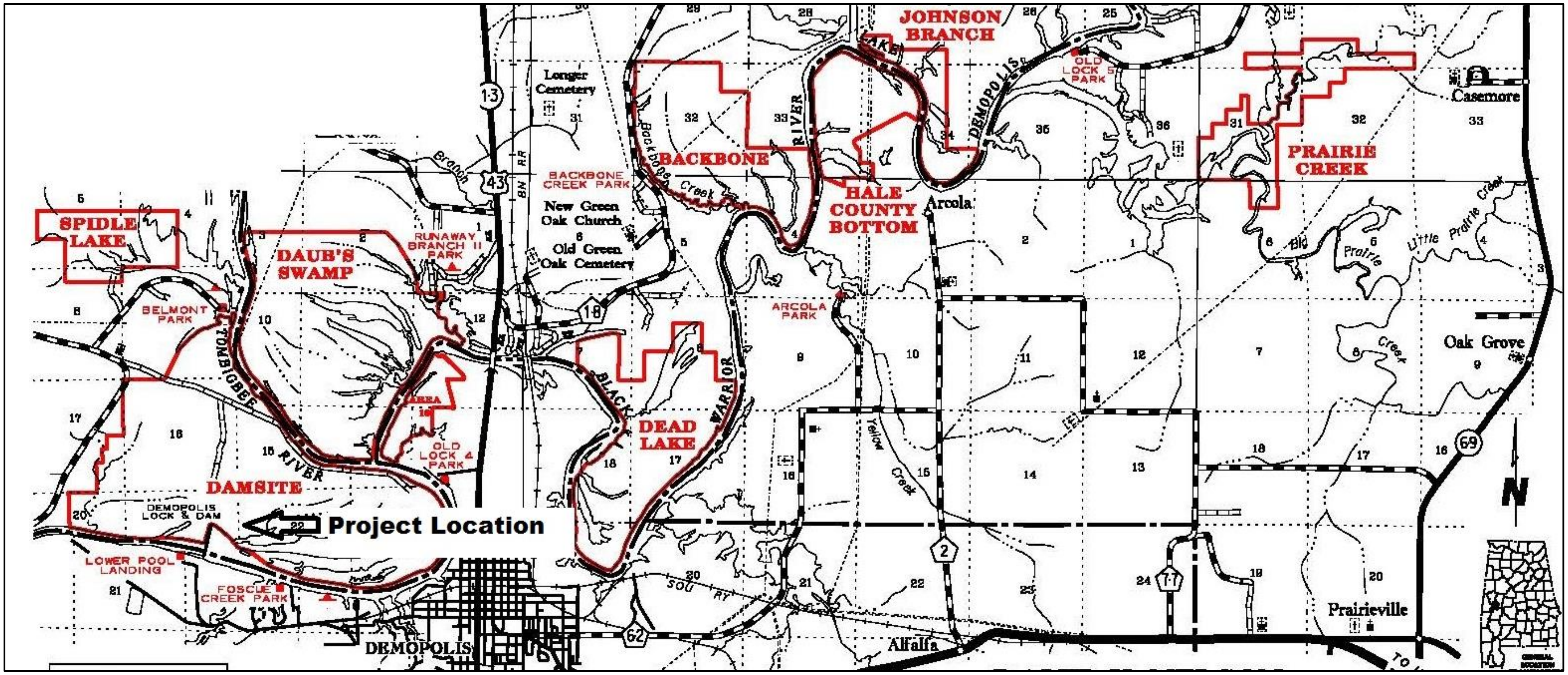


Figure 3-33. David K. Nelson Wildlife Management Area Map, with Damsite Management Unit shown in lower left corner (Source: Alabama DCNR, 2016b)

Recreation Use and Activities

The majority of visitors to the lakes in the Black Warrior-Tombigbee system are from Alabama, Mississippi, Georgia, and Tennessee; however, many do visit from outside the southeastern U.S. Visits to the Tennessee – Tombigbee Waterway totaled 1,705,480 in 2012 (Corps, 2013). One draw for visitors is the largemouth bass fishing in Demopolis Lake. The lake also supports crappie, hybrid striped bass, and bream fishing opportunities. The Demopolis Dam tailwater fishery is popular for its hybrid striped bass and catfish fishing opportunities (Alabama DCNR, 2016d). Hunting is a popular activity at Demopolis WMA, including within the Damsite Management Unit, which would be used for project construction. Game animals include deer, turkey, feral swine and waterfowl. Pleasure boats cruising America's Great Loop[213] use the Tennessee-Tombigbee Waterway each year in the fall.

Land Use

The proposed project is located in an area of the Tombigbee River Basin, which is characterized as rural with agriculture and forest products as the primary land uses. Land use in Sumter and Marengo Counties is primarily agriculture, with woodland the most common type, followed by pasture and cropland agricultural uses.

There are no lands in the immediate vicinity of the project that are included in the national trails system, or designated as wilderness, and no portion of the Tombigbee River is included on the list of wild and scenic rivers. No portion of the Tombigbee River is listed on the Nationwide Rivers Inventory (NRI).[214]

3.3.5.2 Environmental Effects

Effects of Project Construction on Recreation

The proposed project would impact recreation where project construction activities and recreational use intersect. For example, project construction would limit hunting and fishing on the north shore of the Tombigbee River in the project vicinity by

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[213] The Great Loop is a continuous waterway that allows boaters to travel parts of the Atlantic Ocean, Gulf Intracoastal Waterways, the Great Lakes, Canadian Heritage Canals, and the inland rivers of the Midwest.

[214] The NRI, which was created in 1982 and amended in 1993, identifies river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance (NPS, 2011).

limiting access provided by the existing access road. However, this would only affect recreationists during project construction. Also, while hunting and fishing opportunities would remain within the Demopolis WMA, minor effects to hunting and fishing could happen as a result of project construction. These effects would only take place during construction, and are seen as necessary for the proposed improvements.

Our Analysis

Construction of the proposed project facilities would be unlikely to significantly affect recreation near Demopolis Lock. Construction activities, such as increased noise, dirt, and access blockages would be temporary. The closures would take place on both the north bank and the south bank of the Tombigbee River. During construction, bank fishing opportunities could be suspended. Spillway Falls Park, however, located 1,500 feet downstream from Demopolis Lock, offers many south bank-fishing opportunities on the Tombigbee River, including a picnic shelter, picnic sites, and a boat launch. Further, hunters, as well as anglers would still be able to access other areas of the Demopolis WMA while project construction is occurring.

Effects of Proposed Operation on Recreation Enhancements and Public Access

Birch Power proposes to operate the project in a run-of-release mode, shutting down turbines during low-flow periods in order to maintain pool levels. Birch Power states that the project would not interfere with the Demopolis Lock operation or with navigation on the Tombigbee River. Birch Power further states that while development of the powerhouse and tailrace channel would change the character of the open water on the overbank shelf downstream from the dam, this area could still be used by recreationists including fishermen and boaters. Birch Power also proposes to install a fishing platform on the south bank of the Tombigbee River.

Our Analysis

Operation of the proposed project is unlikely to affect boaters because Birch Power proposes to operate the project in a run-of-release mode, within the guidelines set by the Corps, which would keep the reservoir pool elevation at or above the spillway crest elevation of 73 feet ASL when the project is operating. Any safety measures required by the Commission would help ensure boater safety after the project is constructed and operational. The proposed improvements to the existing access road would allow hunters and anglers to access the north shore area, as well as the Demopolis WMA, more easily.

The proposed angler access trail would enable anglers and other recreationists to access the north shore of the river, once completed. The upgraded access road would allow for easier access to this area, for hunting and fishing pursuits. A north bank fishing access area measure, as part of a RMP, could be implemented, depending upon the results of a feasibility assessment. This prospect is discussed further in the section below.

Also, while a fishing platform would allow for improved access to those fishing on the south bank of the river, the platform is not needed. The effect on recreational fishing due to the proposed project would be small. A feasibility assessment for a north bank fishing access facility would help to identify and foster adequate fishing opportunities on the north bank of the river. Adequate fishing opportunities exist on the south bank of the river, and can be accessed by crossing riprap by foot at Spillway Falls Park, just downstream of the Demopolis Dam. A parking area for approximately 10 vehicles is located at Spillway Falls Park. Also, a fishing platform on the south bank would be situated across the river at a substantial distance from the other components of the proposed project and would be awkward to include in the project boundary. Good opportunities and access for fishing on the north bank could be realized from the feasibility assessment. Together, the small degree of long-term effect on fishing opportunities anticipated from the proposed project, the fact that adequate fishing opportunities already exist on the south bank, and the likelihood that a feasibility analysis will identify a location for a fishing facility on the north bank, negate the need for a south bank fishing platform.

Recreation Management Plan

A RMP, with a feasibility assessment of a north bank fishing access facility included, would help to provide for the identified and future recreation interest for the life of a license. The RMP would also include conceptual plans, consultation (including periodic consultation), and a monitoring program. Development of a RMP would ensure that the recreation facilities are designed and constructed with the consultation of the Corps and Alabama DCNR.

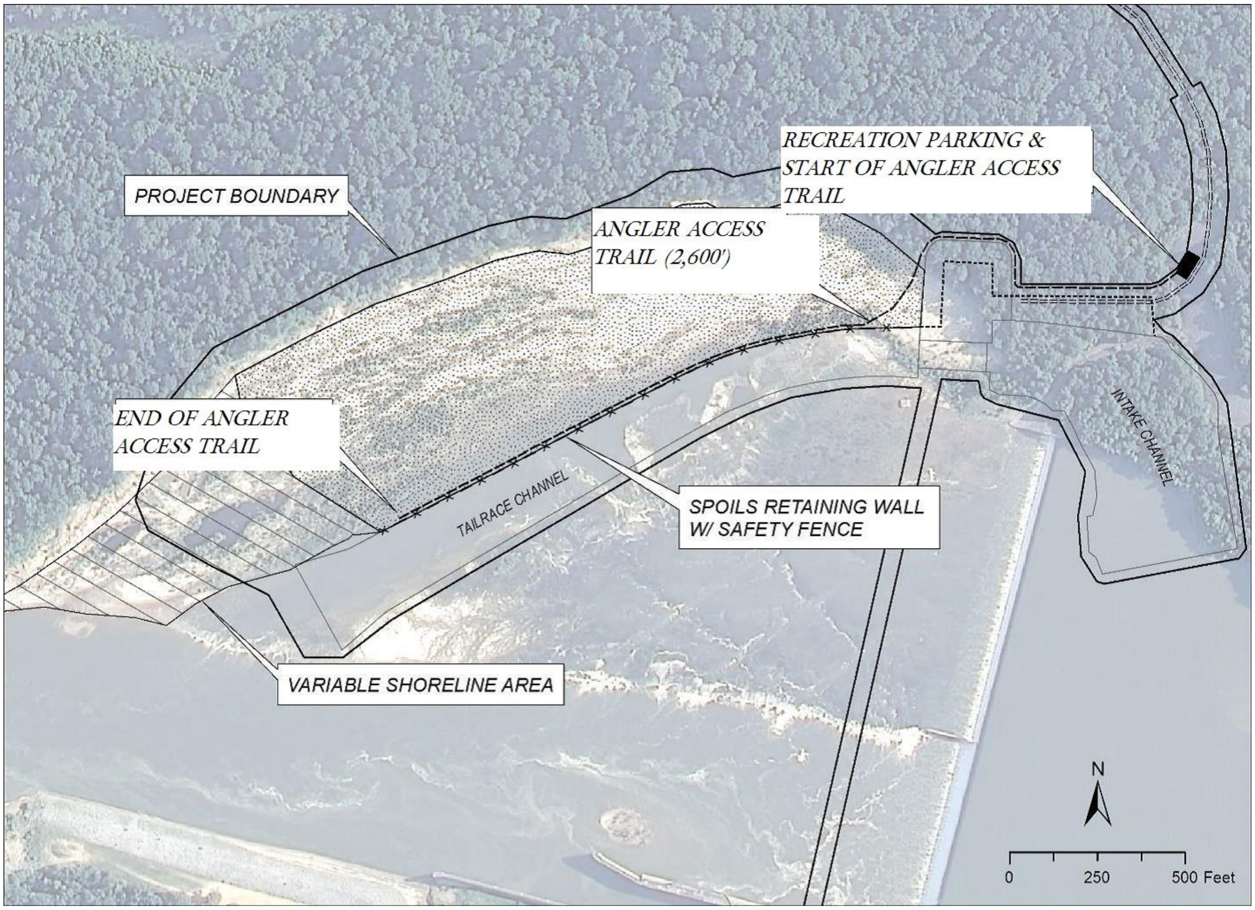

Figure 3-34. Location of proposed angler access trail and recreation parking (Source: Letter filed by Birch Power on March 7, 2017, as modified by staff).

Project Effects on Land Use

Birch Power proposes to construct, operate, and maintain the associated project recreation facilities. Project features would be constructed in a similar architectural style to the existing lock and dam to minimize the effect on aesthetic resources (see section 3.3.6.1, *Affected Environment*, *Aesthetic Resources*).

Our Analysis

Constructing, operating, and maintaining the proposed project would not have a major effect on the land use in the area, as the Demopolis Lock and Dam have been operational for almost 65 years.

Development of hydroelectric facilities would be consistent with the history of industrial use along the Tombigbee River. Birch Power's proposal to construct project facilities to blend aesthetically with the existing facilities would minimize any negative effects on land use. The proposed transmission line route would largely follow existing rights-of-way, with minimal effects on surrounding land use.

3.3.6 Aesthetic Resources

3.3.6.1 Affected Environment

The proposed Demopolis Project is located in part, within the Demopolis WMA, characterized by rolling hills, undeveloped lands, and small ponds. A notable visual component of the landscape at the project is a chalk shelf, which is an outcrop of exposed Demopolis chalk (see section 3.3.1.1., *Affected Environment*, *Geology*) that is visible downstream of the dam under low flow conditions (see figure 3-1). Spillway Falls Park was constructed in order to provide visitors a viewpoint to see and hear water pouring over the spillway and adjacent chalk shelves.[215]

3.3.6.2 Environmental Effects

Construction-Related Effects on Aesthetics

The recreation facilities proposed for the north bank of the river include a parking area and angler access trail, an access road, and a fishing platform on the south bank, and are listed in detail in Section 3.3.5, *Recreation and Land Use*. These project facilities would be visible to recreational users in the vicinity of the project. The angler access trail would be built directly adjacent to a proposed 1,700-foot-long retaining wall on the north bank of the river. The fishing platform would be built below Demopolis Lock.

Birch Power notes that proposed excavation of the chalk shelf is needed to develop hydropower at the site, stating that under existing conditions the shelf area is often dry when flows are low during the summer recreation season (also see section 3.3.2.1, *Affected Environment*, *Aquatic Habitat*). In a letter dated March 17, 2014,[216] the Corps stated that eliminating the cascading water from the spillway and chalk shelves would negatively impact the experience of, and use by, visitors to Spillway Falls Park.

Birch Power proposes to construct a 1,700-foot-long engineered retaining wall downstream of the dam on the north bank of the Tombigbee River to contain spoils that are excavated during project construction. To minimize aesthetic impacts, the retaining

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[215] See the letter filed by Birch Power on May 21, 2014, which includes an email correspondence between Birch Power and the Corps in Attachment A, with a description of Spillway Falls Park and the value of the viewshed (Consultation Documents).

[216] *Id*.

wall would be constructed from local rock materials, which Birch Power states, would blend with surrounding exposed bedrock and riverbank. The site would be replanted with native, wetland vegetation and would be used for recreation and wildlife habitat.

A new powerhouse would be constructed on the north bank of the Tombigbee River as part of the proposed project. To minimize aesthetic impacts, Birch Power proposes to blend the powerhouse in with the existing dam infrastructure and visual character of the existing Corps facilities.

Our Analysis

Construction of the proposed recreation facilities would temporarily alter the aesthetic viewshed at the proposed project. The chalk shelf excavation would cause a temporary alteration of the viewshed in the project area. Heavy equipment, construction debris, dust, and silt fencing would be present in the project vicinity for the duration of construction. Construction of the retaining wall would be visually apparent to recreationists on the south bank of the Tombigbee River. During construction, heavy equipment would be visible, as well as construction debris and dust. Construction of the powerhouse would minimally alter the viewshed, mainly due to tree removal. Construction vehicles, debris, and dust would also be present during construction of the powerhouse. The construction activities are seen as necessary for the proposed improvements, and would be temporary in nature.

Operation-Related Effects on Aesthetics

Once constructed, the recreation facilities proposed for the north bank of the river would include a parking area and angler access trail, an access road, and a fishing platform on the south bank, and these are listed in detail in Section 3.3.5, *Recreation and Land Use*. These project facilities would be visible to recreational users in the vicinity of the project. Excavation of the chalk shelf would yield a change of flows. The angler access trail would travel directly adjacent to the proposed 1,700-foot-long retaining wall on the north bank of the river. The fishing platform would be in place below Demopolis Lock.

Our Analysis

Construction of the project as proposed would result in a change of flows (see discussion in section 3.3.2.2, *Operational Effects on Water Quantity*), thus changing the aesthetic viewshed for boaters and those using Spillway Falls Park.[217] Currently, users

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[217] *See* section 3.3.2, *Aquatic Resources*, for information on flows and the chalk shelf.

on the south bank of the river are able to view the north bank lands in an unobstructed way, save for the existing Demopolis Lock and Dam. While the constructed retaining wall would still allow for those lands to be seen, the wall would lessen the viewshed in the vicinity. The visual effects of the retaining wall would increase with lower tailwater elevations. At low tailwater elevations, about 42 feet of the retaining wall's height would be visible to recreationists. The tailwater elevation ranges from 33 to 76 feet. The retaining wall would be visually apparent to recreationists in the south bank area, downstream of the Demopolis Dam.

The proposed powerhouse would be visible from viewpoints on the south shore of the Tombigbee River and from watercraft on the river. The powerhouse would project 40 feet above the top of the spillway. Compared to the existing view, the proposed powerhouse, if constructed, would minimally affect the viewshed, mainly through tree removal. This would be somewhat offset through blending the powerhouse in with the existing dam infrastructure and visual character of the existing Corps facilities. The associated proposed powerlines would span the river and would be potentially visible up to 1.5 miles upstream and downstream of the dam. The powerlines are essential for power delivery and the span does not seem overly excessive (i.e., the line lengths are not excessively long with regard to the proposed project and existing infrastructure).

3.3.7 Cultural Resources

3.3.7.1 Affected Environment

Section 106 of the NHPA requires the Commission to evaluate potential effects on properties listed or eligible for listing in the National Register prior to an undertaking. In this case, the undertaking is the issuance of an original license for the proposed project. Project-related effects associated with this undertaking include those effects associated with the construction, operation, and maintenance of the proposed project as well as the day-to-day operation and maintenance of the project after issuance of a license.

Section 106 also requires that the Commission seek concurrence with the Alabama SHPO on any finding involving effects or no effects on historic properties and allow the Advisory Council on Historic Preservation (Advisory Council) an opportunity to comment on any finding of effects on historic properties. If Native American properties have been identified, section 106 requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

On May 5, 2011, the Commission designated Birch Power as its non-federal representative for carrying out day-to-day consultation regarding the licensing efforts pursuant to section 106 of the NHPA. However, the Commission remains largely responsible for all findings and determinations regarding the effects of the proposed project on any historic property, pursuant to section 106. On August 12, 2013, staff established a Restricted Service List for the project in order to discuss project effects on cultural resources.[218] The cultural resource work group (CRWG) for the project includes the Alabama SHPO, Advisory Council, Corps, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Chickasaw Nation, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Kialegee Tribal Town, Muscogee (Creek) Nation, Poarch Band of Creek Indians, Seminole Nation of Oklahoma, United Keetoowah Band of Cherokee Indians, and Birch Power.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property located within the proposed project's APE could be affected by the issuance of a license for the project. According to the Advisory Council's regulations, an APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist."[219] The APE encompasses the likely extent of project construction and operations as well as project-related environmental measures that could be undertaken during the term of any license issued for the proposed project.

The APE for the project is defined as: (1) all lands enclosed by the proposed project boundary, which would include the powerhouse, the 650-foot-long intake channel, the 2,000-foot-long tailrace channel, the 20.2-acre wetland reclamation site, the 5,800-foot-long access road, a substation, a 4.4-mile-long overhead transmission line that would cross the Tombigbee River and interconnect with the local grid, appurtenant facilities, and all project-related staging areas; and (2) lands outside the project boundary where project uses may impact the character or use of historic properties, if historic properties exist. By email dated June 27, 2014, the CWRG, including the Alabama SHPO, concurred with the definition of the project's APE (email from P. Leppert, FERC, Washington, D.C. to CRWG, filed September 9, 2014).

Cultural History Overview

The following discussion of the cultural context of the project is adapted from the Phase I Cultural Resource Survey for the proposed project and the Corps' Cultural Resources Reconnaissance Study of the Black Warrior-Tombigbee System Corridor, Alabama, Vol. 5 (Jackson, 2015; Wilson, 1983).

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[218] 78 Fed. Reg. 50410.

[219] 36 C.F.R. Section 800.16(d) (2014).

Prehistoric Period

Prehistoric occupation of the Demopolis Project area may be generally divided into five temporal periods: (1) the Paleoindian period (prior to 8,000 B.C.); (2) the Archaic period (8,000-1,500 B.C.); (3) the Gulf Formational period (1,500 B.C. to 100 B.C.); (4) the Woodland period (100 B.C.-1050 A.D.); and (5) the Mississippian period (1050-contact).

The Paleoindian period is characterized by highly mobile bands of hunter-gatherers traversing the landscape in search of food and high-quality stone tool material. Paleoindian archaeological sites are often identified by the presence of distinctive fluted projectile points and a tool kit which includes uniface and biface technology, scrapers, gravers, cores, and hammerstones. Archaeological sites from this period are generally rare because of their age and the ephemeral nature of open-air sites. However, during the Dalton horizon (8500 to 8000 B.C.), evidence of the use of rockshelters emerges in the Southeast.

The Archaic period is characterized by a change in subsistence strategy as people began relying on smaller game and increased their reliance on plant materials. This shift is often considered a response to changes in climate and environmental conditions. Changes in subsistence sources required different tool technologies; projectile points became smaller, and tools associated with plant collection and processing begin to appear in the archaeological record. Within the Tombigbee Basin, sites dating to the Archaic period indicate seasonal occupation, with large summer camps in river bottom areas and smaller winter settlements in the uplands.

The Gulf Formational period is represented by the presence of ceramics. In west Alabama, settlements from this period are characterized by the predominance of fiber-tempered ceramics, which were introduced into the region between 1,500 and 1,300 B.C., although later Gulf Formational ceramics may be sand-tempered. Archaic technologies, including projectile points, were used by Gulf Formational people; however, these tools are often made of exotic, non-local stone indicating increased trade.

The Woodland period is marked by the appearance of fabric- and cord-marked ceramics, along with changes in burial practices, domestic structures, and trade. Woodland peoples used uplands and smaller streams more frequently than their Archaic ancestors, and their habitation sites, commonly located along floodplains, tended to be more permanent. Increasing sedentism went hand-in-hand with the adoption of horticulture. Hunting and gathering subsistence activities continued with changes in technology. Bows were introduced and replaced heavy stone projectiles. Changes in burial patterns and material culture, as well as the construction of mounds, suggest developments in ceremonialism and social complexity during this period.

In the Southeast, the Mississippian period is distinguished by the emergence of more elaborate and complicated social structures. The period is characterized by distinctive pottery forms and decorations; increased territoriality and warfare; floodplain agriculture based on maize, squash, and beans; religious ceremonialism; long-distance trade; and highly organized chiefdoms. In the Tombigbee Basin, the Mississippian period is defined by the Moundville phase, which is characterized by elaborate mound building and religious ceremony. The tribal groups present at the time of European contact are descendants of Moundville peoples.

Historic Period

Many tribal groups, including the Alabama, Cherokee, Chickasaw, Choctaw, Coushatta, and Muscogee (Creek), occupied the area now known as Alabama during the early contact period (1650-1700). In general, these native populations lived in small tribal towns, which interacted frequently with each other for trade. Beginning in the mid-17th century, Spanish, French, and English explorers began establishing outposts in the region as they competed for trade dominance in the Southeast. These European settlers increasingly manipulated the existing native economies with imported goods, altering settlement and hunting patterns of the native populations. The influx of American settlers following the Revolutionary War accelerated displacement of native populations. The last native occupation in the lower Tombigbee basin ended with cessions of Choctaw territory west of the Mississippi in 1830 as part of the Treaty of Dancing Rabbit Creek.

European occupation of the Black Warrior-Tombigbee Basin dates to the 16th century, with the first Spanish settlement established at Escambia Bay on the Gulf Coast. In 1582, La Salle claimed the northern Gulf Coast for France and Pierre Le Moyne d'Iberville established a colony at Biloxi (in current-day Mississippi) in 1699. France ceded the lower Tombigbee Basin to Britain in the Treaty of Paris in 1763 and following the American Revolution, a large number of British loyalists settled in the Tombigbee Valley. The area became American territory in 1813.

During the early period of European settlement, transportation was limited to Indian trails and waterways. For early settlers, the region was an important source for fur, hides, indigo, timber, resin, livestock, rice, tobacco, fish, and pecans. Following the American Revolution, road construction facilitated movement of settlers to the Tombigbee Basin; however, waterways continued to serve as the primary trade routes. Towns, including Demopolis, were developed to take advantage of the river system for trade. Local industries including tanneries, grist mills, cotton gins, brick ovens, and salt works developed along the waterways. Cotton production dominated the economy until the Civil War, when economic, social, and political changes during Reconstruction destabilized the region’s economy. Timbering rose as the primary industry during the early 20th century, and a number of paper mills located adjacent to the region’s rivers. Investments by the federal government during the 20th century, including the system of locks and dams on the Tombigbee River, supported the local economy through increased shipping.

Prehistoric and Historic Resources

Birch Power completed a Phase I cultural resource survey in 2015 for the proposed project (Jackson, 2015). The Phase I survey included three components: (1) a review of existing information; (2) field surveys with shovel testing; and (3) a viewshed survey of above-ground resources. The Phase I survey concluded with the investigators' recommendations for the National Register-eligibility of identified cultural resources and description of potential effects of the project on any identified National Register-eligible resources.

Investigators used existing data to identify previously documented cultural resources within the proposed project's APE and to prioritize survey areas within the APE based on the likelihood of finding cultural resources. During the field survey, the investigators walked linear transects within the APE, conducting surface and subsurface testing throughout the process. In zones with high and intermediate probability for cultural resources, investigators shovel tested an area every 30 meters (98 feet). Otherwise, they shovel tested an area every 60 meters (197 feet). In floodplain areas along the Tombigbee and Black Warrior Rivers, the investigators used augers to conduct tests in areas with strong potential for deeply (up to 10 feet) buried cultural deposits. Above-ground resources were also documented. The investigators also conducted viewshed surveys of a one-half mile radius around the proposed project area. During this portion of the survey, investigators recorded any structures, buildings, or objects appearing to be at least fifty years old within the viewshed of the proposed project. These structures were then assessed by qualified investigators for eligibility to be listed on the National Register.

The background investigations indicated that three previously-recorded archeological sites fell near the project's APE. During the survey, however, investigators found no evidence of these sites. No prehistoric archeological sites were identified. Investigators did identify three new historic archeological sites (1MO231, 1MO232, and 1MO233) as follows.

Site 1MO231 is a small historic artifact scatter near the terminus of the proposed project's transmission line corridor. Material collected consisted of small brick fragments, glass, and iron nail fragments. The materials indicate mid-19th to mid-20th century manufacture dates. There was no evidence of structural features at the site. Because of the lack of intact deposits, the investigators recommended site 1MO231 as ineligible for inclusion in the National Register.

Site 1MO232 represents an early nineteenth and twentieth century house site. Much of the house remains standing, along with two outbuildings and an associated well.

The site is adjacent to an existing transmission line and has previously been used for timber cultivation. Otherwise, the site is relatively intact and undisturbed. Materials collected at the house site represent very late usage (ca. 1960 to 1970). The investigators recommended that, under Criterion D,[220] the cabin and its associated outbuildings are eligible for listing on the National Register. The cabin and outbuildings could provide more information as to the methods of construction and type of materials used to construct a vernacular dwelling in rural Marengo County in the mid-20th century.

Site 1MO233 is a small historic artifact scatter recovered within an existing transmission line corridor. The construction of the existing transmission line heavily impacted the site and no evidence of intact structural remains were apparent. Due to the lack of intact cultural deposits, investigators recommended site 1MO233 as ineligible for listing in the National Register.

During the viewshed survey, investigators identified one National Register-listed structure, the Foscue House, which was located outside of the project's APE but within the viewshed of the proposed project's transmission line corridor. Investigators also identified one additional home, House #1, which met the 50-year threshold for National Register eligibility and retained integrity but did not display exceptional architectural qualities for its type within the local geographic area. Investigators recommended this site as ineligible for listing in the National Register.

Traditional Cultural Properties

By letter issued March 8, 2011, Commission staff initiated consultation with potentially-affected Indian tribes[221] to determine if the tribes desired to participate in the licensing process for the project. At that time, the Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Chickasaw Nation of Oklahoma, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Kialegee Tribal Town, Muscogee (Creek) Nation, Poarch Band of Creek Indians, Seminole Nation of

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[220] Historic properties eligible for listing on the National Register under Criterion D are those which are significant for their ability to yield important information about prehistory or history.

[221] Consultation was initiated with the following tribes: Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Cherokee Nation, Chickasaw Nation, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Eastern Band of Cherokee Indians, Jena Band of Choctaw Indians, Kialegee Tribal Town of the Muscogee (Creek) Nation, Muscogee (Creek) Nation, Poarch Band of Creek Indians, Seminole Nation of Oklahoma, Thlopthlocco Tribal Town, and United Keetoowah Band of Cherokee Indians in Oklahoma.

Oklahoma, and United Keetoowah Band of Cherokee Indians in Oklahoma expressed interest in further consultation on the Demopolis Project. The consulting tribes have not reported any known traditional cultural properties within the project's APE to date.

3.3.7.2 Environmental Effects

Effects on Historic Properties

Two known historic properties, site 1MO232 and the Foscue House, have the potential to be adversely affected by construction and operation of the proposed Demopolis Project. Use and maintenance of the project's access roads, project-related recreation, vandalism, and Birch Power's proposed mitigation measures associated with other resource areas could also affect these properties. Project effects are adverse when an activity directly or indirectly alters the characteristics of a historic property that qualifies it for inclusion in the National Register. Any adverse effects must be resolved in consultation with the Alabama SHPO and any potentially affected tribes.

Table 3-18 describes the historic properties identified within or near the Demopolis Project's APE by investigators and the recommendations of the investigators and Alabama SHPO regarding the resources.

Table 3-18. Demopolis Project historic properties (Source: Jackson, 2015).

Resource Name	National Register Eligibility	Project-Related Effects	Alabama SHPO Recommendation
1MO232	Eligible	Located within the project's APE and may be affected by construction of the proposed project.	Avoidance; mitigation if avoidance is not possible. Additional evaluation of above-ground structures.
Foscue House	Listed	Located within the viewshed of transmission line corridor.	No effect; transmission line routed along existing utility ROW.

In the license application, Birch Power proposed no measures for the protection of historic properties present at the project. In a letter dated March 13, 2015,[222] the

[222] The March 13, 2015, correspondence was included with the Final Report for the Phase I Cultural Resource Survey, filed by Birch Power on April 3, 2015.

Alabama SHPO determined that the construction of the proposed project would not adversely affect site 1MO232 if Birch Power avoids the site during construction of the project. If avoidance is not possible, the Alabama SHPO stated that data recovery would be necessary and that any mitigation proposals would need to be reviewed and approved by the Alabama SHPO prior to the undertaking. Additionally, the Alabama SHPO agreed with Birch Power's recommendations that no other archeological sites or historic structures, including the Foscue House, would be affected by the proposed project.

Our Analysis

Avoidance of site 1MO232 would protect the historic property from adverse effects associated with project construction; however, over the term of a license, project operation and maintenance, or project-related recreation, vandalism, or mitigation measures associated with other resources could also affect this property. Additionally, there exists the potential for the discovery of unknown cultural resources during construction, operation, and maintenance of the project.

By developing a HPMP in consultation with the Alabama SHPO and affected tribes, Birch Power could outline its specific proposal for avoiding, minimizing or mitigating adverse effects to site 1MO232 and plans for implementing any necessary treatment measures if avoidance is not possible. Further, a HPMP would reduce the need for consultation with the Alabama SHPO in the future by providing a list of activities (i.e., routine repair, maintenance, and replacement in-kind) that would not require consultation with the Alabama SHPO because such activities would have little or no potential effect on historic properties. A HPMP would also provide a description of the process for treatment of previously unidentified historic properties discovered at the project over the term a license.

To meet the requirements of section 106, the Commission intends executed a PA with the Alabama SHPO on October 17, 2017, for the protection of historic properties that would be affected by the construction and operation of the project. The terms of the PA would require Birch Power to address all historic properties identified within the project's APE through the development of a HPMP.

3.4 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the proposed Demopolis Project would not be constructed, and the environmental resources in the project area would not be affected. The power that would have been developed from renewable resources would have to be replaced by nonrenewable fuels.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the project's use of the river for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[223] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the final EA for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

Table 4-1 summarizes some of the general assumptions and economic information we use in our analysis.

We find that the values provided by Birch Power are reasonable for the purposes of our analyses. Cost items common to all alternatives except the no-action alternative include: taxes and insurance costs; estimated future capital investment required to maintain and extend the life of plant equipment and facilities; cost to prepare the license application; normal operation and maintenance cost; and Commission fees. The no-

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[223] *See Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

action alternative only includes the cost to prepare the license application. All dollars are year 2017, unless specified otherwise.

Table 4-1. Parameters for the economic analysis of the Demopolis Project (Source: Birch Power, staff).

Economic Parameter	**Value**	**Source**
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff
Cost of capital (Long-term interest rate)	8.15 percent[a]	staff
Short-term interest rate (during construction)	8.15 percent	Staff
Discount rate	8.15 percent	Staff
Property taxes and fees	$300,000/year	Applicant
Power Value	$55.00/MWh[b]	Staff
Proposed capacity (MW)	48.0	Applicant
Proposed average annual generation (MWh)	173,000[c]	Applicant
Construction cost	$69,358,550	Applicant
Annual operating and maintenance cost	$125,000/year	Applicant
Cost to prepare license application	$350,000	Applicant
Insurance	$65,000	Applicant
Dependable capacity	24.2 MW	Applicant

[a] Birch Power proposes to contribute 30 percent of the project cost at an effective interest rate of 12 percent, and finance the remaining 70 percent over 20 years at an interest rate of 6.5 percent. Staff calculated the weighted interest rate to be 8.15 percent.

[b] Birch Power used the avoided cost of the most likely alternative source of power, a fossil-fueled thermal plant to estimate the total value of project power at $55/MWh.

[c] In the license application, Birch Power estimated the average annual generation to be 213,000 MWh, which was based on the ability to generate at flows as low as 3,000 cfs (i.e., minimum hydraulic capacity). However, in the Water Quality Settlement, Birch Power proposed to only operate at inflows of 5,000 cfs or greater. Under the new proposed operation, average annual generation would be reduced by 40,000 MWh to 173,000 MWh.

4.2 COMPARISON OF ALTERNATIVES

Table 4-2 compares the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for Birch Power's proposal and staff alternative. In this table, a number in parentheses denotes that the difference between the cost of alternative power and project cost is negative, thus the project cost is greater than the cost of alternative power.

Table 4-2. Summary of the annual cost of alternative power and annual project costs for alternatives for the Demopolis Project (Source: staff).

	Applicant's Proposal	**Staff Alternative**[a]
Installed capacity (MW)	48.0	48.0
Annual generation (MWh)	173,000	173,000
Annual cost of alternative power	$9,515,000	$9,515,000
($/MWh)	55.00	55.00
Annual project cost	$7,644,870	$7,459,760
($/MWh)	44.19	43.12
Difference between cost of alternative power and project cost	$1,870,130	$2,055,240
($/MWh)	10.81	11.88

4.2.1 No-action Alternative

Under the no-action alternative, the project would not be constructed and would not produce any electricity. None of the environmental enhancements would be implemented. The only cost associated with this alternative would be the cost to prepare the license application.

4.2.2 Applicant's Proposal

Under Birch's proposal, the Demopolis Project would have an installed capacity of 48.0 MW and generate an average of 173,000 MWh of electricity annually. The average annual cost of alternative power would be $9,515,000, or $55.00/MWh. In total, the average annual project cost would be $7,644,870, or $44.19/MWh. Overall, the project would produce power at a cost that is $1,870,130 or $10.81/MWh, less than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative includes the same developmental components as Birch Power's proposal and, therefore, would have the same capacity and energy values described above for Birch Power's proposal. For the Demopolis Project, table 4-3 shows our recommended additions, deletions, and modifications to the proposed environmental protection and enhancement measures and the estimated cost of each.

Under the staff alternative for the Demopolis Project, based on the same capacity and energy attributes as the proposed project, the cost of alternative power would be $9,515,000, or $55.00/MWh. The average annual project cost would be $7,459,760, or $43.12/MWh. Overall, the project would produce power at a cost which is $2,055,240, or $11.88/MWh, less than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 4-3 provides the cost of the environmental measures for the project considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost. All costs are from Birch Power unless otherwise noted. All costs are presented in 2017 dollars.

Table 4-3. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of constructing and operating the Demopolis Project (Source: Birch Power; staff).

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
Geology and Soil Resources				
1. Develop an erosion control plan that includes BMPs.	Birch Power, Staff	$10,000[d]	$481[d]	$1,424
2. Modify Birch Power's erosion control plan by adding provisions to: (1) implement BMPs during project construction; and (2) hold annual meetings during the first 7 years after ground disturbing activities begin to review the effectiveness of the plan and need for additional measures.	FWS	$0	$0	$0
3. Modify Birch Power's erosion control plan for project construction by adding: (1) draft an annual summary report until erosion control measures are removed and include details of land disturbance, success of erosion control measures, and the need for maintenance and/or monitoring of permanent erosion control measures; (2) provide a draft of each	Staff	$0	$0	$0

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
annual report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; and (3) file annual reports with the Commission, including agency comments and recommendations.				
4. Develop a riverbed scour and shoreline stability plan, in consultation with the Corps and resource agencies, that describes how the licensee would identify bathymetric and topographic conditions, report any bed scour and shoreline instability, and, if needed, identify measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion, and hold annual meetings after construction is complete, including during the first 5 years after initial project operation.	FWS	$10,000[e]	$1,000[e]	$1,943
5. Develop a riverbed scour and shoreline stability plan, in consultation with the Corps and resource agencies, that includes provisions to: (1) document the	Staff	$10,000[e]	$1,000[e]	$1,943

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
existing bathymetric and topographic conditions in the Tombigbee River and along the shorelines immediately downstream of and adjacent to the project's tailrace; (2) monitor for any bed scour and shoreline instability in the Tombigbee River immediately downstream of and adjacent to the project's tailrace for 3 years after the commencement of operations; (3) draft annual monitoring reports during the 3-year monitoring period indicating whether or not any bed scour or shoreline instability was documented during the prior year along with proposals for any measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion, should they be needed based on monitoring results; (4) provide a draft of each annual monitoring report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; (5) file the annual reports with the Commission, including agency comments and recommendations;				

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
and (6) in the third annual report, include any proposals for additional monitoring.				
6. Develop a plan to monitor and remedy project-caused aggradation in the Tombigbee River immediately downstream of and adjacent to the project's tailrace.	Staff	$10,000[e]	$1,000[e]	$1,943
7. Develop a spoils disposal plan to dispose of all excavated sediment on site to improve the access road, develop the parking area, reclaim the overbank shelf to a wetland condition, and stabilize the reclamation site with a retaining wall.	Birch Power	$1,825,000	$0[f]	$172,167
8. Modify Birch Power's proposed spoils disposal plan such that all spoils, including sandbar material dredged during tailrace construction, not otherwise used for improving the access road and constructing the powerhouse parking area are transported to an offsite disposal area; and are tested for contaminants, if necessary.	EPA, Staff	$0[g]	$0	$0

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
Aquatic Resources				
9. Operate the project in a run-of-release mode.	Birch Power, Staff	$0	$0[h]	$0
10. Develop an operation compliance monitoring plan.	Staff	$10,000[i]	$5,000[i]	$5,943
11. Develop and implement an oil and hazardous substances plan.	Birch Power	$10,000	$0	$943
12. Modify Birch Power's proposed oil and hazardous substances plan to include a detailed description of how to properly handle hazardous liquid substances; list procedures that would be implemented in the event of a spill; provide immediate notification to the Commission, Corps, and Alabama DEM upon discovering an accidental spill; and	Staff	$10,000[j]	$0	$943

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
file a report with the Commission within 10 days of a hazardous substance spill.				
13. Use diesel controls, cleaner fuel and cleaner construction practices for transportation, soil movement, or other construction activities, including: (1) strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and (2) use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, engine replacement, or newer, cleaner equipment.	EPA	$17,000[k]	$0	$1,605
14. Develop and implement a plan to completely shut off the project intake works to ensure that no flows run through the powerhouse when the hourly mean flow falls below 5,000 cfs, and resume operation when the hourly mean flow of the Tombigbee River is at least 5,000 cfs (proposed license article 1)	Birch Power, Staff	$5,000[l]	$0	$472

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
15. Install, operate, and maintain one or more permanent flow gauges meeting USGS standards to measure hourly mean flows at the project (proposed license article 1).	Birch Power, Staff	$12,000[m]	$400[m]	$1,532
16. Monitor DO, water temperature, pH, and BOD from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam, as required in WestRock's NPDES permit for the Demopolis Mill.	Birch Power	$0	$34,000[n]	$34,000
17. Maintain, through implementation of management, DO in the project discharge at no less than 5.0 mg/L at all times, and daily average DO at river mile 206 shall not be less than 6.5 mg/L due to project discharge (certification condition 1).	Birch Power, Alabama DEM, Staff	$0	$0	$0
18. Develop and implement measures to maintain DO within the limitations in certification condition 1 through structural and/or operational	Birch Power, Alabama DEM, Staff	$1,000,000	$245,000	$339,338

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
modifications at the project beginning at the initial turbine startup following completion of the powerhouse (certification condition 2).				
19. Maintain DO in the discharge and at river mile 206 as proposed, and maintain DO at 5.0 mg/L during non-generation at these locations.	EPA	$0[o]	$0[o]	$0
20. Install, maintain, and calibrate a tailrace monitor to continuously record DO concentrations and water temperatures at 15-minute intervals during generation following one continuous hour of generation all year long (certification condition 3).	Birch Power, Alabama DEM, EPA, Staff	$9,000[p]	$2,000[p]	$2,849
21. Operate the tailrace monitor as proposed, and during non-generation.	EPA	$0	$0[q]	$0
22. Install, maintain, and calibrate a monitor at river mile 206 to continuously record DO and temperature at no less than 15-minute intervals at all times all year long (certification condition 4).	Birch Power, Alabama DEM, Staff	$9,000[p]	$2,000[p]	$2,849

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
23. Develop a water quality and flow monitoring and management plan with provisions for monitoring water quality in the flow affected area for the first 3 years of operation; estimating flows in the flow affected area; reporting data; and listing any proposals for additional measures that may be necessary if the 3 years of monitoring show that project operation causes the DO concentration to fall below 5.0 mg/L and water temperature to increase to above 90° F.	EPA, Staff	$19,000[r]	$463[r]	$2,256
24. Install a trash rack with a 2.5-inch clear bar spacing.	Birch Power,	$0[s]	$0	$0
25. Install a trash rack with 5-inch clear bar spacing.	Staff	$0[s]	$0	$0
Terrestrial Resources				
26. Construct 4.1 miles of the 4.4 mile-long project transmission line primarily within an existing transmission line right-of-way.	Birch Power, Staff	$0[t]	$0	$0

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
27. Selectively place transmission line poles to avoid small, isolated wetland areas.	Birch Power, Staff	$0[t]	$0	$0
28. Develop a wetland mitigation plan.	Staff	$48,825[u]	$4,882.50[v]	$4,606
29. Provide compensatory mitigation for unavoidable impacts to wetlands through purchase of credits from a mitigation bank, if available, or applicant-responsible mitigation.	EPA	Undefinable[w]	Undefinable	Undefinable
30. Implement a revegetation plan to revegetate lands disturbed by construction of powerhouse facilities and access road; monitor revegetation efforts; and reduce the spread and introduction of nonnative, invasive species.	Birch Power	$0[x]	$7,500[y]	$1,737
31. Modify Birch Power's proposed revegetation plan to include revegetation of all areas disturbed by project construction; criteria for measuring the success of revegetation efforts; use of a revised list of invasive species applicable to the project area; and use of invasive species control techniques and BMPs	Staff	$0[x]	$10,500[y,z]	$2,431

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
that minimize effects on native plants and wood stork habitat.				
32. Restrict mowing in the transmission line corridor to occur outside of the mid-spring to mid-fall timeframe when sensitive wildlife species are reproducing and rearing young.	Staff	$0[t]	$0[t]	$0
33. Develop and implement an avian protection plan that includes site-specific measures and practices to reduce bird mortality.	Staff	$5,000[aa]	$802[aa]	$1,273
Threatened and Endangered Species				
34. Implement a mussel relocation plan to protect federally threatened inflated heelsplitter mussels and mitigate habitat lost during construction and operation.	Birch Power	$75,000[bb]	$1,000[bb]	$8,075
35. Implement a mussel relocation plan to include: conducting pre-construction mussel surveys; mussel survey and mussel handling methods; conducting habitat suitability surveys; relocating all	FWS, Staff	$140,000[cc]	$1,000[cc]	$14,603

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
mussels to suitable habitat; preparing a report to describe the relocation effort; conducting four post-construction mussel surveys at the relocation area, the construction area, and the flow affected area and report on each survey; and conducting mussel surveys and relocations prior to maintenance dredging.				
36. Develop and implement a species protection plan that avoids construction when wood storks are foraging in the area and limits tree removal to periods outside of the northern long-eared bat pup season and broader active season; requires minimum distance buffers between construction activities and wood storks; and requires educational signage regarding the potential presence of wood storks in the project area.	Staff, FWS	$5,000[dd]	$0	$472

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
Recreation Resources				
37. Construct a 2,600-foot-long access trail connecting the recreation parking area on the north bank of the Tombigbee River (included in spoils disposal plan).	Birch Power	$0[s]	$2,500[ee]	$2,500
38. Construct a new parking area on the north side of the Tombigbee River (included in spoils disposal plan).	Birch Power	$0[s]	$2,500[ee]	$2,500
39. Construct a fishing platform on the south bank of the Tombigbee River.	Birch Power	$100,000	$5,000	$14,434
40. Develop a RMP, including a north bank recreation access facility for bank fishing in consultation with the Corps and Alabama DCNR.	Staff	$10,000[j]	$5,000[ee]	$5,943

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2017$)	Annual Cost[a,c] (2017$)	Levelized Annual Cost (2017$)
Cultural Resources				
41. Develop a HPMP in accordance with an anticipated PA between the Commission and the Alabama SHPO.	Staff	$5,000[l]	$0	$472

[a] Costs provided by Birch Power unless otherwise noted.

[b] Capital costs typically include equipment, construction, permitting, and contingency costs.

[c] Annual costs typically include operation and maintenance costs and any other costs that occur on a yearly basis.

[d] Staff estimated $10,000 for development of the plan and $481 per year for implementation of the plan (i.e., $3,000 each year during two years of construction).

[e] Staff estimated $10,000 for development of the plan and $1,000 per year for implementation of the plan.

[f] In the spoils disposal plan filed on May 21, 2014, Birch Power stated that the operation and maintenance costs associated with the plan are included in the revegetation plan.

[g] In the final license application, Birch Power included the costs of transporting spoils to an offsite disposal area in its overall construction costs.

[h] There is no cost for run-of-release because the project is designed to operate in this manner.

[i] Staff estimated $10,000 for development of the plan and $5,000 per year for implementation of the plan.

[j] Staff estimated $10,000 for development of the plan.

[k] Staff estimated $17,000 for installation of idle reduction technologies or oxidation catalysts on excavation equipment and dump trucks used to transport spoils to an offsite spoils disposal facility.

[l] Staff estimated $5,000 for development of the plan.

[m] Staff estimated $12,000 for two flow gauges and installation, and $400 per year to maintain the gauges.

[n] Staff assumes that all sampling would be conducted by hired contractors with the necessary sampling equipment, thus capital costs would be negligible. Staff estimated $34,000 minimum in annual costs, which is based on the need to sample 26 sites every 2 weeks from May 1 to November 30 (16 days) with a crew of two people. Annual costs would be higher if the minimum DO observed is less than 5.9 mg/L (i.e., sampling increases to 2 days per week), or less than 5.2 mg/L (i.e., sampling increases to once per day) (See section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*).

[o] There would be no cost associated with this measure, because when the project is not generating, all water would spill over the dam as it does under existing conditions. Under existing conditions, a DO greater than 5.0 mg/L is maintained downstream of the project (see figures 3-8 and 3-9).

[p] Staff estimated $9,000 in capital costs for sensors (i.e., DO, temperature, and depth to determine appropriate water level), one set of back-up sensors, a data logger, and a wireless telemetry system to monitor real-time data. Staff estimated $2,000 in annual costs for maintenance and repair.

[q] The need for maintenance of monitors is usually caused by the need to clean the monitors and download data. Staff do not anticipate that operating the monitors during non-generation would result in increased cleaning or data download, and thus there would be no additional annual costs associated with this measure compared to those in item 18.

[r] Staff estimated $19,000 to develop a plan ($10,000) and install a monitor ($9,000), and $2,000 for maintenance and repair during each of the 3 years.

[s] Costs are included in the overall construction costs.

[t] Staff estimated the cost would be negligible.

[u] Staff estimated $48,825 for land acquisition and wetland restoration and/or enhancement measures such as drain tile destruction or adjustments to culverts/ditches/etc. to adjust hydrology if needed, non-native invasive plant control, and spread of native seed mix.

[v] Staff estimated 10 percent of capital cost for management of this measure ($4,882.50); actual costs of management would depend on the original condition of the site and the effectiveness of initial treatments.

[w] The recommendation is non-specific with respect to what measures would be needed to meet the requirements. According to the Corps' 2008 Compensatory Mitigation Rule (i.e., Compensatory Mitigation for Losses of Aquatic

Resources)[224] the Corps' district engineer must evaluate the options (e.g., permittee-responsible, mitigation banks, or in-lieu fee programs) and determine the compensatory mitigation to be required in a Corps permit, based on what is practicable and capable of compensating for the aquatic resource functions that will be lost as a result of a permitted activity. In making this determination, the district engineer must assess the likelihood for ecological success and sustainability, the location of the compensation site relative to the impact site and their significance within the watershed, and the costs of the compensatory mitigation project. In addition, permit applicants are responsible for proposing an appropriate compensatory mitigation option to offset unavoidable impacts. Birch Power has not proposed compensatory mitigation and the Corps has not yet evaluated the options to offset unavoidable project impacts. Therefore, a cost for implementing this measure cannot be determined at this time.

[x] Birch Power included the capital costs of native plant protection and nonnative, invasive plant prevention in its overall construction costs.

[y] Monitoring and corrective measures provided for two years following initial revegetation efforts.

[z] Staff estimated that monitoring and corrective measures under a modified revegetation plan would cost $10,500 each year. This estimate is based on additional revegetation efforts that would be associated with the proposed recreation facilities and transmission line. While the total area occupied by these facilities is over 24 acres, land disturbances are limited to: (1) a 3-foot buffer around an 800-foot hiking trail; (2) a 25-foot buffer area around the perimeter of the recreation parking area; and (3) isolated areas disturbed by heavy machinery and pole placement within the proposed transmission line corridor. Relative to Birch Power's proposed revegetation plan, staff estimates an extra 2 acres of monitoring and corrective measures would be required under the modified plan. Separately, staff estimated that costs associated with selective herbicide treatments in wetland areas, and additional consultation with Alabama DCNR and FWS would be negligible.

[aa] Staff estimated $5,000 to develop the plan and $5,000 per year for two years to implement monitoring and reporting requirements.

[bb] Capital costs include the pre-construction (including the footprint of the fishing platform) and post-construction monitoring surveys and mussel relocation (including the footprint of the fishing platform) costs included in Birch

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[224] 33 C.F.R. Part 332 (2008).

Power's proposed plan. The costs for initial sandbar development are included in the cost for tailrace construction. Staff estimates $1,000 in annual costs associated with surveys to be conducted prior to any tailrace dredging activities, which staff estimates might occur every 10 years.

[cc] Staff estimated $140,000 to develop and implement a new mussel relocation plan, which includes the cost to develop a new plan ($5,000), pre-construction surveys ($20,000), habitat suitability surveys ($20,000), a report on the pre-construction survey and relocation effort ($3,000), four post-construction surveys ($80,000), reports for each post-construction survey ($12,000). Annual costs are the same as those described in footnote bb above.

[dd] Staff estimated $5,000 to develop and implement the plan.

[ee] Staff estimated cost for maintenance.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the Demopolis Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on the project and our review of the environmental and economic effects of the proposed project and alternatives, we selected the staff alternative as the preferred alternative. The staff alternative includes elements of Birch Power's proposal with some modifications and additional staff-recommended measures. We recommend this alternative because: (1) issuance of an original license would allow Birch Power to construct and operate the Demopolis Project as an economically beneficial and dependable source of electrical energy; (2) the 48 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance environmental resources affected by the proposed project.

In the following section, we make recommendations as to which environmental measures proposed by Birch Power or recommended by agencies or other entities should be included in any license issued for the project. In addition to Birch Power's proposed environmental measures listed below, we recommend some modifications and additional staff-recommended environmental measures to be included in any license issued for the project.

5.1.1 Measures Proposed by the Applicant

Based on our environmental analysis of Birch Power's proposals in section 3, and the costs presented in section 4, we recommend the following environmental measures proposed by Birch Power to protect and enhance environmental resources and believe the benefits of these measures would justify their cost.

- Develop an erosion control plan that includes BMPs to: (1) minimize erosion and sedimentation during construction; and (2) monitor turbidity to assess impacts during construction as modified below.

- Implement a spoils disposal plan as modified below.

- Develop an oil and hazardous substances plan as modified below.

- Develop, as part of the Water Quality Settlement, a plan to completely shut off the project intake works to ensure that no flow passes through the powerhouse when the hourly mean flow upstream of the project falls below 5,000 cfs, and resume operation when the hourly mean flow is at least 5,000 cfs to protect water quality downstream of the project.

- Install, operate, and maintain, as part of the Water Quality Settlement, one or more permanent flow gauges meeting USGS standards to estimate hourly mean flows upstream of the project.

- Implement the following measures required in Alabama DEM's water quality certificate to protect water quality in the tailrace and downstream of the tailrace: (1) maintain DO in the project discharge at a concentration no less than 5.0 mg/L at all times, and a daily average DO concentration at RM 206 not be less than 6.5 mg/L when the project is operating;[225] (2) develop and implement measures to comply with the DO limitations through structural and/or operational modifications at the project; (3) install and maintain a tailrace DO monitoring device, and at the initiation of power generation, continuously record DO concentrations and water temperatures at 15-minute intervals during periods of generation following one continuous hour of generation all year long, to determine compliance with the requirement to maintain no less than 5.0 mg/L of DO in the tailrace; and (4) install and maintain a DO monitoring device at RM 206, and at the initiation of power generation, continuously record DO and temperature at no less than 15-minute intervals at all times throughout the year, to determine compliance with the requirement to maintain no less than a 6.5 mg/L mean daily average DO concentration at RM 206.

- Install a trash rack to reduce entrainment of large fish and avoid impingement of small fish, as modified below.

[225] In an amendment to the Settlement filed by WestRock on July 31 and signed by Birch Power, the daily average DO at RM 206 would be calculated by totaling the DO value of all individual measurements during each calendar day (i.e., 12:00am through 11:59pm), and then dividing by the number of individual measurements during the calendar day.

- Construct the project transmission line primarily within an existing transmission line right-of-way to minimize disturbances to botanical and wildlife resources.

- Selectively place transmission line poles to avoid small, isolated wetland areas.

- Implement a revegetation plan as modified below.

- Design the powerhouse to be visually compatible with the Corps' existing facilities.

5.1.2 Additional Staff-recommended Measures

Under the staff alternative, the project would be operated with Birch Power's proposed measures, as identified above, and the following additions or modifications:

- Modify Birch Power's proposed erosion control plan for project construction by adding: (1) draft an annual summary report until erosion control measures are removed and include details of land disturbance, success of erosion control measures, and the need for maintenance and/or monitoring of permanent erosion control measures; (2) provide a draft of each annual report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; and (3) file annual reports with the Commission, including agency comments and recommendations.

- Develop a riverbed scour and shoreline stability plan that includes provisions to: (1) document the existing bathymetric and topographic conditions in the Tombigbee River and along the shorelines immediately downstream of and adjacent to the project's tailrace; (2) monitor for any bed scour and shoreline instability in the Tombigbee River immediately downstream of and adjacent to the project's tailrace for 3 years after the commencement of operations; (3) draft annual monitoring reports during the 3-year monitoring period indicating whether or not any bed scour or shoreline instability was documented during the prior year along with proposals for any measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion, should they be needed based on monitoring results; (4) provide a draft of each annual monitoring report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; (5) file the annual reports with the Commission, including agency comments and recommendations; and (6) include any proposals for additional monitoring in the third annual report.

- Develop a plan to monitor and remedy project-caused aggradation in the Tombigbee River immediately downstream of and adjacent to the project's tailrace.

- Modify Birch Power's proposed spoils disposal plan such that all spoils, including sandbar material dredged during tailrace construction, not otherwise used for improving the access road and constructing the powerhouse parking area: (1) are transported to an offsite disposal area; and (2) are tested for contaminants if the offsite disposal area would occur in, or discharge to waters of the U.S.

- Develop an operation compliance monitoring plan to document compliance with the operating requirements of any license issued for the project.

- Modify Birch Power's proposed oil and hazardous substances plan to include: (1) more detail on how hazardous substances would be transported, stored, handled and disposed of in a safe and environmentally protective manner; (2) procedures that would be implemented in the event of a spill to ensure the proper containment and cleanup of any hazardous substances to minimize adverse effects on water quality and aquatic resources in the project area; (3) a provision to provide notification to the Commission, Corps, and Alabama DEM as soon as possible after discovering an accidental spill of hazardous substances; and (4) a provision to file a report with the Commission within 10 days of a hazardous substance spill.

- Develop a water quality and flow monitoring and management plan with provisions for: (1) monitoring DO and water temperature in the flow affected area from May through September for the first 3 years of operation to determine whether or not project operation causes the DO concentration to fall below 5.0 mg/L and water temperature to increase to above 90° F; (2) estimating flows in the flow affected area from May through September for the first 3 years of operation using inflow and operations data; (3) reporting water quality and estimated flow data; and (4) additional measures if the 3 years of monitoring show that project operation causes the DO concentration to fall below 5.0 mg/L and water temperature to increase to above 90° F.

- Modify Birch Power's proposal to include the installation of a trash rack with 2.5-inch clear bar spacing at the project intake, by instead using 5-inch clear bar spacing to reduce entrainment of large fish and avoid impingement of most fish.

- Develop a mussel relocation plan that includes the provisions in condition 2 of FWS's BO and a provision to conduct four post-construction mussel surveys in the flow affected area that begin 1 year post-construction, and then every 3 years thereafter.

- Modify Birch Power's proposed revegetation plan to include: (1) revegetation of all areas disturbed by construction; (2) criteria for measuring the success of revegetation efforts; (3) reference lists of invasive species applicable to the project area (i.e., Sumter and Marengo Counties); and (4) invasive species control techniques and BMPs that minimize effects on native plants and wood stork habitat.

- Restrict mowing, to the extent feasible, in the transmission line corridor to occur outside of the mid-spring to mid-fall timeframe when sensitive wildlife species are reproducing and rearing young.

- Develop an avian protection plan that includes site-specific measures and practices to reduce bird mortality (i.e., collision and/or electrocution) associated with the project transmission line and substation.

- Develop a species protection plan for the threatened wood stork and northern long-eared bat that: (1) limits tree removal to the period of November 1 through March 31, which is outside of the northern long-eared bat pup season (June 1 to July 31), and the broader active season (April 1 to October 31); (2) includes surveys for wood storks prior to construction; (3) adjusts to wood storks foraging in the project area by delaying construction and requiring that construction occur no closer than between 300 feet to 750 feet from wood storks; and (4) requires educational signage regarding the potential presence of federally protected wood storks in the project area.

- Develop a wetlands mitigation plan in consultation with the Corps and Alabama DCNR to mitigate project effects on wetlands and associated wildlife in the project boundary.

- Develop a RMP in consultation with the Corps and Alabama DCNR that includes the proposed recreation improvements, including the results of a completed feasibility assessment for a north bank recreational fishing facility, and the on-going management of project recreation facilities.

- Develop an HPMP, in accordance with the PA executed by the Commission and Alabama SHPO on October 17, 2017, to address the management of historic properties and unevaluated cultural resources within the Demopolis Project's APE.

We discuss the rationale for the measures we are recommending or not recommending below.

Erosion Control Plan

Construction of the proposed project would require excavation and disturbance of instream sediment and upland soils and would likely cause localized erosion, sedimentation, and streambed material transport. Erosion and sedimentation could adversely affect water quality by increasing turbidity, which could in turn negatively affect resident aquatic species, and instream habitats. Birch Power proposes to develop and implement an erosion control plan that includes measures to: (1) construct a temporary earth cofferdam adjacent to the north end of the existing Demopolis Dam for construction of the powerhouse; (2) construct a temporary earth cofferdam at the end of the proposed tailrace near its confluence with the main channel of the Tombigbee River; (3) construct and remove cofferdams during the dry season when flows are low; (4) use Demopolis chalk as the main component of the earthen cofferdams; (5) filter any water pumped from the excavation sites before discharging to the river; (6) construct a silt fence along the banks of the river that lie below ground disturbing activities or temporary spoils areas, and on the downslope end of the main staging area at any location where ground disturbance or temporary vegetation loss could occur; (7) construct a concrete washout station to contain concrete washout from concrete truck clean-up; and (8) install one turbidity meter upstream of the Demopolis Dam to record background turbidity and one downstream of the dam to assess potential impacts from project construction. Condition 1 of FWS's BO would require Birch Power to conduct construction/dredge activities as proposed and implement BMPs during all proposed construction/dredge activities.

Sedimentation of aquatic habitat can modify the substrate surfaces and morphology of a stream channel, reducing habitat availability and smothering and killing aquatic flora and fauna. In addition, high loads of suspended sediment can increase turbidity in riverine habitats leading to reduced light penetration and decreased primary productivity (i.e., plant and algae growth), which then can lead to adverse effects to the rest of the food chain. As discussed in section 3.3.1.2, *Construction Effects on Geology and Soils*, Birch Power's proposed erosion control plan includes measures (i.e., items 1 through 7 listed above) consistent with BMPs that would minimize erosion and sedimentation during in-water and upland construction activities. Birch Power's proposed installation of turbidity meters would provide an additional layer of protection by allowing for immediate identification of turbidity deviations and would inform any actions needed to minimize effects on water quality.

Developing and implementing an erosion control plan with Birch Power's proposed provisions would minimize erosion and sedimentation during in-water and upland construction activities. Nevertheless, it would be a beneficial to include additional measures in the erosion control plan to help verify and document that the proposed provisions are helping to minimize erosion and sedimentation. Specific measures that would be beneficial include, establishing a record of land disturbance events, and a record of the installation, maintenance, and removal of any erosion control measures. Birch Power could also file a summary report detailing land disturbance events, the success of erosion control measures, and the need for maintenance and/or monitoring of permanent erosion control measures.

For the reasons discussed above, we recommend modifying Birch Power's erosion control plan, in consultation with the resources agencies, to include its proposed measures to minimize erosion and sedimentation during construction, and monitor turbidity, and add: (1) draft an annual summary report until erosion control measures are removed and include details of land disturbance, success of erosion control measures, and the need for maintenance and/or monitoring of permanent erosion control measures; (2) provide a draft of each annual report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; and (3) file annual reports with the Commission, including agency comments and recommendations. We estimate that the levelized annual cost of developing an erosion control plan for the project would be $1,424 and conclude that the benefits of the measure outweigh the cost.

Riverbed Scour and Shoreline Stability Monitoring and Mitigation Plan

Under existing conditions, most inflow passes over the dam as uncontrolled spill, with some water being released during lock operations. Under the proposed project's operation, water would be diverted through a powerhouse located downstream of the dam at the end opposite the existing lock.[226] This would modify discharge patterns and hydrodynamics within the Tombigbee River upstream and downstream of the dam, which could lead to riverbed scour and shoreline erosion, especially in and adjacent to the path of the tailrace outflow. Birch Power does not propose any measures to monitor the effects of project operation on scour and shoreline erosion. However, in the draft EA, we recommended that Birch Power develop a riverbed scour and shoreline stability plan that describes how the licensee would identify bathymetric and topographic conditions, report any bed scour and shoreline instability, and, if needed, identify measures to control

[226] A detailed description of the project's proposed operation is provided in section 2.2.5, *Proposed Project Operation*.

erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion.

As discussed in section 3.3.2.2, *Operational Effects on Aquatic Organisms*, scouring caused by discharge from the tailrace could negatively affect freshwater mussels (including the federally threatened inflated heelsplitter), by displacing or modifying the existing sandbar habitat they occupy. The effects of the tailrace discharge could reach the south bank of the Tombigbee River and cause instability and erosion of the shoreline.

Given the uncertainty of the hydrodynamics that would occur at the project post-construction, and the possible scour and shoreline erosion issues discussed above, monitoring how existing conditions along the riverbed change immediately downstream of the dam and adjacent to the mouth of the proposed tailrace, would help determine the need to implement any additional measures to minimize project effects

Thus, we recommend that Birch Power develop a riverbed scour and shoreline stability plan, in consultation with the Corps and resource agencies, that includes at a minimum provisions to: (1) document the existing bathymetric and topographic conditions in the Tombigbee River and along the shorelines immediately downstream of and adjacent to the project's tailrace; (2) monitor for any bed scour and shoreline instability in the Tombigbee River immediately downstream of and adjacent to the project's tailrace for 3 years after the commencement of operations; (3) draft annual monitoring reports during the 3-year monitoring period, indicating whether or not any bed scour or shoreline instability was documented during the prior year along with proposals for any measures to control erosion, stabilize stream banks, prevent slope instability, and minimize detrimental bed scour and shoreline erosion, should they be needed based on monitoring results; (4) provide a draft of each annual monitoring report to the resource agencies and allow the agencies at least 30 days to review the report and provide comments and recommendations; (5) file the annual reports with the Commission, including agency comments and recommendations; and (6) include any proposals for additional monitoring in the third annual report. We estimate that the levelized annual cost of developing a riverbed scour and shoreline stability plan for the project would be $1,943 and conclude that the benefits of the measure outweigh the cost.

<u>Aggradation Monitoring and Mitigation Plan</u>

As discussed immediately above, proposed operation would modify discharge patterns and hydrodynamics of the Tombigbee River downstream of the dam. In addition to the riverbed scour and shoreline erosion that would occur, altered hydrodynamics could also change aggradation patterns downstream of the dam. Birch Power does not propose any measures to monitor the effects of project operation on aggradation patterns downstream of the dam.

The current sandbar distribution downstream of the dam suggests that existing flow patterns carry sand across the chalk shelf and deposit it in the river channel at the base of the shelf as water energy dissipates (figure 3-1). Energy from flow also appears to dissipate along the exterior wall of the lock entrance, where another sandbar is located. As discussed in section 3.3.1.2, *Operational Effects on Scour, Erosion, and Deposition Patterns*, new aggradation patterns could develop in the flow affected area, which has the potential to alter freshwater mussel habitat and negatively affect mussel populations. New aggradation patterns in the flow affected area could also disrupt navigation traffic moving to and from the lock. Further, aggradation in the tailrace has the potential to negatively affect project operation.

Because changes in aggradation patterns are likely after the project is operational, and because the new aggradation patterns could negatively affect mussels, navigation, and project operation, we recommend that Birch Power develop an aggradation monitoring and mitigation plan to monitor and remedy any project-caused aggradation in the Tombigbee River immediately downstream of and adjacent to the project's tailrace resulting from project operation. We estimate that the levelized annual cost of developing an aggradation monitoring and mitigation plan for the project would be $1,943 and conclude that the benefits of the measure outweigh the cost.

Spoils Disposal Plan

Birch Power estimates that construction of the intake channel, powerhouse area, and tailrace channel would require the excavation of 656,000 cubic yards of spoils material, including Demopolis chalk, soil, and alluvium. In its spoils disposal plan filed on May 21, 2014, Birch Power proposes to retain all excavation spoils on site to improve the access road (35,000 cubic yards of spoils), develop the powerhouse parking area (50,000 cubic yards of spoils), and establish a spoils disposal pile on the north side of the river channel, immediately below Demopolis Lock and Dam (571,000 cubic yards of spoils). Birch Power would construct a 1,700-foot-long engineered retaining wall along the north side of the tailrace channel to stabilize the 571,000 cubic yards of spoils. EPA recommends that spoils be evaluated for the potential to contain contaminants in accordance with 40 C.F.R. 230.60 and 230.61, if any dredged material would be placed in waters of the U.S. or sent to a confined disposal facility that discharges to waters of the U.S.

As discussed in section 3.3.3.2, *Project Effects on Wetlands and Riparian Habitat*, placing the spoils on the north side of the river channel would displace 23.1 acres of an existing littoral wetland located in the Damsite Management Unit of the David K. Nelson Wildlife Management Area, which currently provides habitat for the federally threatened wood stork and other wildlife species. In addition, as discussed in section 3.3.1.2, *Operational Effects on Geology and Soils*, the spoils on the north side of the river channel would be susceptible to erosion during flooding events. This could lead to sedimentation of adjacent aquatic habitat, which could negatively affect aquatic resources, including the threatened inflated heelsplitter. The spoils disposal pile could also indirectly affect adjacent wetland habitat in the Damsite Management Unit by disrupting the hydrologic connection between the existing wetlands and the Tombigbee River.

To mitigate the effects of project construction on wildlife habitat, Birch Power proposes to construct a 20.2-acre forested wetland on the spoils pile. However, the spoils disposal plan does not provide conditions favorable to the long-term success of a forested wetland. Birch Power proposes to construct the wetland on top of 571,000 cubic yards of spoil, at a height of approximately 28 feet above the wetland that currently exists on the north side of the river. At this height, the 20.2-acre area would receive limited hydrologic inputs from the river, thereby reducing the potential for saturated soil conditions required by wetland vegetation and exposing the wetland plants to increased competition from upland vegetation. Also, according to estimates provided by Birch Power, the excavated materials would not provide a sufficient soil substrate depth for the growth of most native tree species that Birch Power proposes to plant in the 20.2-acre area. Further, several of the species that Birch Power proposes to plant are intolerant to calcareous substrates such as the Demopolis chalk.

In addition, the 20.2-acre area does not appear to be a suitable mitigation area for wood stork habitat that would be displaced by the spoils disposal site. Wood storks require shallow, open water where prey concentrations are high enough to ensure successful feeding. Birch Power's proposed forested wetland would be located on top of the spoils pile, about 28 feet higher than the existing wetland area used by the wood storks. At this heightened elevation, the area would be less likely to become inundated with water to support fish as prey for the wood stork.

To reduce project effects on wetlands, riparian habitat, wildlife, and the threatened wood stork, we recommend modifying the spoils disposal plan to remove provisions pertaining to the placement of 571,000 cubic yards of spoils on the north side of the river channel, including the creation of a 20.2-acre forested wetland on the spoils pile. As initially proposed by Birch Power in its final license application, we recommend transporting all spoils not otherwise used for improving the access road and constructing the powerhouse parking area to an offsite disposal area. We also recommend (for the reasons discussed below, section 5.1.2, *Mussel Relocation Plan*) that any sandbar material dredged during tailrace construction be transported to the offsite disposal area, rather than being used to try and develop new sandbar habitat for mussels, as proposed by Birch Power. Further, because project spoils could contain contaminated sediments, which have the potential to negatively affect aquatic resources if they are not disposed of properly, we also recommend that the spoils be tested for contaminants, if offsite disposal would occur in, or discharge to, waters of the U.S.

Our recommendation for offsite spoils disposal is consistent with Birch Power's initial proposal, as filed in the final license application on July 2, 2013.[227] Although Birch Power did not propose to test for contaminants in the spoils, if necessary, we anticipate the costs of contaminant testing to be negligible relative to the cost of spoils disposal. Birch Power did not provide a separate cost estimate for offsite spoils disposal in its final license application, but states in Exhibit D that the total construction cost of the project includes all materials, labor, engineering, construction management, and contingencies and includes the estimated cost of mitigation measures. Because our recommendation is consistent with Birch Power's initial proposal, and the costs of offsite spoils disposal appear to be included in the total construction cost of the final license application, there are no additional annual levelized costs associated with this measure. Accordingly, we conclude that the benefits of the measure are worth the cost.

Operation Compliance Monitoring Plan

As described above, Birch Power proposes to operate the project in run-of-release mode. Birch Power's proposal, however, does not specify how it would document compliance with the run-of-release operation or how it would coordinate its operations with the Corps.

Generally, a Commission license for a non-federal project at a Corps dam requires the licensee to develop an operating plan and an MOA with the Corps.[228] The operating plan describes the mode of hydropower operation, pool flow diversion, regulation requirements for the Corps' project, and integration of operation of the hydroelectric facility in the Corps' emergency action plan. The MOA describes the detailed operation of the project acceptable to the Corps and any restrictions needed to protect the purposes of the Corps' project.

Therefore, we recommend that any license issued for the project requires Birch Power to develop an operation compliance monitoring plan in consultation with the Corps, and enter into an operating MOA with the Corps. The plan should include

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[227] On May 21, 2014, Birch Power filed a spoils disposal plan to dispose of all spoils not otherwise used for construction of the access road and powerhouse parking area to an area downstream of the dam on the north side of the river channel, and adjacent to the proposed tailrace channel. The spoils disposal plan replaced Birch Power's original proposal (included in the final license application filed on July 2, 2013) to dispose of all spoils not otherwise used for improving the access road and constructing the powerhouse parking area to an offsite disposal area.

[228] *See* Memorandum of Understanding between the Commission and the Corps of Engineers on Non-federal Hydropower Projects, dated July 2016.

provisions for documenting compliance with the Corps' operating requirements and establish a schedule for reporting project compliance/non-compliance during normal operation and emergencies. The plan should also include provisions for measuring intake velocities at a range of flows to ensure that intake velocities are sufficiently low to protect fish from impingement on the trash rack and to minimize fish entrainment. An operation compliance monitoring plan would also ensure run-of-release operation and minimization of impacts on aquatic resources that could otherwise occur due to changes in flow, pool elevations, or water quality caused by project operations. We estimate that the levelized annual cost of developing an operation compliance monitoring plan would be $5,943 and conclude that the benefits of this measure outweigh the costs.

Oil and Hazardous Substance Plan

Construction of the proposed project could result in the release of hydrocarbons or other toxic substances into the Tombigbee River, adversely affecting aquatic and terrestrial resources. Birch Power proposes to develop and implement an oil and hazardous substances plan to prevent the release of hydrocarbons and other toxic substances into the Tombigbee River during construction. EPA recommends that diesel controls, cleaner fuel and cleaner construction practices be used for transportation, soil movement, or other construction activities, including: (1) strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and (2) use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, engine replacement, or newer, cleaner equipment.

As discussed in section 3.3.2.2, *Construction Effects on Water Quality*, Birch Power's proposed plan does not include any specific measures; however, the use of commonly accepted and approved BMPs to reduce the risk of spills during construction would likely minimize risks to these resources. While there still would be some risk of accidental introduction of hydrocarbons into the Tombigbee River during the construction of the proposed project, the potential adverse effects that spills could have on water quality would be greatly reduced by implementing an appropriate oil and hazardous substances plan.

Therefore, we recommend that Birch Power develop an oil and hazardous substances plan in consultation with resource agencies that includes at a minimum: (1) a detailed description of how to transport, store, handle and dispose of oil, fuels, lubricant products, and other hazardous liquid substances in a safe and environmentally acceptable manner; (2) procedures that would be implemented in the event of a spill to ensure the proper containment and cleanup of any hazardous substances to minimize adverse effects on water quality and aquatic resources in the project area; (3) a provision to provide notification to the Commission, Corps, and Alabama DEM as soon as possible after discovering an accidental spill of hazardous substances; and (4) a provision to file a report with the Commission within 10 days of a hazardous substance spill that identifies: (a) the location of the spill; (b) the type and quantity of hazardous material spilled; (c) any corrective actions that have been undertaken to clean up the spill; and (d) any measures taken to ensure similar spills do not occur in the future. These notification procedures would provide the Commission, Corps, and appropriate resource agencies an opportunity to visit the site, assess the effects of any hazardous material spills, and quickly recommend an appropriate response action(s) in consultation with Birch Power. We estimate that the levelized annual cost of developing an oil and hazardous substances plan for the project would be $943 and conclude that the benefits of the measure outweigh the cost.

Water Quality Monitoring in the Tailrace and Downstream of the Tailrace

Currently all flow passes over the spillway, which aerates the water, producing high concentrations of DO downstream of the dam (see section 3.3.2.1, *Affected Environment, Water Quality*). Birch Power proposes to divert some (at inflows greater than 20,000 cfs and less than 110,000 cfs) or all (at inflows between 5,000 cfs and 20,000 cfs) inflow through the proposed powerhouse intakes and out through the tailrace. As discussed in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*, redirecting flow into the powerhouse would reduce the amount of aeration that occurs in the tailwaters, and would draw deep, and potentially low DO water from the forebay into the powerhouse and out through the tailrace. These changes could potentially reduce downstream DO concentrations, which could adversely affect aquatic resources, as well as the ability of downstream water users to protect water quality and aquatic resources.

To reduce project effects on downstream water quality, Birch Power proposes the following measures which are included in the Water Quality Settlement, but not in Alabama DEM's water quality certificate: (1) develop and implement a plan to completely shut off the project intake works to ensure that no flows run through the powerhouse when the hourly mean flow upstream of the project falls below 5,000 cfs, and resume operations only when the hourly mean flow upstream of the project is at least 5,000 cfs (proposed license article 1); (2) install, operate, and maintain one or more permanent flow gauges meeting USGS standards to measure hourly mean flows upstream of the project (proposed license article 1); and (3) monitor DO, water temperature, pH, and biochemical oxygen demand from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam (proposed license article 3). Birch Power would also implement the following measures required in Alabama DEM's water quality certificate, and proposed in the Water Quality Settlement, to protect water quality in the tailrace and downstream of the tailrace: (1) maintain DO in the project discharge at a concentration no less than 5.0 mg/L at all times, and a daily average DO concentration at RM 206 of no less than 6.5 mg/L when the project is operating (condition 1); (2) develop and implement measures to comply with the DO limitations through structural and/or operational modifications at the project, beginning at the initial turbine startup (condition 2); (3) install and maintain a tailrace DO and water temperature monitoring device, and at the initiation of power generation, continuously record DO concentration and water temperature at 15-minute intervals during periods of generation following one continuous hour of generation all year long, to determine compliance with the requirement to maintain no less than 5.0 mg/L of DO in the tailrace (conditions 3, 5, 6); and (4) install and maintain the DO and water temperature monitoring device, and starting at the initiation of power generation, continuously record DO and temperature at no less than 15-minute intervals at all times throughout the year, to determine compliance with the proposed requirement to maintain no less than a 6.5 mg/L mean daily average DO concentration at RM 206 (conditions 4, 5, 6). In comments on the draft EA, EPA recommends that DO in the tailrace and downstream of the tailrace (RM 206) meet the Alabama water quality criteria of 5.0 mg/L at all times. EPA interprets the language "at all times" to mean all times from January 1 through December 31, including during periods of generation and non-generation. EPA also recommends that Birch Power monitor DO and temperature in the tailrace and downstream of the tailrace at RM 206, during generation and non-generation.

As discussed in section 3.3.2.2, *Operational Effects on Dissolved Oxygen in the Tailrace and Downstream of the Tailrace*, three of four of Birch Power's proposed measures described above, and certification conditions 1 through 6 would minimize any lowering of DO in downstream habitats resulting from project operation and thereby protect aquatic resources from any possible negative effects.[229] Specifically, shutting down project operations when inflow falls below 5,000 cfs, as proposed by Birch Power, would reduce the potential for DO concentrations to fall below Alabama DEM's requirements in certification condition 1, which would protect aquatic resources in the tailrace and downstream of the tailrace. Further, Birch Power's proposal to install flow gauges that meet USGS standards would be appropriate for ensuring accurate inflow measurements and timely operational shutdown when hourly mean flow declines below 5,000 cfs.

Birch Power's implementation of Alabama DEM's certification condition 2 to develop and implement measures to comply with the DO limitations through structural and/or operational modifications at the project, would prevent fish and mussels in the tailrace and downstream of the tailrace from experiencing the potential negative effects of

[229] In section 5.1.3, *Measures Not Recommended by Staff*, we discuss Birch Power's fourth measure (proposed license article 3) of the Water Quality Settlement (i.e., monitor DO, water temperature, pH, and biochemical oxygen demand from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam), which we do not recommend.

low DO concentrations. As discussed in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*, Birch Power specifically proposes, in the Water Quality Settlement, to develop and implement a plan to install, operate, and maintain an oxygenation system designed to meet the DO standards required under Alabama DEM's condition 1. Although Birch Power's proposal is more specific than Alabama DEM's requirements in condition 2, both aim to provide measures that would allow the project to meet the DO limits required in condition 1. Thus, both Alabama DEM's condition 2 and Birch Power's proposed license article 2 would be equally protective of aquatic resources. However, condition 2 provides greater flexibility in meeting the DO limits in condition 1, and would allow Birch Power to determine the type of structural and/or operational modifications to implement, following consultation with the resource agencies and WestRock, and with final Commission approval. Thus, we do not recommend that Birch Power be required to develop and implement a plan to install, operate, and maintain an oxygenation system.

EPA recommends that the DO concentration in the tailrace and at RM 206 meet the Alabama water quality criteria of 5.0 mg/L at all times during generation and non-generation. The water quality criteria state that DO concentrations shall not be less than 5.0 mg/L at all times. However, with respect to new hydropower projects, such as the proposed Demopolis Project, the criteria are more specific and state that "All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5.0 mg/L dissolved oxygen where practicable and technologically possible." This water quality criteria requirement is consistent with Birch Power's proposal and Alabama DEM's certification, and as discussed above, would be protective of aquatic resources. In addition, and separate from the state water quality criteria, the project would not discharge water during periods of non-generation. Rather, water would spill over the dam, as it currently does, during periods of non-generation, and any changes in DO during periods of non-generation would not be attributable to project operation. Thus, there is no need to require Birch Power to meet a DO concentration criteria of 5.0 mg/L for causes not attributable to project generation. Therefore, we do not recommend a requirement for Birch Power to maintain a DO concentration of 5.0 mg/L downstream of the project during non-generation.

Finally, Birch Power's implementation of Alabama DEM's certification conditions 3, 4, 5, and 6 to install and maintain, at the initiation of power generation, DO and temperature monitors in the tailrace and downstream of the tailrace would be necessary to determine whether the project is maintaining DO at the protective limits required in the certification. Alabama DEM's condition 3 would require monitoring during generation following one continuous hour of generation, but would not require monitoring in the tailrace when the project is not operating, as recommended by EPA. As discussed in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream from the Tailrace*, when the project stops generating, all inflow would pass over the spillway and oxygenate the water in the tailwaters to DO concentrations at or above state standards. Thus, any project effects on DO in the tailrace would be quickly reversed by the oxygenated water spilling over the dam, and the benefit of a monitor in the tailrace during non-generation would be negligible. Further, the primary purpose of the monitor in the tailrace, would be to determine whether the project is discharging water with a DO concentration of no less than 5.0 mg/L during generation. Thus, we do not recommend monitoring during non-generation, because the project would not affect DO during non-generation.

Based on the discussion above, we recommend including in any license, Alabama DEM's certification conditions 1 through 6, and Birch Power's proposed article 1. As discussed above, these measures would help ensure that DO concentrations in the tailrace and downstream of the tailrace are maintained at levels that are protective of aquatic resources, and thus would be worth the total annual levelized cost of $347,040 for all of the measures. We do not recommend Birch Power's proposed article 3, and the reasons are discussed below in section 5.1.3, *Measures Not Recommended by Staff.*

<u>Water Quality and Flow Monitoring in the Flow Affected Area</u>

As discussed in section 3.3.2.2, *Operational Effects on Water Quantity*, project operation will reduce or eliminate water spilling over the dam, which could negatively affect the physical habitat and water quality in the flow affected area downstream of the dam. The flow affected area covers 45-acres of riverine habitat, including more than 5.6 acres of high quality sandbar habitat occupied by 13 species of freshwater mussels, including the federally threatened inflated heelsplitter mussel. Birch Power did not propose any measures in the flow affected area. However, EPA recommends that Birch Power collect information, such as gauge records, or visual observations of no flow or pooling water to provide information on the physical condition of the flow affected area.

As discussed in section 3.3.2.2, *Operational Effects on Water Quality,* reduced DO concentrations are likely to occur in the flow affected area when the project is operating at flows between 5,000 cfs and 20,000 cfs, because there would be no aeration caused by water plunging over the spillway or flow moving through the flow affected area. These conditions could cause DO to drop below the state standard of 5.0 mg/L. As discussed in section 3.3.2.2, *Operational Effects on Water Quantity,* at flows greater than 20,000 cfs and less than 110,000 cfs, flows spilling into the flow affected area would always be 20,000 cfs less than under existing conditions, until the project shuts down at 110,000 cfs. Under these reduced flow conditions, aeration would be less, which could also lead to reduced DO concentrations, particularly during the summer months, when inflow is lower and water temperature is higher.

As discussed in section 3.3.2.2, *Operational Effects on Fish and Mussel Habitat in the Flow Affected Area*, if DO drops below the state standard of 5.0 mg/L during operation, fish and freshwater mussels that use the flow affected area for habitat, including the federally threatened inflated heelsplitter, could experience reduced growth, reproduction, and survival. However, because fish are mobile, those present in the flow affected area would likely move into areas with more suitable flows, DO, and temperature, and thereby avoid the negative effects of poor water quality on their biology. Mussels are less mobile than fish, and thus those present on sandbar 1 or other areas of the flow affected area could experience suboptimal conditions that could lead to decreased growth, reproduction, and survival.

As indicated above, reduced flows in the flow affected area could cause water quality to degrade compared to existing conditions. In addition, and as discussed in more detail in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*, reduced flows alone, and independent of water quality, could negatively affect the dispersal of mussel glochidia, and thereby reduce mussel reproduction for those mussels located in the flow affected area. Birch Power could estimate flows in the flow affected area concurrent with the water quality monitoring discussed above by using operational records of flows passing through the turbines to determine the operating flows, and data from the proposed flow gauge located upstream of the project to determine inflows to the project. The difference between inflows and operating flows would provide an estimate of flows passing over the spillway and through the flow affected area.

In order to determine whether or not project operation would reduce water quality in the flow affected area and negatively affect the biology of aquatic resources, including the federally threatened inflated heelsplitter, we recommend that Birch Power develop a water quality and flow monitoring and management plan, in consultation with resource agencies, that includes measures to: (1) monitor DO and water temperature in the flow affected area during project generation to determine whether or not DO concentrations fall below 5.0 mg/L and water temperature increases above 90° F by installing, operating, and maintaining a monitoring device located in the flow affected area to continuously record DO and temperature at no less than 15-minute intervals during the summer (May through September) for the first 3 years of operation; (2) estimate and record hourly flows in the flow affected area for the first 3 years of operation during the summer (May through September) using inflow and operations data; and (3) file a report of the monitoring results along with any proposals for additional measures, including an implementation schedule, if the 3 years of monitoring show that project operation causes the DO concentration to fall below 5.0 mg/L or water temperature to increase above 90° F. Our recommended plan would help to minimize any negative effects of project operation on aquatic resources in the flow affected area, and this benefit would be worth the annual levelized cost of $2,256.

Fish Impingement and Entrainment

To address the issue of fish entrainment and turbine mortality at the project, Birch Power proposes to install trash racks with 2.5-inch clear bar spacing as part of the project's overall design. No agency provided recommendations related to fish entrainment or impingement.

As discussed in section 3.3.2.2, *Fish Impingement, Entrainment, and Turbine Mortality*, Birch Power's (2014a) desktop estimates indicate that most fish populations in Demopolis Lake are unlikely to be negatively affected by entrainment because: (1) most fish killed would be juveniles, which experience high natural mortality rates; (2) the species most likely to be entrained have high reproductive rates; and (3) the species most likely to be entrained have equal or greater population densities in backwater habitats, and thus would not be vulnerable to entrainment. However, Birch Power's (2014a) analysis may provide an inaccurate estimate of entrainment, because the studies used in the analysis were performed at projects with intake velocities that were lower than the 5.5 fps maximum intake velocity that would occur at the Demopolis Project. Nevertheless, at intake velocities of 5.5 fps, larger fish could swim and avoid the intakes, and items (1) through (3) listed above would still be relevant. Thus, even at intake velocities of 5.5 fps, entrainment is unlikely to negatively affect most fish populations in Demopolis Lake.

Very large fish (i.e., bigger largemouth bass and channel catfish, and most paddlefish) would be vulnerable to impingement on Birch Power's proposed trash rack with 2.5-inch bar spacing. Larger paddlefish have burst swim speeds that would allow them to avoid impingement, but largemouth and channel catfish have lower swim speeds and would be susceptible to impingement at trash racks with 2.5-inch bar spacing. However, if the trash racks had bar spacing of 5 inches, then only paddlefish larger than 43 inches would be vulnerable to impingement, but because of their fast swimming speeds, they would be unlikely to be impinged. Thus, increasing trash rack bar spacing from 2.5-inches to 5-inches could eliminate impingement mortality at the project.

Although the bigger largemouth bass and catfish could still be entrained if bar spacing was 5 inches, largemouth bass primarily use shallow, nearshore habitat, and would be unlikely to encounter the deep turbine intakes. Larger channel catfish may use deep water habitat, and thus would be more likely to encounter the turbine intakes and become entrained. However, any impact to the population would be localized, because channel catfish are abundant in backwater habitats of Demopolis Lake, where they would not be vulnerable to entrainment. Further, fish have the potential to survive entrainment through trash racks with 5-inch bar spacing, but if fish are impinged on the proposed trash racks with 2.5-inch bar spacing, mortality is certain given the high intake velocity.

Based on the information presented above, entrainment and impingement are unlikely to negatively affect the majority of fish populations in Demopolis Lake under

Birch Power's proposed trash rack bar spacing of 2.5 inches and intake velocities of 5.5 fps. Nevertheless, the potential impingement of larger and slower moving fish at the proposed trash racks with 2.5-inch bar spacing, which would cause higher mortality than entrainment through trash racks with 5-inch bar spacing, could be completely eliminated if the trash racks bar spacing is increased. Thus, we recommend that Birch Power install trash racks with 5-inch bar spacing, which we estimate to have no additional cost.

Mussel Relocation Plan

During proposed project construction, about 1.4 acres of sandbar would be removed to provide an unobstructed flow path at the end of the tailrace channel. Freshwater mussels, including the federally threatened inflated heelsplitter are present on the sandbar, and thus project construction has the potential to negatively affect the mussel populations in the project vicinity. To mitigate the loss of this habitat, Birch Power proposes to implement a mussel relocation plan that includes measures to: (1) conduct pre-construction mussel surveys at habitats disturbed by construction, prior to any sandbar disturbing activities (i.e., tailrace channel and fishing platform construction, post-license tailrace dredging) and relocate any inflated heelsplitters discovered during the surveys to the sandbar development area, or existing habitat unaffected by project construction; (2) remove the minimum amount (about 1.4 acres) of inflated heelsplitter mussel sandbar habitat during tailrace construction; (3) redistribute sandbar material dredged during tailrace construction to the northwest side of the tailrace channel to develop about 1.4 acres of new sandbar habitat (the sandbar development area); (4) develop additional sandbar habitat to the north of the sandbar development area using appropriate excavation spoils from project construction;[230] (5) dredge any portions of the sandbar development area that constrict powerhouse discharges during maintenance of the tailrace channel, and add appropriate dredged material to the sandbar development area; (6) conduct post-construction mussel surveys annually for the first 3 years after tailrace construction to determine relocation success, identify areas for future relocations, document use of the sandbar development area by inflated heelsplitters, and document physical changes in the sandbar development area;[231] and (7) develop alternative mitigation measures, in consultation with FWS, if the measures described above are

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[230] Birch Power states in the mussel relocation plan that the amount of additional sandbar habitat that could be developed is unknown because the composition of the excavation spoils is unknown, but the area available for additional habitat is about 1.7 acres.

[231] In the mussel relocation plan, Birch Power states that the post-construction mussel surveys would occur on sandbar 1, sandbar 2, the new sandbar development area, and any habitat that might be found in the immediate vicinity of the fishing platform location.

unable to maintain the sandbar development area, or if inflated heelsplitters do not use the new habitat. As discussed in detail in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat,* FWS's BO would require Birch Power to conduct pre-construction mussel surveys throughout the action area (including the area outside the mouth and immediately downstream of the tailrace) and relocate all mussels, using specific handling and relocation procedures, to areas of suitable habitat downstream of the dam and outside the action area, and identified by conducting habitat suitability surveys. FWS's BO would also require Birch Power to report on the relocation effort, and subsequently conduct four mussel surveys that begin 1 year post-construction and then every 3 years thereafter at the relocation habitat and construction area (i.e., tailrace and intake channels).

The general pre-construction survey and relocation approach proposed by Birch Power and required by FWS's BO would minimize the effects of construction on mussels by removing them from the effects of project construction. FWS's BO requirements would have greater benefits than Birch Power's proposal (a full discussion of the benefits of FWS's BO requirements compared to Birch Power's proposal can be found in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat* and section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*). To summarize, Birch Power proposes to only survey for and relocate the federally threatened inflated heelsplitter that would be affected by construction activities. FWS's BO would require surveying for, and relocating all mussel species that would potentially be affected by project construction and operation (i.e., those in action area). Relocating all mussel species (including at least 11 unlisted mussels [see table 3-8]) away from affected habitat would help to minimize the effects of project construction (i.e., disturbance and removal of habitat) and operation (i.e., riverbed scour outside the mouth of the tailrace and reduced flows and potential declines in DO in the flow affected area) on the affected mussel community. FWS's BO would also require Birch Power to begin all pre-construction surveys and relocations no more than 30 days prior to the construction/dredging activities, and if construction/dredging is not initiated within the required 30 days, the action area must be resurveyed and mussels relocated prior to any of the permitted instream construction. Conducting surveys and relocations within timeframe required in FWS's BO would minimize the time period between mussel relocation and construction, and thereby minimize the amount of time that mussels would have to recolonize the construction area before the area is closed off by cofferdams. This strategy would reduce or prevent mussels from recolonizing the construction area and thereby reduce or prevent potential impacts from construction activity.

Birch Power's proposal also does not, but FWS's BO condition 1 does include provisions to minimize stress during mussel collection and relocation. Minimizing stress on mussels would maximize the success of a relocation effort, and thereby reduce the impacts of constructing the project.

Birch Power proposes to relocate inflated heelsplitters to the sandbar development area (and habitat to the north of the sandbar development area if enough suitable spoils from construction exist) and/or undisturbed areas of sandbar 1 and 2. However, the sandbar development area (and areas on the north side) would not remain wetted throughout the year (based on satellite imagery [see figure 3-26]), and has the potential to be unstable during high flows. Further, sandbar 1 is in the flow affected area and would experience reduced flow and reductions in DO concentrations to levels potentially unsuitable for mussels (see section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*). Sandbar 2 would be adjacent to the mouth of the tailrace, which would cause changes in flow that could alter the stability of sandbar 2. Thus, the sandbar development area, and sandbar 1 and 2 are unlikely to provide the habitat conditions needed to support healthy mussel communities. In contrast, FWS's BO would require Birch Power to relocate mussels to existing habitat away from the direct effects of project construction and operation (i.e., outside the action area), and identified as being suitable for mussels by conducting habitat suitability surveys. Relocating mussels to habitat outside the action area would allow relocated mussels to establish themselves on habitat that would be minimally affected by project construction and operation, providing the best opportunity for the relocated mussels to survive, grow, and reproduce. To limit the amount of potential habitat that would need to be surveyed, Birch Power should include in the mussel relocation plan, potential relocation sites based on available information (e.g., AST Environmental, 2011), as required by FWS' BO.

As indicated above, we do not recommend relocating mussels to the proposed sandbar development area, or to areas on the north side of the sandbar development area. Consequently, we also do not recommend developing the sandbar development area, because there is no identifiable need. By association, we do not recommend any of Birch Power's proposed measures related to the development and maintenance of the sandbar development area, which would include: (1) redistributing sandbar material dredged during tailrace construction to develop the sandbar development area; and (2) adding material dredged during maintenance of the tailrace (i.e., after the project is operational) to the sandbar development area. Instead, we recommend that any sandbar material dredged during tailrace construction be included in the offsite disposal of project spoils (see above, section 5.1.2, *Spoils Disposal Plan*).

FWS's BO would require Birch Power to prepare a report and file it with the FWS within 90 days following the completion of all mussel relocation work to include: (1) a description of the efforts, habitat, problems and solutions, results, and conclusions of the relocation effort; and (2) maps with coordinates should be included, showing the work and relocation areas. Preparing and filing a report would provide documentation of the relocation effort, which could be used to guide post-construction surveys (see below) and future measures, if the relocations are not successful.

Birch Power proposes to conduct post-construction surveys for the first 3 years after tailrace construction is complete to determine the success of mussel relocation. In contrast, FWS's BO would require Birch Power to conduct a total of four post-construction surveys at relocation sites that begin during the first year post-construction and then occur every 3 years thereafter. Compared to Birch Power's proposal, the survey strategy required by FWS's BO would allow for a longer-term determination (10 years compared to 3 years) of the relocation success. Conducting surveys over a longer time period would help identify whether the relocated mussels are able to reproduce over a sustained period, which can provide a better determination of true relocation success compared to short-term survey results (Cope and Waller, 1995).

FWS's BO would also require Birch Power to conduct four post-construction surveys that begin during the first year post-construction and then occur every 3 years thereafter to document whether mussels are reestablishing in the construction area (i.e., intake channel and tailrace channel). A mussel survey conducted in the tailrace and intake channels over a 10-year period would help determine whether mussels are colonizing or recolonizing the habitat created by the excavation of those areas, whether mussels are being adequately supported by that habitat, and if not, whether additional measures may need to be identified in consultation with the FWS, to protect mussels that colonize the tailrace and intake channel. Conducting four surveys over a 10-year period would help determine whether mussels that colonize the tailrace and intake channels are able to successfully maintain their populations over a sustained period. This information would be important in determining whether additional measures are necessary to protect the mussels (e.g., relocation and regular relocation surveys).

As discussed above in this section, *Water Quality in the Flow Affected Area*, we are recommending that Birch Power develop a plan to monitor water quality in the flow affected area and to identify additional measures to be implemented to improve water quality, if necessary. Although the plan would help to ensure good water quality in the flow affected area, no flow and reduced flows would still occur when the project is operating. As discussed in section 3.3.2.2, *Operational Effects on Aquatic Organisms and Habitat*, reduced flow could prevent mussel glochidia from becoming suspended in the water column, which could result in reproductive failure for any mussels that recolonize the flow affected area. Conducting post-operational mussel surveys would help to determine whether mussels are recolonizing habitat in the flow affected area, whether mussels are being adequately supported by that habitat (as they are under existing conditions), and if not, whether additional measures (e.g., supplemental flows) may need to be identified in consultation with the FWS and other resource agencies, to protect mussels that recolonize the flow affected area. Conducting four surveys over a 10-year period (i.e., the same frequency required by FWS's BO for the post-construction surveys in the tailrace and intake) would allow for a determination of whether mussels are recolonizing the flow affected area and whether they are able to successfully maintain their populations over a sustained period. This information would help to determine whether additional measures are necessary to protect mussels in the flow affected area.

After the project becomes operational, Birch Power would also maintain the tailrace through periodic dredging. Like the construction activities, dredging would crush, or displace to spoils, any mussels that are in the path of the dredging activities. To minimize the negative effects of maintenance dredging, Birch Power would need to conduct mussel surveys where dredging would occur and relocate any identified mussels to suitable habitat. To reduce or prevent mussels from recolonizing the dredging area and being impacted by dredging activity, the surveys and relocations should occur no more than 30 days prior to any maintenance dredging activities in order to reduce or prevent mussels from recolonizing the dredging area and being impacted by dredging activity.

Because most of the provisions in Birch Power's proposed mussel relocation plan are based on survey, relocation, or dredging actions related to the sandbar development area, and because there is no need to create the sandbar development area, we recommend that Birch Power develop a new mussel relocation plan (rather than modify the existing plan) based on the provisions in condition 2 of FWS's BO and additional staff recommended measures. We recommend that the new mussel relocation plan include provisions for: (1) conducting pre-construction surveys in the action area to locate mussels for relocation; (2) identifying potential relocation sites where habitat suitability surveys could be conducted; (3) conducting habitat suitability surveys for the mussel relocations that would occur below the dam and outside the action area; (4) beginning all pre-construction surveys and relocations no more than 30 days prior to the construction/dredging activities, and if construction/dredging is not initiated within the required 30 days, the action area must be resurveyed and mussels relocated prior to any of the permitted instream construction; (5) including standard mussel survey methods (i.e., identify, count, inventory, photograph mussels); (6) collecting all mussels found within the action area and relocating them to areas of suitable habitat just below the dam; (7) conducting mussel relocation efforts with divers that are qualified and experienced in handling mussels; (8) minimizing stress to mussels at all times during relocation; (9) hand-placing all relocated mussels within relocation sites in suitable habitat; (10) preparing a report and filing with the FWS and Commission within 90 days following the completion of all mussel relocation work to include: (a) a description of the efforts, habitat, problems and solutions, results, and conclusions of the relocation effort; and (b) maps with coordinates showing the work and relocation areas; (11) conducting four post-construction mussel surveys in relocation area(s), the construction areas, and the flow affected area that begin 1 year post-construction, and then every 3 years thereafter; (12) preparing and filing with the Commission, reports on the results of each post-construction survey; (13) determining the need for additional measures to protect mussels, in consultation with the resource agencies, and based on information from the post-construction surveys; and (14) surveying, collecting, and relocating mussels to suitable habitat no more than 30 days prior to any maintenance dredging activities that would occur in the project tailrace after the project is operational.

We estimate that the levelized annual cost of Birch Power's mussel relocation plan would be $8,075. In contrast, the levelized annual cost of our recommended new mussel relocation plan based on the provisions in condition 2 of FWS's BO would be $6,528 more (total levelized annual cost would be $14,603) than Birch Power's proposed plan. As discussed above, a mussel relocation plan based on the provisions in condition 2 of FWS's BO would provide a more comprehensive approach to minimizing the effects of project construction and operation on the mussel community and better protect mussels from project effects. Thus, the additional cost of our recommended mussel relocation plan would be worth the benefit derived from a plan based on the provisions in condition 2.

Wetlands Mitigation Plan

Construction of the project facilities would result in temporary disturbances and permanent loss of wetland habitat, primarily within the Damsite Management Unit of the David K. Nelson Wildlife Management Area, on the northern end of the project boundary. As discussed in section 3.3.3, *Terrestrial Resources*, to mitigate the loss of 20.3 acres of existing wetland habitat in the Damsite Management Unit, Birch Power proposes in its spoils disposal plan to create a 20.2-acre forested wetland on top of the spoils disposal site. Birch Power would also consult with the Alabama DCNR and the Corps on methods for revegetating the site using native plants after the soil substrate is in place. Monitoring and maintenance of the forested wetland would continue for two years following construction.

The Corps states that sufficient hydrology would be needed to support the forested wetland created on top of the spoils and it would be incorrect to assume that the constructed forested wetland would have the same hydrology as the existing adjacent habitat if it had the same grade as this habitat.[232] EPA contends that Birch Power's proposed wetland would be unlikely to have a hydrologic regime supportive of wetland vegetation and wildlife, including for the wood stork. Moreover, EPA does not recommend the disposal of construction spoils onsite because it would constitute disposal of waste and a discharge to existing wetlands which is regulated by section 404 of the CWA and would require compensatory mitigation. EPA concurs with staff's recommendation to transport all spoils not otherwise used for improving the access road and constructing the powerhouse parking area to an offsite disposal area. To address the

[232] Commission staff's February 7, 2017, Technical Meeting Summary.

remaining project effects on wetlands, EPA recommends that Birch Power purchase credits from a mitigation bank, if available, or demonstrate that the ecological "lift" of any proposed (applicant-responsible) wetland mitigation is comparable to that of a mitigation bank. However, contributing to a wetland mitigation bank would not be consistent with Commission guidelines for environmental measures.[233]

As discussed in section 3.3.3.2, *Project Effects on Wetlands and Riparian Habitat*, we conclude that the hydrologic conditions of the area and Birch Power's proposed wetland design would not likely support the majority of the native tree species that Birch Power proposes to plant on the spoils disposal site. Instead, the 20.2-acre area would likely revert to early successional, mesic herbaceous/shrub species that could tolerate a relatively thin soil layer and compacted chalk substrate. In addition, Birch Power has not established the need to restore the existing project wetlands, which were acquired and protected as part of the David K. Nelson Wildlife Management Area under the Water Resources Act of 1986 to mitigate wildlife losses resulting from the construction and operation of the Tennessee-Tombigbee Waterway. Birch Power has also not demonstrated the ecological benefit that would be provided by its proposed spoils disposal plan and forested wetland design.

As discussed above under *Spoils Disposal Plan*, we recommend eliminating the provisions for creating a 20.2-acre forested wetland using spoils on the north side of the river channel. Instead, we recommend transporting all spoils not otherwise used for improving the access road and constructing the powerhouse parking area to an offsite disposal area.

Disposing spoils offsite would preserve the majority of the existing wetlands (i.e., 23.1 acres of littoral wetlands) within the proposed project boundary, but as described in section 3.3.3.1 *Terrestrial Resources*, construction of the project would still result in the permanent loss of 13.95 acres of wetlands in the Damsite Management Unit, which is existing mitigation land. The 13.95 acres would be used for the proposed access road (3.55 acres), powerhouse (0.4 acre), intake channel (1.0 acre), powerhouse parking area (1.6 acres), and tailrace channel (7.4 acres). This Wildlife Management Area was established to mitigate previous environmental effects resulting from the construction and operation of the Tennessee-Tombigbee Waterway in Alabama and Mississippi, another water resource development project in the project area. As discussed further in section 3.3.4.1, *Threatened and Endangered Species*, the majority of the 13.95 acre-area of wetlands that would be permanently lost was also identified by the Alabama DCNR as foraging habitat for wood storks between June and the first of October.

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[233] Policy statement on hydropower licensing settlements. Docket No. PL06-5-000. September 21, 2006.

In comments on the draft EA, EPA states that permitted impacts to wetlands require compensatory mitigation. In addition, EPA recommends the purchase of credits from a mitigation bank in accordance with the 2008 Mitigation Rule, which states that such credits should be considered before permittee-responsible mitigation if the project is located within the service area of an approved mitigation bank with available credits. However, EPA's recommendation to contribute to a wetland mitigation bank would not be consistent with Commission guidelines for environmental measures.[234] According to these guidelines, environmental measures should be: (a) within the scope of the Commission's jurisdiction; (b) specific, rather than general, in nature; and (c) physically or geographically as close to the project as possible.

Other forms of mitigation should be considered given that the project would result in the permanent loss of 13.95 acres of existing mitigation wetlands in the David K. Nelson Wildlife Management Area that also serve as foraging habitat for the threatened wood stork. Birch Power could develop a wetlands mitigation plan to restore, establish, enhance, and/or preserve wetlands within or adjacent to the project boundary to mitigate for the unavoidable loss of the existing wetlands. The wetlands mitigation plan could be finalized as part of final project design to ensure an accurate calculation of mitigation wetland acreage based on the actual acreage of wetlands within the David K. Nelson Wildlife Management Area and wood stork habitat that would be permanently lost. The plan could include provisions to: 1) identify proposed mitigation wetlands adjacent to, or in close proximity to the project, that would be acquired to mitigate unavoidable loss of wetlands within the David K. Nelson Wildlife Management Area; 2) assess the condition of the proposed mitigation wetland structure and function (e.g., type(s) of wetlands, species composition, water quantity and quality, flood water retention, wildlife habitat); 3) describe the condition of the proposed mitigation wetland and the restoration and/or enhancement measures that could improve the structure and function of the proposed mitigation wetland; 4) describe any ongoing monitoring and/or management activities that would be necessary to maintain the improved structure and function of the proposed mitigation wetland; 5) verify, after the proposed mitigation wetland is approved by the Commission, existing wetland types and quality by conducting a wetland delineation survey and file the survey results, any adjustments to the proposed restoration and/or enhancement measures, and ongoing monitoring and/or management activities with the Commission for approval; and 6) provide an implementation and reporting schedule. Based on the condition of the acquired mitigation wetlands, examples of wetland restoration or enhancement measures could include installing and/or removing structures

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[234] Policy statement on hydropower licensing settlements. Docket No. PL06-5-000. September 21, 2006.

to improve water quantity and/or quality, removing non-native invasive vegetation, and/or planting native vegetation. Birch Power could use the Corps and EPA's Model Compensatory Mitigation Plan Checklist as guidance in the development of the plan in the interest of facilitating the Corps' regulatory review under section 404 of the CWA.[235] Consulting with the Corps and Alabama DCNR during development of the plan would also facilitate coordination of wetland mitigation requirements and consistency with the state's management objectives for wetlands in the David K. Nelson Wildlife Management Area. Implementing these measures within and/or near the project boundary would maintain important wetland functions and values at the proposed Demopolis Project during the period of any license that may be issued.

We estimate that the levelized annual cost of developing a wetland mitigation plan with our recommended measures would be $4,606, and conclude that the benefits of the measure outweigh the cost.

Revegetation Plan

Construction of the project would result in the permanent loss and disturbance of wetland, grassland, and deciduous forest habitats. On May 21, 2014, Birch Power filed a revised revegetation plan with a long-term goal of establishing native vegetation on sites disturbed by project construction. The proposed revegetation plan includes the following measures: (1) minimize ground disturbance during construction by using existing roads and designated buffer areas to access construction sites; (2) wash construction equipment to remove weed seeds prior to entering construction areas; (3) preserve areas of native vegetation that are adjacent to construction sites by marking native vegetation areas prior to construction; (4) eliminate nonnative, invasive species that develop within areas disturbed by construction; (5) establish a certified weed-free seed mix for reseeding disturbed areas, in consultation with Alabama DCNR; (6) plant disturbed areas in the spring or early summer following major construction activities; (7) assess revegetation efforts by monitoring areas of revegetation for two years following construction; (8) where revegetation is unsuccessful, eliminate invasive species through the localized use of approved herbicide, reseed the area, and use other adaptive measures as determined through consultation with Alabama DCNR; and (9) prepare and file a report

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[235] See Model Compensatory Mitigation Plan Checklist for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act (Corps-EPA, 2003). Staff reiterates that the Corps is responsible for permitting under section 404 of the CWA. Staff anticipates that the Corps' regulatory process for the project will occur after the Commission's licensing process is complete.

on the effectiveness of the reseeding program with Alabama DCNR and the Commission within six months following the end of the two-year monitoring period.

As discussed in section 3.3.3.2, *Project Effects on Botanical Resources*, implementation of Birch Power's proposed revegetation plan would reduce the effects of project construction on botanical resources by promoting the establishment of native vegetation on disturbed sites, and reducing the potential spread and introduction of invasive species in the project area. However, as proposed, the benefits of the revegetation plan are limited to 5.0 acres of land within the buffer areas of the powerhouse, intake channel, access road, and staging/parking area, and not explicitly applicable to other project areas that would be disturbed by construction of the project, including the transmission line and recreation facilities (specifically, the hiking trail and parking area). In addition, the proposed revegetation plan provides for corrective measures to be taken in the event reseeding is unsuccessful in disturbed areas, but does not discuss the criteria that would be used to measure the success of revegetation efforts. Further, the list of invasive species that would be used to assess the success of revegetation does not coincide with invasive species known to occur in the project area. Finally, the proposed revegetation plan provides for the localized use of herbicides to eliminate invasive species, but does not provide a methodology for minimizing the effects of herbicides on wetland vegetation used by the federally threatened wood stork.

To minimize project effects on botanical species and wood stork habitat in the project area, we recommend implementing the proposed revegetation plan with the following modifications: (1) revegetating all areas disturbed by project construction, including areas adjacent to the intake channel, powerhouse, transmission line, access road, powerhouse parking area, and recreation facilities; (2) specifying the criteria for measuring the success of revegetation efforts, and thresholds for implementing corrective measures; (3) revising the list of invasive species to include species applicable to the project area, in consultation with FWS and Alabama DCNR;[236] and (4) developing and implementing, in consultation with FWS and Alabama DCNR: (a) invasive species control techniques that minimize effects on native plants and wetland habitat (e.g., by using selective chemical application methods, as opposed to broadcast treatments of

[236] The University of Georgia's Early Detection & Distribution Mapping System provides a list of nonnative, invasive species per county (University of Georgia, 2013). A county-by-county search can be performed at the following website: http://www.eddmaps.org/tools/recordsbysubject.cfm.

herbicide sprays) and; (b) BMPs that minimize the subsequent reintroduction and spread of invasive species in the project area.[237]

We estimate that the levelized annual cost of developing a revegetation plan with our recommended measures would be $2,431, and conclude that the benefits of the measure outweigh the cost.

Sensitive Wildlife Species Protection

As discussed in section 3.3.3.2, *Project Effects on Wildlife Resources*, the project transmission line would be constructed in an existing transmission line corridor that could be used as habitat for sensitive wildlife species, including amphibians, birds, and reptiles. In the Alabama Wildlife Action Plan, the Alabama DCNR recommends – as a high priority conservation action – that land managers avoid mowing in these areas during the mid-spring to mid-fall timeframe, which is a critical time of reproduction and rearing for most vertebrate taxa (Alabama DCNR, 2015).

Restricting mowing, to the extent feasible, within the transmission line corridor to occur outside of the mid-spring to mid-fall timeframe (approximately, May 1st to November 1st of each year) would be consistent with the high priority conservation action recommended by Alabama DCNR in the state wildlife action plan and would protect sensitive wildlife species that may occur in the project area.

The mowing restriction would have no additional cost, and therefore the benefits of the measure outweigh the cost.

Avian Protection Plan

Federally protected species, including wood stork, bald eagle, American kestrel, and swallow-tailed kite, potentially occur in the project area. As discussed in section 3.3.3.2, *Project Effects on Wildlife Resources*, construction of project facilities would result in the loss of habitat used by migratory bird species, including habitat within the Damsite Management Unit of the David K. Nelson Wildlife Management Area. Construction of an electrical substation and transmission line – especially in the vicinity

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[237] Birch Power could use the following guides for identifying nonnative invasive species in the project area and evaluating potential herbicide application methods: (1) U.S. Forest Service's 2006 technical report, entitled *Nonnative Invasive Plants of Southern Forests; A Field Guide for Identification and Control* (Forest Service, 2006); and (2) National Park Service's and FWS's publication, entitled *Plant Invaders of Mid-Atlantic Natural Areas* (Swearingen, et al., 2002).

of the Tombigbee River and Damsite Management Unit – would also increase the risk of avian collision and electrocution during flight and foraging. Birch Power did not propose specific measures to reduce project effects on avian species.

To minimize the potential for bird mortality associated with the transmission line and substation, we recommend the development and implementation of an avian protection plan, in consultation with Alabama DCNR, FWS, and Corps, that includes the following measures: (1) design and install power poles that provide adequate separation of energized conductors, groundwires, and other metal hardware; (2) insulate or cover transmission line wires to protect raptors and other large-bodied birds from electrocution hazards; (3) install and maintain line-marking devices to protect birds from colliding with the transmission line; (4) train staff to identify, document, and report instances of avian mortality due to electrocution by, or collision with the project's electrical facilities; and (5) develop and implement site-specific measures and practices to reduce bird mortality reported under item 3, as necessary, including modifications to structures or line arrangement. The plan should address how Birch Power considered APLIC's avian protection guidelines in the design specifications for the transmission line and substation. The implementation of these measures would minimize project effects on federally protected avian species potentially located in the project area, including the federally listed wood stork, bald eagle and other migratory birds.

We estimate that the levelized annual cost of developing an avian protection plan would be $1,273, and conclude that the benefits of the measure outweigh the cost.

<u>Species Protection Plan</u>

The official FWS list of threatened and endangered species includes wood stork and northern long-eared bat as potentially occurring in the project area. Wood storks are known to use wetland habitat within the Damsite Management Unit of the David K. Nelson Wildlife Management Area for foraging during the summer months (June – October 1). Construction of powerhouse facilities would result in the permanent loss and degradation of wood stork habitat in the Damsite Management Unit; and construction of the project transmission line over the Tombigbee River would increase the risk of collision and electrocution of wood storks during flight.

Project construction would also be located in the white-nose syndrome zone of the northern long-eared bat, would involve tree removal, and would be located in an area that contains a potential maternal roost tree. Removing occupied maternity roost trees or any trees within 150 feet of an occupied roost tree is prohibited during the northern long-eared bat pup season (June 1 – July 31) (FWS, 2016f) and FWS also recommends avoiding tree removal during this species' active season (April 1 to October 31) (FWS, 2016a; FWS 2016h).

While Birch Power did not propose specific measures to reduce project effects on wood stork, certain measures proposed in the final license application would be consistent with FWS's wood stork habitat management guidelines (FWS, 1990b). Birch Power's proposal to operate the power plant in a run-of-release mode would reduce the effects of the project on traditional water levels and seasonal drying (section 2.2.5, *Proposed Project Operation*). Our recommended oil and hazardous substances plan (section 3.3.2.2, *Construction Effects on Water Quality*), along with the recommendation to use invasive species control techniques that minimize effects on native plants (section 3.3.3.2, *Project Effects on Botanical Resources*), would reduce the risk of contaminating wood stork habitat. In addition, our recommended avian protection plan would minimize the risk of avian electrocution and collision with the project substation and transmission line (section 3.3.3.2, *Project Effects on Wildlife Resources*).

As discussed in section 3.3.4.2, *Threatened and Endangered Species, Environmental Effects, Terrestrial Species, Wood Stork*, additional measures are needed to protect wood stork and northern long-eared bat during project construction. In the draft EA, staff recommended a species protection plan that would include measures consistent with FWS's habitat management guidelines for wood storks and requirements to avoid prohibited incidental take of northern long-eared bats. The plan contemplated limiting construction activities to the October 15 to May 15 time period, which would be outside of wood stork foraging season and of the pup-rearing season for northern long-eared bats. Birch Power stated that this measure of the plan would render the project infeasible because it would limit construction to seasons that tend to have higher flows, which would significantly extend the project construction time frame and increase costs.

Birch Power requested an alternative measure to protect these species, such as using the estimated $5,000 capital cost of the species protection plan as a contribution to habitat improvement projects for endangered species through the Alabama DCNR or FWS. However, without additional details regarding specific habitat improvement projects, such as the target species, types of improvements, and location(s) for implementation, this alternative is not consistent with Commission guidelines for environmental measures because they should be: (a) within the scope of the Commission's jurisdiction; (b) specific, rather than general, in nature; and (c) physically or geographically as close to the project as possible. In contrast, the species protection plan includes specific measures to protect wood storks and northern long-eared bats that may occur within the project boundary during project construction.

FWS filed clarifications to its determinations for the wood stork and the northern long-eared bat related to the measures of the staff recommended species protection plan. FWS indicated that the plan would be consistent with habitat management guidelines for wood stork without a strict seasonal restriction on project construction. FWS agreed that the staff measures to minimize potential effects of project construction on wood storks were appropriate when this species is present in the project area. FWS also clarified that it typically allows tree removal during the inactive period for northern long-eared bats and that "…once the trees are removed there would no longer be any impacts to this species." In addition, FWS stated that based on the 4(d) rule and the biological opinion associated with the listing of the northern long-eared bat, as long as the trees are removed during the inactive season, there would be a "may affect, not likely to adversely affect" for this species.

Accordingly, we recommend modifying the staff recommended species protection plan such that it includes the following measures: (1) limit tree removal to November 1 through March 31, which is outside of the northern long-eared bat pup season (June 1 to July 31), and the broader active season (April 1 to October 31); (2) survey construction areas for wood storks prior to commencing construction; (3) to the extent wood storks are actively foraging in the project area, either (a) delay construction activities until wood storks disperse, or (b) conduct construction activities no closer than between 300 feet to 750 feet from wood storks, depending on the presence or lack of solid vegetation screens, respectively; and (4) at the proposed recreation parking area within the Demopolis Management Unit, provide educational signage regarding the potential presence and protected status of wood storks. The modifications to the original staff recommended species protection plan would address potential project effects to wood storks and northern long-eared bats while allowing more flexibility in the timing of construction activities throughout the year, including during the summer months when inflow and water levels tend to be lower.

We estimate that the levelized annual cost of developing a species protection plan would be $472, and conclude that the benefits of the measure outweigh the cost.

Recreation Management Plan and North Bank Recreation Access

Recreation access along the north bank of the Tombigbee River is limited to the use of the Demopolis WMA for hunting. As part of the spoils disposal plan, Birch Power proposed to construct a trail that would provide public access to the project's tailrace for fishing. However, our recommended modifications to the plan would make the proposed trail infeasible. Therefore, we recommend that a feasibility assessment be conducted for a north bank recreation access facility for bank fishing and the results of the feasibility assessment be integrated into a RMP for the project. Because additional consultation is required prior to construction of recreation facilities, and in order to manage recreation at the project, we recommend that Birch Power develop a RMP to guide the construction, operation, and maintenance of the project's recreation facilities. We recommend that the RMP include: (1) Birch Power's proposals for construction, operation and maintenance of the project's access road improvements and parking area; (2) the staff-recommended feasibility assessment to provide angling access on the north bank of the Tombigbee River, including: (a) conceptual plans, (b) a discussion of how any new access opportunities would affect other resources and resource plans, including wetlands or wood stork habitat if the proposed access encroaches on this area (discussed in section 3.3.4.2, *Threatened and Endangered Species, Environmental Effects, Terrestrial Species, Wood Stork*); (3) a discussion of how Birch Power would monitor recreation use at the project facilities over the term of a license; and (4) provisions to periodically consult with the Corps and Alabama DCNR about recreation use and needs at the project and revise the RMP based on needs identified through Birch Power's recreation use monitoring or consultation.

Development of a RMP would ensure that the recreation facilities are designed and constructed with the consultation of the Corps and Alabama DCNR. A RMP would allow for specific measures to be integrated for maintenance of the facilities, which will allow for continuous recreation at the project for the life of a license. A RMP would coordinate with other resource plans to protect sensitive areas and species in the project area. Therefore, we conclude that the benefits are worth the levelized annual cost of $5,943 to develop a RMP.

Historic Properties Management Plan

Construction, operation, and maintenance of the proposed Demopolis Project may result in adverse effects on historic properties, including site 1MO232, which is an early nineteenth and twentieth century house site with many extant features. The Alabama SHPO recommends avoidance of the site, which is located in the proposed project's transmission line corridor; however, the SHPO also recommended that if avoidance was not possible, Birch Power would need to consult further on treatment measures to lessen or mitigate the effect. Because project operations and maintenance may continue to affect historic properties over the term of a license, we recommend that a HPMP be developed that describes Birch Power's treatment measures for avoiding, lessening, or mitigating adverse effects to known historic properties, including site 1MO232. Additionally, we recommend that the HPMP contain a protocol for treatment of any unknown cultural resources discovered during construction, operation, or maintenance of the project over the term of a license.

To satisfy the requirements of section 106, the Commission intends to execute a PA for the project that would include stipulations for the protection of historic properties, including development of a HPMP for the project. Specifically, the PA would require that the HPMP include, but not be limited to, a discussion of all cultural resources identified within the APE of the proposed project, their National Register eligibility status, project-related effects, and specific management measures to resolve project-related adverse effects. The HPMP would be developed in consultation with the Alabama SHPO and affected tribes. We conclude that the benefits are worth the levelized annual cost of $472 to develop a HPMP.

5.1.3 Measures Not Recommended by Staff

Annual Review Meetings for Erosion and Riverbed Scour

Condition 1 of FWS's BO would require Birch Power to hold annual coordination meetings for the first 5 years after construction is complete to review the effectiveness of the erosion control plan and riverbed scour and shoreline stability plan to assess if changes are necessary. Meeting annually would provide no specific and direct benefit to resources affected by erosion and riverbed scour. Further, as discussed above, Birch Power could document the effectiveness of the plans by drafting annual reports, providing the draft reports to the resource agencies for review, comments, and recommendations, and filing the final reports with any agency comments and recommendations. Therefore, we have no justification for recommending a license requirement for holding annual meetings to review the effectiveness of the erosion control plan and riverbed scour and shoreline stability plan.

Monitor Water Quality for Paper Mill NPDES Permit Requirements

In proposed license article 3 of the Water Quality Settlement, Birch Power proposes to monitor DO, water temperature, pH, and BOD from May 1 through November 30 of each year in the Tombigbee River between Demopolis Lock and Dam and Coffeeville Lock and Dam.[238] As stated in the Water Quality Settlement, the purpose of this measure is for Birch Power to be responsible for all ambient water quality sampling in the Tombigbee River during the period of May 1 through November 30 each year, as required in WestRock's NPDES Permit for the Demopolis Mill (also clarified in a letter filed by Birch Power on September 12, 2016). However, as discussed in section 3.3.2.2, *Operational Effects on Dissolved Oxygen in the Tailrace and Downstream of the Tailrace*, the additional water quality monitoring is not needed because the monitoring of the tailrace and downstream of the tailrace, as required in Alabama DEM's certification conditions 3 and 4, would be adequate for determining whether Birch Power is maintaining DO concentrations at or above the required limits in condition 1, which would be protective of aquatic resources. In addition, because the project would not contribute organic matter that would affect BOD, and because there is no indication that the project would alter water temperature or pH downstream of the tailrace in a way that would negatively affect aquatic resources during operation, there is no need to monitor

[238] The water quality monitoring in Birch Power's proposed license article 3 would require monitoring at 26 sampling sites at a frequency of once per two weeks, twice per week, or once every day, depending on the minimum DO concentration observed during sampling (for additional details on the proposed sampling, see section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*).

these variables. Consequently, the monitoring in Birch Power's proposed license article 3 is not needed to identify the effects of project operation on water quality.

Operation of the Demopolis Project could cause DO downstream of the project to fall below existing levels (see section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream from the Tailrace*), which could result in increased water quality monitoring for WestRock, based on its NPDES permit requirements. Although operation of the Demopolis Project could potentially result in WestRock incurring the cost of additional monitoring to meet its NPDES permit requirements, the Commission has no authority to enforce a provision requiring Birch Power to pay damages (i.e., provide increased water quality monitoring caused by the project operation's DO lowering effects) that might be caused by project operation.[239]

Use of Emission Controls on Construction Equipment

EPA recommends that diesel controls, cleaner fuel and cleaner construction practices be used for transportation, soil movement, or other construction activities, including: (1) strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and (2) use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, engine replacement, or newer, cleaner equipment.

In the draft EA, we recommended that Birch Power develop an oil and hazardous substances plan in consultation with resource agencies. Large quantities of liquid hydrocarbons have the potential to spill into the Tombigbee River during construction. The purpose of the plan recommended in the draft EA was to minimize the risk of introducing hydrocarbons into the Tombigbee River during project construction. However, given the relatively short-term nature and very minimal project construction footprint, requiring construction equipment emission control strategies or technologies would have insignificant benefits to air quality not only regionally, but also in the immediate project area. Therefore, there is no justification for emission control strategies or technologies during construction and we do not recommend that they be required in a license.

South Bank Fishing Platform

Birch Power proposes to install a fishing platform on the south bank of the Tombigbee River, below Demopolis Lock, to improve fishing access. Alabama DCNR requested consultation during the design and placement process of a fishing platform,

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[239] FPA Section 10(c), 16 U.S.C. § 803(c)

which would allow for a site to be selected based on the operational effects of downstream hydraulics. The proposed fishing platform would be located on the south bank of the river, across from the project, at an existing Corps' recreation site located outside of the project boundary. The Corps has not commented on its interest in maintaining the facilities or the availability of resources necessary for them to do so. Further, Birch Power has not described a clear connection between the need for a south bank fishing pier and project effects on recreation resources. Because the proposed fishing platform would not provide recreation access to the project or help address a recreation need that cannot otherwise be satisfied at the project (i.e., fishing access), we do not recommend this measure.

Rather, as described previously, we recommend that Birch Power focus any new recreation development on the north side of the Tombigbee River, where project effects on existing recreation access would occur. As discussed above, we recommend that Birch Power prepare a RMP with the results of a feasibility assessment for a north bank recreation access facility designed to address the need for continued public access to the north bank of the Tombigbee River. Because staff's recommended proposal would ensure potential opportunities for public access for anglers at the project, and the benefits of the fishing platform are not related to the project impacts, we conclude that a south bank fishing platform is not worth the annual levelized cost of $14,434, and construction of the proposed fishing platform is not recommended.

Angler Access Trail and Recreation Parking Area

Birch Power proposes to construct an angler access trail and an associated parking area to the north bank of the Tombigbee River for bank fishing access. The proposed angler access trail and parking area would be located near the proposed powerhouse. However, staff does not recommend this measure because the proposal is not well-defined and has the potential to conflict with the goals for managing terrestrial resources and endangered species at the project.

Instead, we recommend that Birch Power implement the RMP discussed above, which would include the results of a feasibility assessment for providing angler access on the north bank of the Tombigbee River. Because staff's recommended proposal for a RMP with the results of a feasibility assessment for a north bank recreation access facility for bank fishing would ensure potential opportunities for public access for anglers at the project and the benefits of the angler access trail and associated parking area are not related to the project impacts, we conclude that these measures are not worth the combined annual levelized cost of $5,000, and the proposed angler access trail and associated parking area are not recommended to be constructed.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Construction and initial operation of the Demopolis Project may cause unavoidable short-term increases in erosion and sedimentation within the Tombigbee River in locations immediately upstream and downstream of the project. However, implementation of an erosion control plan with our recommended measures, would minimize the potential for negative effects, and no long-term effects from erosion are expected.

During operation, Birch Power would divert water through the powerhouse and tailrace, which would modify hydrodynamics downstream of the dam, especially when most or all inflow would be discharged through the powerhouse. Changes in hydrodynamics could lead to riverbed scour and shoreline erosion, which could displace or modify existing sandbar habitat for the federally threatened inflated heelsplitter mussel, and cause sedimentation of the river, respectively. Our recommended riverbed scour and shoreline stability plan would include provisions to monitor changes in scour and shoreline stability downstream of the dam, and develop measures to minimize scour and shoreline erosion, if needed, which would reduce project impacts to aquatic habitat.

Altered hydrodynamics caused by project operation could also change aggradation patterns downstream of the dam. New aggradation patterns could develop in the flow affected area, which could lead to sediment deposition over existing freshwater mussel habitat and negatively affect mussel populations. In addition, new aggradation patterns could alter the navigation channel and disrupt navigation traffic moving to and from the lock. Our recommended aggradation monitoring and mitigation plan would include provisions to monitor and remedy any project-caused aggradation, which would reduce project effects on aquatic habitat and navigation.

Construction of the proposed project would require the use of an assortment of heavy equipment. This equipment would require gasoline or diesel fuel, motor oil, hydraulic fluid, and other lubricants, which would be stored on site at a total estimated volume of 1,600 gallons. Our recommended oil and hazardous substances plan would protect water quality and aquatic organisms from the effects of spilled hydrocarbons.

Operation of the proposed project may result in lower DO concentrations in the tailrace and downstream of the tailrace compared to existing conditions downstream of the dam. However, Alabama DEM’s certification requirements for Birch Power to implement management (i.e., operational and/or structural modifications) to maintain DO in the project discharge at no less than 5.0 mg/L at all times, and the daily average DO at river mile 206 at no less than 6.5 mg/L would protect aquatic resources. In addition, Alabama DEM’s certification requirement to monitor DO in the tailrace and downstream of the tailrace would help determine whether management is effective in maintaining DO at the required limits in the tailrace and downstream of the tailrace. Further, Birch

Power's proposal to limit operation to periods when inflow is equal to or greater than 5,000 cfs, would reduce the potential for DO to fall below Alabama DEM's required DO limits in the tailrace and downstream of the tailrace.

Operation of the project may also result in lower DO concentrations in the proposed flow affected area compared to existing conditions downstream of the dam. Our recommended water quality and flow monitoring and management plan would reduce any potential negative effects of project operation on DO and water temperature in the flow affected area by requiring Birch Power to monitor DO and water temperature in the flow affected area during the first 3 years of project operation to determine to what extent project operations are affecting water quality in the flow affected area, and to develop a plan to improve water quality if necessary.

Operation of the project would result in some unavoidable fish entrainment-related mortality as fish pass through the turbines. Birch Power's proposal to install trash racks with 2.5-inch clear spacing would reduce entrainment of larger fish; however, the project's maximum intake velocity of 5.5 fps could result in entrainment of smaller fish and impingement of larger and slower swimming fish. Our recommended trash-rack bar spacing of 5 inches would prevent impingement of most larger and slower swimming fish and thereby eliminate most impingement at the project.

A temporary loss of aquatic habitat would occur within portions of the river enclosed by cofferdams. Construction activities such as cofferdam placement and removal, excavation, and boat traffic in the immediate project area could displace aquatic organisms, representing a minor, short-term effect during construction. Any mussels currently present within or near the proposed construction footprint could be permanently impacted. Although, few mussels were found within the majority of the construction footprint, several mussels, including the federally threatened heelsplitter were observed on sandbar 2, which would be partially removed during excavation of the tailrace. The staff-recommended mussel relocation plan would reduce the effects of project construction on the mussel community by relocating all mussels from the action area to suitable habitat outside the action area, followed by monitoring to determine the effectiveness of the relocation efforts. Nevertheless, relocation efforts may not remove 100 percent of the mussels from the construction footprint, and relocated mussels might not fully adapt to the new habitat. Thus, there could be some loss of mussels during construction, but these losses would be minimized with the staff-recommended mussel relocation plan.

Construction of the project would result in the permanent loss and temporary disturbance of botanical resources and wetland habitat in the Damsite Management Unit and along an existing transmission line right-of-way. Birch Power's proposals to construct the project transmission line primarily within an existing transmission line right-of-way; avoid wetland areas when placing transmission line poles in the existing right-of-way; and operate the project in run-of-release mode, would minimize disturbances to botanical resources and wetland habitat in the project area. Birch Power's revegetation plan, along with our recommended modifications and our wetland mitigation plan, would also minimize the effects of project construction on botanical resources and wetland habitat by promoting the reestablishment of native vegetation on disturbed sites and reducing the spread and introduction of nonnative, invasive species.

Project construction and maintenance would result in the permanent loss of wildlife habitat, including habitat used by raptors and other large birds. The construction of an electrical substation and transmission line would also increase the probability of avian collision and electrocution during flight and foraging. To protect sensitive wildlife species, we recommend restricting mowing, to the extent feasible, in the transmission line corridor to occur outside of the mid-spring to mid-fall timeframe when most vertebrate taxa are reproducing and rearing young. Our recommended avian protection plan would also minimize the risk of avian electrocution and collision with the project substation and transmission line.

Project construction and operation would also result in the loss of wood stork and potential northern long-eared bat habitat in the Damsite Management Unit, including wetlands that would be replaced by project facilities and potential roosting trees that would be removed. The staff alternative includes a species protection plan that would minimize detrimental human-related impacts on wood storks and northern long-eared bats by limiting intrusion into foraging areas when wood storks are present and limiting tree removal to northern long-eared bats' inactive season.

Construction of the proposed Demopolis Project would result in the construction of public recreation facilities. Hunting in the Demopolis WMA would be affected during the construction. Development of a RMP, in consultation with the Corps and Alabama DCNR, would ensure that the facilities are constructed, operated and maintained in an orderly manner, and allow for mitigating measures.

Compared to the existing view, the proposed powerhouse, if constructed, would minimally affect the viewshed, mainly through tree removal. This would be somewhat offset through blending the powerhouse in with the existing dam infrastructure and visual character of the existing Corps facilities. The associated proposed powerlines would span the river and be potentially visible up to 1.5 miles upstream and downstream of the dam. The powerlines are essential for power delivery and the span does not seem to be excessive.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

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

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency will attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

In response to the Commission's Ready for Environmental Analysis notice, no fish and wildlife agencies submitted recommendations for the project.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C. § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed seven qualifying comprehensive plans that are applicable to the Demopolis Project. No inconsistencies were found.

The following is a list of qualifying comprehensive plans relevant to the Demopolis Project:

Alabama Department of Conservation and Natural Resources. 1990. Wildlife lands needed for Alabama. Montgomery, Alabama. October 1990.

Alabama Department of Conservation and Natural Resources. n.d. Alabama's comprehensive wildlife conservation strategy. Montgomery, Alabama.

Alabama Department of Economic and Community Affairs. Alabama Statewide Comprehensive Outdoor Recreation Plan (SCORP): 2008-2012. Montgomery, Alabama.

Gulf States Marine Fisheries Commission. 2006. The striped bass fishery of the Gulf of Mexico, United States: A regional management plan. Ocean Springs, Mississippi. March 2006.

U.S. Fish and Wildlife Service. 2000. Recovery plan for the Mobile River Basin aquatic ecosystem. Department of the Interior, Daphne, Alabama. November 17, 2000.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

U.S. Fish and Wildlife Service. 1990. Gulf Coast joint venture plan: A component of the North American waterfowl management plan. June 1990.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.

6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Demopolis Project is licensed as proposed with our additional recommended measures, the project would operate while providing protective measures for aquatic, terrestrial, recreation, aesthetic, and cultural resources in the project area.

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

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Alabama DEM (Alabama Department of Environmental Management. 2016. Integrated water quality monitoring and assessment report. Montgomery, Alabama.

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Birch Power. 2014b. Fish Entrainment and Turbine Mortality Report Addendum. Demopolis Lock and Dam Hydroelectric Project FERC No. 13102. Idaho Falls, ID. Filed September 16, 2014.

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APPENDIX A

STAFF RESPONSES TO COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT

Commission staff issued its draft environmental assessment (EA) for the licensing of the Demopolis Lock and Dam Hydroelectric Project (Demopolis Project) on June 29, 2017. Staff requested comments on the draft EA be filed within 30 days from the issuance date. The following entities filed comments pertaining to the draft EA.

Commenting Entity	**Date Filed**
Birch Power Company (Birch Power)	July 25, 2017
U.S. Environmental Protection Agency (EPA)	July 28, 2017
WestRock Mill Company, LLC (WestRock)	July 31, 2017
U.S. Fish and Wildlife Service (FWS)	August 18, 2017
FWS[240]	February 16, 2018

Below, we summarize the substantive comments, provide responses to those comments, and explain how we modified the text of the draft EA, as appropriate, to address the comments. The comments are grouped by topic for convenience.

Analysis of Alternatives

Comment: EPA comments that the draft EA only presented the proposed alternative, and that the staff alternative is the proposed alternative that is missing a few components from the proposed action. EPA also comments that the no action alternative was mentioned but never analyzed.

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[240] The letter filed by FWS on February 16, 2018, was FWS's biological opinion (BO) for the federally threatened inflated heelsplitter mussel. The BO included information related to the draft EA, which we discuss below. The BO was timely filed under the ESA consultation time frame.

Response: The range of alternatives that must be considered is a matter within an agency's discretion,[241] and there is no requirement to examine each proposed mitigation or enhancement measure as a separate alternative.[242] The EA considers Birch Power's proposal, a staff alternative, and a no action alternative. While the staff alternative does include many of Birch Power's proposed facilities and environmental protection measures, it is substantially different from Birch Power's proposal as discussed in detail in Sections 5.1.2, *Additional Staff-recommended Measures* and 5.1.3, *Measures Not Recommended by Staff*, of the EA.

For original projects like the proposed Demopolis Project, the no action alternative would be license denial, meaning the project would not be constructed and there would be no change to the existing environment. Given that the existing environment serves as the baseline for the Commission's analysis of environmental effects, there are no project-related effects to analyze under the no action alternative.

Purpose and Need

Comment: EPA comments that the draft EA presented an inadequate description of the purpose and need for the project, and recommends a review of that section.

Response: The NEPA regulations describe the Purpose and Need section as specifying the "underlying purpose and need" for the proposed action (and alternatives).[243] The Southeastern sub-region of SERC's increasing need for power, as described on page 2 of the EA, is the underlying purpose and need.

Project Operation

Comment: WestRock comments that it agrees with our recommendation to develop, as part of the Water Quality Settlement, a plan to completely shut off the project intake works to ensure that no flow passes through the powerhouse when the hourly mean flow upstream of the project falls below 5,000 cfs, and resume operation when the hourly mean flow is at least 5,000 cfs to protect water quality downstream of the project, as long as the recommendation is incorporated into the license, as stated in Article 1 of the Water Quality Settlement.

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[241] *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 551-52 (1976).

[242] *Idaho Power Co.*, 110 FERC ¶ 61,242 (2005) at PP 80-85.

[243] 40 C.F.R. Part 1502.13 (2003).

Response: Our recommendation to include such a measure in any license issued for the project is unchanged from the draft EA.

Aquatic Resources

Comment: EPA recommends continuous monitoring of DO and temperature in the tailrace and downstream of the tailrace at RM 206, during generation and non-generation periods.

Response: The EA has been updated to include an analysis of EPA's recommendation in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream from the Tailrace*. In section 5.1.2, *Additional Staff-recommended Measures*, we present our justification for not recommending that Birch Power monitor water quality in the tailrace during non-generation.

Comment: EPA recommends that DO in the tailrace and downstream of the tailrace (RM 206) meet the Alabama water quality criteria of 5.0 mg/L at all times. EPA interprets the language "at all times" to mean all times from January 1 through December 31, including during periods of generation and non-generation.

Response: The EA has been updated to include an analysis of EPA's recommendation in section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream from the Tailrace*. In section 5.1.2, *Additional Staff-recommended Measures*, we present our justification for not including EPA's recommendation in a license.

Comment: EPA recommends that we include in our analysis of operational effects on water quality, consideration of the effects of dewatering the flow affected area on aquatic resources, and not limit our analysis to the effects of changes in numeric criteria (i.e., DO concentration in mg/L and temperature in °F).

Response: As indicated in the draft EA in section 3.3.2.2, *Operational Effects on Water Quantity*, the flow affected area would not be dewatered as a result of project operation. Specifically, on page 83 of the draft EA, we state: *When there is zero flow over the spillway, water depth in the flow affected area would be unchanged compared to existing conditions because depth in the flow affected area is controlled by downstream river hydraulics, including the relatively large 190,800 acre Coffeeville Lake*. Further, we clarify that Coffeeville Lake extends from Demopolis Dam to Coffeeville Dam and includes all water in the flow affected area. The Corps operates Coffeeville Dam to maintain a constant reservoir elevation of 32.5 feet (National Geodetic Vertical Datum) at river flows up to 80,000 cfs.[244] An analysis of the operational effects of dewatering the flow affected area is not necessary, because dewatering would not occur.

Comment: EPA comments that if there is no water in the flow affected area, it is unlikely that a designated use of aquatic life or any other designated use is being met. Consequently, EPA recommends that Birch Power collect other information, such as gauge records, or visual observations of no flow or pools of standing water to provide information on the physical condition of the flow affected area that would demonstrate whether the designated use is impaired.

Response: The EA has been updated to include an analysis of EPA's recommendation in section 3.3.2.2, *Operational Effects on Water Quality in the Flow Affected Area*. In section 5.1.2, *Additional Staff-recommended Measures*, we present our justification for recommending that Birch Power develop a water quality and flow monitoring and management plan that includes a provision for estimating flows in the flow affected area for the first 3 years of operation using inflow data from Birch Power's proposed flow gauge and project operation data.

Comment: EPA recommends that we revise the draft EA to evaluate the effect of no flow on the designated use(s) of waters in the flow affected area.

Response: The waters immediately downstream of Demopolis Lock and Dam (i.e., from Demopolis Lock and Dam downstream to the Sucarnoochee River [about 13 miles downstream]) have a designated use for fish and wildlife. In the Alabama water quality criteria, at Alabama DEM Administrative Code r. 335-6-10-.09, the best usage of waters for fish and wildlife are fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water contact sports or as a source of water supply for drinking or food-processing purposes. In section 3.3.2.2, *Operational Effects on Water Quality in the Flow Affected Area*, and section 3.3.2.2, *Fish and Mussel Habitat in the Flow Affected Area*, we thoroughly addressed the indirect effects (i.e., potential increases in temperature above 90° F and decreases in DO below 5.0 mg/L) of no flow on the aquatic resources (i.e., a designated use) that would be included in the designated use for fish and wildlife. In section 3.3.2.2, *Fish and Mussel Habitat in the Flow Affected Area*, we also discuss a possible direct effect of no flow on freshwater mussels located in the flow affected area. Specifically, we discuss the potential for no flow conditions to

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[244] See Federal Energy Regulatory Commission. 1989. Environmental Assessment for the Coffeeville Lock and Dam Water Power Project (FERC No. 8862). March 1989.

prevent freshwater mussel glochidia from becoming suspended in the water column, which could result in reproductive failure. No additional analysis is needed.

Comment: EPA recommends that we revise the EA to include an analysis of the flows that are needed to maintain the designated use in the flow affected area.

Response: Based on our analysis in the EA, we recommend measures to maintain the designated use in the flow affected area, with requirements for future observation and adjustment. We recommend that all mussels in the flow affected area be relocated to suitable existing habitat downstream from the project to avoid adverse effects (see section 5.1.2, *Additional Staff-recommended Measures*). Subsequent to the mussel relocations, we recommend that Birch Power collect data that could be used to inform the need for additional measures. Specifically, we recommend that Birch Power: develop a mussel relocation plan that includes a provision for conducting four post-construction mussel surveys in the flow affected area that would begin 1 year post-construction, and then every 3 years thereafter to determine whether mussels are recolonizing the flow affected area and whether they are able to successfully maintain their populations over a sustained period. We also recommend that Birch Power develop a flow monitoring and management plan to estimate flows in the flow affected area during the first 3 years of operation (i.e., May through September), with provisions for reporting data and proposing additional measures to mitigate negative effects on water quality, if necessary. We find this approach will be superior in effectiveness and cost to conducting additional flow analysis at this time.

Comment: WestRock comments that it disagrees with our interpretation of Alabama DEM's certification condition 1 regarding the requirement to maintain a daily average DO concentration at RM 206 not to be less than 6.5 mg/L. WestRock specifically disagrees with our interpretation in the draft EA, where we state that the certification requirement was for Birch Power to maintain a daily average DO concentration at RM 206 not to be less than 6.5 mg/L, *unless low DO is caused by non-project related factors* (emphasis added to the phrase that WestRock does not approve). However, the certification states that Birch Power shall maintain a daily average DO concentration at RM 206 not to be less than 6.5 mg/L due to discharge from the turbines. In addition, the Settlement indicates that Birch Power would maintain a daily average DO concentration at RM 206 not be less than 6.5 mg/L whenever flows are running through the project's hydropower works. WestRock comments that neither the Settlement nor the certification provide any process or standards for Birch Power to demonstrate a "non-project factor" as the cause for non-compliance with the 6.5 mg/L DO requirement, and any such mechanism would be impractical from a compliance perspective.

Response: We agree that our interpretation of the 6.5 mg/L requirement is inconsistent with the certification and would be impractical from a compliance perspective. Consequently, we have revised the EA throughout the document by replacing the language, "unless low DO is caused by non-project related factors" with the language, "when the project is operating." This revision is consistent with the amendment to the Settlement, filed by WestRock on July 31, 2017, which states that DO levels in the Tombigbee River at RM 206 shall be no less than 6.5 mg/L, whenever flows are running through the project's hydropower turbine works.

Comment: WestRock comments that it disagrees with our recommendation in the draft EA against adoption of Birch Power's proposed license article 3 in the Settlement, which would require Birch Power to assume responsibility for WestRock's water quality sampling requirements under its NPDES permit. WestRock also comments that proposed project operations are expected to cause DO concentrations to fall below existing levels in the Tombigbee River, which would cause more frequent sampling than under existing conditions.

EPA comments that it expects the monitoring required under WestRock's NPDES permit to be met, whether by WestRock or by Birch Power.

Response: We agree that project operations have the potential to cause DO to fall below existing levels, which could cause WestRock to incur more frequent water quality sampling under its NPDES permit. However, as discussed in section 3.3.2.2, *Operational Effects on Dissolved Oxygen in the Tailrace and Downstream of the Tailrace*, the additional water quality monitoring has no benefit with respect to project effects. The water quality monitoring in the tailrace and downstream of the tailrace, as required in Alabama DEM's certification conditions 3 and 4, should be adequate for determining whether Birch Power is maintaining DO concentrations at or above the required limits in condition 1, which would protect aquatic resources. Further, as discussed in section 5.1.3, *Measures Not Recommended by Staff*, the Commission has no authority to enforce a provision requiring Birch Power to pay damages (i.e., providing increased water quality monitoring caused by the project operation's DO lowering effects) that might be caused by project operation (FPA Section 10(c), 16 U.S.C. § 803(c)). Nevertheless, the licensee could, as an off-license measure, implement measures that are outside the Commission's authority through an agreement, like the Water Quality Settlement.

Comment: WestRock comments that it is not clear from the draft EA, whether or not the Commission recommends adopting in any license, proposed article 2 of the Water Quality Settlement, which requires Birch Power to install, operate, and maintain an oxygen aeration system (i.e., oxygenation system as described in the EA) at the project. WestRock comments that the Commission should affirmatively recommend adoption of proposed article 2.

Response: In section 5.1, *Comprehensive Development and Recommended Alternative* of the draft EA, we recommended that Birch Power develop and implement measures to comply with the DO limitations through structural and/or operational modifications at the project, as required in Alabama DEM's water quality certificate (condition 2). We did not, however, recommend a requirement that would limit Birch Power's options to the language of its proposed license article 2 for installing, operating, and maintaining an oxygenation system. As we indicated in section 5.1, *Comprehensive Development and Recommended Alternative*, both Alabama DEM's condition 2 and Birch Power's proposed license article 2 would be equally protective of aquatic resources, but Alabama DEM's condition 2 provides greater flexibility in meeting the DO limits in condition 1, and would allow Birch Power to determine, in consultation, the type of structural and/or operational modifications to implement.

<u>Comment</u>: WestRock requests that we recommend in the final EA that the following provisions be included in any license issued to Birch Power: (1) provide to the operator of the Demopolis Mill downstream of the project, any water quality, or other reports and data collected by the gauges, monitors, and sampling efforts; (2) consult with the operator of the Demopolis Mill prior to filing for approval by the Commission any project operational change or any project-related activity that may affect water quality in the Tombigbee River downstream of the project; and (3) provide to the operator of the Demopolis Mill all water quality reports required by Alabama DEM's water quality certification.

<u>Response</u>: As indicated in footnote 26 in section 2.2.6, *Proposed Environmental Measures* of the draft EA (and footnote 43 of the final EA), we consider the three provisions above to be general and administrative measures and not environmental measures. Thus, there was no detailed environmental analysis of these three general and administrative provisions in the draft EA and there is no detailed environmental analysis of these measures in the final EA.

However, regarding administrative items 1 and 3 above, any license issued would typically require that water quality reports be filed with the Commission. Once filed, the reports would be available to the public, including WestRock. Thus, there is no need for a license condition requiring that Birch Power file reports directly to WestRock.

Regarding administrative item 2, any proposal by Birch Power to modify project operations subsequent to receiving a license, would likely require Birch Power to file an application with the Commission and to receive Commission approval prior to commencing the modification. During this process, the application to modify project operations would be available for public comment, at which time WestRock could provide comments on any proposed changes to project operations. Therefore, there is no need for a license condition requiring Birch Power to consult with the operator of the Demopolis Mill prior to seeking Commission authorization for any project operational change, or any new project-related activities that may affect water quality in the Tombigbee River downstream of the project.

Comment: The comments filed by WestRock on July 31, 2017 include Appendix 1, which is an amendment to the Settlement signed by Birch Power. The amendment replaces Appendix B (Proposed Conditions for the Alabama DEM Certification) of the Settlement filed on August 15, 2016, with the certification issued by Alabama DEM on September 29, 2016.

Response: We recognize that the amendment replaces Appendix B of the Settlement filed on August 15, 2016, with the certification issued by Alabama DEM on September 29, 2016. The replacement of Appendix B is consistent with our recognition in the draft EA and final EA that Birch Power's proposed measures include the conditions of the certification issued on September 29, 2016.

Comment: The amendment to the Settlement discussed above, adds a section (i.e., section 3.7) indicating that the daily average DO level at RM 206 shall be calculated by totaling the DO value of all individual gauge measurements during each calendar day, and then dividing by the number of individual measurements during the calendar day.

Response: In the final EA, we recognize this amendment to the Settlement (i.e., section 3.7), and include it as part of Birch Power's proposed measures in the EA, by adding footnote 44 to section 2.2.6, *Proposed Environmental Measures* and 96 to section 3.3.2.2, *Operational Effects on Water Quality in the Tailrace and Downstream of the Tailrace*. We also include footnote 227, in section 5.1.1, *Measures Proposed by the Applicant*, which indicates that we are including this proposal as part of our recommended staff alternative.

Comment: The amendment to the Settlement discussed above, adds a section (i.e., section 3.8) that would require Birch Power to report to WestRock within 72 hours, any instance in which the daily average DO concentration at RM 206 is less than 6.5 mg/L. The amendment also states: *In such reports, Birch will provide data demonstrating the deviation, the reason(s) for the deviation, and corrective measures implemented by Birch to prevent future deviations of the mean daily DO standard. Following consultation with WestRock, Birch will immediately seek approval of the Commission or ADEM of such corrective measures, as may be required by the Commission or ADEM*.

Response: It is the responsibility of the Commission to ensure that a licensee complies with the provisions of any license issued. Further, reporting of non-compliance would be a requirement of any license issued and all non-compliance reports would be filed with the Commission, and would be available in the public record. Consequently, there is no need to include in any license the requirement for Birch Power to report directly to WestRock.

<u>Terrestrial Resources/Wetland</u>

<u>Comment</u>*:* EPA comments that the draft EA does not mention Section 404 of the Clean Water Act (CWA), and is concerned that Birch Power has proposed using wetlands as a receiving body for waste/spoil material. EPA recommends that the discharge of spoils into the 23.1-acre existing wetland area not be included in this project.

EPA also recommends that spoils be evaluated for the potential to contain contaminants in accordance with 40 C.F.R. 230.60 and 230.61, if any dredged material would be placed in waters of the U.S. or sent to a confined disposal facility that discharges to waters of the U.S.

<u>Response</u>*:* The Corps is responsible for permitting under section 404 of the CWA and staff anticipates that the Corps' permitting process will occur after the Commission's licensing process is complete. The staff alternative does not include Birch Power's proposal to deposit spoils on the north side of the river channel downstream of Demopolis Lock and Dam. Instead, the staff alternative would require that all spoils not used for improving the access road and constructing the powerhouse parking area be transported to an offsite disposal area.

The EA has been updated in section 3.3.1.2, *Construction Effects on Geology and Soils* to include an analysis of EPA's recommendation to evaluate spoils for contaminants. In section 5.1.2, *Additional Staff-recommended Measures*, we present our justification for recommending that Birch Power modify the spoils disposal plan such that all spoils not otherwise used for improving the access road and constructing the powerhouse parking area be: (1) transported to an offsite disposal area; and (2) tested for contaminants if the offsite disposal area would occur in, or discharge to waters of the U.S.

<u>Comment</u>*:* EPA is concerned that wetlands on the north side of the proposed project site were described in the draft EA as a "reclamation area." EPA states that no information was presented to document a degraded condition on the north side of the project site. Therefore, a need for reclamation has not been demonstrated, and the impacts associated with deposition of spoils over the existing wetland are not warranted, but rather, constitute disposal of waste. EPA comments further that elevating the site would alter the hydrologic regime such that it would be unlikely to support wetland vegetation and fauna (including the wood stork), and that the discharge of spoils there constitutes the disposal of waste.

<u>Response</u>*:* In the draft EA, we use the term, "reclamation area" or "reclamation site" only to describe Birch Power's proposal, but we do not use that terminology to

describe the staff alternative. We concluded that the proposed elevated wetland is unlikely to have a hydrologic regime that would support wetland species. Therefore we recommended not constructing the proposed elevated wetland. Instead, under the staff alternative, the existing wetlands on the north side of the river channel downstream of Demopolis Lock and Dam would remain intact and the temporary impacts associated with construction of the tailrace, powerhouse, and parking area would be minimized through the implementation of the erosion control plan, spoils disposal plan, revegetation plan, a wetlands mitigation plan, and the wildlife protection plans.

Comment: EPA states that permitted impacts to wetlands require compensatory mitigation.[245] Given the proposed permanent loss of wetlands at the Demopolis Project, EPA recommends the purchase of credits from a mitigation bank in accordance with the 2008 Mitigation Rule.

Response: Compensatory mitigation involves actions taken to offset unavoidable adverse impacts to wetlands, streams and other aquatic resources authorized by Clean Water Act section 404 permits and other Department of the Army (i.e., Corps) permits.[246] As noted above, in this proceeding staff anticipates that the Corps' 404 regulatory process will occur after the Commission's licensing process is complete. We have expanded the discussion of this topic in section 3.3.3, *Terrestrial Resources*, and added a staff-recommended wetland mitigation plan to address project effects to existing wetlands.

Threatened and Endangered Species

Comment: On August 18, 2017, FWS provided concurrence with the determinations of effect on federally listed threatened and endangered species (i.e., ovate clubshell, southern clubshell, wood stork, northern long-eared bat) made by Commission staff in the draft EA. FWS also stated it had sufficient information to complete a BO for the federally threatened inflated heelsplitter.

On August 17, 2017, FWS informed staff that recent e-DNA[247] surveys conducted by the Alabama Division of Wildlife and Freshwater Fisheries indicated the presence of the federally endangered Alabama sturgeon in the Tombigbee River below Coffeeville

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[245] 40 C.F.R. 230 subpart J.

[246] 73 Fed. Reg. 19,594-19,705 (April 10, 2008).

[247] Environmental DNA, or eDNA refers to the genetic information emitted from organisms as they interact with their environment (e.g., DNA within shed tissues, excrement, etc.), which can be collected from soil, water, or air samples, rather than sampled directly from an individual organism.

Lock and Dam (i.e., at river miles 64, 77.5, and 116). FWS observed that the draft EA did not address the Alabama sturgeon and inquired whether or not Commission staff planned to analyze potential project effects to this species. On January 31, 2018, Commission staff issued a supplemental analysis to address the potential project effects on the Alabama sturgeon. On February 13, 2018, FWS concurred with staff's determination on Alabama sturgeon.

On February 16, 2018, FWS issued a final BO for the federally threatened inflated heelsplitter, which completes formal consultation. The BO included reasonable and prudent measures, terms and conditions, and conservation recommendations for the inflated heelsplitter.

Response: We have updated the EA accordingly.

Comment: EPA commented that, because of the potential for impacts to aquatic life and impacts to threatened species, EPA supports close coordination with the FWS.

Response: We have been in close coordination with the FWS regarding threatened and endangered species since the draft EA was issued on June 29, 2017. Below is a summary of our coordination.

- June 29, 2017 – Draft EA issued
- June 30, 2017 – FERC staff issued a letter to FWS requesting consultation under the Endangered Species Act (ESA) (i.e., formal consultation for inflated heelsplitter and informal consultation for ovate clubshell, southern clubshell, wood stork, and northern long-eared bat)
- August 9, 2017 – FWS filed a letter concurring with staff determinations for informal consultation and commenced formal consultation.
- November 27, 2017 – FWS's draft BO for inflated heelsplitter was filed.
- December 6, 2017 – FERC staff issued comments on FWS's draft BO.
- January 31, 2018 – FERC staff issued a supplemental analysis of project effects to include the Alabama sturgeon and requested concurrence with our conclusion that licensing the Demopolis Project is not likely to adversely affect the Alabama sturgeon.
- February 13, 2018 – FERC staff receive a letter from FWS (dated February 8, 2018) indicating it concurred with our determination of "may affect, not likely to adversely affect" the Alabama sturgeon.
- February 16, 2018 – FERC staff received FWS's final BO for the inflated heelsplitter.

Comment: Condition 1 of FWS's BO would require Birch Power to conduct construction/dredge activities as proposed and implement best management practices (BMPs) during all proposed construction/dredge activities.

Response: We are recommending the implementation of BMPs during construction/dredge activities as conditions of any license issued. BMPs for construction and dredge activities would be best implemented through an erosion control plan. Birch Power proposes to develop an erosion control plan that would include measures consistent with BMPs to minimize erosion, contain sediment, stabilize soils after construction is complete, and minimize and monitor turbidity. In section 5.1.2, *Additional Staff-recommended Measures*, we present our justification for recommending that Birch Power develop an erosion control plan with BMPs. We also recommend that Birch Power implement the proposed revegetation plan that includes BMPs for minimizing soil disturbance and stabilizing soils.

Comment: Condition 1 of FWS's BO would also require Birch Power to provide the FWS, for review and approval, the erosion control plan, spoils disposal plan, revegetation plan, recreation management plan, riverbed scour and shoreline stability plan, oil and hazardous substances plan, water quality monitoring and management plan, and a plan to monitor and remedy project caused aggradation in the project area, a minimum of 60 days prior to construction activities.

Response: This provision of condition 1 of FWS's BO is administrative in nature and not an environmental measure. Accordingly, we do not analyze this provision in the final EA. Nevertheless, our recommendation is that any license to construct and operate the Demopolis Project would require Birch Power to develop the plans in consultation with the resource agencies, including FWS, prior to the final plans being filed with the Commission. The Commission usually requires that the licensee allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plans with the Commission. The Commission also usually requires that final plans be filed with the Commission at least 90 days prior to any ground disturbing activities. Thus, the FWS would able review and approve the plans well in advance of 60 days before construction. Final approval of the plans, however, would come from the Commission.

Comment: Condition 1 of FWS's BO also would require Birch Power to hold annual coordination meetings for the first 5 years after construction is complete to review the effectiveness of the erosion control plan, and the riverbed scour and shoreline stability plan to assess if changes are necessary.

Response: The EA has been updated to include an analysis of condition 1 of FWS's BO in section 3.3.1.2, *Construction Effects on Geology and Soils and section 3.3.1.2, Operational Effects on Geology and Soils*. In section 5.1.3, *Measures Not*

Recommended by Staff, we present our justification for not recommending, pursuant to section 10(a) of the FPA, annual coordination meetings for the first 5 years after construction is complete to review the effectiveness of the erosion control plan and riverbed scour and shoreline stability plan to assess if changes are necessary. However, we recognize that pursuant to the ESA, the measure may need to be a condition of any license issued for the proposed project.

Comment: Condition 2 of FWS's BO would require Birch Power to provide a copy of the mussel relocation plan to the FWS for review and concurrence, and to the Commission and the Corps for review. FWS's BO would also require Birch Power to provide the mussel relocation plan to FWS, the Commission, and the Corps, 2 weeks prior to any mussel collection and relocation.

Response: As indicated in section 3.3.2.2, *Construction Effects on Aquatic Organisms and Habitat* at footnote 107, the specific provision above is not an environmental measure and thus we did not analyze it in the final EA. However, we acknowledge that plans required by the license should be made available to the stakeholders, including FWS. We also recognize that the resource agencies require adequate time to review the mussel relocation plan prior to implementation. Appropriate timeframes would be included in any license requirements.

Comment: In the BO, under *Terms and Conditions*, FWS states that, "Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service's, Law Enforcement Office (USFWS LE-Daphne, AL (251-441-5787)). Additional notification must be made to the Fish and Wildlife Service's, AFO (251/441-5181). Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury."

Response: Pursuant to section 10(a) of the FPA, we recommend including the above measure stipulated by FWS's BO as a condition in any license issued for the project.

Comment: In the BO, FWS includes a conservation recommendation (#1) for FERC to continue working and coordinating (i.e., early coordination) with the resource agencies to monitor inflated heelsplitter populations across their range, where they occur in areas adjacent to FERC and Corps projects. FWS includes a second conservation recommendation (#2) for FERC to utilize programs under its purview to fund studies or conservation projects aimed at recovering, conserving, and restoring threatened or endangered species and/or their habitats within their current range (e.g., coordination and participation with the Strategic Habitat Units (http://www.alh2o.org/).

Response: We recognize that monitoring inflated heelsplitters across their range, and funding studies or conservation projects could help to understand the species' status and recovery needs, and foster the recovery of threatened and endangered species. However, this proceeding is specific to the licensing of the Demopolis Project. If licensed, the construction and operation of the Demopolis Project would not affect inflated heelsplitters, Alabama sturgeon, wood stork, or northern long-eared bat across their range. There is no nexus to those populations located in areas unaffected by project construction and operation. Further we are recommending several measures in section 5.1, *Comprehensive Development and Recommended Alternative* that would minimize any potential effects of project construction and operation on listed species. In addition, and with respect to conservation recommendation #2, Commission policy does not typically support funding requirements, especially those that are unspecified and without a full nexus to the project.[248] We do not recommend including conservation recommendations #1 and #2 as license requirements.

Comment: In the BO, FWS includes a third conservation recommendation for FERC to work with the Corps to develop conservation measures to promote greater public access and use, such as placement of fishing piers or walking trails.

Response: In section 5.1.2, *Additional Staff-recommended Measures*, we recommend that Birch Power develop a recreation management plan, in consultation with the Corps and Alabama DCNR that provides for the proposed recreation improvements, including the results of a feasibility assessment for a north bank recreational fishing access facility for bank fishing, and the management of the project recreation facilities. We find that this measure would be adequate for promoting greater public access and use, and we do not recommend any additional measures.

Comment: Birch Power's July 25, 2017, comments on the draft EA state that the seasonal time constraints on project construction in the staff-recommended species protection plan would render the project infeasible because it would increase the overall construction time, the cost for cofferdams and other dewatering measures, and the risk of cofferdam failure. Birch Power requests that the species protection plan be modified to substitute an alternative wood stork and northern long-eared bat conservation measure that is commensurate with the impacts and allows continuous construction throughout the summer months to take advantage of low water conditions. Birch Power also suggests that the $5,000 estimated capital cost of this measure (EA, p. 216) could be contributed to habitat improvement projects for these species through the Alabama DCNR or FWS.

Subsequently, in an email filed on October 25, 2017, FWS clarified that it typically allows tree removal during the inactive period for northern long-eared bats (i.e.,

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[248] *See Settlements in Hydropower Licensing Proceedings Under Part 1 of the Federal Power Act*, 116 FERC ¶ 61,270 (2006) at P 26.

October 15 through March 31), and that "…once the trees are removed there would no longer be any impacts[249] to this species." In a letter filed on November 30, 2017, FWS based on the 4(d) rule and the biological opinion associated with the listing of the northern long-eared bat, as long as the trees are removed during the bat inactive season of October 15 through March 31, there would be a "may affect, not likely to adversely affect" for this species. In the same letter, FWS stated that it received additional site specific information from the Corps' Demopolis Lock and Dam project manager, indicating that no wood storks have been documented in the project area during the last eleven years.[250] FWS also stated that it agreed with the staff recommended protection measures for wood storks as described in the draft EA, but clarified that implementing the measures would be necessary only when/if wood storks are present.

Response: Staff modified the species protection plan to be consistent with FWS's recommendations for northern long-eared bats and wood storks on October 25, 2017, and November 30, 2017, as well as the 4(d) rule for northern long-eared bats.

MOU/Other

Comment: EPA comments that the draft EA does not include information regarding coordination with the Corps, stating their awareness of the July 20, 2016 Memorandum of Understanding (MOU) between FERC and the Corps.

Response: The MOU between FERC and the Corps was crafted after this relicensing proceeding began. Nevertheless, the Corps is on the project's mailing list and was consulted as a participant in the relicensing proceeding. Additionally, on July 11, 2013, we issued the notice of application tendered for filing with the Commission and soliciting additional study requests, in which we asked for agencies who wished to cooperate in the preparation of the environmental document.

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[249] Staff assumes that FWS refers to the direct impacts of tree removal here, and not the indirect impacts to northern long-eared bats associated with the loss of potentially suitable habitat. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the proposed action and occur later in time but still are reasonably certain to occur.

[250] No other details were provided about the documentation of wood stork's use of the project area. Therefore, staff assumes that the Corps refers to anecdotal observations of Corps staff working at the Demopolis Lock and Dam and not wood stork surveys.

Other/Commission Settlement Policy

Comment: WestRock comments that the adoption of staff recommendations that diverge from the Settlement terms would be fundamentally inconsistent with the Commission's policy of encouraging settlements, and in the final EA, staff should recommend adoption of all proposed license articles from the Settlement, without modification.

Response: The Commission has previously stated that it favors settlements in licensing cases. When parties are able to reach settlements time and money can be saved, positive relationships among entities can be formed, and the Commission is able to gain a clear sense of the parties' views on the issues. However, the Commission's policy on settlements looks not only to the wishes of the settling parties, but also at the greater public interest, and whether settlement proposals meet the comprehensive development/equal consideration standard.[251] Our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative* of the EA, reflect our responsibility to meet these standards. In some cases doing so means that we do not recommend adoption of proposed license articles included in the Settlement.

Other/Construction BMPs

Comment: EPA recommends that diesel controls, cleaner fuel and cleaner construction practices be used for transportation, soil movement, or other construction activities, including: (1) strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and (2) use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, engine replacement, or newer, cleaner equipment.

Response: The EA has been updated to include an analysis of EPA's recommendation in section 3.3.2.2, *Construction Effects on Water Quality*. In section 5.1.3, *Measures Not Recommended by Staff*, we present our justification for not recommending a requirement in a license for emission control strategies or technologies during construction.

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[251] *See* Settlements in hydropower licensing proceedings under part I of the Federal Power Act, 116 FERC ¶ 61, 270 (2006) at P 1-4.

APPENDIX B

U.S. DEPARTMENT OF INTERIOR'S BIOLOGICAL OPINION ACTION AREA, REASONABLE AND PRUDENT MEASURES, TERMS AND CONDITIONS, AND CONSERVATION MEASURES

ACTION AREA

The project site (Figure l) located at approximately, 32° 30' 53.07" N, -87° 52' 29.28" W, consists of river bottom approximately 900 feet above the dam and approximately 1,880 feet below the dam at Demopolis in Marengo County, Alabama. The proposed project will remove approximately 656,000 cubic yards of sediment affecting approximately 45 acres of water bottoms from the Tombigbee River and a total of approximately 140 acres of uplands, wetland, river bank and water bottom. The approximately 140 acres will increase when the spoil disposal area is identified. On the north side of the river, the project would include a 1.2-mile-long, 25-foot-wide access road, and a parking area at the powerhouse. Project power would be transmitted from the powerhouse to an electrical substation located on top of the powerhouse, and from there through a new 4.4-mile-long, 115-kilovolt transmission line to an existing distribution line.

The Service has described the action area (Figure 3) to include the approximately 140 acre (the project area boundary directly below the dam to include the wetlands and the area above the dam for the intake). It also includes the southern bank of the Tombigbee River, south of the tailrace, below the locks and all the area between the dam and the boat ramp (32.52 13 13 N, -87.891408 W). The Service included this area due to the high likelihood of changes in river dynamics affecting species.

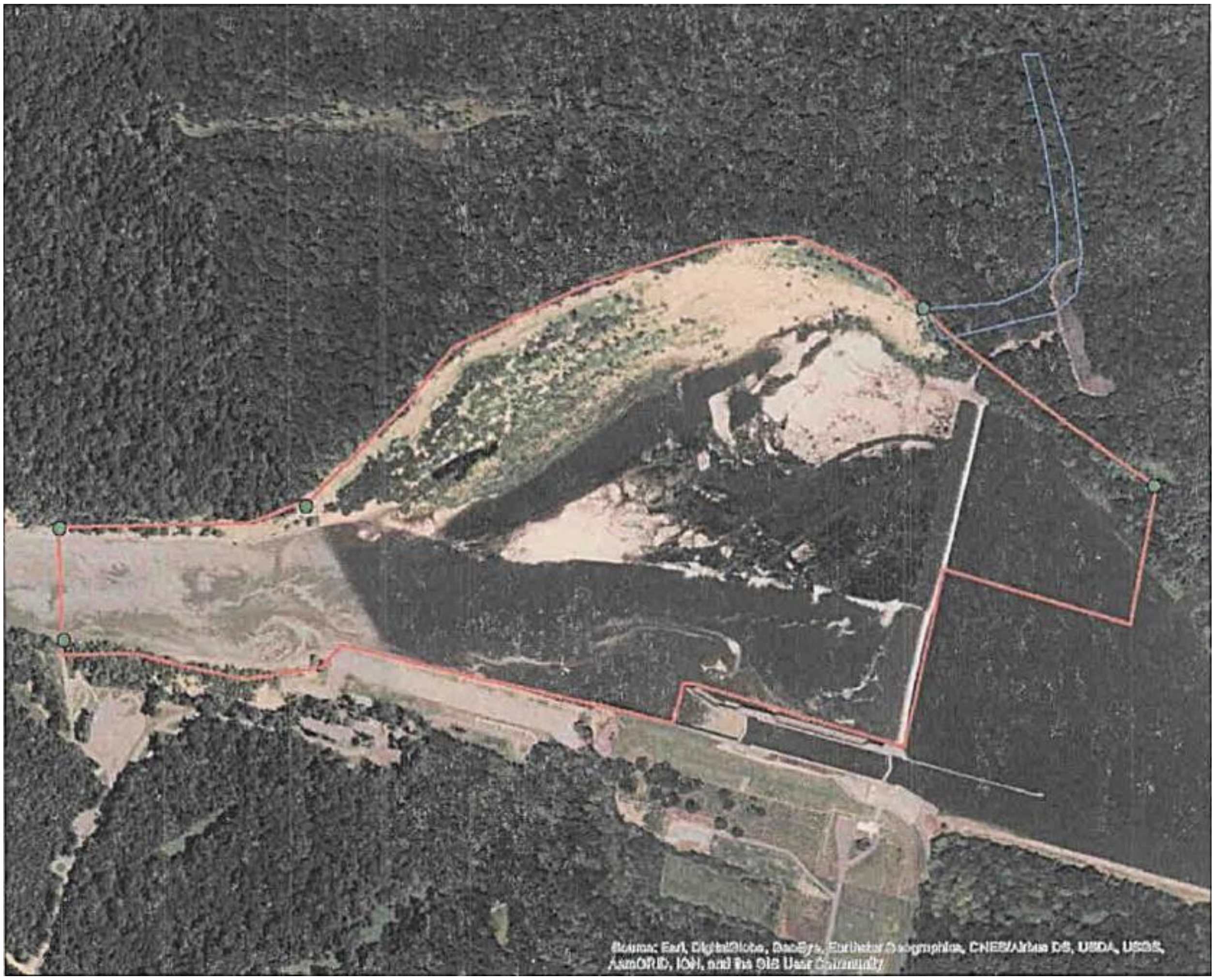

Figure 3. The approximately 140 acres the Service identified as the Action Area (outlined in red).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure(s) are necessary and minimize impacts of incidental take of inflated heelsplitter:

1. Implement best management practices implemented to minimize sedimentation resulting from pre-construction/dredge and construction/dredge activities.

2. Conduct Pre and Post construction mussel surveys minimizing impacts to mussels at the site.

3. Minimize impacts from spoil disposal, recreational enhancements, revegetation activities, streambed erosion, shoreline stability issues, and river hydrology changes.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the applicant must comply with the following terms and conditions, which carry out the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Conduct construction/dredge activities as proposed and implement best management practices during all proposed construction/dredge activities.

   Provide the Service for review and approval, the erosion control plan, spoil disposal plan, revegetation plan, recreation management plan, riverbed and scour stability plan, oil and hazardous substances plan, water quality monitoring and management plan, and a plan to monitor and remedy project caused aggradation in the project area, a minimum of 60 days prior to construction activities.

   For five years, hold post construction annual coordination meetings to review the effectiveness of the erosion control plan, and the riverbed and scour stability plan to assess if changes are necessary.

2. A mussel relocation plan will be provided to the Service's AFO for review and concurrence. A copy will also be sent to FERC and USACE for their review/records. The plan will identify the survey methods and identifying the proposed relocation site. The Service, FERC, and USACE should receive this plan at least two weeks prior to the proposed collection and relocation.

   No more than 30 days prior to the construction/dredging activities, surveys will be conducted for habitat suitability and federally listed threatened or endangered species.

   Mussel relocation efforts will be conducted only by divers qualified and experienced in handling mussels and must hold valid state and federal permits. Copies of these valid permits should be attached to the relocation plan.

   All mussels collected for relocation will be identified, counted, inventoried, and photographed. Mussels should be kept in mesh bags in site water prior to removal or kept moist and cool by covering with a wet blanket or sack, and kept out of direct sunlight. If mussels are removed from a moist, cool environment they should not remain unprotected more than 10 minutes. Precautions to minimize stress to mussels should be used at all times.

   All mussels found within the action area will be collected and relocated to areas of a suitable habitat just below the dam. To prevent the re-colonization of mussels into the project area, the permitted instream construction/dredging will begin within 30 days of the conclusion of the survey. If construction/dredging is not initiated within the required 30 days, the project area must be resurveyed and mussels relocated prior to any of the permitted instream construction.

All mussels will be hand-placed within relocation sites in suitable habitat and in a natural position. Precautions should be taken to ensure each mussel is firmly embedded and stabilized in the substrate. This procedure should be included and illustrated in the relocation plan.

A report will be prepared following the completion of all mussel relocation work describing efforts, habitat description, problems and solutions, results, and conclusions. Maps with coordinates should be included, showing the work and relocation areas. This report will be provided to the Service's AFO within 90 days after the completion of all mussel relocation efforts.

Develop post-monitoring of the relocation area and post-monitoring of the construction/dredge area to document re-establishment of mussels. The post construction surveys will be conducted one year post construction and then every three years thereafter for ten years (for a total of 4 post construction surveys).

Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service's, Law Enforcement Office (USFWS LE-Daphne, AL (251-441-5787)). Additional notification must be made to the Fish and Wildlife Service's, AFO (251/441-5181). Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that any inflated heelsplitter mussel located within – 140 acre action will be incidentally taken. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. FERC or USACE must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION MEASURES

Section 7(a)(l) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

The Service recommends that the action agencies consider implementing the following conservation recommendations:

1. Continue working and coordinating (i.e., early coordination) with the resource agencies to monitor inflated heelsplitter populations across their range, where they occur in areas adjacent to FERC and USACE projects.

2. Utilize programs under their purview to fund studies or conservation projects aimed at recovering, conserving, and restoring threatened or endangered species and/or their habitats within their current range (e.g., coordination and participation with the Strategic Habitat Units (http://www.alh2o.org/).

3. Work with USACE Demopolis to develop conservation measures to promote greater public access and use, such as placement of fishing piers or walking trails.