DOWNSTREAM RELEASE ALTERNATIVES

PHASE 1 REPORT

R.L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

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1.0 INTRODUCTION

Alabama Power Company (Alabama Power) owns and operates the R.L. Harris Hydroelectric Project (Harris Project), licensed by the Federal Energy Regulatory Commission (FERC or Commission) (FERC Project No. 2628). The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources.

Alabama Power began operating the Harris Project in 1983. Initially, the Harris Project operated in peaking mode with no intermittent flows between peaks. Agencies and non-governmental organizations requested that Alabama Power modify operations to potentially enhance downstream aquatic habitat. In 2005, based on recommendations developed in cooperation with stakeholders, Alabama Power implemented a pulsing scheme for releases from Harris Dam known as the Green Plan (Kleinschmidt 2018a). The purpose of the Green Plan was to reduce the effects of peaking operations on the aquatic community downstream. Although Green Plan operations are not required by the existing license, Alabama Power has operated Harris Dam according to its guidelines since 2005. A copy of the Green Plan Release Criteria is provided in Appendix B.

The purpose of the Green Plan was to, within the physical and regulatory limits of the plant and equipment, reduce the effects of various hydropower operations on the downstream aquatic and environmental resources. From 2005 to 2017, the Alabama Cooperative Fish and Wildlife Research Unit (ACFWRU) conducted monitoring of shallow-water fish and benthic macroinvertebrate communities which has indicated a positive fish community response and increased shoal habitat availability (Irwin et al. 2011). However, some stakeholders noted that the temperature of the turbine releases could have potential effects on aquatic resources in the Tallapoosa River below Harris Dam.

1.1 Study Background

Alabama Power is using the Integrated Licensing Process (ILP) to obtain a new license for the Harris Project from FERC. During stakeholder one-on-one meetings and at an October 19, 2017 Issue Identification Workshop, stakeholders requested that Alabama Power evaluate Green Plan releases compared to the pre-Green Plan peaking flows. Stakeholders also commented that alternative downstream release scenarios should be evaluated as part of the relicensing process. On November 13, 2018, Alabama Power filed ten proposed study plans for the Harris Project, including a study plan for downstream release alternatives. FERC issued a Study Plan Determination on April 12, 2019, which included FERC staff recommendations. Alabama Power incorporated FERC's recommendations and filed the Final Study Plans with FERC on May 13, 2019.

Alabama Power formed the Harris Action Team (HAT) 1 to evaluate downstream release alternatives in the Tallapoosa River downstream of Harris Dam. Alabama Power held a HAT 1 meeting on September 11, 2019, to discuss the models, the methods, and the model inputs and outputs (how the model will be used) for the Downstream Release Alternatives Study.

Based on stakeholder input, the Downstream Release Alternatives Study evaluates the effects of pre- and post-implementation of the Green Plan operations, a continuous minimum flow of 150 cfs (which is roughly the equivalent daily volume of three ten-minute pulses), and an alternative/modified Green Plan operation[1] (e.g., changing the time of day in which Green Plan pulses are released) on Harris Project resources. In addition to these four alternatives, Alabama Power will also evaluate:

- A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gauge, rather than the current 75%;
- A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;
- 300 cfs continuous minimum flow;
- 600 cfs continuous minimum flow; and a
- 800 cfs continuous minimum flow.[2]

[1] The alternative/modified Green Plan operation downstream release alternative will be evaluated as part of Phase 2. Results from the other three scenarios as well as from the Downstream Aquatic Habitat Study, Aquatic Resources Study, and Recreation Evaluation Study are needed to design the alternative to be studied.

[2] Due to the timing of receiving the requests to evaluate these alternatives, impacts to existing operational parameters, including reservoir levels, hydropower generation, flood control, navigation, and drought operations will be included in the Phase 2 Report.

This study is being conducted in two phases. In Phase 1, Alabama Power has used models developed in other Harris Project FERC-approved relicensing studies and conducted modeling simulations using specific methods, tools, and processes (as described in the FERC-approved Study Plan) to evaluate impacts to existing operational parameters, including reservoir levels, hydropower generation, flood control, navigation, and drought operations. In Phase 2, Alabama Power will analyze the effects of each downstream release alternative on other resources, including water quality, water use, erosion and sedimentation (including invasive species), downstream aquatic resources (temperature and habitat), wildlife and terrestrial resources, threatened and endangered species, recreation, and cultural resources. This report describes the results of Phase 1 of this study.

2.0 GEOGRAPHIC SCOPE AND MODEL BOUNDARIES

The FERC-approved geographic scope (i.e., the study area) of this study corresponds with the physical area and/or resources influenced by the proposed operational change, which may or may not be consistent with the Harris Project boundary. The Harris Project operations have direct, indirect, and potential cumulative effects on Harris Lake and downstream Tallapoosa River resources. The area of project influence is the Harris Reservoir and Tallapoosa River downstream of Harris Dam through Horseshoe Bend. Because the Alabama-Coosa-Tallapoosa (ACT) is operated as a system and is set up as such in the various models, the impacts of the release alternatives on operational parameters must be evaluated accordingly. The geographic scope of analyses for each operational parameter for Phase 1 is listed in Table 2-1. Section 2.1 describes the model boundaries, which represent a physical area included in the various models used in the study.

TABLE 2-1 SUMMARY OF OPERATIONAL PARAMETERS, GEOGRAPHIC SCOPE, AND RATIONALE

OPERATIONAL PARAMETER	GEOGRAPHIC SCOPE	RATIONALE
Harris Operating Curve	Harris Reservoir	Effects on Harris Reservoir levels
Hydropower Generation	Alabama Power's Coosa and Tallapoosa Projects	Effects on hydropower generation would impact system-wide operations
Flood Control	Lake Harris and Harris Dam to Montgomery Water Works	Model parameters are set to evaluate flood operation effects to Montgomery Water Works
Navigation	ACT Basin	Model parameters are set to evaluate effects on the ACT Basin per the USACE Master Water Control Manual
Drought Operations	ACT Basin	Model parameters are set to evaluate effects on the ACT Basin per the USACE Master Water Control Manual

2.1 Model Boundaries

The following sections describe the ACT river basin as used in the various models used in this study. The ACT network extends from Carters Dam and Allatoona Dam, both upstream of Alabama Power's hydroelectric projects on the Coosa River, and from Harris Dam, on the Tallapoosa River, to the tailwater of Claiborne Lock and Dam on the Alabama River. Regulation in the upper portion of the basin is provided by Carters and Allatoona Dams. The middle of the watershed is represented by eleven Alabama Power hydroelectric projects on the Coosa and Tallapoosa Rivers. The three additional federal projects on the Alabama River were also included where needed in the models.

2.1.1 Tallapoosa River

2.1.1.1 Harris Reservoir

The Harris Reservoir extends up the Tallapoosa River 29 miles from Harris Dam, which is located at River Mile (RM) 136.7 of the Tallapoosa River, with an arm also extending up the Little Tallapoosa River. There are no other major impoundments upstream of Harris Dam. There are two operating United States Geological Survey (USGS) gages upstream of Harris Dam. The Heflin gage (No. 02412000; located approximately 26 miles upstream of Harris Dam) has sixty-eight years of discharge and stage data. The Newell gage (No. 02413300; located 35.5 river miles upstream of the confluence of the Little Tallapoosa and Tallapoosa Rivers) has forty-five years of daily average discharge and stage data. Harris Reservoir receives inflows from approximately 1,454 square miles of drainage.

2.1.1.2 Harris Dam to Martin Pool

The Tallapoosa River below Harris Dam (RM 136.7[3]) is an upper basin type stream with steep slopes and narrow floodplains that include rapids. It also contains two currently operating USGS gage sites, the Wadley (No. 02414500; RM 122.79) and Horseshoe Bend (No. 02414715; RM 93.7) gages. The Wadley gage has ninety-seven years of daily flow and stage data and Horseshoe Bend has thirty-five years of daily flow and stage data. The stream channel is characterized by rock outcrops and a few sand bars. The stream is

[3] River miles in this report are consistent with the georeferenced locations in the models used for the study. This resulted in slightly different river mile values than were referenced in the Harris PAD, which were based on USACE stream mileage tables.

crossed by four highway bridges and two railroad bridges. The most populated community along this reach of the Tallapoosa River is the City of Wadley at RM 122.97. This free-flowing reach of the Tallapoosa River ends at the Martin Dam Project (FERC No. 349) reservoir near RM 88.0.

2.1.1.3 MARTIN RESERVOIR

The Martin Reservoir ranges from RM 88 to the Martin Dam at RM 60. The primary purpose of Martin Dam is hydropower generation. The Martin Reservoir receives inflows from the Tallapoosa River, representing 2,131 square miles of drainage, and local inflows from an additional 853 square miles of tributaries that flow directly into the lake.

2.1.1.4 YATES AND THURLOW RESERVOIRS

The Yates and Thurlow Project (FERC No. 2407) Dams impound the Tallapoosa River from RM 60 to RM 49.7, with the Yates pool backing up to the toe of Martin Dam. Thurlow Dam is the most downstream dam on the Tallapoosa River. These dams are located at the base of the fall line of the Tallapoosa basin. These reservoirs provide very minimal storage and simply generate power from releases at Martin Dam along with local inflows and are operated at constant levels, except during major floods. During some periods, the local inflows to these lakes are sufficient to satisfy downstream minimum flow requirements. Yates Reservoir receives inflows from approximately 3293 square miles of drainage and Thurlow Reservoir receives inflows from approximately 3308 square miles of drainage.

2.1.1.5 LOWER TALLAPOOSA RIVER

The reach of river below Thurlow Dam is a free-flowing system that enters the alluvial plain with widening floodplains and much flatter slopes. This reach of the Tallapoosa River contains approximately forty-nine miles of stream and is crossed by at least three major road bridges. Alabama Highway 229 crosses at RM 39.8; a county road bridge crosses the river at RM 18.5; and U.S. Highway 231 crosses the river at RM 9.8 and is a four-lane highway. Three USGS gage sites have data on this reach. The Tallassee (RM 47.98) gage (No. 02418500) is approximately one mile downstream of Thurlow Dam. The Milstead gage (No. 02419500) is located on the Alabama Highway 229 Bridge (RM 39.8), and the most downstream gage on the Tallapoosa River is located at the Montgomery Water Works plant (No. 02419890) at RM 12.9. A major pipeline crosses the river at RM 48.99

and the reach from the tailwaters of Thurlow to just below the pipeline remains relatively steep. The entire Tallapoosa River basin is approximately 4,687 square miles.

2.1.2 ALABAMA AND COOSA RIVERS

The Tallapoosa and Coosa Rivers merge near Montgomery to form the Alabama River. Drainage area of the Coosa, at its mouth, is approximately 10,161 square miles and the Tallapoosa is 4,675 square miles at its mouth. Therefore, the Coosa River has the greatest influence on the total flows in the Alabama River with 68 percent of the drainage area. Flows from the Coosa enter the Alabama River from two sources, Jordan and Bouldin Dams. Jordan Dam was constructed on the mainstem of the Coosa River and Bouldin Dam is a diversion lake with hydroelectric power facilities that simply draw flows from Jordan Reservoir. Jordan Dam is 19 miles upstream of the confluence of the Coosa and Tallapoosa rivers. The Alabama River flows from Montgomery west to converge with the Tombigbee River forming the Mobile River. The USACE's Robert F. Henry Lock and Dam on the Alabama River at RM 245.4, is located approximately 69 miles downstream of the confluence of the Tallapoosa and Coosa Rivers. Two USGS gages are located on the Alabama River in this 69-mile reach. These gages are identified as the "near Montgomery gage" (No. 02420000) at RM 287.7 and the "Montgomery gage" (No. 02419988) at RM 296.9.

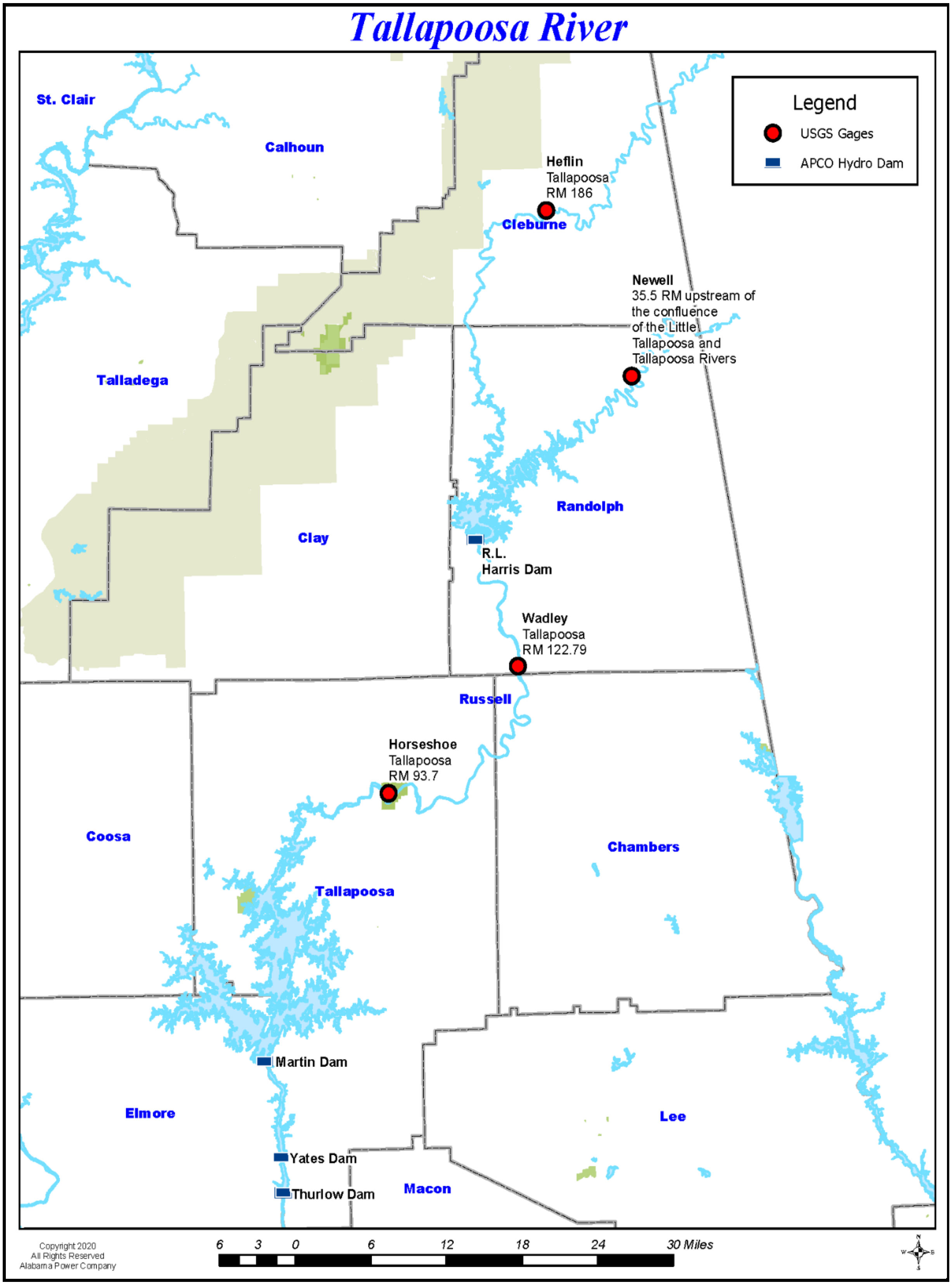

Figure 2–1 Tallapoosa River Map

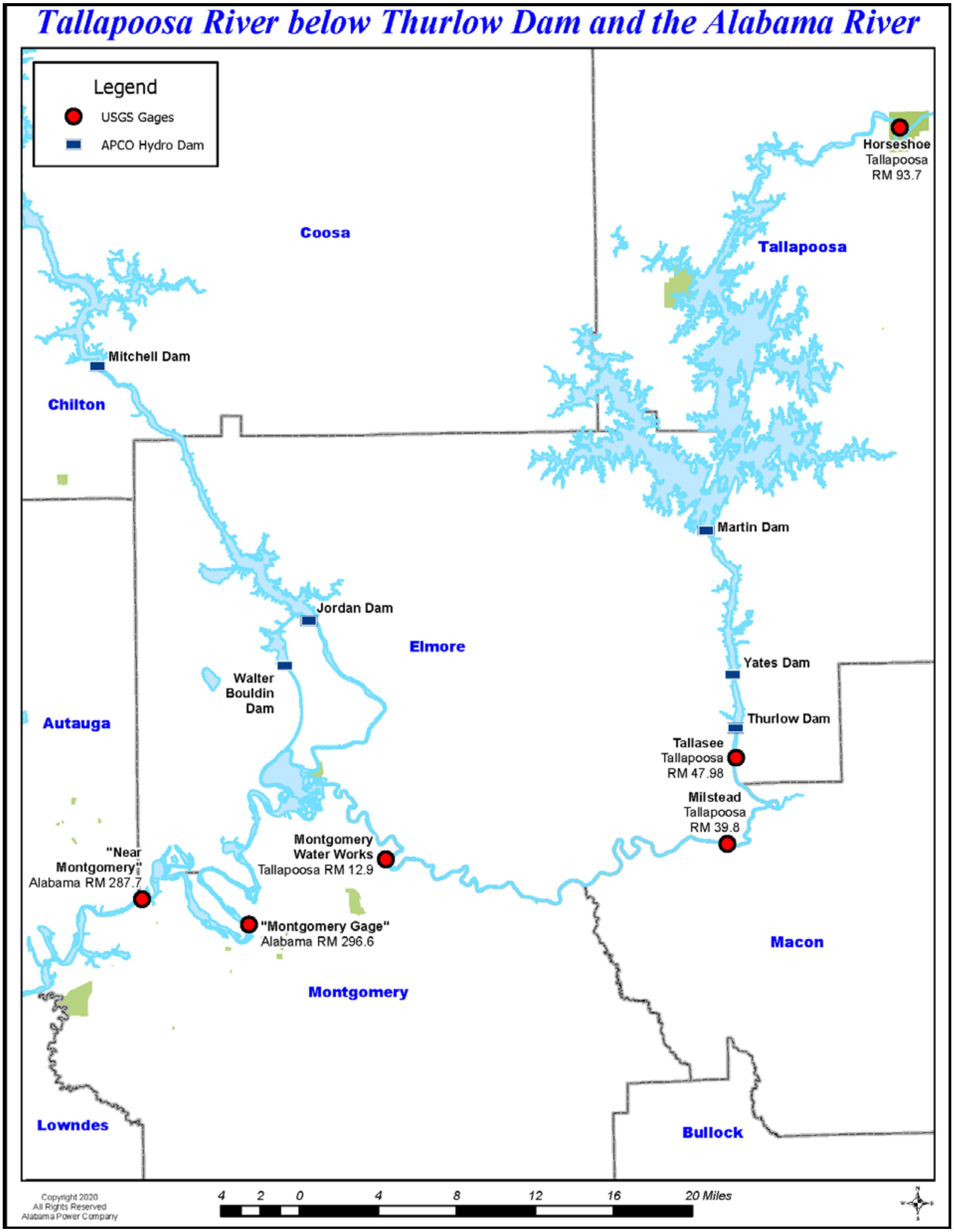

FIGURE 2–2 MAP OF THE TALLAPOOSA RIVER BELOW THURLOW DAM AND THE ALABAMA RIVER

3.0 MODEL SUMMARY

3.1 Overview

Study methods included using existing data (hydrologic record and baseline information) in order to develop the appropriate simulation models to conduct the analysis of the downstream release alternatives. The primary tool for this study is HEC-River Analysis System (HEC-RAS); however, Alabama Power used other HEC models to address the effects of downstream release alternatives.

Impacts to the Harris Project were evaluated by modeling the current operations combined with each downstream release alternative through the daily HEC-Reservoir Simulation Model (HEC Res-Sim) for the ACT basin. During Phase 2 of this study, the outflow hydrographs from HEC-ResSim will be routed downstream using HEC-RAS to assess effects on Project resources.

Alabama Power used the following data and models to conduct the analysis of the downstream release alternatives.

DATA

1. Alabama-Coosa-Tallapoosa (ACT) unimpaired flow database – this database was developed by the USACE with input and data from other stakeholders in the ACT comprehensive study, including both the states of Georgia and Alabama, Alabama Power, and others. The unimpaired flow data set that served as a basis for the 2010 critical yield analysis for the ACT Basin included data for the period from 1939 through 2008. Subsequently, the unimpaired flow dataset has been extended through 2011[4]. This dataset includes average daily flows from 1939 – 2011 with regulation influences removed.

2. Other data – Other data sources include daily and hourly USGS, USACE, and Alabama Power records.

[4] Although when developing the study plan Alabama Power anticipated the dataset to include the years 1939-2016, the unimpaired dataset provided by the USACE includes 1939-2011.

MODELS

1. HEC-River Analysis System (HEC-RAS) – This hourly time step model was used to route flows in the unsteady state[5] along the river. This model will be used to assess effects of alternative release scenarios on boatable days, wetted perimeter, and temperature. During Phase 2, model inputs will also include data from other ongoing studies.

2. HEC-ResSim – This model was used, on a daily timestep, to evaluate the ability of Alabama Power to maintain the operating curve at the Harris Reservoir under the various downstream release alternatives. In Phase 2 of this study, this model will look at, if applicable, operational changes at the Harris Project in conjunction with operating curve changes on an hourly timestep. It will focus on the hourly flood study operations. This model, in conjunction with the HEC-RAS model, will show impacts, if applicable, to the Martin Dam Project operations.

3. HEC-Data Storage System and Viewer (HEC-DSSVue) – This is the USACE's Data Storage System, which is designed to efficiently store and retrieve scientific data that is typically sequential. Data in HEC-DSS database files can be graphed, tabulated, edited, and manipulated with HEC-DSSVue. This program was used to display some of the output of the other HEC models.

4. Alabama Power Hydro Energy (HydroBudget) Model – This model is a proprietary daily model that is used to evaluate the net economic gains or losses that could result from downstream flow alternatives at the Harris Project.

[5] In hydraulic modeling, simulations run in the unsteady state consider the variance of flow with respect to time.

4.0 MODEL DEVELOPMENT

The respective models summarized in Section 3.0 were developed to analyze the impacts of the downstream release alternatives on operational parameters and other resources. This section discusses how the models were developed, calibrated, and/or verified.

4.1 Data Sources and Descriptions

4.1.1 Hydrologic Data

Hydrologic data was collected in the form of stream flow historic records at established gage sites. This included Alabama Power's records of releases from its dams, the ACT unimpaired flow data, and USGS published flow records at its established gage sites. Due to the extensive stream gage data, determination of runoff hydrographs from rainfall records was not necessary. For long term evaluations, average daily flows primarily from the ACT unimpaired flow data were utilized; and, for short term evaluations, hourly flows were used. Records at some gage sites only contained average daily flows. Hourly flows were interpolated at these sites by combining the average daily flows with the estimated instantaneous peak values.

4.1.2 Hydraulic Data

Hydraulic data consisted of stream gage historical stage records, highwater marks during flood events, spillway and gage ratings at the dams, and gate operation schedules for the respective structures. Seasonal reservoir levels for Harris and Martin were represented by the published flood control guide curves.

4.1.3 Topographic and Geometric Data

The channel geometry of the Tallapoosa River in the HEC-RAS model was represented using data collected during bathymetric surveys of channel cross sections between RM 136.7 and RM 88.0. The overbank geometry (i.e., the area outside of the main river channel) was represented using LiDAR data. Bathymetry data from RM 136.7 to RM 123.0 was collected by survey during two different field efforts in 1999 and 2003. The 1999 surveying effort was completed by Sublett Surveying, LLC and extended from RM 136.7

to RM 130. The 2003 surveying effort was completed by Alabama Power and extended from approximately RM 130 to RM 123. Trutta Environmental Solutions collected bathymetry data for the reach of the Tallapoosa between Wadley and the Martin reservoir in 2019 using two different survey methods. In areas with sufficient depth for boating, a Global Positional System (GPS)/Global Navigation Satellite System (GNSS) rover antenna (Trimble R10) mounted above an 200 kHz echosounder (CEE-LINE, CEE Hydrosystems) was mounted to a kayak and used to collect river bottom elevations at 1-second intervals as the surveyor paddled in a path across the river channel perpendicular to the flow. In areas where there was insufficient depth for boating, the GPS/GNSS rover antenna was mounted on a 2-meter survey rod and river bottom elevations were collected manually at approximately 10-foot intervals in a path across the river channel perpendicular to the flow. The average horizontal and vertical accuracy of these survey data was 0.08 feet and 0.15 feet, respectively. A total of 120 bathymetric cross sections between Wadley and the Martin reservoir were surveyed. Additionally, in January 2006, Alabama Power contracted Lasermap Image Plus to collect LiDAR and imagery for the reach of the Tallapoosa River from just below Tallassee to the Montgomery Water Works, and, in 2018, contracted EagleView to collect LiDAR and imagery for the Tallapoosa River downstream from Harris Dam through Horseshoe Bend. Table 4-1 provides summary metadata of the sources of elevation used for the Tallapoosa River bathymetry and overbank areas. Figure 4-1 shows the extent of each dataset in relation to the Tallapoosa River.

TABLE 4-1 ELEVATION SOURCES' METADATA

DATA SOURCE	DATE COLLECTED	RM LOCATION IN MODEL	DISTANCE / AREA COVERED	USAGE IN HEC-RAS MODEL
Sublett Surveying, LLC	1999	136.7 to 130.0	6.7 miles	Channel Bathymetry
Alabama Power	2003	130.0 to 123.0	7.0 miles	Channel Bathymetry
Trutta Environmental Solutions	2019	123.0 to 88.0	35.0 miles	Channel Bathymetry
EagleView	2018	136.7 to 88.03	185 square miles	Overbank Terrain

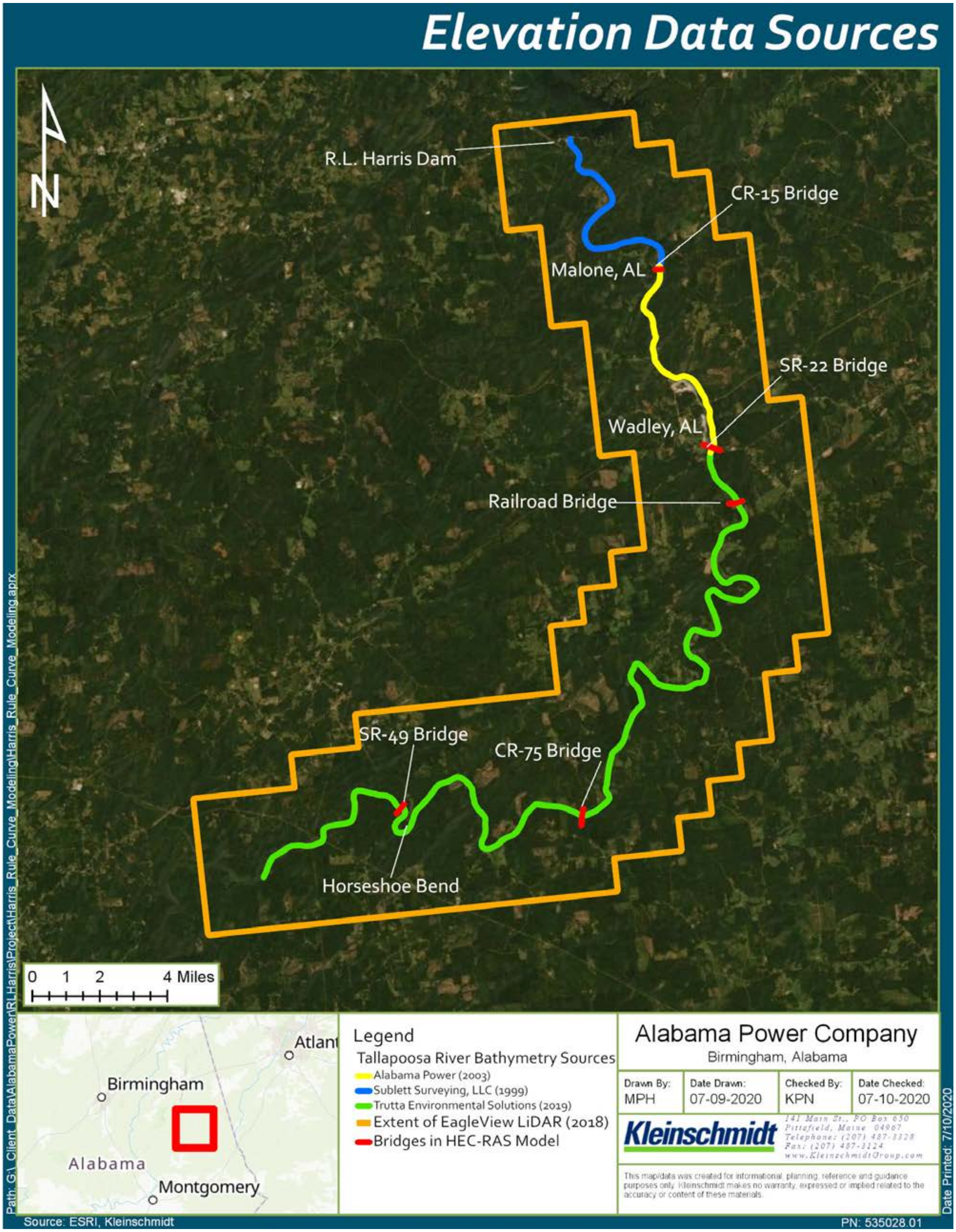

FIGURE 4–1 EXTENTS OF ELEVATION DATA SOURCES

In HEC-RAS, cross sections were drawn along the river at each location where a bathymetric cross section was collected. The data from the bathymetric cross section was imported into the model for each cross section, and LiDAR data was used for areas outside of the stream channel. Combining both datasets provided accurate representations of the terrain for the entire cross section. Dimensions of the four highway bridges spanning the Tallapoosa River between Harris Dam and Martin Reservoir were obtained from engineering drawings from the Alabama Department of Transportation. Drawings for a railroad bridge located at RM 120.9 were not available; thus, its dimensions were estimated using aerial photos and LiDAR data.

4.2 HEC-ResSim Daily Model

The ACT HEC-ResSim model was initially developed in conjunction with USACE to replace the HEC-5 model of the basin. To calibrate the HEC-ResSim model, the HEC office and USACE Mobile District entered conditions from 1977, 1995, and 2006 in both HEC-ResSim and HEC-5. Adjustments were made to the model and network until the ResSim model was able to reproduce the HEC-5 results. Working with the USACE Mobile District and HEC office, a reservoir network was developed that contained current physical and operational rules for each project in the ACT basin. The ACT reservoir network, described in Section 2.0, was further refined during the recent WCM update process. Version 3.4.1 of HEC-ResSim was used to simulate the current operations, providing a baseline condition in the model.

The ACT unimpaired flow database was used for flow data from 1939 through 2011[6]. These data include inflow and diversions for junctions in the network, along with evaporation for each reservoir. A daily time step was used in the model, which limits some operational flexibility when compared to an hourly model but allows for many alternatives to be evaluated over a long simulation period.

Harris Dam is modeled in HEC-ResSim with both a minimum requirement and a maximum constraint at the downstream gage at Wadley. This maximum limit can be exceeded when Harris Reservoir is in flood control operations and follows the induced surcharge function. There is also a minimum release requirement based on the flow at the upstream gage of Heflin. A power generation rule applies during normal and flood operations. The project

[6] Although when developing the study plan Alabama Power anticipated the dataset to include the years 1939-2016, the unimpaired dataset provided by the USACE includes 1939-2011.

is operated in tandem with the downstream reservoir, Martin, for minimum flow operations when the pool is not being operated for flood control.

4.2.1 Operational Features

4.2.1.1 Minimum Flow Operations

The reservoir network defined by the Mobile District and Alabama Power includes the current operations for all the reservoirs in the basin as best captured by a daily model. Downstream flow requirements were included in the network. To meet these requirements, the storage projects on each river act as a system. On the Tallapoosa River, Harris and Martin work in tandem to provide the Thurlow minimum flow requirement. On the Coosa River, Logan Martin, in tandem with Weiss and H. Neely Henry developments, operates through the run-of-river reservoirs to meet the flow requirement at Jordan Dam. For each of these river systems, the projects release water based on maintaining an approximately equal percentage of available storage at each project. The downstream flow requirement does include the intervening flows between the storage project discharge and the flow requirement location so that reservoir releases may be less than the measured downstream required flows.

The minimum flow requirement at Thurlow is included in the model as an operational rule at Martin, which Harris also supports by operating in tandem with Martin. This is because Yates and Thurlow are entered as flow-through projects with no operational rules, that is, the flow that enters the project also exits. The flow rule is programmed to allow a cutback during drought conditions. Depending on the month and drought intensity, the minimum flow requirement ranges from 1,200 cfs to 350 cfs. Flows at the Tallassee gage were found to meet or exceed 350 cfs for the entire period of record.

There are two minimum flows modeled at Harris Dam - a minimum flow of 45 cfs at Wadley and a release based on the previous day's Heflin flow, representing the Green Plan. The downstream minimum flow at Wadley is met with a with a flow rule of 45 cfs measured at Wadley throughout the entire year. The Green Plan is represented by a daily minimum release from Harris Dam based on the previous day's flow at the Heflin gage. The required release ranges from 85 cfs, when Heflin flows are less than 50 cfs, to 1,067 cfs, when Heflin flows are 900 cfs or higher. The Green Plan does include provisions for cutbacks in releases during periods of drought.

4.2.1.2 DROUGHT OPERATIONS

The Alabama-ACT Drought Response Operations Plan (ADROP) provides for three incremental drought intensity level responses based on the severity of drought conditions in the basin.[7] The drought intensity level (DIL), ranging from 0 to 3, is based on three triggers – basin inflow, state line flows, and composite storage.

- The basin inflow computation differs from the navigation basin inflow, because it does not include releases from Allatoona Lake and Carters Lake.
- A low state line flow trigger occurs when the Mayo's Bar USGS gage (Gage No. 02397000) measures a flow below the monthly historical 7Q10[8] flow.
- Low composite conservation storage occurs when the Alabama Power projects' composite conservation storage is less than or equal to the storage available within the drought contingency curves for the Alabama Power reservoirs.

These thresholds are evaluated on the 1st and 15th of every month in the model. The DIL increases as more of the drought indicator thresholds (or triggers) are met. The ADROP matrix defines monthly minimum flow requirements for the Coosa, Tallapoosa, and Alabama Rivers as function of DIL and time of year. Such flow requirements are modeled as daily averages. The storage volumes in the Alabama Power Coosa and Tallapoosa projects are balanced to support this release. Once a drought operation is triggered, the DIL can only recover from drought condition at a rate of one level per period (i.e., the DIL can only recover at the rate of one level every 15 days).

4.2.1.3 NAVIGATION OPERATIONS

Navigation operations in HEC-ResSim are based on basin inflows and the historical average storage usage from Alabama Power projects during a given month. Releases are made from Alabama Power projects on the Coosa and Tallapoosa Rivers, along with local inflow, in order to provide the navigation flows in the model. Basin inflow targets are designed to provide channel depths of 9.0 ft and 7.5 ft in the Alabama River below the Claiborne Lock and Dam. If a 9.0 ft channel cannot be made available due to inflows, a 7.5

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[7] Alabama Power uses ADROP as its drought operating plan for its hydroelectric projects in the Coosa and Tallapoosa river basins. The Harris Project is included in ADROP only to the extent that its storage is analyzed for the composite storage trigger.

[8] The lowest 7-day average flow that occurs, on average, once every 10 years.

ft channel is attempted, which would allow light loaded barges to move through the system. If basin inflows do not support a 7.5 ft channel, navigation releases are suspended. During drought operations, releases to support navigation would be discontinued until the DIL is equal to zero.

4.2.1.4 FLOOD CONTROL OPERATIONS

The flood control procedures in the 1972 agreement between the USACE and Alabama Power referenced in Article 13 of the existing Harris license are incorporated into the daily HEC-ResSim model. The flood control zone is defined as the area below the top of the dam and above the operating curve, ranging from 785 ft to 793 ft depending on the date. The elevation 790 ft serves as a transition elevation for flood control operations. When the reservoir elevation is above the operating curve and below 790 ft, Harris is operated to keep the Wadley gage at or below a stage of 13.0 ft, with a maximum release of 13,000 cfs. If the pool elevation exceeds 790 ft and the operating curve, releases are 16,000 cfs or greater if determined by induced surcharge curves. The 45 cfs minimum flow at the Wadley site and power operations are included in the flood control operating zone.

4.2.1.5 SPILLWAY OPERATIONS

The spillway at Harris is included in the HEC-ResSim model to capture releases from the project that exceed the turbine capacity. With the Harris flood control procedures and spillway characteristics in the daily model, spill frequency and duration can be determined. Although there is a slight underestimation of the frequency of spill (0.5 percent difference), HEC-ResSim satisfactorily models the flood control operations at Harris.

4.2.1.6 HYDROPOWER OPERATIONS

A power guide factor was used in the HEC-ResSim model to simulate the existing generation at Harris. The power guide factor relates plant factors to the percentage of power storage remaining in the reservoir. The factors represent the hours of generation per day as a function of the remaining power storage. The power guide factor creates a zone for utilizing hydropower and is comparable to the zone between the existing operating guide curve and the drought curve. Generation is employed after all flow requirements have been met. With full power storage available, Harris is programmed to generate 3.84 hours per day. These 3.84 hours per day include both peaking and nonpeaking generation (e.g., Green Plan releases, releases made for reservoir management, etc) and are based on the average number of hours a day that Harris operates over the entire year, utilizing actual historic generation data.

4.3 Harris-Martin HEC-RAS Model

As part of Phase 1, Alabama Power developed a HEC-RAS model. This model will be used during Phase 2 of the study to assess downstream impacts.

The USACE HEC-RAS software was used to develop a hydraulic model of the Tallapoosa River from immediately downstream of Harris Dam (RM 136.7) to Martin Dam (RM 60). Significant updates were made to the Tallapoosa HEC-RAS model in 2017 with, at a minimum, version 5.0.4 of HEC-RAS. Further revisions to the model were made in 2019 using the most recent version of the software, version 5.0.7.

4.3.1 HEC-RAS Model Geometry

The 2017 model was comprised of 306 1-dimensional (1D) cross sections and 6 storage areas. The storage areas were those that can backwater during flood conditions, allowing for out-of-river storage of flood waters. In the HEC-RAS model software, storage areas are represented by stage-storage relationships. The 1D cross sections included the bathymetric data collected in 1999 and 2003 for RM 136.7 to RM 123.0; however, all other cross section bathymetry downstream of RM 123.0 only had an estimated thalweg elevation and an assumed trapezoidal or triangular shape. All cross sections' overbank areas out of the river had elevation data based on coarse USGS digital elevation model (DEM) raster data.

The 2019 model geometry incorporated the recently acquired terrain data and bathymetry. As discussed in Section 4.1.3, Trutta collected bathymetry data in 2019 from RM 123.0 to RM 88.0, which, in addition to the 1999 and 2003 data, provided bathymetry from the tailwater of Harris Dam (RM 136.7) to the beginning of the Martin Pool (RM 88.0). The original cross sections between RM 123.0 and RM 88.0 were removed and replaced with new cross sections placed at each of the locations where bathymetric cross sections were surveyed in 2019. The cross sections located between RM 136.7 and RM 123.0 had bathymetric data from the previous surveys and were not removed. However, the overbank areas outside of the river channel were resampled using the LiDAR data collected in 2006 to replace the less detailed USGS DEM data for all cross sections. Artificial cross sections were interpolated between the surveyed cross sections as needed to provide adequate model stability. When cross sections were interpolated, the bathymetric data within the banks of the channel was retained but the overbank terrain was updated to match the actual overbank terrain under the interpolated cross section. This was done because the bathymetry between the surveyed cross sections was unknown and interpolating between known data was a reasonable assumption, but the overland data was available from the LiDAR and did not need to be interpolated. The final geometry with all the newly surveyed and interpolated cross sections included a total of 436 cross sections.

In addition to the changes to the cross sections, two of the storage areas located between RM 136.7 and RM 88.0 were replaced with 2-dimensional (2D) mesh areas and additional 2D mesh areas were added in areas that can backwater during floods. The 2D mesh areas perform the same function as the storage areas, which is to allow for flood waters to be stored outside of the main river during floods. However, unlike storage areas, 2D meshes are composed of many cells in a connected grid with attribute data obtained from the terrain data underlying the cells. Because the storage areas are represented by stage-storage relationships, any water contained within a storage area can immediately flow back into the river no matter how large the storage area is. Unlike storage areas, the model computes the flow into and out of each cell in each 2D mesh as the river rises and falls, and water flowing into the mesh takes time to travel out of the mesh back into the river, which more accurately simulates flood routing. Due to the improved resolution of the LiDAR data that was available, the total number of offline storage where 2D meshes were used between RM 136.7 and RM 88 was 25. The 4 remaining storage areas included in the geometry are located downstream of RM 88.0 where LiDAR data was not available.

The model includes 4 highway bridges and 1 railroad bridge spanning the Tallapoosa River. Data for the 4 highway bridges was obtained from drawings provided to Alabama Power by the Alabama Department of Transportation. Data for the railroad bridge was obtained by examining aerial imagery and the LiDAR data.

4.3.2 HEC-RAS Model Calibration

Historical flow and stage data were available from the two USGS streamflow gages between the Harris Dam and start of the Martin Pool; the gage at Wadley (RM 122.79) and the gage at Horseshoe Bend (RM 93.7). Stage-discharge rating curves for the gages were obtained from the USGS website for comparison with the model results. An unsteady state rating curve flow plan was created in the HEC-RAS model that increased flow in the river from 2,000 cfs up to approximately 80,000 cfs, which provided stage data for flows in that range at the two USGS gage locations. Model calibration was completed by adjusting the Manning's roughness values in the channel and overbanks until the model matched the historical data as closely as possible over the range of flows modeled, and flow roughness factors were used to adjust the selected Manning's values in the river with flow, since roughness typically decreases as flow increases. The HEC-RAS model results of flow versus stage at the USGS gage locations for the calibration are plotted against the historical flow versus stage data of the gages and shown in Figures 4-2 and 4-3.

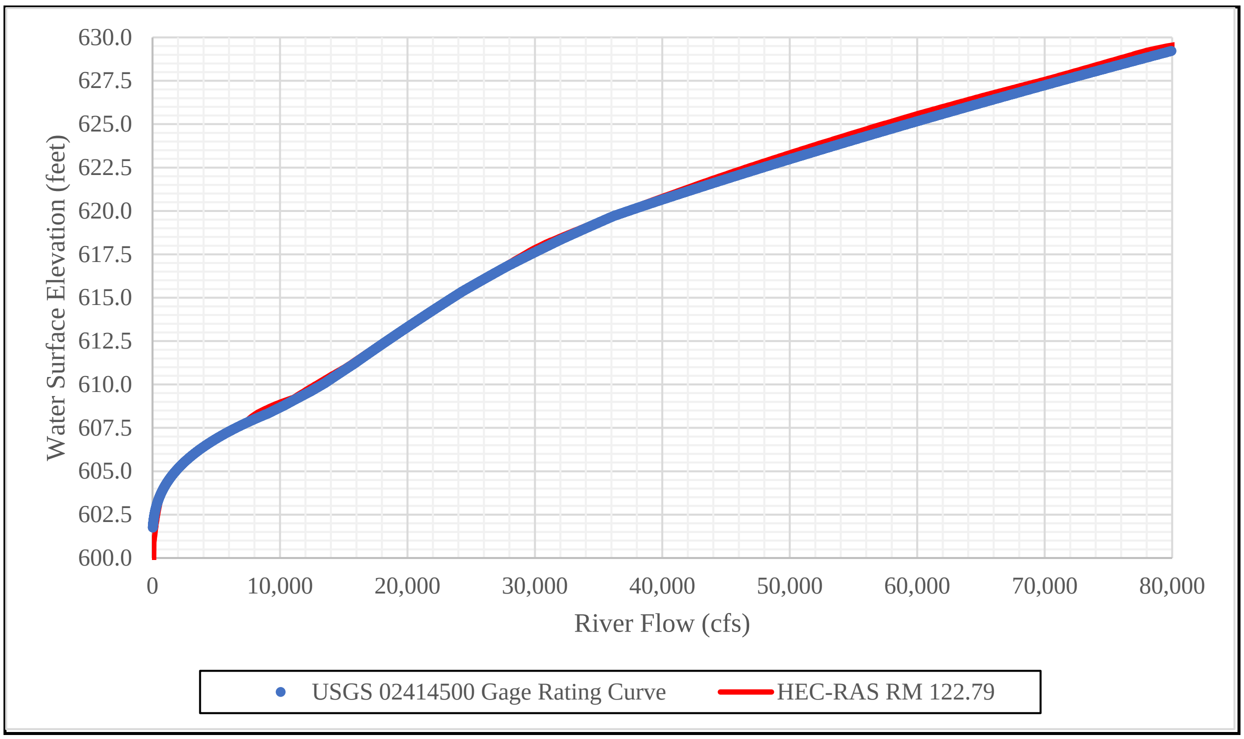

FIGURE 4–2 HARRIS-MARTIN HEC-RAS MODEL RESULTS VERSUS USGS WADLEY GAGE NO. 02414500

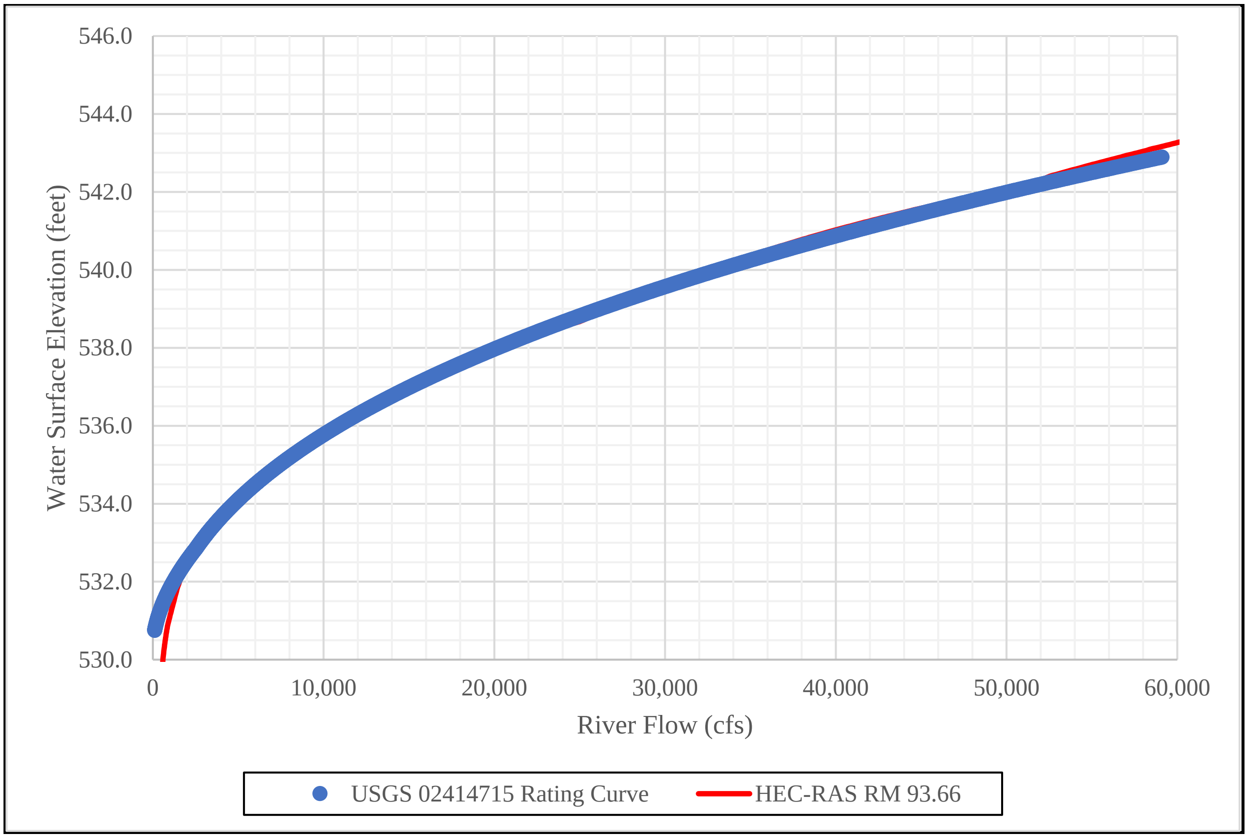

FIGURE 4–3 HARRIS-MARTIN HEC-RAS MODEL RESULTS VERSUS USGS HORSESHOE BEND GAGE NO. 02414715

4.3.3 MODEL FLOW DATA

Based on analysis of the unimpaired flow dataset, 2001 was selected as a "normal" water year as inflows to the Harris Project were closest to the median, and hourly flow data was available for that year. Since 2001 pre-dated Green Plan implementation, hourly discharge records for Harris Dam were used to model the Pre-Green Plan scenario. The Green Plan scenario was created by applying existing Green Plan rules to the Pre-Green Plan releases. The 150 cfs continuous minimum flow scenario was created by amending the Pre-Green Plan scenario such that no hourly interval had less than a 150 cfs discharge from Harris Dam.[9] Figures 4-4 through 4-7 show a monthly hydrograph from each of the four seasons

[9] Alabama Power will explain how the additional alternatives (alternative/modified Green Plan, variation of existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gauge, hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria, and 300 cfs, 600 cfs, and 800 cfs continuous minimum flow.) are created in the model in the Phase 2 Report.

of the year, showing the general differences between the three different outflows from Harris Dam (the entire year is not shown because it is not possible to identify three different curves with so much data displayed).

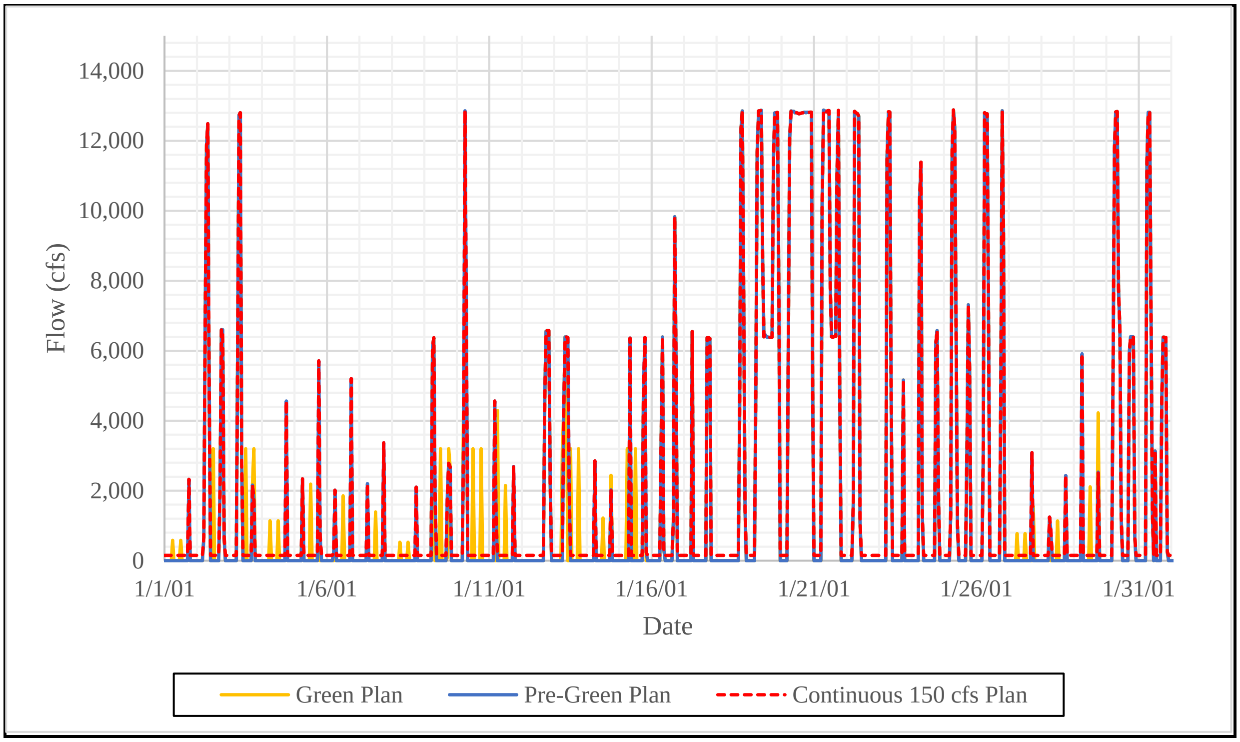

FIGURE 4–4 JANUARY HARRIS DAM DISCHARGES

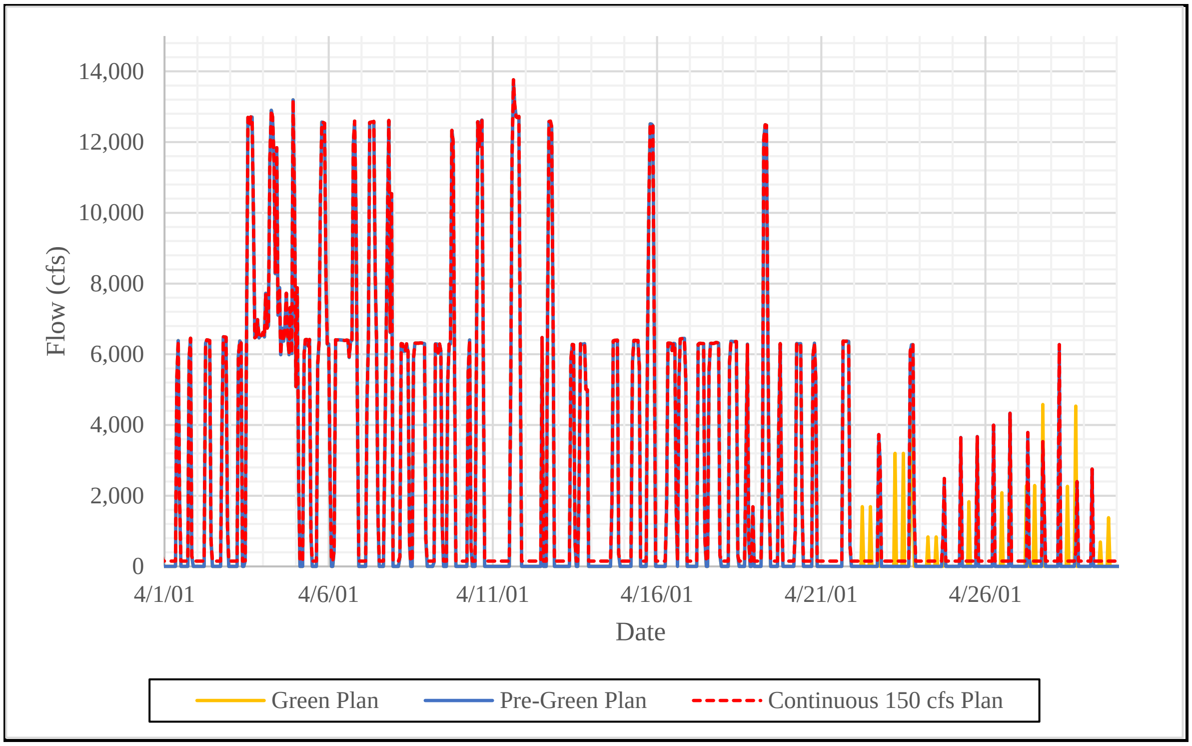

FIGURE 4–5 APRIL HARRIS DAM DISCHARGES

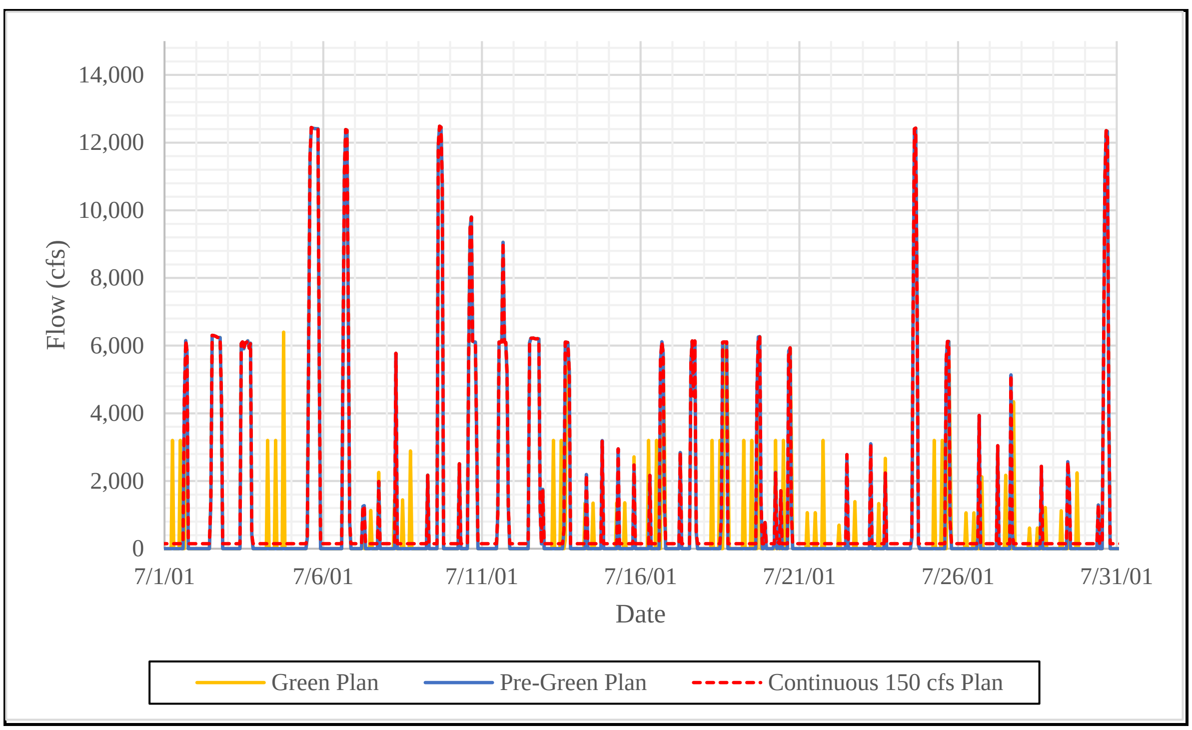

FIGURE 4–6 JULY HARRIS DAM DISCHARGES

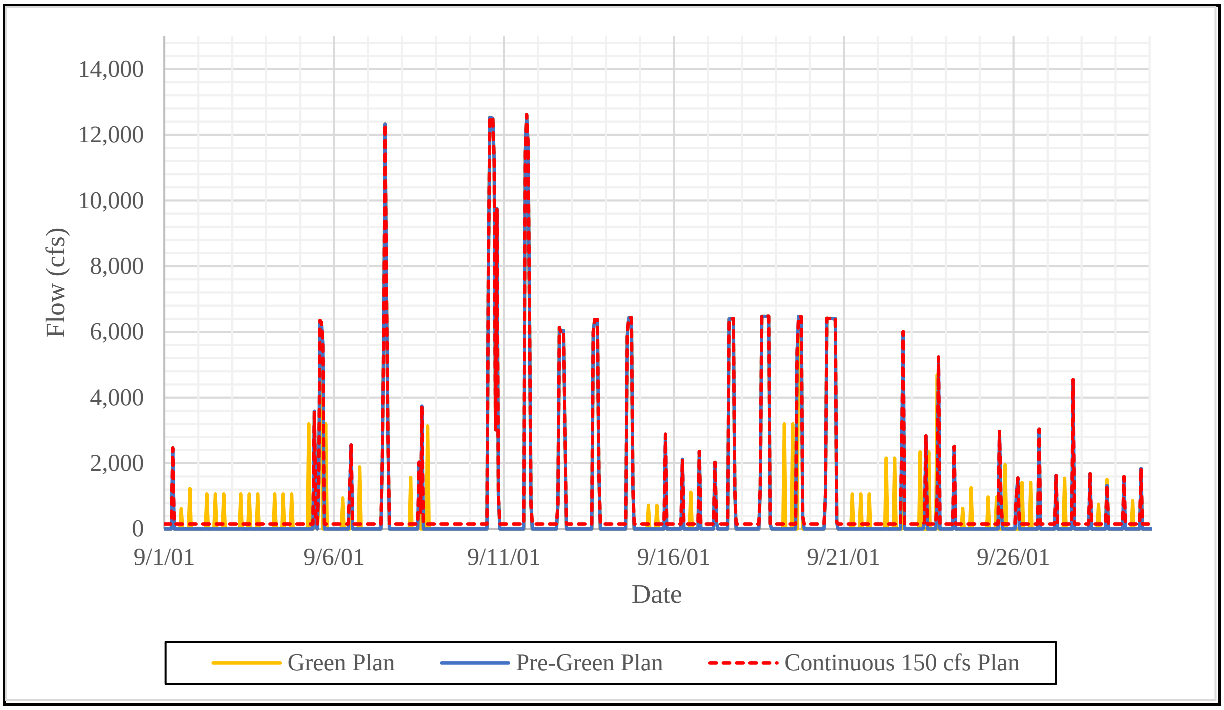

FIGURE 4–7 SEPTEMBER HARRIS DAM DISCHARGES

For all three downstream alternatives simulations, the flow data input to the model domain included the following:

- An inflow hydrograph to the Tallapoosa River at the upstream end of the model (RM 136.7) from the Harris Dam (described above);
- A uniform lateral inflow hydrograph added to the river between RM 136.6 and RM 122.7, which represented the intervening flow from the watershed between Harris Dam and the USGS gage at Wadley; and
- A uniform lateral inflow hydrograph added to the river between RM 122.7 and RM 93.7, which represented the intervening flow from the watershed between the USGS gage at Wadley and the USGS gage at Horseshoe Bend.

Data for the intervening flow hydrographs was obtained from the two USGS gages for the year 2001. Data were available in 15- and 30-minute measurements at Wadley and Horseshoe Bend, respectively, which were resampled to 1-hour measurements to match the Harris Dam discharges. The intervening flow for the watershed between the dam and the Wadley gage was determined by subtracting the Pre-Green Plan flows from Harris Dam from the discharge measured at the Wadley gage. Review of historical data found that there is an approximately 3-hour lag between the time that flow leaves Harris Dam and arrives at Wadley and was accounted for in determining the intervening flow. The intervening flow between the Wadley USGS gage and the Horseshoe Bend gage was determined by subtracting the historical Wadley flows from the flows measured at Horseshoe Bend. Review of the historical data found that there is an approximately 7-hour lag between flows leaving Wadley and arriving at the Horseshoe Bend gage. The lag time was accounted for in the determination of the intervening flow. All three downstream release alternatives hydrographs are very similar; therefore, the same intervening flows were used for the three alternatives. Figures 4-8 through 4-11 show the intervening flow hydrographs at Wadley and Horseshoe Bend for one month out of each of the four seasons of the year (the entire year is not shown because it is not possible to identify the different curves with so much data displayed).

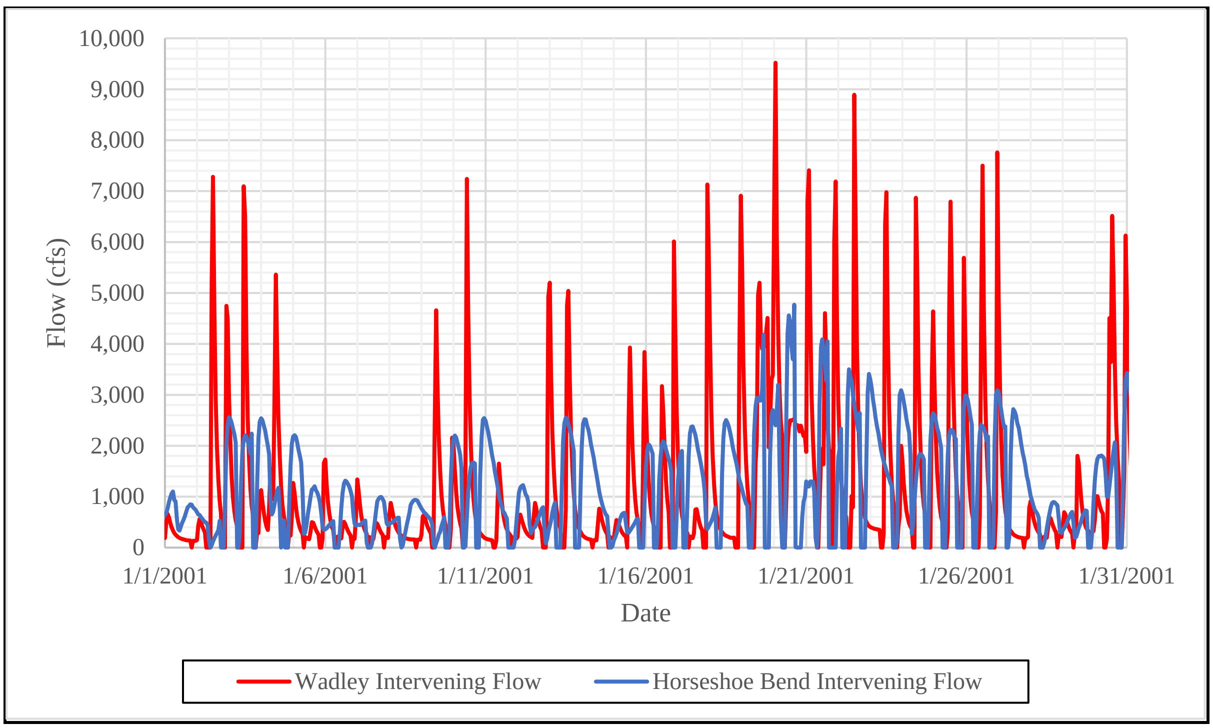

FIGURE 4–8 WADLEY AND HORSESHOE BEND JANUARY INTERVENING HYDROGRAPHS

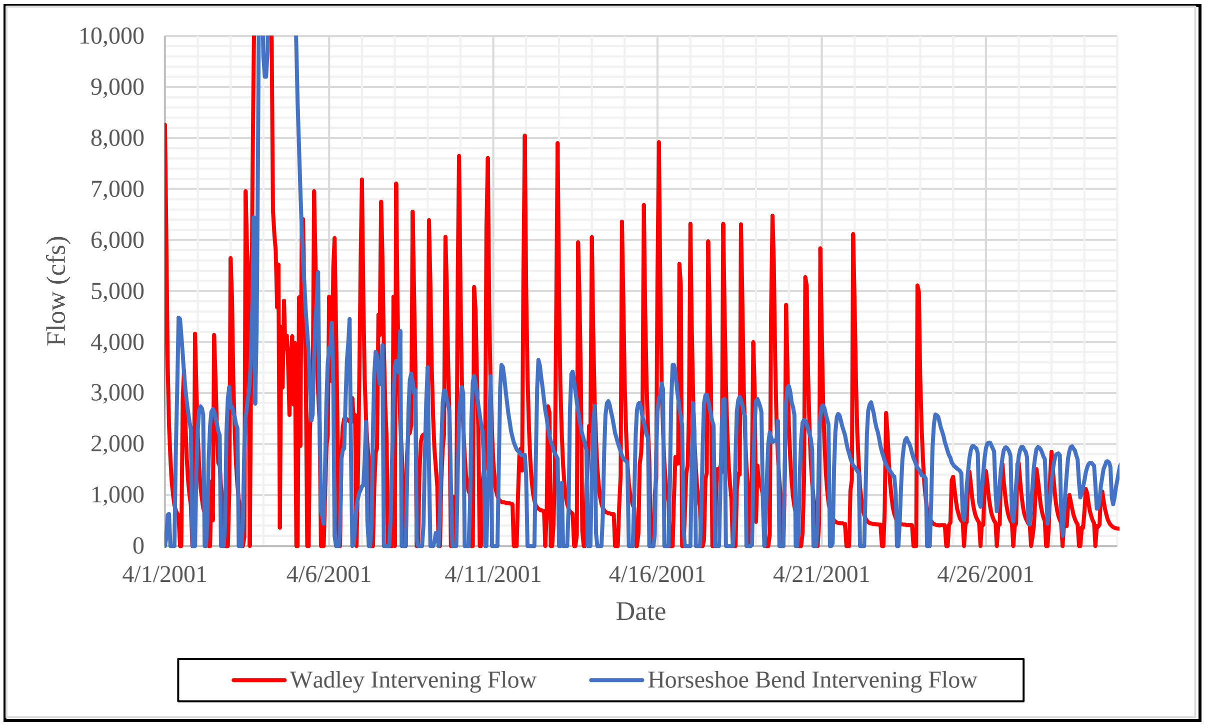

FIGURE 4–9 WADLEY AND HORSESHOE BEND APRIL INTERVENING HYDROGRAPHS

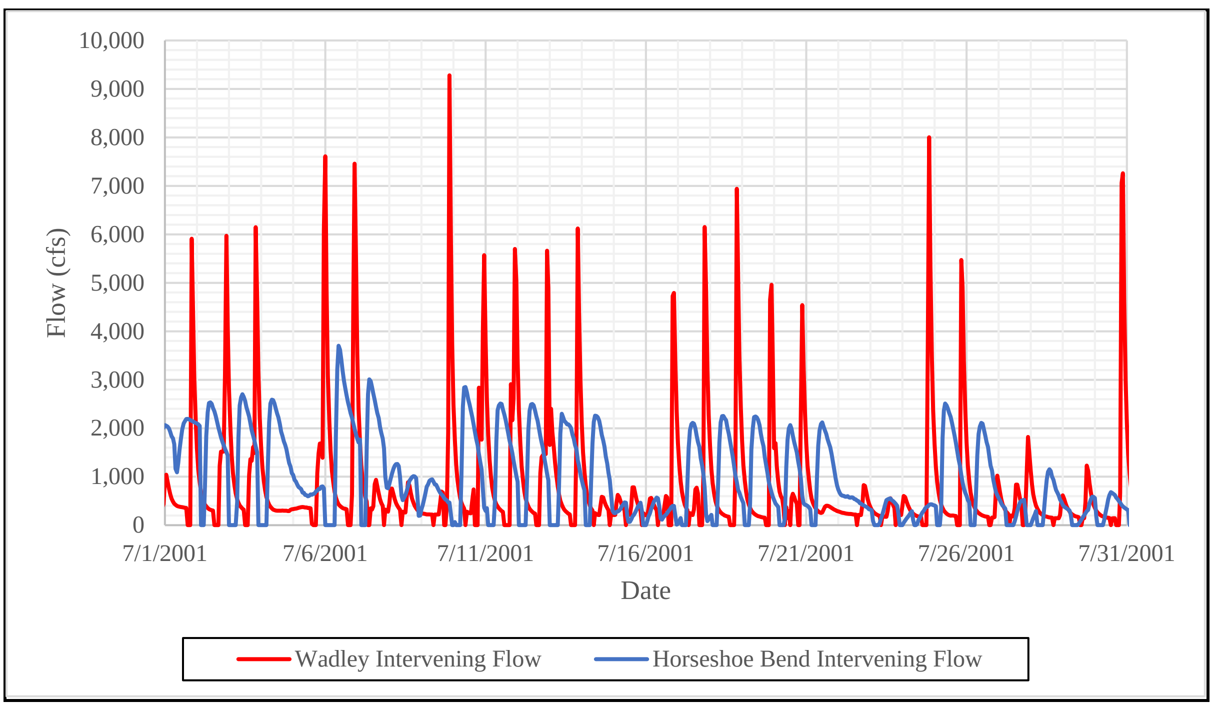

FIGURE 4–10 WADLEY AND HORSESHOE BEND JULY INTERVENING HYDROGRAPHS

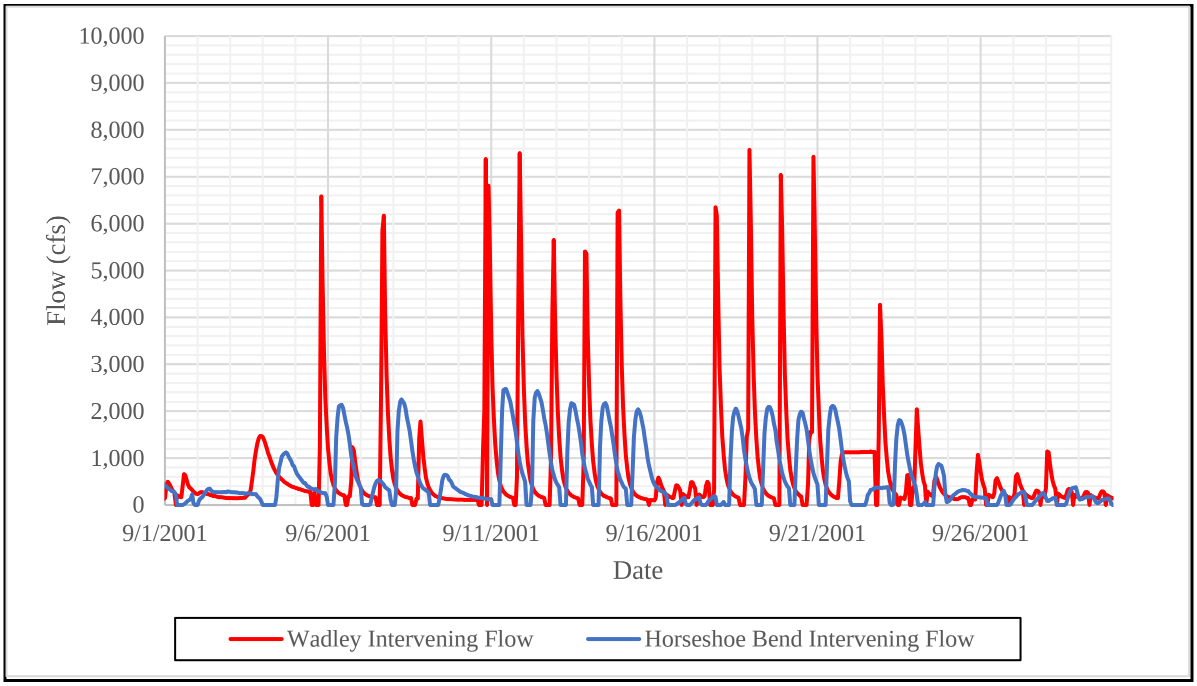

FIGURE 4–11 WADLEY AND HORSESHOE BEND SEPTEMBER INTERVENING HYDROGRAPHS

4.3.4 MODEL LOGIC AND OPERATION

All simulations were computed using the unsteady flow analysis in the HEC-RAS model. The simulation modeled 365 days of real time based on the data for the year 2001. The computational timestep was 3 minutes, which provided model stability and accuracy. Data was output from the model at an hourly timestep.

The upstream model boundary is located at RM 136.7, immediately downstream from the Harris Dam, and is an inflow hydrograph as described in Section 4.3.3. All 2D mesh areas did not have any storage volume initially, however, the 4 storage areas that are located in the Martin pool between RM 88.0 and RM 60 required an initial storage and were set to elevation 490.5 feet msl to match the downstream stage hydrograph. Two uniformly distributed lateral inflow hydrographs were included as described in Section 4.3.3. The downstream model boundary of the model is located at RM 60.8. For all simulations, a constant stage hydrograph equal to elevation 490.5 feet msl was used, which is the normal operating elevation in the Martin Pool.

4.4 HydroBudget Model

The HydroBudget Model is an analytical daily model for the determination of power production and its value by simulating actual reservoir operation. By using the HydroBudget model rather than actual generation records, Alabama Power has developed an accurate estimate of annual generation under existing conditions (baseline) to which alternatives can be compared. The model assumes that all dams are in place for the 1940-2018 period of record.

FERC has recognized the validity of this HydroBudget Model approach in estimating annual generation by accepting this method in the context of Alabama Power's relicensing of the Yates and Thurlow Project (P-2407) in the early 1990's. Alabama Power has submitted the same method to evaluate the changes for the recent Martin Relicensing.

The parameters for the model include turbine discharge ratings and efficiencies, generator efficiencies, head loss, and operating guidelines. In addition, hourly power system marginal costs (lambdas) are used to calculate the most valuable use of inflows. There are no specific power requirements; therefore, when there is flow available the model will stay on the flood control guide curves. To meet flow targets downstream, Martin and Logan Martin, in tandem with the other Alabama Power storage projects, are operated as a system. This operation allows for a balanced contribution from the Tallapoosa and Coosa rivers.

5.0 RESULTS

5.1 Harris Reservoir Elevations

Because each downstream release alternative uses the same daily volume of water as current operations, there is no effect on the ability of Alabama Power to maintain the operating curve at the Harris Reservoir.

5.2 Hydropower Generation

Alabama Power's HydroBudget model was used to evaluate the energy produced and value related to pre-Green Plan and Green Plan downstream release alternatives. Each alternative was evaluated to determine the economic impact (loss or gain) to Alabama Power customers from a hydropower generation perspective. Using the 2018 system lambdas, returning to Pre-Green Plan operations would result in an approximate $357,000 average annual economic gain to Alabama Power customers from a hydropower generation perspective. This economic gain results because all hydropower generation would occur during peak times rather than a portion of generation occurring during off-peak pulsing operations. In evaluating the 150 cfs minimum flow alternative, there are too many unknowns at this time to generate reliable/accurate HydroBudget results. Therefore, a robust evaluation of all alternatives[10], including assumptions about how any continuous minimum flow is delivered (e.g., via a minimum flow unit), will be presented in the Phase 2 Report. Note that HydroBudget does not evaluate capital and O&M costs, which could be considerable for any additional generating or non-generating mechanism needed to provide a 150 cfs minimum flow. Additional capital and O&M costs associated with such measures will be considered in other economic analyses required by the relicensing process.

[10] Including the alternative/modified Green Plan, variation of existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gauge, hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria, and 300 cfs, 600 cfs, and 800 cfs continuous minimum flow.

5.3 Flood Control

The downstream release alternatives were modeled with the current USACE-approved flood control procedures that are incorporated into the daily HEC-ResSim model. The operational rules for flood control prescribe maximum releases from the reservoir based on the date and pool elevation. Modifying the downstream releases would not impact this operation.

5.4 Navigation

Navigation levels are triggered by inflow for the ACT basin. The required basin inflow to support each navigation channel depth includes a volume historically contributed by the storage projects on the Coosa and Tallapoosa Rivers and USACE's assumptions for dredging the navigation channel in the Alabama River. Altering the downstream releases at Harris would not impact this trigger. Therefore, there is no impact to the number of days over the period of record that each alternative would support navigation releases under each of the downstream release alternatives.

5.5 Drought Operations

Alabama Power evaluated how drought operations may be positively or adversely affected by the downstream release alternatives. Because each alternative uses the same daily volume of water as current operations, there is no effect on ADROP. Two of the three triggers in ADROP are based on factors independent of Harris Reservoir, basin inflow, and state-line flows. The impact of the release alternatives to the volume of water in the Harris reservoir is negligible with respect to the third ADROP trigger, basin-wide composite storage. There is no change in the percentage of time spent over the period of record in each DIL.

6.0 CONCLUSIONS

Alabama Power will use the information in this report and the HEC-RAS model to complete Phase 2 of the Downstream Release Alternatives Study Plan (Table 6–1)[11]. The modeling results combined with other environmental study analyses will result in a final recommendation from Alabama Power on any downstream release at Harris.

The Phase 1 modeling results indicate that Pre-Green Plan, Green Plan, and 150 cfs minimum flow have no effect on Harris Reservoir levels, flood control, navigation, or drought (ADROP) operations. Because the mechanism for providing a 150 cfs minimum flow has not been determined at this point, it is unclear at this point what, if any, impacts to hydropower generation may occur.

[11] The geographic scope for Phase 2 is defined in the FERC SPD.

TABLE 6-1 PHASE 2 RESOURCE IMPACTS ANALYSIS METHODS

RESOURCE	METHOD
Water Quality	• HEC-RAS model • Existing information – Water Quality Baseline Report • Results from the FERC-approved Water Quality Study • Qualitatively evaluate potential effects on dissolved oxygen in the tailrace
Water Use	• HEC-RAS model • Existing information - Water Quantity, Water Use, and Discharges Report
Erosion	• HEC-RAS model • FERC-approved Erosion and Sedimentation Study (erosion portion only) • LIDAR, aerial imagery, historic photos
Aquatic Resources	• HEC-RAS model • HEC-RAS to evaluate effects on wetted habitat • HEC-RAS to evaluate effects on water temperature in the Tallapoosa River below Harris Dam • FERC-approved Downstream Aquatic Habitat Study • FERC-approved Aquatic Resources Study
Wildlife and Terrestrial Resources - including Threatened, and Endangered Species	• HEC-RAS model • FERC-approved Threatened and Endangered Species Study

RESOURCE	**METHOD**
Recreation Resources	• HEC-RAS model • FERC-approved Recreation Evaluation Study • Existing information on boatable flows
Cultural Resources	• HEC-RAS model • LIDAR, aerial imagery, and expert opinions

7.0 REFERENCES

Irwin, E.R. and T.P. Goar. 2015. Spatial and temporal variation in recruitment and growth of Channel Catfish, Alabama Bass, and Tallapoosa Bass in the Tallapoosa River and associated tributaries. U.S. Department of Interior, Fish and Wildlife Service, Cooperator Science Series FWS/CSS-116, Washington, D.C.

Kleinschmidt Associates. 2018a. Summary of R.L. Harris Downstream Flow Adaptive Management History and Research. R.L. Harris Project, FERC No. 2628. Kleinschmidt Associates, Birmingham, Alabama.

APPENDIX A

ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

A

A&I	Agricultural and Industrial
ACFWRU	Alabama Cooperative Fish and Wildlife Research Unit
ACF	Apalachicola-Chattahoochee-Flint (River Basin)
ACT	Alabama-Coosa-Tallapoosa (River Basin)
ADCNR	Alabama Department of Conservation and Natural Resources
ADECA	Alabama Department of Economic and Community Affairs
ADEM	Alabama Department of Environmental Management
ADROP	Alabama-ACT Drought Response Operations Plan
AHC	Alabama Historical Commission
Alabama Power	Alabama Power Company
AMP	Adaptive Management Plan
ALNHP	Alabama Natural Heritage Program
APE	Area of Potential Effects
ARA	Alabama Rivers Alliance
ASSF	Alabama State Site File
ATV	All-Terrain Vehicle
AWIC	Alabama Water Improvement Commission
AWW	Alabama Water Watch

B

BA	Biological Assessment
B.A.S.S.	Bass Anglers Sportsmen Society
BCC	Birds of Conservation Concern
BLM	U.S. Bureau of Land Management
BOD	Biological Oxygen Demand

C

°C	Degrees Celsius or Centrigrade
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulation
cfs	Cubic Feet per Second
cfu	Colony Forming Unit
CLEAR	Community Livability for the East Alabama Region
CPUE	Catch-per-unit-effort
CWA	Clean Water Act

D

DEM	Digital Elevation Model
DIL	Drought Intensity Level
DO	Dissolved Oxygen
dsf	day-second-feet

E

EAP	Emergency Action Plan
ECOS	Environmental Conservation Online System
EFDC	Environmental Fluid Dynamics Code
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act

F

°F	Degrees Fahrenheit
ft	Feet
F&W	Fish and Wildlife
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FNU	Formazin Nephelometric Unit
FOIA	Freedom of Information Act
FPA	Federal Power Act

G

GCN	Greatest Conservation Need
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning Systems
GSA	Geological Survey of Alabama

H

Harris Project	R.L. Harris Hydroelectric Project
HAT	Harris Action Team
HEC	Hydrologic Engineering Center
HEC-DSSVue	HEC-Data Storage System and Viewer
HEC-FFA	HEC-Flood Frequency Analysis
HEC-RAS	HEC-River Analysis System
HEC-ResSim	HEC-Reservoir System Simulation Model
HEC-SSP	HEC-Statistical Software Package

HDSS	High Definition Stream Survey
hp	Horsepower
HPMP	Historic Properties Management Plan
HPUE	Harvest-per-unit-effort
HSB	Horseshoe Bend National Military Park

I

IBI	Index of Biological Integrity
IDP	Inadvertent Discovery Plan
IIC	Intercompany Interchange Contract
IVM	Integrated Vegetation Management
ILP	Integrated Licensing Process
IPaC	Information Planning and Conservation
ISR	Initial Study Report

J

JTU	Jackson Turbidity Units

K

kV	Kilovolt
kva	Kilovolt-amp
kHz	Kilohertz

L

LIDAR	Light Detection and Ranging
LWF	Limited Warm-water Fishery
LWPOA	Lake Wedowee Property Owners' Association

M

m	Meter
m^3	Cubic Meter
M&I	Municipal and Industrial
mg/L	Milligrams per liter
ml	Milliliter
mgd	Million Gallons per Day
µg/L	Microgram per liter
µs/cm	Microsiemens per centimeter
mi^2	Square Miles
MOU	Memorandum of Understanding

MPN	Most Probable Number
MRLC	Multi-Resolution Land Characteristics
msl	Mean Sea Level
MW	Megawatt
MWh	Megawatt Hour

N

n	Number of Samples
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NWI	National Wetlands Inventory

O

OAR	Office of Archaeological Resources
OAW	Outstanding Alabama Water
ORV	Off-road Vehicle
OWR	Office of Water Resources

P

PA	Programmatic Agreement
PAD	Pre-Application Document
PDF	Portable Document Format
pH	Potential of Hydrogen
PID	Preliminary Information Document
PLP	Preliminary Licensing Proposal
Project	R.L. Harris Hydroelectric Project
PUB	Palustrine Unconsolidated Bottom
PURPA	Public Utility Regulatory Policies Act
PWC	Personal Watercraft
PWS	Public Water Supply

Q

QA/QC	Quality Assurance/Quality Control

R

RM	River Mile
RTE	Rare, Threatened and Endangered
RV	Recreational Vehicle

S

S	Swimming
SCORP	State Comprehensive Outdoor Recreation Plan
SCP	Shoreline Compliance Program
SD1	Scoping Document 1
SH	Shellfish Harvesting
SHPO	State Historic Preservation Office
Skyline WMA	James D. Martin-Skyline Wildlife Management Area
SMP	Shoreline Management Plan
SU	Standard Units

T

T&E	Threatened and Endangered
TCP	Traditional Cultural Properties
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TRB	Tallapoosa River Basin
TSI	Trophic State Index
TSS	Total Suspended Soils
TVA	Tennessee Valley Authority

U

USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

W

WCM	Water Control Manual
WMA	Wildlife Management Area
WMP	Wildlife Management Plan
WQC	Water Quality Certification

APPENDIX B

GREEN PLAN RELEASE CRITERIA

R L Harris Release Criteria – *Effective March 1, 2005*

1. Daily Release Schedule
    a. The required Daily Volume Release will be at least 75% of the prior day's flow at the USGS Heflin Gauge.
    b. In the event that the Heflin Gauge is not in service, the required Daily Volume Release will be at least one-fourth of the previous day's inflow into R L Harris Reservoir.
    c. The Daily Volume Release will not to be below 100 DSF.
    d. Operations to ensure that flows at Wadley remain above the 45 cfs minimum mark shall continue.
    e. The required Daily Volume Release will be suspended if R L Harris is engaged in flood control operations.
    f. The required Daily Volume Release will be suspended if it jeopardizes the ability to fill R L Harris.
2. Hourly Release Schedule
    a. If less than two machine hours are scheduled for a given day, then the generation will be scheduled as follows:
        i. One-fourth of the generation will be scheduled at 6 AM.
        ii. One-fourth of the generation will be scheduled at 12 Noon.
        iii. One-half of the generation will be scheduled for the peak load.
        iv. If the peak load is during the morning, one-fourth of the generation will be scheduled at 6 PM.
    b. If two to four machine hours are scheduled for a given day, then generation will be scheduled as follows:
        i. Thirty minutes of generation will be scheduled at 6 AM.
        ii. Thirty minutes of generation will be scheduled at 12 Noon.
        iii. The remaining generation will be scheduled for the peak load.
        iv. If the peak load is during the morning, thirty minutes of the generation will be scheduled at 6 PM.
3. Two Unit Operation
    a. On the average, there will be more than 30 minutes between the start times between the two units.
    b. Two units may come online with less than 30 minute difference in their start times if there is a system emergency need.
4. Spawning Windows

    Spring and Fall spawning windows will scheduled as conditions permit. The operational criteria during spawning windows will supersede the above criteria.

R L HARRIS RELEASE CRITERIA – *Effective March 1, 2005*

1. Daily Release Schedule

   a. The required Daily Volume Release will be at least 75% of the prior day's flow at the USGS Heflin Gauge.

   b. In the event that the Heflin Gauge is not in service, the required Daily Volume Release will be at least one-fourth of the previous day's inflow into R L Harris Reservoir.

   c. The Daily Volume Release will not to be below 100 DSF.

   d. Operations to ensure that flows at Wadley remain above the 45 cfs minimum mark shall continue.

   e. The required Daily Volume Release will be suspended if R L Harris is engaged in flood control operations.

   f. The required Daily Volume Release will be suspended if it jeopardizes the ability to fill R L Harris.

DROUGHT 2007-2008 R L HARRIS RELEASE CRITERIA

a. If the flows at Wadley are at or above 100 cfs, there will be one pulse per day, which will result in a Daily Volume Release of approximately 50 DSF.

b. The flows at Wadley will not be lower than the flows at Heflin.

R L HARRIS MINIMUM FLOW PROCEDURE

STEP 1: CREATE SCHEDULE BASED ON PRIOR DAY'S HEFLIN FLOW

Prior Day's Heflin Flow (DSF)	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	R L Harris Total Disch (DSF)
0 < HEFLIN Q < 150	10 MIN	10 MIN	10 MIN	30 MIN	133
150 < HEFLIN Q < 300	15 MIN	15 MIN	30 MIN	1 HR	267
300 < HEFLIN Q < 600	30 MIN	30 MIN	1 HR	2 HRS	533
600 < HEFLIN Q < 900	30 MIN	30 MIN	2 HRS	3 HRS	800
900 < HEFLIN Q	30 MIN	30 MIN	3 HRS	4 HRS	1,067

STEP 2: ADD ADDITIONAL PEAK GENERATION AS NEEDED

STEP 3: ADJUST SCHEDULE IF NECESSARY

TOTAL SCH GENERATION	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	R L Harris Total Disch (DSF)
IF GENERATION = 1 MACH HR	15 MIN	15 MIN	30 MIN	1 HR	267
IF GENERATION = 2 MACH HRS	30 MIN	30 MIN	1 HR	2 HRS	533
IF GENERATION = 3 MACH HRS	30 MIN	30 MIN	2 HRS	3 HRS	800
IF GENERATION = 4 MACH HRS	30 MIN	30 MIN	3 HRS	4 HRS	1,067
IF GENERATION = 5+ MACH HRS			ALL		

NOTES

1. SCHEDULING OF GENERATION DOES NOT PRECLUDE THE ADDITION OF GENERATION AT ANY TIME.
2. ALL START TIMES ARE APPROXIMATE.
3. WHEN PULSING, IF THE SYSTEM DOES NOT DICTATE GENERATION DURING THE PM, A PULSE WILL BE SCHEDULED AT 6 PM.
4. R L HARRIS MIN FLOW PROCEDURE WILL BE SUSPENDED DURING ANY OF THE FOLLOWING CONDITIONS:
    A) TALLAPOOSA RIVER HAS BEEN PLACED UNDER FLOOD CONTROL OPERATIONS.
    B) FISH SPAWNING OPERATIONS HAVE BEEN SCHEDULED.
    C) APC HAS DECLARED THAT CONDITIONS EXIST THAT THREATEN THE SPRING FILLING OF R L HARRIS RESERVOIR.

APPENDIX C

STAKEHOLDER COMMENT TABLE

Commenting Entity	Date of Comment & FERC Accession Number	Comment on Draft Downstream Release Alternatives Phase 1 Study Report	Alabama Power Response
Federal Energy Regulatory Commission (FERC) Note: footnotes included in the original letter have been omitted from this table	6/10/2020 20200610-3059	During the ISR Meeting, Alabama Power requested that stakeholders provide downstream flow alternatives for evaluation in the models developed during Phase 1 of the Downstream Release Alternatives Study. Stakeholders expressed concerns about their ability to propose flow alternatives without having the draft reports for the Aquatic Resources and Downstream Aquatic Habitat Studies, which are scheduled to be available in July 2020 and June 2020, respectively. It is our understanding that during Phase 2 of this study, Alabama Power would run stakeholder-proposed flow alternatives that may be provided with ISR comments, as well as additional flow alternatives that stakeholders may propose after the results for the Aquatic Resources and Downstream Aquatic Habitat Studies are available. Please clarify your intent by July 11, 2020, as part of your response to stakeholder comments on the ISR.	See Alabama Power's response filed July 10, 2020 (Accession No. 20200710-5122).
FERC		According to the approved study plan, the goal of the Downstream Release Alternatives Study is to evaluate the effects of four downstream flow release alternatives on project resources. The four release alternatives are: (1) the Green Plan, or Alabama Power's current pulsing operation; (2) the Pre-Green Plan, or Alabama Power's historic peaking operation; (3) the Pre-Green Plan with a continuous baseflow of 150 cubic feet per second (cfs); and (4) a modified Green Plan. The Phase 1 Report, filed on April 10, 2020, presented complete results for Pre-Green Plan operation and Green Plan operation, partial results for the Pre-Green Plan with a 150-cfs baseflow, and no results for the modified Green-Plan alternative. During the ISR Meeting, Alabama Power requested that stakeholders identify and propose downstream flow release alternatives so that the proposed alternative's effects on environmental resources can be assessed during Phase 2 of the study. To facilitate modelling of downstream flow release alternatives, we recommend that Alabama Power run base flows of 150 cfs, 350 cfs, 600 cfs, and 800 cfs through its model for each of the three release scenarios (i.e., the Pre-Green Plan, the Green Plan, and the modified Green Plan flow release approach). The low-end flow of 150 cfs was proposed by Alabama Power as equivalent to the daily volume of three 10-minute Green Plan pulses. This flow also is about 15 percent of the average annual flow at the United States Geological Survey's flow gage (#02414500) on the Tallapoosa River at Wadley, Alabama, and represents "poor" to "fair" habitat conditions. We recommend 800 cfs as the upper end of the base flow modeling range because it represents "good" to "excellent" habitat and is nearly equivalent to the U.S. Fish and Wildlife Service's Aquatic Base Flow guideline for the Tallapoosa River at the Wadley gage. The proposed base flows of 350 cfs and 600 cfs cover the range between 150 cfs and 800 cfs.	As indicated in the final report and its July 10, 2020 filing, Alabama Power will model the following additional downstream flow scenarios: • A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%; • A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria; • 300 cfs continuous minimum flow; • 600 cfs continuous minimum flow; and a • 800 cfs continuous minimum flow. These recommended flow release alternatives are in addition to Alabama Power's release alternatives in the FERC-approved Study Plan that include: • Pre-Green Plan (peaking only; no pulsing or continuous minimum flow); • Green Plan (existing condition); • Modified Green Plan (changing the time of day in which the Green Plan pulses are released); and • 150 cfs continuous minimum flow. For additional information about why some proposed alternatives will not be analyzed, see the July 10, 2020 filing.

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		In addition, we recommend that the modeling for Alabama Power's Aquatic Resources Study and Downstream Aquatic Habitat Study, as well as any Phase 2 assessment(s) include all the downstream flow release alternatives identified and evaluated as part of the Downstream Flow Release Alternatives Study. The results of all the modeling for the Aquatic Resources Study and Downstream Aquatic Habitat Study should be included in the final study reports and filed with the Updated Study Report, due by April 12, 2021.	All alternatives will be analyzed in the Aquatic Resources Study and Downstream Aquatic Habitat Study, as well as the Phase 2 analysis.
FERC		The Draft Downstream Release Alternatives (Phase 1) Study Report refers to data sets (e.g., topographic and geometric data on pages 12-13 and 17-19) that were used to develop the models. To assist us in interpreting the models, we recommend including in the final study report a table and/or figure that summarizes all of the data sets used in the models and identifies their spatial extents in terms such as watershed segments, river miles (RMs), and square miles covered by each dataset (as appropriate), with reference to other geographic landmarks (e.g., nearest city, dam, bridge, etc.). Please incorporate into the table and/or figure, the stakeholder- and Alabama Power-identified erosion areas of concern. In addition, please provide the metadata for each data set used.	The final report includes a table and figure to clarify what data are being used, when it was collected and by whom, and the data's geographic extent. However, the table and figure do not include the erosion areas of concern. A synthesis of the HEC-RAS model and other data collected in other studies will occur in the Phase 2 analysis.
FERC		Page 14 of the Draft Downstream Release Alternatives (Phase 1) Study Report includes a description of the HEC-ResSim model that was developed for the project. Harris Dam was modeled in HEC-ResSim with both a minimum release requirement and maximum constraint at the downstream gage at Wadley. The draft report states that the minimum release requirement is based on the flow at the upstream Heflin gage, which is located on the Tallapoosa River arm of Harris Reservoir and has 68 years of discharge records. Page 5 of the draft report indicates that there is also a gage (Newell) on the Little Tallapoosa River Arm of the reservoir, which has 45 years of discharge records. It appears that only the Heflin gage was used in developing the minimum release requirement. As part of your response to stakeholder comments on the ISR, please explain the rationale for basing the minimum releases in the HEC-ResSim model only on the flows at the Heflin gage and not also on the flows at the Newell gage.	See Alabama Power's response filed July 10, 2020 (Accession No. 20200710-5122).
FERC		Pages 15 and 16 of the Draft Downstream Release Alternatives (Phase 1) Study Report, state that the drought indicator thresholds, or triggers, are only evaluated on the 1st and the 15th of every month in the model and that once a drought operation is triggered, the drought intensity level can only recover from drought condition at a rate of one level per "period." Please clarify in the final report if one "period" is equal to 15 days (i.e., the interval for evaluating drought triggers) and if this protocol is used for managing reservoir operations currently, or if it is only a parameter used in the model.	The drought operations have been clarified in the final report.

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Alabama Department of Conservation and Natural Resources (ADCNR) Note: footnotes included in the original letter have been omitted from this table	6/11/2020 20200611-5152	The Downstream Release Alternatives Study as is, presents the results for three downstream release alternatives: Pre-Green Plan operation, Green Plan operation, and Pre-Green Plan operation with a 150 cfs continuous minimum flow. Throughout the document the "Pre-Green Plan operation with a 150 cfs continuous minimum flow", is often referenced as "continuous minimum flow of 150 cfs". When referencing this downstream release alternative in the document it would be helpful to use the full "Pre-Green Plan operation with a 150 cfs continuous minimum flow" to clarify and fully identify the alternative. If a modified Green Plan, details pending, is evaluated with a continuous minimum flow, the addition will assist in differentiating the alternatives.	The addition of five additional alternatives should clarify which alternative is being discussed. Alabama Power has, and will continue, to be consistent with how the alternatives are referenced.
ADCNR		A fourth Modified Green Plan downstream release alternative was included to be evaluated in the initial Study Plan for the Downstream Release Alternatives Study. ADCNR maintains its recommendation for a fourth alternative Modified Green Plan be fully evaluated. Details and design of a Modified Green Plan alternative are pending results from the Aquatic Resources Study. For a complete Downstream Release Alternative Study comparing four release alternatives, the Modified Green Plan alternative should be completed and included in this study or Phase 2. ADCNR requests the opportunity to provide specific recommendations for the Modified Green Plan alternative after assessing all of the planned study reports. ADCNR has consistently stated and provided published peer reviewed references that support recommendations for downstream flows to mimic a natural flow regime with an adaptive management of flows that follows state dissolved oxygen guidelines and provides natural temperature regimes, at all times for the sustained long term benefit and conservation of aquatic species (See ADCNR, P-2628-005 FERC ¶ 20181002-5006).	It is Alabama Power's intent to provide stakeholders 30 days to review, provide comments, and recommend any additional flow analyses based on the information in the draft reports.
ADCNR		On page 1, section 1.0 of the Downstream Release Alternatives Study, replace "However, some stakeholders noted that the temperature of the turbine releases could have potential effects on aquatic resources in the Tallapoosa River below Harris Dam." with "However, some stakeholders noted that the temperature of the turbine releases has documented negative impacts on aquatic resources in the Tallapoosa River below Harris Dam." (See ADCNR, P-2628-005 FERC ¶ 20181002-5006).	Section 1.0 summarizes the Introduction of the Downstream Release Alternatives Study Plan and this sentence was taken directly out of the approved Study Plan. The purpose of the study is to evaluate any effects and the magnitude of identified effects on the resources; therefore, Alabama Power does not feel that the sentence needs to be changed at this time.
ADCNR		On page 2, section 1.1, of the Downstream Release Alternatives Study, change "i.e." to "e.g." It should be "for example" not "that is" if an Aquatic Resources Study is required to evaluate and design the alternative to be studied as stated in footnote of the page. Downstream Aquatic Habitat Study and Recreational Evaluation Study results should be considered as inclusions in the footnote as prerequisites to fully evaluate and recommend an alternative Modified Green Plan to be modeled and evaluated as a downstream release alternative.	This change has been made in the final report.

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ADCNR		On page 21, section 4.3.3 Model Flow Data of the Downstream Release Alternatives Study, ADCNR recommends re-stating that the Modified Green Plan alternative is not included in this model section pending results from additional studies and will be evaluated in Phase 2. This section states why 2001 data was used and presented but does not specify why the date range of 1/1/01-1/31/01 was specifically selected from the entire year data. ADCNR recommends including why this month was selected and providing additional figures similar to Fig. 4-3. showing a months' worth of data at four 1-month intervals covering spring, summer and fall sample portions of hydrographs to fully illustrate model flow data throughout the year.	This has been modified to re-state that the additional alternatives will be evaluated in Phase 2. In addition, the final report includes additional figures to show the hydrographs during each season of the year.
ADCNR		On page 25, section 5.2 of the Downstream Release Alternatives Study, remove the descriptive words "slight" and "worse" when detailing if alternatives will increase or decrease average annual economic costs to Alabama Power customers and provide estimated amount ranges for each alternative. If, "there are currently too many unknowns at this time to generate accurate and reliable Hydro Budget results", please explain how an assumption of whether it will be "same" or "worse" can be made. For comparisons of alternatives, additional details should be provided describing how a Pre-Green Plan peaking operation with a 150 cfs continuous minimum flow, regardless of generation or no generation to produce the minimum flow, would not be a significant economic gain, if not evaluating capital and O&M costs into the equation.	This section has been modified to remove the preliminary analysis that was included in the draft report to reflect that a more robust analysis on hydropower generation will be completed in Phase 2.
ADCNR		On page 27, section 6.0 Conclusions of the Downstream Release Alternatives Study, a space between "results indicate" should be included.	This change has been made in the final report.

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Alabama Rivers Alliance (ARA) Note: footnotes included in the original letter have been omitted from this table	6/11/2020 20200611-5114	The extent to which the Harris project has altered flows of the Tallapoosa River is reflected in comments submitted by the Alabama Department of Conservation and Natural Resources (ADCNR) in 1982, which lament the "loss of 49 percent of the last major free-flowing river habitat…in Alabama." According to the ADCNR's reading of USGS data at the time, flows from the pre-dam period of 1923 to 1972 equaled or exceeded the minimum flow of 45cfs stipulated in Article 13 of the license 100% of the time. Flows of 8,000cfs due to single turbine generation at Harris were equaled or exceeded during that era only 4.4% of the time, and flows of 16,000cfs due to two-unit generation were equaled or exceeded only 1.2% of the time. For decades the Tallapoosa downstream of Harris has weekly experienced flows it otherwise would have seen, on average, roughly eight days out of a given year. This flow regime has not been without consequences. Researchers have documented as much as a 67% reduction in flows than during pre-dam periods, greater instability of day-to-day flow variations, and an increase in very low-flow periods. The flow instability and altered thermal patterns caused by hydropeaking operations have depressed species richness, "influenced fish persistence and colonization," reconfigured the downstream macroinvertebrate community, and created "adverse effects on hydraulic variables such as water velocity, depth, and temperature." As a result of Harris operations, the 14-mile stretch of the Tallapoosa from the dam to Alabama Highway 77 is currently listed by ADEM as a Category 4C waterbody impaired due to hydrologic alteration. And the U.S. Geological Survey's (USGS) Open-File Report from last year indicates "that hydrologic alteration in the river has affected various biological processes." Despite the past decades of disruption, studies performed during the ILP and a reinvigorated adaptive management approach can shape a new framework for creating positive ecological responses below Harris. As the USGS Open-File Report on adaptive management of flows from Harris states, "[i]f flow and thermal alteration from the dam can be modified toward improving natural resource objectives, adaptive management processes and long-term monitoring could further reduce uncertainty related to biotic response to new Federal Energy Regulatory Commission licensing requirements."	Comment noted.

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ARA		A. Wider Variety of Release Patterns Needs to Be Modeled and Considered We appreciate that Licensee was willing fifteen years ago to enter into a collaborative process with stakeholders and to voluntarily operate the Harris project according to an adaptive management plan known as the Green Plan, the purpose of which "was to reduce effects of peaking operations on the aquatic community downstream." The Green Plan was a starting point for adaptive management, but evidence suggests it has not improved conditions for aquatic life. The most recent published literature demonstrates that although "habitat availability for fishes increased under the Green Plan management…improved conditions did not improve recruitment processes for species of interest." Further, "results indicate that the Green plan did not meet the stakeholder objective to restore and maintain macroinvertebrate community composition similar to unregulated reaches within the regulated portions of the river." Since beginning adaptive management and the Green Plan roughly fifteen years ago, no actual adaptation or iteration has occurred. This relicensing and the studies now underway provide an opportunity to iterate, adapt, and improve flows and subsequent impacts on downstream aquatic life, recreation opportunities, erosion and sedimentation, and water quality. In order to make the refinements contemplated by a full adaptive management process, a wide variety of flow scenarios should be studied, and "continuing adaptive management in tandem during the FERC relicensing process would be advantageous to include a specific assessment of long-term objectives of all stakeholders."	Comment noted.
ARA		B. Until Aquatic Resources and Aquatic Habitat Study Reports Are Available, It Is Premature to Ask Stakeholders to Specify All Flow Alternatives to Model Commenters, stakeholders, and FERC staff have encouraged Licensee to examine a broad range of flows throughout the ILP. Currently, licensee is studying two possibilities other than its current flow regime and its prior flow regime. The Draft Downstream Release Alternatives Phase 1 Report filed by Licensee assesses impacts to operational parameters (e.g., generation, reservoir levels, flood control) under three flow scenarios: (i) the current Green Plan pulsing regime that has been in effect since 2005 through a voluntary adaptive management process; (ii) the pre-Green Plan regime with no intermittent flows between peaks, which occurred from 1983 to 2004; and (iii) a continuous minimum flow of 150cfs, which is the equivalent daily volume of the current Green Plan pulses and has never been physically implemented and studied.	Comment noted.

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		A fourth release scenario, the alternative/modified Green Plan, will be evaluated in Phase 2 of the study, once results from the Aquatic Resources Study are available to shape the design of an altered Green Plan. The two alternatives that have never been implemented—a continuous minimum flow of roughly an equivalent volume and altering the timing of the existing Green Plan releases— are effectively different flavors of the existing release scheme, though studying those modifications may yield important insights into improving flows. The summary of the Initial Study Report meeting reflects that Licensee desires "to hear from stakeholders now" regarding alternative flow scenarios stakeholders would like to have modeled, despite no draft Aquatic Resources Study or Aquatic Habitat Study reports being available. The downstream release alternatives, aquatic resources, water quality, and aquatic habitat reports are all deeply interrelated, and without at least draft reports of the fisheries studies, stakeholders should not be required to propose alternative flow scenarios until more information is available. Indeed, Licensee itself acknowledges that the results from the Aquatic Resources Study are needed to design the fourth flow scenario it plans to model. Those same results will also inform what variety of inputs stakeholders suggest. In fact, the logical time to propose additional flow scenarios is after Licensee has "analyze[d] the effects of each downstream release alternative on other resources, including water quality… downstream aquatic resource (temperature and habitat), wildlife and terrestrial resources, threatened and endangered species, recreation, and cultural resources," which will be accomplished by Phase 2 of the study. At a minimum, stakeholders should be equipped with the draft fisheries studies showing the current status of aquatic resources before being required to list all alternative flows to be studied.	
ARA		C. Preliminary Proposals for Additional Flow Modeling and Study Modification Request However, ARA understands that the modeling of additional flows takes time and effort, and Licensee has made clear that it would like to have as much stakeholder input as to various flows to model as soon as possible. While reserving the right to request other release alternatives be considered once more information is made available to stakeholders, ARA proposes the following study modification request pursuant to 18 C.F.R. § 5.15(d) for additional flow scenarios be analyzed as part of the Downstream Release Alternatives Study: (i) A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin streamgage, rather than the current 75%;	As indicated in the final report and its July 10, 2020 filing, Alabama Power will model the following additional downstream flow scenarios: • A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%; • A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria; • 300 cfs continuous minimum flow; • 600 cfs continuous minimum flow; and a • 800 cfs continuous minimum flow.

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		(ii) A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria; (iii) A constant but variable release that matches the flow at the USGS Wadley streamgage to the UGSG Heflin streamgage to mimic natural flow variability; and (iv) 300cfs and 600cfs minimum flows. Some of these flows, particularly items (iii) and (iv) may have been modeled internally by Licensee as part of the original adaptive management process; however, those models are not currently available as part of this relicensing. Studying a wider range of potential flows during the ILP could result in improved diversity and abundance of aquatic life and habitat, more recreation opportunities, decreased erosion and sedimentation, and gains in water quality.	These recommended flow release alternatives are in addition to Alabama Power's release alternatives in the FERC-approved Study Plan that include: • Pre-Green Plan (peaking only; no pulsing or continuous minimum flow); • Green Plan (existing condition); • Modified Green Plan (changing the time of day in which the Green Plan pulses are released); and • 150 cfs continuous minimum flow. For additional information about why some proposed alternatives will not be analyzed, see the July 10, 2020 filing.
Environmental Protection Agency (EPA)	6/12/2020 20200612-5025	Section 4.2: Study Progress of the ISR, states …" In evaluating the 150 cfs minimum flow alternative, there are too many unknowns at this time to generate reliable/accurate HydroBudget results; however, if the 150 cfs minimum flow is provided through a non-generation mechanism, the impact to hydropower generation will be the same or slightly worse than the impact from Green Plan operations. …" EPA would like to request clarification or supporting information regarding this conclusion.	Although this comment refers to the Initial Study Report, the section in the Downstream Release Alternatives Report has been modified to remove the preliminary analysis that was included in the draft report to reflect that a more robust analysis on hydropower generation will be completed in Phase 2.
EPA		Section 4.4: Remaining Activities does not include any follow-up to address these unknowns described in Section 4.2. Minimum flows are likely to have a significant impact on aquatic life resources, which will be evaluated in Phase 2. EPA recommends against making assumptions that minimum flows will have an adverse impact if the data is not ample enough to make that conclusion. For instance, quantifying the impact could result in finding that they are minor or negligible as compared to the Green Plan. EPA recommends that a Remaining Activity be added to gather the information needed to quantify the impacts.	Although this comment refers to the Initial Study Report, the section in the Downstream Release Alternatives Report has been modified to remove the preliminary analysis that was included in the draft report to reflect that a more robust analysis on hydropower generation will be completed in Phase 2.

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EPA		FERC and Alabama Rivers Alliance submitted questions asking why modelling of downstream releases were limited to 150 cfs and why an option was not presented to model the Green Plan with minimum flows. EPA raised the same concerns and would like to recommend the addition of a scenario that includes a minimum flow for the Green Plan.	Alabama Power declines the recommendation to study all of the continuous minimum flows combined with the Green Plan. Alabama Power asserts that modeling one combination of a continuous minimum flow AND pulsing (the hybrid Green Plan listed above) is adequate to determine the effect of this downstream release alternative on Project operations and other resources. The eight alternatives Alabama Power will model will provide sufficient information to evaluate the resources of interest, determine any downstream release proposals, and determine protection, mitigation, and enhancement (PM&E) measures to be incorporated into the new license for the Project.
EPA		In question 7 by EPA: Alabama Power responded that the flows would be set without variation or modification throughout the term of the license. EPA would like to provide another resource (supported by the US Department of Energy, 2020) that could improve the study results by comparing models used in this Multi-model research: *Multi-model Hydroclimate Projections for the Alabama-Coosa-Tallapoosa River Basin in the Southeastern United States https://www.ornl.gov/publication/multi-model-hydroclimate- projections-alabama-coosa-tallapoosa-river-basin-southeastern* This research focuses on the project area and includes relevant information and data that could be used for Alabama's study. Efforts to adaptively managing flows would allow Alabama Power to respond to changing conditions or new information within the system.	Comment noted.

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EPA	6/12/2020 20200612-5079	During the April 29, 2020, Initial Study Report meeting, Federal Energy Regulatory Commission (FERC) and Alabama Rivers Alliance submitted questions asking why modelling of downstream releases were limited to the Green Plan, Pre-Green Plan, and Pre-Green Plan with 150 cfs minimum flow. Questions were also asked as to why only the 150 cfs minimum flow was selected. Multiple questions were asked about the possibility of having an option of the Green Plan with a minimum flow. Further, Alabama Power suggested that any requests for additional flow scenarios be submitted as soon as possible before phase 2 starts. The EPA requests that the flow scenarios include the evaluation of an option including both the pulses of the Green Plan with a minimum flow, and a higher minimum flow. The 150 cfs minimum flow was selected based upon the volume of water used for the Green Plan, as opposed to an analysis based upon protective minimum flows for aquatic life.	As indicated in the final report and its July 10, 2020 filing, Alabama Power will model the following additional downstream flow scenarios: • A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%; • A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria; • 300 cfs continuous minimum flow; • 600 cfs continuous minimum flow; and a • 800 cfs continuous minimum flow. These recommended flow release alternatives are in addition to Alabama Power's release alternatives in the FERC-approved Study Plan that include: • Pre-Green Plan (peaking only; no pulsing or continuous minimum flow); • Green Plan (existing condition); • Modified Green Plan (changing the time of day in which the Green Plan pulses are released); and • 150 cfs continuous minimum flow. For additional information about why some proposed alternatives will not be analyzed, see the July 10, 2020 filing.
EPA		Additionally, EPA requests the inclusion of both adaptively managed flow scenarios and adaptive management as an outcome. The state-of-the-science on environmental flows includes adaptive management as a key feature for the protection of aquatic life. The evaluation could examine how monitoring would be used to evaluate the success of the flows, and any potential adjustments that may be needed over time. The EPA submitted resources that supports this request in March 2019.	It is premature in the relicensing process to determine protection, mitigation, and enhancement (PM&E) measures. If study results show that the downstream resources could benefit from an adaptive management process, Alabama Power may consider evaluating adaptive management as a PM&E measure along with other potential PM&E measures.