Water Quality Study Report

R.L. Harris Hydroelectric Project

FERC No. 2628

Prepared for:

Alabama Power Company

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Revised November 2021

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1.0 INTRODUCTION

Alabama Power Company (Alabama Power) owns and operates the R.L. Harris Project (FERC Project No. 2628) (Harris Project), licensed by the Federal Energy Regulatory Commission (FERC or Commission). Alabama Power Company (Alabama Power) is relicensing the 135-megawatt (MW) Harris Project, and the existing license expires in 2023. 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. These structures, lands, and water are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir (Harris Reservoir) created by the R.L. Harris Dam (Harris Dam). Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary (Figure 1-1). This includes land to 795 feet mean sea level (msl)[1], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA) located in Jackson County, Alabama (Figure 1-2). These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan. These lands are leased to, and managed by, the State of Alabama for wildlife management and public hunting and are part of the Skyline WMA (ADCNR 2016b).

For the purposes of this study, "Lake Harris" refers to the 9,870-acre reservoir, adjacent 7,392 acres of Project land, and the dam, spillway, and powerhouse. "Skyline" refers to the 15,063 acres of Project land within the Skyline WMA in Jackson County. "Harris Project" refers to all the lands, waters, and structures enclosed within the FERC Project Boundary,

[1] Also includes a scenic easement (to 800 feet msl or 50 horizontal feet from 793 feet msl, whichever is less, but never less than 795 feet msl).

which includes both Lake Harris and Skyline. Harris Reservoir refers to the 9,870-acre reservoir only; Harris Dam refers to the dam, spillway, and powerhouse. The Project Area refers to the land and water in the Project Boundary and immediate geographic area adjacent to the Project Boundary (Alabama Power Company 2018).

Lake Harris and Skyline are located within two river basins: the Tallapoosa and Tennessee River Basins, respectively. The only waterbody managed by Alabama Power as part of their FERC license for the Harris Project is the Harris Reservoir.

Commonly used acronyms that may appear in this final report are included in Appendix A.

1.1 STUDY BACKGROUND

During the October 19, 2017 Issue Identification Workshop, several stakeholders noted water quality as a potential issue at the Harris Project. On November 13, 2018, Alabama Power filed ten proposed study plans for the Harris Project, including a study plan for water quality. 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) 2 (Water Quality and Use) to specifically address water quality issues at Lake Harris and in the Tallapoosa River downstream of Harris Dam. Alabama Power distributed an email to HAT 2 participants on May 1, 2019, requesting identification of locations of areas of water quality concern. Alabama Power did not receive any additional areas of water quality concern. Alabama Power held a HAT 2 meeting on September 11, 2019, where it presented information on the water quality monitoring and addressed a stakeholder question about a previously identified area of concern near Foster's Bridge[2].

Alabama Power prepared and filed a Draft Water Quality Study Report with FERC on April 10, 2020. Concurrently, Alabama Power distributed the draft report to the HAT 2 participants. Stakeholders provided comments on the Draft Water Quality Study Report and this Final Water Quality Report addresses the comments received. This final report supports the relicensing process and supplements information included in the 2016 Baseline Water Quality Report (Appendix L of the Pre-Application Document [PAD]) and

[2] At the 2017 Issue Identification Workshop, stakeholders raised the area near Foster's Bridge as a potential area of water quality concern.

fulfills the requirements of the FERC-approved Water Quality Study Plan. Therefore, this final report summarizes data collected from 2017 through 2020 with the exception of Alabama Water Watch (AWW) data which includes years prior to 2017. AWW data was not available to Alabama Power to include in the 2016 Baseline Water Quality Report. Data sources include Alabama Power, Alabama Department of Environmental Management (ADEM), and AWW. No additional data was available for streams at Skyline. Since the 303(d) listed section of Little Coon Creek at Skyline is impaired due to siltation, it is addressed in the Final Erosion and Sedimentation Report.

A summary of data sources for this report is provided in Table 1-1. See Section 5.2.1.7 of the PAD for more information on federally approved water quality standards.

Table 1-1 Summary of Water Quality Data Sources

Location	Source	Description	Period
Lake Harris	ADEM	Vertical profiles and discrete chemistry samples at six locations	April - October 2018; June, July, September, & October 2020
	Alabama Power	Vertical profiles in the forebay	March - October 2017 – 2020
	Alabama Water Watch	Surface samples at six locations	Monthly to semi-monthly, 2011 – 2019
Tallapoosa River, Harris Dam to Horseshoe Bend	ADEM	Monthly measurements and discrete samples at Tailrace, Malone, Wadley, and Horseshoe Bend	2018 – 2020 (no measurements collected at Tailrace in 2019)
	ADEM	Continuous (15-minute interval) monitoring at Malone	May 2018 – November 2019; April – November 2020
	Alabama Power	15-minute intervals monitoring during generation (approximately 800 ft downstream of dam)	June - October 2017 – 2020; June 2021
	Alabama Power	Continuous (15-minute interval) monitoring (approximately 0.5 miles downstream of dam)	March - October 2019; May – October 2020; March – June 2021
	Alabama Water Watch	Surface samples at Horseshoe Bend	1993, 2007, & 2014 – 2017

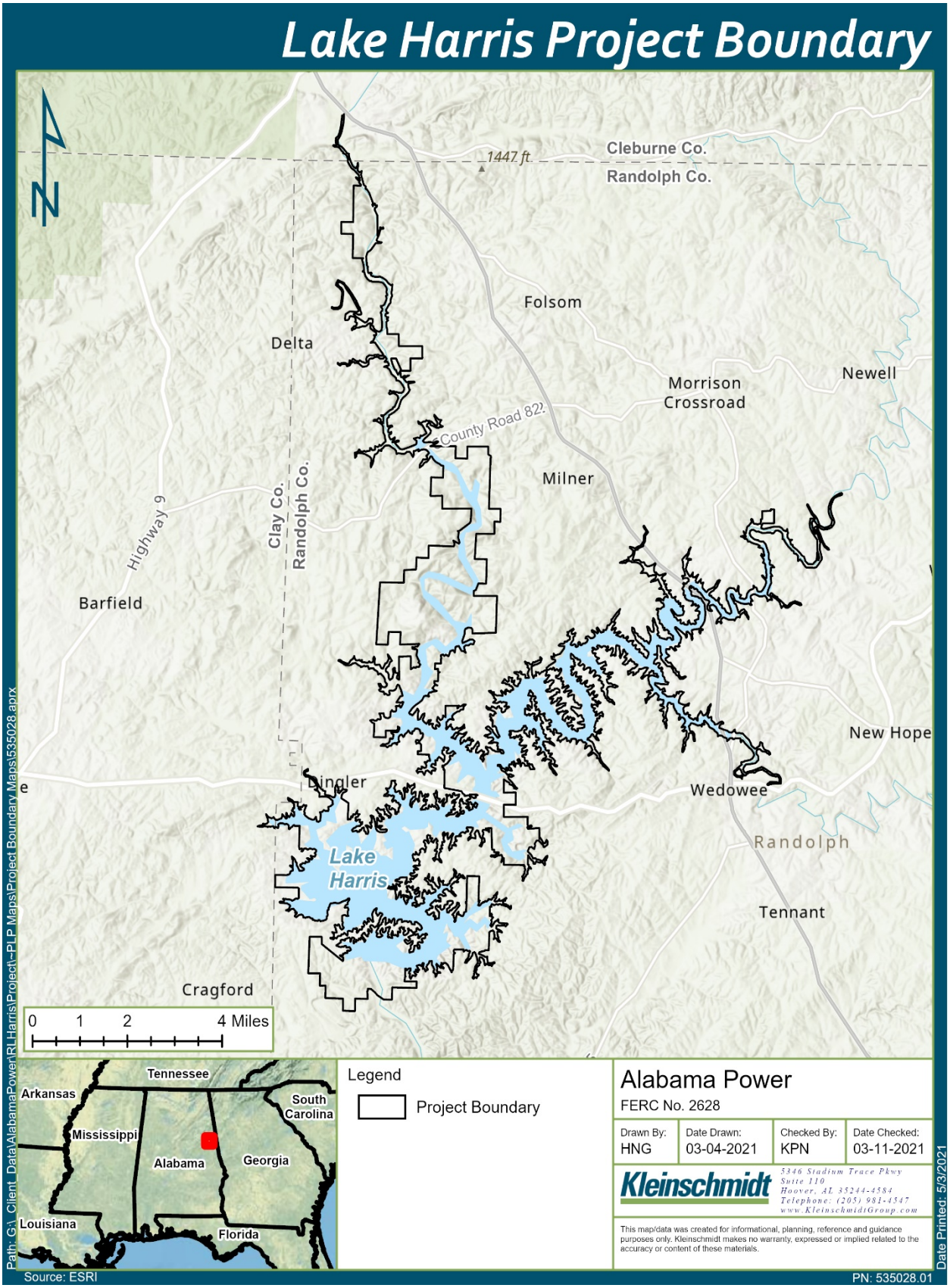


Figure 1-1 Lake Harris Project Boundary

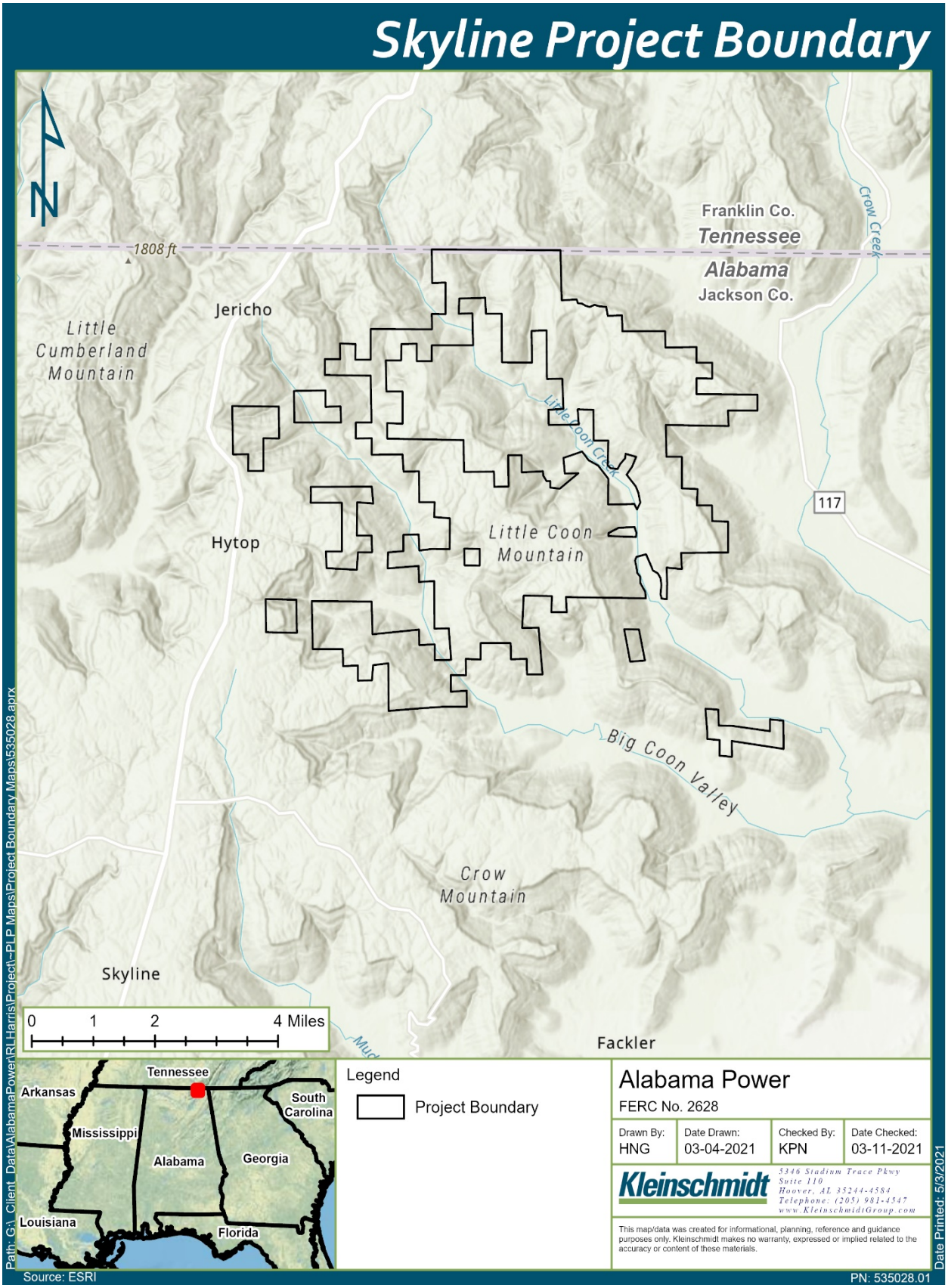


Figure 1-2 Skyline Project Boundary

2.0 LAKE LEVELS AND HYDROLOGY

The Tallapoosa River and Little Tallapoosa River are the largest tributaries that flow into Harris Reservoir. The United States Geological Survey (USGS) maintains streamflow gauges on these tributaries upstream of Harris Reservoir:

- Station #02412000 Tallapoosa River Near Heflin, AL
- Station #02413300 Little Tallapoosa River Near Newell, AL

Streamflow records from these gauges provide insight into the hydrologic conditions, particularly inflow, at Harris Reservoir. Figure 2-1 summarizes the monthly average of daily total streamflow from the two gauges. Based on these data, streamflow or inflow to Harris Reservoir was well below average during the last eight months of 2016 as well as from July to October 2019.

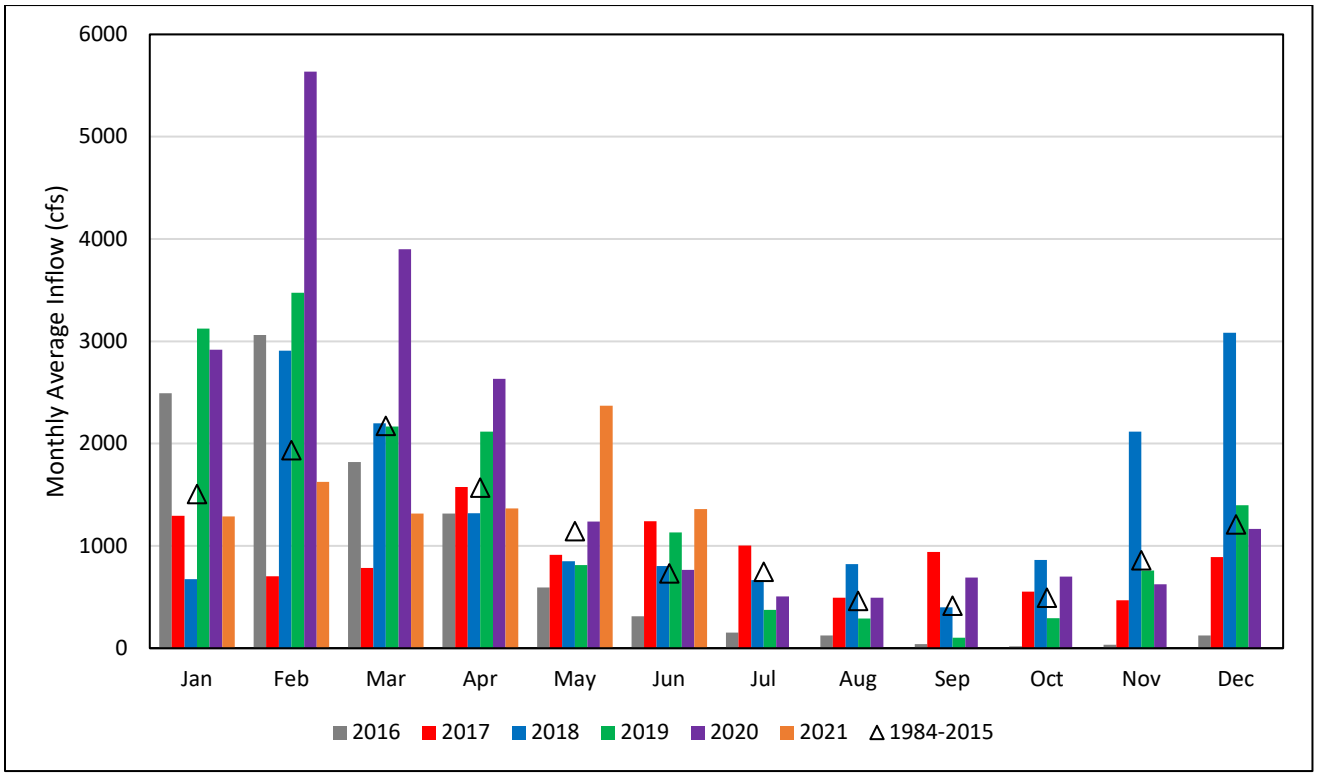


Figure 2-1 Historical and Study Period Inflow to Harris Reservoir

Lake levels at Harris Reservoir are maintained at or below target elevations according to the operating curve (Figure 2-2). In 2017, Alabama Power performed an early spring fill, reaching the summer pool elevation of 793 ft msl one month earlier than normal. Harris Reservoir was two feet above the winter pool elevation of 785 ft msl during the months of February and March in 2017, and February to April in 2018. Harris Reservoir was

maintained at or near target summer pool levels in 2017 and 2018 but dropped below those levels in 2019 as a result of low inflows from July to October. In 2020 and through June of 2021, Harris Reservoir elevations were maintained at or near the operating curve.

Compared to long-term averages, flows in the Tallapoosa River downstream of Harris Dam, as measured at the USGS Wadley gage (Station No. 02414500) were lower in February and March, and higher in June to October of 2017. In 2018 and 2019, flows were below the long-term average for most of the summer months. In 2020, flows were higher from January to April, but similar to long-term averages the remainder of the year (Figure 2-3).

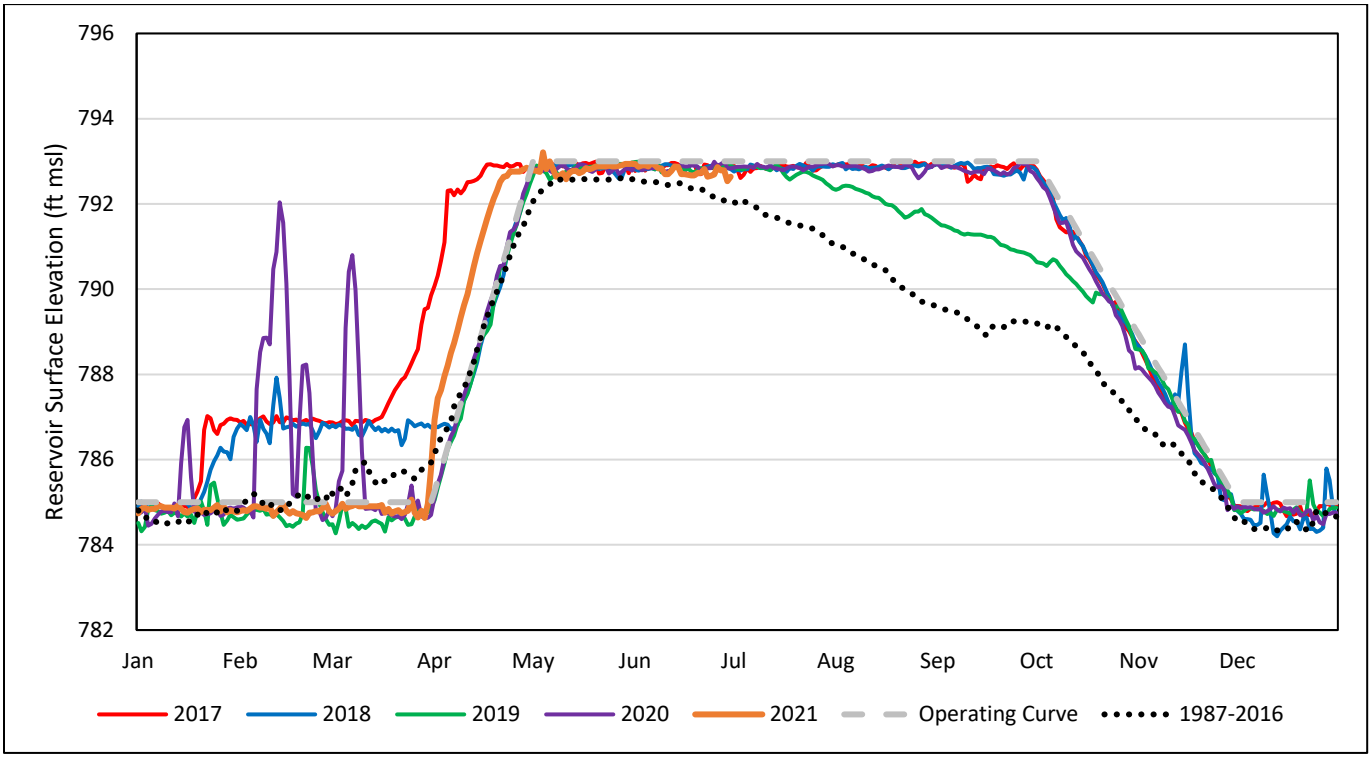


Figure 2-2 Harris Reservoir Surface Elevations for 2017-2021

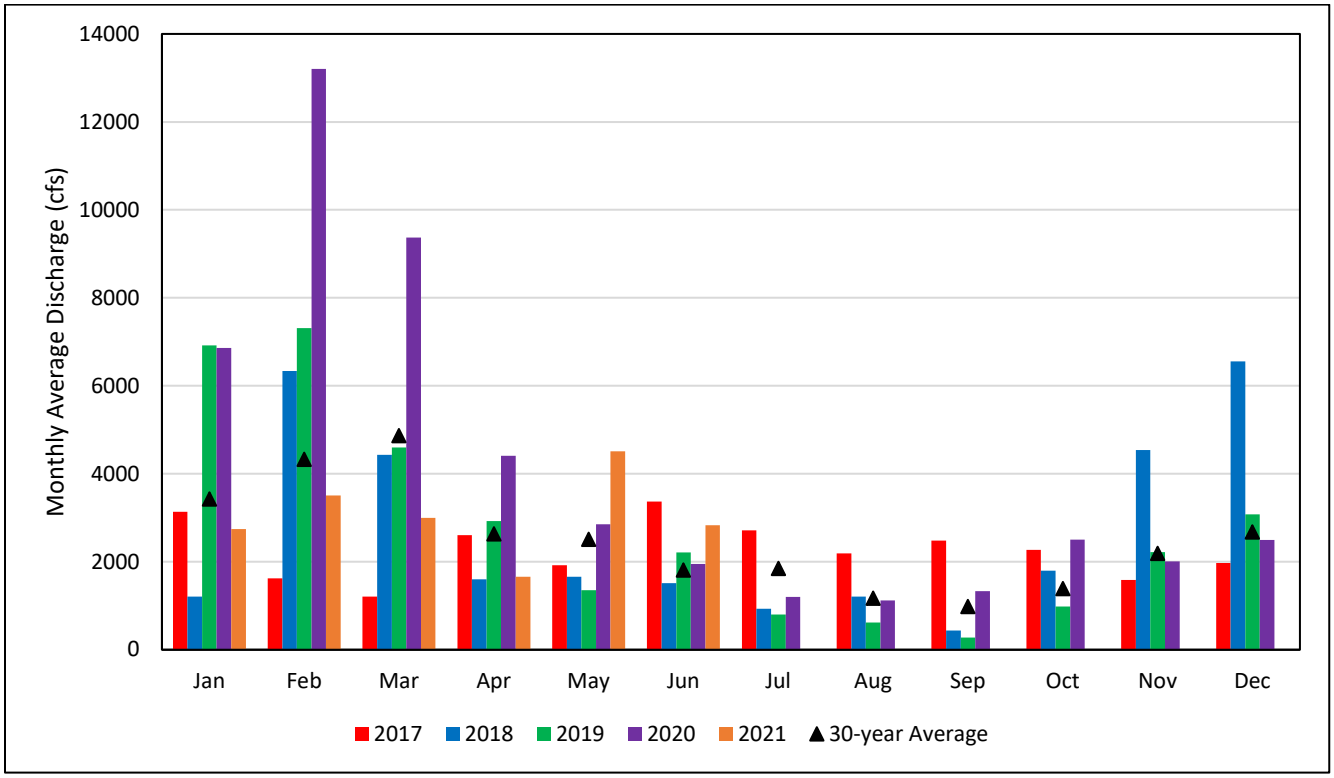


Figure 2-3 Tallapoosa River Monthly Average Discharge at Wadley

3.0 RESERVOIR WATER QUALITY

3.1 VERTICAL PROFILES

ADEM performed water quality sampling at six Harris Reservoir sites in April through October 2018 and in June through October 2020 (Figure 3-1). As part of its monitoring program, ADEM collects basic water quality data throughout a vertical profile from the reservoir surface to the bottom at regular depth intervals (approximately 3 feet). Water temperature, dissolved oxygen, pH, and conductivity data from these profiles are presented in Figure 3-2 to Figure 3-5. In 2020, only water temperature and dissolved oxygen profiles were available (Figure 3-6 and Figure 3-7). Generally, during the spring and summer, the Harris Reservoir stratifies into three layers:

- an epilimnion, which is fairly uniform in temperature and is well oxygenated
- a hypolimnion, a cold, less oxygenated bottom layer
- a metalimnion or thermocline, which is a transition layer between the epilimnion and hypolimnion

In accordance with the Water Quality Study Plan, Alabama Power collected monthly vertical profile data in the forebay (Figure 3-8) from March through October each year from 2017 to 2020. Due to high flows at the end of the month when the profile was scheduled, Alabama Power was unable to collect vertical profile data in September 2017. Water temperature and dissolved oxygen data from these forebay profiles are presented in Figure 3-9 and Figure 3-10.

3.2 DISCRETE CHEMISTRY

ADEM collected and analyzed monthly surface water samples for numerous parameters at six stations on Harris Reservoir in April through October 2018, and in June, July, September and October 2020. These data are summarized in Table 3-1. Water clarity, as measured by mean Secchi Disk depth (a measure of water clarity), was highest at RLHR-6 (2.71 m) and lowest at RLHR-3 (1.35 m). Similarly, concentrations of nutrients such as nitrogen and phosphorus, as well as chlorophyll *a* (a measure of algal abundance), were higher at the upper reservoir stations (RLHR-3, RLHR-4 and RLHR-5).

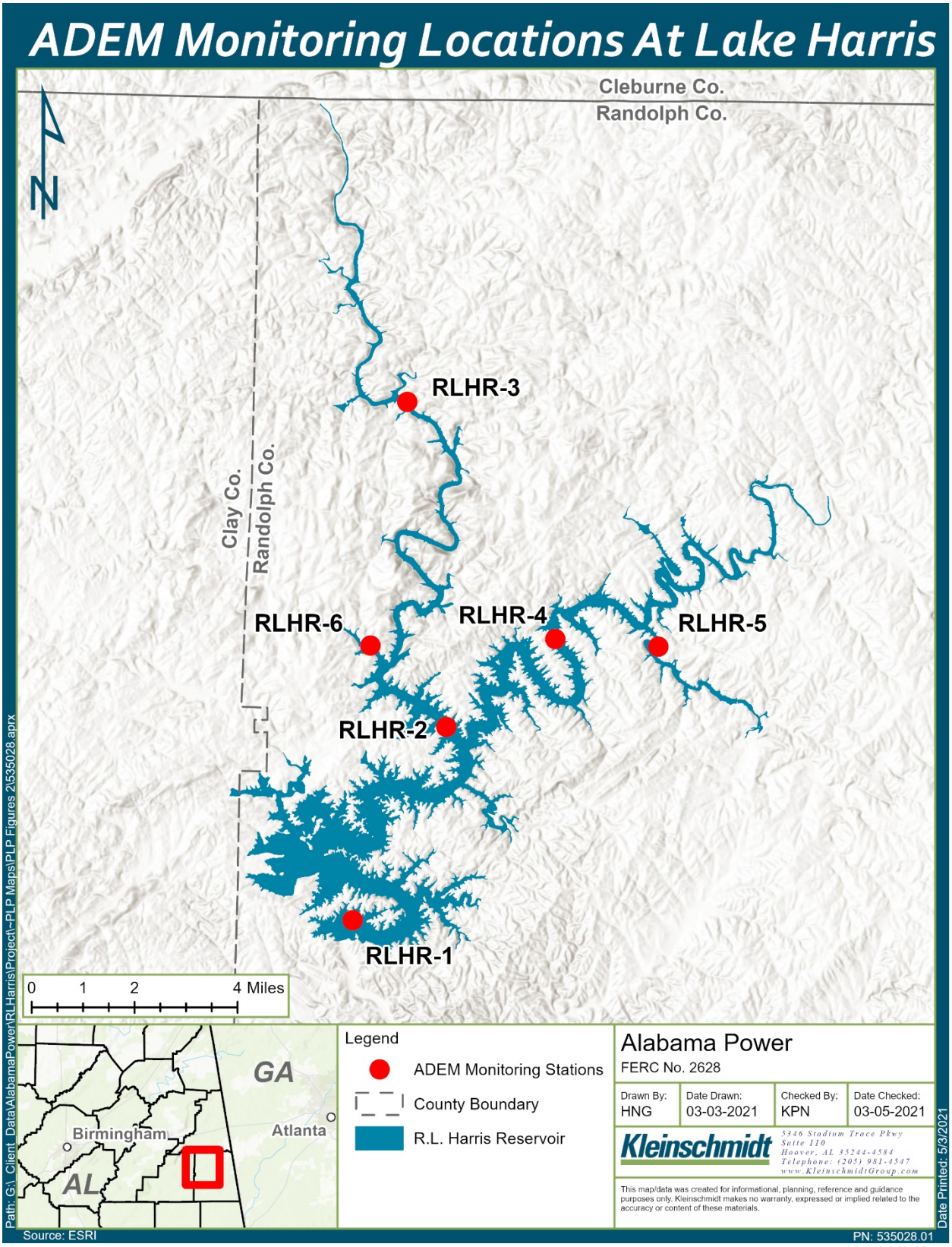
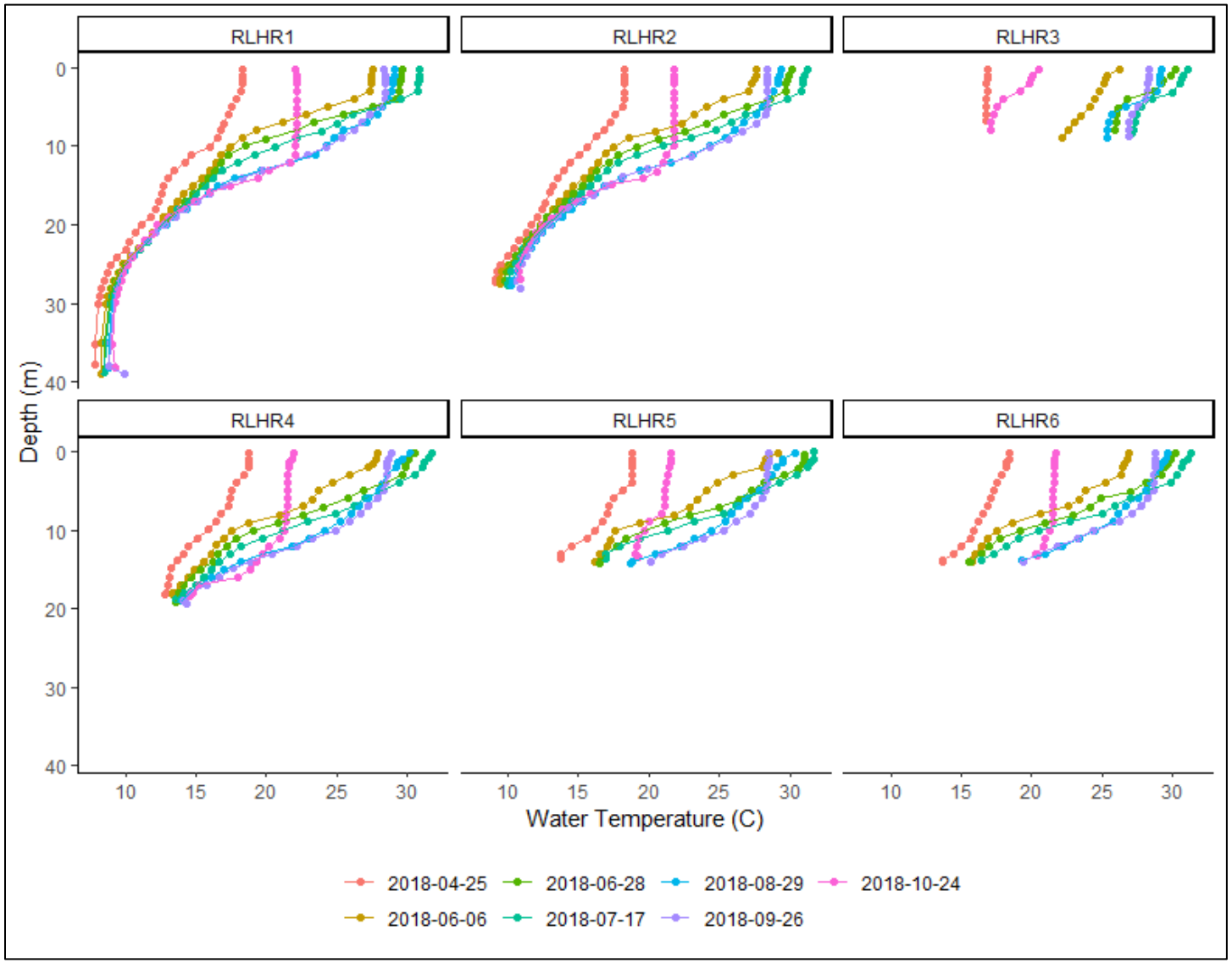
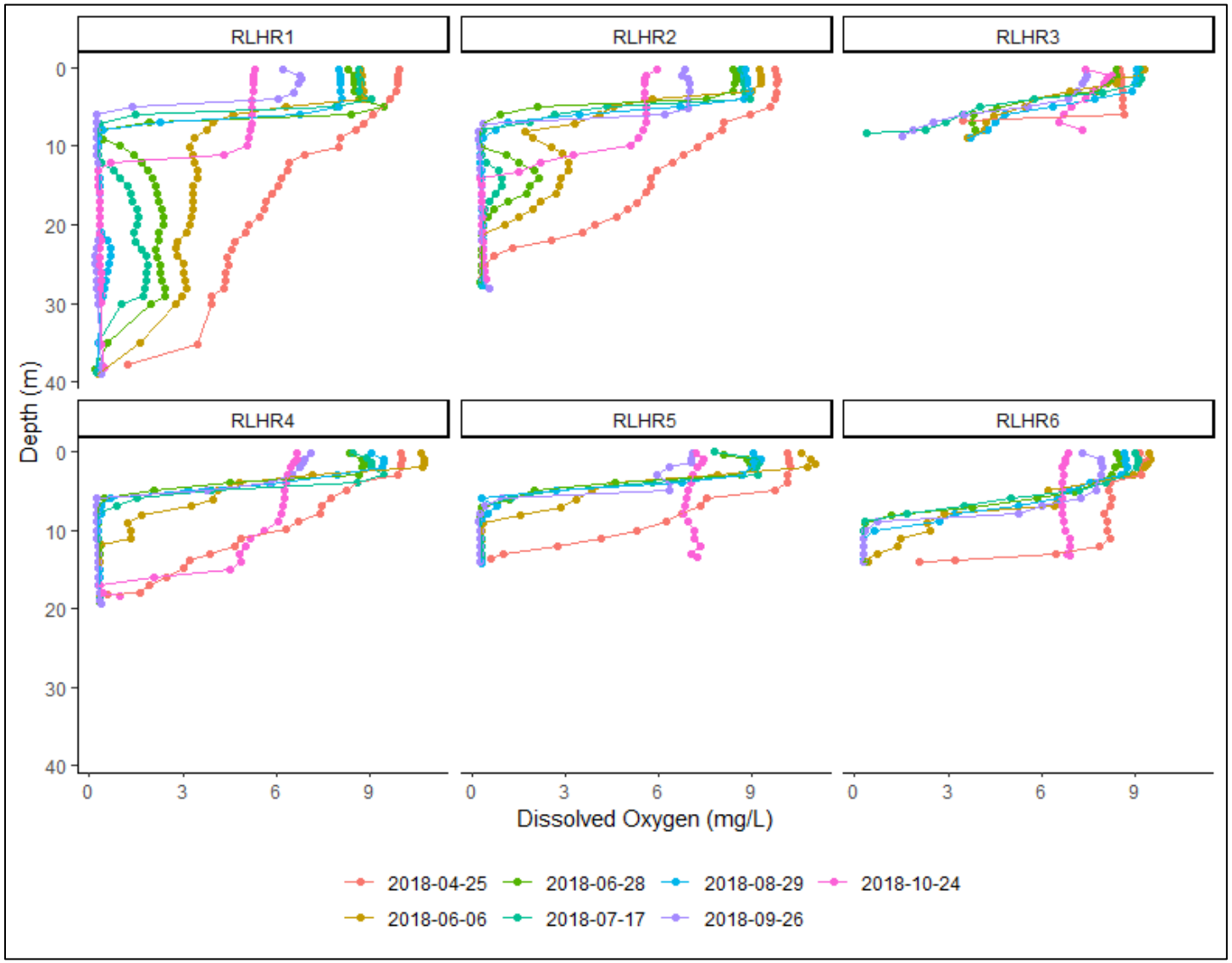


Figure 3-1 ADEM Monitoring Sites on Harris Reservoir



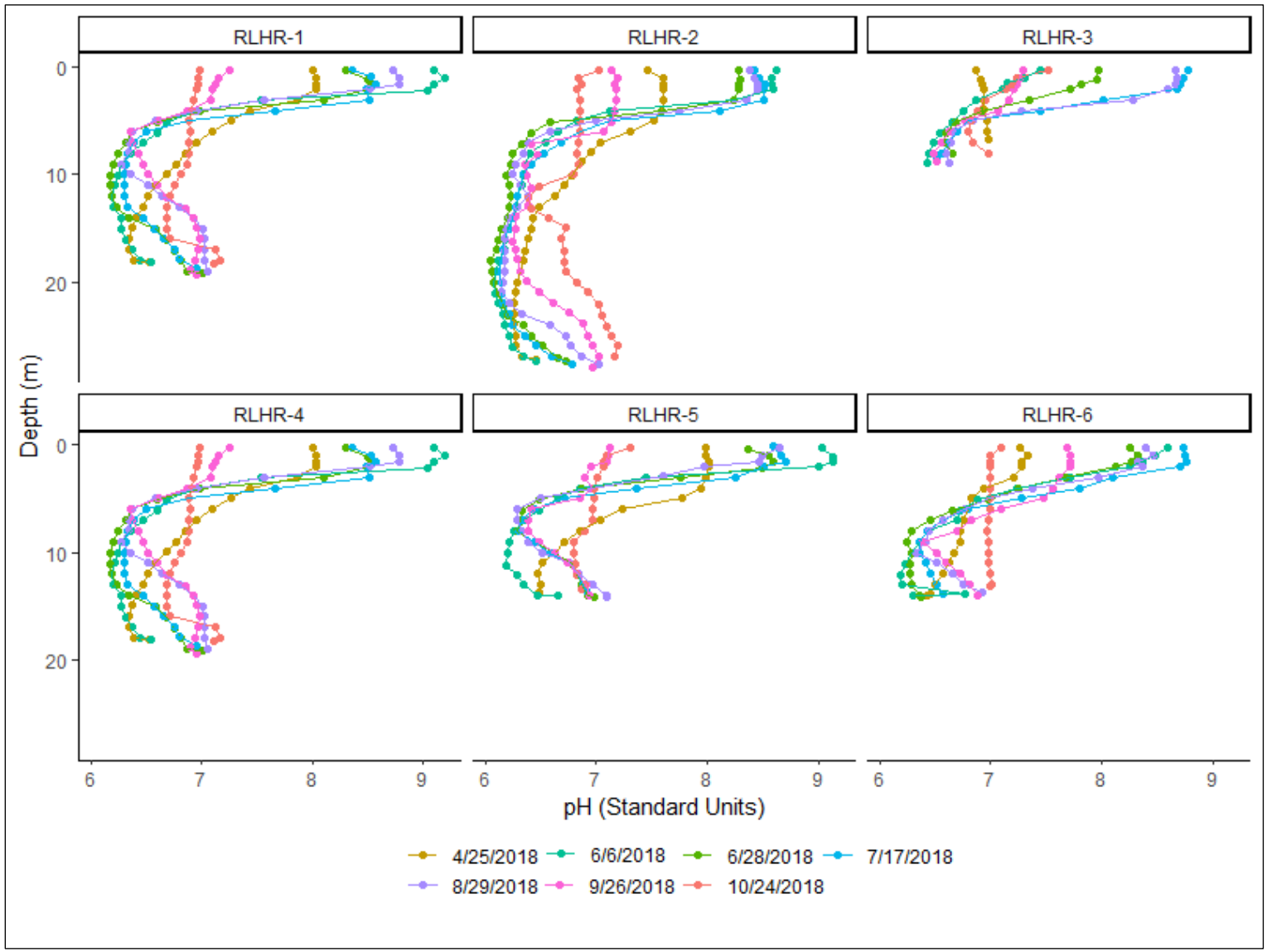
Source: ADEM 2019

Figure 3-2 2018 ADEM Harris Reservoir Water Temperature Profiles



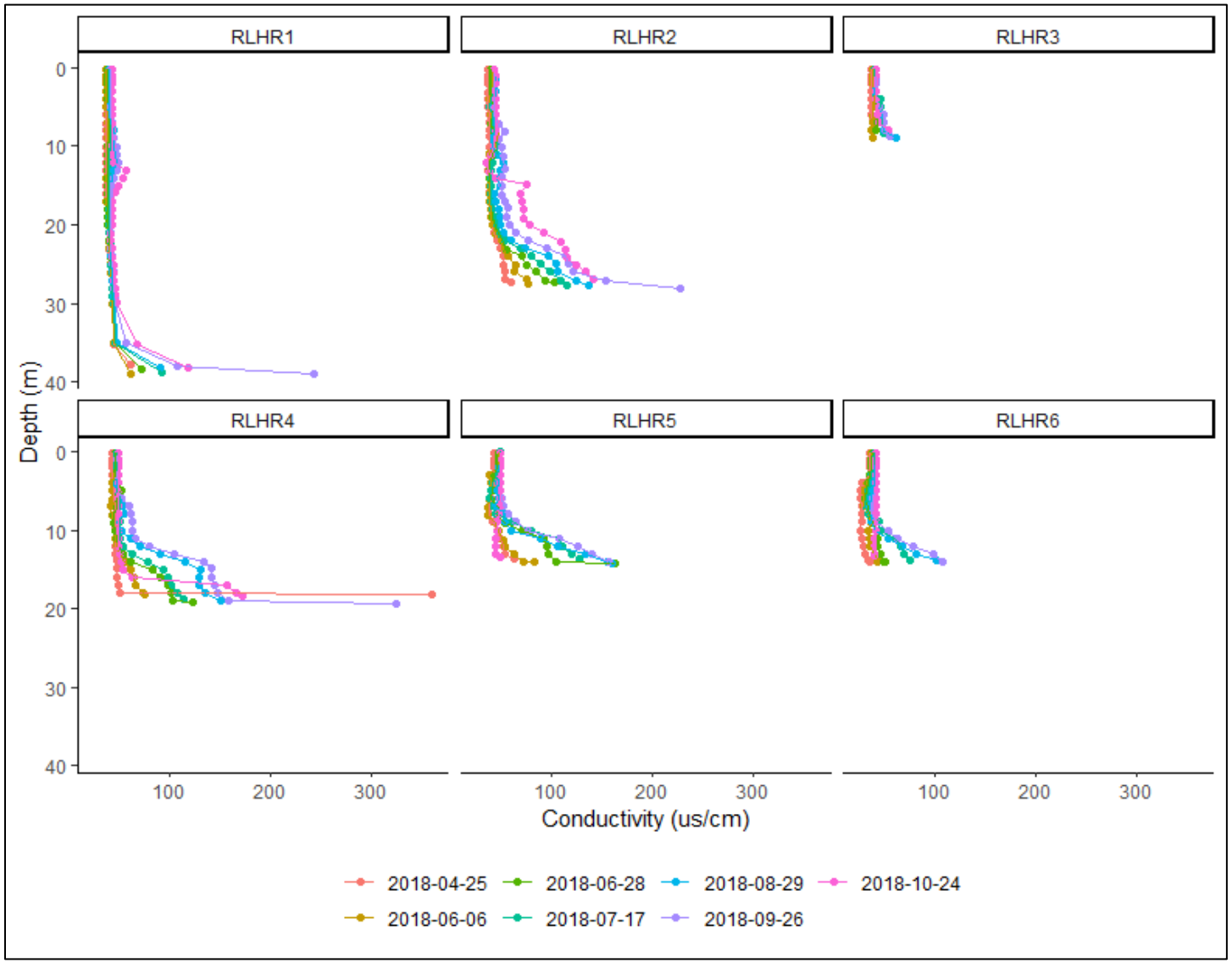
Source: ADEM 2019

Figure 3-3 2018 ADEM Harris Reservoir Dissolved Oxygen Profiles



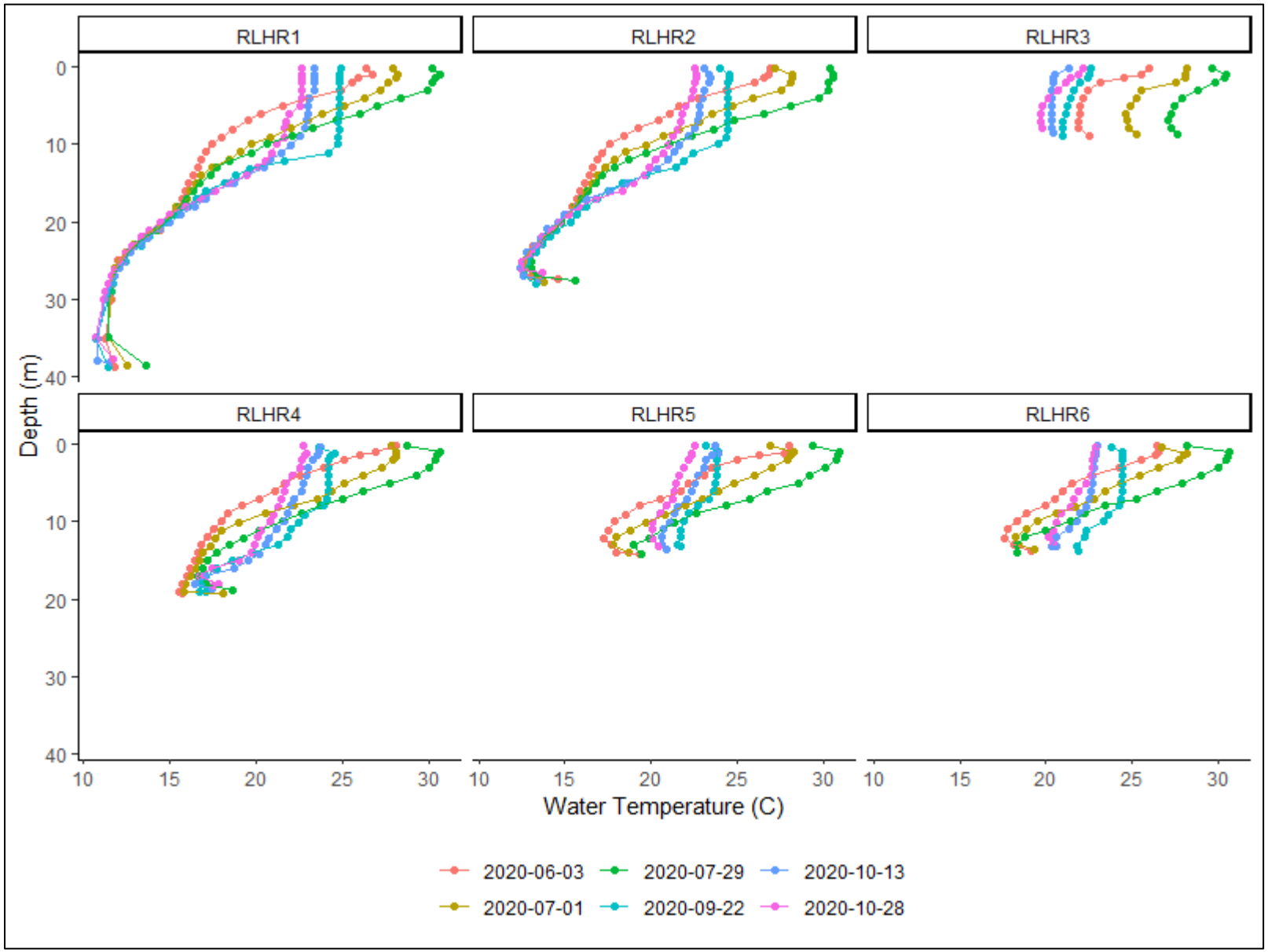
Source: ADEM 2019

Figure 3-4 2018 ADEM Harris Reservoir pH Profiles



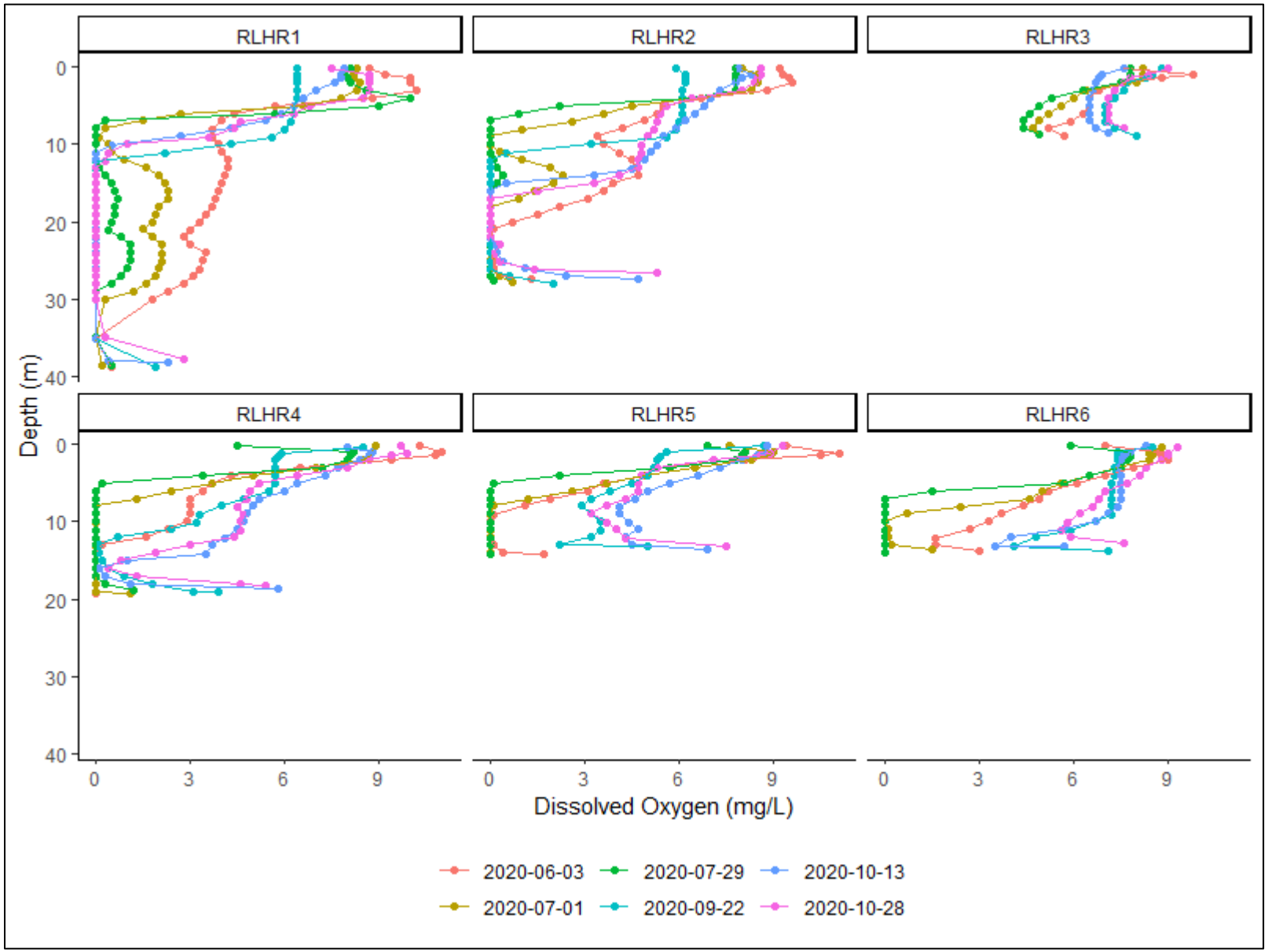
Source: ADEM 2019

Figure 3-5 2018 ADEM Harris Reservoir Conductivity Profiles



Source: ADEM 2021

Figure 3-6 2020 ADEM Harris Reservoir Water Temperature Profiles



Source: ADEM 2021

Figure 3-7 2020 ADEM Harris Reservoir Dissolved Oxygen Profiles

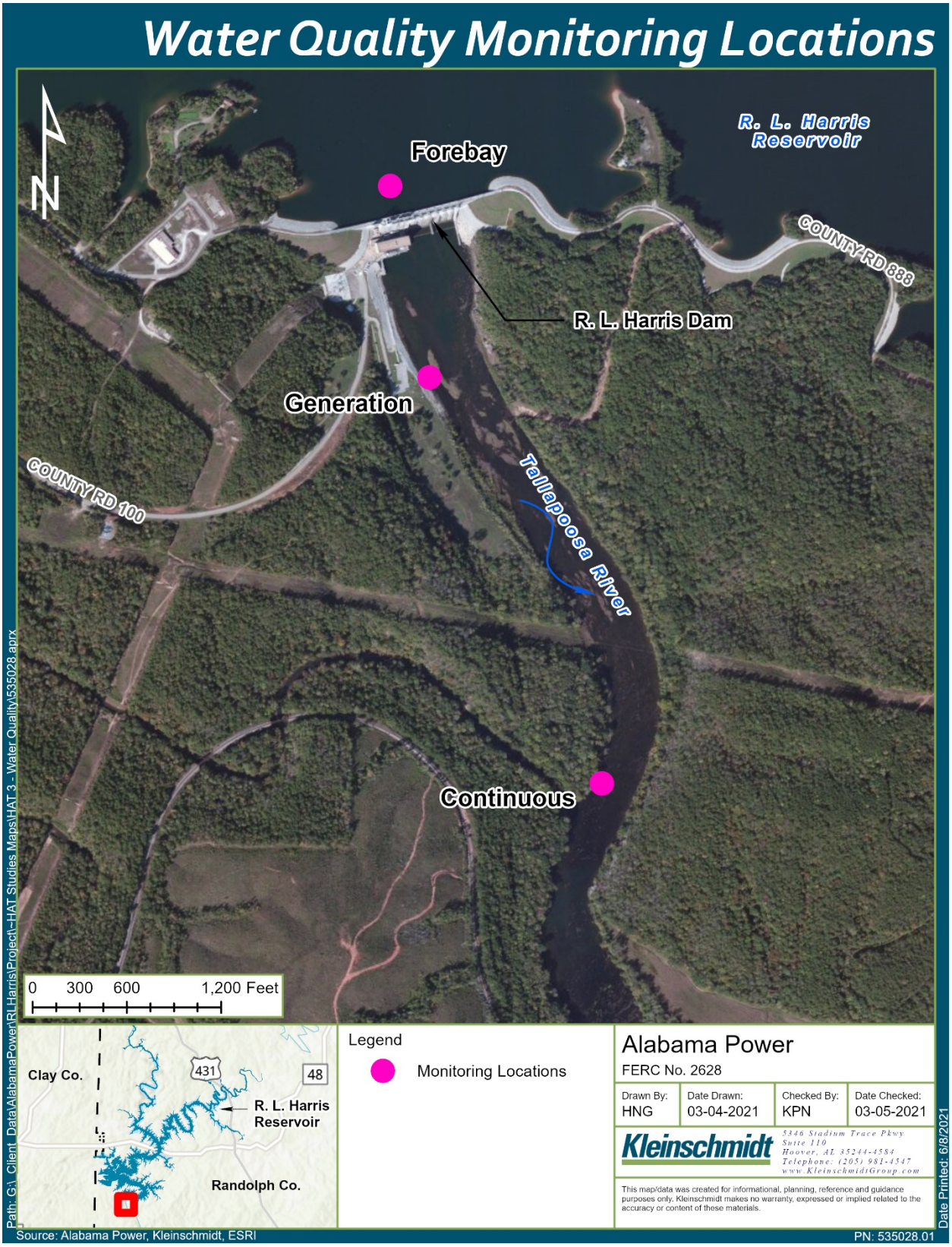
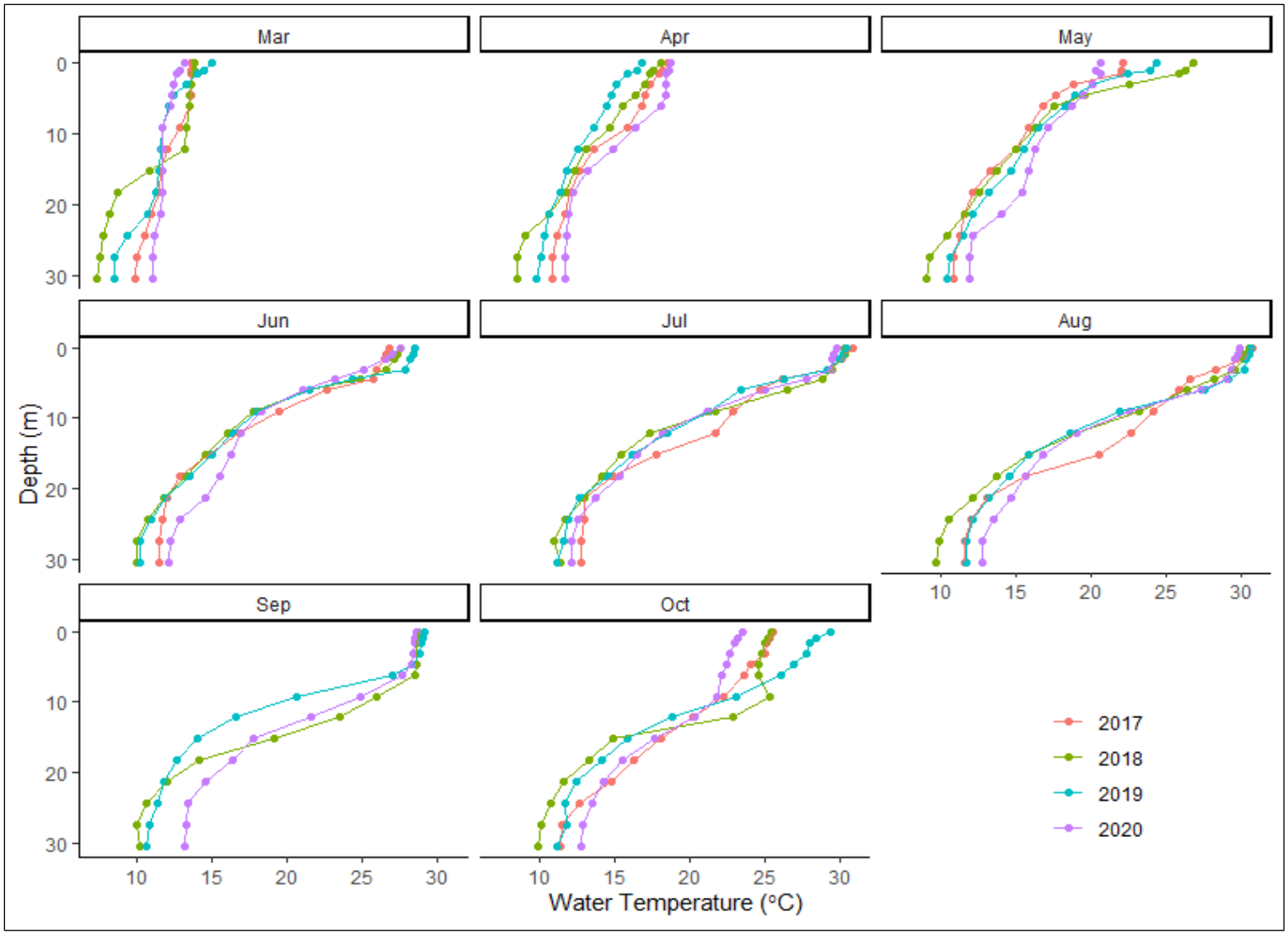
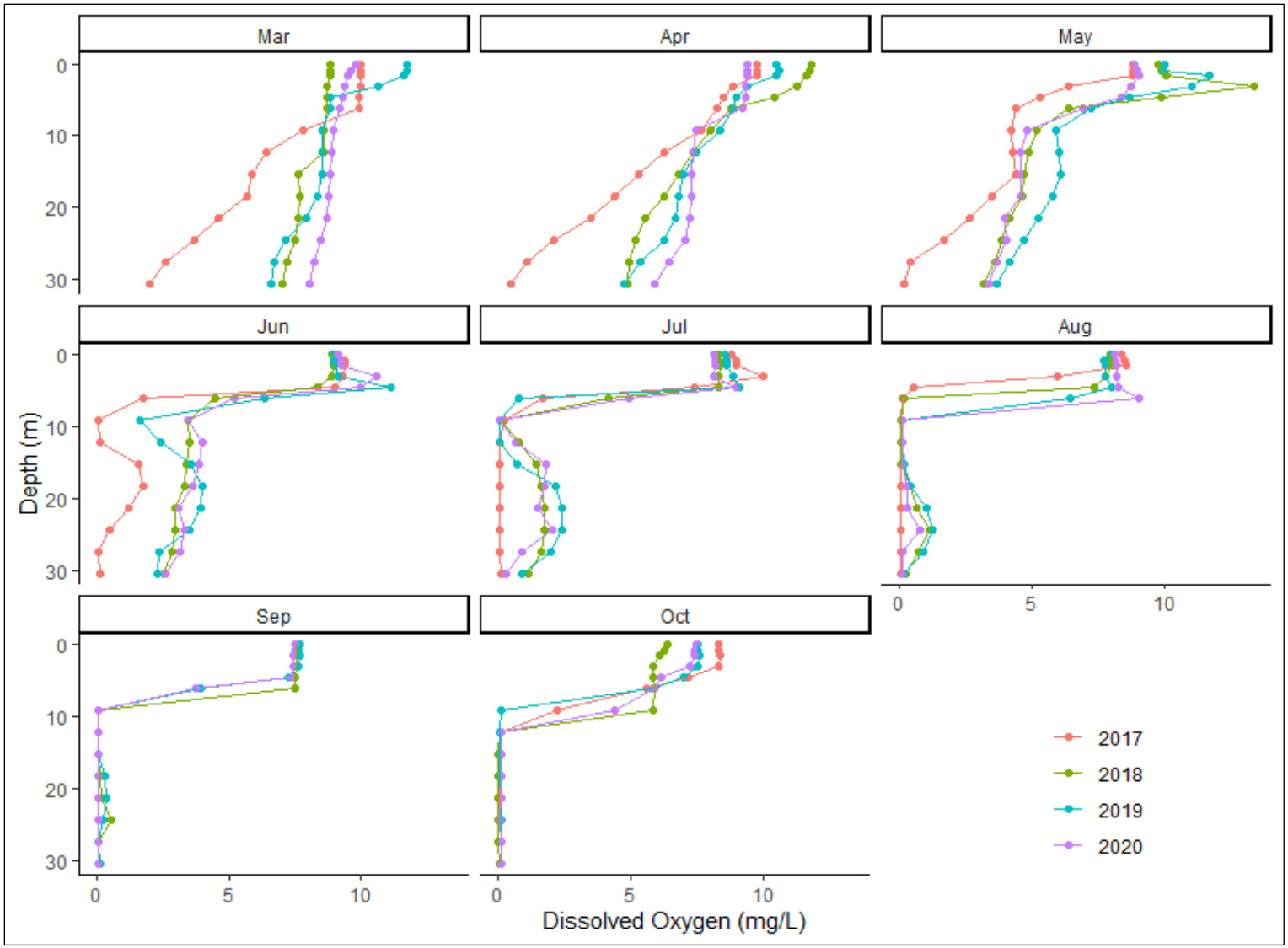


Figure 3-8 Alabama Power Monitoring Locations



Source: Alabama Power 2020

Figure 3-9 2017-2020 Alabama Power Forebay Temperature Profiles



Source: Alabama Power 2020

Figure 3-10 2017-2020 Alabama Power Forebay Dissolved Oxygen Profiles

Table 3-1 Summary of 2018 and 2020 Parameter Averages from ADEM Sites on Harris Reservoir

Parameter	n	RLHR-1	RLHR-2	RLHR-3	RLHR-4	RLHR-5	RLHR-6	Units
Alkalinity, total	12	12.3	12.8	13.5	13.6	13.7	12.1	mg/L
Ammonia-nitrogen	12	0.011	0.006	0.011	0.007	0.009	0.003	mg/L
5-day BOD	12	0.00	0.00	0.00	0.00	0.43	0.00	mg/L
Calcium	7	2.23	2.72	2.92	2.78	2.68	2.54	mg/L
Chloride	12	2.53	2.63	2.12	3.90	3.84	2.34	mg/L
Chlorophyll *a*	12	7.82	6.06	11.89	10.86	11.08	5.79	mg/m3
Depth, Secchi disk depth	12	2.86	2.40	1.30	2.02	1.90	2.06	m
Escherichia coli	7	1.3	1.5	6.8	4.0	6.0	3.1	MPN/100 mL
Hardness	7	10.1	12.2	13.0	12.9	12.4	11.5	mg/L
Nitrate + Nitrite	12	0.024	0.029	0.054	0.073	0.062	0.025	mg/L
Kjeldahl nitrogen	12	0.292	0.287	0.406	0.366	0.420	0.313	mg/L
Light attenuation, depth at 99%	12	6.8	6.1	3.3	5.3	4.9	5.2	m
Magnesium	7	1.11	1.32	1.40	1.44	1.39	1.26	mg/L
Orthophosphate	12	0.001	0.000	0.004	0.001	0.001	0.001	mg/L
Phosphorus	12	0.011	0.014	0.031	0.018	0.022	0.016	mg/L
Total dissolved solids	12	25.1	31.1	30.3	28.5	29.7	22.2	mg/L
Total suspended solids	12	1.8	1.4	5.0	2.3	3.2	3.0	mg/L
Turbidity	12	2.2	3.0	9.1	3.2	3.6	4.1	NTU

Source: ADEM 2021

Key:

BOD	Biochemical Oxygen Demand
m	Meter
m3	Cubic Meter
mg/L	Milligram per Liter
MPN	Most Probable Number
n	Number of Samples
NTU	Nephelometric Turbidity Units

3.3 ALABAMA WATER WATCH

Alabama Water Watch (AWW) is a citizen volunteer water quality monitoring program that was established in 1992. As part of this program, citizens, including members of the Lake Wedowee Property Owners Association, have performed monitoring at over 40 sites on Harris Reservoir according to U.S. Environmental Protection Agency (EPA)-approved monitoring plans. Many of the sites are currently inactive and did not have recent data available. Data from six active monitoring sites (Figure 3-11) with recent available data were obtained and summarized in Table 3-2. AWW conducted bacteria monitoring at three sites on Harris Reservoir, the results of which are summarized in Table 3-3. These data and data from the inactive monitoring sites can also be viewed on AWW's website at www.alabamawaterwatch.org.

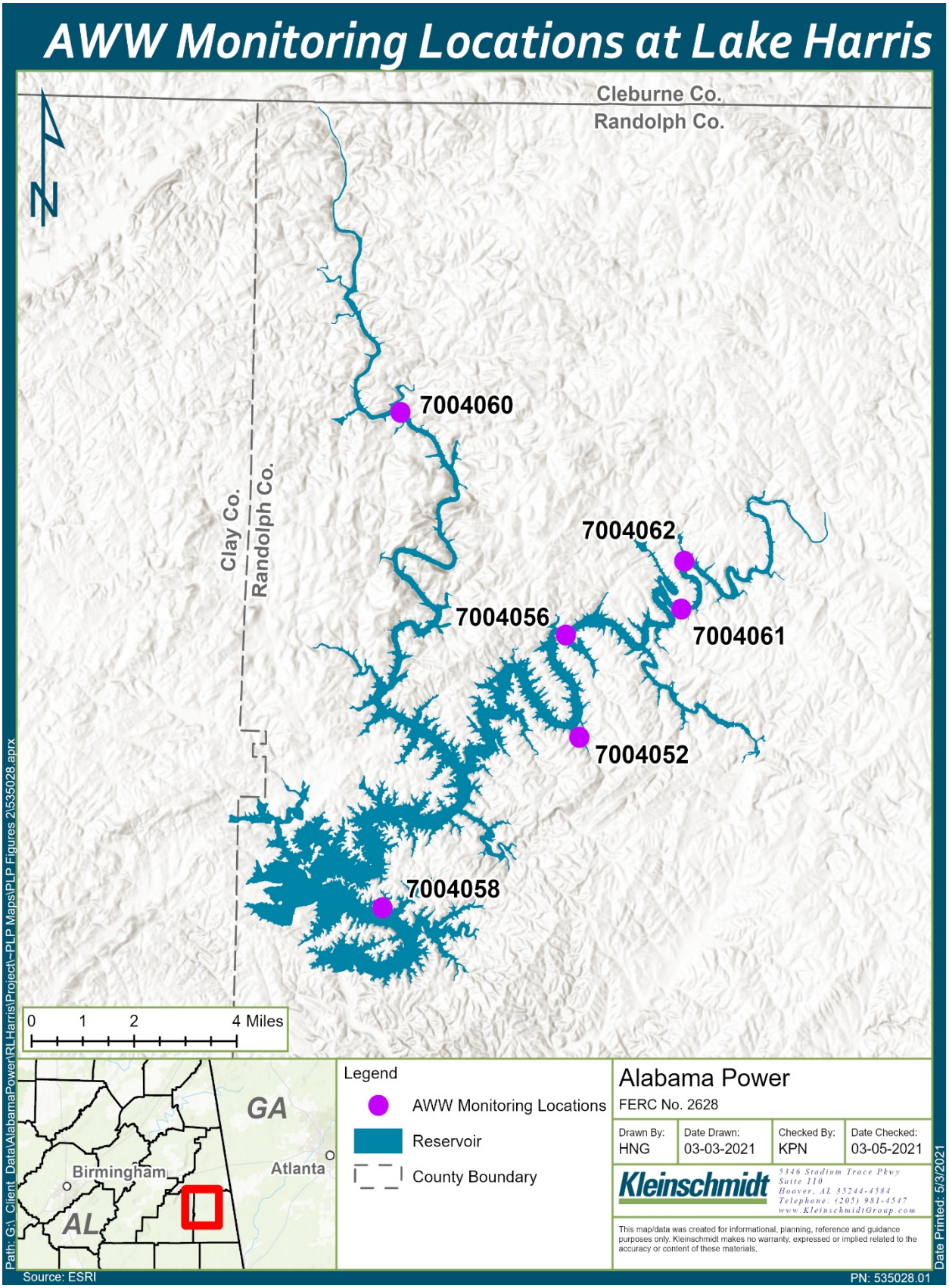


Figure 3-11 Alabama Water Watch Monitoring Sites at Harris Reservoir

Table 3-2 Summary of Results from Alabama Water Watch Sites on Harris Reservoir

Parameter		Location						Units
		700 4052	700 4056	700 4058	700 4060	700 4061	700 4062	
Water Temperature	Min	7.5	5	10	6	14	6	°C
	Avg	20.5	22.1	23.3	21.0	25.1	22.4	
	Max	32	32	31	31	29	31	
Dissolved Oxygen	Min	5.2	2.95	5.7	6.5	5.3	5.1	mg/L
	Avg	7.92	5.96	7.94	8.15	6.50	6.97	
	Max	12.6	8.95	11.3	11.3	8.3	8.8	
pH	Min	6.5	6	6.5	6	7	6.5	SU
	Avg	7.19	7.01	7.25	7.07	7.29	7.09	
	Max	9.5	9	8	8.5	8	8	
Alkalinity	Min	5	10	15	20	15	15	mg/L
	Avg	17.8	20.8	21.4	20.7	17.9	18.4	
	Max	25	35	25	25	20	30	
Hardness	Min	10	10	10	10	10	20	mg/L
	Avg	17.7	32.7	12.8	20.0	15.7	35.0	
	Max	40	70	20	40	40	100	
Turbidity	Min	2	2	2	2	2	2	JTU
	Avg	2.2	2.4	2.0	2.0	2.0	2.0	
	Max	5	8	2	2	2	2	
Secchi Depth	Min	0.25	0.3	0.95	0.4	0.85	0.5	m
	Avg	1.4	1.4	2.2	0.9	1.3	1.3	
	Max	2.8	2.9	3.2	1.7	1.6	4.5	
# Samples		60	59	32	41	7	16	
Date Range		11/11 to 06/19	06/12 to 09/19	04/13 to 08/19	10/15 to 09/19	06/17 to 01/19	11/17 to 09/19	

Source: AWW 2019; Data from 2011-2019

Key:

C	Centigrade
mg/L	Milligrams per Liter
SU	Standard Units
JTU	Jackson Turbidity Units
m	Meters

Table 3-3 Summary of E. coli Test Results from Alabama Water Watch Sites on Harris Reservoir

Location	Minimum (MPN/100 mL)	Average (MPN/100 mL)	Maximum (MPN/100 mL)	# of Samples
7004052	0	19	233	27
7004056	0	74	789	49
7004058	0	9	233	29
All Sites	0	42	789	105

Source: AWW 2019; Data from 2011 - 2019

Key:

MPN Most Probable Number

4.0 DOWNSTREAM WATER QUALITY

4.1 ADEM MONITORING

ADEM performed monitoring in the Tallapoosa River at four sites downstream of Harris Dam in 2018, 2019, and 2020 (Figure 4-1). The site immediately downstream of Harris Dam (MARE-12) was sampled monthly in 2018 from April to October during periods of non-generation, and in 2020 from June to October only during periods of generation (Table 4-1). Dissolved oxygen levels at this station were all above 5.0 milligrams per liter (mg/L). Conductivity ranged from 39 to 45 microsiemens per centimeter (µs/cm), and pH ranged from 6.44 to 6.92. Table 4-2 presents a summary of discrete chemistry samples collected by ADEM at this site in 2018 and 2020.

In May 2018, ADEM installed a monitoring station in the Tallapoosa River at the Malone bridge crossing, approximately seven river miles downstream of Harris Dam. The station recorded measurements of water temperature, dissolved oxygen, conductivity, pH, Turbidity, and chlorophyll *a* at 15-minute intervals. The station was initially installed on a bridge pier near the left bank but was relocated to a pier near the middle of the river channel in April 2019. Table 4-3 provides a summary of the monthly average values for each parameter, as well as minimum and maximum monthly values for water temperature and dissolved oxygen. Overall, dissolved oxygen levels were above 5 mg/L for a majority of monitoring period, with less than one percent of all measurements falling below 5 mg/L. Line plots of the 15-minute data for water temperature and dissolved oxygen are provided in Figure 4-2 and Figure 4-3.

Results of the monthly in-stream measurements collected by ADEM from March 2018 through February 2019 at the Wadley site (TA-1), located approximately 14 miles downstream of Harris Dam, indicated the highest water temperatures occurred during July through September (Table 4-4). Lowest dissolved oxygen levels occurred in the July through October samples, though no measurements less than 6.0 mg/L were recorded. Measurements of pH were typically circumneutral[3], and conductivity ranged between 34 and 45 µs/cm. Table 4-5 presents a summary of discrete chemistry samples collected by ADEM from March 2018 through February at the Wadley site.

[3] Meaning "nearly neutral".

Results of the monthly in-stream measurements collected by ADEM from January 2018 through December 2020 at the Horseshoe Bend site (TART-1) located approximately 44 miles downstream of Harris Dam indicated the highest water temperatures occurred during July (Table 4-6). Lowest dissolved oxygen levels typically occurred in June through October, though no measurements less than 7.1 mg/L were recorded. Measurements of pH were typically circumneutral, and conductivity ranged from 33 to 45 µs/cm. Table 4-7 presents a summary of results for discrete chemistry samples collected by ADEM at Horseshoe Bend.

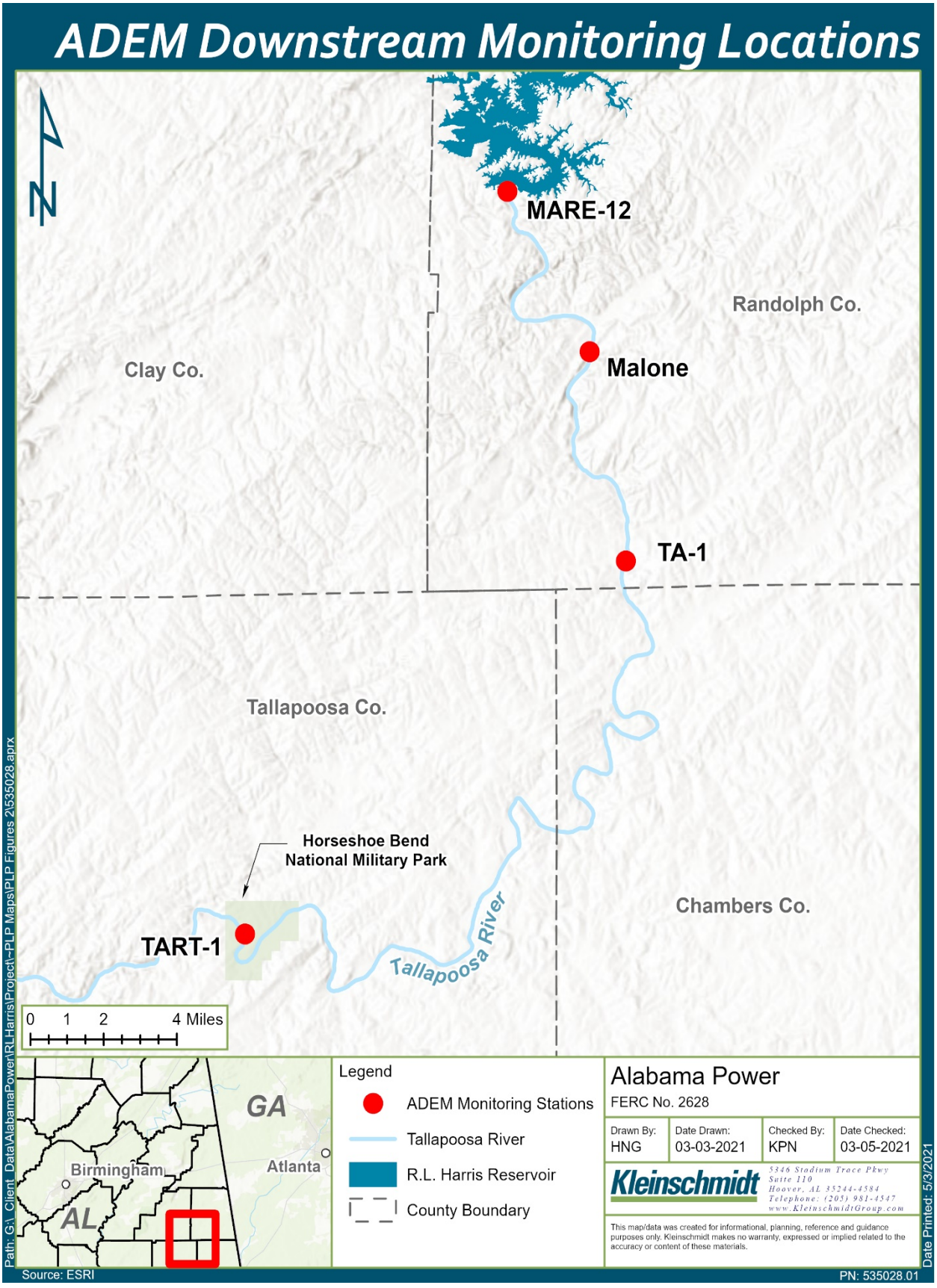


Figure 4-1 ADEM Downstream Monitoring Locations

Table 4-1 Water Column Averages for Parameters Measured by ADEM at the Harris Dam Tailrace (MARE-12)

Date	Water Temperature (°C)	DO (mg/L)	pH	Specific conductance (µs/cm)
4/25/2018	18.15	9.62	6.92	39
6/6/2018	20.19	8.64	6.66	39
6/28/2018	22.08	8.44	6.47	40
7/17/2018	23.79	6.66	6.62	41
8/29/2018	24.55	5.82	6.49	43
9/26/2018	24.52	6.09	6.44	44
10/24/2018	20.87	7.53	6.75	45
6/2/2020	20.00	6.15	5.91	28
6/29/2020	21.15	6.82	5.89	33
7/27/2020	23.74	6.55	6.03	37
8/24/2020	24.42	6.24	5.99	33
9/22-2020	22.91	7.51	6.66	36
10/13/2020	21.59	7.16	7.18	55
10/28/2020	20.40	4.09	5.92	42

Source: ADEM 2019; 2021

Key:

DO	Dissolved Oxygen
mg/L	Milligrams per Liter
C	Centigrade
µs/cm	Microsiemens per Centimeter

Table 4-2 2018 and 2020 Summary of Results from ADEM Samples Collected at Harris Dam Tailrace (MARE-12)

Parameter	n	Mean	Min	Max	Units
Alkalinity, total	13	12.2	9.4	20.6	mg/L
Ammonia-nitrogen	13	0.010	0.0	0.1	mg/L
BOD, 5-day	12	0.0	0.0	0.0	mg/L
Chloride	13	2.55	2.3	2.8	mg/L
Chlorophyll *a*	12	3.4	1.8	6.9	ug/L
Escherichia coli	10	1.9	1.0	6.3	MPN/100 mL
Nitrate + Nitrite	13	0.123	0.0	0.3	mg/L
Kjeldahl nitrogen	13	0.266	0.0	0.6	mg/L
Orthophosphate	12	0.001	0.0	0.0	mg/L
Phosphorus	13	0.012	0.0	0.0	mg/L
Total dissolved solids	13	25.0	13.0	36.0	mg/L
Total suspended solids	13	3.3	0.0	17.0	mg/L
Turbidity	13	2.9	0.0	4.5	NTU

Source: ADEM 2021

Key:

BOD Biochemical Oxygen Demand
cfu Colony Forming Unit
µg/L Microgram per Liter
n Number of Samples
mg/L Milligram per Liter
MPN Most Probable Number
NTU Nephelometric Turbidity Unit

Table 4-3 Monthly Summary of Results for Parameters Monitored by ADEM in the Tallapoosa River at Malone

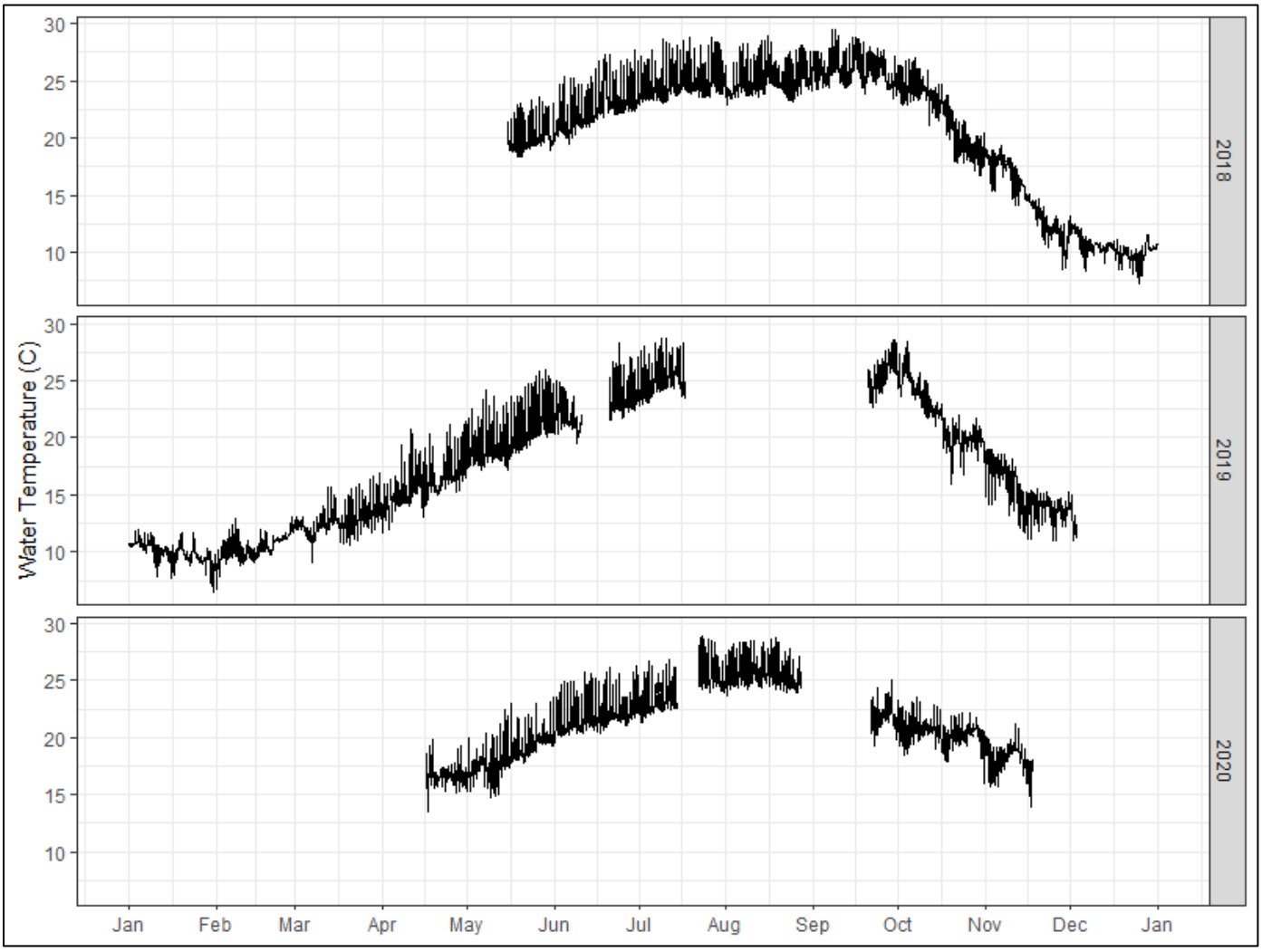
Year/ Month	Water Temperature (°C)			Dissolved Oxygen (mg/L)			Conductivity (µs/cm)	pH	Turbidity (FNU)	Chlorophyll *a* (µg/L)
	Max	Mean	Min	Max	Mean	Min				
2018										
May	23.59	20.05	18.30	9.72	7.41	6.14	38.7	6.63	9.65	3.52
Jun	27.73	22.60	19.51	10.06	7.11	5.23	39.3	6.60	8.61	3.61
Jul	28.76	24.93	22.83	8.90	6.43	3.92	41.0	6.66	6.50	2.91
Aug	28.96	25.11	22.93	8.09	6.26	4.46	43.0	6.69	9.34	3.19
Sep	29.46	26.06	23.50	7.88	6.27	4.55	44.6	6.75	6.74	1.78
Oct	27.08	22.01	16.69	9.05	6.42	4.73	44.0	6.59	4.32	1.27
Nov	19.38	14.71	8.52	11.47	6.89	4.86	44.6	6.55	10.02	1.37
Dec	12.53	10.30	7.28	11.79	9.16	6.7	40.3	6.54	16.03	2.47
2019										
Jan	11.99	9.96	6.49	11.55	9.93	9.18	35.5	6.58	10.91	1.97
Feb	13.12	10.40	6.77	11.82	10.09	9.37	35.0	6.66	10.00	1.95
Mar	16.87	12.69	9.15	11.74	9.50	8.18	32.2	6.68	7.47	2.04
Apr	21.46	16.04	11.69	12.59	9.26	7.71	33.5	7.00	12.98	3.60
May	25.97	20.05	17.12	11.78	7.97	6.15	36.4	6.78	5.73	3.37
Jun	28.34	22.66	19.54	9.95	7.12	5.33	37.5	6.58	15.37	2.84
Jul	28.73	25.21	22.80	9.75	6.85	5.23	38.0	6.55	2.15	1.39
Sep	28.62	25.58	22.70	9.52	7.62	5.69	42.3	7.14	1.83	0.14
Oct	28.46	21.89	15.97	10.71	7.29	5.46	41.4	6.66	6.77	0.33
Nov	19.01	15.26	11.02	11.18	7.51	4.96	41.6	6.52	5.68	0.35
Dec	15.04	12.86	11.05	10.72	7.20	5.33	44.7	6.48	6.08	0.33
2020										
Apr	19.85	16.73	13.59	11.13	8.09	7.08	32.5	6.78	10.17	2.78
May	23.59	18.42	14.71	11.90	7.77	6.29	33.7	6.73	8.19	2.29
Jun	26.30	21.84	19.55	11.05	7.40	5.60	35.4	6.70	5.71	2.70
Jul	28.87	24.18	21.38	10.09	6.66	5.50	39.9	6.73	7.58	1.47
Aug	28.71	25.73	23.72	8.05	6.47	5.28	38.5	6.62	4.84	0.99
Sep	25.09	21.97	19.35	9.55	7.02	5.46	41.3	6.72	2.48	0.61

Year/ Month	Water Temperature (°C)			Dissolved Oxygen (mg/L)			Conductivity (µs/cm)	pH	Turbidity (FNU)	Chlorophyll *a* (µg/L)
	Max	Mean	Min	Max	Mean	Min				
Oct	23.55	20.46	15.93	9.96	6.74	4.75	42.7	6.67	5.00	0.31
Nov	21.18	18.08	13.93	11.01	6.94	5.14	42.3	6.84	3.21	0.55

Source: ADEM 2021

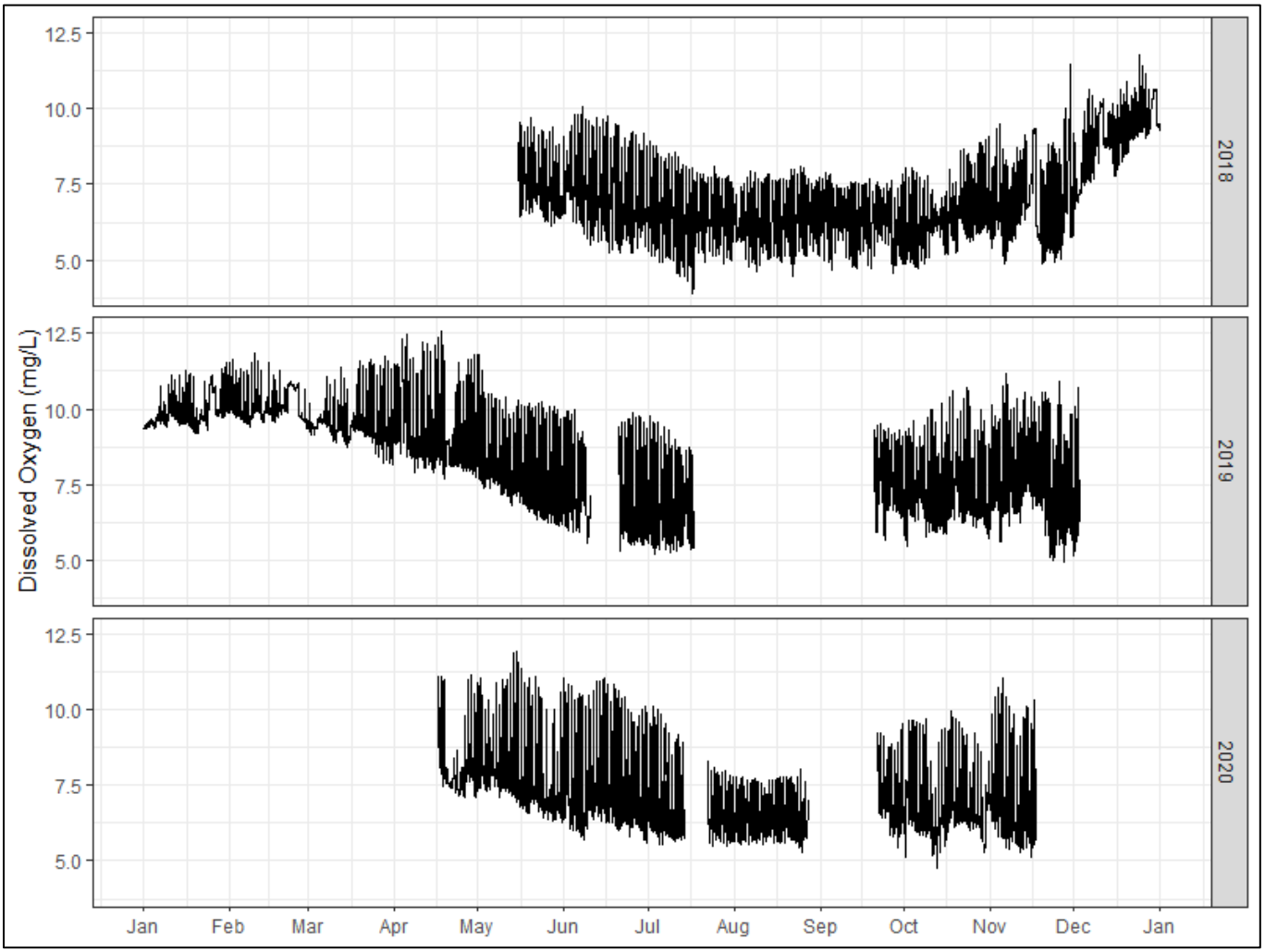
Key:

C	Centigrade
mg/L	Milligrams per Liter
µs/cm	Microsiemens per Centimeter
FNU	Formazin Nephelometric Unit
µg/L	Microgram per Liter



Source: ADEM 2021

Figure 4-2 Line Plots of 15-minute Water Temperature Data Collected by ADEM on the Tallapoosa River at Malone



Source: ADEM 2021

Figure 4-3 Line Plot of 15-minute Dissolved Oxygen Data Collected by ADEM on the Tallapoosa River at Malone

Table 4-4 2018-2019 ADEM Water Column Average by Parameter from Tallapoosa River at Wadley (TA-1)

Date	Water Temperature (°C)	DO (mg/L)	pH	Specific conductance (µs/cm)
3/12/2018	11.53	9.76	6.32	34
4/11/2018	14.94	10.05	6.77	38
5/9/2018	19.38	9.03	6.62	38
6/11/2018	22.35	8.25	6.37	38
7/9/2018	25.29	8.19	6.27	39
7/30/2018	26.65	7.58	6.43	40
9/26/2018	26.58	7.67	6.63	45
10/15/2018	23.02	7.97	6.55	42
12/6/2018	9.38	9.85	6.54	40
1/16/2019	8.52	10.58	6.19	36
2/6/2019	10.29	10.61	6.39	36

Source: ADEM 2019

Key:
DO Dissolved Oxygen
mg/L Milligrams per Liter
C Centigrade
µs/cm Microsiemens per Centimeter

Table 4-5 Summary of 2018 – 2019 Results for ADEM Samples Collected from the Tallapoosa River at Wadley (TA-1)

Parameter	n	Mean	Min	Max	Units
Alkalinity, total	11	10.9	8.9	14.4	mg/L
Ammonia-nitrogen	11	0.016	0.000	0.120	mg/L
BOD, 5-day	11	0	0	0	mg/L
Chloride	11	2.56	2.24	3.17	mg/L
Chlorophyll *a*	11	1.4	0.0	3.2	µg/L
Escherichia coli	11	35.4	8.4	201.4	MPN/100 mL
Nitrate + Nitrite	11	0.219	0.038	0.363	mg/L
Kjeldahl nitrogen	11	0.079	0.000	0.274	mg/L
Orthophosphate	11	0.002	0.000	0.006	mg/L
Phosphorus	11	0.017	0.013	0.023	mg/L
Total dissolved solids	11	29.6	16.0	51.0	mg/L
Total suspended solids	11	3.55	0.00	13.00	mg/L
Turbidity	11	6.0	1.8	16.6	NTU

Source: ADEM 2019

Key:

BOD	Biochemical Oxygen Demand
cfu	Colony Forming Unit
µg/L	Microgram per Liter
n	Number of Samples
mg/L	Milligram per Liter
MPN	Most Probable Number
NTU	Nephelometric Turbidity Unit

Table 4-6 2018-2020 ADEM Water Column Average by Parameter from Tallapoosa River at Horseshoe Bend (TART-1)

Date	Water Temperature (°C)	DO (mg/L)	pH	Specific conductance (µs/cm)
1/9/2018	6.26	12.07	6.76	45
2/28/2018	13.41	9.77	6.72	38
3/14/2018	11.96	9.96	6.60	38
4/11/2018	15.80	9.20	6.72	39
5/9/2018	21.18	8.07	6.38	39
6/11/2018	25.60	7.12	6.40	41
7/9/2018	26.01	7.20	6.43	39
7/30/2018	29.39	7.26	6.62	39
9/26/2018	28.15	7.30	6.60	43
10/15/2018	22.88	7.51	6.46	43
11/13/2018	14.65	8.20	6.55	39
12/5/2018	10.09	10.10	6.78	40
1/8/2019	10.96	10.41	6.74	37
2/5/2019	10.42	10.74	6.71	37
4/2/2019	13.75	10.01	7.20	33
5/8/2019	21.70	8.49	7.25	37
6/5/2019	26.73	6.78	7.06	39
7/16/2019	28.68	6.58	7.22	43
8/6/2019	27.85	6.74	7.14	42
9/5/2019	28.39	7.32	7.57	42
10/1/2019	27.61	6.47	6.74	44
11/14/2019	6.75	11.70	6.96	44
12/11/2019	12.66	9.37	7.16	46
1/15/2020	13.93	9.03	6.70	29
3/10/2020	11.71	9.91	6.63	29
5/19/2020	20.03	8.93	6.84	33
6/17/2020	23.75	7.60	6.95	34
7/14/2020	26.11	6.88	6.83	35
8/11/2020	29.00	6.72	7.10	41
9/15/2020	28.15	7.34	7.34	45
10/14/2020	21.30	7.92	6.77	41
11/18/2020	14.25	9.58	6.95	43
12/8/2020	10.85	10.48	6.94	44

Source: ADEM 2019

Key: DO Dissolved Oxygen C Centigrade
mg/L Milligrams per Liter µs/cm Microsiemens per Centimeter

Table 4-7 Summary of 2018-2020 Results for ADEM Samples Collected from the Tallapoosa River at Horseshoe Bend (TART-1)

Parameter	n	Mean	Min	Max	Units
Alkalinity, total	40	11.8	7.1	21.1	mg/L
Ammonia-nitrogen	42	0.016	0.000	0.096	mg/L
BOD, 5-day	41	0	0	0	mg/L
Calcium	4	4.52	1.95	12.20	mg/L
Chloride	42	2.48	1.80	3.00	mg/L
Chlorophyll *a*	42	0.97	0.00	4.00	µg/L
Escherichia coli	42	201.7	6.2	2419.6	MPN/100 mL
Hardness	4	21.7	9.9	56.4	mg/L
Nitrate + Nitrite	42	0.177	0.037	0.332	mg/L
Kjeldahl nitrogen	42	0.228	0.000	1.070	mg/L
Magnesium	4	2.53	1.23	6.31	mg/L
Orthophosphate	41	0.004	0.000	0.009	mg/L
Phosphorus	42	0.020	0.010	0.070	mg/L
Sulfate	42	1.67	0.00	2.28	mg/L
Total dissolved solids	42	32.9	1.0	71.0	mg/L
Total suspended solids	42	12.7	0.0	122.0	mg/L
Turbidity	45	14.7	3.2	102.0	NTU

Source: ADEM 2021

Key:

BOD	Biochemical Oxygen Demand
µg/L	Microgram per Liter
mg/L	Milligram per Liter
n	Number of Samples
NTU	Nephelometric Turbidity Unit
MPN	Most Probable Number

4.2 ALABAMA POWER MONITORING

4.2.1 GENERATION MONITOR

For purposes of developing an application for a Section 401 Water Quality Certification, per agreement with ADEM, Alabama Power conducted dissolved oxygen and temperature monitoring in the tailrace at the monitor placed approximately 800 feet downstream of the Harris Dam on the west bank of the river[4] (see Figure 3-8 for monitor location). Measurements were recorded at 15-minute intervals during generation from June to October of 2017–2020, and June 2021 (see Appendix B). Tabular summaries of these

[4] See Aquatic Resources Study Report for a complete analysis of temperature data from Harris Dam to Horseshoe Bend

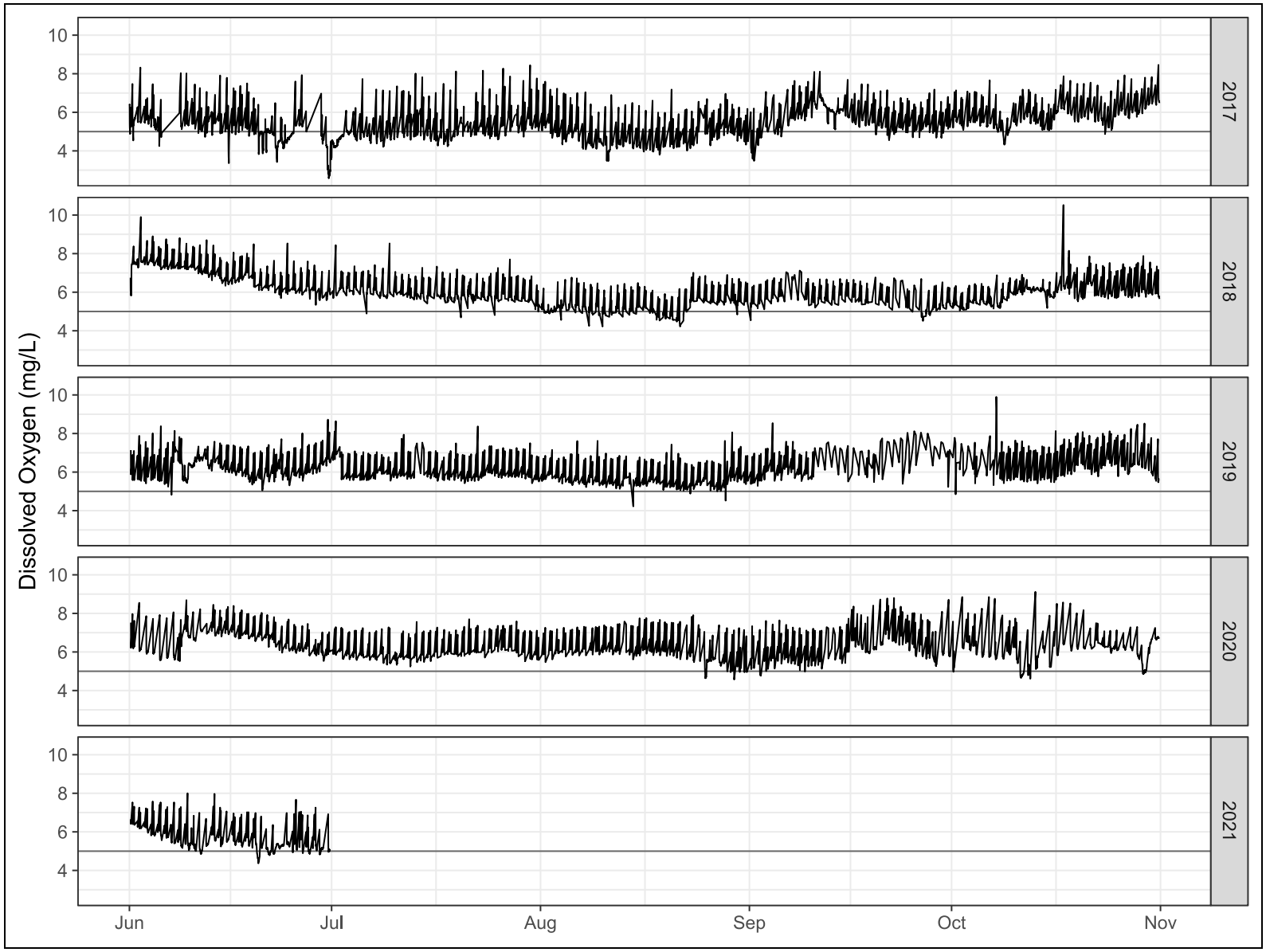
measurements are presented in Table 4-8. Figure 4-4 and Figure 4-5 provide graphical depictions of the data.

Dissolved oxygen levels were consistently greater than 5 mg/L during the 2018, 2019, and 2020 monitoring periods. Dissolved oxygen levels were typically lowest in August of each year of the monitoring period. Dissolved oxygen levels in 2017 were lower than those measured during the 2018, 2019, and 2020 monitoring periods. Section 6.2 provides a discussion of the suspected primary cause of the low dissolved oxygen levels in the 2017 data. Water temperatures were typically lowest in June and October and highest in August and September during the monitoring period.

Table 4-8 Summary of Dissolved Oxygen and Water Temperature Data Collected During Generation

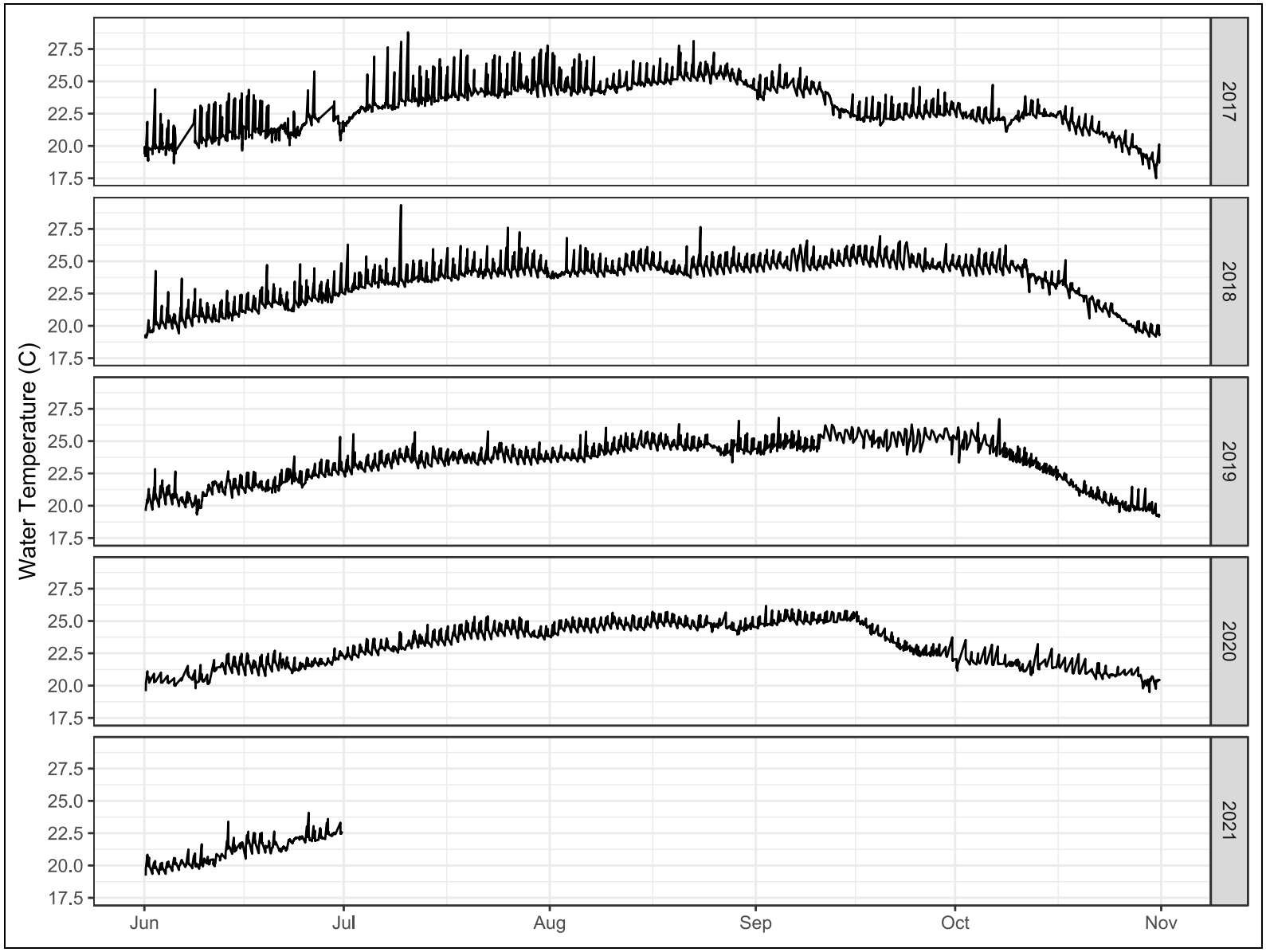
	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
Year/Month	Min	Avg	Max	Min	Avg	Max
2017						
Jun	2.58	4.94	8.32	18.65	21.04	25.77
Jul	3.64	4.98	8.44	21.14	23.52	28.80
Aug	3.47	4.61	7.59	23.88	24.84	28.13
Sep	3.48	5.74	8.11	21.60	23.17	26.30
Oct	4.33	5.74	8.46	17.50	21.38	24.73
2018						
Jun	5.34	6.82	9.90	19.09	21.19	24.85
Jul	4.69	5.92	8.53	22.44	23.92	29.35
Aug	4.22	5.21	7.01	23.67	24.34	27.65
Sep	4.51	5.52	7.12	24.14	24.94	26.95
Oct	5.04	6.02	10.52	19.16	22.94	26.23
2019						
Jun	4.82	6.22	8.72	19.31	21.33	25.33
Jul	5.42	6.11	8.64	22.25	23.66	25.75
Aug	4.22	5.71	8.06	23.35	24.42	26.58
Sep	5.23	6.47	8.54	23.95	24.95	26.81
Oct	4.85	6.35	9.90	19.14	21.20	26.71
2020						
Jun	5.52	6.53	8.69	19.57	21.23	22.89
Jul	5.24	5.95	7.70	21.98	23.51	25.37
Aug	4.57	5.87	7.91	23.73	24.68	25.72
Sep	4.77	6.16	8.80	21.91	23.92	26.17
Oct	4.61	5.96	9.12	19.49	21.09	23.54
2021						
Jun	4.37	5.40	8.00	19.22	21.24	24,09

Source: Alabama Power 2021



Source: Alabama Power 2021

Figure 4-4 Line Plot of Dissolved Oxygen Data Collected During Generation



Source: Alabama Power 2021

Figure 4-5 Line Plot of Water Temperature Data Collected During Generation

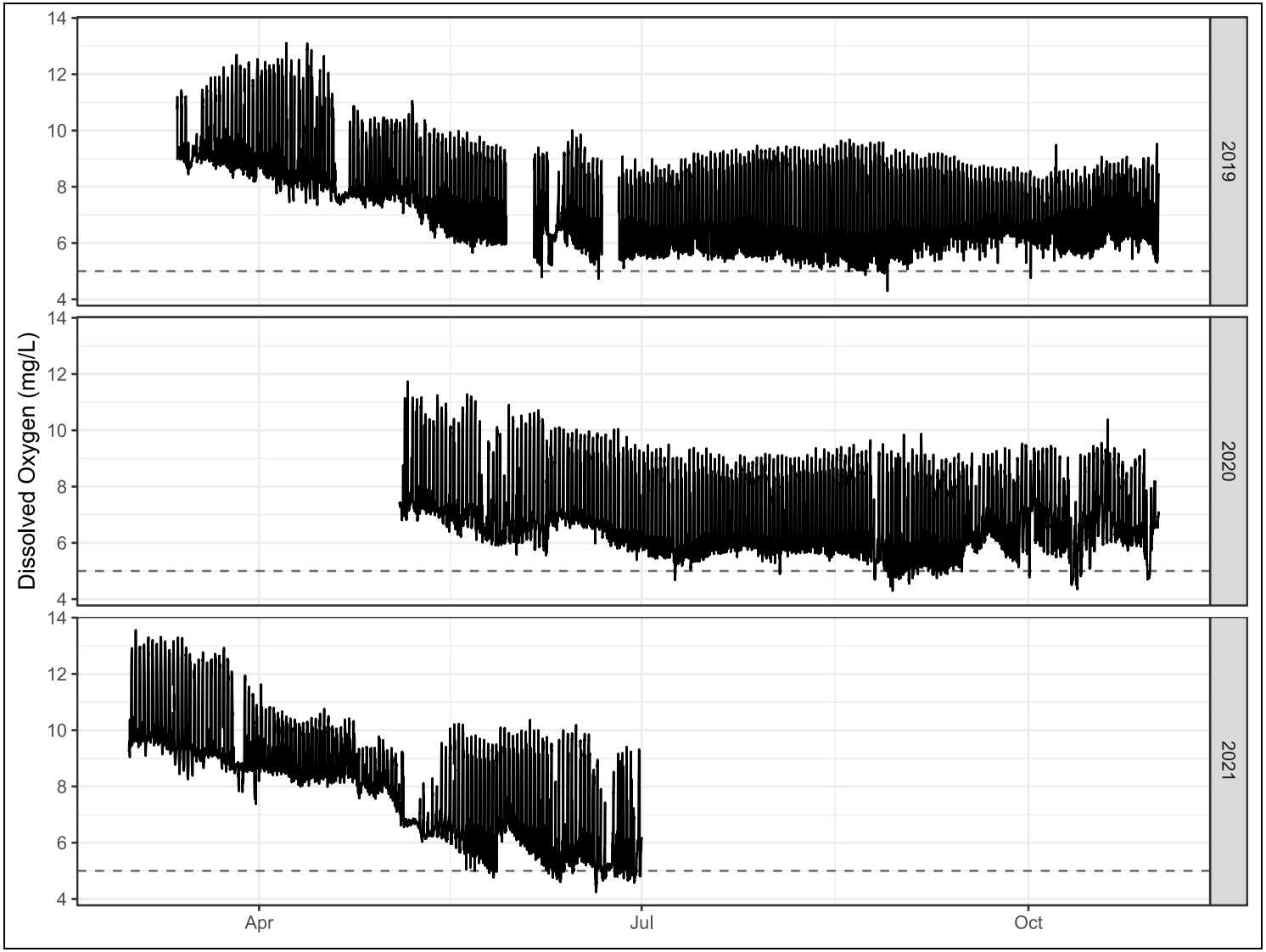
4.2.2 CONTINUOUS DOWNSTREAM MONITOR

Alabama Power monitored dissolved oxygen and water temperature continuously regardless of discharge approximately 0.5 miles downstream of Harris Dam from March to October of 2019, May to October 2020, and March to June 2021 (see Figure 3-8 for monitor location). Measurements of dissolved oxygen and water temperature were recorded at 15-minute intervals. Dissolved oxygen levels were generally lowest from June through October. A summary of dissolved oxygen and water temperature data from the continuous monitor is presented in Table 4-9. These data indicate the highest average water temperature occurred during August. Line plots of dissolved oxygen and temperature data from the continuous monitor are presented in Figure 4-6 and Figure 4-7.

Table 4-9 Monthly Summary of Dissolved Oxygen and Water Temperature Data Collected at the Continuous Downstream Monitor in 2019, 2020, and 2021

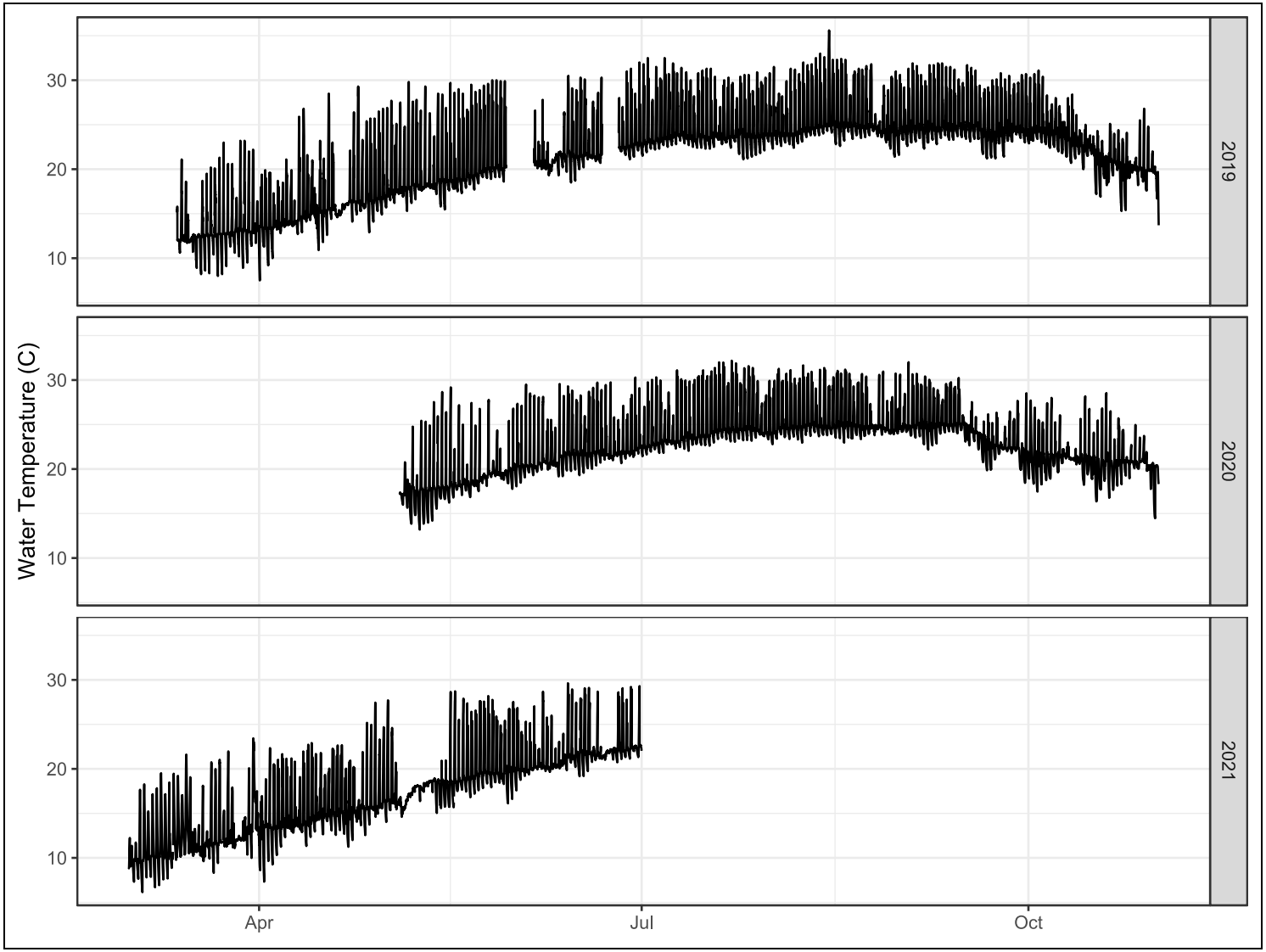
	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
Year/Month	Min	Avg	Max	Min	Avg	Max
2019						
Mar	8.18	9.50	12.69	8.00	13.13	23.20
Apr	7.26	8.84	13.11	7.50	16.10	29.30
May	5.66	7.86	11.05	15.30	20.10	30.00
Jun	4.72	6.96	10.01	18.50	22.32	32.00
Jul	5.32	7.07	9.46	21.10	24.66	32.50
Aug	4.29	7.04	9.68	21.40	25.51	35.60
Sep	5.07	7.12	9.30	21.20	25.36	31.90
Oct	4.75	7.20	9.53	13.70	22.01	31.10
2020						
May	5.90	7.50	11.74	13.19	18.62	29.18
Jun	5.39	7.30	10.72	18.05	22.01	30.29
Jul	4.67	6.71	9.50	21.44	24.64	32.18
Aug	4.29	6.75	9.65	22.78	25.51	31.65
Sep	4.55	6.69	9.88	18.44	24.14	32.01
Oct	4.35	6.85	10.39	14.47	20.91	28.54
2021						
Mar	7.37	9.99	13.56	6.14	12.33	23.44
Apr	7.56	8.92	11.63	7.32	15.44	27.45
May	4.76	7.07	10.23	14.03	18.86	28.72
Jun	4.24	6.32	10.37	17.57	21.71	29.63

Source: Alabama Power 2021



Source: Alabama Power 2021

Figure 4-6 Line Plot of Dissolved Oxygen Data from the Continuous Downstream Monitor



Source: Alabama Power 2021

Figure 4-7 Line Plot of Water Temperature Data from the Continuous Downstream Monitor

4.2.3 COMPARISON OF GENERATION AND DOWNSTREAM MONITORING RESULTS

A comparison of dissolved oxygen levels measured at the Generation and Downstream monitors is presented in Table 4-10. Generally, dissolved oxygen levels were higher at the Downstream monitor when compared to the Generation monitor. A summary of events where dissolved oxygen levels fell below 5 mg/L is presented in Table 4-11. At the Generation Monitor, the large majority of these events occurred in 2017, with an average duration of 3.1 hours per event. A discussion of potential causes for these events is presented in Section 6.0.

Table 4-10 Comparative Summary of Generation and Downstream Monitor Dissolved Oxygen Data

	Generation Monitor			Downstream Monitor		
Year/Month	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**
2019						
Jun	4.82	6.22	8.72	4.72	6.96	10.01
Jul	5.42	6.11	8.64	5.32	7.07	9.46
Aug	4.22	5.71	8.06	4.29	7.04	9.68
Sep	5.23	6.47	8.54	5.07	7.12	9.30
Oct	4.85	6.35	9.90	4.75	7.20	9.53
2020						
Jun	5.52	6.53	8.69	5.39	7.30	10.72
Jul	5.24	5.95	7.70	4.67	6.71	9.50
Aug	4.57	5.87	7.91	4.29	6.75	9.65
Sep	4.77	6.16	8.80	4.55	6.69	9.88
Oct	4.61	5.96	9.12	4.35	6.85	10.39
2021						
Jun	4.37	5.40	8.00	4.24	6.32	10.37

Table 4-11 Summary of Events Where Dissolved Oxygen Was Less Than 5 mg/L

Year/Month	Generation Monitor		Downstream Monitor	
	# of Events	Avg Duration	# of Events	Avg Duration
2017	**145**	**3.1**	**NA**	**NA**
Jun	24	7.2	NA	NA
Jul	43	2.3	NA	NA
Aug	57	2.5	NA	NA
Sep	17	1.3	NA	NA
Oct	4	2.8	NA	NA
2018	**28**	**6.6**	**NA**	**NA**
Aug	25	6.4	NA	NA
Sep	3	8.7	NA	NA
2019	**2**	**0.4**	**7**	**0.8**
Jun	1	0.5	2	1.8
Aug	1	0.3	4	0.4
Oct	NA	NA	1	0.3
2020	**12**	**2.5**	**31**	**2.1**
Jul	0	0.0	2	1.4
Aug	6	1.2	13	1.4
Sep	1	4.0	11	1.1
Oct	5	3.9	5	6.3
2021	**8**	**4.5**	**22**	**3.6**
May	NA	NA	1	2.8
Jun	8	4.5	21	3.6

Source: Alabama Power 2021

4.3 AWW MONITORING AT HORSESHOE BEND

Alabama Water Watch citizen volunteers have performed periodic monitoring on the Tallapoosa River at Horseshoe Bend since 1993, including from 1993 to 2007, and 2014 through 2017. A summary of the results for all parameters monitored at this site is presented in Table 4-12. Results were similar to those obtained by ADEM during its monitoring events at the same location.

Table 4-12 Summary of AWW Water Quality Monitoring Data from the Tallapoosa River at Horseshoe Bend

Parameter	Minimum	Mean	Maximum	Count	Units
1993–2003 (Pre-Green Plan)					
Water Temperature	4.0	19.0	31.0	108	°C
pH	6.0	6.7	7.1	109	SU
Dissolved Oxygen	3.4	8.0	11.3	108	mg/L
Dissolved Oxygen Saturation	40.0	85.3	127.2	107	%
Total Alkalinity	10	17	35	109	mg/L
Total Hardness	10	20	50	109	mg/L
Turbidity	2	10	25	109	JTU
Secchi Depth	0.9	1.8	4.0	9	m
2008–2017 (Post-Green Plan)					
Water Temperature	5	18.5	31	37	°C
pH	6	6.8	7.5	37	SU
Dissolved Oxygen	4.4	8.1	10.5	36	mg/L
Dissolved Oxygen Saturation	58.4	83.6	114.8	36	%
Total Alkalinity	15	19	40	37	mg/L
Total Hardness	10	34	90	37	mg/L
Turbidity	2	7	25	30	JTU
Secchi Depth	NA	NA	NA	0	m

Source: AWW 2019

Key:

C	Centigrade
mg/L	Milligrams per Liter
SU	Standard Units
JTU	Jackson Turbidity Units
m	Meters

5.0 STAKEHOLDER-IDENTIFIED AREAS OF POTENTIAL WATER QUALITY CONCERN

In accordance with the FERC-approved study plan, Alabama Power asked HAT 2 participants to submit areas of water quality concern (areas believed to have degraded water quality conditions) to be evaluated. Only one area, Lake Harris at Foster's Bridge (RLHR-3 in Figure 3-1), was identified as a concern with regard to potential nutrient enrichment and associated impacts[5]. Alabama Power used existing and historical data to assess the Foster's Bridge area, as described in the sections below.

The drainage area for the Tallapoosa River above Foster's Bridge includes 739.5 square-miles within Alabama and Georgia. Based on the most recent land cover data (2016), a majority of this drainage area is forested (> 70 percent), with agricultural use making up 11.2 percent of the total (Table 5-1). A comparison to land cover data from 2001 indicates little change over the 15-year period.

Table 5-1 Summary of Land Cover in the Area Draining to Foster's Bridge

Land Cover Class	Area (mi^2)		Percent (%) of Total	
	2001	2016	2001	2016
Open Water	4.3	4.5	0.6	0.6
Developed	43.2	46.1	5.8	6.2
Barren	1.0	0.9	0.1	0.1
Forested	524.5	525.9	70.9	71.1
Scrub/shrub	17.4	32.8	2.4	4.4
Grassland/Herbaceous	47.5	36.7	6.4	5.0
Agriculture	91.3	82.5	12.4	11.2
Wetlands	10.0	10.1	1.4	1.4

Source: MRLC 2019

In 1996, ADEM placed a 4.3-mile portion of the Tallapoosa River near Heflin, AL on the Section 303(d) list of impaired waters due to organic enrichment and low dissolved oxygen levels. The source of impairment was attributed to industrial and municipal point sources, agricultural non-point sources, and flow regulation/modification due to the Howle and Turner Dam[6]. As required by the Clean Water Act, ADEM developed a total maximum daily load (TMDL) to determine what levels of pollutants the river could receive and still be able to meet acceptable dissolved oxygen criteria. The recommended effluent

[5] This area was identified by stakeholders during the 2017 Issue Identification Workshop
[6] Howle and Turner Dam was removed in June 2019.

limits from the TMDL were included in subsequent National Pollution Discharge Elimination System (NPDES) permits for the industrial and municipal sources.

ADEM conducted periodic water quality monitoring at Foster's Bridge, including analysis of nutrient concentrations. A summary of data collected at this location by ADEM from 2005 to 2015 was included in the 2018 Pre-Application Document – Appendix L – Baseline Water Quality Report (Alabama Power 2018). A more detailed analysis of nutrient concentrations from this station dating back to 1997 was conducted. The data were compared to nutrient criteria for lakes and reservoirs developed by the EPA for total nitrogen, total phosphorus, mean Secchi depth, and chlorophyll *a* (EPA 2000). As depicted in Figure 5-1, concentrations of total nitrogen and phosphorus have historically exceeded the recommended criteria, though there appears to be a decreasing trend over time.

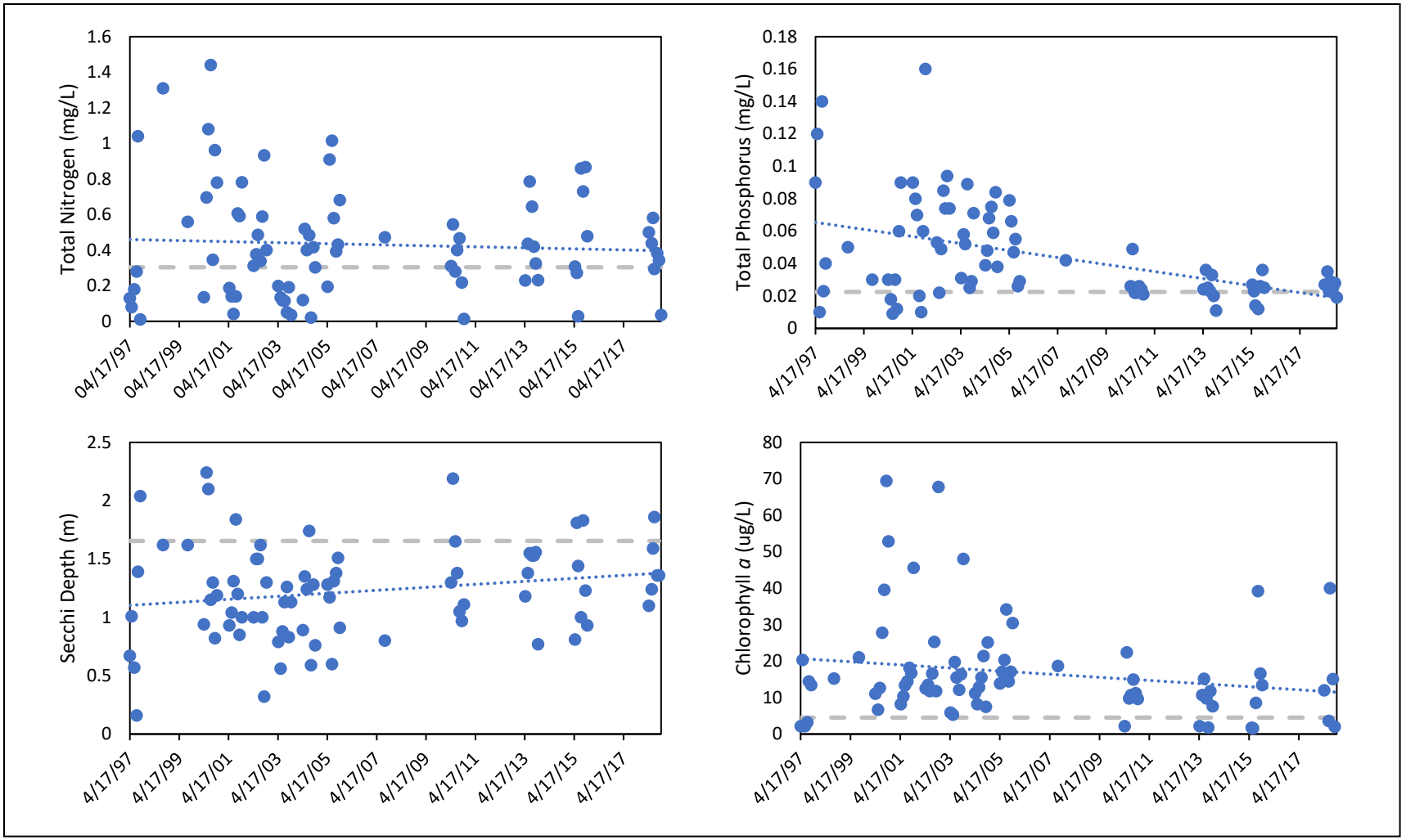


Figure 5-1 Total Nitrogen, Total Phosphorus, Secchi Depth, and Chlorophyll *A* Results for ADEM's Foster's Bridge Monitoring Location

(Dotted blue line indicates linear trend over time. Dashed gray line indicates EPA-recommended criteria)
NOTE: Increasing Secchi depth values indicate greater water clarity

6.0 DISCUSSION AND CONCLUSION

6.1 RESERVOIR WATER QUALITY

Harris Reservoir is typically stratified from June through October, with hypoxic/anoxic conditions at depths greater than 30 feet. However, in some years, based on antecedent climate and hydrologic conditions, hypoxia may develop within the metalimnion, with more oxygenated water in the overlying epilimnion and underlying hypolimnion as was seen in some summer months in this study. This negative heterograde oxygen profile may be the result of increased loads of oxygen-demanding organic matter and decreased water transparency associated with inflows from large precipitation events (Effler et al. 1998; Wetzel 2001). A review of historical forebay dissolved oxygen profiles indicates this phenomenon is not uncommon at Harris Reservoir.

A portion of the Harris Reservoir was placed on ADEM's 2018 303(d) list of impaired waters due to mercury in fish tissue samples (ADEM 2018). The 2018 303(d) list included portions of 49 other lakes/reservoirs in Alabama due to mercury in fish tissue attributed to atmospheric deposition, including portions of Lakes Martin, Yates, and Thurlow downstream of Harris on the Tallapoosa River. The Foster's Bridge area of concern identified by stakeholders appears to have been affected by historic point sources of nutrients upstream of the Project. Reductions in nutrient levels due to implementation of a TMDL has resulted in improved conditions.

6.2 DOWNSTREAM WATER QUALITY

Alabama Power incorporated an aeration system into the turbine design at Harris Dam to provide up to a 2 mg/L increase in dissolved oxygen. After completing construction and commencing operations at Harris, Alabama Power performed testing on the aeration system in 1983 to determine its effectiveness. Results of the 1983 test indicated the aeration system increased dissolved oxygen levels by an average of 1.37 mg/L.

In August 2016, as part of a study to determine an appropriate monitoring location, Alabama Power performed an additional test of the aeration system. During the test, dissolved oxygen loggers were deployed at four locations within the tailrace area. Each turbine unit was operated for approximately 30 minutes without aeration, after which aeration was turned on and the turbine was operated for an additional 30 minutes before

operations ceased. Results from the 2016 test were similar to 1983, with aeration yielding an average dissolved oxygen increase of 1.1 mg/L.

Data collected during generation immediately downstream of Harris Dam in 2018, 2019, and 2020 indicated dissolved oxygen was greater than 5 mg/L for 94.6 percent of all measurements (90.7 percent in 2018. 99.6 percent in 2019, and 95.2 percent in 2020). Data from the continuous monitoring station that recorded data during both generation and non-generation in 2019 and 2020 indicated dissolved oxygen levels were greater than 5 mg/L for 99.2 percent of all measurements. Monitoring data collected by Alabama Power in 2017 showed numerous events where dissolved oxygen was less than 5 mg/L. The low dissolved oxygen events in 2017 may be attributed to conditions in Harris Reservoir that were impacted by severe drought in the summer and fall of 2016, where inflows to the lake were at historic lows (Figure 2-1). In addition, a variance that allowed for the lake to be filled two feet above the normal rule curve earlier in the year was likely another contributing factor. Also, high inflows associated with above average precipitation in summer 2017 may have contributed high loads of oxygen-demanding organic matter to the metalimnion resulting in hypoxia closer to the surface[7]. As shown in the 2017 vertical profile data collected by Alabama Power (Figure 3-8), dissolved oxygen levels at depths below 20 ft in the lake were hypoxic/anoxic from June through October 2017.

Data collected by ADEM on the Tallapoosa River at Harris Dam, Wadley, and Horseshoe Bend showed dissolved oxygen levels were above 5 mg/L during each of their sampling events. Data from the recently installed continuous monitor at Malone indicated that dissolved oxygen levels were equaled to or greater than 5 mg/L for 99.3 percent of the monitoring period.

[7] The intake invert elevation is 746 ft msl and includes an 18 ft moveable sill which, when fully raised, results in an intake invert elevation of 764 ft msl. Therefore, the effective intake depth during summer pool conditions (793 ft) is 29 ft.

7.0 REFERENCES

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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

2017 – 2021 ALABAMA POWER WATER QUALITY MONITORING DATA

(ATTACHED IN MICROSOFT EXCEL SPREADSHEET FORMAT)

APPENDIX C

STAKEHOLDER COMMENT TABLE

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	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	Figure 3-8, on page 18 of the Draft Water Quality Study Report shows dissolved oxygen (DO) profiles for the Harris Project forebay. While much of the data is typical of the DO stratification pattern in a southern reservoir, the figure also shows that in June, July, and August of 2017 and 2019, there was a 2.0 to 3.0 milligram per liter increase in DO concentration at a depth of about 20 to 25 meters in Lake Harris, which is uncommon in such reservoirs. Please include Alabama Power's interpretation of this DO anomaly in the final Water Quality Study Report.	An explanation has been included in the Final Study Report.
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	On pages ii-iv., Table of Contents, of the Water Quality Study, some of the page numbering does not coincide with the document contents. For example, Lake Levels and Hydrology page 7 of Table of Contents is on page 8.	Corrected in Final Study Report.
ADCNR		On page 3, section 1.1, of the Water Quality Study, after "A summary of data sources for this report is provided in" a large space creates and extra page that appears to be unnecessary and should be removed.	Corrected in Final Study Report.
ADCNR		On page 8, section 2.0, of the Water Quality Study "October of 2107" should be changed to 2017.	Corrected in Final Study Report.
ADCNR		On page 9, Figure 2-2 of the Water Quality Study, specify if the 1987-2016 data is a monthly average or long-term average in the figure key or label.	In Figure 2-2, the triangle for each month represents the average for that month over the period 1987-2016.
ADCNR		On page 22, Table 3-2 of the Water Quality Study, include minimum and maximum ranges of data to this Table, if available.	Included in the Final Study Report.
ADCNR		On page 25, Figure 4-1 of the Water Quality Study, provide major tributary names and periodic river mile markings to aid in location descriptions.	Figure revised accordingly in the Final Study Report.
ADCNR		On page 27, Table 4-3 of the Water Quality Study, include minimum and maximum ranges of data to this Table, if available.	Maximum and minimum values for water temperature and dissolved oxygen have been added to the table in the Final Study Report.
ADCNR		On page 39, of the Water Quality Study, "Error! Reference source not found?" should be removed or corrected.	Corrected in Final Study Report.
ADCNR		On page 42, Table 4-11 of the Water Quality Study, if available, separate and provide this data into Pre- Green Plan and Post-Green Plan implementation year groupings to further examine if operational differences affect water quality.	Corrected in Final Study Report.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
ADCNR		On page 46, section 6.2 of the Water Quality Study, additional data, evidence or other alternatives should be provided to make the statement that "The low dissolved oxygen events in 2017 may be attributed to conditions in Harris Reservoir that were impacted by severe drought in the summer and fall of 2016, where inflows to the lake were at historic lows (Figure 6-1)". On page 17, Figure 3-7 of the Water Quality Study does not indicate that temperature stratification occurred differently in 2017 versus 2018 or 2019. Year 2017 data, on page 37, Figure 4-4, and downstream water quality data on page 46, Figure 6-1 of the Water Quality Study disputes the theory that conditions were caused by previous year conditions. Inflows were above average during 2017, which means discharge was higher. This is another reason low dissolved oxygen could have been more pronounced in 2017. This same scenario has been observed in Lake Martin, where higher spring/summer rainfall leads to increased discharge, which leads to poorer water quality below the thermocline (Sammons and Glover 2013). If a dam is drawing from the hypolimnion under these conditions, it can lead to a discharge of lower oxygenated water during a high precipitation spring/summer. In addition to evaluating potential causes of the 2017 low dissolved oxygen events, changes and improvements that can be made to detect, adjust and improve operations to prevent another 2017 event from occurring again should be considered and evaluated for the sustained benefit of downstream aquatic resources.	Additional information describing the hydrologic conditions in 2017 has been including in the Final Study Report. Dissolved oxygen and any necessary changes or improvements will be evaluated by ADEM as part of its 401 water quality certification.

Alabama Rivers Alliance (ARA) Note: footnotes included in the original letter have been omitted from this table	6/11/2020 20200611-5114	The caliber and usefulness of the studies conducted pursuant to the ILP will only be as good as the quality and quantity of data collected. ARA recommends that each opportunity to gather relevant data be taken during the relicensing process. The Draft Water Quality Study Report gathers data from three sources: Alabama Power Company (Licensee), the Alabama Department of Environmental Management (ADEM), and Alabama Water Watch. Of primary concern for downstream ecological health are the two monitors collecting data closest to the dam, both of which are operated and monitored by Licensee. Continuous, 15-minute interval data for dissolved oxygen levels and water temperature has been collected from a monitor in the tailrace (approximately 800 feet from the dam) during the months of June - October in 2017, 2018, and 2019 ("Tailrace Monitor"). A second continuous, 15-minute interval monitor operated by Licensee was placed roughly 0.5 miles downstream of the dam ("Downstream Monitor") and collected dissolved oxygen and temperature data from March 12 through October 31 of 2019, excluding approximately a week's worth of data due to problems with the monitor. Data collected by these two monitors, in particular, are essential to understanding the quality of water being discharged by Harris because they are closest to the dam and are the only continuous samplings included in the study. The ILP process allows for two seasons of study and data collection; however, Licensee is only collecting one season's worth of water quality data under the current study plan.3 While the 2019 dissolved oxygen levels from the Downstream Monitor met or exceeded 5mg/L 99.9% of the time,4 this is but one year's worth of data collected during a non- drought year. Data from the Tailrace Monitor for 2017 and 2018—closer in time to actual drought conditions in late 2016—shows "numerous events" where dissolved oxygen levels did not meet 5mg/L.5 Due to flooding events, the Downstream Monitor could not be deployed until March 12, 2019, and was inoperable for approximately another week due to a dead battery and washing ashore.6 Combined, roughly three weeks of data (or ~10% of the total) scheduled to be collected in the Water Quality Study Plan was not collected because of equipment failure and environmental conditions. To bolster the studies being performed, and to provide the most useful reports to stakeholders and FERC, pursuant to 18 C.F.R. § 5.15(d), ARA proposes a second year of water quality monitoring at the Downstream Monitor to collect dissolved oxygen and water temperature data in 15-minute intervals from July1 – October 31, 2020, and from March 1 – June	The continuous monitor was re-deployed in early May 2020 and the generation monitor was redeployed in June 2020. Each remained deployed until October 31, 2020 and data was incorporated into the Final Study Report. The continuous monitor will be redeployed from March 1 – June 30, 2021, and the generation monitor will be redeployed from June 1 – June 30, 2021.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
		30, 2021. While 2020 has been a wet year thus far, conditions later in the year and early next year may provide an opportunity to collect data during drier, potentially drought, periods.	
ARA		Additionally, we request that discharge data be included along with the dissolved oxygen and temperature data collected by the Downstream Monitor in 2020-21 to enable stakeholders to better understand the relationship between releases and water quality. The Tailrace Monitor data included in Appendix B to the Water Quality Report for 2017-2019 includes 15-minute interval discharge data for "Turbine 1," "Turbine 2," and "Total Discharge," and such data should be included with the continued monitoring data.	The correlation between discharges and travel times has not been evaluated to determine which continuous monitor readings represent water passing through the turbines. Therefore, discharge data has not been included with the continuous monitor data. Furthermore, ADEM evaluated the generation monitor location and determined that it was representative of discharge from the units.
ARA		Finally, an assessment of any aeration or aspiration devices used to boost dissolved oxygen levels should also be included in order to take into account such artificial enhancements (and to consider any declines in water quality were these devices not to function properly). Documents filed with FERC prior to Harris' operation describe "incorporating into the turbine discharge an aspiration system to provide up to a 2 ppm increase in dissolved oxygen."[7] The condition of any existing aspiration system and a comparison to current technologies used to enhance dissolved oxygen levels should be undertaken.	A discussion of existing aeration measures has been included in the Final Report.
ARA		There is significant stakeholder concern over the temperature of releases from Harris, and ARA understands that analysis of the effects of temperatures will be included in the forthcoming Aquatic Resources Study Report. This concern stems from the scientific literature documenting the ecological consequences of cold-water pollution from hydroelectric dams and decades of research on Harris indicating "thermal alteration and generation frequency negatively affect the occupancy of most fish species below the dam." As additional study and analysis of the thermal regime progresses and is reported in the Aquatic Resources Study, ARA recommends that temperature and flows be considered in tandem during this analysis because "both discharge and temperature must be simultaneously considered for the successful implementation of environmental flow management below dams."	Comment noted.
ARA		The existing license for Harris required Licensee to work with state agencies and EPA prior to commencement of construction to come up with an "optimum design and placement of the project intake structures to permit withdrawal of water from selected levels of the reservoir to control the water quality of the discharges from the powerhouse. Within four years of the issuance of the existing license, Licensee was required to	It is premature to study remedial actions prior to determining if and to what extent they are needed.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
		file a revised (and then a re-revised) Exhibit S that included its plans to study the potential fishery resources of the reservoir and "a description of measures being taken to maintain or change the water quality of the Tallapoosa River downstream from the project. Licensee's re-revised Exhibit S filed in April of 1982 evidenced Licensee's understanding of the connection between temperatures and water quality and the need to design an intake structure to withdraw high-quality surface waters. Licensee's re-revised Exhibit S reads in part: "For enhancement of discharge water quality, it is desirable to withdraw water from as close to the surface as possible. At Harris Dam, which employs seasonal drawdown, the objective of surface withdrawal has been solved by incorporating into the design movable sills at the invert of each intake opening….Location of these sills at the highest levels possible for operation will ensure the highest quality water being drawn into the turbines." Despite early attempts to engineer an intake to accommodate epilimnetic withdrawals and "solve" the problem of cold releases with lower dissolved oxygen content, thermal pollution has plagued the river downstream from Harris since it began operations. Unfortunately, neither the Aquatic Resources Study Plan nor the Draft Water Quality Report contemplate the study of any potential remedial actions to adjust water temperatures in line with unregulated reaches of the Tallapoosa. Licensee has acknowledged that once an issue has been identified with water temperatures, it plans to study technologies that can address the thermal regime. Due to the available evidence of low temperatures impacting both colonization and persistence of fishes and the downstream macroinvertebrate community and the sizeable stakeholder concern, ARA urges thorough study of the infrastructure enhancements available for implementation at Harris to control release temperatures. A variety of temperature management strategies exist, including multi-level intake structures, floating intakes, and reservoir destratification approaches using pumps and submerged weirs, as well as operational adjustments in the timing and volume of releases.	

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
Environmental Protection Agency (EPA) Note: footnotes included in the original letter have been omitted from this table	6/12/2020 20200612-5025	Section 5.2: Reports on the dissolved oxygen (DO) data. The EPA recommends that data be included in the document where it is analyzed as an Appendix in all future documents or provide live links and page numbers to where the data is located, in order to provide an easier discussion to review.	The data was included as an appendix to the draft report and has also been included as an appendix to the Final Report.
EPA		The EPA would like to note that the analysis of DO is inconsistent with how it should be evaluated against the Water Quality Standard (WQS). Below are comments from prior EPA recommendations: *The WQ Study Plan does not indicate that the goal of characterizing water quality would be to evaluate where water quality standards are not being met, and to develop conditions to be included in the 401 Certification to operate the Project in such a manner as to attain those WQS. The goal as written does not indicate any action to be taken once the characterization of the water quality is complete. The EPA recommends that the goal be clarified to note that where WQS are not being met, the 401 may be conditioned so that WQS can be met through operational changes or other modifications to the project."* The purpose of collecting water quality data is to compare it to the Alabama WQS. However, the DO data analysis only reports the results in terms of percentages. The WQS, below, does not include the use of percentages for protection of Fish and Wildlife: *4. Dissolved oxygen:* *(i) For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations* ***shall not be less than 5 mg/l at all times****; except under extreme conditions due to natural causes,* ***it may range between 5 mg/l and 4 mg/l,*** *provided that the water quality is favorable in all other parameters. The normal seasonal and daily fluctuations shall be maintained above these levels.* ***In no event shall the dissolved oxygen level be less than 4 mg/l due to discharges from existing hydroelectric generation impoundments.*** *All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5 mg/l dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency, in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities.*	The DO data provided in the Water Quality Report is intended to be a high level summary rather than a detailed analysis. As EPA notes, the analysis that will be performed for purposes of evaluating the data with respect to the Water Quality Standards will be conducted as part of the 401 Water Quality Certification process with ADEM. Alabama Power will work with ADEM to provide the data and analysis needed for the 401 water quality certification.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
		Each data point must be compared to the WQS for DO. For WQS purposes, data are not aggregated and evaluated on percentages. DO is a parameter that has a direct effect on aquatic life. That is, if a sample is extremely low on a particular event, it does not help aquatic life if a sample taken at a later unrelated time shows sufficient oxygen. Therefore, the data for oxygen should not be averaged or reviewed as percentages, but reviewed against the water quality standard as stated above. For water below the dam, for instance, it should not be less than 4 mg/l. That is not to be averaged with other data. For downstream water, it shall not be less than 5 mg/l at all times, although it may range between 5 mg/l and 4 mg/l. The analysis should include a discussion of the number of samples that did not meet the state WQS for and the measured DO value. It is important to know both how many times the WQS were not met, as well as to know how much it deviated from the state WQS. This is critical as these data will be used as the basis for submitting the 401 WQ certification.	
EPA		Section 5.4: The EPA recommends developing a matrix where each sampling result is compared to water quality standards.	See previous comment.
EPA		In question 8 by Alabama Rivers: EPA recommends that temperature be addressed in the water quality section and be included with the WQ certification as appropriate.	Temperature is being analyzed as part of the Aquatic Resources Study Plan.
Alabama Department of Environmental Management (ADEM)	20200612-5017 6/12/2020 on Draft Study Report	On page 13 of the report, the RLHR-1 DO profile is not consistent with the ADEM data we reviewed.	The figure has been revised in the Final Study Report.
ADEM		On page 23 of the report, it states that ADEM installed a monitoring station in the Tallapoosa River at the Malone bridge crossing in May 2019. The year should be corrected to 2018.	The year has been revised in the Final Study Report.
ADEM		Starting on page 26 of the report, please note the location of the ADEM data used in the tables and whether the data was averaged.	Location is included in table title. Data represent average of vertical profiles by parameter and date.
ADEM		On page 39 of the report, the "Error! Reference source not found." Will need to be fixed.	Corrected in Final Study Report.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
ADEM		On page 46 of the report, it states that the 2018 303(d) list included portions of 43 other lakes/reservoirs in Alabama due to mercury in fish tissue attributed to atmospheric deposition. That number should be corrected to 49 lakes/reservoirs and reservoir embayments in Alabama impaired for mercury due to atmospheric deposition.	Corrected in Final Study Report.
Comments below were received after the Final Water Quality Study Report[1] and Updated Study Report[2] filings on April 12, 2021			
FERC	20210609-3045 6/9/2021 On USR	Table 4-9, Section 4.2.2 of the Final Water Quality Report, provides the monthly summary of dissolved oxygen (DO) concentration and water temperature data collected at the continuous downstream monitor in 2019 and 2020. The data presented is for the entire dataset. To effectively compare data for generation and non-generation periods, please add a table to the report that includes the same information provided in table 4-9, but that differentiates the data for generation and non-generation periods. In addition, include a comparative analysis of that data in Section 4.2.2 of the report, including the percentage of time below 5.0 milligrams per liter (mg/L) and 4.0 mg/L for generation and non-generation periods.	The requested changes were made in the revised Water Quality Study Report.
FERC		Appendix B of the Final Water Quality Report provides an Excel spreadsheet that includes the 2017-2020 water quality monitoring data for the generation and downstream continuous monitors. The data for the generation monitor includes generation information (i.e., total discharge and discharge by turbine) for each DO concentration and water temperature data point. However, the dataset for DO and water temperature at the downstream continuous monitor does not include generation information. The purpose of collecting continuous data is to provide a means to compare DO and water temperature for generation and non-generation periods. To allow for such comparisons, please revise Appendix B of the water quality report to include generation information for each DO and water temperature data point for the downstream continuous monitor, as was done for the generation monitor. Also, update the spreadsheet to include data collected during 2021: March 1 – June 30 for the continuous monitor; and June 1 – June 30 for the generation monitor.	The requested data is provided in Appendix B of the revised Water Quality Study Report.

[1] Accession No. 20210412-5760

[2] Accession No. 20210412-5737

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
ADEM	20210611-5026 6/11/2021 On USR	In the Final Water Quality Study Report under Section 4.1 ADEM Monitoring on Page 25, Alabama Power Company (APC) states, "The site immediately downstream of Harris Dam (MARE-12) was sampled monthly in 2018 from April to October, and in 2020 from June to October during periods of non-generation." ADEM collected data at the site immediately downstream of Harris Dam (MARE12) during periods of non-generation in 2018. However, ADEM did collect data during periods of generation in 2020. This statement in the Final Water Quality Study Report should be corrected.	The requested changes were made in the revised Water Quality Study Report.
ADEM		In the dataset for the Continuous Monitor for 2019-2020, it would be helpful if periods of generation & non-generation were specified in order to see how the downstream dissolved oxygen (DO) and temperature are being affected. In addition, it would be helpful to see the complete dataset as opposed to the statistics alone in Tables 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, and 4-9.	The requested data is provided in Appendix B of the revised Water Quality Study Report.
ADEM		According to ADEM Administrative Code 335-6-10-.09: All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5 mg/l dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency, in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities. APC's data charts summarize DO as averages and there is concern that the 5 mg/L minimum DO requirement would be misinterpreted as applying to those averages. A complete dataset would be beneficial to ensure there is no confusion between single recorded measurements and averages. APC should also take measures to ensure that the downstream DO is meeting the state's water quality standard of 5 mg/L at all times.	The requested data is provided in Appendix B of the revised Water Quality Study Report.

ARA	20210611-5070 6/11/2021 On USR	Monitoring data collected by Licensee, the Alabama Department of Environmental Management (ADEM), and Alabama Water Watch presented with the Final Water Quality Study Report show numerous events where dissolved oxygen (DO) levels failed to meet water quality standards. These recurring low DO levels pose a threat to aquatic resources below Harris. State water quality criteria specify that for waters classified as Fish and Wildlife, DO levels must meet the following: "For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations shall not be less than 5 mg/1 at all times; except under extreme conditions due to natural causes, it may range between 5 mg/1 and 4 mg/1, provided that the water quality is favorable in all other parameters. The normal seasonal and daily fluctuations shall be maintained above these levels. In no event shall the dissolved oxygen level be less than 4 mg/1 due to discharges from existing hydroelectric generation impoundments. All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5 mg/1 dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency, in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities." Data provided in the Appendix B spreadsheet to the Final Water Quality Report show DO levels did not meet 5 milligrams per liter (mg/L) downstream of Harris at the following times and locations: 1. ADEM Malone Monitor (approximately seven river miles downstream of dam; collected data at 15-minute intervals from May 2018 through September 2020) a. 111 instances during July 2018; 79 instances during August 2018; 171 instances during September 2018; 81 instances during October 2018; 25 instances during November 2018; 3 instances during November 2019; 10 instances during October 2020. 2. APC Generation Monitor (approximately 800 feet downstream of dam; collected data at 15-minute intervals from June to October 2017-2020) a. 552 instances during June 2017; 625 instances during July 2017; 586 instances during August 2017; 109 instances during September 2017; 49 instances during October 2017; 4 instances in July 2018; 223 instances during August of 2018; 74 instances during	The requested data is provided in Appendix B of the revised Water Quality Study Report.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
		September 2018; 3 instances during June 2019; 4 instances during August 2019; 1 instance during October 2019; 36 instances during August 2020; 18 instances during September 2020; 85 instances during October 2020. 3. APC Downstream Monitor (approximately 0.5 miles downstream of dam; collected data at 15-minute intervals from March to October of 2019 and May to October 2020) a. 16 instances during June 2019; 11 instances during August 2019; 2 instances during October 2019; 14 instances during July 2020; 75 instances during August 2020; 64 instances during September 2020; and 134 instances during October 2020. Interpreting ADEM's Malone monitor data, the Final Water Quality Report states: "Overall, dissolved oxygen levels were above 5mg/L for a majority of monitoring period, with less than one percent of all measurements falling below 5mg/L." As other stakeholders have warned, interpretation of DO data in terms of percentage of time meeting the 5mg/L threshold obscures the harm to aquatic biota that can result from a single low-DO event. A more ecologically appropriate approach would be to focus on times when DO levels are not meeting water quality criteria with an assessment of possible corrective measures. The Final Water Quality Report averages and summarizes other ADEM monitoring data from a site at Wadley (TA-1) and a site at Horseshoe Bend (TART-1); however, the full dataset is not included in the Appendix B spreadsheet. Again, averaging and summarizing data can be helpful to present results but risks misleading stakeholders about occasional or isolated low-DO events that harm and kill aquatic species. The data from ADEM's Wadley and Horseshoe Bend sites are presented as summaries and averages in Tables 4-4, 4-5, 4-6, and 4-7, but we ask that Licensee include the full monitoring data in the Appendix B spreadsheet for the Wadley (TA-1) and Horseshoe Bend (TART-1) ADEM sites.	

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
ARA		The Final Water Quality Report contains some discussion of the aeration system used to enhance DO levels, which can "provide up to a 2 mg/L increase in dissolved oxygen." According to Licensee, the aeration devices were tested in 1983 and showed a 1.37 mg/L average increase in DO levels. Licensee tested the aeration system again in 2016, and results showed an average increase in DO levels of 1.1 mg/L. ARA requests that copies of both test results be made available to stakeholders. ARA recommends Licensee conduct a full appraisal of the condition of the aeration devices and a comparison to currently available technologies used to support DO levels. As of 2016, the devices were only operating at 55 percent of their originally stated potential, and the effectiveness of the aeration system declined by approximately 20 percent since it was last tested in 1983. At some point, this system will have to be refurbished or upgraded, and addressing it as part of the relicensing process could help avoid repetition of the prolonged period of low DO levels from 2017. Were the aeration devices to have provided a full 2 mg/L boost, water quality criteria would have been met much more frequently during that time. As a "party responsible for impoundments" under Ala. Admin. Code r. 335-6-10-.09, Licensee should seek to improve the design of existing facilities by evaluating whether the aeration devices should be updated or if other technologies should be integrated to ensure low-DO events do not occur. Modification of the existing intake structure could also allow for warmer water with higher levels of DO to be released and ensure that water quality criteria are met.	Comment noted.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
EPA	06/07/2021 20210607-5012 On USR	During this relicensing process, the EPA has commented on the importance of monitoring below the dam during generation and non-generation. The EPA understands that the amount of data can be substantive, and that AP would like to minimize excess of information. In the final Water Quality (WQ) Report, AP indicated that WQ data was included. The DO data utilized in this relicensing process covers limited periods. The monitoring data is a critical component for making appropriate assessment determinations based on DO data. Comment: In the final WQ Report, the EPA recommends expanding the data in the current tables to include side-by-side monitoring results showing generation and non-generation data with a summary of the events in which dissolved oxygen (DO) was below the required concentration and what was done to mitigate these events. Also, we suggest the analyzing individual DO measurements and comparing that data to existing DO standard in Alabama1 to properly assess Water Quality Standards (WQS) in the 401certification process.	The requested changes were made in the revised Water Quality Study Report.
EPA		*Attachment 3 Final Water Quality Report* We recommend clarifying the type of monitoring conducted below the dam by Alabama Department of Environmental Management (ADEM) (2018 Apr-Oct and 2020 Jun-Oct), also expanding the information of the collected data into Attachment 3 including monitoring data, monitoring areas, dates, times, etc. The information shown in Figure 4-1 is not specific and we recommend including the link to the GIS files for location accuracy. Further, the EPA recommends consulting with ADEM about the use of more accurate terms (page 25) to explain the results of the data. Also, you might reach out to the EPA for term clarifications.	The requested data is provided in Appendix B of the revised Water Quality Study Report.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
		4.0 Downstream Water Quality *4.1 ADEM Monitoring* Malone station recorded data at 15-minute intervals and included monthly maximum, mean and minimum values for 2018, 2019 and 2020. The data for ADEM's Tailrace station (MARE-12) for 2018 and 2020 (page 25), Wadley station for 2018 and 2019, and Horseshoe Bend station for 2018, 2019 and 2020 is presented without maximum, mean and minimum values. The report states that DO levels at Tailrace station were all above 5.0 mg/L, however, it is unclear if individual data points in the averages or monthly samples were below 5.0 mg/L. Comment: The EPA recommends adding the maximum, mean and minimum values for MARE-12, Wadley and Horseshoe Bend stations, as well as data that would help to clarify missing data points. If the data is too large, a spreadsheet inserted into the attachment would help to better understand results.	The data for the tailrace (Table 4-1), Wadley (Table 4-4), and Horseshoe Bend (Table 4-6) represent water column averages for each sampling date, which is different from the time-series averages presented for Malone in Table 4-3. The ADEM data is in Appendix B of the revised Water Quality Study Report.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
EPA		*4.2 Alabama Power Monitoring* *4.2.1 Generation Monitor* The data was collected (page 37) at a station about 800 feet below the dam in the Tallapoosa River during periods of power generation in 15-minute time periods. The data was collected during generation periods over approximately 153 days of each year in 2017-2020. The monitoring at the generation site represents about 21.5% of the time (measured in hours) in the months of June-October in 2017-2020, and about 9% of the time (measured in hours) in 2017- 2020. The 2017 data collected at the Generation Monitor site indicates that DO values fell below the DO minimum standard of 5.0mg/L 44.2% of the time. Appendix B of Water Quality study report indicates 1921 of 4341 readings taken during the generation periods in June-October range from 2.58-4.99 mg/L DO. The 2018 data collected at the Generation Monitoring site in July, August and September indicates that DO values fell below the DO minimum standard of 5.0mg/L 18.3% of the time. Appendix B of Water Qualtiy study report 2021 indicates 301 of 1643 readings taken during generation periods July-September range from 4.22-4.99 mg/L DO. The data collected at the Generation Monitoring site indicates that there are several times where DO water quality requirements were not met (DO fell below the minimum standard of 5.0mg/L). Such times included June, August and October 2019; August, September and October 2020; 9% of the data during 2017-2020; 44.2% of the data during 2017, and 18.3% July-September 2018. Comment: as recommended above, all individual DO measurements need to be compared to the Alabama's DO standard and specify how many days/hours per month in 2017-2020 did DO values fall below the DO minimum standard and what measures were implemented to mitigate or address the deficiencies if any.	The requested changes were made in the revised Water Quality Study Report.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
EPA		*4.2.2 Continuous Downstream Monitor* Data was collected at a station about one half mile below the dam in the Tallapoosa River continuously over 234 days in 2019 and continuously over 181 days in 2020. The monitoring at the continuous downstream site represents about 55.2% (measured in hours) of 2019 and 2020, there was no monitoring data in 2017 and 2018. The 2019 data collected at the downstream site indicates that during June, August and October, the DO fell below the DO minimum standard of 5.0mg/L. The 2020 data collected at the downstream site indicates that during July, August, September, and October the DO fell below the DO minimum standard of 5.0mg/L. Comment: The EPA recommends clarifying whether data for 2017, 2018 and 2019 were broken out in the 2020 Draft WQ Report, but the data was merged for 2017, 2018, 2019 and 2020 in the current 2021 report (Appendix B of Attachment 3 Final Water Quality Report)? We recommend explaining how this was done or present the data in a different less confusing way.	The requested changes were made in the revised Water Quality Study Report.

EPA		*6.2 Downstream Water Quality* The study report states that DO percentages of greater than 5mg/L meet the state DO standard. Please note the following data summarizing when data fell below the DO standard: • The 2017 data collected at the Generation Monitor site indicates DO values below the DO minimum standard of 5.0mg/L 44.2% of the time. Appendix B of Water Quality study report indicates 1921 of 4341 readings taken during the generation periods in June-October range from 2.58-4.99 mg/L DO. • The 2018 data collected at the Generation Monitoring site in July, August and September indicate that DO values fell below the DO minimum standard of 5.0mg/L 18.3% of the time. Appendix B of Water Qualtiy study report 2021 indicates 301 of 1643 readings taken during generation periods July-September range from 4.22-4.99 mg/L DO. • The 2019 data collected at the Generation Monitoring site indicate there are several times in June, August and October and that the DO fell below the DO minimum standard of 5.0mg/L. The 2020 data collected also indicate there are several times in August, September and October the DO fell below the DO minimum standard of 5.0mg/L. • The 2019 data collected at the continuous downstream site indicate that during June, August and October the DO fell below the DO minimum standard of 5.0mg/L. • The 2020 data collected at the continuous downstream site indicate that during July, August, September and October the DO fell below the DO minimum standard of 5.0mg/L. As noted in the revised Exhibit S March 24, 1980 letter (AP to FERC page 3-4) in the Water Quality section, "To further assure 5ppm or better of dissolved oxygen in the turbine discharge" Alabama Power Company incorporated an aspiration system into the turbine discharge that provides up to 2ppm increase in DO. This type of system is in use in many of Alabama Power's existing facilities. Section 6.2 of the WQ report indicates that this aeration system was tested in 1983 and found to increase DO by an average of 1.37 mg/L. The 2016 test run resulted in an increase average of 1.1mg/L.	Comment noted.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Water Quality	Alabama Power Response
		Consistent with March 24, 1980 letter from AP to FERC, as technological advances/upgrades become available, such as the aeration system, movable sill system, etc., they will be incorporated in order to "maintain or enhance water quality downstream of the project" including the "Maintenance of minimum stream flows" and "Maintenance of 5ppm dissolved oxygen in discharges". Comment: The EPA recommends (besides the known aeration system) reaching out to other sources regarding additional technologies to mitigate DO levels. Additionally, it is noted in the Draft Downstream Release Alternatives Phase 2 Report that the current movable sill is in its highest position, therefore, we suggest determining whether modifying/retrofitting the sill can benefit DO or temperature levels.	
EPA		Alabama's DO standard (circa 1968) includes a provision that new hydroelectric generation impoundments and new hydroelectric generation units to existing impoundments be designed so that the discharge will contain at least 5 mg/l DO (at all times) where it is technologically possible. The standard also includes a provision that the State, EPA and parties responsible for impoundments coordinate to improve the design of existing facilities and further ensure that the DO standard will be met. This certification process provides an opportunity for the coordination effort that is part of the State's DO standard. Page 294-300 of Attachment 2 Final Water Quality Report, Exhibit S (Mar 24, 1980 of FPC Dec 27, 1973 license page 3-4) includes the subsections entitled Maintenance of minimum stream flows and Maintenance of 5ppm dissolved oxygen in discharges which are contained under the section entitled Water Quality. Also, as noted in the letter from AP, the revised Exhibit S describes measures that will be taken to maintain or enhance water quality downstream of the project consistent with the license application requirements.	Comment noted.